Honeywell

HC900 Hybrid Control Designer

User Guide

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Industrial Measurement and Control

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About This Document

Abstract

The **Hybrid Control Designer** program operates on a PC with Windows NT/ 2000/ ME. It lets you edit, view and monitor HC900 Hybrid Controller control strategy configurations and edit your Operator Interface menu, screen and button configurations. It uses graphic symbols and line drawing connections to represent control strategies. Completed configurations are loaded into the control system using a dedicated communication port in the controller.

References

The following list identifies all documents that may be sources of reference for material discussed in this publication.

Document Title	Doc ID
HC900 Controller Technical Overview	51-52-03-31
HC900 Controller Installation and User Guide	51-52-25-107
HC900 Operator Interface User Guide	51-52-25-108
HC900 Hybrid Controller Function Block Reference Guide	51-52-25-109
HC900 Hybrid Controller Communications User Guide	51-52-25-111

Contacts

World Wide Web

The following lists Honeywell's World Wide Web sites that will be of interest to our customers.

Honeywell Organization	WWW Address (URL)
Corporate	*http://www.honeywell.com*
Industrial Measurement and Control	*http://www.honeywell.com/imc*

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Contact us by telephone at the numbers listed below.

	Organization	Phone Number	
United States and Canada	Honeywell	1-800-423-9883	Tech. Support
		1-888-423-9883	Q&A Faxback (TACFACS)
		1-800-525-7439	Service

Symbol Definitions

The following table lists those symbols that may be used in this document to denote certain conditions.

Symbol	Definition
DANGER	This **DANGER** symbol indicates an imminently hazardous situation, which, if not avoided, **will result in death or serious injury**.
WARNING	This **WARNING** symbol indicates a potentially hazardous situation, which, if not avoided, **could result in death or serious injury**.
CAUTION	This **CAUTION** symbol may be present on Control Product instrumentation and literature. If present on a product, the user must consult the appropriate part of the accompanying product literature for more information.
CAUTION	This **CAUTION** symbol indicates a potentially hazardous situation, which, if not avoided, **may result in property damage**.
	**WARNING** **PERSONAL INJURY:** Risk of electrical shock. This symbol warns the user of a potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 Vdc may be accessible. **Failure to comply with these instructions could result in death or serious injury.**
	ATTENTION, Electrostatic Discharge (ESD) hazards. Observe precautions for handling electrostatic sensitive devices
	Protective Earth (PE) terminal. Provided for connection of the protective earth (green or green/yellow) supply system conductor.
	Functional earth terminal. Used for non-safety purposes such as noise immunity improvement. NOTE: This connection shall be bonded to protective earth at the source of supply in accordance with national local electrical code requirements.
	Earth Ground. Functional earth connection. NOTE: This connection shall be bonded to Protective earth at the source of supply in accordance with national and local electrical code requirements.
	Chassis Ground. Identifies a connection to the chassis or frame of the equipment shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.

Table of Contents

Overview

Software Overview

The Controller and Operator Interface configurations are performed using HC900 Hybrid Control Designer software on a PC operating with Windows™ NT, ME, or 2000 Operating Systems.

Easy-to-use Windows-based software, operable over Ethernet or via an RS232 port or modem connection, simplifies controller and operator interface configuration . It provides advanced monitoring functions for debug, uploads the complete, annotated graphic controller and operator interface configuration, and supplies an array of printouts for enhanced documentation.

In some instances, an On-line configuration download capability allows configuration changes such as block additions or block substitutions to be made, with restrictions, without switching the controller to program mode, avoiding initialization.

Once a configuration is installed into the controller and operator interface, the software may be used to develop or change recipes, edit data storage schedules, monitor areas of the configuration to verify proper operation, or perform calibration functions.

Hybrid Control Designer Configuration Software

Features

- Graphic drag and drop, soft-wire configuration
- Supports on-line configuration changes
- Configuration upload that includes graphic configuration to recreate the function block diagram and OI assignments
- Configures Controller and Operator Interface in an integrated environment
- ConfiguresView OI data storage, e-mail alarms
- Configures recipes (Variables only), SP profiles, SP schedules, sequences with on-line operation, provides easy file generation for media transfer to HC900 OI's locally and file management.
- Configuration partitioning using "Worksheets"
- Extensive monitoring tools including watch windows, concurrent detailed block parameter windows, digital/logic power flow via color coding, live data at block pins, and a signal traceback facility
- Windows NT, 2000, ME support
- Use Ethernet or RS-232 to access controller

Worksheets

Worksheets are a logical partition of a configuration and selected by tabs that appear on the Main Window.

A configuration is built using four main elements (or Worksheets) of configuration.

The user-friendly graphic development environment allows partitioning of the control strategy into up to 20 "worksheets" of 20 pages each. This allows the configuration to be organized according to process function, allows faster configuration access, and improves documentation.

The configuration originator may apply additional security to specific worksheets to prohibit access to proprietary operations while allowing other users to modify unprotected worksheets or generate recipe and data storage files.

Blocks are simply selected from a categorized list, dropped on a selected worksheet page, and soft-wired to other blocks directly or via tag references. Editing tools such as box copy and paste speed development.

Monitoring

On-line monitoring tools allow quick analysis of execution problems. These include:

- Multiple function blocks monitor access on a single display from multiple worksheets. Most internal parameters are available for read/write plus block outputs may be forced including I/O and logic blocks. Major blocks such as PID, Setpoint Programmer and Sequencers have dialog boxes to allow operation and test. Stored profiles or sequences may also be selected on-line.
- User-selected Watch Window lists allow access to digital and analog I/O, Signal Tags, Variables (for write actions), and custom display data groups by tab selection. A user-defined watch window provides custom association of parameters for a debug session. Watch windows also allow write (or force) capability.
- Logic power flow indication using color-coded soft wiring for digital connections to and between block pins including signal tags and connectors
- Live data at block pins (analog floating point or digital status) on a complete block or pin basis.
- Signal Trace-back, for any input to a block, for finding the signal sources for quick identification of potential errors.
- A Forced Blocks window shows all forced outputs and allows release of force conditions individually.
- Data update selection as fast as 250 ms.
- Retention of monitoring setup when moving back and forth between editing and monitoring modes.

The user-selected, dockable Watch Window lists and Signal Trace-back finds the signal sources and provides a clear view of the configuration operation allowing quick identification of potential faults.

Read/write interaction is provided for most blocks including PID, Setpoint Programmer and Sequencers.

A FIND function allows location of multiple instances of specific tags, variables, and function blocks across all worksheets. A right click on any signal tag also allows selection of a "Find Where Used" listing for fast access to tag destinations and return to the tag source.

Configuration Download

Configuration download capability (Hot Start) allows configuration changes such as block additions or block substitutions to be made, with restrictions, without switching the controller to program mode, avoiding initialization (Cold Start). Corrections or additions are executed shortly after download – within 3 normal scan cycles. For scan information, refer to the HC900 Hybrid Controller Installation and User Guide.

Operator Interface Configuration

Configuration of the Operator Interface is an integral part of the controller configuration. Controllers that have been configured with Operator interface data provide the necessary display format data. This unique attribute guarantees compatibility of the controller and user interface databases and greatly simplifies product maintenance.

Hybrid Control Designer configuration software uses the database of the function block control strategy to develop operating displays for the Operator Interface. A large selection of display templates is provided that may be assigned quickly and easily to the Operator Interface.

Additional Software Functions

In addition to creating displays and defining display access, Hybrid Control Designer software allows users to set up data archiving schedules, develop recipes, create alarm grouping, establish operator security and define a number of other operator interface attributes.

Documenting your configuration is supported through a variety printable presentation formats. A few of these include a summary of the controller I/O, the graphic configuration diagram, function block properties, recipe groups, setpoint profile groups, Operator Interface display and point selections, among others.

Recipe/Data Storage File Generation

Recipes and data schedules may be defined within the configuration and/or created as files (via File New) for external file transfer to HC900 operator interfaces via storage media (floppy disk or ZIP disk) or for file management.

Reports

Documenting your configuration is supported through a variety of report formats. Each can be print-previewed. A few of these include a summary of the controller I/O used, function block worksheet selection (each page of diagram worksheet printed as 8.5 x 11" sheet), function block properties, variable and tag parameters, Modbus addresses, Data Storage Settings, recipe listings, setpoint profile listings, sequencer listings, setpoint scheduler listings, OI display groups, Alarm and Event Groups, and controller setup.

Function Block Configuration development

Function Block configuration development is performed using "Drag and Drop " techniques for positioning graphic icons on a FBD Worksheet from a list of available functions. Once dragged and dropped from the Item list onto any FBD worksheet, you can double-click on a block and open a Properties page in which you can configure the specific parameters of that block.

Signal flow connections from icon to icon form the flow of the control strategy by using either softwire connections or named tags to complete the controller configuration.

You can create up to 20 graphic diagrams, 1 page high by 20 pages wide. The completed diagram may be printed on 20 pages of 8.5" x 11" paper. Completed configurations may also be saved on a 3.5" floppy disk and loaded into the controller through a 3.5" floppy disk drive in the operator interface unit, thus eliminating the need for a direct connection of a PC to the controller.

Hardware and Software requirements

Specification	Description
PC Requirements	**CPU:** Pentium, 200MHz **Operating System:** Windows NT, Windows ME, Windows 2000 **Display Color:** Minimum resolution (256 color x 1024 x 768 resolution) **Pointing Device:** Mouse, Trackball or compatible device **RAM:** 64MB Minimum **Removable Disk Drive:** CD Drive **Ports:** RS232, Ethernet
System Interconnection	Connected to the controller through its RS232 Port using PC Port (COM1 - COM8) **Maximum Distance between Controller File and PC:** 50 Feet **Cable Type:** Standard 9 Pin null modemRS232 **Cable Termination:** 9-pin "D" connector Connected to the controller through its Ethernet Port **Maximum Distance between Controller**

Specification	Description
	File and PC: 100 meters (368 feet) w/o repeaters **Cable Type:** CAT 5 shielded twisted pair IEEE 802.3 **Cable Termination:** 10/100 baseT RJ45
Configuration	**Off-line** Configuration or, with restrictions, make incremental configuration changes and download them to the controller without taking the process off-line. **On-line** Monitoring allows the user to test the developed configuration.
Modem Support	*PC Interface:* Supports Microsoft Windows Telephony API (TAPI) device independent modem communications. Baud rate = 9600, 19200, 38400. *Controller Interface:* Connects to the controller RS-232 configuration port. *Some commercially available modems with equivalent specifications to those validated should function with the HC900 controller. For validated Modems, see "HC900 Controller and Installation Guide".*

How To Use This Help

Introduction

This section briefly describes the help system included with the HC900 Hybrid Control Designer , and gives instructions on how to use the different types of help offered with the program.

This help system uses the same conventions as Help for Windows ’95 and "NT" regarding the following:

- Help window
- Accessing help from the help menu
- Help system’s contents page
- F1 key
- Search Function

On-line help system

The on-line help system offers a convenient and quick way to get information about the task that you are performing in the application.

The help system offers context-sensitive help which means that at any time you request help, a help topic appears that pertains specifically to where you are in the program.

For example, if you are focused on a particular program window, dialog box, or entry field, you will get a help topic that describes that particular area.

Requesting Help

To request Help on any area of the application, use one of the following methods:

• HELP MENU

This is the last item on the menu bar. Choose a Help topic from the Help menu.

Help Topics

From the Help menu, click "Help Topics". The Help Contents tab appears. This is a list of all Help topics available including Menus, Configuration Parameters, and Toolbar. Selecting a topic causes information about that topic to be displayed. If the information about a topic exceeds the height of the window, a vertical scroll bar will be displayed.

About Honeywell Hybrid Control Designer

Copyright or version information about the application.

PRESS F1

Press F1 to get help in any of this area:

Configuration Dialog Boxes

Get a definition of any Dialog Box Parameter selection on the applications window.

• RIGHT-CLICK FOR HELP TOPICS

Right-click on any Function Block to access topic help for that particular Block.

Help navigation

When you finish reading about a topic, you can choose one of the commands along the top of the help window to navigate through the help system.

	View the top-level Help Contents page.
	Return to previously viewed information. When you choose the Back button, you retrace your path through the help topics you have already viewed.
	Prints Help topic.
	Move forward one help screen.
	Move back one help screen.

What to Know Before You Start

Rack, Module, and Channel Assignments

The controller contains one or more racks. Each rack contains I/O modules and each I/O module contains a number of channels. Each rack, module and channel is assigned a number in the configuration that corresponds to a physical location in the installed racks.

Before starting, determine the I/O content of the controller racks. Although configurations can be constructed using default I/O locations, the recommended configuration approach is to first verify that the proper I/O is available to execute the desired configuration, and to record the location of each I/O Rack, Module, and Channel so that they may be properly entered during configuration file development.

Please note that there are **NO** expansion racks permitted on HC900-C30 controller.

 To allow for and facilitate future expansions and modifications, it is usually a good idea to leave some IO module slots vacant in each rack, since in software configuration of the IO, the identification of each IO point depends on the physical position of the IO hardware (Rack #, Module #, and Channel #). If all module slots in a rack are full, addition of one IO module to a given rack could require hardware and software modifications for one or more other IO Racks in the system.

Refer to the Honeywell Controller Installation and User Guide's hardware configuration checklist for your Rack, Module, and Channel addresses for I/O Function Blocks in the Function Block Diagram configuration.

Implementation

Starting the Application

When the application is started, the only viewable parts are the File Browser and the Worksheet Toolbox.

Go to the **Main Toolbar** or the **File Menu** and select:


or NEW - Displays a "Choose a New File Type" dialog box with three tabs.

New Configuration:
Select the "**Configuration**" tab. From the drop-down menus, select Controller and Revision. Click OK and a new Hybrid Control Designer Configuration file is listed in the File Browser and a new diagram is placed in the Main Window area.

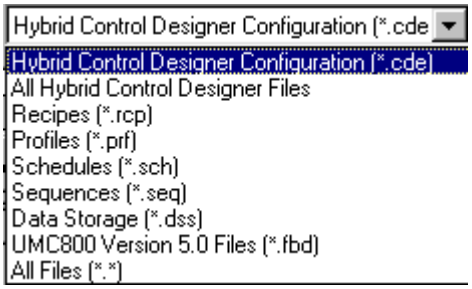
New Recipes:
Select the "**Recipe**" tab. On the tab, click on a radio button to select one of the following:
Recipes (Variables)
Setpoint Profile
Setpoint Schedule
Sequence

Click OK. The associated "Editor" dialog box will appear and a new "Opened Recipe File" is listed in the File Browser. Refer to the specific Recipe type for specifics.

New Data Storage:
Select the "**Data Storage**" tab. On the tab, click on a radio button to create a new Data Storage File

or


or OPEN. - Displays the *"Open"* dialog box.
From the "Files of Type" drop-down menu, select a file type.



Navigate to folder where the file is stored.
Click on the desired file name, then click "OPEN".

or


or Upload (Configuration) - The Upload File dialog box will appear. A temporary file name will be place in the "File Name" box.
Check the current connection. This will indicate over which communications port the upload will occur.
Change the current connection, if necessary, prior to beginning the upload.
Press "START". The dialog box will show "Percent Complete".
The Uploaded Configuration File (.cde) will appear with a temporary file name.
From the "File" menu, select Save or Save As and enter a file name and path in the appropriate fields.

Connecting the PC to the Controller

The PC can be connected to the Controller by:

- Direct Serial RS-232 connection
- Modem connection via Remote Access.
- Direct Ethernet connection
- Networked Ethernet connection

For details refer to the HC900 Hybrid Controller Installation and User Guide, document 51-52-25-107, section "Connecting the HC900 Controller to a PC with the Hybrid Control Designer Software."

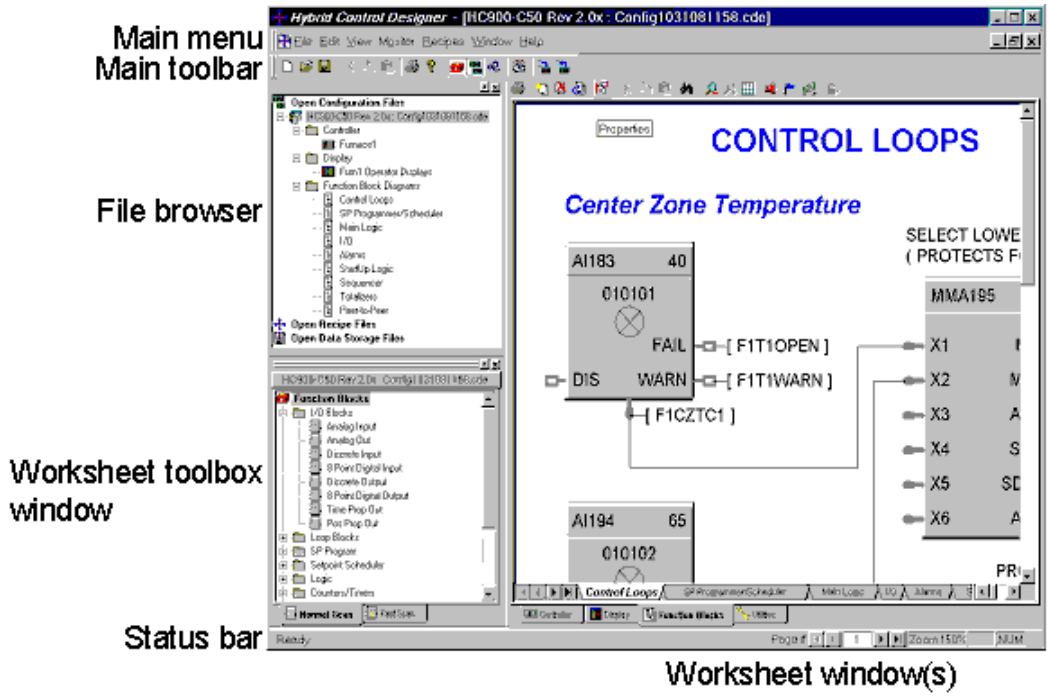
User Interface

User Interface Overview

The main components of the User Interface are:

Main Menu

- Main Toolbar
- Worksheet Window(s)
- File Browser
- Worksheet Toolbox Window
- Status Bar



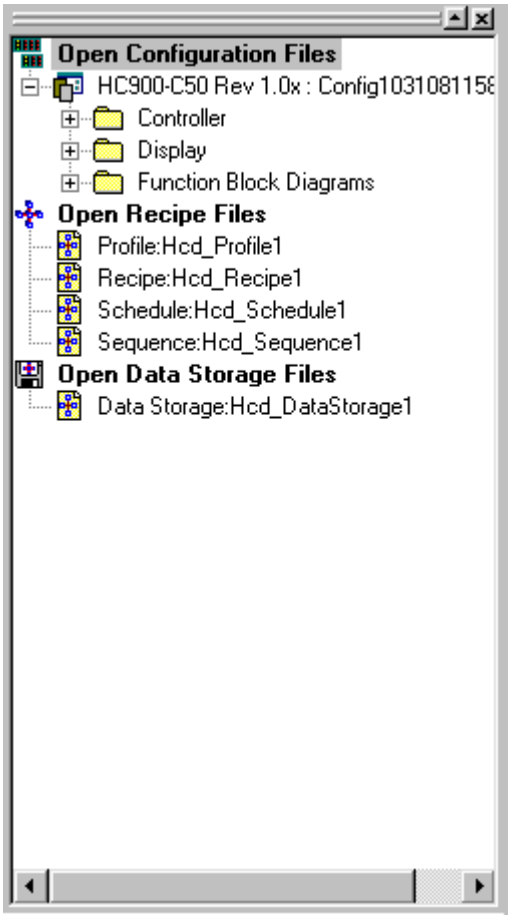
Main Window Area

General Terminology

Term	Definition
Browser	Defaults to the top left side of the Worksheet is a dockable window listing opened files. It allows you to move quickly between files and worksheets.
Configuration Files	A Configuration File contains a Control Strategy that you have created best suited for your application. All Open Configuration Files appear in the Browser Window
Recipe File	A Recipe File refers to one of 4 types of user files – a "Recipe" file consisting of Variables only, a Setpoint Profile, a Setpoint Schedule, or a Sequence.
Data Storage File	A Data Storage File contains a data storage schedule for loading at the operator

Term	Definition
	interface via storage media.
Function Blocks	A Function Block is a unit of software that performs a set of operations on its *Input Signals* and *Function Block* parameters and produces *Output Signals.* These output signals can be configured as inputs to other blocks, whose output parameters can be configured as inputs to other function blocks, and so on.
Main Window	The Main Window contains Menus, toolbars and worksheet window plus other items that help you navigate through the application.
Menu	The Main Menu is a top-level menu for this application. You select (highlight) a menu and then choose a command from the drop-down menu. Choosing the command carries out the action.
Status Bar	The status bar is located along the bottom of the window. It indicates information about the current window, the time, the date, download, upload, monitoring and network information. This status bar can be displayed or not displayed from the "View" menu.
Tab	A configuration is built using three main worksheet types: Controller, Display, and Function Blocks. Select the desired tab , located at the bottom of the configuration window for type of worksheet. There are also Tabs in the Function Block Diagrams that allow you to navigate around the multiple FBD Worksheets.
Toolbox	The Worksheet Toolbox, located on the lower left side of the Worksheet, is a dockable window and lists all the function block by category separated by fast and normal scan tabs at the base of the toolbox.It allows you to drag and drop function blocks onto FBD worksheets.
Trace Window	Helps you find problems with soft-wire and signal connections between Function Blocks.
Watch Summary Window	The Watch Summary window lets you monitor the following groups of data from the controller: Signal, Variables, I/O. OI Display Groups.
Worksheet	A Worksheet is a logical partition of a configuration. A configuration is built using three main Worksheet) types: Controller, Display, and Function Blocks. A fourth worksheet type)Utilities) included Maintenance functions for the controller.

File Browser Window



The File Browser is a dockable window listing open configuration files, open Recipe files and open Data Storage files.

It allows you to move quickly between configurations and worksheets.

Double-click on a worksheet in the browser and it will make it the active view.

You can collapse or expand the tree and you can enlarge or shrink the size of the window.

It can be enabled or disabled from

The main menu (VIEW),

Main Toolbar button, or

Right click on the FBD white space (VIEW)

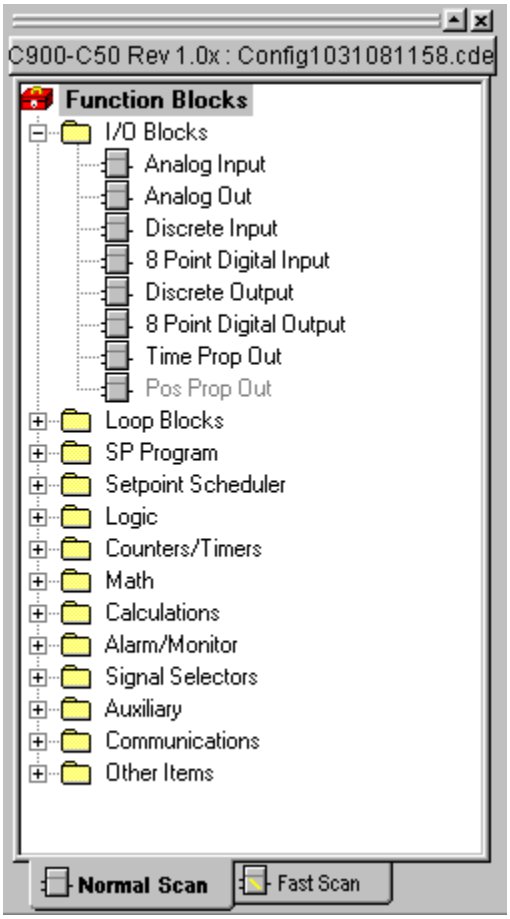
Right-click on the **Controller** worksheet to view its properties. The "Controller's Identification" dialog box will appear. You can change the controller's name and view the controller type and revision.

Right-click on a **Function Block Diagram** worksheet to view its properties. Append New Worksheet, or Delete the selected worksheet.

Protected Worksheets will show a lock symbol in the worksheet Icon.

Right-click on a **Configuration Name** to close the configuration or view the Configuration's properties.

Worksheet Toolbox Window



The Worksheet Toolbox is a dockable window listing all function blocks. **The name of the active configuration appears at the top of the window**. Function blocks are categorized under Normal Scan and Fast Scan, shown at tabs at bottom of window.

Click on either tab to display its available function blocks.

Click on a Function Block and drag and drop it onto FBD worksheets. Double clicking on any function block will provide access to the details of that block.

You can collapse or expand the tree and you can enlarge or shrink the size of the window.

It can be enabled or disabled from

The main menu (VIEW)

Main Toolbar button, or

Right click on the FBD white space (VIEW)

Click on the "Header Button" to view the active configuration's file statistics.

Traceback Window

This feature helps you find problems with soft-wire and signal connections between Function Blocks.

For Example:

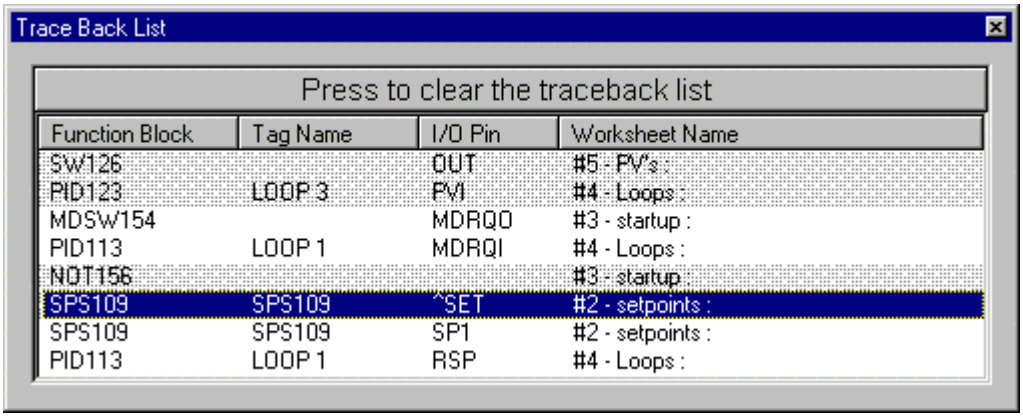
If you are testing a configuration that you've built and want to know why a Digital Output is ON when it should be OFF, you can search for the source of the Input Signal.

Traceback is useful for finding the analog or digital source signal.

Trace Window

Access the Trace Window from the Main Menu Toolbar 

Or, from the View Menu on the main menu.



It is a dockable, sizeable window.

The Trace Window provides a list of all blocks/pins you have traced and lists :

- Block ID
- Tag Name
- I/O Pin Name
- Worksheet name

Trace Window Update

Each time you perform a Trace, the window will update with a new pair of block/pins.
The ***first item*** is the ***signal source***, the ***second item*** is the ***signal destination***.

Select any of the rows in the Traceback window to recall the diagram to display the selected block.

The last trace is on the top of the list.

Right Mouse Click Procedure to Trace Signals

Select a Function Block of interest.

Right Mouse click on any INPUT pin.

Select "TRACE". Traceback will "find" the source of the connection you selected and refresh the FBD view with that block visible (Highlighted) - even if the other side of the connection is on a ***different*** worksheet.
The Output pin of the block (the signal source) will be displayed in RED.

From that block, repeat the traceback to another block and another block, etc.

Use the Traceback list to view your Traceback history.

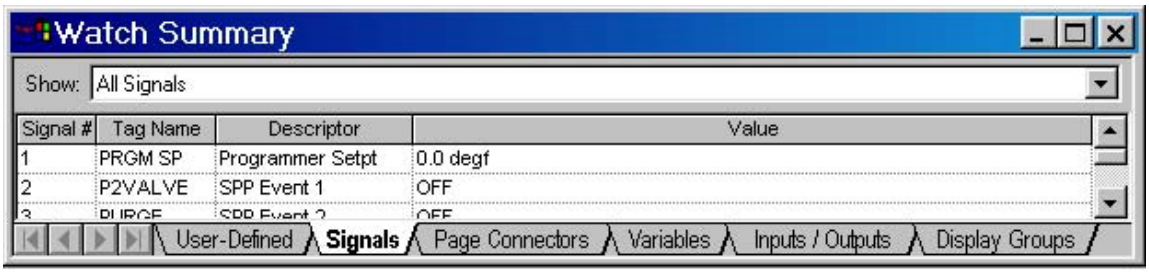
You can clear the Trace List by pressing the bar at the top of the window.

Watch Summary Window

 accesses the Watch Summary Window from the Monitor Toolbar

Or, the menu item "Watch Summary" from the Monitor Menu on the main menu.

This is a view of the Watch Summary Window. It is a Dockable (movable), sizable window.
[Press and hold the CTRL key down to prevent Docking when moving the window]



There are five tabs at the bottom of the window that lets you monitor the following groups of data from the controller. Click on any of the tab titles below **to view an example** of the selected data for that tab. All parameter listings may be **sorted** by column.

- User Defined (Customized list of Variables, Signal Tags, Page Connectors)
- Signals (can be filtered by type - All, Analog, Digital)
- Page Connectors (can be filtered by type - All, Analog, Digital)
- **Variables** (can be filtered by type - All, Analog, Digital)
- I/O (can be filtered by type - AI, AO, DI, DO)
- OI Display groups (Overviews, Panel Meters, Alarms, Trends, etc)

Docking and Undocking the Window

Double clicking in the Title Bar area of the Watch Summary Window will toggle its docked state. If the window is docked, double clicking in the title bar area will undock the window.

If the window is Undocked
- double-clicking in the title bar area will dock the window at it last docked position
- Dragging the window to the top, bottom, left, or right edge of the main viewing area of the application will dock the window at that location

[Press and hold the CTRL key down to prevent Docking when moving the window]

Hot Links

You can click on any I/O function block or Signal on the Controller Worksheet or any I/O function block, Signal, or Variable in the Watch Window and that item will be located on the Function Block Diagram.

As you move the mouse over a HOT LINK, the text changes to Underlined Blue and

the cursor changes to a Hand.

Writes or Forces

By clicking on the item in the Value column, you may write a value such as for a Variable or force a value for an analog input or digital input. For I/O, a Forced column will indicate that the I/O point is forced.

Status Bar

The status bar is located along the bottom of the application's window. It indicates information about the current window. It can be turned on or off in the "View" Menu.

Menu Item Description - The text string at the far left on the status bar gives a brief description of the menu item in focus. If you pull down a menu list and position the cursor on a menu item this field will describe the menu item.

Connected Field - To the left of the Page Number indicator are two fields that are visible when you are in Monitor Mode. One indicates "Connected" and the other is a green LED that flashes when communications is active between the PC and controller.

Worksheet Page Number -To the left of the Zoom indicator is a page number field. This will display the page number of the **current FBD Worksheet**. It is blank for other worksheet types (Display, Controller, and Utilities). There are scroll buttons to navigate through pages of the worksheet.

Zoom Level – indicates the level of Zoom active on the worksheet. (i.e 100%)

Active Keyboard Keys - Toward the far right, you will see indicators to alert the user that the Caps Lock key on the keyboard is active , the NUM lock on the keyboard is active, or the SCRL (Scroll Lock) key is active.

Menu Conventions

The following menu conventions are used:

Menu Convention	Meaning
Dimmed command	You will not be able to use this command at the current time. (For example: You may need to select another item before using this command.)
An ellipsis (**...**) following a command	A dialog box will appear when you choose this command. The dialog box contains options you need to select before the command can be completed.
A check mark next to a command	The command is in effect. When you remove the check mark (by selecting the command), the command is no longer in effect.
A key combination next to a command	The key combination is a keyboard accelerator *shortcut* for this command. You can use this key combination to choose this command.
A triangle next to a command	When you choose this command, a cascading menu appears, listing additional commands.

Selecting a Menu

In this application, you select (highlight) a menu and then choose a command from that menu. Choosing the command carries out the action.

To choose an item from a selected menu:

Mouse

Using the mouse pointer, point to the name of the menu on the menu bar, and click the left mouse button. This opens the menu. To move directly to a menu item, drag the selection cursor down the menu until the desired item is highlighted, then release the button.

UP/Down Arrow Keys

Press the “ALT” key to highlight the menu bar then use the UP/Down arrow keys on the keyboard to select the item, then press “Enter”.

Underlined Letter

If a name in the menu bar has an underlined letter you can press ALT and then type the letter that’s underlined to open the menu.

For example: to open the FILE menu in the Hybrid Control Designer main window, press ALT+F.

Closing a Menu

To close a menu:

- Click the menu name or anywhere outside the menu, or
- Press ESC to close the menu but remain on the menu bar so that you can make another selection

Main Drop-down Menus

Main Menu

The Main Menu is located across the top of the User Interface. The menus are:

File Menu

Edit Menu

View Menu

Monitor Menu

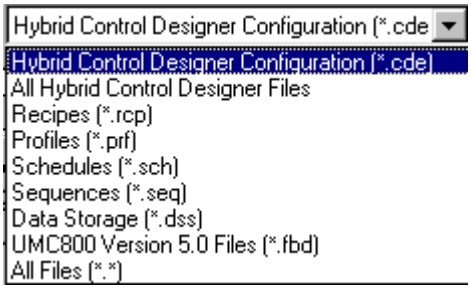
Recipes Menu

Window Menu

Help Menu

File Menu

Menu Selection	Function
New *Toolbar*:  *Shortcut*: CTRL+N	Displays a "Choose a New File Type" dialog box with these tabs: ***New Configuration:*** Select the "**Configuration**" tab. From the drop-down menus, select Controller and Revision. Click OK and a new Configuration file is listed in the File Browser and a new diagram is placed in the Main Window area.

Menu Selection	Function
	New Recipes: Select the "**Recipe**" tab. On the tab, click on a radio button to select one of the following: Recipes (Variables) Setpoint Profile Setpoint Schedule Sequence Click OK. The associated "Editor" dialog box will appear and a new "Opened Recipe File" is listed in the File Browser. Refer to the specific Recipe type for specifics. ***New Data Storage:*** Select the "**Data Storage**" tab. On the tab, click on a radio button to create a new Data Storage File
Open … *Toolbar*:  *Shortcut*: CTRL+O	Displays the *"Open"* dialog box. From the "Files of Type" drop-down menu, select a file type.  Navigate to folder where the file is stored. Click on the desired file name, then click "OPEN". Opens files and converts UMC800 (*.FBD) configuration files.
Close	Closes the active document window. It will also close a minimized window if active. [It will not close an active dialog box.]
Save *Toolbar*:  *Shortcut*: CTRL+S	Saves the active configuration. First time save displays the "*Save As*" dialog box.
Save As ...	Displays the *"Save As"* dialog box. Prompts user to name the active configuration and select the file in which the file is to be stored.
Download	Configuration Download transfers a saved configuration **FROM** the PC **TO** the controller. The Controller may be in either RUN or PROGRAM mode.
Upload Configuration	Configuration Upload transfers a configuration **FROM** the controller **TO** the PC including graphic function block pages, text annotations, stored recipes/profiles/schedules/sequences, OI display assignments, OI data storage setup. The uploaded file name, as a default, will include the controller name, alias name (if assigned) and network name (if assigned). The Controller may be in ANY mode.

Menu Selection	Function
	No configuration file is required to be opened prior to the Upload Request
Upload…	Opens the "Upload" dialog box that lists the type of recipes available to upload. Click on a radio button to select one of the following: Recipes (Variables) Setpoint Profile Setpoint Schedule Sequence Data Storage. Upload transfers a recipe **FROM** the controller **TO** the software.
Hang Up Modem	When communicating with a controller via a Modem, select this to disconnect the Modem from the controller.
Properties ...	Displays the *"File Properties "* dialog box. Tabs allow user to fill in Configuration **File properties**, read Configuration File **Statistics (**capacity usage), **read protection**, and worksheet protection (password access to individual worksheets)
Write Protect File ...	Displays the *"Add Write Protection"* dialog box. Can enter and confirm a password for the selected file. Use the check box to turn "Write Protect" on or off.
Print Report *Toolbar:*  *Shortcut*: CTRL+P	Displays the "Print Report" Dialog box. Lets you choose reports for printing from 5 different categories: Controllers Function Block Diagrams Displays Recipes Alarms and Events
Print Report Preview	Lets you choose a report preview (Print Preview) for printing from the 5 categories: Controllers Function Block Diagrams Displays Recipes Alarms and Events The selected report is displayed on the screen as it will look when printed.
Export Report	Lets you export reports as files in comma or tab separated format.
Print Setup ...	Displays *"Print Setup"* dialog box. Allows user to select printer, paper type, and orientation.
Most Recent Files	Lists the most recent files that were open.
Exit	Exits the application.

Edit Menu

Menu Selection	Function
Undo *Toolbar*:  *Shortcut*: CTRL+Z	Click once to undo the last action. Click on the down arrow to see all previous actions. To undo several actions, move mouse to an earlier action and click on it: all actions from that action forward are undone. If you accidentally undo an action, use redo. You can undo only actions that affect the contents of the configuration; you can't undo actions that affect the display of the configuration (such as zoom).
Redo *Toolbar*:  *Shortcut*: CTRL+Y	Click once to redo the last Undone action. Click on the down arrow to see all Undone actions. To redo several actions, move mouse to earliest desired action and click on it: all actions from that action forward are redone. If you accidentally redo an action, use undo. You can redo only actions that affect the contents of the configuration; you can't redo actions that affect the display of the configuration (such as zoom).
Cut *Toolbar*:  *Shortcut*: CTRL+X	Moves the currently selected FBD diagram items from the current Function Block diagram and places them on the clipboard. Indicated by a red dotted line. Upon pasting the items, all links to them (e.g., display references, Modbus address, recipes) are preserved as if they were moved, they are not deleted and pasted as a new copy.
Copy *Toolbar*:  *Shortcut*: CTRL+C	Copies the currently selected FBD diagram items from the current Function Block diagram and places it on the clipboard. Indicated by a blue dotted line.
Paste Toolbar:  *Shortcut*: CTRL+V	Places the contents of the clipboard containing FBD diagram items onto the Function Block Diagram at the location determined by the blinking insertion point caret. This command is unavailable if the clipboard is empty. Cut and pasted items maintain their links (e.g., display references, Modbus addresses, recipes), they are not deleted and pasted as a new copy. If you paste a cut (not copied) function block and soft wires to the same or different worksheet in the same configuration, the soft wires will be dangling (unconnected) and you are asked to specify how you want to resolve dangling soft wires.
Delete	Deletes the currently selected item on the function block diagram.
Append FBD Worksheet	Adds a new Function Block Diagram. A new tab will appear at the bottom of the diagram window. The new diagram reference will be placed in the File Browser. Click on FBD name to edit.
Delete FBD Worksheet	Deletes the selected Function Block Diagram and its reference in the File Browser.
Reorder FBD Worksheets…	Opens the Worksheet order dialog box. Allows you to change the order of the worksheets as they appear at the bottom of the Worksheet area. Click on worksheet name and use the increment-decrement buttons at the top of the dialog box to change the worksheet order.
Worksheet Properties…	Opens the "Worksheet Properties" dialog box. Allows you to enter or editthe Title and Description of the worksheet. Type in a title (24

Menu Selection	Function
	characters) and description (32 characters) for your Worksheet -.
Unlock Worksheets	Displays "Unlock Worksheets" dialog box. Enter password to unlock all protected worksheets. Click on "Unlock".
Block and Tag Order	Opens the " Block Execution Order" or the "Fast Block Execution Order" dialog box to let you re-arrangeblock execution order. Also available from FBD worksheet toolbar. Select "Tag Order" to re-arrange the tags order for: Alternator Operates Device Controls HOA Switches Loops Ramp Operates Sequencers SP Programmers SP Schedulers Stage Operates
Alarms	Opens the "Alarm Group Configuration" dialog box. Lets you set up or edit alarm groups . Also available from FBD worksheet toolbar.
Events	Opens the "Configure Event List" dialog box. Allows you to Set up or Edit Events. Also available from FBD worksheet toolbar.
Modbus Register Map…	Available for configuration revision 2.0 or higher. Lets you "Edit Modbus Register Addresses " dialog box.
Find *Shortcut*: CTRL+F	Searches for an item on the "Find Item" dialog box. Select an item type from the "Show" drop-down menu to search, then select an Item from the "Item" drop down menu. The Tag, Variable, or Function Block will be highlighted on the Function Block Diagram.
Go To *Shortcut*: CTRL+G	Displays the *"Enter Page Number"* dialog box and allows you to enter the page number to which you want to go. (1-20)
Options	Options are: **Warning Level** Allows enable/disable of Open Input and Unassigned I/O warnings. Click on Box to select. **Default Annotation Attributes** Allows the setting of default font characteristics for Text Annotations. **Export Delimiter** Allows setting of export report's default format (comma delimited or tab delimited).

View Menu

Menu Selection	Function
Toolbar	Displays or hides the toolbar in the top of the Main window. Gray box with √ mark indicates display.
Status Bar	Displays or hides the status bar at the bottom of the Main window. Gray box with √ mark indicates display.
File Browser	Displays or hides the File Browser at the top left of the Main window. Gray box with icon indicates display.
Worksheet Toolbox	Displays or hides the Worksheet Toolbox at the bottom left of the Main window. Gray box with icon indicates display. Tabs separate fast scan and normal scan function block types.
Trace Window	Allows you to view the Traceback list.
Phone Book	Opens the "Select the Number to Call" dialog box. Lets you add and delete phone number on the list.
Grid	Displays or hides a Grid on the FBD Worksheet
Zoom Out	Lets you Zoom in out to see more of a document. Zoom levels of 50%, 75%, 100%, 125%, and 150%. Also available from FBD worksheet toolbar.
Zoom In	Lets you zoom in to return items to normal size. Zoom levels of 50%, 75%, 100%, 125%, and 150%. Also available from FBD worksheet toolbar.

Monitor Menu

Menu Selection	Function
Monitor Mode	Enters or exits monitor mode. **While in monitor mode, edits to the configuration cannot be made.** If entering monitor mode, selecting this menu item opens the "Enter Monitor Mode" dialog box.
Monitor Toolbar	The Monitor Toolbar toggles each monitor window listed below:
Set Update Rate	You can specify the monitor update rate that determines how often data is collected from the controller during monitoring.
Watch Summary Window	Toggles the Watch Summary Window that lets you view groups of related data such as I/O and Signal Tags.
Controller Diagnostics	Toggles the Controller Diagnostics Window that lets you view the controller parameters and values.
Rack Diagnostics	Toggles the Rack Diagnostics window that lets you view the Rack Diagnostics, Expansion I/O Comm Diagnostics(C50 CPU only) and the I/O Module parameters and indicators.

Menu Selection	Function
Controller Ports Diagnostics	Toggles the Configuration Port Diagnostics window that lets you view the Configuration Port parameters and values. Configuration Port RS485 OI Port Network Port Expansion I/O Comm (C50 CPU only) Host Connections Peer to Peer Connections
Modbus Master Ports Diagnostics	
Monitor Function Block *Shortcut*: CTRL+M	Toggles the Function Block Monitor Windows that lets you monitor all the parameters of the selected Function Block.
Forced Blocks	Toggles the Forced Block Summary Window that lets you see all the outputs that are being forced and permits release of the force condition for a selected output.
All Function Block Windows	Allows you toggle the function block windows that are open - On/Off.
All Pins	Lets you toggle monitoring values (numeric or On/Off state) at any input or output pin – Display or Hide.
All Monitor Windows	Allows you toggle the Monitor windows that are open - On/Off.

Recipes Menu

Accesses all recipe pools. To learn about the different recipe types read Recipe Overview.

Menu Selection	Function
Recipes (Variables)…	A recipe (variables) is a list of Variables with settings that define the ingredients needed to make a product or run a particular batch. This selection opens the Recipe Pool dialog box and allows viewing, adding, editing, and printing of Recipe details. You can save the selected recipe item to a file; open a recipe file and insert it into the pool; and download the selected recipe item to a controller's recipe pool.
Setpoint Profiles…	Setpoint Program (Profile) configuration provides a quick and easy way to create, edit, and save different ramp/soak (setpoint) profiles for the Setpoint Programmer (SPP) control blocks in the configuration. This selection opens the Setpoint Profile Pool dialog box and allows viewing, adding, editing, and printing of Setpoint Profile details. You can save the selected SPP item to a file; open a SPP file and insert it into the pool; and download the selected SPP item to a controller's Setpoint Profiles pool.
Setpoint Schedules…	Setpoint Schedule configuration provides a quick and easy way to create, edit, and save different Setpoint Schedules for the Setpoint Scheduler (SPS) control blocks in the configuration. This selection opens the Setpoint Schedule Pool dialog box and allows viewing, adding, editing, and printing of Setpoint Schedules details. You can save the selected SPS item to a file; open a SPS file and insert it into the pool; and download the selected SPS item to a controller's Setpoint Schedule pool.
Sequences…	Sequence configuration provides a series of inter-related events used to start-up

Menu Selection	Function
	or shut-down a unit process, or a series of timed and process measurement dependent events that are executed to produce a final product. This selection opens the Sequence Pool dialog box and allows viewing, adding, editing, and printing of Sequence details. You can save the selected SEQ item to a file; open a SEQ file and insert it into the pool; and download the selected SEQ item to a controller's Sequence pool.

Window Menu

Menu Selection	Function
Cascade	Arranges windows so that they overlap making it easy to select a window.
Tile Horizontally	Arranges windows side by side. Each window is visible and none overlap.
Tile Vertically	Arranges windows over and under each other. Each window is visible and none overlap.
Arrange All	Arranges configuration Icons when configurations are minimized.
(Open window designations)	Lists all Function Block Diagrams, recipes, and data storage files that are open and checks the one that is active. Click any file to display it.

Help Menu

Help Topics

Calls up the top level Helps Contents page.

Selecting a **Topic** displays information about that topic. If the information about a topic exceeds the height of the window, a vertical scrollbar will be displayed.

Selecting the **Index** tab lets you type in the first few letters of the word you are looking for.

Selecting the **Find** tab lets you search for specific words and phrases in Help topics, instead of searching for information by category.

About Help

Displays copyright and software version, and user name and company name entered during software's installation.

Right-click Help for Help Topics

Right-click on any Function Block to access topic help for that particular Block

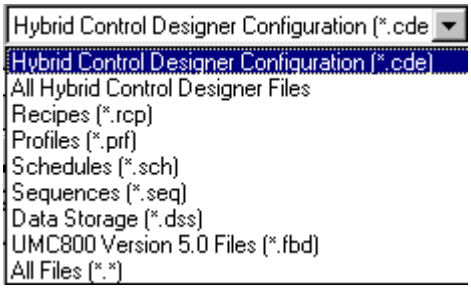
Hotspots

When the cursor is over a hotspot area on an image, it turns to a hand indicating that when clicked some sort of action occurs.

Main Window Toolbar

Main Toolbar Functions

Click on ICON to open a dialog box.

ICON	Function	Dialog Box Comments - Use F1 for Help
	**New**	Displays a "Choose a New File Type" dialog box with these tabs. ***New Configuration:*** Select the "**Configuration**" tab. From the drop-down menus, select Controller and Revision. Click OK and a new Hybrid Control Designer Configuration file is listed in the Hybrid Control Designer Browser and a new diagram is placed in the Main Window area. ***New Recipes:*** Select the "**Recipe**" tab. On the tab, click on a radio button to select one of the following: Recipes (Variables) Setpoint Profile Setpoint Schedule Sequence Click OK. The associated "Editor" dialog box will appear and a new "Opened Recipe File" is listed in the File Browser. Refer to the specific Recipe type for specifics. ***New Data Storage:*** Select the "**Data Storage**" tab. On the tab, click on a radio button to create a new Data Storage File
	**Open**	Displays the *"Open"* dialog box. From the "Files of Type" drop-down menu, select a file type.  Navigate to folder where the file is stored. Click on the desired file name, then click "OPEN". Opens files and converts UMC800 (*.FBD) configuration files.
	**Save**	Saves the active configuration. First time save displays the "*Save As*" dialog box.
	**Cut**	Moves the currently selected FBD diagram items from the current Function Block diagram and places them on the clipboard. Indicated by a red dotted line. Upon pasting the items, all links to them (e.g., display references, Modbus

ICON	Function	Dialog Box Comments - Use F1 for Help
		address, recipes) are preserved as if they were moved, they are not deleted and pasted as a new copy.
	**Copy**	Copies the currently selected FBD diagram items from the current Function Block diagram and places it on the clipboard. Indicated by a blue dotted line.
	**Paste**	Places the contents of the clipboard containing FBD diagram items onto the Function Block Diagram at the location determined by the blinking insertion point caret. This command is unavailable if the clipboard is empty. Cut and pasted items maintain their links (e.g., display references, Modbus addresses, recipes), they are not deleted and pasted as a new copy. If you paste a cut function block and soft wires to the same or different worksheet in the same configuration, the soft wires will be dangling (unconnected) and you are asked to specify how you want to resolve dangling soft wires.
	**Undo**	Click once to undo the last action. Click on the down arrow to see all previous actions. To undo several actions, move mouse to an earlier action and click on it: all actions from that action forward are undone. If you accidentally undo an action, use redo. You can undo only actions that affect the contents of the configuration; you can't undo actions that affect the display of the configuration (such as zoom).
	**Redo**	Click once to redo the last Undone action. Click on the down arrow to see all Undone actions. To redo several actions, move mouse to earliest desired action and click on it: all actions from that action forward are redone. If you accidentally redo an action, use undo. You can redo only actions that affect the contents of the configuration; you can't redo actions that affect the display of the configuration (such as zoom).
	**Print**	Displays the "Print Report" Dialog box. Lets you choose reports for printing from 5 different categories: Controllers Function Block Diagrams Displays Recipes Alarms and Events
	**Help Topics**	Opens Help Topics Table of Contents and Help information screen.
	**Worksheet Toolbox**	Displays or hides the Worksheet Toolbox Window.
	**File Browser**	Displays or hides the File Browser Window.

ICON	Function	Dialog Box Comments - Use F1 for Help
	**Traceback Window**	Displays or hides the Traceback Window.
	**Monitor Mode**	Enters/Exits Monitor Mode and allows On-line Monitoring and Diagnostics. ***When pressed***, the active configuration is in the Monitor mode (and cannot be edited). ***When not pressed***, the active configuration is in the edit mode.
	**Download**	Opens the "Download File" dialog box. Press start to Download file selected to the controller.
	**Upload**	Opens the "Upload File" dialog box. Press start to Upload file selected from the controller.

Navigation

Navigational Tools

Navigational Tools available:

- Main Menus and Main Window Toolbar
- File Browser Window
- Worksheet Category Tabs
- Worksheet Toolbars (Controller, Display, Function Block Diagram, Utilities)
- Find / Go To
- Function Block Help (right mouse click on block)
- Connection Traceback Window
- Finding an Item on the FBD Worksheet
- Hot Links
- Keyboard Navigation

Right Mouse Click

Shown below are the right-click menus.

See also Right Click In Monitor Mode.

Right Click On Function Block Object (not pins)

- **Help -** Calls up Topic Help for Function Block selected
- **Execution Order**
- **Cut**
- **Copy**
- **Paste**
- **Delete**
- Edit Modbus Register Address
- **Properties**

Right Click On Unconnected Function Block pins*

- Signal Tag
- Page Connector
- Analog Variable
- Digital Variable
- Numeric Constant
- Connector
- Paste – Reconnects a signal tag or page connector that you cut from another pin.

*When you drop one of these items it automatically connects to the pin you right-clicked on.

Right Click on Connected Function Block Input Pins

- Trace

Right Click on Variable

- **Help -** Calls up Topic Help for Function Block selected
- **Execution Order**
- **Cut**
- **Copy**
- **Paste**
- **Delete**
- **Add to Modbus Registers**
- **Properties**

Right Click on Signal Tag

- **Help** – calls up help
- **Find Where Used** – Opens Find dialog box. Lets you locate any and all places where the signal tag is used.
- **Cut** -- Cuts the signal tag so you can reconnect (paste) it to a different unconnected pin of the same type (digital or analog). Can reconnect to a different function block. Item is grayed out indicating the cut. Press Esc to cancel.
- **Delete** – Deletes the signal tag.
- **Add to Modbus Registers**
- **Properties**

Right Click on Page Connector

- **Help** – calls up help
- **Find Where Used** – Opens Find dialog box. Lets you locate any and all places where the page connector is used.

- **Cut** --Cuts the page connector so you can reconnect (paste) it to a different unconnected pin of the same type (digital or analog). Can reconnect to a different function block. Item is grayed out indicating the cut. Press Esc to cancel.
- **Delete** – Deletes the page connector.
- **Add to Modbus Registers**
- **Properties**

Click On FB Diagram White Space

- Cut
- Copy
- Paste
- Drop Other Items
- Execution Order
- Fast Logic Order
- Find
- Go To
- View (displays the view menu)
- Properties [File]

Keyboard Navigation

Press	To
LEFT ARROW	Scroll worksheet to the left
RIGHT ARROW	Scroll worksheet to the right
UP ARROW	Scroll worksheet up
DOWN ARROW	Scroll worksheet down
END	Go to the end of last page
HOME	Go to the beginning of first page
PAGE DOWN	Go to the next worksheet page
PAGE UP	Go to the previous worksheet page
CTRL+LEFT ARROW	Go to the end of last page
CTRL+RIGHT ARROW	Go to the beginning of first page
CTRL+UP ARROW	Go to the top of the page
CTRL+DOWN ARROW	Go to the bottom of the page
CTRL+PAGE DOWN	Go to the next worksheet tab
CTRL+PAGE UP	Go to the previous worksheet tab

Other keyboard functions

If necessary, you can use the standard keystroke conventions to move around.

ALT used together with the underlined letter in text labeling an object lets you select that object.

TAB select next field or object in dialog boxes and configuration templates

SHIFT+TAB select previous field or object in dialog boxes and configuration templates

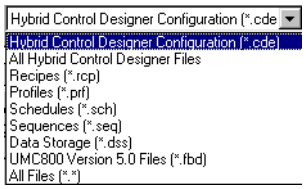
UP ARROW previous choice in the field

DOWN ARROW next choice in the field

ALT+DOWN ARROW opens a drop-down list box

File Management

Opening an Existing File

Select "Open" from the File Menu… or  **from the Main Toolbar** *Shortcut*: CTRL+O	Displays the *"Open"* dialog box. Drop-down the "Files of Type' menu and select a file type.  Navigate to folder where the file is stored. Click on the desired file name, then click "OPEN".
or	From the "File" menu, select one of the most recently opened file listed above the "Exit" item.

Creating a New Configuration File

Select "New" from the File Menu then "Configuration"tab from the dialog box **or**  **from the Main toolbar** *Shortcut*: CTRL+N	Displays a "Choose a New File Type" dialog box. Select the "Configuration" tab. From the drop-down menus, select Controller and Revision. Click OK and a new Hybrid Control Designer Configuration file is listed in the Hybrid Control Designer Browser and a New diagram is place in the Main Window area.

Saving a Configuration File

To Save an Existing File

1. Select "SAVE" from the "FILE" menu or from the Main Toolbar
2. If there are no unconnected inputs that need to be set to OFF or 0, the data is saved automatically.
3. If there are unconnected inputs that have not been previously set to OFF or 0, The Hybrid Control Designer will notify you that there are unconnected inputs and ask if you want to see a list of unconnected inputs.
4. Click "Yes" to view the summary of unconnected inputs.
5. Click "Log File" to save the list to a text file, if desired.

To Save a New File or Save the File as a New Name

1. Select "SAVE AS" from the "FILE" menu. The "Save As" dialog box will open.

Type in the new file name in that field.

2. From the drop-down menu in the "Save as Type" field, select the configuration type depending on the controller you have.
3. If there are no unconnected inputs that need to be set to OFF or 0, the data is saved automatically.
4. If there are unconnected inputs that have not been previously set to OFF or 0, The Hybrid Control Designer will notify you that there are unconnected inputs and ask if you want to see a list of unconnected inputs.
5. Click "Yes" to view the summary of unconnected inputs.
6. Click "Log File" to save the list to a text file, if desired.

Creating other file types

Create/Edit Recipe (Variables): See page 167

Create/Edit Setpoint Profile: See page 170

Create/Edit Setpoint Schedule: See page 176

Create/Edit Sequence: See page 180

Create/Edit Data Storage Settings: See page 83

Conversions

Introduction

Hybrid Control Utilities allows you to convert a UMC800 configuration to a HC900 configuration. After the conversion, any I/O blocks in configuration will not have channel addresses assigned to them nor will you be able to assign addresses. However, you can save the configuration and edit it with HC Designer; you cannot edit it with Hybrid Control Utilities.

Users of UMC 800 controllers will benefit from their product experience and application engineering investment by converting UMC800 version 5.0 (or later) configurations for file compatibility with HC900 controllers. There is no need to re-engineer the application

The UMC800 conversion choice will appear as a file type under the “file open” dialog. The files will be filtered by the extension *.FBD. The file will be opened as a HC900 version 1 configuration.

Considerations

Before you try to import an UMC800 Release 5 configuration, there are some issues to consider.

Consideration:	Reason:
1. If the UMC800 configuration has variables in the event group these variables will not be included in the event group of the imported configuration.	*Only signals can be events in the HC900. Variables can’t be events.*
2. If the UMC800 configuration contains signals that have been assigned to both an alarm and an event group, they will be imported as alarmed signals in the imported configuration. They will not be included in the event group.	*Alarms and events are mutually exclusive in the HC900.*

Consideration:	Reason:
3. With pre-version 2.0 configurations, in some rare instances the imported configuration can have wires connected to the wrong blocks. This can happen when a new IO block expands in size so that the output pin ends up on top of another block's output pin.	*UMC800 pin stealing bug. Bug was fixed in Rev. 2.0.* *The HC900 IO blocks are larger that the UMC800 IO blocks to accommodate for new pins.*
4. The AI, AO, DI and DO blocks can end up slightly outside of the imported page.	*The HC900 IO blocks are larger that the UMC800 IO blocks to accommodate for new pins.*
5. Some of the annotation text can now end up on top of the AI, AO, DI and DO blocks.	*The HC900 IO blocks are larger that the UMC800 IO blocks to accommodate for new pins.*
6. The hardware addresses are reset to zero in the imported configuration.	*The IO addressing (rack, module, channel) in the HC900 is different that in the UMC800.*
7. The following blocks in a UMC800 configuration will cause the import to be aborted: Modbus Slave Modbus Read Modbus Write Frequency Input Pulse Input After importing the configuration as an HC900 Rev. 1 configuration, you can convert the Rev. 1 configuration to a Rev. 2 configuration by performing a Save As command. You can then add Modbus function blocks to this newer configuration.	*These blocks are not present in the HC900 Rev. 1. The configuration can be imported after these blocks are removed.*
8. The sensor input types for the analog input block changed from UMC800 to HC900. Some sensor types in UMC800 are not supported by HC900. Some sensor types are translated to a similar sensor (same type, but the range might be different).	*See Function Block Reference Guide for Analog Input types available.*
9. When a UMC800 configuration is imported into the HC900, block numbers are incremented by 100. Two exceptions are the Analog System Block (ASYS) and the Fast System Block (FSYS). The ASYS block is block number 249 in the UMC800 and changes to block 1 in the HC900. The FSYS block is block number 250 in the UMC800 and changes to block number 2 in the HC900.	*The UMC800 had some reserved systems blocks starting at block 249 with the Analog System Block. The reserved system blocks were moved in the HC900. The blocks from 1 to 100 are now reserved for use by the system. The first user block in the HC900 starts at 101. Imported block numbers need to be updated to the new location.*

Consideration:	Reason:
10. The Write Constant (WCON) and Read Constant (RCON) blocks will have their block value and block index values reset to zero. The Write Tuning Constant (WTUN) will have its block number parameter incremented by 100 to make it point to the same block in the HC900 configuration.	*Since blocks are renumbered as part of the conversion the block number in the WTUN block needs to be updated by adding 100 so that the block it references is the same in both configurations. The other blocks also have an index value. Since it is not feasible to update the index value, both values will be set to zero. The block and index values will have to be re-entered manually.*

Procedure

1. Select "Open" from the FILE menu. The Open dialog box will appear.
2. At the "Look in:" field, navigate to the folder in which the UMC800 file is located (.FBD)
3. At the "File of type:" field, select "**UMC800 Version 5.0 files (*.FBD)**" from the drop-down menu.
4. Select the .FBD file from the list on the dialog box, then click "Open".
   An admonishment will appear stating that "This is an older file. Saving it will irreversibly convert file to latest format"
   Click "OK", the Configuration File will appear on the application
5. Select "Save" or "Save "AS" from the FILE menu.
   The dialog box will open. Click "Save", the file will be saved as a .cde file.

Converting HC900 Configurations

You cannot download a HC900-C50 configuration to a HC900-C30 and vice versa. You must first convert the configuration before doing a download.

Conversion Procedure

1. With the configuration file open, select “SAVE AS” from the “FILE” menu. The “Save As” dialog box will open.
2. From the drop-down menu in the “Save as Type” field, select the type of Controller configuration that you want to convert **TO**. (See table below.)
3. Select “SAVE”.
4. If there is a problem with the conversion from C50 to C30, the “Conversion Error” dialog box will appear indicating what the error is. For example:
   Too many Loop Blocks,
   Greater than 400 User Function Blocks,
   Expansion Rack used in Configuration.

5. If there is no problem, the conversion will proceed.

6. If there **are no** unconnected inputs that need to be set to OFF or 0, the data is saved automatically.
7. If there **are** unconnected inputs that have not been previously set to OFF or 0, the application will notify you that there are unconnected inputs and ask if you want to see a list of unconnected inputs.
8. Click “Yes” to view the summary of unconnected inputs.
9. Click “Log File” to save the list to a text file, if desired.

Using the table below as a guide, start with an “original configuration” and do a File, Save As, and save the configuration to the newer revision (or different controller type).

The new configuration can only be downloaded to a controller of the same type.

	Save As…						
Original Configuration Type and Revision	C50, ver 1.0x	C50, ver 1.1x	C50, ver 2.0x	C50, ver 2.1x	C30, ver 1.1x	C30, ver 2.0x	C30, ver 2.1x
C50, ver 1.0x	Allowed	Allowed	Allowed	Allowed	Allowed*	Allowed*	Allowed*
C50, ver 1.1x	Not allowed	Allowed	Allowed	Allowed	Allowed*	Allowed*	Allowed*
C50, ver 2.0x	Not allowed	Not allowed	Allowed	Allowed	Not allowed	Allowed*	Allowed*
C50, ver 2.1x	Not allowed	Not allowed	Not allowed	Allowed	Not allowed	Not allowed	Allowed*
C30, ver 1.1x	Not allowed	Allowed	Allowed	Allowed	Allowed	Allowed	Allowed
C30, ver 2.0x	Not allowed	Not allowed	Allowed	Allowed	Not allowed	Allowed	Allowed
C30, ver 2.1x	Not allowed	Not allowed	Not allowed	Allowed	Not allowed	Not allowed	Allowed

*Restricted by the memory limitation of a C30 Controller

Uploading a file from the controller

Introduction

Upload transfers a file **FROM** the controller **TO** the PC. Uploadable files are configurations, recipes, and data storage.

The Controller may be in ANY mode.

No configuration file is required to be opened prior to the Upload Request.

Uploading Configuration

6. From the "File Menu" select Upload Configuration, or click on the Upload icon on the Main Toolbar  ,or click on the Upload icon on the Utilities Worksheet Toolbar  then select "Upload

Configuration".

7. The Upload File dialog box will appear. A temporary file name will be place in the "File Name" box.
8. Under "Current CommLink Settings", select the port and address to communicate to a controller. Reference "Utilities Worksheet" for configuring the PC Ports.
9. Press "START". The dialog box will show "Percent Complete".
10. The Uploaded File will appear with an automatic file name containing the controller name, its local name (or alias), and the network it is on.
11. From the "File" menu, select Save or Save As and enter a file name and path in the appropriate fields.

Uploading Recipe or Data Storage

1. From the "*File Menu*" select **Upload...** The Upload File dialog box will appear. A temporary file name will be place in the "File Name" box.
2. Under “Current” CommLink Settings”, select the port and address to communicate to a controller. Reference "Utilities Worksheet" for configuring the PC Ports.
3. Press "START".
4. Select a file type to upload. If uploading a recipe you’ll be asked to choose which recipe in the controller’s memory to upload.
5. The dialog box will show "Percent Complete". When the upload is complete, the Uploaded File will appear (with a temporary file name) in the editor for that file type.
6. From the "File" menu, select Save or Save As and enter a file name and path in the appropriate fields.

Downloading a file to the controller

Introduction

Once a control strategy—configuration file—is opened, Configuration Download transfers a configuration FROM the PC TO the controller.

The Controller may be in either RUN or PROGRAM mode (not Run-Locked)

ATTENTION: You cannot download an HC900-C50 configuration to an HC900-C30 and vice versa. You must first convert the configuration before doing a download. See "Converting HC900 configurations ".

Procedure

1. From the File Menu select "Open" or Upload a file* from the controller.
2. Select the file (.cde) that is to be downloaded.
3. The selected function block diagram will appear in the Active View window. Only the active file window can be downloaded.
4. From the "File Menu" select Download or click on the Download icon on the Main Toolbar  or click on the Download icon on the Utilities Worksheet Toolbar  then select "Download

Configuration".

5. The "Download File" dialog box will appear. Check the Port and Address information for correctness.
6. Press "START" to download the configuration to the configuration buffer.

   The download will begin if the controller is in:PROGRAM mode or RUN mode.

   The download will be rejected if the controller is in:RUN/LOCKED mode or OFFLINE mode.

   The dialog box will show "Percent Complete".
7. After the database tables have been transferred to a configuration buffer, select one of the following 3 commands to transfer from the buffer to the controller:

HOT START - the controller will use the new or updated configuration in RUN Mode.

During a Hot Start:

- Controller memory will not be re-initialized
- Outputs will be held at their current value.
- Controller will stay in RUN mode

There are two possible actions with a Hot Start:

- If the Hot Start will be completed within approximately 3 controller scan cycles, then the Hot Start will proceed automatically.
- If the Hot Start requires longer than 3 controller scan cycles, a dialog box displays a) the estimated duration of the Hot Start and b) options to initiate or cancel the Hot Start.

COLD START - the controller will transition through normal PROGRAM-TO-RUN mode transition
- Controller memory will be re-initialized
- Outputs will be turned off during re-start
- Controller will return to RUN mode

ABORT - the controller will disregard the new configuration and continue to use the previous configuration.

8. The dialog box status line will state "Mode Change in Progress" then "Download Successful" when completed.

Downloading in Run Mode

⚠ WARNING

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the configuration in the application and the potential dangers of downloading a configuration while running. Downloading in RUN Mode has the potential to create a hazardous situation. Changes to the configuration result in a short suspension of the control program followed by an immediate execution of the new configuration. It is the user's responsibility to ensure that configuration changes will not result in a hazardous situation.It is the user's responsibility to assess this risk for his process. Failure to comply with these instructions could result in death or serious injury to people and/or property damage.

Downloading in Run Mode (Hot Start) is a means to make configuration changes and download them to the controller without taking the process off-line.

It is intended for incremental changes to a running configuration, such as:

Adding and Deleting Blocks
Modifying block configuration parameters
Adding/changing soft-wires, signals, variables

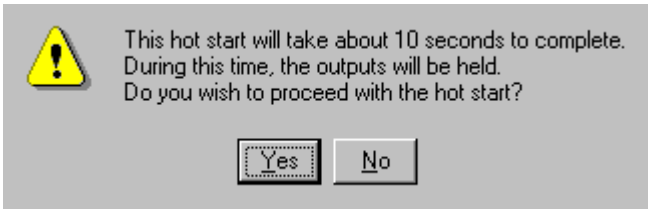
Adding OI displays, Data Storage
Adding Recipes, SP Profiles, SP Schedules, or Sequencers.
Adding, deleting, or modifying I/O (DI, DO, AI, AO).

IMPORTANT: If you intend to make a set of changes to a running configuration and wish to preserve the context of the current configuration parameters you should perform an upload from the controller first to assure that you have the current configuration, make the incremental changes, and then download.

Cautions

Configuration Change Transfer

Once the HOT START button is depressed, the configuration will be updated with the new changes. Note: During the time period required to perform the Hot Start, the controller will suspend the execution of its function blocks and hold its outputs at their current value. If you select Hot Start and the Hot Start will take longer than approximately three controller scan cycles, a popup window appears:



If this time period is acceptable, click Yes to begin the Hot Start. If this time period is not acceptable, press No.

Configuration Parameters

All Configuration Parameters are set to the value or state in the .cde file following a download. For example: Tuning constants could be over written by a Download while in Run Mode. The tuning constants are considered part of the configuration. If you DO NOT first upload the present configuration, you will overwrite the active parameters with the values in the configuration that are downloaded. The new download is an all or nothing proposition.

Data Storage Schedule

Assuming changes have NOT been made to an OI data Storage Schedule, the data storage will be interrupted only as long as it takes to transfer the configuration changes.

Downloading controller firmware

Background

Code download provides a mechanism to upgrade the firmware in your HC900 Hybrid Controller to a newer version without the need to replace the CPU card. This can be useful if you wish to upgrade your controller to take advantage of new features and functions as they are introduced, or in the event that a software bug requires field repair.

Getting Started

Before you begin the download there are a few things you need to be aware of.

1. Code Download can take from a couple of minutes using Ethernet to over one hour if using a Modem. Therefore, it is highly recommended that you do not start the code download procedure at a time

when the likelihood of power failure is increased, such as during thunderstorms.

2. The code download function is only available through the HC900 Hybrid Control Designer program connected to the controller via the CONFIGURATION port or Ethernet port on the HC900. Use the Utilities Worksheet to do the download.

3. The controller will not allow the controller firmware download to begin if the battery is bad.

4. Code download will destroy the configuration database in the controller. Therefore, before code download is started, either upload the configuration file via the operator interface and save on floppy, or upload and save to your PC via the software's Utilities Worksheet.

Controller Firmware Files

Install these three files in the same directory:

Controller File	*Version of file .CPU*
Scanner File	*Version of file .SCN*
Loader File	*Loader.S19*

To obtain these files, go to http://content.honeywell.com/ipc/faq, Modular Control Systems, HC900. Version 1.03 or later must be used. It is recommended that both the controller and scanners be upgraded together.

Program Lock Mode

Before starting the Controller Firmware Download, make sure the controller is in the "Program Lock" mode.

To do this, flip the Mode Switch on the front of the CPU to the right hand position.

Download Procedure

Step	Action
1	Backup the controller configuration either by uploading to floppy disk on the operator interface, or uploading and saving via the Hybrid Control Designer.
2	Make sure the controller is in "Program Lock" mode.
3	In Hybrid Control Designer select the Utilities Worksheet tab.
Controller Module	
4	From the "Controller Utilities Functions" select "Download to Controller".  On the sub-menu, select "Controller Firmware", then "**Controller Module**".
5	Use the "Look in:" drop down list in the "Open" dialog box to select the drive and folder you placed the files in.
6	Select and open the file "***Version*.CPU**" displayed in the file list box.
7	Select the "Port" and "Address" on the "Download File" dialog box.
8	Click on the "Start" button in the "Download File" dialog box. The download will start, and progress is displayed. The download itself will take a few minutes, depending on the Port type and connection.

Step	Action
9	A "Download Succeeded" status will be displayed in the "Download File" dialog box. If a failure is detected, an error message will appear in the Status section of the "Download File" dialog box. See "Error Messages" for a list of possible messages and resolutions. Also see Failure Modes.
Scanner Module	
10	From the "Controller Utilities Functions" select "Download to Controller".  On the sub-menu, select "Controller Firmware", then "**Scanner Module**".
11	Use the "Look in:" drop down list in the "Open" dialog box to select the drive and folder you placed the files in.
12	Select and open the file "***Version*.SCN**" displayed in the file list box.
13	Select the "Port" and "Address" on the "Download File" dialog box.
14	Click on the "Start" button in the "Download File" dialog box. The download will start, and progress is displayed. The download itself will take a few minutes, depending on the Port type and connection.
15	A "Download Succeeded" status will be displayed in the "Download File" dialog box. If a failure is detected, an error message will appear in the Status section of the "Download File" dialog box. See "Error Messages" for a list of possible messages and resolutions. Also see Failure Modes.
16	Restore the configuration from the backup copy you previously made.

Failure Modes

If there is a download failure indication on the "Download File" dialog box:

- DO NOT cycle the controller power and DO NOT remove the battery.
- Check the physical connections.
- Check for power failures.
- Restart the download from the beginning.

Download firmware error messages

This is a list of possible error messages that could be displayed as the result of a Download Firmware failure.

Error Message	What to do
Instrument must be in PROGRAM LOCK mode to perform this operation	Put controller in program lock mode before starting code download.
Instrument's battery missing or dead	Replace controller battery before starting code download.

Error Message	What to do
Missing loader binary file	Could not open the loader file. Make sure the "loader.s19" file is in the same directory as the firmware file to be downloaded.
Could not open firmware update file	Make sure the firmware file is present in the directory selected.
Programming is not required, the downloaded version matches the code in the controller	The version in the controller matches the version that was downloaded.
The downloaded file is corrupted	The firmware file was bad. Replace the firmware file
Failed to complete file transfer	Could be caused by communication loss or controller power failure. Restart code download again.
Controller is not responding, code download failed	Could be caused by communication loss or controller power failure. Restart code download again.
Failed to put instrument into loader transfer mode	Could be caused by communication loss or controller power failure. Restart code download again.
Failed to get controller status	Could be caused by communication loss or controller power failure. Restart code download again.
Unexpected controller mode. Code download will abort. The controller will now reset	Could be caused by communication loss or controller power failure. Restart code download again.
Failed to get expansion rack status	Could be caused by communication loss or controller power failure. Restart code download again.
FLASH erase failure. Replace the controller card	The controller has a hardware problem. Replace the controller card.
FLASH programming failure. Replace the controller card	The controller has a hardware problem. Replace the controller card.
FLASH memory failure. Replace the Controller card	The controller has a hardware problem. Replace the controller card.

Error Message	What to do
An incomplete code download has been detected. Do not remove controller power! Removing controller power could result in damage to the scanner card(s)	A previous code download was aborted or failed. Code download will proceed using the selected file.
An incomplete code download has been detected. Code download will proceed using the selected file	A previous code download was aborted or failed. Code download will proceed using the selected file.
No scanner racks detected	Most likely cause is no expansion racks connected to the main controller. It can also be caused by a failed scanner card. If a scanner is properly connected to the controller and this message is displayed, replace the scanner card.
“Rack 1: SUCCESS, Rack 2: FAILED"	Completion report for scanner code download. There should be a SUCCESS status for each card connected to the main controller rack. A FAILED status could be caused by a communications problem between the main controller rack and the scanner racks or by a failed scanner card. Restart code download again.

File Properties

Selecting "Properties" from the file menu, lets you fill in the title and author of the file as well as view the file statistics (Number of Blocks, Inputs, and other items).

From the Hybrid Control Designer Window File menu, select "Properties".
The "File Properties" dialog box will appear.

Select a tab:

"General " – Enter Title and Author. Read Date created and Last Modified plus device information.

"Statistics" - Read statistics for all function blocks and worksheets.

"Read Protection" - Indicates current protection. If file is unprotected, click on "Protect File" to allow new password entry or change current password.

"Worksheet Protection" - Indicates current protection. If worksheet is unprotected, click on "Protect" to allow new password entry or change current password. Also, you can change or remove worksheet protection.

How to Add Worksheet Protection

Introduction

The HC900 Hybrid Control Designer provides an optional configuration Worksheet protection. New files default to "No Protection". Worksheets can be protected on individual basis where all protected worksheets use the same password. A user has limited access to protected worksheets.

Protected Worksheet Type	View Worksheet	Edit Worksheet
Controller	YES	NO
Display	YES	NO
Function Blocks	NO	NO

Protected Worksheets:

- can be **"unlocked"**. Protection is disabled, but not removed from the file. If you save the file, the worksheet protection will be "locked" when the file is reopened.
- can have their **passwords changed**. In order to change a password, you will need to know the current password.
- Can have their **protection "removed"**. Removing the protection is permanent. If you save the file, the worksheet will not be protected when the file is reopened.

Protection Symbols

There are three symbols that could appear on the "Worksheet Protection" tab that indicate the level of protection for the file:

 = No protection is in place, worksheets are 'Unlocked"

 = Protection exists, and the worksheets are "Unlocked".

 = Protection exists, and the worksheets are "Locked".

Protecting a Worksheet When There is No Protection

Step	Action
1	From the "File" menu, select "Properties", then select the "Worksheet Protection " tab.
2	Click on the "Change Protection" button.
3	Click on the box next to the worksheet names you want to protect, then select "DONE" button.
4	Click on the "Lock" button to setup a password.
5	Enter a password for the file in the "New Password" field (up to 14 characters).
6	Re-enter the password in the "Confirm New Password" field.
7	Click "OK".

To Change a Password

Step	Action
1	From the "File" menu, select "Properties", then select the "Worksheet Protection " tab.

Step	Action
2	Click on the "Change Password" button.
3	Enter the current password in the appropriate field.
4	Enter a New Password in the appropriate field.
5	Confirm the new password in the appropriate field.
6	Click "OK".

To Temporarily Unlock a Worksheet

Step	Action
1	From the "File" menu, select "Properties", then select the "Worksheet Protection " tab.
2	Click on the "Unlock" button.
3	Enter the current password in the appropriate field.
4	Click "OK", the worksheets are unprotected **NOTE:** *the "Controller", "Display", and "Function Block" worksheets also have a toolbar button to unlock worksheets.* 

To Permanently Remove Worksheet Protection

Step	Action
1	From the "File" menu, select "Properties", then select the "Worksheet Protection " tab.
2	Click on the "Remove Protection" button.
3	Enter the current password in the appropriate field.
4	Click "OK", the worksheets are unprotected.

Protecting a Worksheet When Worksheets Protection is Active

Step	Action
1	From the "File" menu, select "Properties", then select the "Worksheet Protection " tab.
2	"Unlock" the worksheet.
3	Change protection.
4	Select worksheet names, then "DONE".
5	Select "LOCK"

Write Protect a File

Introduction

Optional configuration File Write protection is provided. This feature makes use of the disk general file "Read Only" attribute. All the files default to "No Protection". When set to "Read Only", the file is Write Protected, which means it cannot be over written or deleted.

Select "Write Protect File" from the FILE menu.

Use the Check Box on the dialog box that appears to turn the attribute On (selected) or Off (deselected).

PC Comm Ports and Connections

How to Manage PC Comm Ports and Connections

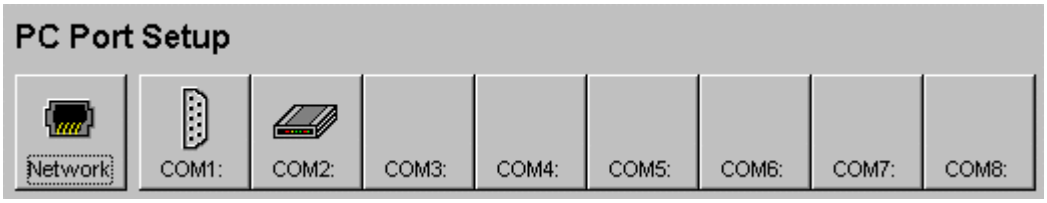
The middle and lower portions of the Utilities Worksheet contain the PC Comm Ports and Connections functions.

Setting up your PC Comm Ports consists of the following functions:

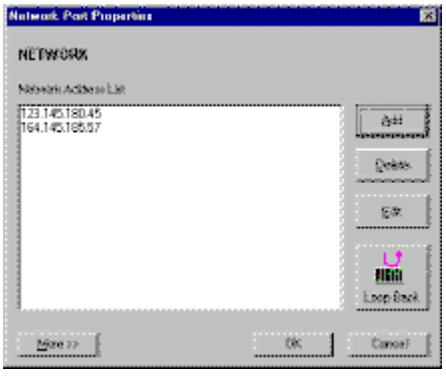
- PC Network Port Setup
- PC Serial Comm Port Setup
- PC to Controller Connection Settings
- Remote Loopback test
- Remote Access
- Communications Statistics

PC Network Port Set Up

The software lets you setup a PC Network Port and up to 8 PC Serial Comm ports for interface to a specific controller (serially via the controller's RS-232 configuration port or over a network via the controller's Ethernet port, accessed by its IP address). You will need an Network Interface Card (NIC) in your PC for network connection. If there is a Modem on your PC, a symbol will appear on one of the Serial comm ports buttons.



Setting Up a Network Port

1. Click on the Network Port setup button	
2. The Network Port Dialog Box will Open **To ADD a Network address**: Click on ADD and enter the Address in the appropriate field. **To Delete a Network address**: Click on an address in the Network address list, then click Delete button. The address will be deleted. **To Edit a Network address**: Click on EDIT and change the address in the appropriate field. **To do a Loopback test for a specific address** Click on the Loopback button.	

3. For **Advanced Network Setup**, click on the MORE>> button at the bottom of the "Network Port Properties" dialog box. *Number of Retries before Abort* - Enter a decimal value *Retry Delay* - Enter a value in milliseconds *Timeout* - Enter a value in milliseconds *Note: It is not recommended that you set the values lower than those shown in the dialog box, since it may cause some communications operations to fail.* Press **Reset** button to reset these fields to their default values	

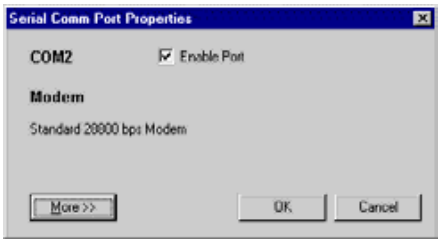
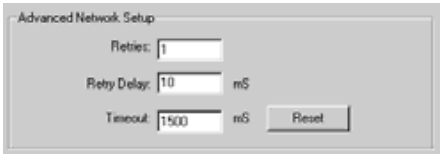
PC Serial Com Port Setup

The software lets you setup a Network Port and up to 8 Serial Comm ports. If there is a Modem on your PC, a symbol will appear on one of the Serial Comm Ports buttons. See Setting up a Serial Com Port with a Modem.

Setting Up a Serial Comm Port

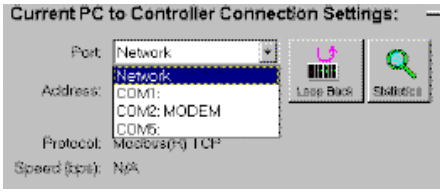
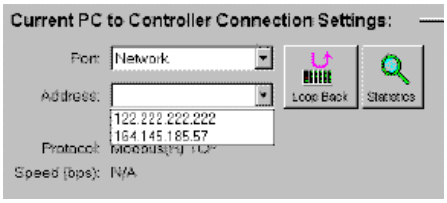
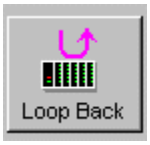
1. Click on the Serial Comm Port setup button. When there is no port Icon above the comm port name, the port is currently disabled.	
2. The "Serial Comm Port Properties" Dialog Box will Open Click the 'Enable Port" box Manually select a Baud Rate from the "Speed" drop-down menu, or if a controller is currently connected to the ports, press the "Detect" button to detect the controller's RS232 baud rate. Click OK,	
3. The Serial CommPort Button will now show an icon indicating that the port has been set up.	
4. For **Advanced Network Setup**, click on the MORE>> button at the bottom of the "Serial Comm Port Properties" dialog box. *Number of Retries before Abort* - Enter a decimal value *Retry Delay* - Enter a value in milliseconds *Timeout* - Enter a value in milliseconds *Note: It is not recommended that you set the values lower than those shown in the dialog box, since it may cause some communications operations to fail.* Press **Reset** button to reset these fields to their default values.	

Setting Up a Serial Comm Port with a Modem

1. Modems must be "Installed" in MS Windows.	
2. Click on the Serial Comm Port Setup button that contains an image of a Modem	
3. The "Serial Comm Port Properties" Dialog Box will Open Click the 'Enable Port" box There is NO Baud selection because the speed is determined by the controller's modem. Click OK,	
4. For **Advanced Network Setup**, click on the MORE>> button at the bottom of the "Serial Comm Port Properties" dialog box. *Number of Retries before Abort* - Enter a decimal value *Retry Delay* - Enter a value in milliseconds *Timeout* - Enter a value in milliseconds *Note: It is not recommended that you set the values lower than those shown in the dialog box, since it may cause some communications operations to fail.* Press **Reset** button to reset these fields to their default values.	
5. For **Telephony Settings**, click on the MORE>> button at the bottom of the "Serial Comm Port Properties" dialog box. **Click on a radio button to select one of the following two options:** *No Timeout* - No timeout is performed and the application will stay connected until you Hang Up *Connection Timeout* - Enter in the active field (in minutes) how long the application will leave the line open before hanging up automatically. The Modem will hang up if there is no communications activity for this amount of time.	

PC to Controller Connection Settings

After setting up your PC Network and PC Serial Comm Ports:

Select a Port from the drop-down menu	
If you selected "Network" Select the Address of the controller from the drop-down menu.	
You can run a loopback test	
You can view and reset the communications statistics	

Remote Loopback Test

Remote Loopback tests the connection between the PC and the Controller.

Running the test

1. Click on the Loopback icon on the Utilities Worksheet Window.  The "Remote Loopback Test" dialog box will appear.
2. Click "SEND". The Status line will read:
   Instrument Responded Correctly, or
   Instrument did not Respond - check the connections
3. Click "Close".

Remote Access

Overview

The Hybrid Control Designer software supports Remote Controller Access via dial-up modem. An external modem is required at the controller and is connected to the standard RS 232 configuration port.

If a modem is already installed on the PC the Hybrid Control Designer will notify you that it exists.

Remote Access functions include on-line monitoring Live Monitor - Overview, Uploading and Downloading Configurations.

Procedure

1. Click on the Utilities tab.
2. Click on a Comm Port, under PC Port Setup, that indicates a Modem.

3. The Serial Comm Port Properties dialog box opens,
   Click on the "Enable Port" box.
4. From the "Port" drop-down menu, select "COMx:MODEM".

   will appear next to the Statistics button.
5. Click on this icon and the "Select the Number To Call" will appear.

To **Hang Up** a call, select **"Hangup Modem"** from the File Menu in the Main Menu.

A message will ask you to confirm that you want to hang up.

Select the Number to Call

Select the Number to Call Dialog Box

To ADD a Phone Number
Type in the Phone Number, Name, and Comments in their respective fields, then click on **"ADD to List".** The information will appear in the Phone Number List.

To DELETE a Phone Number
Click on a name or number in the Phone Number List and click **"Remove from list**". The line will be deleted and all the Phone numbers and names will move up one line.

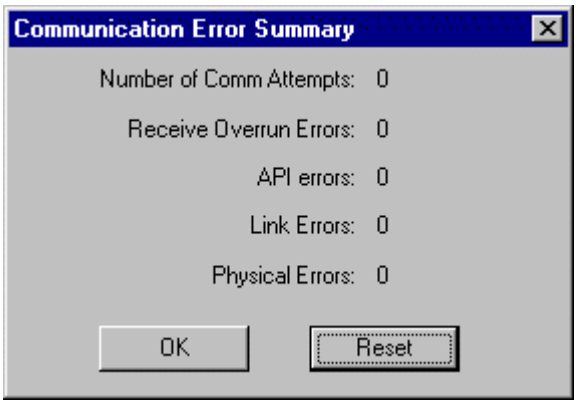
To SELECT a number to call
Click on a name or number in the Phone Number List and click **"Dial".**

To **Hang Up** a call, select **"Hangup Modem"** from the File Menu in the Main Menu.

A message will ask you to confirm that you want to hang up.

Communications Statistics

The "Statistics" button on the "Current PC to Controller Connections Settings" will launch the "Communications Error Summary" dialog box. The summary statistics are shown below:



See the table below for corrective action for each communication error.

Click on "Reset" to change the statistics to "0".

Error	Reason
Number of Comm Attempts	Count of messages sent down to a Controller
Receive Overrun Errors	A count of Controller response messages that were longer than expected. Make sure you have the latest version of HC Designer and that it is compatible with the Controller version. Contact Technical Support if the problem continues.
API Errors	The number of Application Errors are typically errors reported by the Controller. Common reasons for this error: Instrument responded to the wrong message. Check that there isn't more than one device with the same IP or Modbus address trying to communicate with the Controller. Controller communication port is in use by other device(s). Instrument responded with an error code. Take note of any error message dialog boxes that may popup while communicating with the Controller (e.g. While Monitoring). Attempt any corrective action based on the reported errors. Contact Technical Support if the problem continues.
Link Errors	Count of messages that could not be interpreted by HC Designer. Typically these occur when the response message contains garbled data. Check physical connections between the Controller and the PC. If you are using a modem or a serial cable, this error may be the result of "line noise".
Physical Errors	Count of hardware type errors. These typically occur when the Controller doesn't respond. Check cable and other hardware connections. If using a modem or a serial cable, verify the cable connections and baud rates of all pieces.

Worksheets Overview

What is a Worksheet?

A Worksheet is a logical partition of a configuration. A configuration is built using three main Worksheet types.

They are organized by type.

- Controller Worksheet (1 per configuration)
- Operator Panel Worksheet (1 per configuration)
- Function Block Diagram Worksheet - FBD (up to 20 per configuration)

In addition, a Utilities Worksheet is available to provide a set of maintenance functions for the controller.

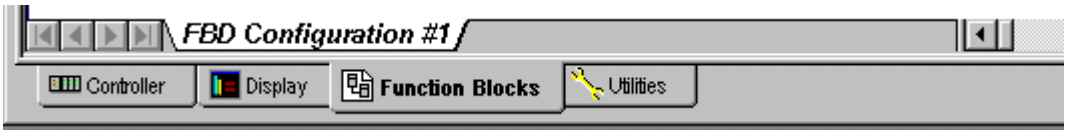
Each Worksheet may have full or restricted access (Worksheet Protection).

Worksheet Category Tabs

A configuration is organized into three categories shown as tabs at the bottom of the Main window:

- Controller
- Display
- Function Blocks

An additional tab, Utilities, is provides access to a variety of useful functions that interact with the controller.



Controller Worksheet

Controller Worksheet Overview

There is one worksheet for the configuration. It displays the I/O in all configured racks.

Toolbar

The Controller Worksheet has a Toolbar to launch dialog boxes to configure:

Print Worksheet- Prints the IO summary as viewed on the worksheet.

Controller Identification - Enter a***controller name***. It will be displayed on the Operator Interface used for Peer Communications (16 characters).

Controller E-Mail Notification

Unlock Worksheets

I/O Summary

A summary of each addressed I/O point (as well as unassigned I/O points) in the configuration indicates:

- Rack/Module/Channel
- Block ID - a hot link when clicked finds the I/O block on the Function Block Diagram
- Engineering Units and AI Input range
- Signal Tag of primary output pin (if present) a hot link when clicked finds the signal tag on the Function Block Diagram
- Signal Descriptor of primary output pin (if present)

This assignment summary is built and updated dynamically on the worksheet body. It can be printed from the toolbar Icon.

Controller Configuration Toolbar

Click on ICON to open a dialog box.

ICON	Function	Dialog Box Comments - Use F1 for Help
	**Print Worksheet**	Click to open the standard ***Print*** dialog box. Fill in appropriate fields Printed Output is the I/O Summary as viewed on the worksheet. To display each page, as it will look when printed, click Print Report Preview on the File menu.
	**Controller Identification**	Click to open the ***Controller Identification*** dialog box. Type in a name for your controller configuration. (same as Worksheet name) Also indicates controller type and revision. (read only).
	**E-Mail Notification**	Click to open the ***E-Mail Notification*** dialog box. Two Tabs on Dialog Box: ***General -*** FROM name displayed for convenience (read only) and SUBJECT information -

ICON	Function	Dialog Box Comments - Use F1 for Help
		31 character configurable text. ***To List -*** enter up to 3 configurable E-Mail addresses. For each Email address check an Alarm/Event priority ***See*** "E-Mail Notification"
	**Unlock Worksheets**	Click to open the "Unlock Worksheets" dialog box. Enter a password and click "Unlock" to unlock all worksheets.

E-Mail Notification

 opens the **E-Mail Notification** dialog box. It lets you configure up to three E-Mail addresses per controller configuration for Alarm and Event notification.

There are two tabs on the dialog Box.

General Tab

FROM The ***Controller name*** is configured by the builder of the Configuration file [Read Only]

SUBJECT Enter an Event Subject (up to 31 characters)
Enter an Alarm Subject (up to 31 characters)

To List Tab -

Enter up to 3 configurable E-Mail addresses.(32 characters per addresses)
For each Email address check the Alarm/Event priorities you want the E-mail address to receive.

Events do not have multiple priorities like alarms because they are considered at a priority lower than all alarms.

Alarm priorities were set during "Alarm Group Configuration" under "Alarm Details"
2 = Low Priority Alarm
3 = Medium Priority Alarm
4 = High Priority Alarms
5 = Emergency Alarm

The priority of an event is always indicated as "1" - (see Event Configuration)

Attention: See "Set Controller Network Parameters" and follow the wizard to set up a SMTP mail server IP Address.

Examples:

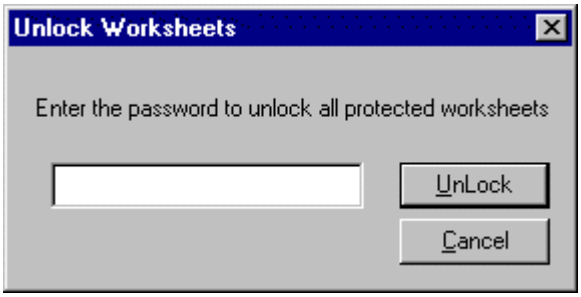
Somebody@somewhere.com receives ***only priority 5 Alarms***
(only the check box for "5" is checked

Aperson@somewhere.com receives ***all Alarms and Events***
(all 5 boxes are checked)

People@somewhere.com receives ***only Events***
(only check box for "1" is checked)

Unlock the Worksheets

opens the "Unlock Worksheets" dialog box.



Enter the password in the field and then, press "UNLOCK".

How to add/change worksheet protection.

Display Worksheet

Operator Panel Worksheet Overview

The Operator Panel Worksheet has a Toolbar to launch dialog boxes to configure:

O/I Display Buttons [1 - 8] Model 1042; [1 - 5] Model 559
and Display Groups

O/I Security (Operator Interface Settings)

O/I Data Storage

Alarm Groups

Event List

Filenames

Start Up Banner Page

Help Message screens.

Unlock Worksheets

There is a Display Keys Report that indicates current O/I Button assignments:

Display Button Number

Display Position on the button

Display Format

Group Title or Tag name

This assignment summary is built and updated dynamically on the worksheet body. It can be printed from the toolbar.

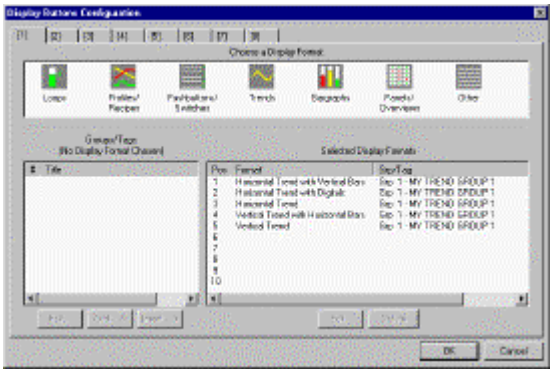
Display Buttons Configuration

Overview

This function lets you customize display access by assigning specific display screens to a set of assignable buttons. OI Model 1042 has 8 assignable buttons, Model 559 has 5. Each assignable button supports a sequence of up to ten screens. Screens assigned to these buttons may be Monitor screens (view data only) or Operate screens (take actions). The type of screen and the data presented on the screen is defined during configuration.

Configuration Procedure

 on the Operator Panel Worksheet Toolbar opens the "Display Buttons Configuration" dialog box.



Select one of the tabs (one for each button) located across the top of the dialog box.

"Choose a display format" field. This will determine what will be shown in the "Groups/Tags" field located below the "Display Format" selection box.
Display Formats are organized into 7 categories.

For examples of the Display Formats, refer to the ***Operator Interface User Guide***.

Category	Available Display Formats
Loops	1 Loop faceplate with trend 1 Loop Numeric Auto-Manual Bias Multi-loop Faceplate
Profiles/ Recipes	Recipe Load Sequencer Setpoint Programmer Setpoint Scheduler
Pushbuttons/ Switches	Device Control Operate Four-Selector Switch HOA Switch Pushbutton
Trends	Horizontal Trend Horizontal Trend with Digitals Horizontal Trend with Vertical Bars Vertical Trend Vertical Trend with Horizontal Bars
Bargraphs	3 Pt Horizontal 3 Pt Vertical 6 Pt Horizontal 6 Pt Vertical
Panels/ Overviews	1 Pt Rotating Panel Multipoint Panel Overview Panel - 4 Pts Panel Meter
Other	Alarm Alternator Operate Data Storage Status Messages Ramp Operate

Category	Available Display Formats
	Stage Operate

A list of configured Groups/Tags and their titles will appear in the "Groups/Tags" selection window on the tab. The format selection title is listed under "Groups/Tags".
Click on a Group/Tag number.

Click **ADD** - to add the selection to the "Selected Display Formats" list.
Click **INSERT** - to insert into a screen position. Other entries will shift down. Note that you must first select (click) the position in the "Selected Display Formats" list, on the right-hand side of the dialog, where you want to insert this display.
Click **DELETE** - to delete a page from a selected position in the "Selected Display Formats" list.

Click **EDIT** - to change the Tag Order or to bring up the Display Tag Group Configuration dialog box. Note: You can also double-click on an entry in the "Groups/Tag" list or the "Selected Display Formats" list. This action produces the same result as clicking on the Edit button for the selected entry.

Each time you configure a Loop (PID, CARB, ONOFF, TPSC, or AMB), SP Programmer (SPP), SP Scheduler (SPS), Sequencer, Hands/Off/Auto Switch (HOA), Ramp, Stage, Alternator or Device Control (DC) function block, you will have assigned a unique Tag Name to the block. This selection lets you arrange tags to determine the tag order in various displays on the operator interface. The order in which they appear in this "Tag Order" dialog box can be changed to coincide with the order in which you want them to be displayed.

For other Display Groups, it allows you to go and edit the group; for example: Trend, Bar, Overview, and others.

Configuring or Viewing Display Tag Groups

Overview

The "**Display Tag Groups**" let you configure groups of tags that can be accessed by the operator interface using a standard set of display formats and a predefined menu hierarchy. These groups are configured using tabs that appear on the "Display Tag Groups Configuration" dialog box. The groups are listed below.

After you have completed all the group configurations you can select the groups to be displayed and assign them to a specific operator panel display button. Refer to (Display Button Configuration)

Configuration

 on the Operator Panel Worksheet Toolbar opens the "Display Tag Group Configuration" dialog box.

Select one of the tabs (one for each group) located across the top of the dialog box.

Click on tab below to access the configuration procedure for the specific tab.

Alarms Display Tag Group

The Alarm Display Tag Group configuration tab provides a drop list of **Alarm** groups.

You can configure 20 Alarm Groups of 12 alarm points each. Each group contains a set of selected digital signal tags. An Alarm may be any Digital Signal Tag. There are up to 240 alarm points available. Each alarm point can be configured to generate an E-mail notification.

Select the **Alarm tab** then Select Display Group from the drop-down menu. Digital signals will be displayed in the "Selected Tags List" field.

You can also select "Alarms" from:

- the EDIT menu on the Main Menus
- the FBD Worksheet toolbar button
  (when you **do not have** an OI and **do not** need to use
  Alarm Group logic in the control strategy)
- the FBD Worksheet by dropping an ALMGR block onto the configuration and either double-clicking on the block or right-clicking on the block and selecting the properties menu item on the context menu to bring up the 'Alarm Group Configuration" dialog box.
  (when you **do not have** an OI and **do** need to use
  Alarm Group logic in the control strategy)

From the "Selected Tags List" drop-down menu, select the type of tags you wish displayed in the list. The default selection is "ALL".

Enter the group title. Use any mix of numbers, letters, and spaces

Select a 'Tag Name" from the "Select Tag List".

Click on **ADD**, the selected signal tag will be placed in the next available position in the "Selected Tags" field,
OR
Select a position in the "Selected Tags" field, then click on **INSERT.** The selected signal tag will be placed in the position chosen and the other signal tags will reorder as required.

Repeat the selection for up to 12 tags for each group.

Select a signal in the "Selected Tags" field and click on **ALARM DETAILS**, and enter Alarm details in the Dialog Box.

Click OK.

Note: when you edit "Alarm Group 1-20" from either the O/I Worksheet, the FBD worksheet, or the FBD Alarm Group block, you are editing the same data.

Panel Meter Display Tag Groups

This selection lets you configure groups of **Panel Meter** Displays. Each group may contain a mix of analog signal tags, digital signal tags, analog variables, and digital variables.

Select the **Panel Meter tab** then Select Display Group from the drop-down menu. Analog signal tags, digital signal tags, analog variables, and digital variables will be displayed in the "Selected Tags" field.

From the "Selected Tags List" drop-down menu, select the type of tags you wish displayed in the list. The default selection is "ALL".

Enter the group title. Use any mix of numbers, letters, and spaces.

Select a 'Tag Name" from the "Select Tag List".

Click on **ADD**, the selected signal tag or variable will be placed in the next available position in the "Selected Tags" field,
OR
Select a position in the "Selected Tags" field, then click on **INSERT.** The selected signal tag will be placed in the position chosen and the other signal tags will reorder as required.

Repeat the selection for up to 12 tags for each group.

Click OK.

Trend Display Tag Groups

A selection of horizontal or vertical trend format displays is available to provide a historical record of recent control performance. Trend displays may be configured with analog or digital points on each display. Trend displays allow a user selectable time period of from 0.5 to 24 hours each. Each display will retain from 1.5 to 6 screens of historical data that may be recalled from memory. Trend graph displays provide traditional value versus time plots in horizontal or vertical orientation. Each group may contain a mix of analog signal tags and digital signal tags.

Attention: If you want **trends displayed logarithmically** make sure that the first signal tag selected has the decimal place setting. (Exponential Notation). See "Signal Tags".

Select the **Trend tab** then Select Display Group from the drop-down menu. Analog signal tags and digital signal tags will be displayed in the "Selected Tags" field.

From the "Selected Tags List" drop-down menu, select the type of tags you wish displayed in the list. The default selection is "ALL".

Enter the group title. Use any mix of numbers, letters, and spaces

Select a 'Tag Name" from the "Select Tag List".

Click on **ADD**, the selected signal tag will be placed in the next available position in the "Selected Tags" field,
OR
Select a position in the "Selected Tags" field, then click on **INSERT.** The selected signal tag will be placed in the position chosen and the other signal tags will reorder as required.

Enter the "Scale High" and "Scale Low" values for each signal selected.

Select a Time base for the Trend Display from the Drop down menu. (30 minutes to 24 hours)

Repeat the selection for up to 6 tags for each group.

Click OK.

Bar Display Tag Groups

This selection lets you configure 8 groups of **Bar Displays**. Bar Graph displays provide graphic representation of multiple analog or digital signal tags using horizontal or vertical orientation. Bar Graph displays are available in 3-point or 6-point vertical or horizontal format. Each group may contain a mix of analog signal tags and digital signal tags.

Select the **Bar tab** then Select Display Group from the drop-down menu. Analog signal tags and digital signal tags will be displayed in the "Selected Tags" field.

From the "Selected Tags List" drop-down menu, select the type of tags you wish displayed in the list. The default selection is "ALL".

Enter the group title. Use any mix of numbers, letters, and spaces

Select a 'Tag Name" from the "Select Tag List".

Click on **ADD**, the selected signal tag will be placed in the next available position in the "Selected Tags" field,
OR
Select a position in the "Selected Tags" field, then click on **INSERT.** The selected signal tag will be placed in the position chosen and the other signal tags will reorder as required.

Enter the "Scale High" and "Scale Low" values for each signal selected. Defaults are 0 and 100.

Repeat the selection for up to 6 tags for each group.

Click OK.

Overview Display Tag Groups

This selection lets you configure groups of Overview Displays. An **Overview** display will present the current status/state for analog or digital tagged points. The display allows operator entry of values via assigned analog and digital variables.. Each group may contain a mix of analog signal tags, digital signal tags, analog variables, and digital variables for monitor only and/or operator entries. Analog entries for variables have range limits and digital variables may be turned on or off (via corresponding label).

The user may adjust analog and digital variables listed on overview displays while in operation. Configure entry limits for analog variables. Use entry limits for analog variables. Use entry limits of 0 (low) and 1 (high) for digital limits.

Select the **Overview tab** then Select Display Group from the drop-down menu. Analog signal tags, digital signal tags, analog variables, and digital variables will be displayed in the "Selected Tags" field.

From the "Selected Tags List" drop-down menu, select the type of tags you wish displayed in the list. The default selection is "ALL".

Enter the group title. Use any mix of numbers, letters, and spaces.

Select a 'Tag Name" from the "Select Tag List".

Click on **ADD**, the selected signal tag or variable will be placed in the next available position in the "Selected Tags" field,
OR
Select a position in the "Selected Tags" field, then click on **INSERT.** The selected signal tag will be placed in the position chosen and the other signal tags will reorder as required.

Enter the "Min Value" and "Max Value" values for each signal selected. Defaults are
–99999 and +99999

Repeat the selection for up to 12 tags for each group.

Click OK.

Single Point (Rotating) Panel Display Tag Groups

This selection lets you configure 2 groups of **Single Point (Rotating) Panel** Displays. Single Point Panel displays provide a single point alphanumeric readout that consists of the tag and current value. The display sequences through a list of up to 12 analog or digital signals or analog or digital variables. Each group may contain a mix of analog signal tags, digital signal tags, analog variables, and digital variables.

Select the **Single Point tab** then Select Display Group from the drop-down menu. Analog signal tags, digital signal tags, analog variables, and digital variables will be displayed in the "Selected Tags" field.

From the "Selected Tags List" drop-down menu, select the type of tags you wish displayed in the list. The default selection is "ALL".

Enter the group title. Use any mix of numbers, letters, and spaces.

Select a 'Tag Name" from the "Select Tag List".

Click on **ADD**, the selected signal tag or variable will be placed in the next available position in the "Selected Tags" field,
OR
Select a position in the "Selected Tags" field, then click on **INSERT.** The selected signal tag will be placed in the position chosen and the other signal tags will reorder as required.

Repeat the selection for up to 12 tags for each group.

Click OK.

Multi-Point Panel Display Tag Groups

This selection lets you configure 8 groups of **Multi-Point Panel** Displays. Multi-Point Panel displays present the current value/state for up to seven Analog or Digital signal tags or analog or digital variables in the controller. Each group may contain a mix of analog signal tags, digital signal tags, analog variables, and digital variables.

Select the **Multi Point tab** then Select Display Group from the drop-down menu. Analog signal tags, digital signal tags, analog variables, and digital variables will be displayed in the "Selected Tags" field.

From the "Selected Tags List" drop-down menu, select the type of tags you wish displayed in the list. The default selection is "ALL".

Enter the group title. Use any mix of numbers, letters, and spaces.

Select a 'Tag Name" from the "Select Tag List".

Click on **ADD**, the selected signal tag or variable will be placed in the next available position in the "Selected Tags" field,
OR
Select a position in the "Selected Tags" field, then click on **INSERT.** The selected signal tag will be placed in the position chosen and the other signal tags will reorder as required.

Repeat the selection for up to 7 tags for each group.

Click OK.

Alarm Details

Select a tag in the "Selected Tags" area of the Alarm Group Configuration dialog box, then click on "Alarm Details' button. The **Alarm Details** dialog box opens and enables you to enter details for the selected tag.

The block number and output number are listed across the banner. The Tag number and descriptor is listed in field below the banner.

Details include:

- ***Alarm Priority*** - used for routing alarms to Email (which Email addresses get which alarms)
  Each of 3 E-mail address may have any/all alarm priorities assigned to it.

2 *- Low Priority Alarm*
3 *- Medium Priority Alarm*
4 *- High Priority Alarm*
5 *- Emergency Alarm*
(select from the drop-down menu)

- *E Mail Notification* of alarms, by priority, on a point by point basis.
  (check the box to allow Email notification*)* The E-mail will be sent:
  - if an alarm occurs on a point configured to send E-mail.
  - to any/all of the 3 E-mail addresses that have the associated alarm priority assigned.

- ***Detailed Text*** - appears on the Operator Interface.
  (enter 2 lines of detailed text -24 characters max for each line*)*

- ***Trigger Direction*** -
  Trigger on ON state means alarm goes ON when triggered by rising edge (the discrete goes off-to-on)
  Trigger on OFF state means alarm goes ON when triggered by falling edge (the discrete goes on-to-off)
  (click on radio button to select)

- ***Alarm Acknowledge -*** Group acknowledge

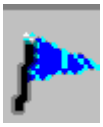
Manual Acknowledge - Can be acknowledged by operator. When a manual acknowledge alarm goes into alarm and then out of alarm without being acknowleged by the operator, it will be indicated as

cleared. Use when you want the operator to be able to acknowledge the alarm or see that the alarm was acknowledged and cleared.

Auto Acknowledge -When an auto acknowledge alarm goes into alarm and then out of alarm without being acknowledged by the operator, it will show no indication it was in alarm. Alarm can still be acknowledged by the operator when it is in the alarm state. An alarm point with this attribute will never indicate "clear" status.
(click on radio button to select*)*

Note: an alarm will always be stored to the O/I Archive list.

Event List Configuration

 on the Operator Panel Worksheet Toolbar opens the **Configure Event List** dialog box.

You can also select "Events" from:
- the EDIT menu on the Main Menu
- the FBD Worksheet toolbar button

- Up to 64 digital signals can be configured as events.
- The most recent 150 events will be available for display at the Operator Interface
- Events can generate Emails.
- From 150 to 1500 event records can be stored on the Operator Interface archive disk.
- Each event must have at least one of the following destinations:
  Email, OI archive, or OI Display
- You can select the events from a list of **all digital tags**.
- A digital signal may be either an Event or an Alarm, but not both

Procedure

Enter a Title for the Event list.

From the drop-down menu, select the type of tags you want to display on the tag name list.

Click on each tag name you want included in the list.

Click on ADD. The selected tag or variable will be placed in the next available position in the "Selected Tags List".

Select a tag in the list then, click on "Event Details" button to enter details for the tag selected. Details include:
E Mail Notification
Store to O/I Archive List
Display on O/I
Trigger Direction for ON or OFF state

Click OK.

Event Details

The **Event Details** dialog box enables you to enter details for the tag selected when you configure events. The block number and output number are listed across the banner. The Tag name and tag descriptor is listed in field below the banner.

Events do not have multiple priorities like alarms. They are considered a lower priority than alarms.

Details include:

- *E Mail Notification* of events on a point by point basis. (Check the box to allow Email notification*)* The E-mail will be sent:
  - if an event occurs on a point configured to send E-mail.
  - to any/all of the 3 E-mail addresses that have events assigned. **Event priorities** are always indicated as "1"
- ***Store to OI Archive List*** -OI Event File on the data archive disk on an event by event basis
- ***Display on OI*** - presentation on OI Status line and Event Summary display
- ***Trigger Direction*** – ON – Event on rising edge (Off-to-on transition)

  OFF – Event on falling edge (off-to-on transition).

(click on radio button to select)

E-Mail Notification


opens the **E-Mail Notification** dialog box. It lets you configure up to three E-Mail addresses per controller configuration for Alarm and Event notification.

There are two tabs on the dialog Box.

General Tab

FROM The ***Controller name*** is configured by the builder of the Configuration file [Read Only]

SUBJECT Enter an Event Subject (up to 31 characters)
Enter an Alarm Subject (up to 31 characters)

To List Tab -

Enter up to 3 configurable E-Mail addresses.(32 characters per addresses)
For each Email address check the Alarm/Event priorities you want the E-mail address to receive.

Events do not have multiple priorities like alarms because they are considered at a priority lower than all alarms.

Alarm priorities were set during "Alarm Group Configuration" under "Alarm Details"
2 = Low Priority Alarm
3 = Medium Priority Alarm
4 = High Priority Alarms
5 = Emergency Alarm

The priority of an event is always indicated as "1" - (see Event Configuration)

Attention: See "Set Controller Network Parameters" and follow the wizard to set up a SMTP mail server IP Address.

Examples:

Somebody@somewhere.com receives ***only priority 5 Alarms***
(only the check box for "5" is checked

Aperson@somewhere.com receives ***all Alarms and Events***
(all 5 boxes are checked)

People@somewhere.com receives ***only Events***
(only check box for "1" is checked)

Operator Interface Settings

 on the Operator Panel Worksheet Toolbar opens the "**Operator Interface Settings**" Dialog Box.

Select one of the tabs:

Security

Save

Main Menu

Language

Security Tab

This lets you configure, download, and upload security settings for the operator interface. The security configuration is divided into two areas: **Operator Security** and **Engineer Security**.

Each of the security features shown in the dialog box offers a different level of security.

Item	Feature	Description
1	**Enable Security**	This is a master enabling switch. **Click on box** to enable security on any of the engineer or operator secured items that are also selected. *If this is **not** selected, no engineer or operator secured items will be secured, even if they are selected.*
2	**Operator Security Code**	Enter a 3-digit NUMERIC code that will be used to secure items 3 through 9. 0 disables Operator Security
3	**Set Up Control**	Click to secure access to setup items. Click off to allow unrestricted access.
4	**Change between Auto and Manual Control**	Click to secure loop mode AUTO/MANUAL operation Click off to allow unrestricted access
5	**Change between Local and Remote Setpoint**	Click to secure changing between Local and Remote Setpoints. Click off to allow unrestricted access.
6	**Disk Utilities/ Data Storage**	Click to secure access to disk utilities, data storage controls, and load data storage settings. Click off to allow unrestricted access.
7	**Setpoint Programmer - Scheduler - Sequencer operations**	Click to secure Setpoint Program/Scheduler/Sequencer operation. Click off to allow unrestricted access.
8	**Recipe**	Click to secure recipe and variable edit operation. Click off to allow

Item	Feature	Description
	operations/Variable Edit	unrestricted access.
9	**Log On/Off**	Click to secure Log On/Off operation. Click off to allow unrestricted access.
10	**Engineer Security Code**	This is a higher level of security than the operator security code because it secures access to "off-line" functions such as calibration. Choose a 3-digit code which will be used to secure the item 11 through 13. 0 disables Engineering Security
11	**Unit Setup**	Click to secure Set Mode, Set Time and Date, Set Security, Comm Ports., Self Tests, Calibrate AI, Calibrate AO. Click off to allow unrestricted access.
12	**Function Block Edit**	Click to secure Edit Device Control and HOA EDIT displays. Click off to allow unrestricted access.
13	**Edit Menus**	Click to secure Edit Device Control and HOA operate display Edit menus. Click off to allow unrestricted access

Save tab

The Save tab is available for Rev. 2.0 or later configurations.

Prevents unauthorized saves by specifying which items can be saved to the controller's pool.

- Recipes
- Setpoint Profiles
- Schedules
- Sequences

Main Menu tab

The Main Menu tab is available for Rev. 2.0 or later configurations.

Specify which items appear on the OI main menu:

- Recipes
- SP Programmers
- SP Schedulers
- Sequencers
- Loops
- Alarms/Events/Diags
- Summary Displays
- Unit Setup
- Disk Utilities
- Data Storage
- Log Off

Language tab

Specify the language for all OI menus.

O/I File Names for Disk Storage

 on the Operator Panel Worksheet Toolbar opens the **OI File Names** dialog box.

You can configure up to 25 file name roots (6-characters) for use by the operator interface in disk storage.

The Operator Interface lets you choose a name root and append it with a 2-digit number. Then a 3-character extension is automatically added to create a filename for the disk storage functions.

Please use DOS format File Names.

The first several names listed in the dialog box are defaults and can be changed.

Click on a box and enter a file name.

Start Up Display Configuration

 on the Operator Panel Worksheet Toolbar opens the **Start Up Display Configuration** dialog box.

This selection lets you enter **Title Text** and **Comment Text** for your start up display. The "Start Up display" is the first screen displayed following start up and is **not associated with any display button.**

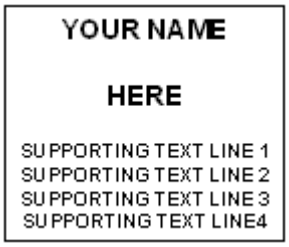
This same text is also viewed on the OI's Logoff Display.

Configuration Procedure

Enter a title on the Startup display. The title can be up to 2 lines in length but there is a maximum of 12 characters per line.

Enter a text message on the Startup display. The message can be up to 4 lines in length but there is a maximum of 24 characters per line.

Example



Message Display Configuration

 on the Operator Panel Worksheet Toolbar opens the **Message Display Configuration** dialog box.

This selection lets you configure 10 pages of **Help Message Displays**.

Configuration Procedure

Select a page from the drop-down menu or navigate to the desired page using the Forward/Reverse buttons on the top of the dialog box.

Enter a title text for the display. The title can be one line in length but there is a maximum of 24 characters per line.

Enter a message text for the display. The message can be up to 11 lines in length for each page but there is a maximum of 32 characters per line.

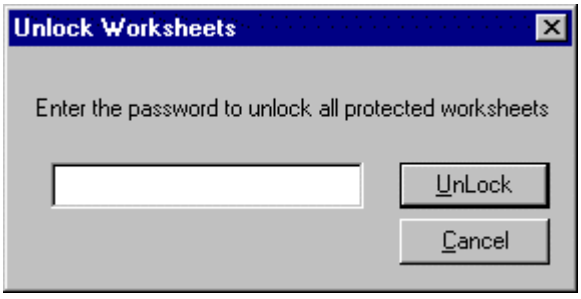
Example

START UP NOTES

USE RECIPE #1 AFTER SHUTDOWN
CHANGE SETPOINT TO 450
SHUT OFF PUMP #1
TURN OFF WATER VALVE
RESET LIMIT CONTROL
VERIFY WATER LEVEL ON TANK #1

Unlock the Worksheets

opens the "Unlock Worksheets" dialog box.



Enter the password in the field and then, press "UNLOCK".

How to add/change worksheet protection.

Data Storage

Data Storage Overview

The Data Storage feature provides background storage of process information on a storage device for analysis by an off-line computer equipped with Honeywell data analysis software.

Data stored files can not be reviewed from the operator interface. The instrument can support both continuous and discontinuous (batching) modes of the following storage types:

Trends - Two Trend groups of up to 12 points each can be stored. Floppy disk capacity for trends is inversely proportional to the number of trend points and the storage time interval (that is, the time between trend samples). For example, when storing 2 trend groups of 12 points each at a storage interval of 2 seconds, the storage device will be filled in a few hours. Conversely, when storing 1 trend group of 3 points at a storage interval of 30 minutes, the storage device could take several months to be filled.

Point Log (unit data samples) - A point log file to take a "snapshot" of process data for up to 12 points is also provided. Point log samples can be scheduled to occur at a user-specified time synchronized to the controller's Real Time Clock (RTC) or by a digital event in the controller. The maximum sample rate for point log data is 60 seconds per sample. The Point log file has a maximum capacity of between 2000 and 5000 records per file.

Alarms - Alarm recording is available to store on and off alarm actions. Alarm data includes the point tag, a 16-character point description, and the time and date of alarm occurrence. The Alarm file has a capacity of between 150 and 1500 records per file.

Events - Digital event recording is also available to store on and off transitions of digital events in the controller. Event data includes the point tag, a 16-character point description, and the time and date of event occurrence. An Event file has a capacity of between 150 and 1500 records per file.

Setpoint Programs/Schedules, instrument configurations, recipes, variables, diagnostics, and calibrations are not part of the Data Storage feature.

Associated Information

Data Storage Conventions

Data Storage Enable Conditions

Data Storage Configuration

Data Storage Conventions

Storage Modes

Trends, Point Log, and Alarms/Events can be stored in ***Continuous*** or ***Batch*** modes. In addition, Point Log can be stored in ***On Command*** mode.

Mode	Description
Off	No data will be collected
Continuous	Data is sampled at the storage interval
Batch	Data is sampled at the storage interval, but also a Batch Enable Signal separates the sampled data into numbered batches. Batch #1 begins when the Batch Enable Signal turns on, and ends when the signal turns off. Batch #2 begins when the Batch Enable Signal turns on, and ends when the signal turns off, etc. No batch mode data is collected while the Batch Enable Signal is off. The Batch Enable Signal does not affect data being stored as Continuous or On Command.
On Command	Point Log data is sampled on each off-to-on transition of the Point Log Enable Signal.

Storage intervals

When data storage is enabled, samples are taken at regular intervals known as the storage intervals. These intervals can be from a few seconds to 30 minutes. Each data type has its own storage interval. For example:

Trends can be stored using one interval (like 5 seconds),
Point Log using another interval (like 10 per day), and
Alarms/Events (stored as they occur).
Or, they can **all use the same interval**. It depends on how data storage has been configured.

In ***Continuous*** *and* ***Batch*** *modes*, the storage interval determines how often data is sampled and stored:

For **trends**, data is first sampled when storage is enabled and again at equally spaced intervals thereafter. For example, if trend storage is enabled at 2:03 p.m. and the interval is 10 minutes, trend storage occurs at 2:03, 2:13, 2:23, etc. until storage is disabled.

For **Point Log**, data is first sampled after storage is enabled but not until the programmed Start Time. Data is sampled at equally spaced intervals after the Start Time. For example, suppose the Start Time is 3:00 p.m. and the storage interval is 10 minutes. If storage is enabled at 2:03 p.m., the first sample will occur at 3:00 and every 10 minutes thereafter. If storage is disabled at 3:35 and enabled at 3:42, storage will resume at 3:50. Notice that the interval is synchronized to the Start Time.

Alarm/Events are logged on occurrence with time and date (No interval)

In ***On Command*** *mode for Point Log*, there is no storage interval or Start Time. A single sample of Point Log data is taken when the Point Log Enable changes from off (disable) to on (enable).

How Storage is Enabled

Data collection may be started through key actions from the operator interface keyboard or from digital status signals from the controller. An "S" in the status line of the operator interface display indicates active storage. *[For detailed information refer to Data Storage Enable Conditions]*

Disk Capacity

The disk capacity (in time) is calculated and displayed once all storage initialization is complete. This eliminates the need for manual calculations and gives the operator the exact duration of the disk. All

file types in the data storage feature may be configured to stop collecting data when the file is full or to continue in a circular storage mode (roll-over) where the oldest data is discarded as new data is collected. When roll-over is **not** selected, a disk full warning indication is provided in the status line of the display. The configurator, as required, may change the percent full limit. A storage buffer in the operator interface allows changing the disk media without the loss of process data.

Calculation for Data Storage Capacity

$$\text{Trend Capacity (In Hours)} = \frac{\text{Disk factor} * (R1)}{F1 + (F2 * (R1/R2))}$$

Where:
R1 and R2 are the storage rates (in seconds) for Trend 1 and Trend 2, respectively.
F1 and F2 are the point factors associated with the number of points per trend file.
Disk Factors:

398	Trends files only active
394	Trends files + Alarms and Events
347	Trend files, + alarms and Events + Point Log Files

Number of points in trend

1	2	3	4	5	6	7	8	9	10	11	12
14.00	20.16	26.53	33.60	38.77	45.82	50.40	56.00	63.00	72.00	84.00	84.00

Point Factor (F1 and F2)

File Extensions

The following File Extensions are used for the HC900 Controller's Data Storage output files:

LNT for **Trend** Files

LNP for **Point Log** Files

LNA for **Alarm** Files

LNE for **Event** Files

Data Storage Enable Conditions

How storage is enabled

Data Storage Enable/disable is an Operator Interface function. If a schedule is developed in the software, all storage is automatically enabled.

Enable controls

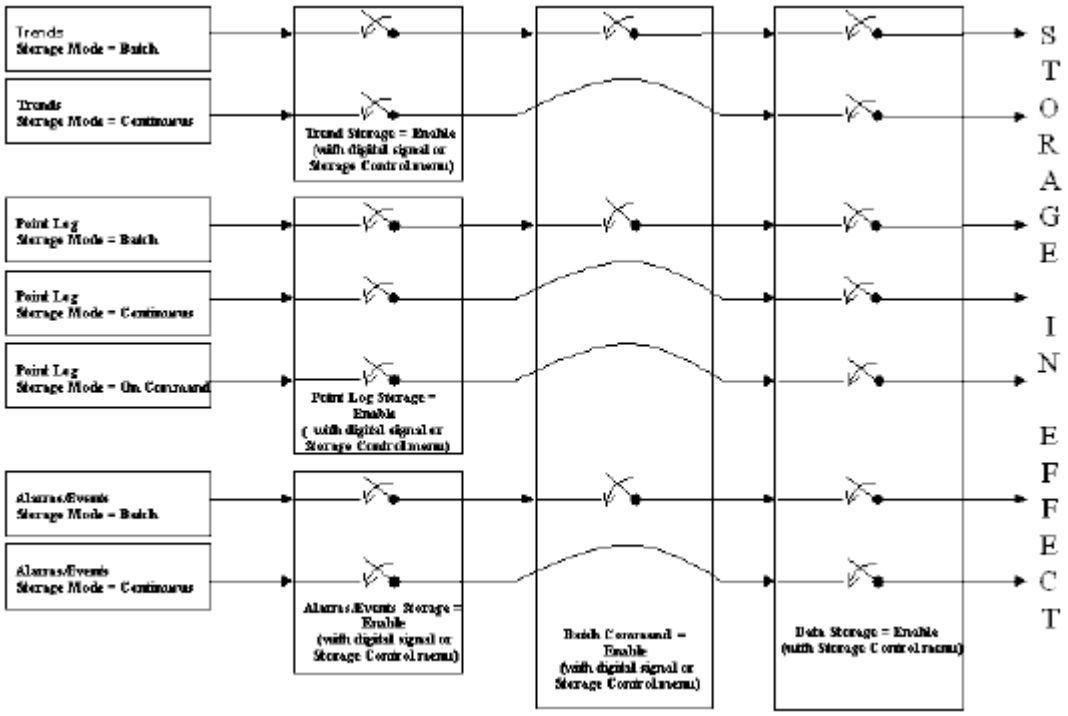
The figure below shows the controls that must be enabled for each storage mode and data type. The left side shows the three data types and their possible storage modes (only one storage mode is in effect for any data type). The arrows show the conditions required for that storage to take place.

For example, trend batch storage requires:

the Trend Storage Control to be on (enabled at configuration – if any signal is selected for storage i.e. Signal Enable = NONE),

the Batch Command Control to be on (enabled at configuration), and

the Data Storage Control to be enabled (enabled at Operator Interface).
Notice that the Batch Command Control applies only to batch storage mode.



Three Levels of Enabling

There are three levels of Data Storage Enable:

Data Storage Disable Signal (Operator Interface) – See Note 1.
Data Type Enable Signals
Batch Command Enable Signal

Note 1. *Since any storage schedules loaded into the system automatically enables storage, the operator interface can disable storage*.

Data Type Enable Signals

This level of control is the Data Type Enable Signal. Each data type (trends, point log, and alarms/events) has its own Enable Signal that can either be configured as a digital signal on the Hybrid Control Designer, or if not configured as a digital signal (NONE selected on Hybrid Control Designer Data Storage Configuration), it will appear on the Storage Control menu on the operator interface

For example, if the Trend Enable Signal is *configured as a digital signal in the* Hybrid Control Designer Data Storage Configuration, it will **not** appear on the Storage Control menu on the operator interface. This is done to avoid having two conflicting sources for the enable signal.

When a *digital signal is not used*, the Trend enable signal is set to enable when the configuration is loaded. The Trends can then be disabled from the Operator Interface.

The Enable Signal has two functions for Point Log storage.

In Continuous and Batch modes, it enables Point Log storage to begin at the Start Time and at every storage interval thereafter.

In On Command mode, when it changes from off (disable) to on (enable), it causes a single sample of Point Log data to be stored at that moment. (*See Point Log Storage Enable Conditions*)

Batch Command Enable Signal

This level of control is the Batch Command. It is a single control signal that starts and stops storage for all data types configured for batch storage. It does not affect Continuous or On Command storage.

If the Batch Signal is *configured as a digital signal* in the Hybrid Control Designer Data Storage Configuration, it will **not** appear on the Storage Control menu on the Operator Interface. This is done to avoid having two conflicting sources for the signal.

When a *digital signal is not used* and Batch storage has been selected, the Batch command signal is set to Stop. Batches can be started from the Operator Interface.

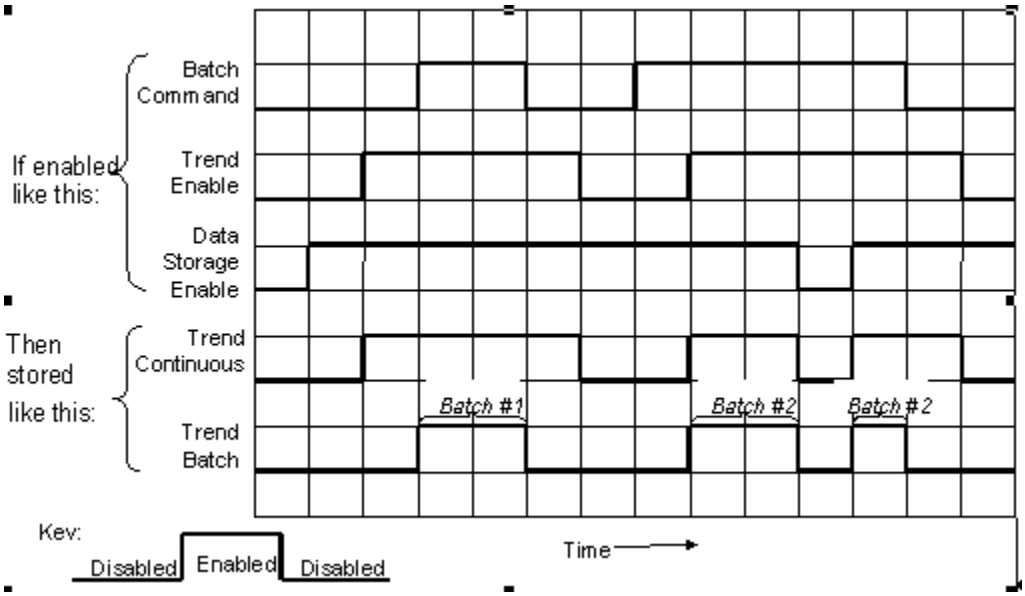
Storage Enable Conditions

Trend Storage Enable Conditions

The figure below shows examples of Trend Storage Enable Conditions.

Notice that **Continuous Trend** storage occurs unless ***Trend Disable*** or ***Data Storage Disable*** is selected.

For **Batch Trend** storage, notice that Trend enable/disable, Data Storage enable/disable must be set to enable and Batch command must be Start.



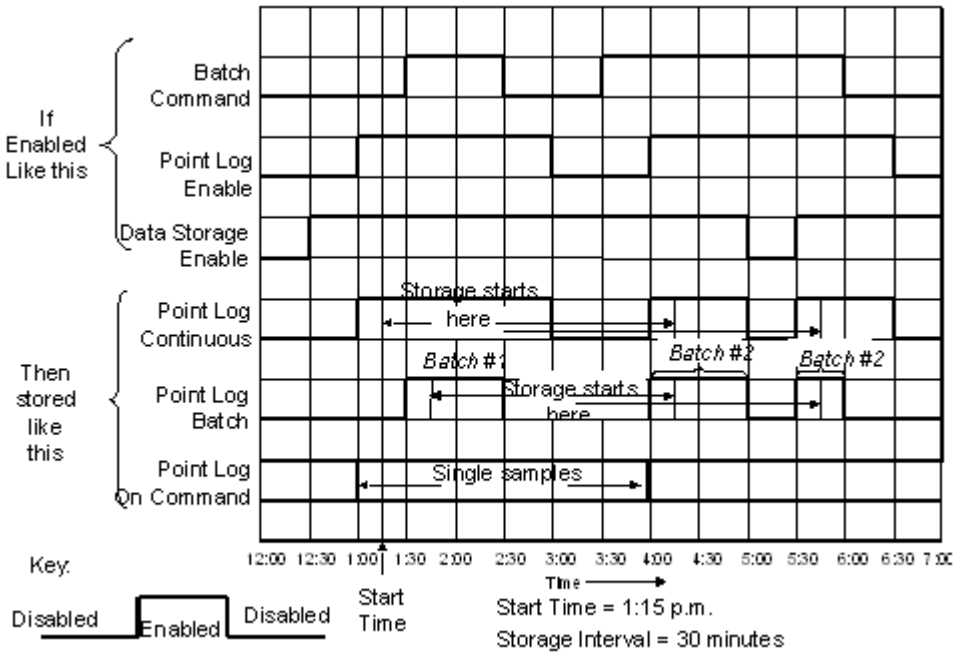
Point Log Storage Enable Conditions

The figure below shows examples of Point Log Storage Enable conditions.

Notice that it occurs unless ***Point Log Disable*** or ***Data Storage Disable*** is selected.

For **Batch Point Log** storage, notice that *all three enables must be on.*
The figure shows that storage does not actually occur until the Start Time occurs, and then at every Storage Interval thereafter.

For **On Command Point Log** storage, notice the samples are taken the instant Point Log Enable is enabled but not at intervals.

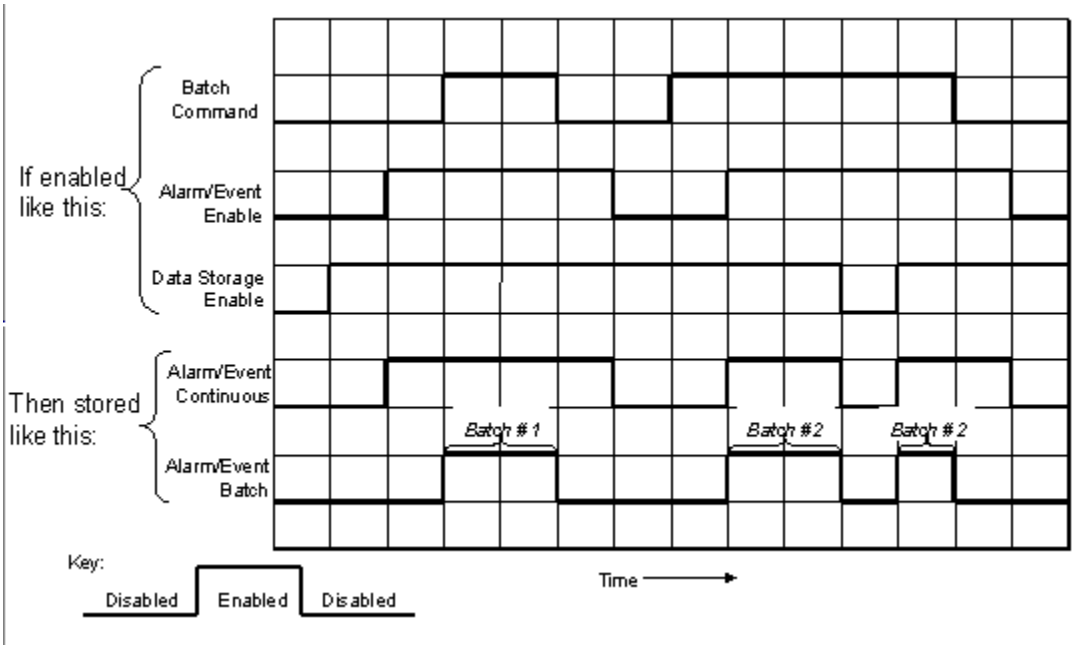


Alarm/Event Storage Enable Conditions

The figure below shows examples of Alarm/Event Enable conditions.

Notice that **Continuous Alarm/Event** storage occurs unless ***Alarm/Event Disable*** and ***Data Storage Disable*** is selected.

For **Batch Alarm/Event** storage, *all three enables must be on.*



1: Although Alarm Storage is active during the specified time periods, Alarm records will only be saved on active transitions of the alarm status. If no alarm occurs during the active period, the data for that period will be blank.

Data Storage Configuration Access

 on the Operator Panel Worksheet Toolbar opens the ***Data Storage Configuration*** dialog box.

This facility allows you to configure groups of data that will be stored to the Operator interface's data storage device. This process history can be a valuable source of information to analyze process operations quality and upsets.

The groups are configured in Hybrid Control Designer and downloaded as part of the configuration.

You can also create a new data storage file (.dss) separate from the configuration. On the File menu, select New, Data Storage.

Select a tab at the top of the dialog box to access a specific Data Storage Configuration dialog box.

Create/Edit Data Storage File

Creates/edits a data storage file (.DSS). File can be downloaded to the controller.

Step/Item	Action/Description
Select File, Open.	Lets you choose a .DSS file to edit. After selecting file the Data Storage Editor appears.
OR	
Select File, New.	"Choose a new file type" box appears.
Select Data Storage tab.	Data Storage button appears.
Select Data Storage.	The Data Storage Editor appears.
THEN	
Select a Reference Configuration.	A data storage file must have a configuration to give it context. Select an open configuration from the pull-down list. If none available, select Open Configuration to open one. The configuration will open. Click back to Data Storage Editor and select the reference configuration.
Trend	Trend setup.
Point Log	Point Log setup.
Alarm/Event	Alarms/Events setup.

Step/Item	Action/Description
Pre-initialize Disk	Prepares zip disk for data storage. Select this to avoid the long initialization time on the operator interface.
Print	Prints the data storage settings.
Save	Saves the data storage file as .DSS file.
Download	Downloads data storage file to the controller.

Trend Storage Configuration

Trend storage will provide the following:

Number of Files:	2 maximum
Points per Trend:	12 maximum, Analog or Digital
Storage Modes:	Off, Batch, Continuous
Storage Interval:	2, 5, 10, 20,30,40, 50 seconds 1, 2, 5, 10, 20, 30 minutes
External Control:	Digital Tagged Signal – Start/Stop of both Trends

Configuration Procedure

Select the "**TREND**" tab on the "Data Storage Configuration" dialog box.

Active Field	Description
Batch Enable Signal	This signal starts and stops storage for Trends configured for "Batch" storage. It does not affect "Continuous" storage selection. From the pull-down menu, select: ***NONE*** – Batch is started/stopped only through the operator interface's Data Storage Control Menu (defaults to Stop on configuration download) ***ANY DIGITAL TAG*** – Batch is started/stopped only through the on/off state of the selected Digital Signal. It **will not** appear on the operator interface's data Storage Control Menu *For detailed information concerning Data Storage Enable, refer to "Data Storage Enable Conditions"*
Group	Use the pull-down menu and select a Trend Group for configuration.
Title	Enter a Group Title. There is a maximum of 24 characters *(Note: This is not displayed on the Operator Interface. It only serves as a reminder for the user.)*

Active Field	Description
File name	Enter a File Name. There is a maximum of 8 Alpha Numeric characters. (DOS File Name restrictions)
Tag List	• From the Tag List drop-down menu, select the type of signals you want the tag list to display. • Click on a Tag Name and click **ADD>>**. The tag name will be added to the "Selected Tags" list.
Selected Tag List	**Scaling Signals** Scale each tag selected for High and Low values for the Trend Display. Click on the "Scale High" and "Scale Low" fields and enter the value. To delete a signal tag, click on a tag and click **Delete**.
Storage Intervals	**Storage Interval** From the Storage Interval drop-down menu, select a storage interval of from 2 seconds to 30 minutes. When Data Storage is enabled, samples will be taken at the interval selected here. *Refer to Storage Intervals in Storage Conventions*
Data Type Enable Signals	This enable signal turns storage on and off for trends. From the pull-down menu, select: ***NONE*** – Trend Storage Enable is started/stopped only through the operator interface's Data Storage Control Menu (defaults to Enable on configuration download), or, ***ANY DIGITAL TAG*** – Trend Storage is started/stopped only through the on/off state of the selected Digital Signal. It **will not** appear on the operator interface's data Storage Control Menu *For detailed information concerning Trend Storage Enable, refer to "Trend Storage Enable Conditions".*
Storage Mode	From the pull-down menu, select a Storage Mode. Refer to "Data Storage Conventions" for mode definitions.
Rollover	**Click** this box to allow data storage to continue collecting data in a circular storage mode where the oldest data is discarded as new data is collected. **Clear** this box to allow data storage to stop collecting data when the file is full. You can configure a Warning Level for Disk Full %.
Warning Level	If you **do not select rollover**, enter a percent in the appropriate box.

Point Log Storage Configuration

Point Log storage will provide the following:

Number of Files:	One
Points per File:	12 maximum, Analog or Digital
Storage Modes:	Off, Batch, Continuous, On Command
Storage Interval: (all relative to start time)	1 to 59 minutes, one minute increments 1 to 23 hours, one hour increments 1 to 30 days, one day increments Once month, same day of each month
External Control:	Digital Tagged signal - start/stop storage to file - On Demand sampling

Configuration Procedure

Select the "**POINT LOG**" tab on the "Data Storage Configuration" dialog box.

Active Field	Description
Batch Enable Signal	This signal starts and stops storage for Point Logs configured for "Batch" storage. It does not affect "Continuous" or "On Command" storage selections. From the pull-down menu, select: ***NONE*** – Batch is started/stopped only through the operator interface's Data Storage Control Menu (defaults to Stop on configuration download) ***ANY DIGITAL TAG*** – Batch is started/stopped only through the on/off state of the selected Digital Signal. It **will not** appear on the operator interface's data Storage Control Menu *For detailed information concerning Data Storage Enable, refer to "Data Storage Enable Conditions"*
File name	Enter a File Name. There is a maximum of 8 Alpha Numeric characters. (DOS File Name restrictions)
File Record Limit	Enter a File Record Limit number of between 2000 and 5000.
Tag List	• From the Tag List drop-down menu, select the type of signals you want the tag list to display. • Click on a Tag Name and click **ADD>>**. The tag name will be added to the "Selected Tags" list.
Selected Tag List	**Scaling Signals** Scale each tag selected for High and Low values for the Point Log Display. Click on the "Scale High" and "Scale Low" fields and enter the value. To delete a signal tag, click on a tag and click **Delete**.
Data Type Enable Signals	This enable signal turns storage on and off for Point Logs.

Active Field	Description
Enable Signals	From the pull-down menu, select: ***NONE*** – Point Log Storage Enable is started/stopped only through the operator interface's Data Storage Control Menu (defaults to Enable on configuration download), or, ***ANY DIGITAL TAG*** – Point Log Storage is started/stopped only through the on/off state of the selected Digital Signal. It **will not** appear on the operator interface's data Storage Control Menu *For detailed information concerning Trend Storage Enable, refer to "Point Log Storage Enable Conditions".*
Storage Mode	From the pull-down menu, select a Storage Mode. Refer to "Data Storage Conventions" for mode definitions.
Storage Interval	NOTE: *For On Command storage mode, there is no storage interval or start time*. (They are not used.) • Click on "Change". The "Storage Interval" dialog box will appear. • Click on the radio button for Minutes, Hours, or Days and select a storage interval from the Edit box. Or, click on the radio button for "Once a Month". • Click OK *Refer to Storage Intervals in Storage Conventions*
Start Time	NOTE: For On Command storage mode, there is no storage interval or start time. (They are not used.) • Click on "Change". The "Change Time" dialog box will appear. • In the Edit box in each field, select a start time. • Click OK. *Refer to Storage Intervals in Storage Conventions*
Rollover	**Click** this box to allow data storage to continue collecting data in a circular storage mode where the oldest data is discarded as new data is collected. **Clear** this box to allow data storage to stop collecting data when the file is full. You can configure a Warning Level for Disk Full %.
Warning Level	If you **do not select rollover**, enter a percent in the appropriate box.

Alarm/Event Storage Configuration

Alarm/Event storage will provide the following:

Number of Files:	One each
Records per File:	150 to 1500 records per file
Data Types:	All Alarms – Time/Date, On/Off All Events – Time/Date, On/Off
Storage Modes:	Off, Batch, Continuous
External Control:	Digital Tagged Signal – Start/Stop storage to file

Configuration Procedure

Select the "**Alarm/Event**" tab on the "Data Storage Configuration" dialog box.

Active Field	Description
Batch Enable Signal	This signal starts and stops storage for Alarm/Events configured for "Batch" storage. It does not affect "Continuous" storage selections. From the pull-down menu, select: ***NONE*** – Batch is started/stopped only through the operator interface's Data Storage Control Menu (defaults to Stop on configuration download) ***ANY DIGITAL TAG*** – Batch is started/stopped only through the on/off state of the selected Digital Signal. It **will not** appear on the operator interface's data Storage Control Menu *For detailed information concerning Data Storage Enable, refer to "Data Storage Enable Conditions"*
Alarm File Name	Enter a File Name. There is a maximum of 8 Alpha Numeric characters. (DOS File Name restrictions)
Alarm File Record Limit	Enter an Alarm File Record Limit number of from 150 to 1500.
Event File Name	Enter a File Name. There is a maximum of 8 characters
Event File Record Limit	Enter an Event File Record Limit number of from 150 to 1500.
Data Type Enable Signal	This enable signal turns storage on and off for Alarm Events. From the pull-down menu, select: ***NONE*** – Alarm/Event Storage Enable is started/stopped only through the operator interface's Data Storage Control Menu (defaults to Enable on configuration download), or, ***ANY DIGITAL TAG*** – Alarm/Event Storage is started/stopped only through the on/off state of the selected Digital Signal. It **will not** appear on the operator interface's data Storage Control Menu *For detailed information concerning Trend Storage Enable, to "Alarm/Event Storage Enable Conditions"*

Active Field	Description
Storage Mode	From the pull-down menu, select a Storage Mode. Refer to "Data Storage Conventions" for mode definitions.
Rollover	**Click** this box to allow data storage to continue collecting data in a circular storage mode where the oldest data is discarded as new data is collected. **Clear** this box to allow data storage to stop collecting data when the file is full. You can configure a Warning Level for Disk Full %.
Warning Level	If you **do not select rollover**, enter a percent in the appropriate box.

Function Block Diagram (FBD) Worksheet

FB Worksheet Overview

Function Block Diagram Worksheets let you build your control strategy graphically right on the User Interface. It provides a full complement of SAMA-style symbols that we call Function Blocks that can be "softwired " to each other. It also includes signal tag generation capability for resident control data that can be linked to displays and other software programs.

The Function Block Diagram Worksheet has a Toolbar to launch dialog boxes to configure:

Worksheet Properties -Enter a configuration name and description in the appropriate fields.

Alarm Group Configuration

Event List Configuration

Block Order

The toolbar also contains icons for Cut, Copy, and Paste; Zoom Level, and an Icon to toggle a grid on and off on the worksheet.

The Function Blocks are listed in the Worksheet Toolbox (Function Block Menu Tree).

You Drag and Drop the function blocks from the menu onto the worksheet and softwire them to create a control strategy. See FB Diagram Rules

There are:

up to 20 worksheets per configuration

Up to 20 pages per FBD worksheet

A total of up to 400 Function Block Pages (20 x 20)

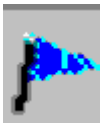
There is extended use of Right Mouse Click.

FBD Configuration Toolbar

Click on ICON to open the dialog box.

ICON	Function	Dialog Box Comments - Use F1 for Help
	**Print Worksheet**	Click to print the active worksheet. It opens the "Print" dialog box for printing.
	**New FBD Worksheet**	Click to select a new FBD Configuration Worksheet. It will be listed under "Function Block Diagrams" in the File Browser. A new tab will be created at the bottom of the FB Diagram See "Worksheet Properties: to assign a Title and Description.
	**Delete FBD Worksheet**	Click to delete the selected FBD Worksheet highlighted on the File Browser. This will delete all the items in the worksheet.
	**Reorder FBD Worksheets**	Opens the Worksheet order dialog box. Allows you to change the order of the worksheets as they appear at the bottom of the Worksheet area. Click on worksheet name and use the increment-decrement buttons at the top of the dialog box to change the worksheet order.
	**FBD Worksheet Properties**	Type in a title and description of your FBD Worksheet. The title will appear in the File Browser and on the associated FB Worksheets tab at the bottom of the diagram.

ICON	Function	Dialog Box Comments - Use F1 for Help
		❖❖❖ ❖❖❖ ❖❖❖
	**Cut**	Moves the currently selected FBD diagram items from the current Function Block diagram and places them on the clipboard. Indicated by a red dotted line. Upon pasting the items, all links to them (e.g., display references, Modbus address, recipes) are preserved as if they were moved, they are not deleted and pasted as a new copy.
	**Copy**	Copies the currently selected FBD diagram items from the current Function Block diagram and places it on the clipboard. Indicated by a blue dotted line.
	**Paste**	Places the contents of the clipboard containing FBD diagram items onto the Function Block Diagram at the location determined by the blinking insertion point caret. This command is unavailable if the clipboard is empty. Cut and pasted items maintain their links (e.g., display references, Modbus addresses, recipes), they are not deleted and pasted as a new copy. If you paste a cut function block and soft wires to the same or different worksheet in the same configuration, the soft wires will be dangling (unconnected) and you are asked to specify how you want to resolve dangling soft wires. ❖❖❖ ❖❖❖ ❖❖❖
	**Find Item**	Allows you find an Item on the FBD worksheet. Opens the "Find Item" dialog box.
	**Zoom Out**	You can "zoom out" to see more of the page at a reduced size. Zoom levels of 50%, 75%, 100%, 125%, and 150%.
	**Zoom In**	You can "zoom in" to return items to normal size. Zoom levels of 50%, 75%, 100%, 125%, and 150%.
	**Grid**	Lets you place a grid in the FBD Diagram. This can aid in the placement of items on the diagram. ❖❖❖ ❖❖❖ ❖❖❖
	**Alarms**	Click to open the "Alarms Group Configuration" Dialog Box. It lets you configurealarm points. See "Alarm Group Configuration"

ICON	Function	Dialog Box Comments - Use F1 for Help
	**Events**	Click to open the "Configure Event List" Dialog Box. It lets you configure events in the controller. See "Event List Configuration"
	**Block Tag Order**	Click to show drop down menu. Lets you changethe execution order of the function blocks. Select Execution Order, Fast Logic Order, or Tag Order.
	**Unlock Worksheets**	Click to open the "Unlock Worksheets" dialog box. Enter a password and click "Unlock" to unlock all worksheets.

How to Add a New FBD Worksheet

- Right click on the FBD Worksheet name on the Browser. Select "Append New Worksheet", or
- Select the "New FBD Worksheet" icon on the Function Block Diagram Toolbar (far left), or
- From the Edit menu on the Main Drop-down menus, select "Append New Worksheet".

A new worksheet will appear at the bottom of the Function Block Diagram list in the browser and a blank worksheet will be place on the Hybrid Control Designer.

Right click on the new Worksheet name in the browser or double-click on the worksheet's tab then, select Properties and set the new worksheet properties.

For each worksheet added, a tab will appear at the bottom of the Function Block Worksheet area with the name of the worksheet that was set in "Worksheet Properties" on it. Use the scroll bar for access to a specific worksheet tab.

How to Navigate Between FBD Worksheets

Use the Worksheet Tabs

For each worksheet added, a tab will appear at the bottom of the Function Block Worksheet area with the name of the worksheet that was set in "Worksheet Properties" on it. If necessary, use the scroll bar to access other worksheet tabs. Click on the tab to select the associated Worksheet.

Use the File Browser

The File Browser, located on the top left side of the Worksheet, is a movable window listing opened files.

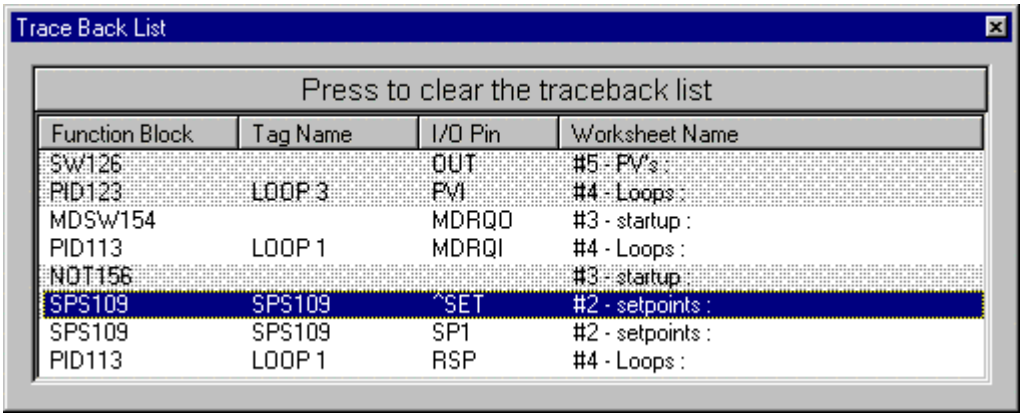
It allows you to move quickly between files and worksheets.

To select a particular Worksheet, double-click the Function Block Worksheet name.

Use the Connection Traceback

Access the Trace Window from the Main Menu Toolbar 

Or, from the View Menu on the main menu.



The Trace Window provides a list of all blocks/pins you have traced and lists :

- Block ID
- Tag Name
- I/O Pin Name
- Worksheet name

The last trace is on the top of the list.

Selecting a function block from the list will activate the associated function block worksheet.

Use the "Find Item" feature

From the "Edit" Menu on the main menu select "Find". It lets you search for an item on the FBD Worksheet.
Select the item type from the "Show" drop down menu on the "Find Item" dialog box.
Select an item from the "Item" drop-down menu. Click on the Worksheet in the "Find Results" field and the associated worksheet will be selected and the Tag, Variable, or Function Block will be highlighted on the worksheet.

Keyboard Navigation

You can use the keyboard to navigate through the FBD Worksheets.

Press	To
LEFT ARROW	Scroll worksheet to the left
RIGHT ARROW	Scroll worksheet to the right
UP ARROW	Scroll worksheet up
DOWN ARROW	Scroll worksheet down
END	Go to the end of last page
HOME	Go to the beginning of first page
PAGE DOWN	Go to the next worksheet page
PAGE UP	Go to the previous worksheet page

Press	To
CTRL+LEFT ARROW	Go to the end of last page
CTRL+RIGHT ARROW	Go to the beginning of first page
CTRL+UP ARROW	Go to the top of the page
CTRL+DOWN ARROW	Go to the bottom of the page
CTRL+PAGE DOWN	Go to the next worksheet tab
CTRL+PAGE UP	Go to the previous worksheet tab

Other keyboard functions

If necessary, you can use the standard keystroke conventions to move around.

ALT *used together with the underlined letter in text labeling an object lets you select that object.*

TAB *select next field or object in dialog boxes and configuration templates*

SHIFT+TAB *select previous field or object in dialog boxes and configuration templates*

UP ARROW *previous choice in the field*

DOWN ARROW *next choice in the field*

ALT+DOWN ARROW *opens a drop-down list box*

Traceback Window

Overview

This feature helps you find problems with soft-wire and signal connections between Function Blocks.

For Example:

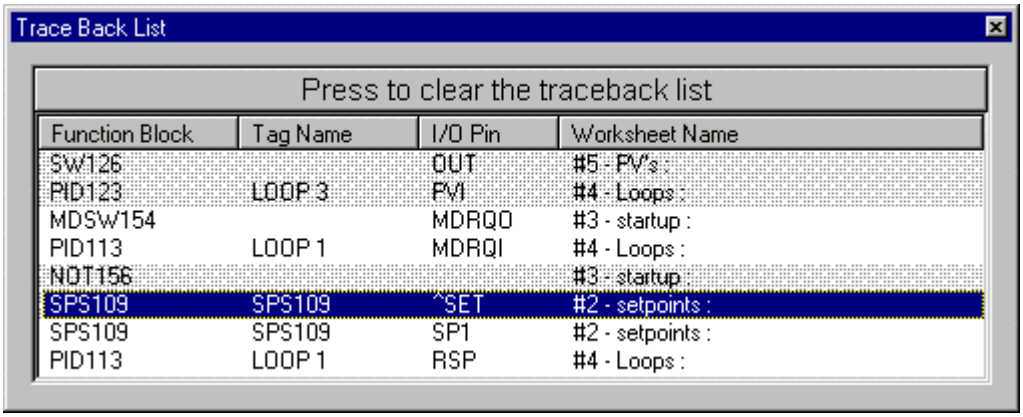
If you are testing a configuration that you've built and want to know why a Digital Output is ON when it should be OFF, you can search for the source of the Input Signal.

Traceback is useful for finding the analog or digital source signal.

Trace Window

Access the Trace Window from the Main Menu Toolbar 

Or, from the View Menu on the main menu.



It is a dockable, sizeable window.

The Trace Window provides a list of all blocks/pins you have traced and lists :

Block ID
Tag Name
I/O Pin Name
Worksheet name

Trace Window Update

Each time you perform a Trace, the window will update with a new pair of block/pins.
The ***first item*** is the ***signal source***, the ***second item*** is the ***signal destination***.

Select any of the rows in the Traceback window to recall the diagram to display the selected block.

The last trace is on the top of the list.

Right Mouse Click Procedure to Trace Signals

Select a Function Block of interest.

Right Mouse click on any INPUT pin.

Select "TRACE". Traceback will "find" the source of the connection you selected and refresh the FBD view with that block visible (Highlighted) - even if the other side of the connection is on a ***different*** worksheet.
The Output pin of the block (the signal source) will be displayed in RED.

From that block, repeat the traceback to another block and another block, etc.

Use the Traceback list to view your Traceback history.

You can clear the Trace List by pressing the bar at the top of the window.

Resolve Dangling Soft Wires

When you cut a function block(s) and any connected soft wires, after you paste the selection onto the same or different worksheet *in the same configuration,* the pasted soft wires are left dangling (unconnected). To resolve these dangling soft wires a dialog box appears with the following choices.

a) **Delete dangling soft wires**. Select this to delete the soft wires from the pasted function block(s). The soft wire connections prior to the cut will be broken.

b) **Split dangling soft wires using signal tags**. Select this to restore the pre-cut connections using automatically created signal tags. The function blocks will again be connected not with soft wires but with signal tags.

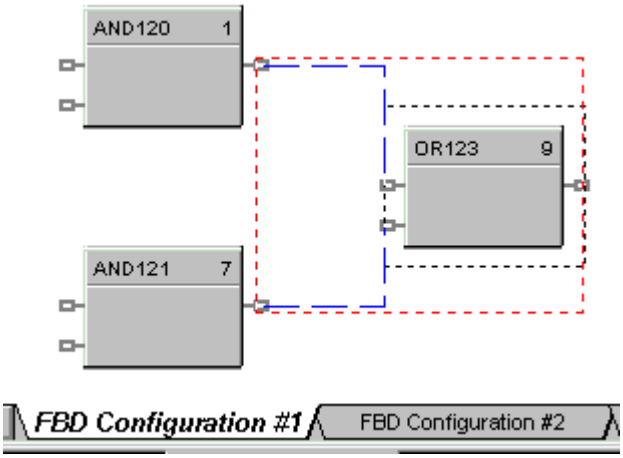
c) **Split dangling soft wires using page connectors (available in configuration revisions 2.x or higher).** Select this to restore the pre-cut connections using automatically created page connectors. The function blocks will again be connected not with soft wires but with page connectors.

The last two choices are selectable only if sufficient quantities of signal tags or page connectors remain.

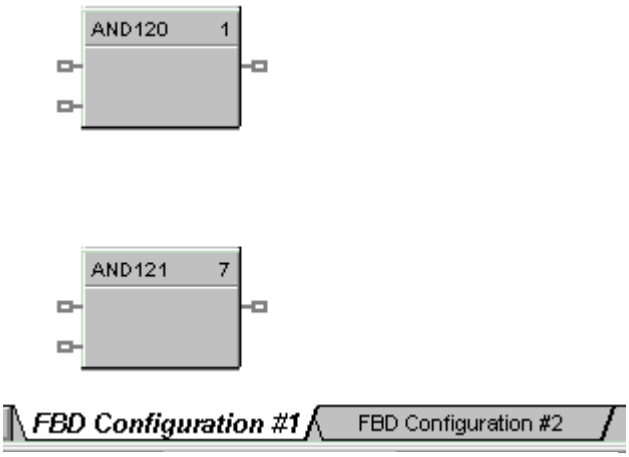
ATTENTION: The automatically created signal tags or page connectors can sometimes overlap or hide the original connectors so check behind them, don’t assume the previous connectors were replaced.

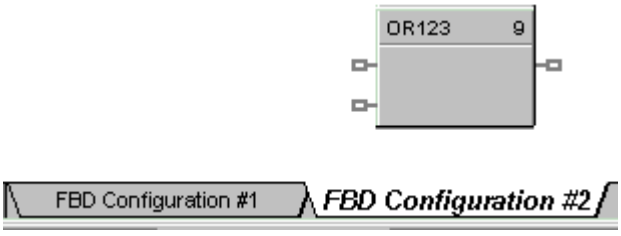
Examples

Before the cut:

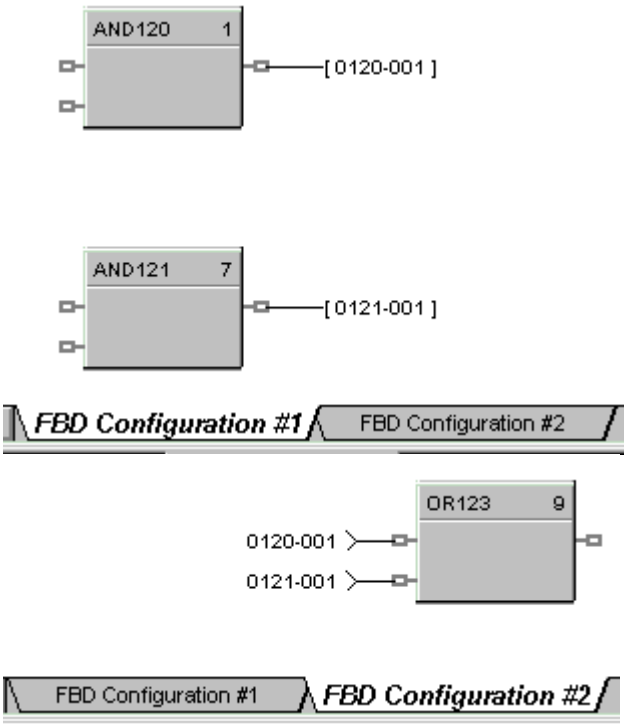


After pasting on a different worksheet and **Delete dangling soft wires**:

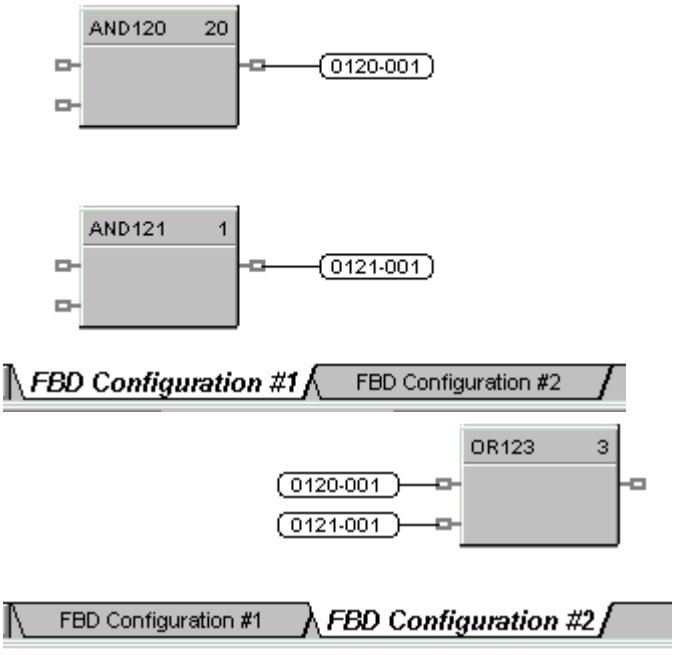




After pasting on a different worksheet and **Split dangling soft wires using signal tags**:



After pasting on a different worksheet and **Split dangling soft wires using page connectors:**

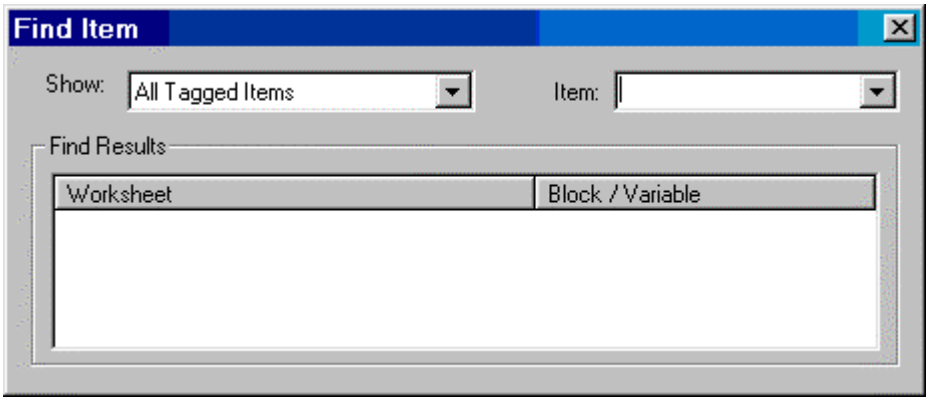


How to Find an Item on the FBD Worksheet

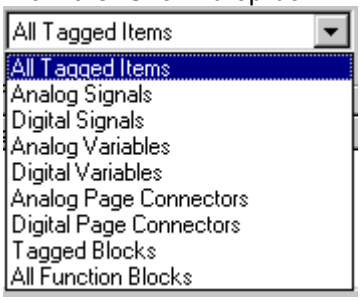
On the FBD worksheet lets you find an item and all places it is used (such as a signal tag used multiple times).

Access

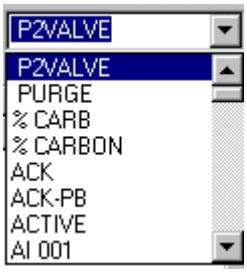
From Edit menu or by right clicking an item on the FBD worksheet. Opens the "Find Item" dialog box.



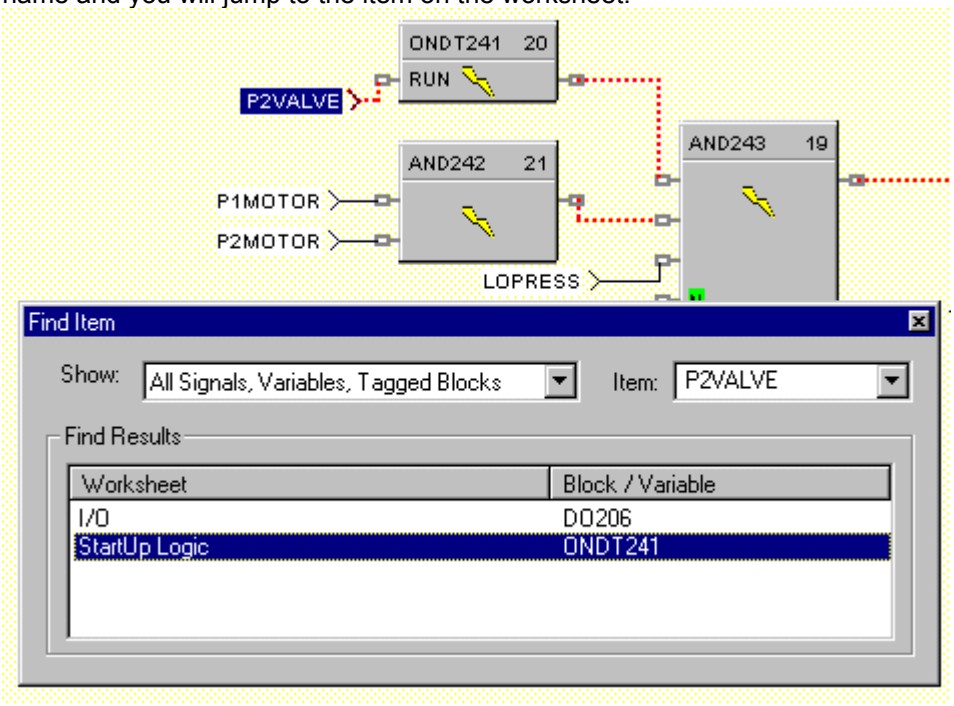
From the "Show" drop-down menu, choose an item type



From the "Item" drop-down menu, choose an item. If you already right clicked on an item in the FBD worksheet it will be displayed here.



The Find Results" field will indicate the Worksheet where the item is located. Click on the Worksheet name and you will jump to the item on the worksheet.



Double click on an item on the worksheet to open the "properties" dialog box. The Tag or Variable Number or Function Block name will appear on the dialog box banner.

How to Change a FBD's Worksheet Properties

- Right click on the new Worksheet name in the browser and select "Properties", or
- Double click on the worksheet tab, or
- Select the "Properties" icon on the Function Block Diagram Toolbar (3rd from left), or
- From the Edit menu on the Main Drop-down menus, select " Worksheet Properties".

Enter a Title *(worksheet name will appear on the File Browser and worksheet tabs)* and Description *(enhance the Worksheet name with descriptive text)* in the appropriate fields of the dialog box. The descriptive name appears on the FBD Report Printouts. Reference "Print Report"

How to Change the Worksheet Order

The Worksheet Order dialog box lists the FBD worksheets as they appear on the tabs at the bottom of the Function Block Worksheet area.

- In the dialog box, click on the Worksheet name that you want to reorder
- Change the worksheet order using the Increment/decrement buttons at the top right of the worksheet order dialog box

The tabs will be reordered at the bottom of the worksheet area.

How to Delete a FBD Worksheet

- Right click on the new Worksheet name in the browser and select "Delete Worksheet", or
- Select the "Delete" icon on the Function Block Diagram Toolbar (2nd from left), or
- From the Edit menu on the Main Drop-down menus, select " Delete Worksheet".

The selected worksheet will be deleted.

How to Add Worksheet Protection

Introduction

The HC900 Hybrid Control Designer provides an optional configuration Worksheet protection. New files default to "No Protection". Worksheets can be protected on individual basis where all protected worksheets use the same password. A user has limited access to protected worksheets.

Protected Worksheet Type	View Worksheet	Edit Worksheet
Controller	YES	NO
Display	YES	NO
Function Blocks	NO	NO

Protected Worksheets:

- can be **"unlocked"**. Protection is disabled, but not removed from the file. If you save the file, the worksheet protection will be "locked" when the file is reopened.
- can have their **passwords changed**. In order to change a password, you will need to know the current password.
- Can have their **protection "removed"**. Removing the protection is permanent. If you save the file, the worksheet will not be protected when the file is reopened.

Protection Symbols

There are three symbols that could appear on the "Worksheet Protection" tab that indicate the level of protection for the file:

 = No protection is in place, worksheets are 'Unlocked"

 = Protection exists, and the worksheets are "Unlocked".

 = Protection exists, and the worksheets are "Locked".

Protecting a Worksheet When There is No Protection

Step	Action
1	From the "File" menu, select "Properties", then select the "Worksheet Protection " tab.

Step	Action
2	Click on the "Change Protection" button.
3	Click on the box next to the worksheet names you want to protect, then select "DONE" button.
4	Click on the "Lock" button to setup a password.
5	Enter a password for the file in the "New Password" field (up to 14 characters).
6	Re-enter the password in the "Confirm New Password" field.
7	Click "OK".

To Change a Password

Step	Action
1	From the "File" menu, select "Properties", then select the "Worksheet Protection " tab.
2	Click on the "Change Password" button.
3	Enter the current password in the appropriate field.
4	Enter a New Password in the appropriate field.
5	Confirm the new password in the appropriate field.
6	Click "OK".

To Temporarily Unlock a Worksheet

Step	Action
1	From the "File" menu, select "Properties", then select the "Worksheet Protection " tab.
2	Click on the "Unlock" button.
3	Enter the current password in the appropriate field.
4	Click "OK", the worksheets are unprotected **NOTE:** *the "Controller", "Display", and "Function Block" worksheets also have a toolbar button to unlock worksheets.* 

To Permanently Remove Worksheet Protection

Step	Action
1	From the "File" menu, select "Properties", then select the "Worksheet Protection " tab.
2	Click on the "Remove Protection" button.
3	Enter the current password in the appropriate field.
4	Click "OK", the worksheets are unprotected.

Protecting a Worksheet When Worksheets Protection is Active

Step	Action
1	From the "File" menu, select "Properties", then select the "Worksheet Protection " tab.
2	"Unlock" the worksheet.
3	Change protection.
4	Select worksheet names, then "DONE".
5	Select "LOCK"

Alarm Group Configuration

 opens the **Alarm Group Configuration** dialog box.

You can also select "Alarms" from:
- the EDIT menu on the Main Menu
- the FBD Worksheet by dropping an ALMGP block onto the configuration - when you **do not have** an O/I and **do** need to use Alarm Group logic in the control strategy)

The Alarm Display Tag Group configuration tab provides a drop list of **Alarm** groups. You can configure 20 Alarm Groups of 12 alarm points each for a total of 240 alarm points in the controller.

Each group contains a set of selected digital signal tags. An Alarm may be any Digital Signal Tag.

All alarms are displayed at the OI.

Each alarm point can be configured to generate an E-mail notification.

Procedure

Select a Display Group from the drop-down menu. Digital signals will be displayed in the "Selected Tags" field.

From the "Selected Tags List" drop-down menu, select the type of tags you wish displayed in the list. The default selection is "ALL".

Enter the group title. Use any mix of numbers, letters, and spaces

Select a tag then click on **ADD**, the selected signal tag will be placed in the next available position in the "Selected Tags" field,
OR
Select a position in the "Selected Tags" field, then click on **INSERT.** The selected signal tag will be placed in the position chosen and the other signal tags will reorder as required.

Repeat the selection for up to 12 tags for each group.

Select a signal in the "Selected Tags" field and click on **ALARM DETAILS**, and enter Alarm details in the Dialog Box.

Click OK.

Alarm Details

Select a tag in the "Selected Tags" area of the Alarm Group Configuration dialog box, then click on "Alarm Details' button. The **Alarm Details** dialog box opens and enables you to enter details for the selected tag.

The block number and output number are listed across the banner. The Tag number and descriptor is listed in field below the banner.

Details include:

- ***Alarm Priority*** - used for routing alarms to Email (which Email addresses get which alarms)
  Each of 3 E-mail address may have any/all alarm priorities assigned to it.

2 *- Low Priority Alarm*
3 *- Medium Priority Alarm*
4 *- High Priority Alarm*
5 *- Emergency Alarm*
(select from the drop-down menu)

- *E Mail Notification* of alarms, by priority, on a point by point basis.
  (check the box to allow Email notification*)* The E-mail will be sent:
  - if an alarm occurs on a point configured to send E-mail.
  - to any/all of the 3 E-mail addresses that have the associated alarm priority assigned.

- ***Detailed Text*** - appears on the Operator Interface.
  (enter 2 lines of detailed text -24 characters max for each line*)*

- ***Trigger Direction*** -
  Trigger on ON state means alarm goes ON when triggered by rising edge (the discrete goes off-to-on)
  Trigger on OFF state means alarm goes ON when triggered by falling edge (the discrete goes on-to-off)
  (click on radio button to select)

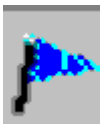
- ***Alarm Acknowledge -*** Group acknowledge

Manual Acknowledge - Can be acknowledged by operator. When a manual acknowledge alarm goes into alarm and then out of alarm without being acknowleged by the operator, it will be indicated as cleared. Use when you want the operator to be able to acknowledge the alarm or see that the alarm was acknowledged and cleared.

Auto Acknowledge -When an auto acknowledge alarm goes into alarm and then out of alarm without being acknowledged by the operator, it will show no indication it was in alarm. Alarm can still be acknowledged by the operator when it is in the alarm state. An alarm point with this attribute will never indicate "clear" status.
(click on radio button to select*)*

Note: an alarm will always be stored to the O/I Archive list.

Event List Configuration

 on the Operator Panel Worksheet Toolbar opens the **Configure Event List** dialog box.

You can also select "Events" from:
- the EDIT menu on the Main Menu
- the FBD Worksheet toolbar button

- Up to 64 digital signals can be configured as events.
- The most recent 150 events will be available for display at the Operator Interface
- Events can generate Emails.
- From 150 to 1500 event records can be stored on the Operator Interface archive disk.
- Each event must have at least one of the following destinations:
  Email, OI archive, or OI Display

- You can select the events from a list of **all digital tags**.
- A digital signal may be either an Event or an Alarm, but not both

Procedure

Enter a Title for the Event list.

From the drop-down menu, select the type of tags you want to display on the tag name list.

Click on each tag name you want included in the list.

Click on ADD. The selected tag or variable will be placed in the next available position in the "Selected Tags List".

Select a tag in the list then, click on "Event Details" button to enter details for the tag selected. Details include:

E Mail Notification
Store to O/I Archive List
Display on O/I
Trigger Direction for ON or OFF state

Click OK.

Execution Order

Execution Order is the order in which function blocks are executed in the control strategy.

Block numbers from 101 to 500(CPU C30) or 2100(CPU C50) are assigned in the sequence that they are programmed. This block number determines the execution order.

When you change the Block Order Number of a function block, the execution number assigned to the function block on the worksheet also changes.

Methods to change the Execution Order:

- **From the "Edit" menu on the Main Menu**

Select "Block and Tag Order" on the Edit menu, then select "Execution Order" or "Fast Block Execution Order".

- **Right Mouse click on a *Function Block* in the diagram**

Then select "Execution Order".

A dialog box is displayed containing all the function blocks, block Tag Names (except Fast Logic) and descriptors.

- **Right Mouse click on a *Fast Logic Function Block* in the diagram**

Then select "Fast Logic Order".

A dialog box is displayed containing all the Fast Logic function blocks, block Tag Names and descriptors.

Right mouse click on FBD white space

You can select either execution list:

Execution Order

Fast Logic Order

The software finds the name and number of the block selected and highlights it in the execution list.

You can then re-arrange the execution order
-- by using the Up and Down arrow keys at the top of the dialog box, or
-- by clicking and holding on a block and dragging it to a new place in the order.

See also "Tag Order"

Event Details

The **Event Details** dialog box enables you to enter details for the tag selected when you configure events. The block number and output number are listed across the banner. The Tag name and tag descriptor is listed in field below the banner.

Events do not have multiple priorities like alarms. They are considered a lower priority than alarms.

Details include:

- *E Mail Notification* of events on a point by point basis. (Check the box to allow Email notification*)* The E-mail will be sent:
  - if an event occurs on a point configured to send E-mail.
  - to any/all of the 3 E-mail addresses that have events assigned. **Event priorities** are always indicated as "1"
- ***Store to OI Archive List*** -OI Event File on the data archive disk on an event by event basis
- ***Display on OI*** - presentation on OI Status line and Event Summary display
- ***Trigger Direction*** – ON – Event on rising edge (Off-to-on transition)

  OFF – Event on falling edge (off-to-on transition).

(click on radio button to select)

E-Mail Notification


opens the **E-Mail Notification** dialog box. It lets you configure up to three E-Mail addresses per controller configuration for Alarm and Event notification.

There are two tabs on the dialog Box.

General Tab

FROM	The ***Controller name*** is configured by the builder of the Configuration file [Read Only]
SUBJECT	Enter an Event Subject (up to 31 characters) Enter an Alarm Subject (up to 31 characters)

To List Tab -

Enter up to 3 configurable E-Mail addresses.(32 characters per addresses)
For each Email address check the Alarm/Event priorities you want the E-mail address to receive.

Events do not have multiple priorities like alarms because they are considered at a priority lower than all alarms.

Alarm priorities were set during "Alarm Group Configuration" under "Alarm Details"
2 = Low Priority Alarm
3 = Medium Priority Alarm
4 = High Priority Alarms
5 = Emergency Alarm

The priority of an event is always indicated as "1" - (see Event Configuration)

Attention: See "Set Controller Network Parameters" and follow the wizard to set up a SMTP mail server IP Address.

Examples:

Somebody@somewhere.com receives ***only priority 5 Alarms***
(only the check box for "5" is checked

Aperson@somewhere.com receives ***all Alarms and Events***
(all 5 boxes are checked)

People@somewhere.com receives ***only Events***
(only check box for "1" is checked)

Tag Order

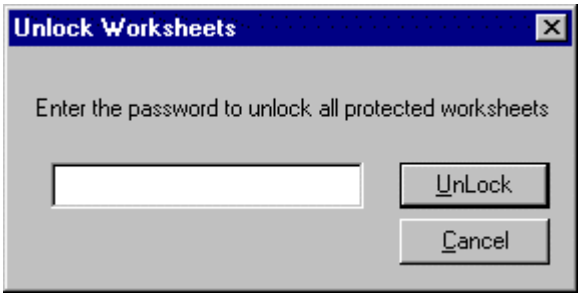
Each time you configure a Loop (PID, CARB, ONOFF, TPSC, or AMB), SP Programmer (SPP), SP Scheduler (SPS), Sequencer, Hands/Off/Auto Switch (HOA), Device Control (DC), Alternator, Ramp, or Stage function block, you will have assigned a unique Tag Name to the block. Each Loop (PID, CARB, ONOFF, TPSC, or AMB), SP Programmer (SPP), SP Scheduler (SPS), Sequencer, Hands/Off/Auto Switch (HOA), Device Control (DC), Alternator, Ramp, or Stage function block, is assigned a unique Tag Name to the block.

This selection lets you arrange Tags to determine the tag order in various displays on the operator interface. The order in which they appear in this “Tag Order” dialog box can be changed to coincide with the order in which you want them to be displayed.

To assign Tags to Display Buttons, refer to Display Button Configuration.

Unlock the Worksheets

opens the "Unlock Worksheets" dialog box.



Enter the password in the field and then, press "UNLOCK".

Function Block Information

Function Block Directory-alphabetical

This is an **alphabetical** list of all the function blocks in the HC900 Hybrid Controller. It provides you with the block's name, a brief description of the block and its ID symbol.

For ***complete information*** on any function block in the table, refer to the Function Block Reference Guide.

-A-

Function Block Name	Function	ID
Absolute Value	The output is the absolute value for a single analog variable input	**ABS**
ADD-4 input	Use to add 4 analog or numeric inputs to get an output.  on the block indicates Fast Scan.	**ADD**
ADD	Use to Add two analog or numeric inputs to get an output.  on the block indicates Fast Scan.	**ADD**
Alarm Group	The Alarm Group Function Block allows you to tie alarm groups into the Control Strategy. It provides remote acknowledgement of all alarms in the group.	**ALMGR**
Alternator	The Alternator (ALT) function block is typically used to alternate the starting sequence of a group of pumps, valves, filters, etc. for optimizing run-time and equalizing equipment wear. Each block accepts up to 16 inputs and controls up to 16 outputs.	**ALT**
Analog Alarm	Provides the setpoint, PV compare attributes (for comparing against another input or a fixed value) to generate a logic status output for OFF-normal conditions that may be enunciated by the operator interface as an alarm. Provides a delay selection and latching functions.	**ALM**
Analog Input	Reads value of an Analog Input from a specified real I/O address. Converts an analog input value to corresponding output in engineering units based on the necessary scaling and conversions performed.	**AI**
Analog Output	Regulates Analog Output current. Input and output scaling is available.	**AO**
Analog Variable	Named **Analog Variable** that can be connected to function block inputs and can be changed from the operator interface, recipe load, Peer controller, or Supervisory Host.	
AND-2 input	Boolean logic function turns digital output **ON** if both inputs are **ON**, otherwise output is **OFF**. Individual inputs may be inverted. This block is part of the *Logic Blocks* category.	**AND**

Function Block Name	Function	ID
	 on the block indicates Fast Scan.	
AND-4 input	Boolean logic function turns digital output **ON** if all inputs are **ON**, otherwise output is **OFF**. Individual inputs may be inverted. This block is part of the *Logic Blocks* category.  on the block indicates Fast Scan.	**AND**
AND-8 input	Boolean logic function turns digital output **ON** if all inputs are **ON**, otherwise output is **OFF**. Individual inputs may be inverted. This block is part of the *Logic Blocks* category.  on the block indicates Fast Scan.	**AND**
Auto-Manual Bias	On transfer from Manual to Auto; Bias is calculated to make PV + Bias = Output.	**AMB**

-B-

Function Block	Function	ID
Binary Coded Decimal Translator	Accepts up to 8 digital inputs in sequence and interprets the ON/OFF status of the first 4 inputs as a BCD value between 0 and 9 and the second 4 digits as a value between 10 and 90 for a total range of 0 to 99.  on the block indicates Fast Scan.	**BCD**
Bumpless Analog Transfer Switch	Provides "bumpless" switching between two analog input values (X and Y) that is triggered by a digital input signal (SY). When switched, the output ramps to new value at a specified rate. A rate is available for each status of the digital input.	**XFR**

-C-

Function Block	Function	ID
Carbon Potential	A combined Carbon Potential and PID algorithm calculation to control Carbon Potential of furnace atmospheres based on a Zirconia probe input.	**CARB**
Compare Deviation	Compares up to 6 analog inputs to a + and - deviation set around a 7th Input reference value and sets an output true or false based on the comparison result.	**DCMP**
Comparison Calculation	Compares the value of X input to the value of Y input and generates separate digital outputs to indicate greater than, equal, or less than status.  on the block indicates Fast Scan.	**CMPR**

Function Block	Function	ID
Connector	Used to connect constants or signal tags to function block without a continuous wire. Connectors may only be connected to function block inputs. Signal tags supported may be analog or digital.	
Continuous Average	Calculates the continuous average value of the configured input over a configured time period. When the averaging period elapses, the instantaneous average will maintain the last calculated average value, the internal accumulators and sample counters are cleared, and the time remaining is re-initialized to the full average period.	**CAVG**

-D-

Function Block	Function	ID
Deviation Compare	Compares up to 6 analog inputs to a + and - deviation set around a 7th Input reference value and sets an output true or false based on the comparison result.	**DCMP**
Device Control	The Device Control function block is normally used to control pumps. Based on certain events, the device will be held in one of six states: READY, PRESTART, STARTING, RUNNING, STOPPING, DISABLED, or FAILED. The READY (off state) is the initial state of the function block.	**DC**
Dewpoint	Monitors Dewpoint or carbon Potential, or to supply a Dewpoint PV to a PID function Block for Dewpoint control, based on a Zirconia O_2 probe input.	**DEWP**
Digital Encoder	The block digitally encodes up to 16 digital inputs to a single floating point output value.	**DENC**
Digital Input-8 point	Provides read access for up to 8 physical digital inputs. It minimizes the number of blocks required to configure all of the Digital I/O required in a system. The output states may be inverted. This block is part of the *I/O Blocks* category.  on the block indicates .	**DI**
Digital Input	Provides the digital status of a digital input. The output states may be inverted. This block is part of the *I/O Blocks* category.  on the block indicates Fast Scan.	**DI**
Digital Output-8 point	Provides write access to any physical digital output. Provides a digital status from the algorithms and functions to physical logic output hardware. Each block output requires a module and channel number during configuration. The output status may be inverted. This block is part of the *I/O Blocks* category.  on the block indicates Fast Scan.	**DO**
Digital Output	Directs a digital status to a physical logic output. The output status may be inverted. This block is part of the *I/O Blocks* category.	**DO**

Function Block	Function	ID
	 on the block indicates Fast Scan.	
Digital Switch	Selects Input A for output when digital input signal (SA) is ON, otherwise output is B. This block is part of the *Logic Blocks* category.  on the block indicates Fast Scan.	**DSW**
Digital Variable	Named **Digital Variable*** that can be connected to function block inputs and can be changed from the operator interface , recipe load, Peer controller, or Supervisory Host. Double click on the Icon to open the dialog box.	
Division	Use to divide one analog or numeric input into another to get an output.  on the block indicates Fast Scan.	**DIV**

-E-

Function Block	Function	ID
Eight Input AND	Boolean logic function turns digital output **ON** if all inputs are **ON**, otherwise output is **OFF**. Individual inputs may be inverted. This block is part of the *Logic Blocks* category.  on the block indicates Fast Scan.	**AND**
Eight Input OR	Boolean logic function turns digital output **OFF** if all inputs are **OFF**, otherwise output is **ON**. Individual inputs may be inverted. This block is part of the *Logic Blocks* category.  on the block indicates Fast Scan.	**OR**
Eight Point Digital Input	Provides read access for up to 8 physical digital inputs. It minimizes the number of blocks required to configure all of the Digital I/O required in a system. The output states may be inverted. This block is part of the *I/O Blocks* category.  on the block indicates .	**DI**
Eight Point Digital Output	Provides write access to any physical digital output. Provides a digital status from the algorithms and functions to physical logic output hardware. Each block output requires a module and channel number during configuration. The output status may be inverted. This block is part of the *I/O Blocks* category.  on the block indicates Fast Scan.	**DO**
Encoder-Digital	The block digitally encodes up to 16 digital inputs to a single floating point output value.	**DENC**
Event Decoder	The block digitally encodes up to 16 digital inputs to a single floating-point output value.	**DENC**
Exclusive OR	Boolean logic function turns output **ON** if one of two inputs is **ON**, otherwise the output is **OFF**. This block is part of	**XOR**

Function Block	Function	ID
	the *Logic Blocks* category.  on the block indicates Fast Scan.	

-F-

Function Block	Function	ID
Fast Scan System Monitor	The "Fast Logic System" status block provides read access to system values to be used as an input to a Fast Logic block or for monitoring purposes. The FSYS System monitoring block is assigned **block number 2.**  on the block indicates Fast Scan.	**FSYS**
Four Input ADD	Use to add 4 analog or numeric inputs to get an output.  on the block indicates Fast Scan.	**ADD**
Four Input AND	Boolean logic function turns digital output **ON** if all inputs are **ON**, otherwise output is **OFF**. Individual inputs may be inverted. This block is part of the *Logic Blocks* category.  on the block indicates Fast Scan.	**AND**
Four Input MUL	Multiplies four analog or numeric inputs to get an output.  on the block indicates Fast Scan.	**MUL**
Four Input OR	Boolean logic function turns digital output **OFF** if all inputs are **OFF**, otherwise output is ON. Individual inputs may be inverted. This block is part of the *Logic Blocks* category.  on the block indicates Fast Scan.	**OR**
Four Input SUB	Subtracts 3 analog or numeric inputs from one input to get an output.  on the block indicates Fast Scan.	**SUB**
Four Selector Switch	Provides 16 digital outputs in groups of four. A dedicated display allows activating of only one output per group while other outputs in the group are turned off simulating 2, 3, or 4 position selector switches. This block is part of the *Logic Blocks* category. Up to 8 screens (4x16 digital signals) may be configured and assigned to any screen.	**FSS**
Free Form Logic	Reads digital inputs and calculates the output based on a specified Boolean logic function, such as: AND, OR, NOT, or XOR  on the block indicates Fast Scan.	**BOOL**
Free Form Math	Reads Inputs and calculates the Output based on a	**MATH**

Function Block	Function	ID
	specified general purpose calculation, such as: ADD, SUBTRACT, MULTIPLY, DIVIDE, SQ ROOT, ABSOLUTE VALUE, LOG, etc.	
Function Generator **10 Segment**	Generates output characteristic curve based on up to 11 configurable "breakpoints" for both input and output values.	**FGEN**

-H-

Function Block	Function	ID
Hand/Off/Auto Switch	The Hand – Off – Auto (HOA) switch function block permits state change requests from a Local Operator Interface or a Remote source. The block states are: BYPASS (external manual operation of a device), HAND (manual operation from an operator interface), AUTO (default – requests are operated automatically), or OFF (relay to be switched to Bypass, Hand, or Auto). The HOA switch is also used with the Device Control (DC) function block to comprise a Pump Control algorithm.	**HOA**
High Monitor	Monitors two analog input values (X and Y) and turns **ON** a logic output if X *exceeds* Y. A hysteresis adjustment is provided to prevent output cycling.  on the block indicates Fast Scan.	**HMON**
High Selector	Selects the higher of two analog inputs (X or Y) for output.  on the block indicates Fast Scan.	**HSEL**
High-Low limiter	Provides High-Low limit for an analog value. Turns ON high or low logic output if input exceeds or falls below set limits.  on the block indicates Fast Scan.	**HLLM**

-I-

Function Block	Function	ID
I/O Rack Monitor	The rack monitor block is a repository for controller/expansion rack I/O module information, including diagnostics (C50 CPU only). The Rack function block provides Read/Write access to I/O Rack values. This block is always stored in the reserved block area (96 thru 100), are always in the configuration whether visible in the FBD or not. The total number is dependent on the controller type.	**RACK**

-L-

Function Block	Function	ID
Latch	Turns a logic output **ON** when latch input (**L**) turns **ON** and unlatch input is **OFF**. Output turns **OFF** when unlatch input (**U**) turns **ON**. This block is part of the *Logic Blocks* category.  on the block indicates Fast Scan.	**LTCH**
Lead Lag	Modifies an analog input value to include Lead (T2) and Lag (T1) time constants from 0 to 99 minutes when a digital input (EN) is **ON**.	**LDLG**
Loop Switch	Digital interface to control loops to initiate Autotuning, change control action, force bumpless transfer, select tuning set #1 or set#2. Connects to PID, ON/OFF, CARB, or TPSC block switch input.	**LPSW**
Low Monitor	Monitors two analog input values (X and Y) and turns **ON** a logic output if X is *less than* Y.  on the block indicates Fast Scan. A hysteresis adjustment is provided to prevent output cycling.	**LMON**
Low Selector	Selects the lower of two analog inputs (X or Y) for output.  on the block indicates Fast Scan.	**LSEL**

-M-

Function Block	Function	ID
Mass Flow	Calculates gas mass flow (OUT) from differential pressure, temperature, and for pressure input values.	**MSF**
Multiplier-4 input	Multiplies four analog or numeric inputs to get an output.  on the block indicates Fast Scan.	**MUL**
Min-Max-Ave-Sum	Accepts inputs from up to 6 analog variables and outputs analog variables representing the results of a specified operation: **MAX** = Maximum analog value **MIN** = Minimum analog value **AVG** = Average of analog values within a user-specified number of standard deviations **SUM** = Sum of all input values **SDEV** = Standard deviation of all analog values **ALM** = Alarm output for deviation of any variable outside user specified standard deviations.	**MMA**
Modbus Read	Expands the read capability of the Modbus Slave function block to 16 additional data points. Multiple blocks may be connected to the same Modbus Slave block. The Modbus read block has no inputs and 16 outputs. Up to 16 registers can be configured as the source of data for the outputs.	**MBR**

Function Block	Function	ID
Modbus Slave	Allows the controller to act as a master device and communicate with slave devices using the Modbus protocol. Requires one block per slave device, up to 16 devices maximum. Only one block may be assigned to each slave device. It supports 4 read and 4 write parameters plus provides digital indication of communication integrity.	**MBS**
Modbus Write	Expands the write capability of the Modbus Slave function block to 8 additional data points. Multiple blocks may be connected to the same Modbus Slave block. The Modbus write block has 8 inputs and no outputs. The Modbus destination for each of the eight inputs can be configured. An enable pin lets the data value be written once per scan. The configuration data for each point will consist of : the address of the destination device on the Modbus link, the register address of the desired data, and the register type: Integer or Float.	**MBW**
Mode Flags	Turns on an output that corresponds to the current value of mode. Turns all other outputs off. One of each set (AUTO, MAN, IMAN, LO) and (LOCAL, REM) is ON.	**MDFL**
Mode Switch	Digital interface to control loops to select automatic or manual modes and/or local or remote setpoint. Connect to PID, ON/OFF, CARB, or TPSC mode block input.	**MDSW**
Multiply	Use to multiply two analog or numeric inputs to get an output.  on the block indicates Fast Scan.	**MUL**

-N-

Function Block	Function	ID
Negate	Accepts a single analog variable input and negates the output.  on the block indicates Fast Scan.	**NEG**
NOT	Boolean logic function is the reverse state of a digital input if input is **ON** then Output is **OFF**. This block is part of the *Logic Blocks* category.  on the block indicates Fast Scan.	**NOT**
Numeric Constant	Value that can be connected to function block inputs.	

-O-

Function Block	Function	ID
Off-delay Timer	Provides an OFF state logic output delayed by a user specified delay time after an ON to OFF transition of the RST input. This	**OFDT**

Function Block	Function	ID
	block is part of the *Counters/Timers* category.  on the block indicates Fast Scan.	
On-delay Timer	Provides an On state logic output delayed by a user specified delay time after an OFF to ON transition of the RUN input. This block is part of the *Counters/Timers* category.  on the block indicates Fast Scan.*)*	**ONDT**
On Off	Control for ON/OFF application. The output is either On (100%) or Off (0%) with deadband selection.	**ONOFF**
OR-2 input	Boolean logic function turns digital output **OFF** if all inputs are **OFF**, otherwise output is ON. Individual inputs may be inverted. This block is part of the *Logic Blocks* category.  on the block indicates Fast Scan.	**OR**
OR-4 input	Boolean logic function turns digital output **OFF** if all inputs are **OFF**, otherwise output is ON. Individual inputs may be inverted. This block is part of the *Logic Blocks* category.  on the block indicates Fast Scan.	**OR**
OR-8 input	Boolean logic function turns digital output **OFF** if all inputs are **OFF**, otherwise output is **ON**. Individual inputs may be inverted. This block is part of the *Logic Blocks* category.  on the block indicates Fast Scan.	**OR**

-P-

Function Block	Function	ID
Periodic Timer	Provides a digital high (one) output for one controller scan cycle based on a specified time period. Or time of day referenced to real-time clock.	**PTMR**
Page Connector	Lets you connect a signal from a worksheet page to another page and across worksheets.	
PID	**Proportional, Integral, Derivative** - Control for 3-mode single-loop control application with: • Autotuning with Fuzzy Logic overshoot suppression • PID-A, PID-B, Duplex equations • 2 set of PID Constants • 2 Setpoint Values • 2 Alarms • Feedforward • Ratio Control • External Mode Switching and Status	**PID**

Function Block	Function	ID
	• Cascade capability • Soft Start	
Position Proportional Output	Allows the control of a valve or other actuator having an electric motor driven by two digital output channels; one to move the motor upscale, the other to move it downscale, with a feedback signal to indicate motor position. This block is part of the *I/O Blocks* category.	**PPO**
Programmer	Each of the 8 possible SPP blocks can run one profile selected from a pool of 70. Its primary output (SP) is used as a remote setpoint input (RSP) for one or more PID function blocks. Provides various secondary inputs and outputs for selected interaction with other control blocks.	**SPP**
Push Button	Provides the interface from the operator interface to the logic functions of the controller. Provides a one-shot output based on an OFF to ON change of an operator interface F1 to F4 key action. Supports four pushbuttons per block. Up to 4 screens (16 digital signals) may be configured, assigned to any screen access key.  on the block indicates Fast Scan.	**PB**

-R-

Function Block	Function	ID
Ramp	The **RAMP** function block is typically used for variable speed, valve position, and chemical feed control applications to reduce the output value as more external devices are enabled. The ramp block references an analog signal, and using four separate scales multiplexed together, provides a single analog output over a programmed range.	**RAMP**
Rate of Change	Provides: • an analog output representing units per minute change of the analog input, • compare setpoints for high and low rate of change, • compare selections for increasing, decreasing or both directions of change, • a logic 1 (ON) output when input rate exceeds high rate setpoint, • a logic 1 (ON) output when input rate is less than the low rate setpoint.	**ROC**
Read Constant	Reads the numerical value of selected configuration parameter in a given function block using the index number of the parameter.	**RCON**

Function Block	Function	ID
	The selected Block number and Index number will be shown on the front of the block.  on the block indicates Fast Scan.	
Recipe Selection Block	Loads numbered recipe (NUM) into the various blocks of the controller when digital signal (LD) is ON.  on the block indicates Fast Scan.)	**RCP**
Relative Humidity	Calculates a relative humidity value based on a wet bulb, dry bulb, and atmospheric pressure analog inputs.	**RH**
Resettable Timer	Provides increasing or decreasing timing base on an enable input. Increasing time from 0 or preload value. Provides digital output upon reaching Preset Decreasing time from preset or preload value. Provides digital output upon reaching zero. Preset range of 0–99999.9 seconds with output update dependent on analog scan rate.  on the block indicates Fast Scan.	**RTMR**
Rotary Switch	A Single output can be selected from up to 8 analog inputs based on the analog value (1 - 8) applied to the selected input.	**RSW**

-S-

Function Block	Function	ID
Scale and Bias	Use to multiply an input value by a constant (SCALE) and add BIAS to it.  on the block indicates Fast Scan.	**SCB**
Selector Switch-4 switch	Provides 16 digital outputs in groups of four. A dedicated display allows activating of only one output per group while other outputs in the group are turned off simulating 2, 3, or 4 position selector switches. This block is part of the *Logic Blocks* category. Up to 8 screens (4x16 digital signals) may be configured and assigned to any screen.	**FSS**
Sequencer	Controls the output statuses of up to 16 digital outputs and one auxiliary analog output. Each combination of outputs represents a state of a sequence such as Heat, Mix, or Cool.  on the block indicates Fast Scan.	**SEQ**
Setpoint Scheduler Auxiliary	The eight setpoint outputs of the Auxiliary Setpoint block are set to the current step value. The current step is an input to the block and must be connected to the step output of a Master Scheduler block (SPS).	**SPSA**
Setpoint Scheduler	Provide a sequence of multiple setpoint outputs (both analog and digital) which are referenced to a common time base. A suite of Setpoint Scheduler blocks is comprised of one	**SPS**

Function Block	Function	ID
	master Setpoint Block (SPS) (required) and optionally, one Digital Event (SPEV), one Auxiliary Setpoint (SPSA), one State Switch (STSW), and/or one State Flags (STFL) block	
Signal Tag	A **Signal Tag*** is used to assign name to a wire. Drag and drop signal tag icon to the function block diagram and attach to an output wire. Double click on icon to open dialog box. Example is an Analog Signal Tag dialog box.	
Soft Wire	Connects Function Blocks/Objects together. Triggers a help message that explains how to add a softwire.	
Square Root	The output is the square root value of a single analog variable input.	**SQRT**
Stage	The Stage (STG) function block provides differential On/Off control and is typically used to monitor pressure and flow for controlling pumps and operating valves. There are four individual stages grouped together in the function block. The block monitors from one to two analog inputs (PV1, PV2) which are common to all four stages, compares them for each stage by a configurable comparator, and provides On/Off control outputs for the four stages based on configurable setpoints for each stage. Each stage can be individually enabled and forced ON or OFF (OVON/OVOFF)	**STG**
State Flags	Accepts the encoded master (SPS) block state as an input and produces digital outputs corresponding to the current value of STFL.	**STFL**
State Switch	Accepts state request digital inputs and produces an encoded output for input to the master (SPS) block.	**STSW**
Subtract-4 input	Subtracts 3 analog or numeric inputs from one input to get an output.  on the block indicates Fast Scan.	**SUB**
Subtract	Use to Subtract one analog or numeric input from another to get an output.  on the block indicates Fast Scan.	**SUB**
Switch-Digital	Selects Input A for output when digital input signal (SA) is ON, otherwise output is B. This block is part of the *Logic Blocks* category.  on the block indicates Fast Scan.	**DSW**
Switch	Selects input Y for output when digital input signal (SY) is **ON**	**SW**
Synchronizer	Synchronizes changes in setpoint program state (Reset, Run, Hold, and Advance). Used to synchronize the operation of two or more setpoint programmer blocks - **state change commands in any connected SPP blocks or at the input pins will affect all connected SPP blocks.**	**SYNC**

Function Block	Function	ID
System Monitor	It provides read access to controller status values including those related to the Analog execution cycle. The output may be connected to function block inputs. The outputs may also be connected to signal tags for operator interface monitoring. The ASYS System monitoring block is assigned **block number 1.**	**ASYS**

-T-

Function Block	Function	ID
Text	Descriptive data to annotate a specific area of the function block diagram. Drop and drag **T** to function block diagram and enter text in dialog box text field. 80 characters maximum. You can change the default settings of the font characteristics.	
Three Position Step	Motor position control without position sensing. Allows the control of a valve or other actuator having an electric motor driven by two controller outputs; one to move the motor upscale, the other to move it downscale, without a feedback slidewire linked to the motor shaft.	**TPOS**
Time Proportional Output	Proportions the amount of ON time and OFF time of a digital output. Input scaling and cycle time available. Time proportioning outputs are commonly used for electrically heated applications where regulating the amount of ON time Vs OFF time of a heater is used to control temperature. This block is part of the *I/O Blocks* category.	**TPO**
Toggle Flip-Flop	Provides an ON state output when a digital input goes from OFF to ON and the previous state of the output was OFF, and an OFF state output when the digital input goes from OFF to ON and the previous state of the output was ON. RESET input when ON sets output to OFF. This block is part of the *Logic Blocks* category.  on the block indicates Fast Scan.	**TGFF**
Totalize	Integrates an Analog variable using a specified rate. Rate may be in units per minute, hour, or day. A preset is provided to indicate when a specific quantity has been accumulated. Separate enable and reset inputs are provided.	**TOT**
Track and Hold	Provides an output that tracks the value of the input (X) when a digital input signal (TC) is ON; or when (TC) is OFF, hold the output at the last value of (X).	**TAHD**
Trigger	Turns a logic output **ON** for one logic scan cycle when the logic input goes from **OFF** to **ON**. This block is part of the *Logic Block* categories.  on the block indicates Fast Scan.	**TRIG**
Two Input AND	Boolean logic function turns digital output **ON** if both inputs are **ON**, otherwise output is **OFF**.	**AND**

Function Block	Function	ID
	Individual inputs may be inverted. This block is part of the *Logic Blocks* category.  on the block indicates Fast Scan.	
Two Input OR	Boolean logic function turns digital output **OFF** if all inputs are **OFF**, otherwise output is ON. Individual inputs may be inverted. This block is part of the *Logic Blocks* category.  on the block indicates Fast Scan.	**OR**

-U-

Function Block	Function	ID
Up/Down Counter	Count the number of raising edge logic transactions on the input to the block up to a preset value (RPRE or LPRE). When the preset value is reached, a logic output is enabled. A Reset input (RST) resets the block. Value may be set to increase to the preset value or decrease from the preset value of up to 99999 counts.  on the block indicates Fast Scan.	**UPDN**

-V-

Function Block	Function	ID
Variable-Digital	Named **Digital Variable*** that can be connected to function block inputs and can be changed from the operator interface , recipe load, Peer controller, or Supervisory Host. Double click on the Icon to open the dialog box.	
Velocity Limiter	Limits the rate at which an analog input value can change when a digital input signal (EN) is ON. Provides independent increasing and decreasing rate of change limit values. Logic output indicates increasing or decreasing rate is active.	**VLIM**

-W-

Function Block	Function	ID
Write Constant	Writes the numerical value of selected configuration parameter to a given function block. The selected Target block and Index number will be shown on the front of the block.  on the block indicates Fast Scan.	**WCON**
Write Tune Constants	Writes the numerical value of Gain, Rate, and Reset to a Target PID, TPSC, or CARB block without any operator interaction.	**WTUN**

Function Block	Function	ID
	The selected target block number will be shown on the front of the block	
Write Variable	Allows the value of a selected variable to be changed when enabled. The selected Variable number will be shown on the front of the block.  on the block indicates Fast Scan.	**WVAR**

Function Blocks Overview

Function Block Definition

A Function Block is a unit of software that performs a set of operations on its *Input Signals* and *Function Block* parameters and produces *Output Signals.* These output signals can be configured as inputs to other blocks, whose output parameters can be configured as inputs to other function blocks, and so on. By configuring and connecting all the desired input signals and function block parameters, you develop control strategies for both analog and digital operations.

A function block may represent a physical input or output, several inputs or outputs, an internal calculation or an internal function such as a PID algorithm. A single controller configuration may have up to 400(CPU C30) or 2000(CPU C50) user-defined blocks. Block numbers 1-100 are reserved for specific status blocks.

Function Block Identification

Each Function Block has a type identification label of up to 5 characters assigned by during configuration. The label is an abbreviation for the operation or algorithm that the block performs and indicates the block number assigned.

Inputs

Function Block Inputs must be connected to a signal source. Valid sources to a function block input parameter are:

- Signal Tags
- Variables
- Soft Wires
- Constants
- Page connectors

Inputs enter the block from the top or left-hand side.

Note that unconnected inputs will default to 0 or OFF.

Outputs

Function Block Outputs are signals that reflect the results of a function block's execution.

Outputs can be connected to any number of function block inputs including inputs on the same block, but, they *cannot* be connected to:

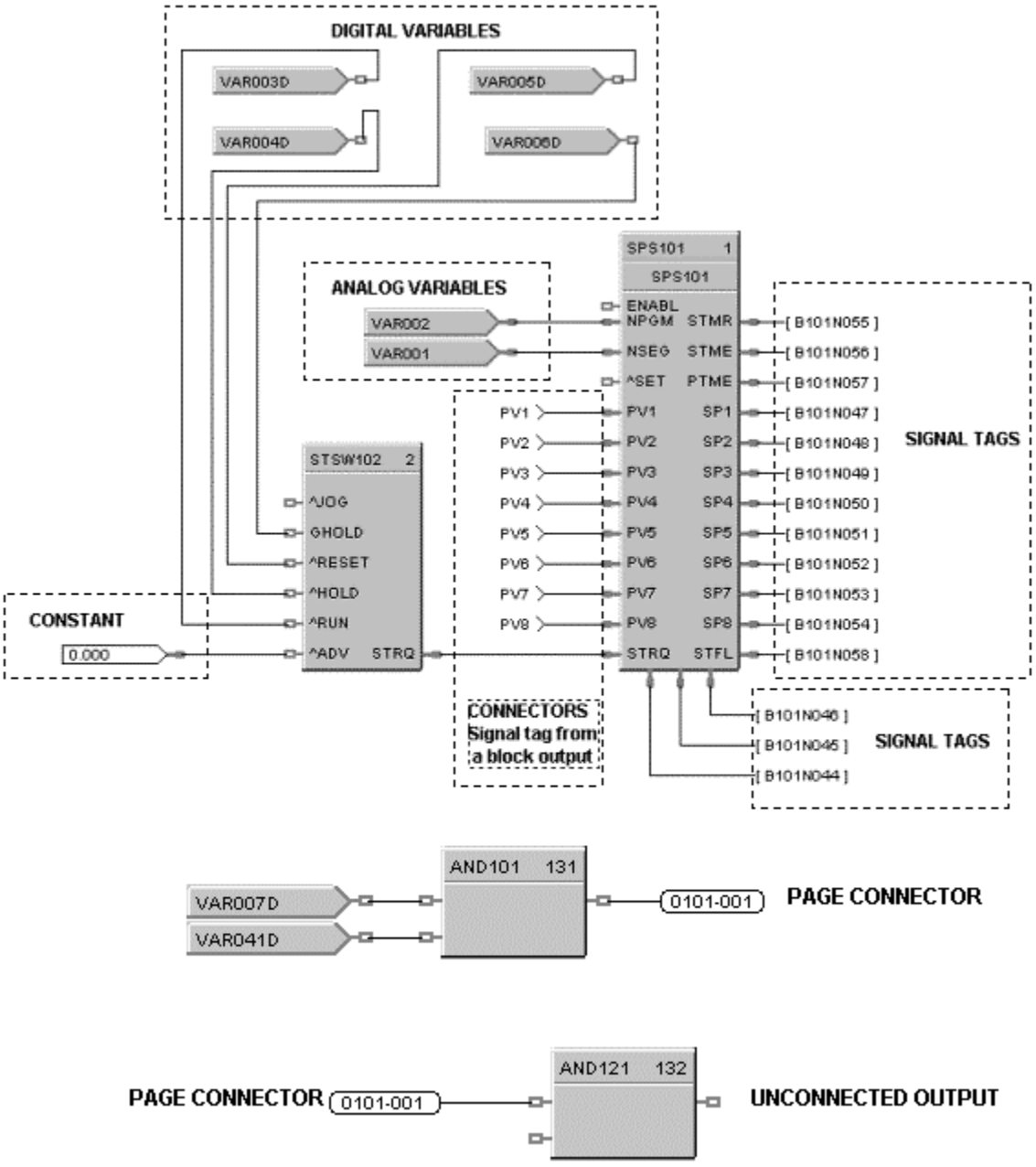
- an output of another block,
- a variable or constant,
- an internal system value from system status block.

Outputs exit the block as straight lines from the bottom or right-hand side.

Note that unused outputs can be left unconnected.

Attention

As shown on the function block example below, there is a visual distinction between analog and digital pins,
Analog Inputs and Outputs are indicated by a solid pin and
Digital Inputs and Outputs are indicated by a hollow pin.



Types of Function Blocks

Function blocks come in three main classes.

- Input

  These process the physical inputs from the controller. Examples are Analog Input, Digital Input. They are the first stage in the controller's configuration.

- Calculations and logic

  These process the data from the input blocks and perform arithmetic, logic and sequencing operations. Examples are PID, Setpoint Programmer, AND, Math, etc. They are the middle stage of the controller's configuration.

- Output

  These process the data from the calculations and logic blocks and are the link with the physical outputs of the controller. The Analog output and Digital output function blocks convert this output information into a voltage or current, which is fed to the corresponding output hardware (such as a current output or relay).

Function Block Attributes

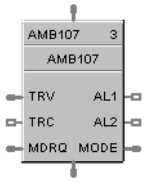
Overview

Function blocks are graphic representations of instrument-like functions

- They are accessible through the Worksheet Toolbox on the Hybrid Control Designer Main Window.
- They have inputs and/or outputs for connections to other blocks or functions, as applicable.
- Each function block is assigned a unique number from 101 to 500(CPU C30) or 2100(CPU C50)

Note: Some blocks have reserved block numbers from 1 to 100

Sample Function Block



Function Block Attributes

Item	Description
1	Blocks have a rectangular graphic form, which varies in size depending on number of inputs and outputs that the block possesses. The block type determines the type of operation or algorithm that the block performs.
2	Each block has type identification label of up to five characters. The label is an abbreviation for the operation or algorithm that the block performs. Each block has a number to uniquely identify the function block. A few blocks have reserved block numbers.
3	Block numbers from 101 to 500(CPU C30) or 2100(CPU C50)are assigned in the sequence that they are programmed. This is the Block ID number. During controller operation, control blocks are executed in numerical order; lowest numbered blocks are executed first unless you change the execution order through the "Edit" menu.
4	Loops, Setpoint programmers, Setpoint Schedulers, Sequencers have unique user-assigned tag names. They are used to identify values for operator displays. Note that tag

Item	Description
	names are automatically displayed in capital letters.
5	Pin labels help identify block's secondary inputs and outputs.
6	Block outputs can be labeled with a "Signal Tag Name. (Right click on the Output pin to drop a signal tag symbol) Signal point names are used to display value/state of block output signals on operator displays.
7	Many blocks have configuration parameters to tailor operation to control requirements at hand.
8	Outputs exit block as straight lines from bottom or right-hand side. Outputs can be connected to any number of control block inputs, but, they *cannot* be connected to: • an output of another block, • a named variable , or • a constant. Note that unused outputs can be left unconnected.
9	Inputs enter block as arrows from top or left-hand side. Inputs can be from: • An output of another block (soft wire), • A named variable (values that can be changed from the Operator Interface (max-150)) (Right click on Input pin to drop a variable) • A connector that references a signal tag or page connector (Right click on Input pin to drop a connector) • A constant that references a signal tag (Right click on Input pin to drop a constant) Note that unconnected inputs will default to 0 or OFF.
10	There is a visual distinction between analog and digital pins, Analog Inputs and Outputs are indicated by a solid pin and Digital Inputs and Outputs are indicated by a hollow pin.

Function Block Usage Guidelines

Except for the following types, a function block algorithm type may be used any number of times up to the limit of 400 blocks on CPU C30 or 2000 blocks on CPU C50:

PID or On/Off loops – CPU C30=8; CPU C50=32

Setpoint Programmers – 8

Setpoint Schedulers – 2

Sequencers – 4

Alternators – 6

Stages – 16

Ramps – 16

Hand/Off/Auto – 16

Device (Pump) Control – 16

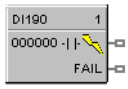
Pushbuttons (4 PB's/block) – 8

Selector switches (4-position) – 8

Modbus Slaves - 16

Fast Scan Indicator

The Fast Scan Indicator is a yellow lightning bolt that has been placed somewhere on the face of the function block. See the example below.



ATTENTION

For information on update rates for these blocks, refer to the "Fast Scan Function Blocks".

Using Function Blocks to Build a Control Strategy

Before You Start

The Hybrid Control Designer software operates on a PC, independently from the controller hardware, until after the configuration is completed and downloaded. For this reason, you must identify the hardware that will be used in the controller so that the configuration constructed will match the intended I/O quantity and location in the controller.

There are two basic methods to begin configuring the controller:

1. Start with the physical I/O requirements of the controller
   Identify the I/O
   Configure the I/O blocks
   Download and test the I/O first, then
   Configure the Control Strategy, or
2. Start with the Control Strategy
   Drop the I/O blocks as needed but leave the physical address 0.0.0
   Download and debug the strategy, then
   Configure the physical I/O addresses.

You can use some combination of these 2 methods, the Hybrid Control Designer and Controller is flexible and will accommodate either approach.

See "Rack, Module, and Channel Assignments".

General Steps to Build a Control Strategy

Configuration is the process of creating/editing a Control Strategy, best suited for your application, using Function Blocks, Variables, and Constants; Operator Interface Display assignments, Setpoint Programs, Schedules, Sequencers, and Recipes; Data Storage, Alarm and Event configuration. The configuration is essential to the controller, since it defines your control strategies and operational displays.

These are the steps of the configuration process as determined by the tasks required:

- **Develop the Control Strategy using Function Block Worksheets**

Step	Task
1	Select the Function Blocks, Variables, and Constants needed to meet the control strategy requirements.
2	Soft-wire the outputs to the inputs.
3	Assign signal tags to block outputs needed on displays.

Step	Task
4	Enter annotations as needed on the diagram.
5	Configure the function block parameters needed to define the operating characteristics.
6	Configure the Execution Order.
7	Configure Setpoint Profiles, Setpoint Schedules, Sequencers, and Recipes.
8	Configure the Alarms and Events.
9	Save the Configuration File
10	Download a Control Strategy

- **Develop the Operator Interface and Data Storage using the Display Worksheet**

Step	Task
1	Configure the Display Tag Groups.
2	Configure the Alarms and Events.
3	Configure the Display Buttons for the Operator Interface.
4	Configure the Start Up and Message Displays .
5	Configure Operator Interface Settings.
6	Configure Data Storage
7	Save the Configuration File
8	Download a Control Strategy

Notes:

- You can initiate a print out of your control strategy whenever you want to assist you in configuring.
- The above is a general approach to building a control strategy. One of the benefits of this product is its flexibility and integration. You can develop some I/O, Control Displays, then download and repeat.

Connecting/Disconnecting Blocks

Introduction

A control strategy is created by connecting function blocks to each other -(Softwiring).

Connecting

To connect two blocks, you must softwire a block's output pin to the other block's input pin (or vice versa).

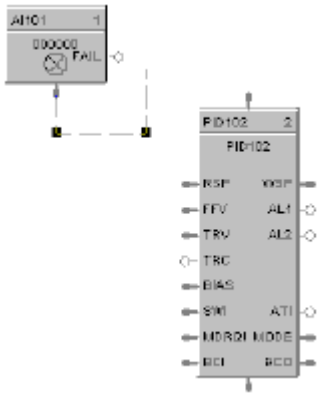
CAUTION

In pre-2.0 configurations, if a function block is (inadvertently) placed on top of another block with pins touching, wires connected to the touching pins may follow the wrong block, when the block again moves. In other words, the connections you see may not be the connections you actually get.

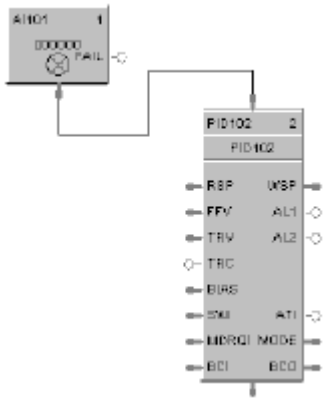
SOLUTION: Place drawing items so their boundaries do not touch or overlap. When moving drawing items groups, release the group over empty diagram space.

The outputs are always on the right or bottom of blocks; inputs are always on the top or left of the blocks.

Double click at the end of a block's output (or input) pin. A single segment wire will adopt a straight or "L" shaped route.



You can click anywhere on the drawing to make a wire vertex and continue to either another vertex or a block pin.



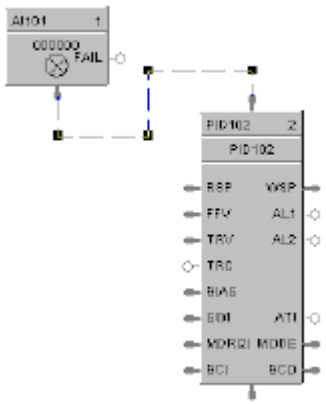
A wire can have up to eight vertices including endpoints.

You can connect two or more wires to the same output pin.

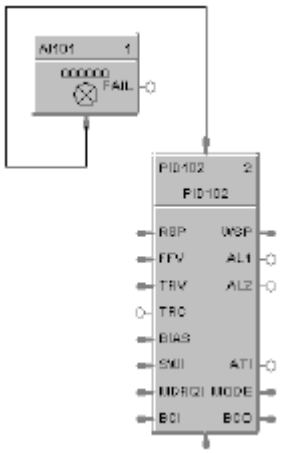
Repositioning

To reposition an existing wire:

Click on the end point of the wire to be repositioned. It will be highlighted in a dotted line showing each vertex.



Click on a vertex and drag into the new position and release



NOTE: A single “L” shaped wire cannot be repositioned. If you must alter the routing, delete the wire and add one with a vertex.

Disconnecting

To disconnect an existing wire:

Click on the end point of the wire to be deleted. The wire is highlighted.

Pull down the “EDIT” menu and select “Delete”, or press the DELETE key.

NOTE: A single “L” shaped wire cannot be repositioned. If you must alter the routing, delete the wire and add one with a vertex.

See also

Wire nodes

Adding a Variable

There are two types of variables; Analog and Digital.

Procedure

Right-click on an Input pin and select "Drop Analog Variable" or "Drop Digital Variable" from the dropdown list

OR

From the Worksheet Toolbox group “Other Items”, drag and drop the Variable symbol to the function block diagram.

The Variable symbol will appear on the Function Block Diagram for configuration.

Analog Variable 

Double click on the symbol to open its properties dialog box. Enter:

Name and Descriptor

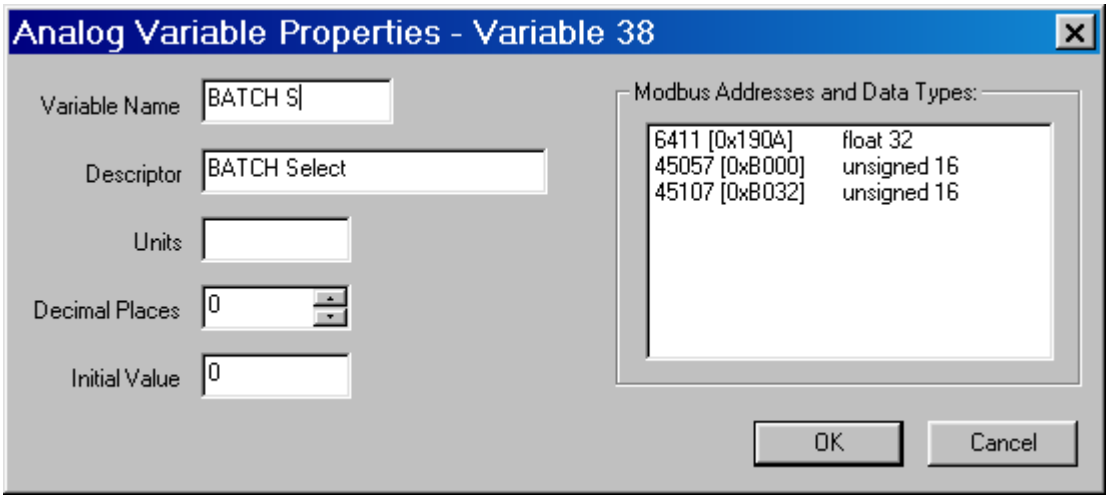
Decimal Places (1-5)

Engineering Units

Decimal Places

Initial Value

Also displayed is the item's default Modbus address and data type, followed by any user-defined addresses.



Digital Variable 

Double click on the symbol to open its properties dialog box. Enter:

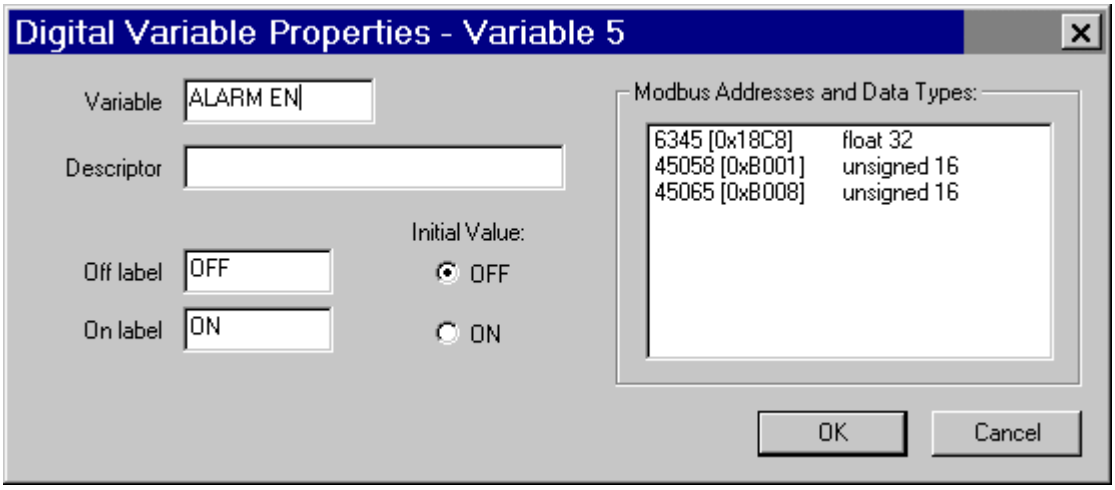
Tag Name and Descriptor

Off Label

On Label

Initial Value (Off or ON)

Also displayed is the item's default Modbus address and data type, followed by any user-defined addresses.



Conventions

Drag and Drop

To add a function block to a controller configuration, select the desired block from the menu tree. Press and hold the left mouse button and drag the block over to the diagram on the right hand side of the screen. Position the block and then release the left mouse button to drop the item into place.

Accessing Context Sensitive Help

Context Sensitive Help is accessed from the function block properties window and other menu lists by pressing the F1 key after selecting the parameter in question.

While in a Controller configuration, click the right mouse button to allow access to Topic Help, Monitor functions, Cut, Copy, Paste functions and Properties Dialog Boxes.

Right Mouse Click

Shown below are the right-click menus. See also Right Click In Monitor Mode.

Right Click On Function Block Object (not pins)

Help - *Calls up Topic Help for Function Block selected*

Execution Order

Cut

Copy

Paste

Delete

Edit Modbus Register Address

Properties

Right Click On Unconnected Function Block pins*

Signal Tag

Page Connector

Analog Variable

Digital Variable

Numeric Constant

Connector

Paste – Reconnects a signal tag or page connector that you cut from another pin.

*When you drop one of these items it automatically connects to the pin you right-clicked on.

Right Click on Connected Function Block Input Pins

Trace

Right Click on Variable

Help - *Calls up Topic Help for Function Block selected*

Execution Order

Cut

Copy

Paste

Delete

Add to Modbus Registers

Properties

Right Click on Signal Tag

Help – calls up help

Find Where Used – Opens Find dialog box. Lets you locate any and all places where the signal tag is used.

Cut -- Cuts the signal tag so you can reconnect (paste) it to a different unconnected pin of the same type (digital or analog). Can reconnect to a different function block. Item is grayed out indicating the cut. Press Esc to cancel.

Delete – Deletes the signal tag.

Add to Modbus Registers

Properties

Right Click on Page Connector

Help – calls up help

Find Where Used – Opens Find dialog box. Lets you locate any and all places where the page connector is used.

Cut --Cuts the page connector so you can reconnect (paste) it to a different unconnected pin of the same type (digital or analog). Can reconnect to a different function block. Item is grayed out indicating the cut. Press Esc to cancel.

Delete – Deletes the page connector.

Add to Modbus Registers

Properties

Click On FB Diagram White Space

Cut

Copy

Paste

Drop Other Items

Execution Order

Fast Logic Order

Find

Go To

View (displays the view menu)

Properties [File]

How to Configure Function Block Parameters

Accessing Block Details

After function blocks are placed on the function block diagram, they can be configured

Most dialog boxes are simple dialog boxes that contain the assigned block number and execution order of the block.

Some dialog boxes contain various parameters and options that are configured based on the particular type of function block. For example: I/O blocks contain Rack, Module, and Channel addresses and function block configuration parameters. Certain function blocks contain a Modbus address.

Tabbed dialog boxes will be used for the most complicated blocks (for example, PID) to organize the data for you.

Procedure

6. To access Block Properties, double click on the selected function block and the corresponding dialog box(es) will be displayed.
7. The dialog box(es) display(s) all parameters having to do with the selected function block.
8. Enter a physical address if applicable.
9. Enter any Tag NamesUser_Assigned_Tag_Names
10. Enter all parameters.on each tab, if present.
11. When all the changes are entered, click OK to enter, or CANCEL.
12. While in a Controller configuration, click the right mouse button to allow access to Topic Help, Monitor functions, Properties Dialog Boxes, and Cut, Copy, and Paste functions. Some function blocks let you customize their Modbus address.

Function Block Address

Addresses identify physical connection points for field wiring to Input/Output modules.

Assign a unique address to each I/O block.

Rack, Module, and Channel address

User Assigned Tag Names

Some blocks have unique, user-assigned tag names.

They are used to identify values for operator displays.

When configuring displays you will be able to select from a list of tag name groups that you have assigned. (See "Configure Tag Order")

Enter a Name in the "Tag Name" field.

Tag names are automatically displayed on the block in capital letters

Function Block Parameters

All Function Block Parameters are values that influence the function block's execution.

To enter a parameter:

Click the cursor on the desired parameter field to highlight it.

Key in the desired value, make a selection from any drop-down menus, or select a radio button, if necessary.

Press F1 for help on any active field.

Click OK when configuration is complete.

Function Block Diagrams

Function Block Diagrams

Function Block diagrams let you build your control strategy graphically right on the Hybrid Control Designer Window. It provides a full complement of SAMA-style symbols that we call Function Blocks that can be “softwired” to each other. It also includes signal tag generation capability for resident control data that can be linked to displays and other software programs.

Function Block Diagram Rules

- Do not place Function Block icons over another or overlap pins.
- A pin output may be soft-wired to any number of inputs of other blocks.
- You may change direction for soft-wiring with a left mouse click (up to 6 direction changes).
- You may use “Signal tags” and “Connectors” to substitute for soft-wired connections and for reference across diagram pages.(right click on the input or output pins)
- You may move a block or group of blocks by selecting blocks or “boxing a group of blocks”.
- You may cross soft-wires.
- You can cut, copy, or paste **(from File menu or Right-click on the diagram)** one or more blocks by selecting or “boxing” within an application or between active applications (allows function block libraries to be stored).

Saving A Configuration File

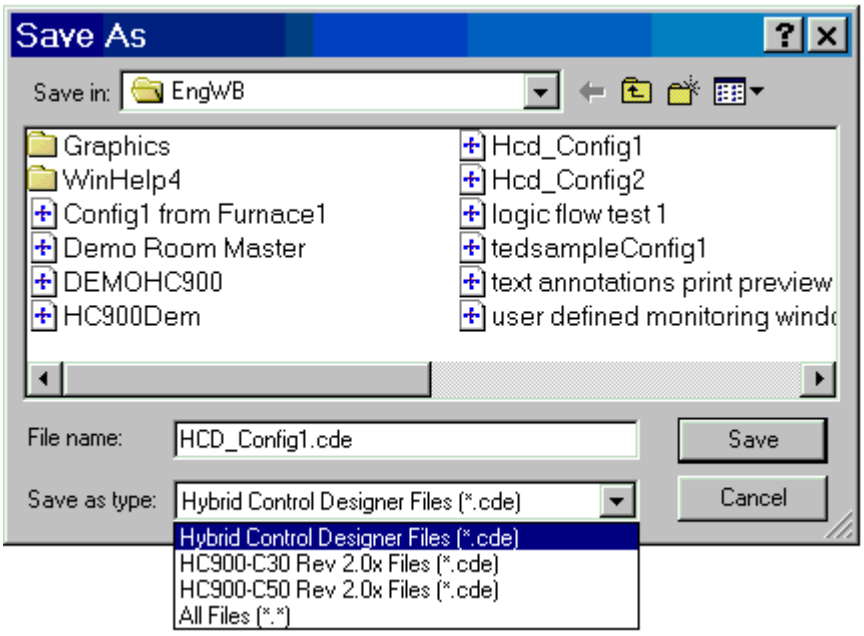
To Save an Existing File

1. Select “SAVE” from the “FILE” menu or from the Main Toolbar 

2. If there are no unconnected inputs that need to be set to OFF or 0, the data is saved automatically.
3. If there are unconnected inputs that have not been previously set to OFF or 0, The Hybrid Control Designer will notify you that there are unconnected inputs and ask if you want to see a list of unconnected inputs.
4. Click “Yes” to view the summary of unconnected inputs.
5. Click “Log File” to save the list to a text file, if desired.
6. Select “SAVE” from the “FILE” menu or from the Main Toolbar 

To Save a New File or Save the File as a New Name

1. Select “SAVE AS” from the “FILE” menu. The “Save As” dialog box will open.



2. Type in the new file name in that field.
3. From the drop-down menu in the “Save as Type” field, select the configuration type depending on the controller you have.
4. If there are no unconnected inputs that need to be set to OFF or 0, the data is saved automatically.
5. If there are unconnected inputs that have not been previously set to OFF or 0, The Hybrid Control Designer will notify you that there are unconnected inputs and ask if you want to see a list of unconnected inputs.
6. Click “Yes” to view the summary of unconnected inputs.
7. Click “Log File” to save the list to a text file, if desired.

Utilities Worksheet

Utilities Worksheet Overview

This Utility Worksheet has three areas the let you perform a variety of tasks for maintaining the HC900 Hybrid Controller and setting up your PC's Communications Ports.

Controller Utility Functions

The upper part of the Utilities Worksheet contains the Controller Utility Functions. It has list of Icons that will launch dialog boxes for the following utilities:

- Diagnostics
- Uploads
- Downloads
- Set Controller Serial Port
- Calibrate Modules
- Set Controller Mode
- Set Controller's Network Parameters
- Set Controller Time
- Data Storage Utility

Current PC to Controller Connection Settings

- Displays Comm Port and Address information. Lets you select a Port and Controller Network Address from the drop-down menus.
- Allows you do a Loopback to check the communications connections.
- Allows you view and reset the communications statistics.
- Allows you to Dial/hang up the modem.

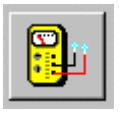
PC Port Setup

Lets you set up a Network Port and up to 8 Comm Ports or Modems.

Controller Utility Functions

The upper part of the Utilities Worksheet contains the Controller Utilities Functions. It has list of Icons that will launch dialog boxes for the following utilities:

ICON	FUNCTION	REFERENCE
	**Controller Diagnostics***	Select from drop down menu: (options are only available in Monitor Mode) **Controller Diagnostics** **Rack Diagnostics** **Controller Ports Diagnostics** **Forced Blocks**

ICON	FUNCTION	REFERENCE
	**Upload from Controller***	Configuration Upload transfers a configuration **FROM** the controller **TO** the PC.
	**Download to Controller***	Once a control strategy is stored on the computer's hard drive, Configuration Download transfers a configuration **FROM** the PC **TO** the controller.
	**Set Controller Port****	Menu selection lets you: Set Protocol for controller's configuration ports
	**Calibrate Controller ****	Click to open the ***Calibrate*** dialog box. Four Tabs on the Dialog Box: ***AI Channel -*** see "Calibrate AI Channel". ***CJ Temp -*** see "Calibrate CJ Temp". ***AO Channel -*** see "Calibrate AO Channel". **PPO Block** – see "PPO Block Calibration "
	**Set Controller Mode****	Click to open the Set Controller Mode dialog box. Read the current mode, select a new mode, then write the new mode to the controller.
	**Set Controller Network Parameters***	A Wizard interface guides you through connecting to a controller in order to view and edit the controller's network parameters In order to change the controller's network parameters, the controller must be in PROGRAM mode.
	**Set Controller Time****	Click to open the Set Controller Time dialog box. Click on "Set to PC Local Time" box to automatically set the controller to the PC local time or deselect the box to manually set the current time and date. Click "Set Time" button to transfer the time and date to the controller.
	**Data Storage Utility**	Click to open the Data Storage Utility dialog box. Select a Removable Disk Drive Group Number and Trend group number. Press "Initialize" to prepare the disk for storage.

These functions prompt you to select a PC port to which to connect.

** These functions communicate to a controller by using the PC Port displayed in " Current PC to Controller Connection Settings".

Utilities Toolbar

Click on ICON to open the dialog box.

ICON	Function	Dialog Box Comments - Use F1 for Help
	**Data Storage Utility**	Click to open the Data Storage Utility dialog box. Select a Removable Disk Drive Group Number and Trend group number. Press "Initialize" to prepare the disk for storage.
	**Set Controller Time**	Click to open the Set Controller Time dialog box. Click on the "Set the PC Local Time" box to automatically set the controller to the PC local time or deselect the box to manually enter a date and time Click "Set Time" button to transfer the time and date to the controller.
	**Set Controller Mode**	Click to open the Set Controller Mode dialog box. Read the current mode, select a new mode, then write the new mode to the controller.
	**Set Controller Network Parameters**	Wizard interface lets you select a serial port or the network port over which the network parameters will be read/written Controller must be in PROGRAM mode.
	**Set Serial Port**	Menu selection lets you: Set the controller Baud Rate, or Auto detect controller Baud Rate
	**Calibration**	Click to open the ***Calibrate*** dialog box. Four tabs on the Dialog Box: ***AI Channel -*** see "Calibrate AI Channel". ***CJ Temp -*** see "Calibrate CJ Temp". ***AO Channel -*** see "Calibrate AO Channel". ***PPO Block –*** see "PPO Block calibration ".
	**Controller Diagnostics**	Select from drop down menu: **Controller Diagnostics** **I/O Module Diagnostics** **Controller Ports Diagnostics** **Forced Blocks**

ICON	Function	Dialog Box Comments - Use F1 for Help
	**Upload**	Configuration Upload transfers a configuration **FROM** the controller **TO** the PC.
	**Download**	Once a control strategy is stored on the computer's hard drive, Configuration Download transfers a configuration **FROM** the PC **TO** the controller.
	**Loopback**	Runs a Remote Loopback test. Dialog box indicated the status of the test.

Uploading a File from the Controller

Introduction

Upload transfers a file **FROM** the controller **TO** the PC. Uploadable files are configurations, recipes, and data storage.

The Controller may be in ANY mode.

No configuration file is required to be opened prior to the Upload Request.

Uploading Configuration

1. From the "File Menu" select Upload Configuration, or click on the Upload icon on the Main Toolbar  ,or click on the Upload icon on the Utilities Worksheet Toolbar  then select "Upload Configuration".
2. The Upload File dialog box will appear. A temporary file name will be place in the "File Name" box.
3. Under "Current CommLink Settings", select the port and address to communicate to a controller. Reference "Utilities WorksheetUtilities_Worksheet_Overview" for configuring the PC Ports.
4. Press "START". The dialog box will show "Percent Complete".
5. The Uploaded File will appear with an automatic file name containing the controller name, its local name (or alias), and the network it is on.
6. From the "File" menu, select Save or Save As and enter a file name and path in the appropriate fields.

Uploading Recipe or Data Storage

1. From the "*File Menu*" select **Upload...** The Upload File dialog box will appear. A temporary file name will be place in the "File Name" box.
2. Under “Current” CommLink Settings”, select the port and address to communicate to a controller. Reference "Utilities Worksheet" for configuring the PC Ports.
3. Press "START".
4. Select a file type to upload. If uploading a recipe you’ll be asked to choose which recipe in the controller’s memory to upload.

5. The dialog box will show "Percent Complete". When the upload is complete, the Uploaded File will appear (with a temporary file name) in the editor for that file type.
6. From the "File" menu, select Save or Save As and enter a file name and path in the appropriate fields.

Downloading a File to the Controller

Introduction

Once a control strategy—configuration file—is opened, Configuration Download transfers a configuration **FROM** the PC **TO** the controller.

The Controller may be in either RUN or PROGRAM mode (not Run-Locked)

ATTENTION: **You cannot download an HC900-C50 configuration to an HC900-C30 and vice versa. You must first convert the configuration before doing a download. See "Converting HC900 configurations ".**

Procedure

1. From the File Menu select "Open" or Upload a file***** from the controller.

   IMPORTANT: If you intend to make a set of changes to a running configuration and wish to preserve the context of the current configuration parameters, you should perform an upload from the controller first to assure that you have the current configuration, make the incremental changes, save the modified file, and then download. This is highly recommended to avoid configuration conflicts.Select the file (.cde) that is to be downloaded.
2. The selected function block diagram will appear in the Active View window. **Only the active file window can be downloaded.**
3. At this point you can make incremental changes to the file. (See "Downloading in the RUN mode" first)'
4. From the "File Menu" select **Download** or

   click on the **Download icon** on the Main Toolbar  ,or

   click on the **Download icon** on the *Utilities Worksheet* Toolbar  then select "Download Configuration".
5. The "Download File" dialog box will appear. Check the Port and Address information for correctness.
6. Press "START" to download the configuration to the configuration buffer.
   The ***download will begin*** if the controller is in:PROGRAM mode or RUN mode.
   The ***download will be rejected*** if the controller is in:RUN/LOCKED mode or OFFLINE mode.
   The dialog box will show "Percent Complete".

7. After the database tables have been transferred to a configuration buffer, select one of the following commands to transfer from the buffer to the controller:

   HOT START - the controller will use the new or updated configuration in RUN Mode.

   During a Hot Start:

   - Controller memory will not be re-initialized
   - Outputs will be held at their current value.
   - Controller will stay in RUN mode

   There are two possible actions with a Hot Start.

   - If the Hot Start will be completed within approximately 3 controller scan cycles, then the Hot Start will proceed automatically.

   - If the Hot Start requires longer than 3 controller scan cycles, a dialog box displays a) the estimated duration of the Hot Start and b) options to initiate or cancel the Hot Start.

   COLD START - the controller will transition through normal PROGRAM-TO-RUN mode transition
   - Controller memory will be re-initialized
   - Outputs will be turned off during re-start
   - Controller will return to RUN mode

   ABORT - the controller will disregard the new configuration and continue to use the previous configuration.

8. The dialog box status line will state "Mode Change in Progress" then "Download Successful" when completed.

Downloading in Run Mode

WARNING

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the configuration in the application and the potential dangers of downloading a configuration while running.

Downloading in RUN Mode has the potential to create a hazardous situation. Changes to the configuration result in a short suspension of the control program followed by an immediate execution of the new configuration. It is the user's responsibility to ensure that configuration changes will not result in a hazardous situation.

It is the user's responsibility to assess this risk for his process. Failure to comply with these instructions could result in death or serious injury to people and/or property damage.

Downloading in Run Mode (Hot Start) is a means to make configuration changes and download them to the controller without taking the process off-line.

It is intended for **incremental changes to a running configuration**, such as:

Adding and Deleting Blocks
Modifying block configuration parameters
Adding/changing soft-wires, signals, variables
Adding OI displays, Data Storage

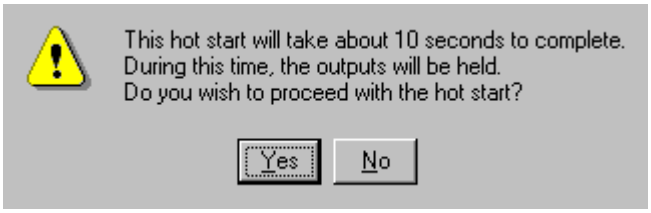
Adding Recipes, SP Profiles, SP Schedules, or Sequencers.
Adding, deleting, or modifying I/O (DI, DO, AI, AO).

IMPORTANT: If you intend to make a set of changes to a running configuration and wish to preserve the context of the current configuration parameters you should perform an upload from the controller first to assure that you have the current configuration, make the incremental changes, and then download.

Cautions

Configuration Change Transfer

Once the HOT START button is depressed, the configuration will be updated with the new changes. Note: During the time period required to perform the Hot Start, the controller will suspend the execution of its function blocks and hold its outputs at their current value. If you select Hot Start and the Hot Start will take longer than approximately three controller scan cycles, a popup window appears:



If this time period is acceptable, click Yes to begin the Hot Start. If this time period is not acceptable, press No.

Configuration Parameters

All Configuration Parameters are set to the value or state in the .cde file following a download. For example: *Tuning constants could be over written by a Download while in Run Mode*. The tuning constants are considered **part of the configuration**. If you DO NOT first upload the present configuration, you will overwrite the active parameters with the values in the configuration that are downloaded. The new download is an all or nothing proposition.

Function Block Changes

If a function block is deleted, Hybrid Control Designer does not re-use the block number.

If a function block is added, Hybrid Control Designer uses the highest current block number + 1.

Restrictions:

When a configuration uses the last block number (500 for C30, 2100 for C50) and you try to add another block, Hybrid Control Designer will prompt you to "de-fragment" the table and recover previously deleted blocks. There can be NO Hot Start this case.

Data Storage Schedule

Assuming changes have NOT been made to an OI data Storage Schedule, the data storage will be interrupted only as long as it takes to transfer the configuration changes.

Set Controller Serial Ports

Use this feature to set the RS232 and RS485 ports protocol.

 has two tabs—RS232 and RS485—each with the following settings.

Honeywell ELN: Default protocol

Modbus Master: Select to set controller up as a master.

Modbus RTU Slave: Select to set controller up as a slave. Enter the following settings.

Slave Type:

Multidrop--select when using more than one slave on the selected PC port.

Point to point--select for one slave

Modem--select when using a modem between the master and slave.

Slave Address: Enter 1-247, or 255.

Modbus Slave Double Register Format: Each IEEE 32-bit floating point number requires two consecutive registers (four bytes, MSB=4, LSB=1 in byte order below) starting with the register defined as the starting register for the information. The stuffing order of the bytes into the two registers differs among Modbus hosts. To provide compatibility, the Double register format is configurable. Selections are:

FPB Floating Point Big Endian Format Byte order - 4, 3, 2, 1 (Default)

FP LB Floating Point Little Endian with byte-swapped Byte order - 2, 1, 4, 3

FP BB Floating Point Big Endian with byte-swapped Byte order - 3, 4, 1, 2

FP L Floating Point Little Endian Format Byte order - 1, 2, 3, 4

Port Enable: Enables or disables port.

Speed (bps): Select Baud rate. All slaves on the same PC port must be the same. **Modbus parity**: Odd or even. All slaves must be the same.

Modbus stop bits: 1 or 2. All slaves must be the same.

Set – Activates settings. If you changed the controller's Baud Rate via a PC RS232 Comm Port, your PC will no longer communicate with the controller. In this case, you are prompted to detect the controller's Baud Rate. This feature will synchronize the PC's Comm Port with the controller and set the PC Baud Rate to the correct Baud Rate.

Set Controller Mode

Set Controller Mode lets you set the controller mode. It can only be set when the controller's mode switch is in the center "Run Mode" position.

ATTENTION: If the controller's mode switch is in one of the "Locked" positions, the mode cannot be changed from this position. It can be changed only by changing the position of the switch.

 opens the **Set Controller Mode** dialog box. Follow the steps on the dialog box

Select a new mode - RUN, PROGRAM, or OFFLINE

Write the new mode to the controller. Press "Set New Mode" button
Program to Run takes some time. An Indicator on the dialog box shows the progress.

Set Controller Network Parameters

opens the "**Controller Identification Setup Wizard**" dialog box.

You can select a serial port or the Ethernet port over which the network parameters will be read/written.

The controller must be in PROGRAM mode to set the Network Parameters.

There are set up options on the wizard. The option you choose depends on how you are connected to a controller and what current knowledge you have of that controller.

Important: *before configuring your controller to work on a corporate LAN, consult with your Network Administrator regarding any corporate networking policies.*

Follow the Wizard instruction to set:

Network Name

User assigned name - can be different from controller name (16-character ASCII name. It is not part of configuration.)

It is required to uniquely define a Peer group if multiple processes, each with its set of peer controllers, are on the same physical cable. The controller binds the "Network name: Controller name" to the IP address of each of its peers at run-time.

Local Name (alias)
User assigned 16-character ASCII name [can be different from controller name]
It is not part of the configuration.

See Controller Identification for more info on names.

Modbus TCP Double Register format
Each IEEE 32-bit floating point number requires two consecutive registers (four bytes, MSB=4, LSB=1 in byte order below) starting with the register defined as the starting register for the information. The stuffing order of the bytes into the two registers differs among Modbus hosts. To provide compatibility, the Double register format is configurable. Selections are:

FP B Floating Point Big Endian Format Byte order - 4, 3, 2, 1 (Default)

FP LB Floating Point Little Endian with byte-swapped Byte order - 2, 1, 4, 3

FP BB Floating Point Big Endian with byte-swapped Byte order - 3, 4, 1, 2

FP L Floating Point Little Endian Format Byte order - 1, 2, 3, 4

IP Address
Controller Internet Protocol Address - Guaranteed unique address, assigned by the Internet Corporation of America for Assigned Names and Numbers (ICANN) IP Address includes four "Octets" (eight bits, translating to integers from 0 to 255, separated by periods). The manufacture default IP Address is 192.168.1.255.

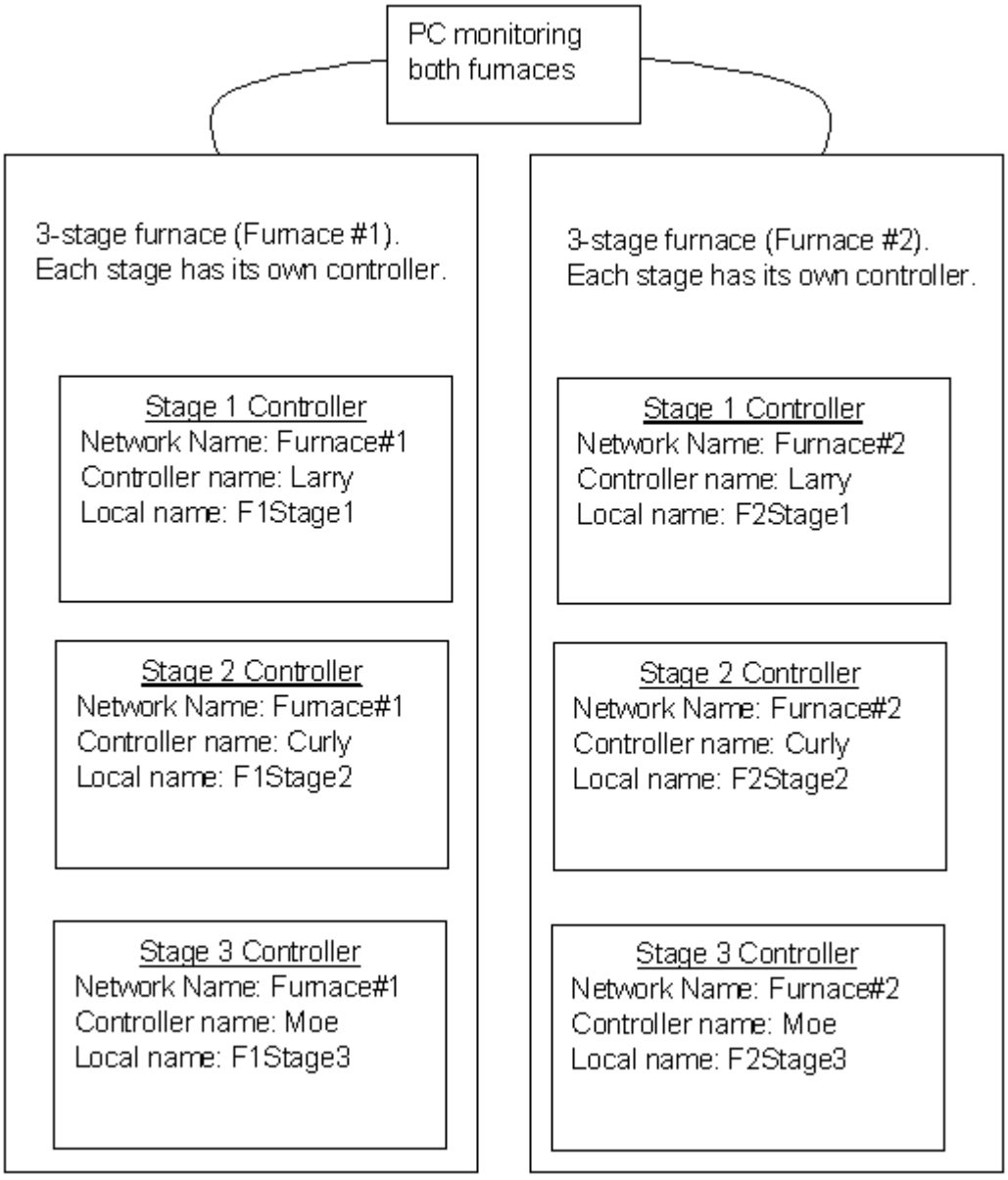
Subnet Mask
Subnet Mask defines the ***netid*** (Network ID) and the ***hostid*** (Host ID) parts of an IP Address.
The ***netid*** uniquely identifies a network, and the ***hostid*** uniquely identifies a computer on the network.
The Subnet Mask can be used to partition the Network into sub-networks, using parts of the ***hostid*** to define new ***netids***, or more correctly ***subnetids***.
Portioning a network in this way enables switches and routers to use the subnetids to reduce collision domains and to promote security.

Gateway IP Address
Used to forward packets to other networks and subnets. The Network Administrator typically provides this address.

Email Server
Outgoing Mail (SMTP) server IP Address: If the controller is configured for E-mail notification, enter the IP Address of the (SMTP) E-mail server.

Controller Identification

The figure below shows how to uniquely identify multiple controllers on a network. Notice the controller names can be the same in both furnaces (Larry, Curly, Moe), but within the same network name they must be unique. To further distinguish controllers, use unique network names (Furnace #1 and Furnace #2). Network name:Controller name are bound to the IP address of each controller. Finally, use a local name (alias) to identify each controller to the end user. This local name is a convenient name such as for displays on the PC, it is not referred to for actual communication.



Set Controller Time

 opens the ***Set Controller Time*** dialog box.

1. Click on "***Set to PC Local Time***" box to automatically set the controller to the PC local time, then click "**Set Time**" button to transfer the PC time and date to the controller, or
2. Deselect the box to manually set the current time and date:
   Pull down the "Current Date" menu and click on a starting date. To change months, use the side arrow buttons at the top of the calendar.
   To set the time, click on the Hour, Minute or Second, then use the up/down scroll keys to the right of the time
3. Click "**Set Time**" button to transfer the time and date to the controller.
4. The status of the download is displayed in the center of the dialog.
5. Click on Close when the status indicates the download is complete.

Data Storage Utility

 opens the **Data Storage Disk Initialization Utility** dialog box.

It is used to initialize ZIP disks offline. (It takes a long time to initialize a disk on the Operator Interface)

Pre-initializing ZIP Diskette

Step	Action
1	Insert the 100MB Zip disk into your PC drive.
2	Select the Data Storage Utility Icon on the Utilities toolbar.
3	The dialog box appears.
4	Select a Drive Letter from the drop-down menu to specify the drive on your PC.
5	Select the number of Trend Groups that the Operator Interface will need from the drop down menu .
6	Click on Pre-initialize to prepare the disk for storage.
7	Exit DSU.
8	Remove disk, insert it into the operator Interface, and initialize it. See Initializing Disk under this section entitled "Data Storage Operation".

Controller Diagnostics

Diagnostics

 has four menu selections on a drop-down menu. It lets you select from a list of diagnostic windows for various controller connections.

The controller must be in "Monitor" mode. Select Monitor Mode from the Monitor menu or click on the Monitor mode icon on the Main toolbar.

- Controller Diagnostics - displays controller status and diagnostic parameters.
- Rack Diagnostics - displays the "Rack Diagnostic Summary" dialog box. Information is for Rack, I/O expansion (C50 CPU only), and Module diagnostics.
- Controller Ports Diagnostics - select a port from the drop-down list.
  Configuration Port
  RS485 OI Port
  Network Port
  Expansion Rack Port (C50 CPU only)
  Host Connections
  Peer-to-Peer connections
- Forced Blocks.- displays a list of Function Blocks, by block ID, that have a forced output pin.

Calibrate Controller

Calibrate Modules

The controller I/O modules are factory calibrated to 0.1% accuracy. But, if greater accuracy is required, you can calibrate the **AI and AO modules** using the Hybrid Control Designer on-line connected to the controller.

You can also calibrate the **Position Proportional Output block**. The calibration of the PPO block is similar to that of the AI and AO except that the calibration values are stored as part of the block's configuration, not on the AI card itself.

 opens the ***Calibrate Modules*** dialog box.

There are four tabs on the Dialog Box:

AI Channel - see "Calibrate AI Channel".

CJ Temp - see "Calibrate CJ Temp".

AO Channel - see "Calibrate AO Channel".

PPO Block – see "Calibrate Position Proportional Output "

Calibrate AI Channel

The Calibrate AI Channel tab allows you to calibrate the selected AI to ensure that the 0 and 100% values selected during configuration is actually correct.

ATTENTION: *You should not access the Utilities Calibrate Controller Analog I/O display while the OI calibration display is being displayed, or vice versa. Calibration can't be done as long as both displays are shown; user must exit either display to do a calibration.*

To calibrate an AI Channel:

1. Enter a Rack #, Module #, and Channel #.
2. Click on Select Input. The program will then poll the controller to see if the selected AI exists.
3. The Cal 0% button is now available. Connect a reference supply to the input pins of the AI. The reference supply must have the following characteristics:
   T/C, mV, Volts Inputs: 1 microvolt resolution
   Ohms, RTD Inputs: 0.1 Ohm resolution
   4-20mA inputs: 4 microamp resolution
4. Set the reference supply to the reference value shown. (The reference value is displayed below the Instrument Status section.) Click on "Cal 0%" to calibrate the low end of the AI.
5. The Instrument Status section of the dialog will display the results of the calibration.
6. If the 0% calibration was successful, the 100% button is now available. Set the reference supply to the reference value shown. Click on "Cal 100%" to calibrate the high end of the AI.
7. If the Cal 100% calibration was successful, the Save Cal button is then available. Click on "Save Cal" to save the current set of calibrations for the selected AI.
8. If either calibration fails,
   the *Instrument Status* section will display an AI Calibration Failed message - Check connections
   The *Reference section* will display a wrong Rack, Module, and channel - reenter Addresses.
9. Click on Close.

Note: Click on "Restore Factory Calibration" button to do same.

NOTE: *Refer to the Calibration section in the HC900 Installation and User Guide for additional Hardware details.*

Calibrate CJ Temp

The Calibrate CJ Temperature tab allows you to ensure the Cold Junction calibration is correct.

To calibrate a CJ Temperature:

1. Enter a Rack #, Module #, and Channel #.
2. At CJ Temperature, enter the actual ambient temperature (measured at the AI pins).
3. Click on Select CJ Input. The program will then poll the controller to see if the selected AI exists. If the AI is found the Cal CJ button will then be available.
4. Click on the Cal CJ button to initiate the calibration. The status of the calibration is displayed in the Instrument Status section of the dialog. If the calibration is successful, the Save Cal button will be available.
5. Click on the Save Cal button to save the current CJ calibration.
6. If the calibration fails, a message will be displayed in the Instrument status section.
7. Click on Close to close dialog.

Note: Click on "Restore Factory Calibration" button to do same.

NOTE: *Refer to the Calibration section in the HC900 Installation and User Guide for additional Hardware details.*

Calibrate AO Channel

The Calibrate AO Channel option allows you to calibrate the selected AO to ensure that the 0 and 100% values selected during configuration are actually correct.

ATTENTION: *You should not access the Utilities Calibrate Controller Analog I/O display while the OI calibration display is being displayed, or vice versa. Calibration can't be done as long as both displays are shown; user must exit either display to do a calibration.*

To calibrate an AO Channel:

1. Enter a Rack #, Module #, and Channel #.
2. Click on Select Output. The program will then poll the controller to see if the selected AO exists.
3. The Cal 0% button is now available. Measure the actual output of the AO at the terminal block with a meter and enter the measurement into 0% Measured. Click on Cal 0% button to calibrate the 0% measurement. The reference value is displayed below the Instrument Status section.
4. The Instrument Status section of the dialog will display the results of the test.
5. If the 0% calibration was successful, the 100% button is now available. Measure the actual output of the AO at the terminal block with a meter and enter the measurement into 100% Measured. Click on Cal 100% button to calibrate the 100% measurement.
6. If the Cal 100% was successful, the Save Cal button is then available. Click on Save Cal in order to save the current set of calibrations for the selected AO.
7. If either of the tests fail, the Instrument Status section will display an AO Calibration Failed message.
8. Click on Close.

Note: Click on "Restore Factory Calibration" button to do same.

NOTE: *Refer to the Calibration section in the HC900 Installation and User Guide for additional Hardware details.*

Restore Factory Calibration

To restore the Factory Calibration:

1. Click on the Restore Factory Calibration button on the dialog box. The Restore Factory Calibration dialog is displayed.
2. Enter the Rack, Module, and Channel number for the desired calibration.
3. Click on Restore to initiate the task. The status of the restore will be displayed in the Instrument Status section of the dialog.
4. Click on Close to close the dialog when the restore is complete.

Calibrate PPO Block

PPO Block Calibration Overview

The Calibrate PPO Block tab allows you to calibrate the selected Position Proportional Output Block to ensure that the 0% and 100% Motor Positions are actually correct and to measure the true motor speed.

The calibration of the PPO Block is similar to that of the AI and AO. However, the calibration values are stored as part of the PPO block's configuration data; not on the AI card itself.
To retain these calibrated values, upload and save the configuration to disk.

The procedure is to move the motor first to its 0% position, wait until the position feedback signal has stabilized, and capture the 0% feedback value.

A similar procedure is done next for the motor's 100% position,

The third step is to measure the true motor speed by moving the motor a fixed period of time, measuring the position feedback delta, and computing a motor speed from this data.

The final step is to save the values in the block's configuration data. All previous calibration values will be overwritten.

Calibration Procedures

There are three methods for calibrating the PPO block. Click on one of the modes shown below for instructions.

AUTO – Controller positions the motor and captures the positions.

SEMI-AUTO – Controller positions the motor and the user captures the positions.

HAND – User positions the motor by hand and captures the positions.

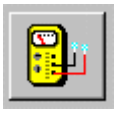
Auto Calibration Procedure

Controller automatically positions the motor and captures the positions.

NOTE: Put the controller in "Offline" or "Program" mode in order to perform calibration.

Select the Utilities tab at the bottom of the Main Window

Under the "Controller Utility Functions", select the "Calibrate Controller" icon.



The "Calibrate" dialog box will open.

Select the "PPO Block" tab at the top of the dialog box.

In the "Calibration Block" field, drop-down the list of PPO blocks and select one.

Under "Calibration Mode", select the "AUTO" radio button.

Under "Calibration Procedure", press "Start".

Result:

The "Start" button is disabled and the Status indication at the top of the dialog box will change to indicate that the motor is moving to its 0% position.
The "Feedback Value" area on the dialog will indicate movement and direction of the motor.
The Progress Bar will indicate progress (Time Remaining) for this step.

The status will change to indicate that the motor is at its 0% position.
The status will change to indicate that the 0% position has been captured.

The status will change to indicate that the motor is moving to its 100% position and the feedback area will indicate movement and direction of the motor.
The progress bar will indicate progress (Time Remaining) for this step.

The status will change to indicate that the motor is at its 100% position.
The status will change to indicate that the 100% position has been captured.

The status will change to indicate that the motor is currently undergoing speed calibration.
The feedback area will indicate movement and direction of the motor.
The progress bar will indicate progress (Time Remaining) for this step.

The status will change to indicate that the PPO Calibration has been saved.

A message box appears indicating that the calibration is complete.
Three choices will also appear. Select one.

Press F2 to Position Motor at 0%
Press F3 to Position Motor at 100%
Press F4 to Leave Motor at Current Position

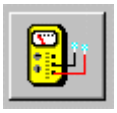
Semi-Auto Calibration Procedure

Controller automatically positions the motor and the user captures the positions

NOTE: Put the controller in "Offline" or "Program" mode in order to perform calibration.

Select the Utilities tab at the bottom of the Main Window.

Under the "Controller Utility Functions", select the "Calibrate Controller" icon



The "Calibrate" dialog box will open.

Select the "PPO Block" tab at the top of the dialog box.

In the "Calibration Block" field, drop-down the list of PPO blocks and select one.

Under "Calibration Mode", select the "SEMI-AUTO" radio button.

Under "Calibration Procedure", press "Start".
The "Start" button is disabled and the Status indication at the top of the dialog box will change to indicate that the motor is moving to its 0% position.
The "Feedback Value" area on the dialog will indicate movement and direction of the motor.
The Progress Bar will indicate progress (Time Remaining) for this step.
The status will change to indicate that the motor is at its 0% position.

Click the Cal 0% button, then the status will change to indicate that the 0% position has been captured.
The status will change to indicate that the motor is moving to its 100% position.
The feedback area will indicate movement and direction of the motor.
The progress bar will indicate progress (Time Remaining) for this step.
The status will change to indicate that the motor is at its 100% position.

Click the Cal 100% button, then the status will change to indicate that the 100% position has been captured.

Click the Cal Speed button.
A dialog box will appear warning that the speed calibration will move the motor.
Press "OK" to start or "Cancel" to abort.
The status will change to indicate that the motor is currently undergoing speed calibration.
The feedback area will indicate movement and direction of the motor.
The progress bar will indicate progress (Time Remaining) for this step.

Click the Save Cal button.
A dialog box will appear that confirms the Motor Calibration Values.

Press "OK" to save the values or "Cancel" to abort.
The status will change to READY and indicate that the PPO Calibration has been saved.

A message box appears indicating that the calibration is complete.
Three choices will also appear. Select one.

Press F2 to Position Motor at 0%
Press F3 to Position Motor at 100%
Press F4 to Leave Motor at Current Position

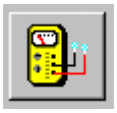
Hand Calibration Procedure

User positions the motor by hand and captures the positions.

NOTE: Put the controller in "Offline" or "Program" mode in order to perform calibration.

Select the Utilities tab at the bottom of the Main Window.

Under the "Controller Utility Functions", select the "Calibrate Controller" icon.



The "Calibrate" dialog box will open.

Select the "PPO Block" tab at the top of the dialog box.

In the "Calibration Block" field, drop-down the list of PPO blocks and select one.

Under "Calibration Mode", select the "HAND" radio button.

Under "Calibration Procedure", press "Start".
The "Start" button is disabled and the Cal 0% button is enabled.

Move the motor by hand to its 0% position.
The feedback area will indicate movement and direction of the motor when it is moving.

When ready, click the Cal 0% button and the 0% position of the motor is captured as indicated in the status.

Move the motor by hand to its 100% position.
The feedback area will indicate movement and direction of the motor when it is moving.

When ready, click the Cal 100% button and the 100% position of the motor is captured as indicated in the status.

Click the Cal Speed button
A dialog box will appear warning that the speed calibration will move the motor.
Press "OK" to start or "Cancel" to abort.
The status will change to indicate that the motor is currently undergoing speed calibration.
The feedback area will indicate movement and direction of the motor.
The progress bar will indicate progress (Time Remaining)

Click the Save Cal button.
A dialog box will appear that confirms the Motor Calibration Values.
Press "OK" to save the values or "Cancel" to abort.
The status will change to READY and indicate that the PPO Calibration has been saved.

A message box appears indicating that the calibration is complete.

Set Point Programming

Terms and Definitions

Term	Definition
Auxiliary Analog Value	In addition to the main ramp and soak output value, a second analog value is available for each step of the profile. This output is a fixed soak value, which may be used to provide a setpoint value for a secondary control loop in the process. An example would be a ramp and soak temperature program combined with pressure setpoints for each step of the profile.
Cycles	A portion of a profile or the entire program may be repeated up to 100 times or indefinitely as specified in the program **Cycles** count value.
Engineering Units	You must assign a descriptor consisting of up to 4 keyboard characters for the engineering units that the setpoint value represents. For example, **GPM** for gallons per minute, **NPS** for number per second, **RPM** for revolutions per minute, and **DEGF** for degrees Fahrenheit.
Guaranteed Hold Soak Limits	Limits High and Low (above and below the Setpoint value) can be configured in selected engineering units. If the PV is outside of configured limits just prior to entering the Soak segment, the soak timer will not be permitted to start. It will start when the PV is within the High and Low limits. Once the soak timer has started and then the PV goes out side of configured limits, the soak timer will halt. It will remain halted until the PV is again within the configured limits. A Guaranteed Hold High or Low limit setting of 0.00 is equal to no limit at all.
Number of Segments	Segments are timed ramp and soak subdivisions of a setpoint program. Consecutive ramps and soaks are allowed. The last segment must be a soak.
Power Loss	A **recovery ramp rate value** is provided in the event of a power loss while a program is running. The ramp rate value is used to return the process to the last operating setpoint prior to power loss. A power OFF digital input and separate timing block will abort the running program if power loss has been OFF for more than a specified time period.
Program	The term "Program" is used to identify the process for selecting and entering the individual ramp and soak segment data for a Setpoint Program function block (SPP) needed to generate a required setpoint versus time **profile** (also called a program).
Program Name	During configuration you must assign a name (descriptive reference) consisting of from 1 to 8 letters or numbers without spaces. Thus, a name can be a combination of letters and numbers. Note that lowercase letters are automatically converted to uppercase.
Program Number	This number is assigned when the software or the Operator Interface creates the profile. The program number is assigned in the "Setpoint Profile Pool" and is shown on the "Edit Setpoint Profile" dialog box.
Ramp Segments	A ramp segment is a starting setpoint and the time or rate to reach the setpoint of the following segment. Typically, segment #1 will be a ramp. Ramp time is determined in either: **TIME***—Hours or Minutes Range = 0.00 hr. to 999.99 hr. / 0.00 min. to 999.99 min. OR

Term	Definition
	RATE*—EU/MIN or EU/HR Range = 0 to 999.99 *This selection of time or rate is made when you configure properties. Make this selection before entering any Ramp during Profile Edit. NOTE: When Ramp unit is configured for TIME, entering "0" will imply an immediate step change in setpoint to the next soak
Running a Profile	Setpoint profiles may be **started, held, advanced, jogged** to a predefined segment or reset from the operator interface or by digital inputs to the block. Programs may be started from a pre-selected segment number.
Segment	A segment is a ramp or soak function which together make up a Setpoint Profile.
Segment Events	You can configure 1 to 16 segment events to turn ON or OFF at the beginning of each segment. Segment events are digital switches that provide ON/OFF outputs through an SPEV control block. **When a segment event is turned ON, it remains ON until the end of the segment at which time it is turned OFF unless it is configured to turn ON in the next segment**. Note that segment events are not interrupted by soak time delays when the process variable is outside the guaranteed soak band. Events turn ON as soon as the previous segment is completed even if the process variable has not reached the soak setpoint. When the program completes, the events are held at current value until the programmer is returned to the ready state.
Setpoint Guarantee	There is a setpoint guarantee function provided that holds the program if a PV exceeds a predefined deviation from setpoint. Selections allow setpoint guarantee to be active for all segments, soak segments only, or for specified segments. Up to 3 Process Variables may be configured as inputs to the block for setpoint guarantee.
Setpoint Value	A setpoint value set for **Ramp**(starting Setpoint value) and Soak(soak setpoint value)segments
Soak Segments	A soak segment is a combination of soak setpoint (value) and soak duration (time). The last segment **must** be a Soak. The soak setpoint range value must be within the setpoint high and low range limits in engineering units. SOAK TIME is the duration of the soak and is determined in: **TIME***—Hours or Minutes Range = 0.00 hr. to 999.99 hr. / 0.00 min. to 999.99 min. *This selection is made when you configure properties.
Synchronizing Programs	Two setpoint programs operating on the same time base can be synchronized using the Synchronize (SYNC) function block. This block automatically starts the second program when the first program is started and maintains synchronization when either program is place in hold.

What is a Setpoint Program?

A Setpoint Program is really a **setpoint versus time profile** that establishes the setpoint values and how they are to vary with time.

Each setpoint profile consists of segments. Each segment of the profile may be a ramp or a soak except the last step that must be a soak.

In addition to the main ramp and soak output value, a second analog value (Aux. Output) is available for each step of the program. This output is a fixed soak value that may be used to provide a setpoint value for a secondary control loop in the process. An example would be a ramp and soak temperature program combined with pressure setpoints for each step of the program.

Each segment can turn on segment events to provide ON/OFF signals through a Setpoint Program Events (SPEV) control block that is used in conjunction with an SPP block.

Each Profile carries its own unique number and a name for identification. (The names are descriptive references [aliases] and uniqueness is not enforced.) Unique names are recommended to avoid operator confusion).

Using the software, you can set the setpoint values, soak times, guaranteed soak band, ramp rates, and event action for individual setpoint profiles in configuration and access the information through the Setpoint profile display in the operator interface. This means that an operator can adjust individual ramp and soak segment settings during operation, but the general profile configuration, including number and name, is under configuration control.

However, any changes made through the SPP Operate display to a program that is running in an SPP block will **not** be written as changes in the program configuration.

Setpoint Program Configuration Overview

Introduction

Setpoint Program (Profile) configuration provides a quick and easy way to create, edit, and save up to 99 different ramp/soak (setpoint) profiles for the Setpoint Programmer (SPP) control blocks in the configuration. An operator can interact with the configured profiles through the Setpoint Program Operate display at the operator interface or operation can be directed through integral actions connected by Softwiring functions.

Configuration Functions

Basic functions that you will use to configure a Setpoint Profile.

Create/Edit Setpoint Profile

Under File-New or File-Open you can access the Profile Editor to create or edit a setpoint profile.

Setpoint Profile Pool

The SP Profile Pool lets you add or delete a profile on a list of configured profiles. Through two menus on the dialog box you can set the properties for each profile and set up or edit the information for each segment that make up a profile. The SP Profile Pool lets you view and save the configuration's setpoint profile to disk.

Setpoint Profile Properties

Setpoint Profile Properties is information for the profile that is entered on five specific tabs. It includes Text, General, Loop/Jog, and Start/Restart.

Setpoint Profile Setup (EDIT)

Setpoint Profile Setup or Edit consists of configuring each segment of the profile and assigning the ramps and soaks and associated information (Values, Time, Auxiliary output, Guaranteed Hold, and Events) in the order required to complete your SP program. Setpoint Profile Setup

lets you view each segment of the profile, the ramps and soaks and associated information (Values, Time, Auxiliary output, Guaranteed Hold, and Events).

Setpoint Schedulers

Setpoint Scheduler Overview

Setpoint Scheduler blocks may be configured for multi-setpoint control. Comprising the suite is a Master block (SPS), Auxiliary Setpoint block (SPSA), Event Decoder block (SPEV), State Switch Block (STSW), and State Flags block (STFL).

The Master block supports ramp or soak outputs operating on a common time base. It accepts one PV for each setpoint. Setpoint guarantee is provided for the master (SPS) block setpoints with a single symmetrical value for each setpoint output.

You can assign a Failsafe value for each setpoint.

The Auxiliary block supports soak only outputs.

The Event block supports event outputs.

A single schedule may include segments and auxiliary block data. The schedules are stored in the controller's memory.

Setpoint Schedules offer the same operating modes and digital controls as setpoint programs.

On-line editing of a running schedule is supported through dedicated operator interface displays

Setpoint Guarantee

Setpoint guarantee is provided for the master block setpoints with a single symmetrical value for each setpoint output. Actions for the guarantee soak may be set on a per segment basis for OFF, high setpoint deviation, low setpoint deviation or both high and low setpoint deviations.

Segments

Each segment of the Setpoint Scheduler allows entry of a next segment recycle location. This function allows unlimited recycle nesting and continuous recycle operation. A jog function allows a single jump to a designated segment number through a digital input to the State Switch block.

Labels

Main Output Labels
Eight character labels and four character engineering units are provided for each Setpoint plus a decimal point selection.
Auxiliary Output Labels
Eight character labels and four character engineering units are provided for each Setpoint plus a decimal point selection
Event Labels
Eight character labels are also provided for the Digital Event block.

Assigning these labels first will aid you in the setpoint schedule configuration process. These labels will appear in the configuration dialog boxes.

Associated Blocks

Setpoint Scheduler Blocks

Setpoint Programmer Blocks

Setpoint Schedule Overview

Introduction

Setpoint Schedule configuration provides a quick and easy way to create, edit, and save up to 20 different Setpoint Schedules for the Setpoint Scheduler (SPS) control blocks in the configuration. An operator can interact with the configured schedules through the Setpoint Program Operate display at

the operator interface or operation can be directed through integral actions connected by Softwiring functions.

Setpoint Scheduler Display Configuration

ATTENTION

Before you proceed with the Setpoint Schedule assign the appropriate labels for the Setpoint Scheduler displays.

Assigning these labels first will aid you in the schedule configuration process.
See Setpoint Scheduler Function Block configuration.
These labels will appear in the configuration dialog boxes.

Configuration Functions

Basic functions that you will use to configure a Setpoint Schedule.

Create/edit Setpoint Schedule

Under File-New or File-Open you can access the Schedule Editor to create or edit a setpoint schedule.

Setpoint Schedule Pool

The SP Schedule Pool lets you add or delete view a schedule on a list of configured schedules. Through this dialog box you will set view the properties for each schedule and set up or edit the information for each segment that make up a schedule.

Setpoint Schedule Properties

Setpoint Schedule Properties is information for the schedule that a Label, a Jog Segment, Time Units, and Guaranteed Hold Limits for each of the eight setpoints.

Setup/Edit Setpoint Schedule

Setpoint Schedule Setup or Edit consists of configuring each segment of the schedule and assigning values for all eight Setpoints of the segment and the Guaranteed Hold Type for each.

You can also set up to 16 events for each segment. Time Units, Recycle Segment, and Recycle Counts selections are included on this dialog box.

You can also assign values to all eight Auxiliary Outputs for each segment by clicking on each “Aux” button on the dialog box.

Sequencers

What is Sequence Control?

The need to control a sequence of operation is a very common control requirement in industrial equipment today. Sequence control can be a very rigid series of inter-related events used to start-up or shut-down a unit process, or it can be a series of timed and process measurement dependent events that are executed to produce a final product.

Sequences can be very simple with only timed or cascaded events that occur regardless of process feedback, or they can be very complex with multiple nested default sequences programmed to occur only if process feedback indicates a need to take alternate actions.

When sequence control is used to produce final product, sequence variations are often required to allow the same equipment to be used to produce multiple types of product. In these applications the sequence is often partitioned into logical units to allow operators and supervisors to monitor the progress of the process using familiar terminology. Heat-up, cool-down, filling, venting, mixing and other similar terms are often used to describe the particular phase the control equipment is executing.

Variations in the product being processed can require changes to the sequence where particular phases are bypassed, duplicated or executed in an alternate manner.

When all of these requirements are combined in a single control specification, developing a suitable control strategy can be a demanding and sophisticated endeavor.

Sequence Configuration Overview

The sequencer function block controls the output statuses of up to 16 digital outputs and one auxiliary analog output. Each combination of outputs represents a state of the sequence such as Heat, Mix, or Cool, for example. The function block supports up to 50 states e.g. PURGE, FILL, HEAT, etc.

The sequence contains up to 64 steps. Each step enables a state, allowing for a state to be designated for several steps.

A pool of 20 sequences, up to 64 steps each, may be stored in controller memory for quick recall and assignment to any of the 4 sequencers.

Each state supports two of digital events as inputs that can designate the end of the associated step.

Time in seconds or minutes, a manual advance, or a digital event can be used to terminate a sequencer step and cause the sequence to advance.

The operational sequence for the steps is retained in a separate sequence file in the memory pool of the controller that may be selected on-demand through a user interface or via a recipe (variables).

Configuration Functions

Basic functions that you will use to configure a Sequence.

Sequence Editor

Create/Edit a Sequence under the File-New or File-Open menus. Accesses the Sequence Editor.

Sequence Pool

When you select "Sequences" from the Recipe menu, the "Sequence Pool" dialog box will be displayed. Through this display, you will add a new sequence or delete an existing one and also enter the properties function and the "Edit Sequence" function to set up each sequence.

Sequence Properties

Sequence Properties is information for the sequencer: Label, Description, a Jog Step, and Time Units.

Sequence Setup (EDIT)

Sequence Setup or Edit consists of configuring each step of the Sequence with a State Number and Name, Time In Step, Time Next Step, Event 1 Next Step, Event 2 Next Step, Advance next step, and an Auxiliary value.

Recipes

Recipe Overview

Multiple meanings of "recipe"

Loop control users apply the word "recipe" differently in different contexts. There is no industry standard for the word's meaning. In a broader sense, a recipe is any collection of data specific to a process setup that can be downloaded into and then run as part of controller's function block configuration. The following are recipe types:

- Recipe (Variables) – see page 163
- Set Point Profile – see page 170
- Set Point Schedule -- see page 176
- Sequence – see page 180

Notice the first recipe type is also called a recipe. The two uses of the word "recipe" can get confusing. In this narrower sense, a recipe is a collection of data—specifically, variables. To distinguish it from the broader meaning HC Designer calls it **"recipe (variables)"**.

To one user a recipe is a collection of variables; to another user a recipe is a set point profile; to another user a recipe is a set point schedule; to another it's a sequence. These different uses of the word "recipe" are all ok as long as you understand they are all recipes in the broader sense.

A recipe needs a configuration for context

A recipe by itself is useless; it must be associated with a specific controller configuration to give it context. Therefore when creating or opening a recipe you must specify by name which configuration the recipe applies to. Set Point Profiles are excluded from this requirement.

Recipe type	How linked to configuration
Recipe	Variable tag names
Setpoint Profile	Not linked to configuration
Setpoint Schedule	Event labels
Sequence	State Name, Event Signal #1, Event Signal # 2

Compatibility

It is up to you to understand how your recipes will work with your configurations. For example, when you download a recipe (variables)(.rcp) to a controller, the recipe's variables, sequential order and their values might make sense in one controller configuration but not another.

Recipe locations

Once created, a recipe can reside in several places. Be aware that having multiple copies of a recipe can cause mixups. For example, suppose you've created a recipe (any type) called COOKIES. It can reside in the following places.

- COOKIES saved as a separate recipe file to disk or floppy. Recipe files can be added to a recipe pool. (See Recipe file types.)
- COOKIES in the recipe pool of a configuration saved to disk as a .CDE file.
- COOKIES in the recipe pool of a currently open configuration in the software. (See Recipes menu)
- COOKIES in the recipe pool of your controller's running configuration. Here it is available to

be loaded into the controller's function block configuration.

- COOKIES actively loaded and running in your controller's function blocks.

This example applies to all recipe types (recipe (variables), schedules, sequences, profiles).

Recipe file types

After creating a recipe or editing one in the recipe pool, you can save a recipe to disk using the following extensions (assigned automatically).

- Recipe (variables): .RCP
- Set Point Profile: .PRF
- Set Point Schedule: .SCH
- Sequence: .SEQ

When part of a configuration's recipe pool, a recipe is not saved as a separate file but is saved in a "slot" in the pool as part of the configuration (.CDE). Any recipe can be accessed in the configuration's recipe pools and saved as its own recipe file if desired.

Recipes Menu

Accesses all recipe pools. To learn about the different recipe types read Recipe Overview.

Menu Selection	Function
Recipes (Variables)…	A recipe (variables) is a list of Variables with settings that define the ingredients needed to make a product or run a particular batch. This selection opens the Recipe Pool dialog box and allows viewing, adding, editing, and printing of Recipe details. You can save the selected recipe item to a file; open a recipe file and insert it into the pool; and download the selected recipe item to a controller's recipe pool.
Setpoint Profiles…	Setpoint Program (Profile) configuration provides a quick and easy way to create, edit, and save different ramp/soak (setpoint) profiles for the Setpoint Programmer (SPP) control blocks in the configuration. This selection opens the Setpoint Profile Pool dialog box and allows viewing, adding, editing, and printing of Setpoint Profile details. You can save the selected SPP item to a file; open a SPP file and insert it into the pool; and download the selected SPP item to a controller's Setpoint Profiles pool.
Setpoint Schedules…	Setpoint Schedule configuration provides a quick and easy way to create, edit, and save different Setpoint Schedules for the Setpoint Scheduler (SPS) control blocks in the configuration. This selection opens the Setpoint Schedule Pool dialog box and allows viewing, adding, editing, and printing of Setpoint Schedules details. You can save the selected SPS item to a file; open a SPS file and insert it into the pool; and download the selected SPS item to a controller's Setpoint Schedule pool.
Sequences…	Sequence configuration provides a series of inter-related events used to start-up or shut-down a unit process, or a series of timed and process measurement dependent events that are executed to produce a final product. This selection opens the Sequence Pool dialog box and allows viewing, adding, editing, and printing of Sequence details. You can save the selected SEQ item to a file; open a SEQ file and insert it into the pool; and download the selected SEQ item to a controller's Sequence pool.

Recipes (Variables)

Recipe (Variables) Overview

Each recipe consists of Variables, and carries its own unique recipe number and name for identification. (The names are descriptive references [aliases] and uniqueness is not enforced. Unique names are recommended to avoid operator confusion). The selected Variables were assigned during the Function Block Diagram Configuration.

It is possible to edit the setting of any recipe Variables through the Recipe Setup display at the operator interface. This means that an operator can adjust individual ingredient amounts in the recipe; but the ingredients (item's Variable Name), the order of the ingredients, and the recipe's number and name are under configuration control.

The recipe variable list is configured using the Hybrid Control Designer application. An operator will be able to change individual item values through the Operator Interface.

For automatic loading of a setpoint profile in addition to other variables, a variable representing a profile number may be included in the recipe. This would also apply to a schedule or sequence number.

Recipe Attributes

A recipe is a list of Variables with settings that define the ingredients needed to make a product or run a particular batch. The items represent Analog and/or Digital Points that were assigned in the Function Block Configuration and are identified by their Variable Names. Recipes have these basic attributes:

- **Recipe Number** - A unique number must be assigned for each recipe that is configured. Numbers can be assigned in any sequence with gaps between numbers, but no two recipes can be given the same number.
- **Recipe Name** - A descriptive name must be assigned consisting of letters or numbers with no spaces. Thus, a name can be any combination of letters and numbers without spaces. Note that lowercase letters are automatically converted to uppercase letters.
- **Recipe Variables** - A list of Variables can be compiled for each recipe. A valid Variable and desired setting must be specified for each recipe item.
- **Adjustable Settings** - The setting for an analog point can be any appropriate value from– 99999 to 99999, and a digital point can be set in its ON or OFF state. It is possible to edit/change any recipe item/Variable Name setting through the "Edit Recipe" Setup dialog box during configuration.

Recipe (Variables) Configuration Overview

A recipe is a list of Variables with settings that define the ingredients needed to make a product or run a particular batch. The items represent Analog and/or Digital Points that are assigned in the Function Block Configuration and are identified by their Variable Names.

Configuration Functions

Basic functions that you will use to configure a Recipe:

Recipe Editor

Create/Edit a Recipe under the File-New or File-Open menus. Accesses the Recipe Editor.

Recipe Pool

When you select “Recipes” from the Recipe menu, the “Recipe Pool ” dialog box will be displayed. Through this display, you will add a new recipe or delete an existing one and also enter the properties function and the “Edit Recipe” function to set up each recipe.

Recipe Properties

The Recipe Properties is merely a name assigned to the recipe, which will be added to the pool. You can also include a descriptor.

Recipe Setup (EDIT)

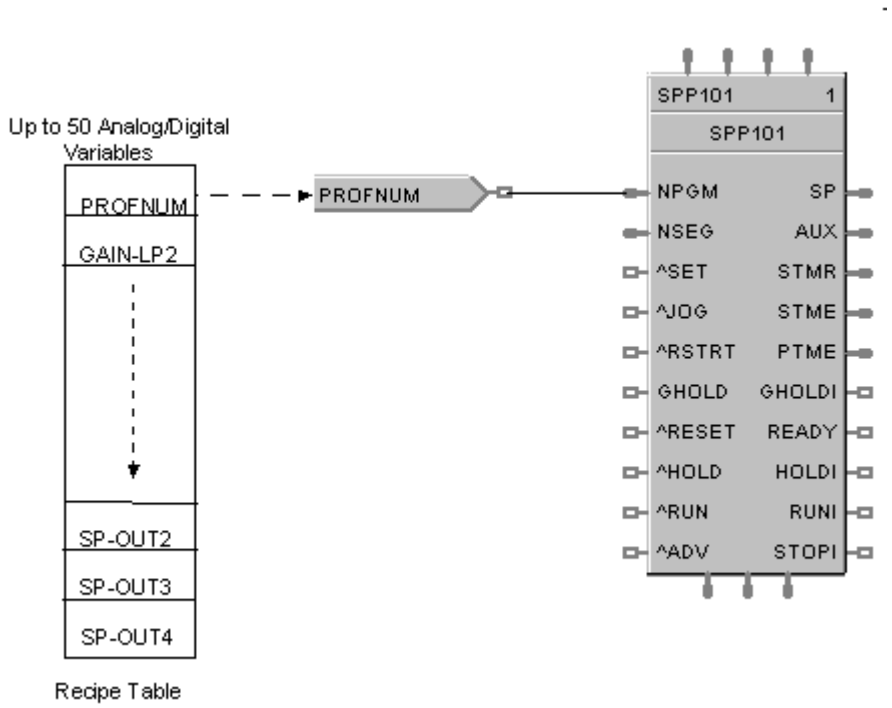
Recipe Set Up or Edit consists of selecting Variable names, assigning an analog value or digital state, and adding them to a list of Recipe items.

Using Recipes to Download Setpoint Profiles

Your configuration might contain the following scenario for downloading setpoint profiles using recipes.

A Recipe can automatically load a stored profile number for use by a specific Set Point Programmer. To do this connect an Analog Variable is connected to the NPGM pin of the Set Point Programmer block given a name such as PROFNUM (see figure below). This Variable is added to the variable list for a recipe and given a number corresponding to the profile number to be loaded. Upon selection and loading of the recipe at the Operator Interface, the programmer will also load the profile number listed in the recipe. The operation of the programmer to run this profile is from the standard Set Point Programmer display.

As an example, for a selection of a SP Profile number 2, the entries into the Edit Recipe dialog box would be
VARIABLE NAME = PROFNUM VALUE = 2



Create/Edit Recipe (Variables) File

Creates/edits a group of variables to be saved as a file (.RCP). File can be downloaded to the recipe pool. A recipe in the pool can later be edited or loaded into the controller's active configuration. The file assumes that the variables are in a certain order in the configuration. Make sure that this order is preserved when loading into a controller's active configuration. Changes to variables via deletions, renaming, or re-directing may affect the recipe content.

Step/Item	Action/Description
Select File, Open.	Lets you choose an .RCP file to edit. After selecting file the Recipe Editor appears.
OR	
Select File, New.	"Choose a new file type" box appears.
Select Recipes tab.	Recipe types appear.
Select Recipes (Variables).	The Recipe Editor appears.
THEN	

Step/Item	Action/Description
Select a Reference Configuration.	A recipe must have a configuration to give it context. Select an open configuration from the pull-down list. If none available, select Open Configuration to open one. The configuration will open. Click back to Recipe Editor and select the reference configuration.
Name and Description	Identify the recipe.
Variable Tag List	Lists all variable tags in the reference configuration. Click on a tag and click Add to add it to the recipe.
Recipe Items • Name • Value	Lists all variables in the recipe. • Name of variable • Value/state of variable. If analog variable, enter a value in the value field. If digital variable, select ON or OFF.
Delete	Deletes selected item from recipe.
Print	Prints the recipe
Save	Saves the recipe as .RCP file.
Download	Downloads recipe to the controller's recipe pool where it can be edited or loaded into the controller's active configuration.

Recipe Pool

This is the recipe (variables) pool. The Recipe Pool lets you add or delete a Recipe on a list of configured Recipes and also enter the "Properties" function and the "Edit Recipe " function to set up each recipe.

Configuration

When you select "Recipes (Variables)" from the Recipes menu, the "Recipe Pool" dialog box will be displayed. From left to right the icons are:

ADD a Recipe:

Put cursor on an empty pool line and select the NEW Icon. The "Recipe Properties" dialog box will open.

EDIT the Properties of an Existing Profile:

Select the Worksheet Properties Icon. The "Recipe properties" dialog box will open.

EDIT a Recipe:

Select the Edit Recipe Icon. The "Edit Recipe" dialog box will appear.

COPY and PASTE:

Select a recipe from the pool window, then select the Copy Icon. Select another location in the pool window, then select the Paste Icon. The copied recipe will be inserted into the location selected.

DELETE a Recipe:

Click on a recipe name and then click on the Delete icon.

PRINT a Recipe:

Click on a recipe name and then select the Print icon. The "Print" dialog box will appear.

Select OK.

A recipe report will be printed with all the information entered on the "Recipe Properties" dialog box. [Variable, Description, Value or State]

SAVE a Recipe:

To save a recipe as a .rcp file, click on a recipe name and then select the Save icon. The "Save As" dialog box will appear.

OPEN a Recipe:

To open a previously saved .rcp file and insert it into the pool, click on the Open icon.

DOWNLOAD a Recipe:

To download a recipe to the controller's recipe pool, click on the Download icon.

Setup/Edit a Recipe in Pool

The "Edit Recipes" dialog box lets you set up or edit a recipe listed in the "Recipe Pool."

Make sure you have clicked on "Properties " and have given that specific recipe a name and description. See RECIPE POOL before proceeding.

Procedure

Click on a recipe name in the active field and select "Recipe" or double click on the recipe name. The "Edit Recipe" dialog box will appear.

To ADD Variable to a Recipe:

Select a variable and click on ADD. A variable number will appear under "Recipe Items".

To DELETE a Variable from a Recipe:

Select a variable number from the "Recipe Items" field, then click "Delete".

To SET UP a Recipe Item

From the "Recipe Items" list, select a variable name from the list of recipe items.

If it is an analog variable, enter a value in the value field.

If it is a digital variable, select ON or OFF, from the drop-down menu in the Value field, as a digital state for the variable.

Repeat this procedure for each recipe variable desired for the recipe you are configuring.

Click "OK". The length of the Recipe (number of variables) will appear in the "Recipe Pool".

Click "CLOSE" on the "Recipe Pool' dialog box to complete the configuration.

Recipe Properties

The Recipe Properties dialog box contains fields for you to view enter:

- a recipe name you want assigned to the recipe, which will be added to the pool.
- a descriptor of 16 characters.

Setpoint Profiles

Create/Edit Setpoint Profile File

Creates/edits a setpoint profile be saved as a file (.PRF). File can be downloaded to the setpoint profile pool. A profile in the pool can be edited or loaded into the controller's active configuration.

Step/Item	Action/Description
Select File, Open.	Lets you choose a .PRF file to edit. After selecting file the Profile Editor appears.
OR	
Select File, New.	"Choose a new file type" box appears.
Select Recipes tab.	Recipe types appear.
Select Setpoint Profile	The Profile Editor appears.
THEN	
Name and Description	Identify the profile.
Properties	This function lets you set the properties for the profile. The information configured here will appear in the Edit SP Profile dialog box.
Ramp Type Eng. Units Time Units Aux. Out Units Guar. Hold Type Guar. Hold High Guar. Hold Low	Properties of the profile. You can change these under Properties.
Add	Adds a step.
Insert	Inserts a step.
Delete	Deletes selected step.

Step/Item	Action/Description
Type	Ramp or Soak. A ramp segment is a starting setpoint and the time or rate to reach the setpoint of the following segment. Typically, segment #1 will be a ramp.
SP Value	Setpoint value set for Ramp(starting Setpoint value) and Soak(soak setpoint value).
Time/Rate	Ramp time is determined in either: TIME*-Hours or Minutes Range = 0.00 hr. to 999.99 hr. / 0.00 min. to 999.99 min. OR RATE*-EU/MIN or EU/HR Range = 0 to 999.99 *This selection of time or rate is made when you configure properties. Make this selection before entering any Ramp. NOTE: When Ramp unit is configured for TIME, entering "0" will imply an immediate step change in setpoint to the next soak.
Aux. Out	In addition to the main ramp and soak output value, a second analog value is available for each step of the profile. This output is a fixed soak value, which may be used to provide a setpoint value for a secondary control loop in the process. An example would be a ramp and soak temperature program combined with pressure setpoints for each step of the profile.
Guar. Hold	OFF or ON. Choose ON to hold the program if a process variable exceeds a predefined deviation from setpoint.
Events	You can configure 1 to 16 segment events to turn ON or OFF at the beginning of each segment. Segment events are digital switches that provide ON/OFF outputs through an SPEV control block. When a segment event is turned ON, it remains ON until the end of the segment at which time it is turned OFF unless it is configured to turn ON in the next segment. Note that segment events are not interrupted by soak time delays when the process variable is outside the guaranteed soak band. Events turn ON as soon as the previous segment is completed even if the process variable has not reached the soak setpoint. When the program completes, the events are held at current value until the programmer is returned to the ready state.
Print	Prints the profile.
Save	Saves the profile as .PRF file.

Step/Item	Action/Description
Download	Downloads profile to the controller's Setpoint Profile Pool where it can be edited or loaded into the controller's active configuration.

Setpoint Profile Pool

The SP Profile Pool lets you add or delete a profile on a list of configured profiles. Through this dialog box you will set the properties for each profile and set up or edit the information for each segment that make up a profile.

Configuration

When you select "Setpoint Profiles" from the Recipes menu, the "Setpoint Profile Pool" dialog box will be displayed. Through this display, you will add a new profile or delete an existing one and also enter the Set Point properties function and the "Edit Program" function to set up each profile.

From left to right the icons are:

ADD a Profile:

Select the NEW Icon. The "Setpoint Profile Properties " dialog box will open.

EDIT the Properties of an Existing Profile:

Select the Worksheet Properties Icon. The "Setpoint Profile Properties " dialog box will open.

EDIT a Profile:

Select the Edit Segments Icon. The "Edit Setpoint Profile " dialog box will appear.

COPY and PASTE:

Select a Profile from the pool window, then select the Copy Icon. Select another location in the pool window, then select the Paste Icon. The copied profile will be inserted into the location selected.

DELETE a Profile:

Click on a profile name and then click on the Delete icon.

PRINT a Profile:

Click on a profile name and then select the Print icon. The "Print" dialog box will appear.

Select OK.

A profile report will be printed with all the information entered on the tabs of the 'Setpoint Profile Properties" dialog box.

SAVE a Profile:

To save a Profile as a .prf file, click on a recipe name and then select the Save icon. The "Save As" dialog box will appear.

OPEN a Profile:

To open a previously saved .prf file and insert it into the pool, click on the Open icon.

DOWNLOAD a Profile:

To download a Profile to the controller's Profile pool, click on the Download icon.

Setup/Edit Setpoint Profile in Pool

The “Edit Setpoint Profile” dialog box lets you set up or edit profile segments for the programs listed in the “Setpoint Profile Pool.”

Make sure you have clicked on “Properties ” and have configured the properties for that specific program.

Edit a program

Click on a profile name in the active field and select the **Edit Item** Icon from the **Toolbar** on the dialog box  or double click on the profile name.

The “Edit Setpoint Profile Segments” dialog box will appear. It presents multiple segments at a time to view and edit. Click on field for drop down menu to appear for some selections.

Edit Setpoint Profile Segments Dialog Box

The three main areas on the “Edit Setpoint Profile Segments” dialog box are:

Properties Information Area

This block of information was developed during “Properties” configuration. It lists the selection and values that were made on the “Setpoint Profile Properties” tab cards. These fields are read only; they are for reference only.

Profile Data Entry area

This data entry area lets you make selections and enter values for each specific segment in the Profile Segment Setup Field.

Profile Segment Setup Buttons

You can add, insert, or delete segments in your program.

Profile Setup/Edit Procedure

The Profile Setup/Edit Procedure consists of building a ramp/soak profile by entering a value or make a selection for each of the following fields.

- adding or inserting segments to a list of segment
- selecting the type of segment—Ramp **or Soak** (drop-down menu)
- selecting Guaranteed Soak (On or Off) for soak segments, if desired (drop-down menu)
- entering the Setpoint value for the ramp or soak
- entering the value of the time or ratio for the segment
- selecting an Aux. Out value (if required) for the segment
- selecting the events (1 - 16) you want turned on or off at the beginning of the segment (drop-down menu)
- repeating the procedure for all the segments in the program

Enter the information in the appropriate fields, and then click OK.

ATTENTION

If you are setting up the profile for the first time, repeat the procedure for all segments in the program.

Setpoint Profile Properties

This function lets you set view the properties for the program selected in the Setpoint Profile Pool. Appears when creating a new profile or editing one in the setpoint profile pool.

Parameters

Refer to the table below for properties. Enter the properties information in the appropriate fields in the dialog box, then click “OK”.

Parameter	Parameter Description	Entry Information
TEXT		
Label	Profile Name	8 characters
Descriptor	Description of Profile	16 characters
Primary Output Label	Primary Output Descriptor Name.	8 characters
Primary Output Engineering Units	Primary Output Engineering Units descriptor	4 characters
Auxiliary Output Label	Auxiliary Output Descriptor name	8 characters
Auxiliary Output Engineering Units	Auxiliary Output Engineering Units descriptor	Auxiliary Output Engineering Units descriptor
GENERAL		
Ramp Type		
Rate	Each ramp segment's time specifies the RATE at which that profile's output will reach the next segment.	Click on Radio button
Time	Each ramp segment's time is the TIME allotted to the profile's output to reach the next segment's value in hours or minutes.	Click on Radio button
Guaranteed Hold Type		
None	No guaranteed hold if a PV deviates a specified amount above or below the profile output.	Click on Radio button
Per Segment	Lets you select specific segments for guaranteed soak where you set up the profile ramps and soaks.	Click on Radio button
All Soaks	All soaks will have a guaranteed soak.	Click on Radio button
All Segments	All segments will have a guaranteed soak	Click on Radio button
Time Units		

Parameter	Parameter Description	Entry Information
Hours *Minutes*	This selection assigns the time units of all segments in HOURS. This selection assigns the time units of all segments in MINUTES.	Click on Radio buttonClick on Radio button
Guaranteed Hold High	A Number in Engineering Units above the setpoint outside of which the timer halts	Enter a value
Guaranteed Hold High	Enter a Number in Engineering Units below the setpoint outside of which the timer halts.	Enter a value
LOOP/JOG		
Jog Segment	Segment number jog will go to.	Enter a value
Loop *Start Segment* *End Segment* *Cycles*	 This designates the number of the first segment of the loop. This designates the number of the last segment of the loop. The last segment of a program must be a soak segment. Last segment of a loop can be a ramp or soak. This number lets the program repeat (loop) a specified number of time from beginning to end. An entry of 0 will cause an indefinite loop.	 Enter a value from 1 to 49 Enter a value from 2 to 50 Enter a value from 0 to 100
START/RESTART Restart Rate	 The Restart Rate value is used to return the process to the last operating setpoint prior to power loss when restart input is connected to power off timing block.	 Enter a value in Engineering Units

Click on the tab to access the properties for that tab.

Enter the information required for each tab then click “OK”.

Press F1 for help in any field

Click on the profile name in the Setpoint Profile Pool and select the Edit Segments Icon (3rd from left) from the Toolbar on the dialog box

Setpoint Schedules

Create/Edit Setpoint Schedule file

Creates/edits a setpoint schedule be saved as a file (.SCH). File can be downloaded to the setpoint schedule pool. A schedule in the pool can be edited or loaded into the controller's active configuration.

Step/Item	Action/Description
Select File, Open.	Lets you choose a .SCH file to edit. After selecting file the Schedule Editor appears.
OR	
Select File, New.	"Choose a new file type" box appears.
Select Recipes tab.	Recipe types appear.
Select Setpoint Schedule.	The Schedule Editor appears.
THEN	
Select a Reference Configuration.	A schedule must have a configuration to give it context. Select an open configuration from the pull-down list. If none available, select Open Configuration to open one. The configuration will open. Click back to Schedule Editor and select the reference configuration.
Name and Description	Identify the schedule.
Properties	Sets properties for the schedule, such as time units and guaranteed hold limits.
Time	Length of time for the segment.
SP1-SP8	Setpoint values.
Events 1-16	Segment events are digital switches that provide ON/OFF output through an SPS function block. When a segment event is turned ON, it remains on until the end of the segment at which time it is turned OFF unless it is configured to turn ON in the next segment. Select from the drop down menu which events you want to turn ON or OFF at the beginning of each segment.

Step/Item	Action/Description
Aux1-Aux8	The auxiliary block supports up to 8 soak only outputs. You can assign values to all eight Auxiliary Outputs for each segment.
GHold1-GHold8	Setpoint guarantee is provided for the master block setpoints with a single symmetrical value for each setpoint output. Actions for the guarantee soak may be set on a per segment basis for OFF, HIGH setpoint deviation, LOW setpoint deviation or both HIGH and LOW setpoint deviations. Click on an active field and select a GHOLD Type from Drop-down menu: OFF - No Guaranteed Hold HIGH setpoint deviation - The schedule will hold if a PV deviates above the Setpoint value set. LOW setpoint deviation - The schedule will hold if a PV deviates below the Setpoint value set on the "Setpoint Schedule Properties" dialog box. HIGH and LOW setpoint deviations - The schedule will hold if a PV deviates above or below the Setpoint value set on the "Setpoint Schedule Properties" dialog box.
Recycle Segment	The segment number at which a recycle will start. Enter a value 0 to 50
Recycle Count	This number lets the schedule repeat (loop) a specified number of times. Enter a value 0-999 or 0 for infinite.
Delete	Deletes selected item from schedule.
Print	Prints the schedule.
Save	Saves the schedule as .SCH file.
Download	Downloads schedule to the controller's schedule pool where it can be edited or loaded into the controller's active configuration.

Setpoint Schedule Pool

The SP Schedule Pool lets you add or delete a schedule on a list of configured schedules. Through this dialog box you will set the properties for each schedule and then set up or edit the information for each segment that make up a schedule.

Configuration

When you select "Setpoint Schedules" from the Recipe menu, the "Setpoint Schedule Pool" dialog box will be displayed. Through this display, you will add a new schedule or delete an existing one and also enter the set properties function and the "Edit Schedule" function to set up each schedule.

From left to right the icons are: 

To ADD a Schedule:

Select the NEW Icon. The “Setpoint Schedule Properties ” dialog box will open.

To EDIT the Properties of an Existing Schedule:

Select the Worksheet Properties Icon. The “Setpoint Schedule Properties ” dialog box will open.

To EDIT a Schedule:

Select the Edit Segments Icon. The “Edit Setpoint Schedule” dialog box will appear.

COPY and PASTE:

Select a schedule from the pool window, then select the Copy Icon. Select another location in the pool window, then select the Paste Icon. The copied schedule will be inserted into the location selected.

To DELETE a Schedule:

Click on a schedule name and then click on the Delete icon.

PRINT a Schedule:

Click on a schedule name and select the Print icon. The "Print" dialog box will appear.

Select OK.

A profile report will be printed with all the information entered on the tabs of the "Setpoint Schedule Properties" dialog box.

SAVE a Schedule:

To save a Schedule as a .sch file, click on a recipe name and then select the Save icon. The "Save As" dialog box will appear.

OPEN a Schedule:

To open a previously saved .sch file and insert it into the pool, click on the Open icon.

DOWNLOAD a Schedule:

To download a Schedule to the controller’s Schedule pool, click on the Download icon.

Setup/Edit Setpoint Schedule in Pool

The “Edit Schedule” dialog box lets you set up or edit a schedule from the schedules listed in the “Setpoint Schedule Pool.”

Make sure you have clicked on “Properties ” and have configured the properties for that specific Schedule.

Edit a Schedule

Click on a schedule name in the active field and select the Edit Segments Icon (3rd from left) from the Toolbar on the dialog box or double click on the schedule name.

The “Edit Schedule Segments” dialog box will appear with the selected Schedule indicated on the top banner. The Hybrid Control DesignerUtilities presents multiple segments at a time to view and edit.

To ADD a Segment

Click on ADD on the dialog box. A new Segment number will appear at the bottom of the segment list.

To DELETE a Segment

Click on a segment number in the field and click “Delete” on the dialog box. The segment will be deleted and all the segment numbers following the deletion will be changed.

To EDIT a Segment

Each segment contains the following Segment attributes: (click on field for drop down menu to appear for some selections)

Parameter	Parameter Description	Entry Information
Time	Length of time for the segment Time Units were selected in the “Setpoint Schedule Function Block PropertiesSetpoint_Scheduler ” Dialog Box	Value in Minutes or Hours, whichever has been selected.
Setpoint Values	Setpoint 1 through Setpoint 8	Enter a setpoint value in each active field
Ghold Type [Ghold1 thru Ghold8]	Setpoint guarantee is provided for the master block setpoints with a single symmetrical value for each setpoint output. Actions for the guarantee soak may be set on a per segment basis for OFF, HIGH setpoint deviation, LOW setpoint deviation or both HIGH and LOW setpoint deviations.	Click on an active field and select a GHOLD Type from Drop-down menu
	OFF - No Guaranteed Hold	
	HIGH setpoint deviation The schedule will hold if a PV deviates above the Setpoint value set.	
	LOW setpoint deviation The schedule will hold if a PV deviates below the Setpoint value set on the “Setpoint Schedule Properties” dialog box.	
	HIGH and LOW setpoint deviations The schedule will hold if a PV deviates above or below the Setpoint value set on the “Setpoint Schedule Properties” dialog box.	
Auxiliary Outputs [Aux1 thru Aux8]	The auxiliary block supports up to 8 soak only outputs. You can assign values to all eight Auxiliary Outputs for each segment.	Enter values for all Auxiliary Outputs in the appropriate fields.
Recycle Segment	The segment number at which a recycle will start	Enter a value 0 to 50
Recycle Count	This number lets the schedule repeat (loop) a specified number of times.	Enter a value 0-999or 0 for infinite
Events [Events 1 thru 16]	Segment events are digital switches that provide ON/OFF output through an SPS function blockSetpoint_Scheduler . When a segment event is turned ON, it remains on until the end of the segment at which time it is turned OFF unless it is configured to turn ON in the next segment.	Select, from the drop down menu, which events you want to turn ON or OFF at the beginning of each segment. Click on the box for each segment. A zero will change to 1 in the selected event position

Setpoint Schedule Properties

This function lets you set the properties for the schedule selected in the Setpoint Schedule Pool. If you are adding a schedule, this dialog box will automatically appear. It will also appear if you select the Worksheet Properties Icon (2nd from left) from the Toolbar on the dialog box. The information configured here will appear in the “Edit Schedule Segment” dialog box.

Configuration

Refer to the table below and enter the properties information in the appropriate fields in the dialog box, then click “OK”. You will return to the “Setpoint Schedule Pool ” dialog box.

Parameter	Parameter Description	Entry Information
General		
Label	Schedule Name	6 characters
Descriptor	Description of schedule	16 characters
Jog Seg	Logic input (JOG) on state switch block will cause the schedule to jump to the start of the segment designated then continue.	Segment number jog will go to
Time Units	This selection assigns the time units (hours ***or*** minutes) for all segments.	
Hours	Time unit in Hours	Click on Radio button
Minutes	Time unit in Minutes	Click on Radio button
Guaranteed Hold Limit	The schedule will hold if a PV deviates above or below (or both) the Setpoint value set here. Select Guaranteed Hold Type on the “Setpoint Edit Schedule” dialog box.	Enter a setpoint value

Sequences

Create/Edit Sequence File

Creates/edits a sequence be saved as a file (.SEQ). File can be downloaded to the sequence pool. A sequence in the pool can be edited or loaded into the controller’s active configuration.

Step/Item	Action/Description
Select File, Open.	Lets you choose a .SEQ file to edit. After selecting file the Sequence Editor appears.

Step/Item	Action/Description
OR	
Select File, New.	"Choose a new file type" box appears.
Select Recipes tab.	Recipe types appear.
Select Sequence.	The Sequence Editor appears.
THEN	
Select a Reference Configuration.	A sequence must have a configuration to give it context. Select an open configuration from the pull-down list. If none available, select Open Configuration to open one. The configuration will open. Click back to Sequence Editor and select the reference configuration.
Name and Description	Identify the sequence.
Properties	Sets properties for the sequence, such as jog step and time units.
Add	Adds a step to the sequence.
Time	Length of time for the segment.
SP1-SP8	Setpoint values.
State	State number for each step of the sequence. A state may be selected multiple times in the sequence. Since time is an attribute of the sequence, the state may be activated for a different time period each time it is selected. (The order does not have to be sequential). Enter a State Number in each active field. States are numbered from 1 to 50.
State name	Name of current state. Enter a state name (12 character max.) Examples: Heating, Cooling, Mixing.
Time in Step	Time duration value for each step of the sequence. Time units can be changed under Properties.
Time in Next Step	Designates the step the sequence will advance to when the time expires. It can be any step in the sequence, including steps that have been previously executed.

Step/Item	Action/Description
Event Signal #1	Click on the Event Signal #1 field and from the drop-down menu, select the event you want signal #1 to represent.
Event 1 Next Step	Each state of the sequence can also be configured to accept two different events to terminate the step. The first occurrence of either event or elapsed time will cause the sequence to advance to the appropriate next step. Enter a value for Event 1 Next Step.
Event Signal #2	Click on the Event Signal #2 field and from the drop-down menu, select the event you want signal #2 to represent.
Event 2 Next Step	Each state of the sequence can also be configured to accept two different events to terminate the step. The first occurrence of either event or elapsed time will cause the sequence to advance to the appropriate next step. Enter a value for Event 1 Next Step.
Advance Next Step	Allows you to select an appropriate action for the manual advance OI action or function block digital advance input. Enter a value.
Aux. Value	Enter an analog output value associated with each state.
Delete	Deletes selected step from sequence.
Print	Prints the sequence.
Save	Saves the sequence as .SEQ file.
Download	Downloads sequence to the controller's schedule pool where it can be edited or loaded into the controller's active configuration.

Sequence Pool

The Sequence Pool lets you add or delete a Sequence on a list of configured Sequences and also enter the "Properties" function and the "Edit Sequence " function to set up each Sequence.

Configuration

When you **select "Sequences" from the Recipes menu**, the "Sequence Pool" dialog box will be displayed. From left to right the icons are:

ADD a Sequence:
Select the **NEW** Icon. The "Sequence Properties" dialog box will open.

EDIT the Properties of an Existing Sequence:
Select the **Worksheet Properties** Icon. The "Sequence Properties" dialog box will open.

EDIT a Sequence:
Select the **Edit Sequence** Icon. The "Setup/Edit Sequences" dialog box will appear.

COPY and PASTE:
Select a recipe from the pool window, then select the **Copy** Icon. Select another location in the pool window, then select the **Paste** Icon. The copied sequence will be inserted into the location selected.

DELETE a Sequence:
Click on a sequence name and then click on the **Delete** icon.

PRINT a Sequence:
Click on a sequence name and then select the **Print** icon. The "Print" dialog box will appear.
Select OK.
A sequence report will be printed with all the information entered on the "Sequence Properties" dialog box. [Label, Description, Jog Step, and Time Units in Hours or Minutes]

SAVE a Sequence:
To save a sequence as an .seq file, click on a recipe name and then select the Save icon. The "Save As" dialog box will appear.

OPEN a Sequence:
To open a previously saved .seq file and insert it into the pool, click on the Open icon.

DOWNLOAD a Sequence:
To download a sequence to the controller's sequence pool, click on the Download icon.

Setup/Edit Sequence in Pool

The "Edit Sequence" dialog box lets you set up or edit a sequence from the sequences listed in the "Sequence Pool" dialog box.

Make sure you have clicked on "Edit Properties" toolbar icon and have configured the properties for that specific Sequence.

Edit a Sequence

Click on a Sequence name in the active field and select the **Edit Item** Icon (3rd from left) from the **Toolbar** on the dialog box or double click on the Sequence name.

The "**Edit Sequence**" dialog box will appear with the selected Sequence indicated on the top banner. Several Steps are shown for viewing and editing.

To ADD a Step
Click on ADD on the dialog box. A new Step number will appear at the bottom of the Step list.

To DELETE a Step
Click on a Step number in the field and click "Delete" on the dialog box. The Step will be deleted and all the step numbers following the deletion will be changed.

To EDIT a Step
Each step contains the following Step attributes:

Parameter	Parameter Description	Entry Information
State Number	State number for each step of the sequence. A state may be selected multiple times in the sequence. Since time is an attribute of the sequence, the state may be activated for a different time period each time it is selected. (The order does not have to be sequential)	Enter a State Number in each active field. States are numbered from 1 to 50
State Name	Name of current state	N/A
Time in Step	Time duration value for each step of the sequence. Time Units are selected on the Sequence Properties dialog box	Enter values for all Steps in the appropriate fields.
Time Next Step	Designates the step the sequence will advance to when the time expires. It can be any step in the sequence, including steps that have been previously executed.	Enter a number for the next step when time expires on current step.
Event Signal #1	The event signal is a digital signal defined in the sequencer block. When Event Signal #1 signal is TRUE the sequence will jump to the step defined in Event 1 Next Step.	N/A
Event 1 Next Step	The occurrence of Event Signal #1 will cause the sequence to advance to the step specified here.	Enter a value for Event 1 Next Step.
Event Signal #2	The event signal is a digital signal defined in the sequencer block. When Event Signal #2 signal is TRUE the sequence will jump to the step defined in Event 2 Next Step.	N/A
Event 2 Next Step	The occurrence of Event Signal #2 will cause the sequence to advance to the step specified here.	Enter a value for Event 2 Next Step.
Advance Next Step	Allows you to select an appropriate action for the manual advance OI action or function block digital advance input	Enter an "Advance Next Step" value.
Aux Value	Enter an analog output value associated with each state.	Enter an analog output value.

Sequence Properties

This function lets you set the properties for the sequence selected in the Sequence Pool. If you are adding a Sequence, this dialog box will automatically appear. It will also appear if you select the **Worksheet Properties** Icon (2nd from left) from the **Toolbar** on the dialog box. The information configured here will appear in the "Edit Sequence" dialog box.

Configuration

Refer to the table below and enter the properties information in the appropriate fields in the dialog box, then click "OK" to return to the "Sequence Pool" dialog box.

Parameter	Parameter Description	Entry Information
General		
Label	Sequence Name	6 characters
Descriptor	Description of Sequence	16 characters
Jog Step	Logic input (JOG) on state switch block will cause the Sequencer to jump to the start of the step designated then continue.	Step number jog will go to
Time Units	This selection assigns the time units (hours or minutes) for all Steps.	
Hours	Time unit in Hours	Click on Radio button
Minutes	Time unit in Minutes	Click on Radio button

On-Line Monitoring

Overview On Line Monitoring

Hybrid Control Designer Monitoring provides the following:

Multiple, concurrent function block Monitor Windows

You can open as many Function Block monitor windows as you want until you run out of physical resources on the PC

You can open Function Block monitor windows concurrently for Function Blocks on *different* Function Block Diagram Worksheets

Function Block monitor window can be resized to better suit concurrent windows

Provides a Watch Window to view groups of related data such as I/O and Signal Tags

Allows Monitoring to cross all FBD worksheet boundaries

There are no boundaries

You can call up Function Block monitor windows from any or all FBD worksheets concurrently

The Watch Window implicitly crosses all worksheets

All other diagnostic windows can also be open concurrently

Select "Monitor Mode" from the "Monitor" menu or select the "Monitor" icon from the Main Toolbar. 

You can specify the monitor update rate that determines how often data is collected from the controller during monitoring. This update rate can be set to either 1/4 second, 1/2 second, 1 second, or 5 seconds.

See "Monitor Toolbar" for the available Monitoring and Diagnostic Windows.

See "Visual Indicators for Monitor Mode" for on-line monitoring indicators.

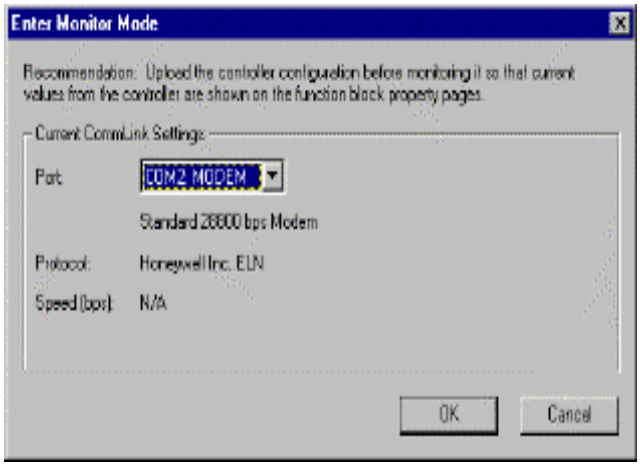
Enter Monitor Mode

Select "Monitor Mode" from the "Monitor" menu or select the "Monitor" icon from the Main Toolbar.

While in monitor mode, edits to the configuration cannot be made.

Procedure

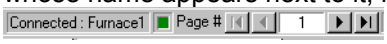
1	Selecting this menu item opens the "Enter Monitor Mode" dialog box

	
2	Select the controller to monitor using the Port and Address fields on this dialog. The dialog box also indicates the Protocol and Baud rate for the selected controller.
3	Click the OK button on this dialog to enter monitor mode for this configuration.
4	The background of the function block diagram worksheet changes to yellow and the cursor includes the Monitor icon [Eye} with the arrow. See "Visual Indicators for Monitor Mode".
5	The Monitor Toolbar will appear, whose buttons you can use to toggle (show or hide) the various monitor windows. These windows can also be toggled using menu items on the Monitor menu.
6	When exiting monitor mode, any monitor windows still open will be closed and will be re-opened at their same positions when monitor mode is re-entered for this configuration.

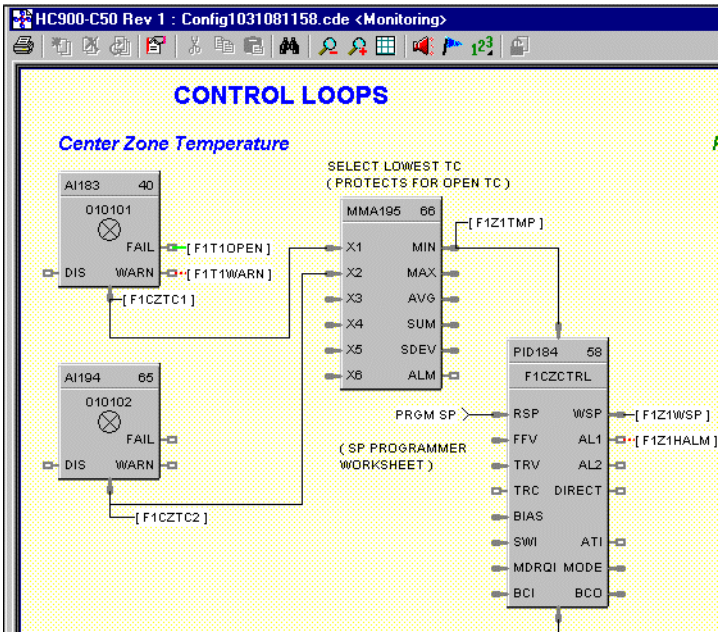
Visual Indicators for Monitor Mode

When "Monitor Mode" is selected there are several indications that the configuration is in Monitor Mode.

1. The "Connected" indicator on the Status Bar will blink to show that the controller, whose name appears next to it, is being monitored.



2. The cursor changes to include the Monitor icon [Eye] along with the arrow.
3. The word **<Monitoring>** appears in the configuration Title Bar at the top of the diagram.
4. The background color of the Function Block Diagram changes to **YELLOW.**



Monitor Update Rate

Introduction

You can specify the monitor update rate that determines how often data is collected from the controller during monitoring. This update rate can be set to either 1/4 second, 1/2 second, 1 second, or 5 seconds.

This option is **allowed only during edit mode**, not while you are monitoring the controller. The default monitor update rate is 1 second and this update rate is remembered between sessions of the software.

If you want to monitor from a relatively slow computer set the monitor update rate to a slow setting.

Procedure

Select "Set Update Rate" from the "Monitor" menu on the Main Drop-down menus.

Select an Update Rate from the Sub-menu:

1/4 Second
1/2 Second
1 Second, or
5 seconds

Monitor Toolbar

Click on ICON to open a dialog box. More than one dialog box can be open at a time.

The Monitor Toolbar toggles monitor windows for the following:

ICON	Function	Window Comments
	**Watch Summary**	Toggles the Watch Summary Window that lets you view groups of related data such as I/O and Signal Tags.

ICON	Function	Window Comments
	**Controller Diagnostics**	Toggles the Controller Diagnostics Window that lets you view the controller parameters and values.
	**Rack Diagnostics**	Toggles the I/O Rack Diagnostics window that lets you view the Rack Diagnostics, Expansion I/O Comm Diagnostics(C50 CPU only), and the I/O Module diagnostics.
	**Configuration Port Diagnostics**	Opens the Configuration Port Diagnostics window that lets you view the parameters and values of the R2-232 port on the controller.
	**RS485 OI Port Diagnostics**	Toggles the RS485 OI Port Diagnostics window that lets you view the operator Interface port parameters and values.
	**Network Port Diagnostics**	Toggles the Network Port Diagnostics window that lets you view the network port parameters and values.
	**Expansion I/O Comm Diagnostics (C50 CPU only)**	Toggles the Expansion I/O Comm Diagnostics window that lets you view the expansion port parameters and values.
	**Host Connections Diagnostics**	Toggles the Host Connections window that lets you view the host connections parameters and values.
	**Peer-to-Peer Diagnostics**	Toggles the Peer-to-Peer Connections Diagnostics window that lets you view the Peer-to-Peer parameters and values.
	**Function Block Monitor**	Toggles the Monitor Function Block window that lets you monitor key parameters of the selected Function Block.
	**Forced Blocks Window**	Toggles the Forced Block Summary Window Window that lets you see all the function blocks that have forced outputs.
	**All Function Block Windows**	Lets you toggle the function block windows that are open - Display or Hide
	**All Pins**	Lets you toggle (display/hide) monitoring values (numeric or On/Off state) at all input and output pins that are shown.
	**All Monitor Windows**	Lets you toggle the Monitor windows that are open - Display or Hide.

How Do I Start Monitoring

Procedure

1. Either upload the configuration from the controller to your PC or Open the file from disk that matches what's in the controller. Hybrid Control Designer will inform you if the file you opened is not currently loaded in the controller. In this case, limited monitoring capabilities will be available.

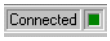
For example, you won't be able to monitor function blocks or bring up the Watch Summary Window.

2. Press the MONITOR button on the main toolbar.

The "Enter Monitor Mode" dialog box will open.
Note: *While in monitor mode, you won't be able to edit the configuration. For example, you won't be able to add or delete function blocks, move items on the Function Block Diagram, or change configuration parameters of function blocks on their property pages. You will, however, be able to view the configuration parameters of function blocks on their property pages, but these values aren't being read from the controller. They exist only in the configuration open in Hybrid Control Designer. That is why it is recommended that you perform an upload from the controller before monitoring so that current values from the controller are shown on the function block property pages."*

3. Select the Comm port and controller address to monitor. Press OK.
It checks to see if information is the same in the controller.

The feedback will be the monitor toolbar.

The Status Bar shows 

on bar indicates that monitor mode is in effect. The green square is an activity indicator and flashes bright green when requests for monitored data are made to the controller.

There is also the word "Monitoring" indicated on the banner of the worksheet,the FBD worksheet background turns yellow and an eye appears with the cursor arrow.
See "Visual Indicators for Monitor Mode" for on-line monitoring indicators.

Right Click Procedure in Monitor Mode

Depending where you right-mouse click on the FBD worksheet during monitoring, the resulting menu will have some differences.
Below each item in red is shown the menu items that appear when you right-click on that item on your FBD during Monitor Mode. Click on a green menu item for more information about that item.

Right click on these	**Function Block**	**Variable**	**Yellow Space**	**Signal Tags**	**Connectors**	**Page Connectors**
To see these choices	Monitor Block	Monitor Block	Execution Order	Watch Summary	Watch Summary	Watch Summary
	Watch Summary	Watch Summary	Fast Logic Order	Add to Watch Summary	Add to Watch Summary	Add to Watch Summary
	Monitor Pins	Add to Watch Summary	Find	Monitor Pins	Monitor Pins	Monitor Pins
	Help	Monitor Pins	Go To	Help	Help	Help

Right click on these	Function Block	Variable	Yellow Space	Signal Tags	Connectors	Page Connectors
	Execution Order	Help	View	Find Where Used	Find Where Used	Find Where Used
	Copy	Execution Order	Properties (File)	Properties (Signal Tag)	Properties (Connector)	Properties
	Properties (Function Block)	Copy				
		Properties (Function Block)				

Right click on these	Input Pins	Output Pins	Wire Node
To see these choices	Trace	Monitor Pins	Help
	Monitor Pins		

Function Block Monitor Window

The Hybrid Control Designer provides live monitoring of all Function Blocks.

To access, select "Monitor Function Block" from the "Monitor" menu or from the Monitor toolbar.

Or

Right Click a function block or variable in Monitor Mode and select the Monitor Block menu item.

The summary will provide status of the parameters shown in the list.

For "Loop" blocks, the current mode will be shown in the lower right of the window
- LSP AUTO = Local Setpoint, Automatic Output
- LSP MAN = Local Setpoint, Manual Output
- RSP AUTO = Remote Setpoint, Automatic Output
- RSP MAN = Remote Setpoint, Manual Output

To change Mode settings of a loop block, click on a radio button to select
- *Local or Remote Setpoint*
- *Automatic or Manual Output*

Click the "Change Mode" button to change the mode.

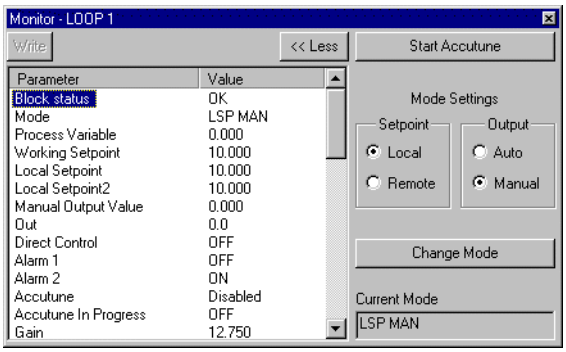
Changing a Parameter

Some blocks allow you to change some parameters. Click on a parameter name, if allowed the "Write" field will become active. Enter an override value in the field.

Click on "X" to exit box.

Attention: All function blocks dialog boxes have a "MONITOR" button when in Monitor mode that will access this window.

Below is an example of a Monitor Window for a PID block.



Forcing/Unforcing an Output

Overview

The ability to **force and unforce the output [pin]** of function blocks and variables from the Hybrid Control Designer is provided as an aid to startup and configuration troubleshooting. The feature is limited to single output per block.

The majority of blocks have a single output, and most of the multiple output blocks have an obvious primary (i.e. most important) output. This may apply to the block's primary analog output (such as for an AI block) or digital output of a logic block (such as for a DI or DO block).
Note: A function block input is never forced.

Some blocks (i.e.Loop Blocks) do not have a forceable output. It is not possible to force/unforce function block outputs from the Operator Interface.

Variables, which are normally set to 0 on download of a new configuration or a change in configuration can have their output value changed on-line. You can also preset the value of a variable using an initialization procedure via function blocks or by setting the Initial Value field on the variable's property page.

You can also display a list of blocks that are presently being forced. See "Forced Blocks Window "

ATTENTION:

All forced outputs are cleared by a CONTROLLER COLD START.

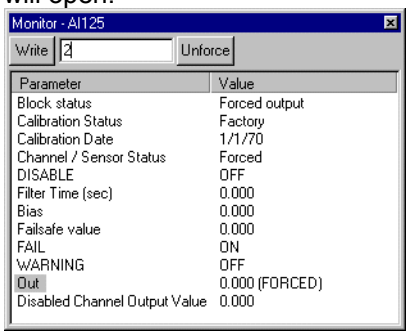
CAUTION

During Live-Monitoring (especially fast logic), it is possible to see transient states where the block output is inconsistent with its input values. This occurs because it is possible for the input values and outputs values to be taken from different controller execution cycles. Therefore, either the viewed inputs or outputs may be "older".

SOLUTION: Recognize this possibility when interpreting results. Use forcing if necessary to create and assess static conditions.

Forcing an Output

1. Do an Upload to make sure the file is current.
2. Enter Monitor Mode - Select the Monitor Mode icon from the Main Toolbar, or select "Monitor Mode" from the Monitor menu. The FBD background turns yellow.
3. Right-Click on a selected function block, then select "Monitor Block". The "Monitor Block" dialog box will open.



4. Select “OUT” or “Output” in the dialog box of the Live Monitor screen. If Forcing is allowed, the Write field becomes active. Enter the Output value in the entry field next to the "Write" button..
   NOTE: for Loop Blocks, put the controller into Manual Mode
5. Click “WRITE”. The output value will change to the value entered for forcing.
   The word Forced will appear next to "Output" and "Block Status".

Changing (Force) a Digital Value from ON to OFF

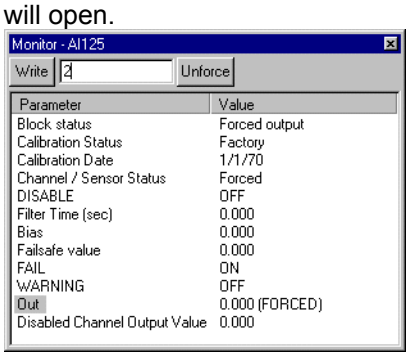
Select “ON” or “OFF” from the drop down list box and click “WRITE”. The selection for the parameter selected will change to the selection entered for forcing.

If there is a problem with the forcing

Check your communication Set Up for correct settings. Make sure the Mode Switch on the controller is in “RUN “ mode

Unforcing an Output

1. Right-Click on a selected function block, then select "Monitor Block". The "Monitor Block" dialog box will open.



2. Click on the forced output (indicated by FORCED).
3. Click Unforce. The original selection for the parameter will return.

Forced Blocks Window

The Hybrid Control Designer lets you see all the function blocks that have forced outputs plus it lets you unforce an output from this window.

1. Select "Forced Blocks" from the "Monitor" drop-down menu or from the Monitor toolbar.

   (This window can be launched from the "Utilities Worksheet"

2. The “Forced Blocks” dialog box will appear.
3. The summary shows a list of Block I.D.s that have a forced output pin.
4. To unforce an output, click on a forced output in the list, then click on the "Unforce Selected Item" button

5. Click on "X" to close the box.

How Do I Stop Monitoring

Press the MONITOR button on the main toolbar.

This will return the associated configuration to EDIT mode.
Feedback will be the monitor button (unpressed), and all open monitor windows will disappear. The FBD Worksheet background returns to white and the eye disappears from the cursor.

Attention: If you return from EDIT mode to Monitor mode, all your previously opened monitor windows will appear (if the same configuration)

Logic Flow

Overview

In Monitor Mode, Logic Flow is shown within the Configuration Worksheet Monitor Window.

Soft Wires are identified to represent the Logic state at the pin of the source in monitor mode.

Function Block pin values can be monitored briefly or you can stick the values on display until you dismiss them. Analog Values are in decimal format and Digital States are On/Off.

Digital Signal Tags and corresponding Connectors at the block pins include color-coded representations for state changes.

Page Connectors include color-coded representations for state changes.

Logic Inversion indicators are pictorially identified on the block and are color-coded to identify logic states impeding or permitting logic flow.

CAUTION

During Live-Monitoring (especially fast scan), it is possible to see transient states where the block output is inconsistent with its input values. This occurs because it is possible for the input values and outputs values to be taken from different controller execution cycles. Therefore, either the viewed inputs or outputs may be "older". Logic monitoring is appropriate for static conditions.

Soft Wire Identification

Soft-wires are identified to represent the Logic state at the pin of the source in monitor mode.

Logic State at the Output Pin = **OFF**

The entire length of the soft-wire will be dashed Red

Logic State at the Output Pin = **ON**

The entire length of the soft-wire will be solid Green

See "Example "

Signal Tags and Connectors/Page Connectors

Digital Signal Tags and Connectors/Page Connectors include color-coded representations for state changes as substitutes for soft-wires.

Logic State at the Output Pin = **OFF**

The Digital Signal Tag and its corresponding Connector/Page Connector will have the entire length of its tail drawn in dashed RED

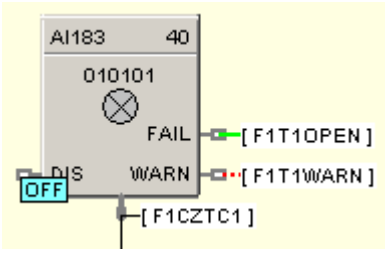
Logic State at the Output Pin = **ON**

The Digital Signal Tag and its corresponding Connector/Page Connector will have the entire length of its tail drawn in solid GREEN

Displaying Function Block's Pin Values

Function Block pin value(s) can be monitored **briefly** and you can set one or all of the values on display (**constant display**) until you dismiss them. Analog Values are in decimal format and Digital States are On/Off.

Displaying a Single Pin Value



Displaying Briefly

Hover the cursor over any pin momentarily. The pin's value will be displayed next to the pin as long as the cursor remains motionless over the pin.

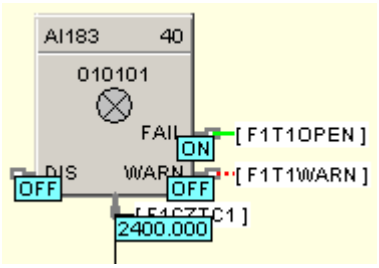
To ***remove*** the briefly displayed value:
remove the cursor from the pin.

Displaying Until Dismissed (Constant Display)

Hover the cursor over any pin and left-click while the pin value is displayed, or right-click and select "Monitor Pins" from the menu.

To ***remove*** the constantly displayed value:
left-click on the pin again, or
right-click and select "Monitor Pins" again from the menu.

Displaying All Function Block Pin Values



Displaying Briefly

Hover the cursor over the interior of a function block momentarily. All of the Function Blocks pin values will be displayed next to the pins as long as the cursor remains motionless over the block.

To ***remove*** the briefly displayed values:
remove the cursor from the block.

Displaying Until Dismissed

Hover the cursor over the interior of a function block and left-click while the pin values are displayed, or right-click and select "Monitor Pins" from the menu.

To ***remove*** the constantly displayed value:
left-click on the pin again, or
right-click and select "Monitor Pins" again from the menu.

Toggling All Pin Values on Worksheet

Select  on the Monitor Toolbar or select "Monitor Pins" from the Monitor menu.

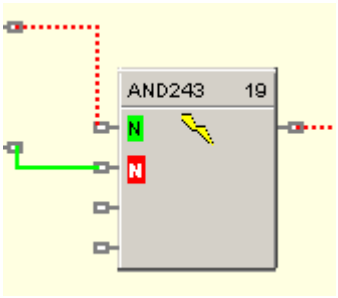
NOTE: Any pin values shown when monitor mode is exited will be re-shown when Monitor mode is re-entered. This only applies to the current session of the application and not between sessions of the application.

Logic Inversion Color Codes

Logic Inversion indicators are pictorially identified on the block and are color-coded to identify logic states impeding or permitting logic flow.

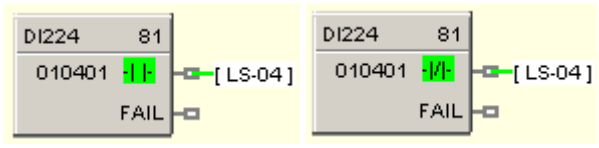
Logic Blocks Inversion Indicators

RED = OFF
GREEN = ON

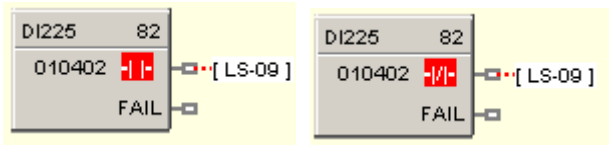


Digital Input Blocks Inversion Indicators

ON **or Inverted ON**

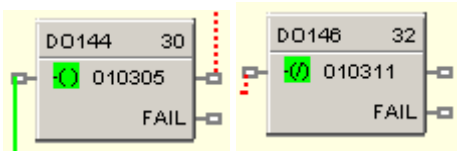


OFF **or Inverted OFF**

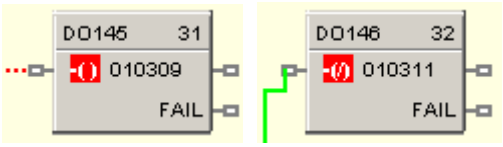


Digital Output Blocks Inversion Indicators

ON **or Inverted ON**



OFF **or Inverted OFF**



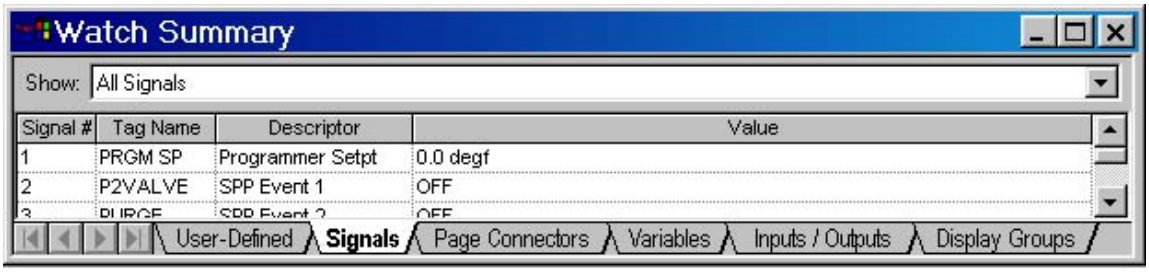
Watch Summary Window

Watch Summary Window

 accesses the Watch Summary Window from the Monitor Toolbar

Or, the menu item "Watch Summary" from the Monitor Menu on the main menu.

This is a view of the Watch Summary Window. It is a Dockable (movable), sizable window.
[Press and hold the CTRL key down to prevent Docking when moving the window]



There are five tabs at the bottom of the window that lets you monitor the following groups of data from the controller. Click on any of the tab titles below **to view an example** of the selected data for that tab. All parameter listings may be **sorted** by column.

- User Defined (Customized list of Variables, Signal Tags, Page Connectors)
- Signals (can be filtered by type - All, Analog, Digital)
- Page Connectors (can be filtered by type - All, Analog, Digital)
- **Variables** (can be filtered by type - All, Analog, Digital)
- I/O (can be filtered by type - AI, AO, DI, DO)
- OI Display groups (Overviews, Panel Meters, Alarms, Trends, etc)

Docking and Undocking the Window

Double clicking in the Title Bar area of the Watch Summary Window will toggle its docked state. If the window is docked, double clicking in the title bar area will undock the window.

If the window is Undocked
- double-clicking in the title bar area will dock the window at it last docked position
- Dragging the window to the top, bottom, left, or right edge of the main viewing area of the application will dock the window at that location

[Press and hold the CTRL key down to prevent Docking when moving the window]

Hot Links

You can click on any I/O function block or Signal on the Controller Worksheet or any I/O function block, Signal, or Variable in the Watch Window and that item will be located on the Function Block Diagram.

As you move the mouse over a HOT LINK, the text changes to Underlined Blue and

the cursor changes to a Hand. 

Writes or Forces

By clicking on the item in the Value column, you may write a value such as for a Variable or force a value for an analog input or digital input. For I/O, a Forced column will indicate that the I/O point is forced.

Find Feature

You can click on any I/O function block or Signal on the Controller Worksheet or any I/O function block, Signal, or Variable in the **Watch Window** and that item will be located on the Function Block Diagram.

As you move the mouse over a HOT LINK, the text changes to Underlined Blue and

the cursor changes to a Hand. 

You can also find within the Watch Summary window itself any tag, descriptor, signal number, variable number, as well as rack number, module number, channel number, or block on the Inputs / Outputs tab. For example, to find a tag in the Watch Summary window, click anywhere in the Tag Name column and start typing the characters of the tag you want to find. The tag matching the characters you type will scroll into view. To find a tag name and prevent the tag hot link from re-positioning the Function Block Diagram, right-click the tag name instead of left-clicking it.

Sort Function

The Sort function in the Watch Summary lets you sort the tag list by:

Signal #

Variable #

Tag Name

Descriptor

Block

At the top of the Watch Window, click on the **Column title**. The list will be sorted accordingly. Clicking the column title the first time sorts the list in ascending (alphabetical) order. Clicking the column title a second time sorts the list in descending (reverse alphabetical) order, and so forth.

Watch Summary - User Defined

In the User-Defined Watch Window, you can create a list of tags that you want to monitor.
You can add the following to the list:

- Signals
- Page Connectors
- Variables

The Watch Summary window doesn't have to be visible in order to add items to the User-Defined tab of it, nor does the "Show" drop-down menu on the User-Defined tab have to match what you'll be adding.

For example, you can add a signal to the User-Defined tab of the Watch Summary window even if the window is not visible or the User-Defined tab's "Show" drop-down menu is set to All Variables. As long as you are in monitor mode, you can add items at any time.

Also note that you can re-order the items in the list by selecting a single range of rows in the list and dragging the rows to another position in the list. A red line will appear as you drag the rows to show you where they will be dropped when you release the mouse button. Select the rows by positioning the cursor until it is over the gray cell at the beginning of the first (or last) row you want to drag. The cursor will then change to an arrow. While holding down the left mouse button, drag the cursor until it is over the gray cell at the beginning of the last (or first) row you want to drag. Release the mouse button. Then position the cursor over any gray cell in the selected rows and drag and drop the rows to their new position. You can delete items in the list by selecting their rows and pressing the Delete key.

Note that there is no limit to the number of items that you can add to the list, but the list is not saved between sessions of the software.

Procedure

From the Monitor menu or Monitor toolbar  , select "Watch Summary... ".

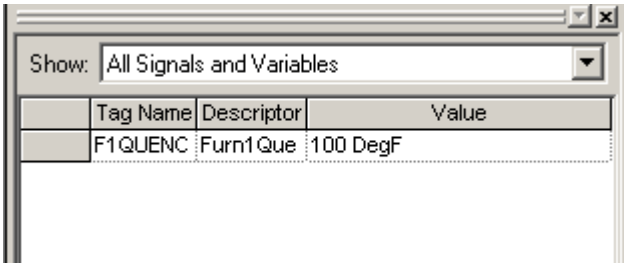
From the tabs at the bottom of the window, select the "**User-Defined**" tab.

At the top of the window, from the "**Show**" drop-down menu, select what you want shown in the window: All, All Signals, All Page Connectors, All Variables.

On the diagram, select a tag to monitor and Right-Click on the tag.

Select "**Add to Watch Summary**" from the drop-down menu

The tag selected will be listed in the "User-Defined" Watch Window.



Repeat steps 4 and 5 for each tag you want included in the list.

Use the "Find Feature " to Find a specific tag on the Function Block Diagram.

Use the "Sort Function " to sort the tag list by a specific column.

Watch Summary - Signals

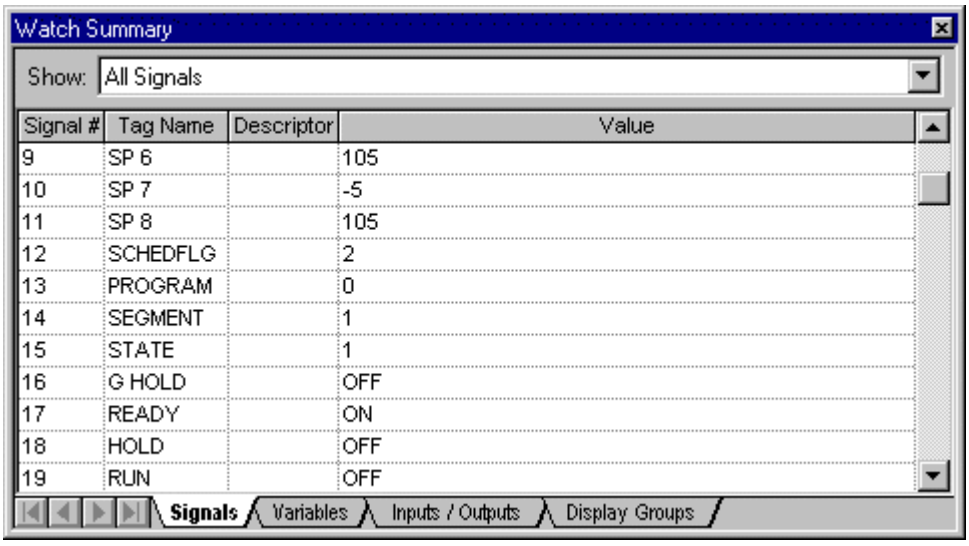
Select a Signal type to show from the drop-down menu at the top of the dialog box.

All Signals - Shows both Analog and Digital Signals in the window.

Analog Signals only

Digital Signals only

Each signal is identified by Signal Number, Tag Name, Descriptor, and Value and is READ Only.



Use the "Find Feature " to Find a specific tag on the Function Block Diagram.

Use the "Sort Function " to sort the tag list by a specific column.

Watch Summary - Page Connectors

Select a Page Connector type to show from the drop-down menu at the top of the dialog box.

All Page Connectors - Shows both Analog and Digital Page Connectors in the window.

Analog Page Connectors only

Digital Page Connectors only

Each page connector is identified by Tag name and Value and is READ Only.

Use the "Find Feature " to Find a specific page connector on the Function Block Diagram.

Use the "Sort Function " to sort the page connector list by a specific column.

Watch Summary - Variables

Select a Variable type to show from the drop-down menu at the top of the dialog box.

All Variables - Shows both Analog and Digital Variables in the window.

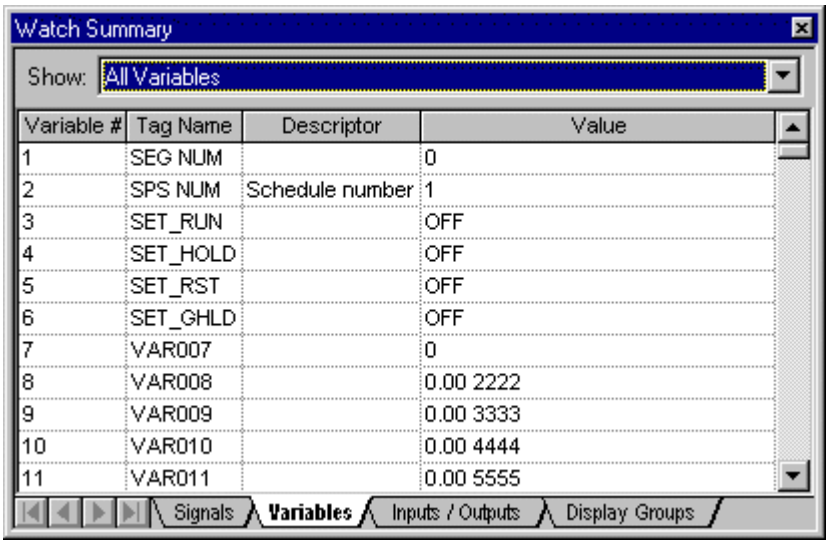
Analog Variables only

Digital Variables only

Each Variable is identified by Variable Number, Tag Name, Descriptor, and Value.

You can change a variable by clicking on a variable value and entering a new value for an analog variable or selecting the appropriate user-configured OFF or ON label from a drop-down menu for a Digital variable.

Note: *the new value entered is not written to the controller until you move off of the current cell either by tabbing out of the cell using the Shift+Tab keys or clicking on another cell using the mouse. If the value you want to change also shows engineering units, as in "100.0 LBS", for example, you just need to change the number portion; you don't need to delete the engineering units or type it in again.*



Use the "Find Feature " to Find a specific tag on the Function Block Diagram.

Use the "Sort Function " to sort the tag list by a specific column.

Watch Summary - Inputs/Outputs

Select an Input or Output type to show from the drop-down menu at the top of the dialog box.

Analog Inputs

Analog Outputs

Digital Inputs

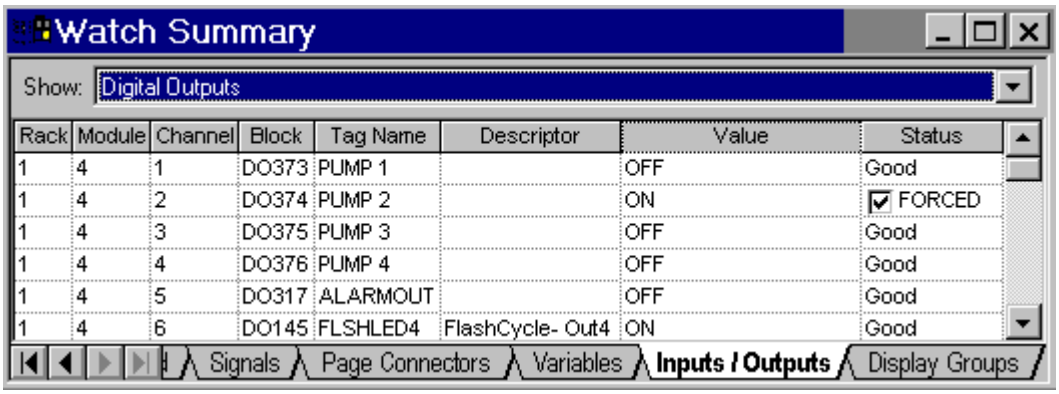
Digital Outputs

Each Input/Output is identified by Rack, Module, Channel Number, Block Name, Tag Name, Descriptor, Value, and Status.
NOTE: *Only "assigned" inputs and outputs are shown in this window. Inputs and outputs whose rack, module, and channel that are all zero are not shown in this window. These unassigned inputs and outputs are shown on the controller worksheet, however*.

You can Force an Output by clicking on a value and entering a new value for an analog input or selecting the appropriate user-configured OFF or ON label from a drop-down menu for a digital input or output.

A Checked Box will appear in the Status column indicating that the Output is forced. [Click off the value cell to see the box]

To **Remove a Force**, double-click to deselect the checked box.



Notes:

Analog outputs cannot be forced

Time Proportioning outputs and Three position Step outputs cannot be monitored since the live value is maintained only on the D.O. module itself. The text "n/a" (for "not available) is shown as the value for these outputs.

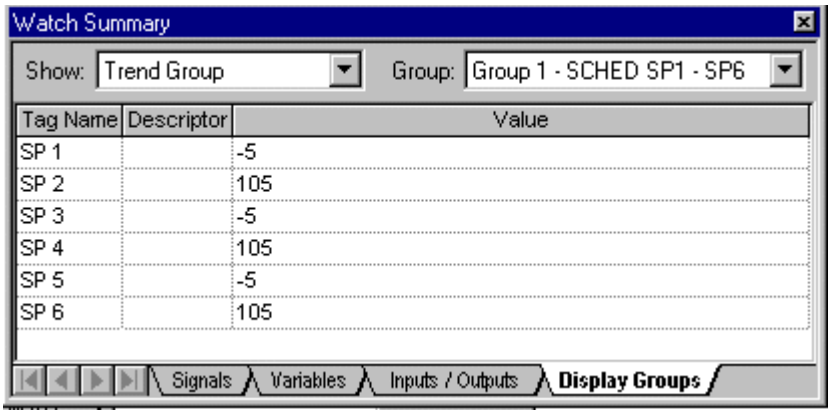
Use the "Find Feature " to Find a specific tag on the Function Block Diagram.

Use the "Sort Function " to sort the tag list by a specific column.

Watch Summary - Display Groups

Watch Summary - Display Groups lets the user monitor the same points configured on the Operator Interface displays.

Select a **Display Group**(Show Menu) then a **Group Number** (Group Menu) from the drop-down menus at the top of the dialog box. The window will monitor the Display Group selected. Note that new values can be written to the variables shown in this window.



Use the "Find Feature " to Find a specific tag on the Function Block Diagram.

Use the "Sort Function " to sort the tag list by a specific column.

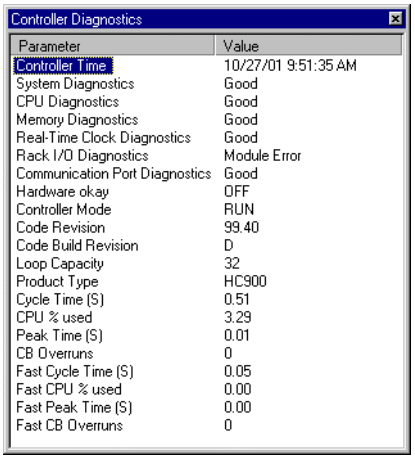
Diagnostics

Controller Diagnostics

Introduction

The Hybrid Control Designer provides live monitoring of Controller diagnostics. The instrument executes diagnostic routines during instrument start-up and during on-line operation and displays the controller status and diagnostics.

1. Select "Controller Diagnostics" from the "Monitor" drop-down menu or from the Monitor toolbar.  .
2. (This window can be launched from the "Utilities Worksheet")
3. The Controller Diagnostic Summary" dialog box will appear.
4. The "Controller Diagnostic Status Indications" will provide status of the parameters shown in the list.
5. Click on "X" to exit box.



Controller Diagnostics Status Indications

The "Controller Diagnostic Summary" dialog box will provide status of the parameters shown in the list.

Parameter	Status	Possible Cause	Controller Action	User Action
SYSTEM DIAGNOSTICS	GOOD	Controller is in RUN mode.	Executes the run mode. Outputs are updated.	None
	FORCED OUTPUT	A block has an output that is forced.	None	Remove force on block output.

Parameter	Status	Possible Cause	Controller Action	User Action
	INVALID CONFIG.	A configuration that exceeds the loop capacity of the controller was downloaded or an invalid configuration exists.	An empty database is created.	Download a valid configuration.
	SWITCH FAULT	A failure is detected in the switch reading.	All control blocks stop running All I/O scanning ceases. This forces the modules into failsafe.	Replace CPU.
CPU DIAGNOSTICS	GOOD	N/A	N/A	N/A
	WATCHDOG	Watchdog reset resulting from software failure	Associated rack monitor block's RACK OK pin is turned off. ASYS block's HW OK pin is turned off.	1. Force a cold start. 2. Upgrade control file software. 3. Replace CPU board. 4. Contact Honeywell Personnel.
	PREFETCH ABORT	CPU failed when attempting to fetch an instruction from the prefetch register.	1. Controller performs a restart 2. Associated rack monitor block's RACK OK pin is turned off. 3. ASYS block's HW OK pin is turned off.	1. Force a cold start. 2. Isolate system from noise and force a cold start. 3. Replace CPU board
	ADDRESS ERROR	The reserved exception occurred for an unknown reason.	Same as above	Same as above
	UNDEFINE ERROR	Bad Instruction Detected	Same as above	Same as above
	DATA ABORT	CPU failed when attempting to access data.	Same as above	Same as above
	SOFTWARE INTERRUPT ERROR	Software Interrupt occurred which is not supported by the software.	Same as above	Same as above
MEMORY DIAGNOSTICS	GOOD	N/A	N/A	N/A

Parameter	Status	Possible Cause	Controller Action	User Action
DIAGNOSTICS	5 DAY LOW BATTERY WARNING	Estimated battery life is less than 5 days.	1. Associated rack monitor block's RACK OK pin is turned off. 2. ASYS block's HW OK pin is turned off.	Replace battery.
	LOW BATTERY	Battery voltage is low.	1. Associated rack monitor block's RACK OK pin is turned off. 2. ASYS block's LOW BATTERY pin is turned on. 3. ASYS block's HW OK pin is turned off.	Replace battery.
	FLASH ERROR	Flash failed to burn	5. Associated rack monitor block's RACK OK pin is turned off. 1. ASYS block's HW OK pin is turned off.	1. Force a cold start. 2. Replace CPU board.
REAL TIME CLOCK DIAGNOSTICS	GOOD	N/A	N/A	N/A
	NOT PROGRAMMED	RTC not programmed	1. Time and date is set to 00:00:00, January 1, 1970. 2. Associated rack monitor block's RACK OK pin is turned off. 3. ASYS block's HW OK pin is turned off.	Program RTC.
	BAD DATA	Bad date and time	Same as above	1. Program RTC. 2. Cycle power. 3. Replace CPU. 4. Replace boards in rack. 5. Replace rack
	PROGRAMMING FAILURE	RTC failed to program	Same as above	Same as above
	READ FAILURE	Unable to read RTC	Same as above	Same as above

Parameter	Status	Possible Cause	Controller Action	User Action
RACK I/O DIAGNOSTICS	Good	N/A	N/A	N/A
	MODULE ERROR	One of the module diagnostics in the associated rack is set to WRONG MODULE, MODULE NO COMM (if the communications is failing due to the module not installed), BAD MODULE, or BAD CHANNEL.	Refer to related Module diagnostic.	Access the I/O Module diagnostics screen.
	HI TEMP	One of the module diagnostics in the associated rack is set to HI CJ TEMPERATURE.	Refer to HI CJ TEMPERATURE in Module diagnostics	Access the I/O Module diagnostics screen
	RACK BACKPLANE FAIL	The Main CPU/Scanner is unable to successfully communicate to any modules that are in its SPI backplane.	All associated module diagnostics are set to MODULE NO COMM. Refer to MODULE NO COMM diagnostic for further details.	1. Remove modules and check for bent pins on connectors. 2. Reinsert modules one at a time and note which module the diagnostic reoccurs, and replace that module. 3. Cycle power to the rack. 4. Replace the power supply. 5. Replace the rack. 6. Replace the CPU board.

Parameter	Status	Possible Cause	Controller Action	User Action
	RACK COMM FAIL	The Main CPU is unable to successfully communicate to an expansion rack that is in its configuration. **Please note that there are NO expansion racks permitted on the HC900-C30 controller**.	Same as above	1. Verify that the expansion rack should be in the configuration 2. Verify that the jumpers on the scanner are setup for the correct rack address. 3. Check that expansion rack is on. 4. Check the expansion rack's status LED for diagnostic information. 5. Check that cable is connected to expansion rack. 6. If a hub is used, check that all cables are properly connected to the hub, proper crossover cables are used, and that hub is powered. 7. Cycle power to the rack. 8. Cycle power to the hub. 9. Replace the expansion rack's power supply. 10. Replace the expansion rack. 11. Replace the expansion rack's scanner board.

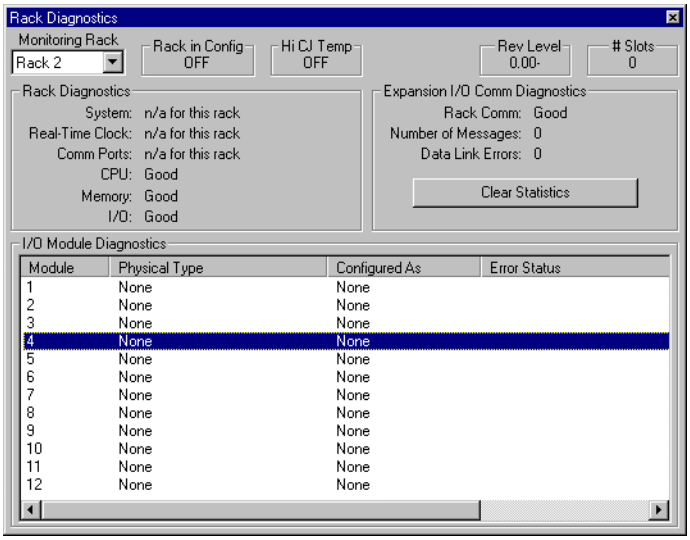
Parameter	Status	Possible Cause	Controller Action	User Action
	RACK SW INCOMPATILITY	The Main CPU determined that its software is not compatible with the scanner module.	All associated module diagnostics are set to MODULE NO COMM. Refer to MODULE NO COMM diagnostic for further details.	1. Upgrade the scanner software either by replacing the module or doing a code-download. 2. Update Main CPU software either by replacing the module or doing a code download.
COMM PORT DIAGNOSTICS	GOOD	N/A	N/A	N/A
	WARNING	One of the comm port's is reporting an application error	*Refer to related Comm port diagnostic*	Access the Comm port diagnostics screen
	FAILED	One of the Comm port's is reporting a physical or data link failure	*Refer to related Comm port diagnostic*	Same as above

Rack Diagnostics

Introduction

1. The Hybrid Control Designer provides live monitoring Rack diagnostics. The instrument executes diagnostic routines during instrument start-up and during on-line operation.
2. Select the "Rack Diagnostics" from the "Monitor" drop-down menu or from the Monitor Toolbar.
    (This window can be launched from the "Utilities Worksheet"
3. The "Rack Diagnostic Summary" dialog box will appear.
4. Select a Rack from the "Monitoring Rack" drop-down menu on the dialog box. The information for the selected rack will appear on the dialog box.
5. The summary window will provide Controller status and diagnostic information ***for the selected Rack:***
   Rack in Configuration - ON or Off
   High CJ Temp status - On or Off
   Revision Level of the Rack - Read Only
   Number of Slots - Read Only
   Rack Diagnostics - The status of the selected rack. Refer to "Controller Diagnostics Status Indications" for diagnostic messages. Not all diagnostics appear for Racks 2 thru 5.
   Expansion I/O Comm Diagnostics (C50 CPU only) - The status of the Expansion I/O Comm Diagnostics. Refer to "Expansion I/O Comm Diagnostic Status Indicators". Read the diagnostics for a particular rack.
   I/O Module Diagnostics - Status of the Modules shown in the list:
   Physical Type
   Configured as (type)
   Error Status.
   Model Number & Rev Level (scroll horizontally to view)

6. Click on X to exit box.



Refer to "I/O Rack Diagnostic Status indicators" for status indications, possible cause, and actions to correct the problem.

I/O Module Diagnostics Status Indications

The "I/O Module Diagnostic Summary" dialog box will provide status of the parameters shown in the list.

Parameter	Error Status	Possible Cause	Controller Action	User Action
I/O Module	GOOD	N/A	N/A	N/A

Parameter	Error Status	Possible Cause	Controller Action	User Action
Diagnostics	HI CJ TEMPERATURE	1. Possible causes of this diagnostic are: 2. One of the two CJs on the module is indicating a temperature reading greater than 70 degrees C. 3. Both cold-junction sensors are failing to convert. 4. The CJs are converting properly, but their differential is greater than 10 degrees C.	1. Associated AI blocks that are configured as T/Cs set their fail pin on, their warn pin off, and their output pin to the failsafe value. 2. Associated AI blocks that are configured as T/Cs set their IO status to "CJ High Temperature" for reason 1 or "CJ Failure" for possible causes 2 and 3. 3. Associated rack monitor block's module fail pin is turned on. 4. Associated rack monitor block's RACK OK pin is turned off. 5. Associated rack monitor block's HITEMP pin is turned on. 6. ASYS block's HITEMP pin is turned on. 7. ASYS block's HW OK pin is turned off.	1. Improve ventilation to rack 2. Replace AI module

Parameter	Error Status	Possible Cause	Controller Action	User Action
	WRONG MODULE	The module does not agree with the module required for the control scenario	1. Associated blocks set their fail pin on, their warn pin off, and their output pin to the failsafe value. 2. Associated blocks set their IO status to "Channel No Comm". 3. Associated rack monitor block's module fail pin is turned on. 4. Associated rack monitor block's RACK OK pin is turned off. 5. ASYS block's HW OK pin is turned off.	1. Verify configuration 2. Replace module with the correct one.
	MODULE NO COMM	Main CPU is unable to communicate to the module for one of the following reasons: • Module is not installed • Backplane problem is inhibiting the CPU to properly communicate with the module • Module is on an expansion rack and the expansion rack communications is failing	Same as above	Action is based on the IODIAG indication. If IODIAG is not MODULE ERROR, then follow the prescribed action defined for that diagnostic. For MODULE ERROR, do the following: 3. Verify configuration 4. Install module.

Controller Ports Diagnostics

Accessing Port Diagnostics

The Hybrid Control Designer provides live monitoring of Controller Ports diagnostics. The instrument executes diagnostic routines during instrument start-up and during on-line operation.

1. Select "Controller Ports Diagnostics" from the "Monitor" drop-down menu or from the Monitor toolbar. There is a sub-menu from which you can choose the type of port you want to monitor:

Toolbar	Menu
	RS232 Configuration Port Diagnostics
	RS485 OI Port Diagnostics
	Network Port Diagnostics
	Expansion I/O Comm Diagnostics **(CPU C50 only)**
	Host Connections Diagnostics
	Peer-to-Peer Connections Diagnostics

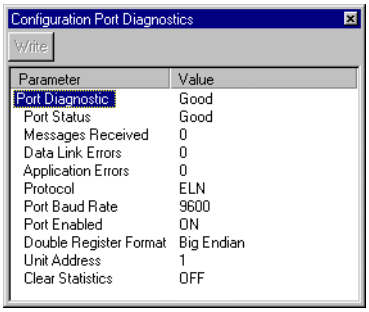
2. The specific monitoring dialog box for that selection will open.

Configuration Port Diagnostics

The Hybrid Control Designer provides live monitoring of the Configuration Port. The instrument executes diagnostic routines during instrument start-up and during on-line operation.

1. Select "Controller Ports Diagnostics" from the "Monitor" drop-down menu then select "Configuration Port" from the list provided or from the Monitor toolbar.
   
2. The “Configuration Port Diagnostic Summary” dialog box will appear. It shows Port Status, Diagnostics, Statistics and parameters for the RS232 Configuration Port.
3. (This window can be launched from the "Utilities Worksheet"
4. The summary will provide status of the parameters shown in the list.
5. Click on "X" to exit box.

Refer to the "Configuration Port Diagnostics Status Indicators" for status indications, possible cause, and actions to correct the problem.



Configuration Port Diagnostics Status Indicators

The "Configuration Port Diagnostic Summary" dialog box will provide status of the parameters shown in the list.

Parameter	Status	Possible Cause	Controller Action	User Action
Configuration	GOOD	N/A	N/A	N/A

Parameter	Status	Possible Cause	Controller Action	User Action
Port Diagnostics	DATA LINK FAILURE	A large number of messages are resulting in data link errors.	1. Rack 1 monitor block's COMPORT DIAG is set to FAILED. 2. Rack 1 monitor block's RACK OK pin is turned off. 3. ASYS block's HW OK pin is turned off. 4. If configured as a Modbus master: a) ASYS and FSYS blocks' Modbus Master Fail pins are turned on. b) Slave and read blocks associated with the slaves experiencing the failure have their read pins frozen to the last value read. c) Slave blocks associated with the slaves experiencing the failure have their BAD COMM and NO SCAN pins turned on. d) IN SCAN STATUS is set to NO for all slaves experiencing the failure. e) COMM STATUS is set to BAD for all slaves experiencing the failure. f) The slaves with the data link errors have a non-zero data link error count. g) The slaves experiencing the failure are moved to the background scan rate.	1. Check baud rate 2. Check connectors 3. Check cable polarity 4. Isolate cabling from electrical interference 5. If RS232 to RS485 converter is used, check its power, switch/jumper settings, and polarity. 6. If configured as a Modbus master, use the slave status screens to determine which slaves are experiencing the problem. For those slaves check: • power • connections • address • baud rate • parity • number of stop bits • for electrical interference • grounding • termination resistor (if at end of link) 7. The diagnostic is cleared by clearing the port's statistics.

Parameter	Status	Possible Cause	Controller Action	User Action
	HW FAILURE	The DUART is failing to operate properly.	1. Rack 1 monitor block's COMPORT DIAG is set to FAILED. 2. Rack 1 monitor block's RACK OK pin is turned off. 3. ASYS and FSYS blocks' HW OK pins are turned off. 4. If configured as a Modbus master: a) ASYS and FSYS blocks' Modbus Master Fail pins are turned on. b) All Modbus slave and Modbus read blocks have their read pins frozen to the last value read. c) All slave blocks have their BAD COMM and NO SCAN pins turned on. d) IN SCAN STATUS is set to NO for all slaves. e) COMM STATUS is set to BAD for all slaves in the function block diagram. f) Statistical data for all slaves is frozen. g) All slaves in the function block diagram are scanned at the background scan rate.	Replace CPU module

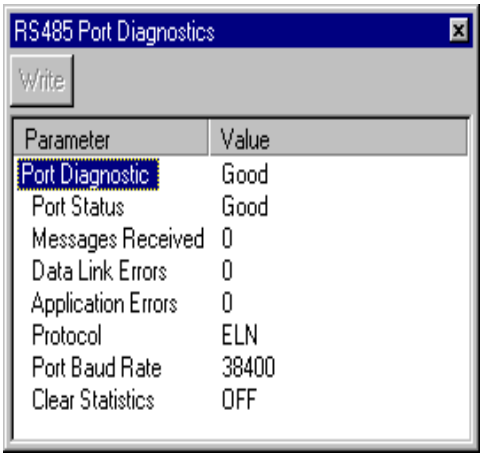
RS485 OI Port Diagnostics

The Hybrid Control Designer provides live monitoring of the RS485 OI Port. The instrument executes diagnostic routines during instrument start-up and during on-line operation.

1. Select "Controller Ports Diagnostics" from the "Monitor" drop-down menu then select "RS485 OI Port" from the list provided or from the Monitor toolbar.

2. The “RS485 O/I Port Diagnostic Summary” dialog box will appear.
   It shows Port Status, Diagnostics, Statistics and parameters for the RS485 OI Port.
   (This window can be launched from the "Utilities Worksheet"
3. The summary will provide status of the parameters shown in the list.
4. Click on "X" to exit box.

Refer to the "RS485 OI Port Status Indicators" for status indications, possible cause, and actions to correct the problem.



RS485 OI Port Status Indicators

The "RS485 OI Port Diagnostic Summary" dialog box will provide status of the parameters shown in the list.

Parameter	Status	Possible Cause	Controller Action	User Action
RS485 O/I Port Diagnostics	GOOD	N/A	N/A	N/A
	APPLICATION ERROR	At least 1 response to a host resulted in an exception code or NAK.	1. Rack 1 monitor block's COMPORT DIAG is set to WARNING. 2. Rack 1 monitor block's RACK OK pin is turned off. 3. ASYS block's HW OK pin is turned off.	At host, determine which message is causing the exception code and fix.
	DATA LINK FAILURE	A large number of messages are resulting in data link errors.	1. Rack 1 monitor block's COMPORT DIAG is set to FAILED. 2. Rack 1 monitor block's RACK OK pin is turned off. 3. ASYS block's HW OK pin is turned off. 4. If configured as a Modbus Master port, associated slave blocks have their read pins frozen to the last value read.	1. Check baud rate 2. Check connectors 3. Check cable polarity 4. Isolate cabling from electrical interference 5. If RS232 to RS485 converter used, check its power, switch/jumper settings, and polarity.
	HW FAILURE	The DUART is failing to operate properly.	Same as above	Replace CPU module

Network Port Diagnostics

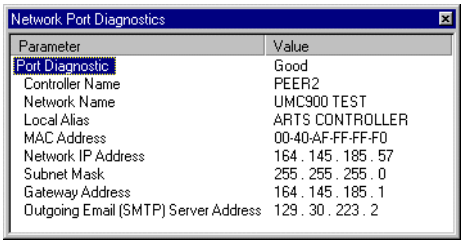
The Hybrid Control Designer provides live monitoring of the Ethernet Network Port. The instrument executes diagnostic routines during instrument start-up and during on-line operation.

1. Select "Controller Ports Diagnostics" from the "Monitor" drop-down menu then select "Network Port" from the list provided or from the Monitor toolbar.

   (This window can be launched from the "Utilities Worksheet"
2. The “Network Port Diagnostic Summary” dialog box will appear. It shows Port Status, Diagnostics, Statistics and parameters for the Ethernet Network Port.
3. The summary will provide status of the parameters shown in the list.
4. Click on "X" to exit box.

Refer to "Network Port Diagnostics Status Indicators" for status indications, possible cause, and actions to correct the problem.



Network Port Diagnostic Status Indicators

The "Network Port Diagnostic Summary" dialog box will provide status of the parameters shown in the list.

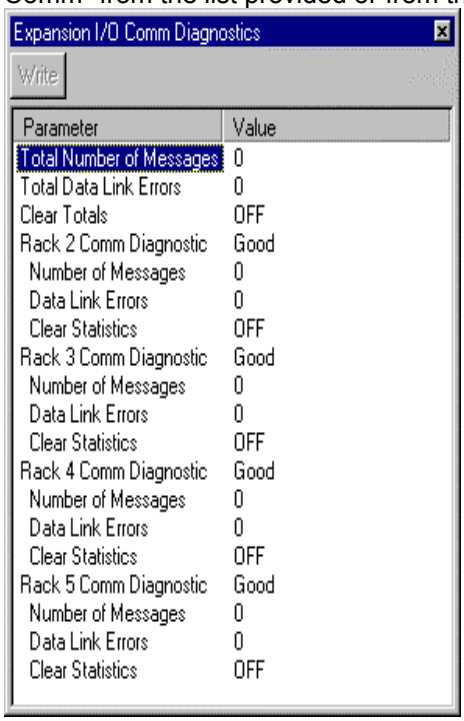
Parameter	Status	Possible Cause	Controller Action	User Action
Network Port Diagnostics	GOOD	N/A	N/A	N/A
	NETWORK SETUP ERROR	Controller/network names determined on network are illegal	Rack 1 monitor block’s COMPORT DIAG is set to FAILED. Rack 1 monitor block’s RACK OK pin is turned off. ASYS block’s HW OK pin is turned off.	Correct the setup problem.
	NO IP ADDRESS	DHCP and IP address are not configured	Same as above	1. If a DHCP server is present, download a configuration that uses DHCP. 2. Enter an IP address

	HARDWARE FAILURE	Ethernet port tests failed during power-up.	Same as above	Replace CPU Module

Expansion I/O Comm Diagnostics

The Hybrid Control Designer provides live monitoring of the Expansion I/O **(C50 CPU only)** Comm subsystem. The instrument executes diagnostic routines during instrument start-up and during on-line operation.

1. Select "Controller Ports Diagnostics" from the "Monitor" drop-down menu then select "Expansion I/O Comm" from the list provided or from the Monitor toolbar.



(This window can be launched from the "Utilities Worksheet"

2. The “Expansion I/O Comm Diagnostic Summary” dialog box will appear. It shows Port Status, Diagnostics, Statistics and parameters for the I/O Expansion I/O Comm subsystem.
3. The summary will provide status of the parameters shown in the list.
4. Click on "X" to exit box.

Refer to "Expansion I/O Comm Diagnostics Status Indicators" for status indications, possible cause, and actions to correct the problem.

Expansion I/O Comm Diagnostics Status Indicators

The "Expansion I/O Comm Diagnostic Summary" dialog box will provide status of the parameters shown in the list. **(C50 CPU only)**

Parameter	Status	Possible Cause	Controller Action	User Action
Rack Comm Diagnostics	GOOD	N/A	N/A	N/A
	Data Link Failure	The communications to a particular rack is resulting in a lot of DLL errors.	1. Related rack monitor block's RACK OK pin is turned off. 2. Depending on the nature of the DLL errors, the associated rack monitor block's module diagnostics, and pins could be affected.	1. Use the OI to determine which rack is experiencing the DLL errors. Verify that the expansion rack should be in the configuration 2. Verify that the jumpers on the scanner are setup for the correct rack address. 3. If a hub is used, check that all cables are properly connected to the hub, proper crossover cables are used, and that hub is powered. 4. Cycle power to the rack. 5. Cycle power to the hub. 6. Replace the HC900-C50 expansion rack's power supply. 7. Replace the HC900-C50 expansion rack. 8. Replace the HC900-C50 expansion rack's scanner board. 9. Replace the main CPU.

	Hardware Failure	The power-up test of the expansion rack Ethernet controller failed.	1. All rack monitor block XIO PORT DIAG are set to HWFAIL. 2. All rack monitor block RACK OK pin are turned off. 3. All modules in the configuration have their diagnostic set to MOD_NOCOMM, their rack monitor module fail pin is turned on., and the rack monitor block's RACK OK pin is turned off. 4. ASYS block's HW OK pin is turned off. 5. The statuses for the AO and AI channels that are affected are set to BAD_CHANNEL.	Replace main-CPU module

Host Connections Diagnostics

The Hybrid Control Designer provides live monitoring of the Host Connections. The instrument executes diagnostic routines during instrument start-up and during on-line operation.

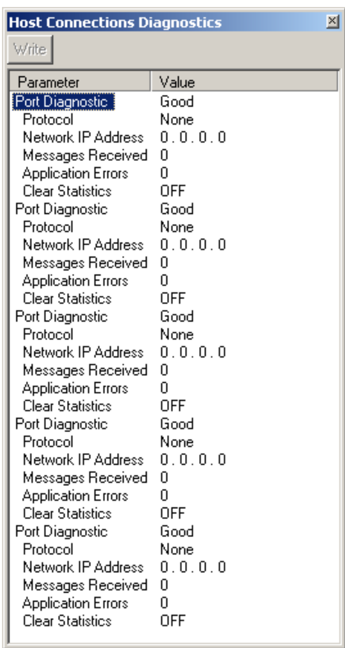
1. Select "Controller Ports Diagnostics" from the "Monitor" drop-down menu then select "Host Connections" from the list provided or from the Monitor toolbar.
   
   (This window can be launched from the "Utilities Worksheet")

2. The “Host Connections Diagnostic Summary” dialog box will appear.

3. The summary will provide status of the parameters shown in the list.

4. Click on "X" to exit box.

Refer to "Host Connections Diagnostics Status Indicators" for status indications, possible cause, and actions to correct the problem.



Host Connections Diagnostics Status Indicators

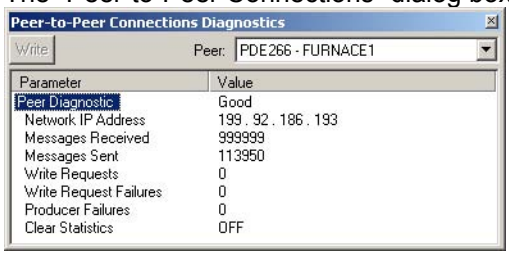
The "Network Host Connections Diagnostic Summary" dialog box will provide status of the parameters shown in the list.

Parameter	Status	Possible Cause	Controller Action	User Action
Network Host Connections Diagnostics	GOOD	N/A	N/A	N/A
	APPLICATION ERROR	At least 1 response to a host resulted in an exception code	1. Rack 1 monitor block's COMPORT DIAG is set to WARNING. 2. Rack 1 monitor block's RACK OK pin is turned off. 3. ASYS block's HW OK pin is turned off.	At host, determine which message is causing the exception code and fix.

Peer-to-Peer Connections Diagnostics

The Hybrid Control Designer provides live monitoring of the Peer-to-Peer Connections. The instrument executes diagnostic routines during instrument start-up and during on-line operation.

1. Select "Controller Ports Diagnostics" from the "Monitor" drop-down menu then select "Peer-to-Peer Connections" from the list provided.
2. (This window can be launched from the "Utilities Worksheet") Select "Controller Diagnostics" icon then select "Controller Ports Diagnostics" then "Peer-to-Peer" Connections.
3. The "Peer-to-Peer Connections" dialog box will appear.



4. The summary will provide status of the parameters shown in the list.
5. Click on "X" to exit box.

Refer to "Peer -to-Peer Connections Diagnostics Status Indicators" for status indications, possible cause, and actions to correct the problem.

Peer-to-Peer Connections Diagnostics Status Indicators

The "Peer-to-Peer connections" dialog box will provide status of the parameters shown in the list.

Parameter	Status	Possible Cause	Controller Action	User Action
Peer-to-Peer Connections Diagnostics	GOOD	N/A	N/A	N/A
	NETWORK SETUP ERROR	Controller/network names determined on network are illegal	Rack 1 monitor block's COMPORT DIAG is set to FAILED. Rack 1 monitor block's RACK OK pin is turned off. SYSTEM MONITOR block's HW OK pin is turned off.	Correct the setup problem.
	NO IP ADDRESS	IP address is not configured	SEE NETWORK SETUP ERROR	Enter an IP address.
	HARDWARE FAILURE	Ethernet port tests failed during power-up.		Replace CPU module

Reports

Print Report

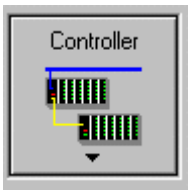
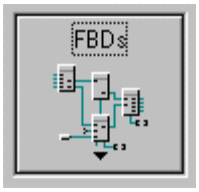
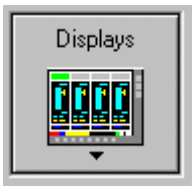
Select "**Print Report**" from the File menu.

Print Report lets you print a report for various functions.

Click on the Icon on the toolbar and select a report from the drop-down menu that appears.

The "Print" dialog box will open to let you print a specific report.

You can also print a report from "Print Report Preview" from the File menu.

Toolbar Icon	Reports Available
	**E-Mail** - Shows how E-mail notification is configured. **I/O Configuration** - Shows configuration of all I/O on all racks.
	**All FBD Worksheets** - *Prints all active FBD worksheets) - not available in "Print Preview" mode.* **FBD Worksheet -** Select worksheet from drop-down list)- Shows the selected worksheet of the function block diagram. **Block Parameters -** Shows a detailed report of each function block's parameters. **Modbus Register Map** **Detailed Function Block Report** - Shows the starting address of each function block, as well as the addresses of all its parameters. Click here for details . **Summary Function Block Report** - Shows the starting address of each function block. Click here for details **User Defined Signals and Variables** - Shows the user-defined Modbus addresses of signals and variables. **Tag Information** - Shows a detailed report of signal tags and/or variables. Choose from Signal Tags, Variables, or Signal Tags and Variables. See sample of this report. **Where Used** - Shows location (worksheet and page) of every item in the function block diagram. **File statistics** - Shows useful file statistics. Schema # is a database revision code used by the controller, OI and the software to ensure compatibility.
	**General Settings** – Shows Operator Interface settings (security, startup display, filenames). **Help Screens** - Shows Operator Interface help screens. **Assigned Display Keys** - Shows Operator Interface displays and contents for each display button. **Data Storage Settings** - Shows data storage settings (trend group data points, batch enable, etc.)

Toolbar Icon	Reports Available
	**Recipes (Variables)** – Shows contents of the selected recipe (variables, descriptions). **Setpoint Profiles** - Shows contents of the selected Setpoint Profile. **Setpoint Schedules** - Shows contents of the selected Setpoint Schedule. **Sequences** - Shows contents of the selected Sequence.
	**All Alarm Groups** - Shows contents of each Operator Interface alarm group display. **All Events** – Shows all configured events and their triggers.

Sample report

Here is a sample report. All reports have a similar layout. You can also do a print report preview to see what a report looks like. Modbus addresses shown are the default addresses unless identified as user-defined addresses.

File Name: HC900-C50 Rev 2.0x : Config1 from FIVERACK on PEERNET *
Controller: FIVERACK **Title:** **Author:**

Signal Tag and Variable Information Report

Hex Addr	Dec Addr	Tag Name	Description	Type	#	Data Type	EU	Decimal Places	Tag Type	'On' Label	'Off' Label	Initial/Source
0x18C0	6337	VAR001		Variable	1	float 32		0	Analog			1.00
0x18C2	6339	VAR002		Variable	2	float 32		0	Analog			0.00
0x18C4	6341	VAR003		Variable	3	float 32		0	Analog			0.00
0x18C6	6343	VAR004		Variable	4	float 32		0	Analog			0.00
0x18C8	6345	VAR005		Variable	5	float 32		0	Analog			0.00
0x2000	8193	R1S1		Signal Tag	1	float 32			Digital	ON	OFF	Block 103 Output 1
0x2002	8195	R1S2		Signal Tag	2	float 32			Digital	ON	OFF	Block 106 Output 1
0x2004	8197	R1S3		Signal Tag	3	float 32			Digital	ON	OFF	Block 109 Output 1
0x2006	8199	R1S4		Signal Tag	4	float 32			Digital	ON	OFF	Block 112 Output 1
0x2008	8201	R1S5		Signal Tag	5	float 32			Digital	ON	OFF	Block 115 Output 1
0x200A	8203	R1S6		Signal Tag	6	float 32			Digital	ON	OFF	Block 118 Output 1
0x200C	8205	R1S7		Signal Tag	7	float 32			Digital	ON	OFF	Block 121 Output 1
0x200E	8207	R1S8		Signal Tag	8	float 32			Digital	ON	OFF	Block 124 Output 1
0x2010	8209	R1S9		Signal Tag	9	float 32			Digital	ON	OFF	Block 127 Output 1
0x2012	8211	R1S10		Signal Tag	10	float 32			Digital	ON	OFF	Block 130 Output 1
0x2014	8213	R1S11		Signal Tag	11	float 32			Digital	ON	OFF	Block 133 Output 1
0x2016	8215	R1S12		Signal Tag	12	float 32			Digital	ON	OFF	Block 136 Output 1
0x2018	8217	R2S1		Signal Tag	13	float 32			Digital	ON	OFF	Block 139 Output 1
0x201A	8219	R2S2		Signal Tag	14	float 32			Digital	ON	OFF	Block 142 Output 1
0x201C	8221	R2S3		Signal Tag	15	float 32			Digital	ON	OFF	Block 145 Output 1
0x201E	8223	R2S4		Signal Tag	16	float 32			Digital	ON	OFF	Block 148 Output 1
0x2020	8225	R2S5		Signal Tag	17	float 32			Digital	ON	OFF	Block 151 Output 1
0x2022	8227	R2S6		Signal Tag	18	float 32			Digital	ON	OFF	Block 154 Output 1
0x2024	8229	R2S7		Signal Tag	19	float 32			Digital	ON	OFF	Block 157 Output 1
0x2026	8231	R2S8		Signal Tag	20	float 32			Digital	ON	OFF	Block 160 Output 1
0x2028	8233	R2S9		Signal Tag	21	float 32			Digital	ON	OFF	Block 163 Output 1
0x202A	8235	R2S10		Signal Tag	22	float 32			Digital	ON	OFF	Block 166 Output 1
0x202C	8237	R2S11		Signal Tag	23	float 32			Digital	ON	OFF	Block 169 Output 1
0x202E	8239	R2S12		Signal Tag	24	float 32			Digital	ON	OFF	Block 172 Output 1
0x2030	8241	R3S1		Signal Tag	25	float 32			Digital	ON	OFF	Block 241 Output 1
0x2032	8243	R3S2		Signal Tag	26	float 32			Digital	ON	OFF	Block 242 Output 1
0x2034	8245	R3S3		Signal Tag	27	float 32			Digital	ON	OFF	Block 243 Output 1
0x2036	8247	R3S5		Signal Tag	28	float 32			Digital	ON	OFF	Block 245 Output 1
0x2038	8249	R3S6		Signal Tag	29	float 32			Digital	ON	OFF	Block 246 Output 1
0x203A	8251	R4S1		Signal Tag	30	float 32			Digital	ON	OFF	Block 253 Output 1
0x203C	8253	R3S7		Signal Tag	31	float 32			Digital	ON	OFF	Block 179 Output 17
0x203E	8255	R3S8		Signal Tag	32	float 32			Digital	ON	OFF	Block 180 Output 17
0x2040	8257	R3S9		Signal Tag	33	float 32			Digital	ON	OFF	Block 181 Output 17
0x2042	8259	R3S10		Signal Tag	34	float 32			Digital	ON	OFF	Block 182 Output 17
0x2044	8261	R3S11		Signal Tag	35	float 32			Digital	ON	OFF	Block 183 Output 17
0x2046	8263	R3S12		Signal Tag	36	float 32			Digital	ON	OFF	Block 184 Output 17
0x2048	8265	SP		Signal Tag	37	float 32		3	Analog			Block 102 Output 43
0x204A	8267	AUX		Signal Tag	38	float 32		0	Analog			Block 102 Output 44
0x204C	8269	STMR		Signal Tag	39	float 32		0	Analog			Block 102 Output 45
0x204E	8271	STME		Signal Tag	40	float 32		0	Analog			Block 102 Output 46

Created Date: 9/3/2002 1:11:46 PM **Modified Date:** 7/17/2003 12:27:13 PM **Page: 1 of 2**

Print Report Preview

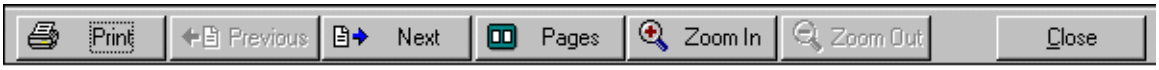
Lets you preview an on-screen version of any printable report.

See Print Report for available reports and their content.

Note: All FBD Worksheets not available in Print Preview mode.

Navigation

A toolbar at the top of the report screen lets you navigate through the reports:



The functions from left to right are:

Print - prints the active report without going to "Print Report" in the file menu.
Previous Page - selects the previous page on the report for display
Next Page - selects the next page on the report for display
Two Pages - shows two report pages at once
Zoom Out - Makes the report larger on the screen
Zoom In - makes the report smaller on the screen
Close - closes the Print Report Preview

Export Report

Select "Export Report" from the File menu.

Export Report lets you export some reports as files in comma delimited (.csv) or tab delimited (.txt) format. The files contain the same data as shown in the printed report, just formatted differently. Exported reports can then be imported by other applications such as third party operator interface configurations.

Not all printable reports can be exported; choices are limited.

Click on the Icon on the toolbar and select a report from the drop-down menu that appears. Name the report and save it as .csv or .txt.

To change the default export file type, see Export Delimiter.

Modbus Register Addresses

Edit Modbus Register Map

Overview

Available in revision 2.0 and later.

The Modbus register map lets you :

- Assign signals and variables to additional Modbus addresses. These additional addresses can be referenced to build displays, for example. Second, it lets you group items in consecutive addresses--such as for a display—which can reduce scan time. Third, signals and variables can be assigned your choice of data type, ensuring compatibility with operator panels and display building software.
- Re-assign any principal function block to a different Modbus address. In pre-2.0 versions of HC Designer, deleting a function block can cause problems with addresses of remaining function blocks, especially when those addresses are accessed by another device. Version 2.0 or later ensures function block address stability plus it lets you choose the address for each function block.

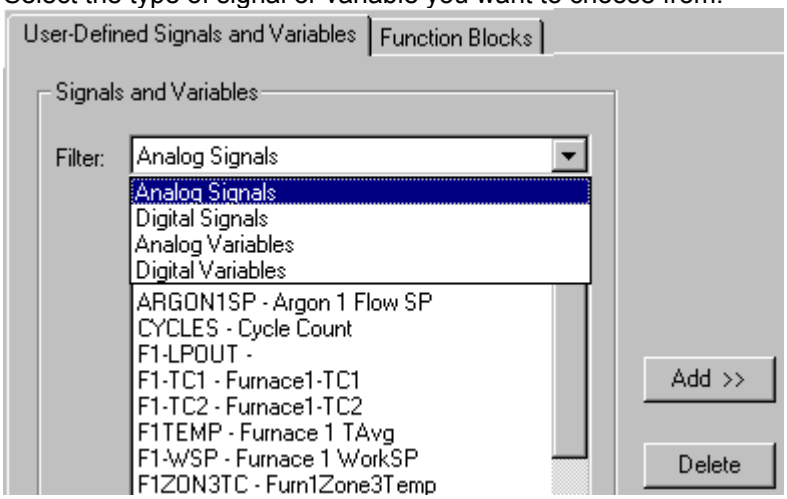
Access

To access the Modbus register map to add or edit an address, select the main menu Edit item or right-click on a configured signal, variable, or function block.

User Defined Signals and Variables Tab

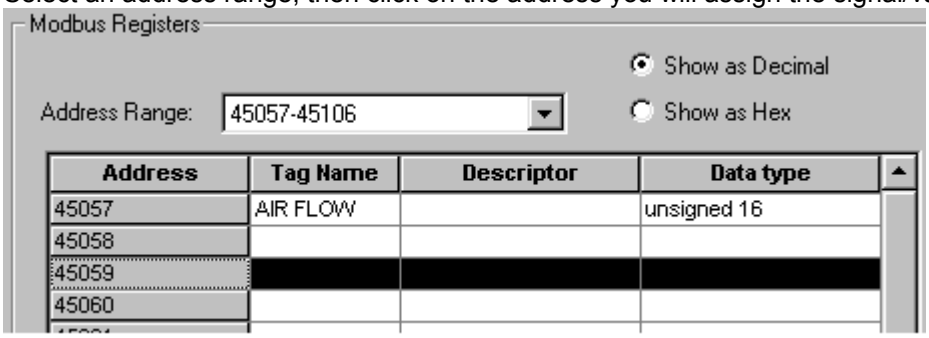
Procedure for editing signal or variable addresses.

Select the type of signal or variable you want to choose from.



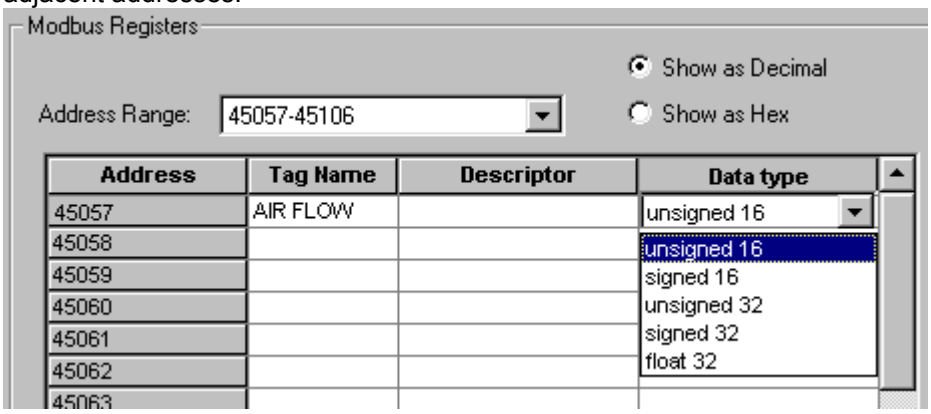
Highlight the desired signal/variable.

Select an address range, then click on the address you will assign the signal/variable to.



Click Add to insert the signal/variable.

Click on the Data Type area of the signal/variable and select a data type. 32-bit data types require 2 adjacent addresses.



You can assign a signal/variable to multiple addresses. Just repeat the preceding steps.

To clear a single address, select it and click Delete. To clear all signal/variable addresses, select Clear All Registers. This does not clear the item's default address, it only clears the addresses assigned here.

To view all addresses of an item, display its Properties.
Signal Tag Properties
Variable Properties

Function Blocks Tab

Procedure for editing function block addresses.

Use Filter to list all configured function blocks of a certain type. Types whose Modbus address can be changed are:

Loops (PID, On-Off, Carbon Potential, 3 Position Step, Auto-Manual Bias)

Alternator

Hand/Off/Auto Switch

Sequencer

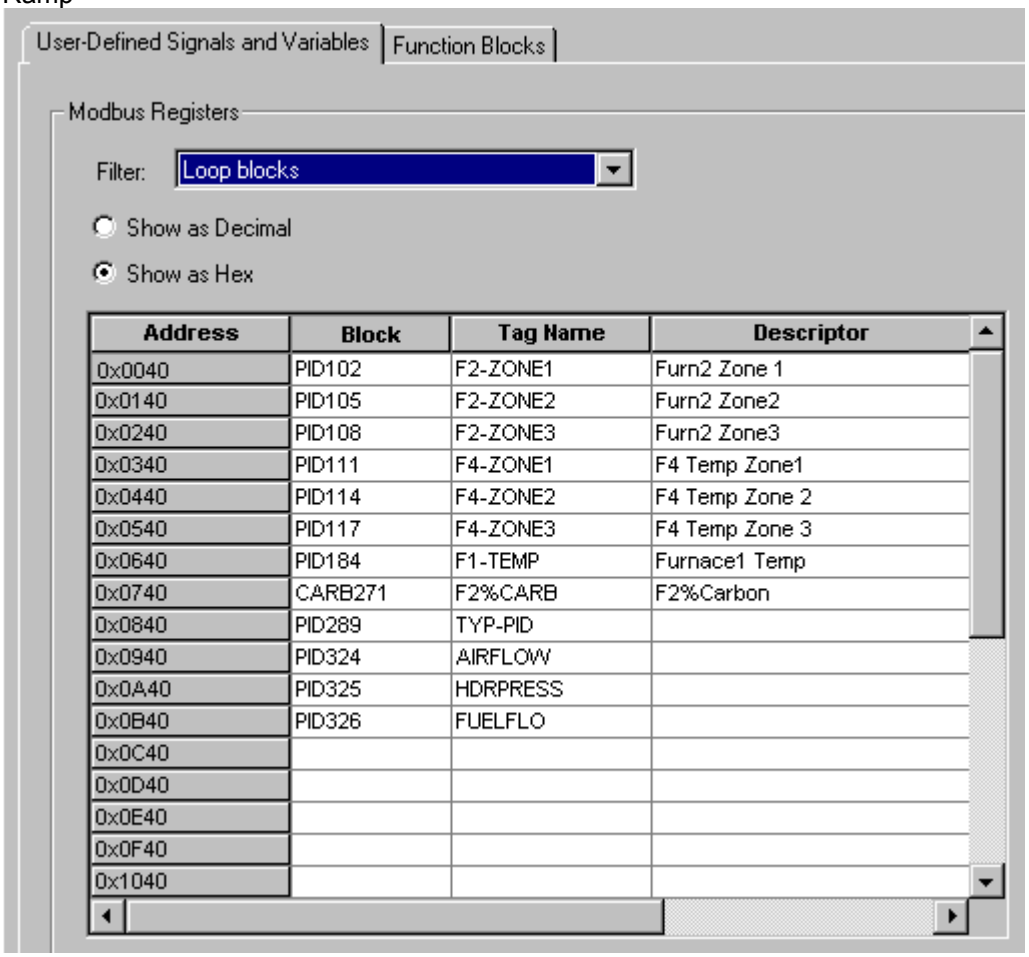
Setpoint Programmer

Setpoint Scheduler

Stage

Device Control

Ramp



Address	Block	Tag Name	Descriptor
0x0040	PID102	F2-ZONE1	Furn2 Zone 1
0x0140	PID105	F2-ZONE2	Furn2 Zone2
0x0240	PID108	F2-ZONE3	Furn2 Zone3
0x0340	PID111	F4-ZONE1	F4 Temp Zone1
0x0440	PID114	F4-ZONE2	F4 Temp Zone 2
0x0540	PID117	F4-ZONE3	F4 Temp Zone 3
0x0640	PID184	F1-TEMP	Furnace1 Temp
0x0740	CARB271	F2%CARB	F2%Carbon
0x0840	PID289	TYP-PID	
0x0940	PID324	AIRFLOW	
0x0A40	PID325	HDRPRESS	
0x0B40	PID326	FUELFLO	
0x0C40			
0x0D40			
0x0E40			
0x0F40			
0x1040			

Addresses containing that type of function block are shown in numerical order.

To move a function block to another address, click on its address to select it, release, then click and drag it to the top of the new address, then drop it. A colored line appears while you're dragging the function block.

If you drop it in an address that's occupied by another function block, the two function blocks will swap addresses.

Unlike signals and variables, only one Modbus address is allowed per function block.

To view the address of any function block, display its Properties by right-clicking on the function block in the configuration diagram under the Controller tab.

Appendix A – Logic Application Examples

Overview

Introduction

Logic programming may be used to implement more robust and higher speed logic functions in the controller. The fast logic program executes all inputs, outputs and function blocks every 27 milliseconds. The fast Boolean logic instruction set includes 2, 4 and 8 input logic blocks with selectable input inversion plus timers, triggers, latches, and other supporting functions. A Sequencer function is also included with functionality beyond typical drum sequencers.

- The controller offers up to 256 digital inputs or outputs and uses digital function blocks to perform logic operations and sequences.
- Extensive PLC ladder logic used for analog functions, PID, setpoint programmer, alarms, interface with operator interface, pushbuttons, lamps is replaced by HC900 function blocks and displays. *(Extensive conditional alarming may expand logic requirements)*
- All logic blocks are executed in order according to sequence.
- All fast logic, logic blocks are executed and outputs updated in 27ms - used to capture faster transitions such as a pushbutton depression on a panel.
- All normal logic blocks are executed at analog update rate.
- You can mix fast and analog scan time logic blocks.
- If you wish Discrete Input function blocks to be scanned prior to execution of succeeding blocks, re-number their sequence order ahead of these blocks.
- You can place any number of connections to the output of a block, or if using signal tags for this purpose, they may be used anywhere.
- Internal signal tags used to transfer statuses to other logic circuits *do not* consume blocks.

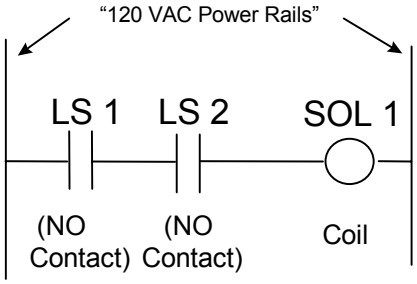
What's in this section?

The following Examples are covered in this section.

Basic PLC Ladder Logic

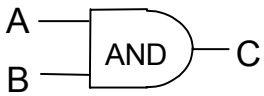
Example 1 - Basic PLC ladder logic

This is a basic series circuit. If Limit Switch 1(LS1) is ON and Limit Switch 2 (LS2) is ON, Solenoid 1 is turned ON. Note LS1 and LS2 are shown in their normal state, wired as Normally Open. When LS1 and LS2 are ON that is their "logic true" state, allowing "power flow" through to the solenoid.



Equivalent Boolean Logic Expression

A = LS1
B = LS2
C = Output



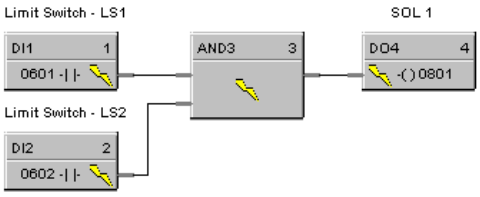
AND Symbol

A * B = C

HC900 Logic

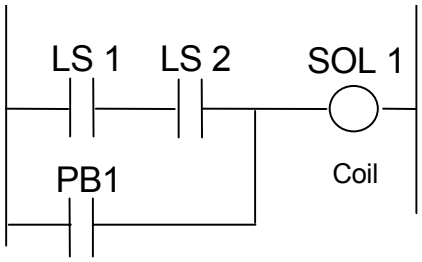
This uses a basic 2 Input AND block connected to a single output.

4 Function blocks are used.



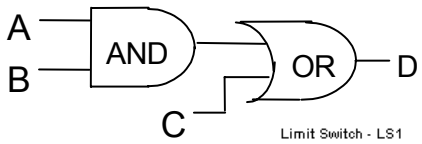
Example 2 - Basic PLC ladder logic

This is a basic series-parallel circuit. If Limit Switch 1 (LS1) is ON and Limit Switch 2 (LS2) is ON, or if pushbutton PB1 is ON, then Solenoid 1 is turned ON, otherwise it is OFF. Note "power flow" can be delivered in either of two paths to the solenoid.



Equivalent Boolean Logic Expression

A = LS1, B = LS2
C = PB1, D = Output



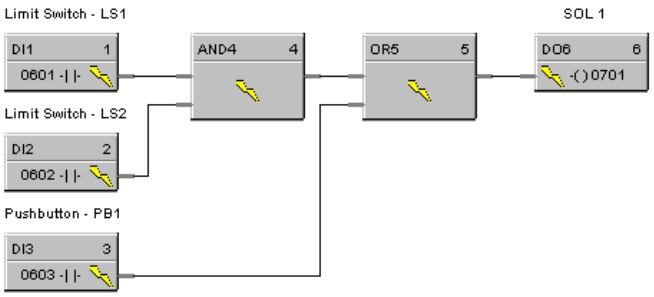
AND Symbol *OR* Symbol

(A * B) + C = D

HC900 Logic

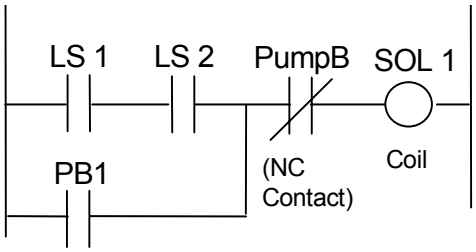
This uses a basic 2 Input AND block and a 2 Input OR block.

6 Function blocks are used.



Example 3 - Basic PLC ladder logic

Example 2 is expanded by adding a Normally Closed (NC) Contact in series with the series-parallel circuit. In PLC logic, if Pump B is OFF (the logic true state for an NC contact), then "power flow" will be allowed through to SOL 1. This is equivalent to a Boolean NOT.

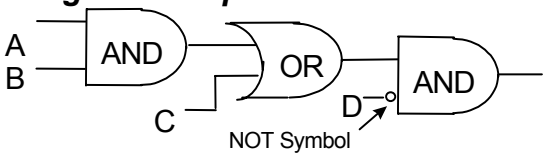


Equivalent Boolean Logic and Expression

A = LS1, B = LS2

C = PB1, D = Pump B

E = Output



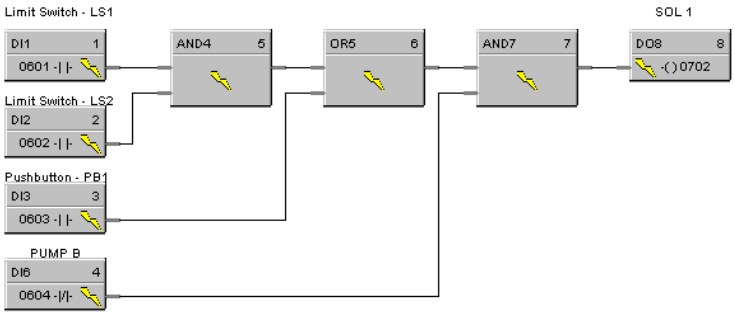
Boolean NOT Symbol

$((A * B) + C)*\overline{D} = E$

HC900 Logic

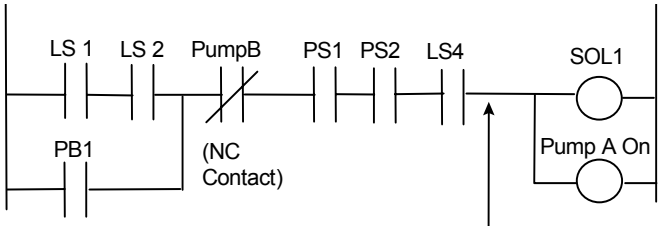
Another discrete input is added plus a 2-In AND block. Note that the DI6 block (PUMP B) is inverted (DI dialog box selection) without adding an Inverter block.

8 Function blocks are used.



Example 4 - Basic PLC ladder logic

This expands the Example 3 to include more permissive limit switch and pressure switch contacts. In addition, a second output is activated to turn on a panel lamp.



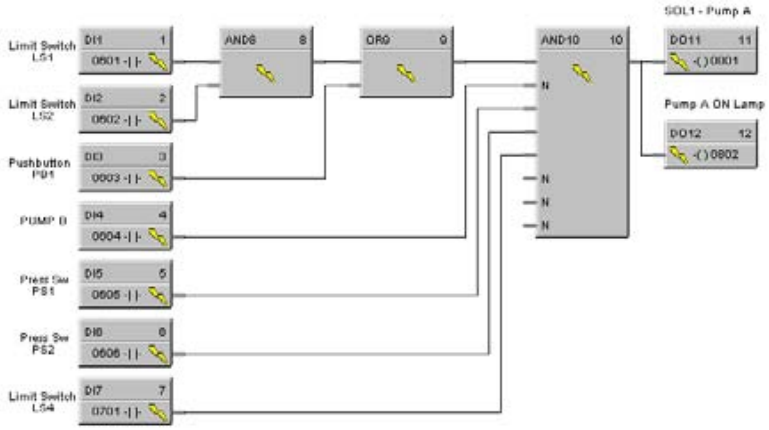
Equivalent Boolean Logic Expression

Boolean NOT symbol (negative logic)

$\overline{((A * B) + C)}*D*E*F*G = Output$ → to this point

HC900 Logic

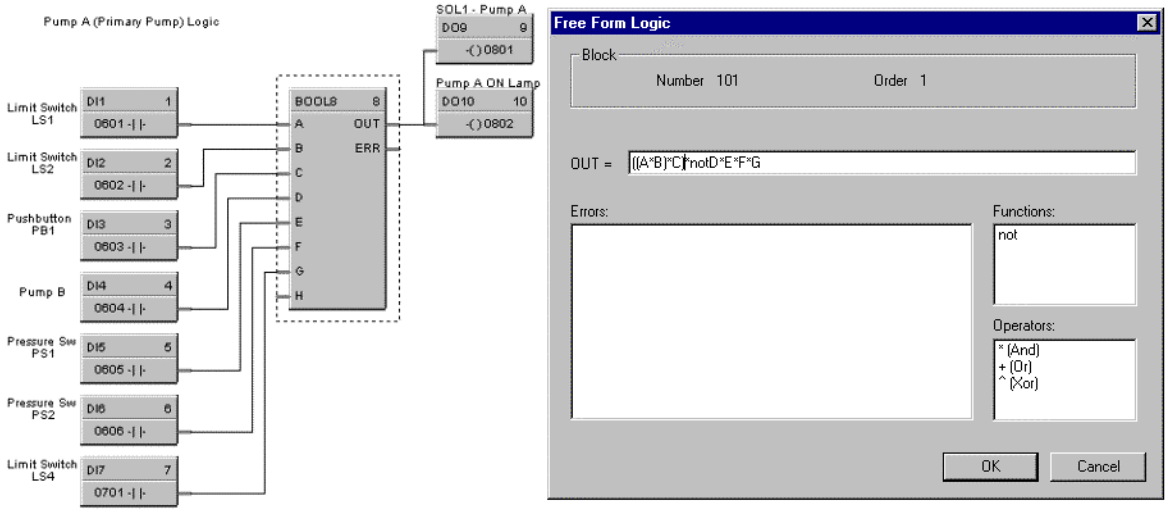
This uses a basic 2 Input AND block, a 2 Input OR block, and an 8 Input AND block. UMC logic blocks allow any input to be **N**egated, removing the need for Inverter blocks. This is done for the Pump B input. Note that **N**egated inputs (Logic NOT) are specified for pins 6, 7 and 8 for unused inputs (which are normally set to 0) to make them "logic 1" so only the used pin inputs 1 thru 5 affect the AND function). Also, multiple DO outputs may be connected to any logic block as shown. 12 Function blocks are used.



Example 5 - Basic PLC ladder logic

Free Form Logic - Boolean Expressions

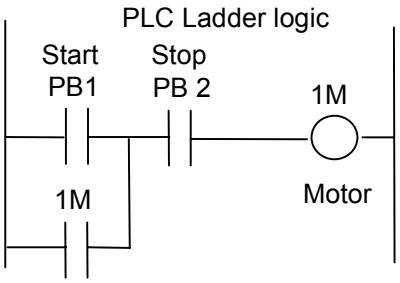
Rather than using individual logic function blocks, a boolean expression may be entered directly using the Free Form Logic block which accepts up to 8 inputs. This can save function blocks. The inputs may come from other blocks with discrete outputs, DI's, or digital signal tags. The example below is a direct entry of the Example 4 boolean expression, with the output connected to two DO's. The Free Form Logic popup dialog box is also shown indicating format for expression entry. Note that Input H is unused. You may use multiple levels of parenthesis to generate the boolean expression. There is no limit to the number of these blocks. This implementation uses 10 function blocks, saving 2 blocks vs. Example 4.



Basic Start/Stop Circuit Example

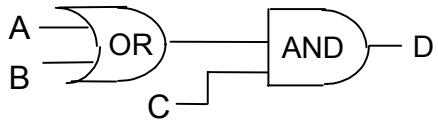
Basic Start/Stop Circuit

The basic PLC start/stop circuit may be used to start a process, turn on motors, etc. With PB2 normally *wired* as a normally closed STOP pushbutton (but shown as a normally open contact in PLC ladder logic), an activation of the PB1 pushbutton turns on 1M (Motor 1). The motor starter switch 1M contact is detected ON in the next scan cycle, latching the startup circuit. Depression of PB2 opens circuit, causing Stop.



Equivalent Boolean Logic and Expression

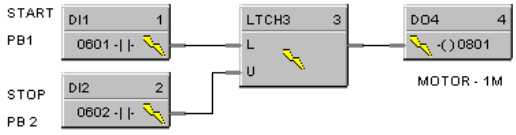
A = PB1, B = 1M
C = PB2, D = Output

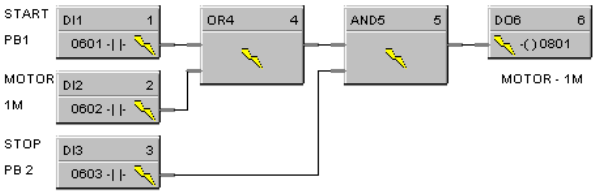


(A + B) * C = D

HC900 Logic

The solution could use a latch block (4 blocks total) with no motor switch contact feedback *or* logic blocks as shown incorporating motor switch contact (6 blocks total).

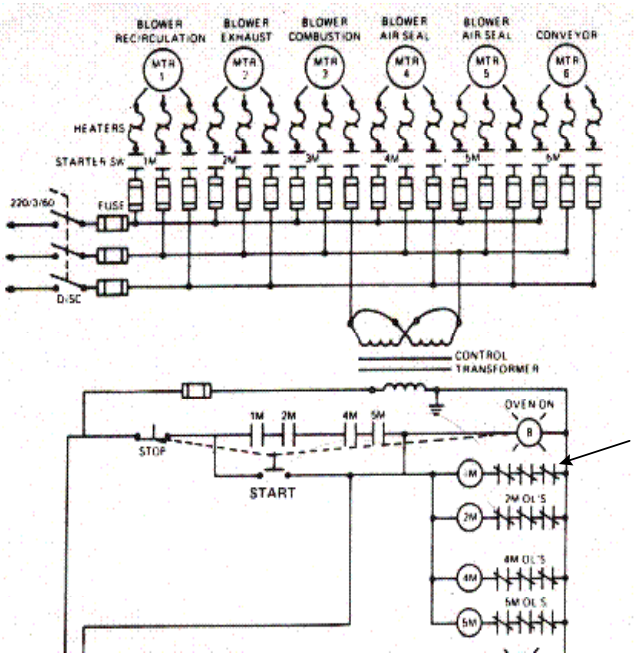




Motor Starters with Permissives Example

Motor Starters with Permissives - Relay Logic Conversion

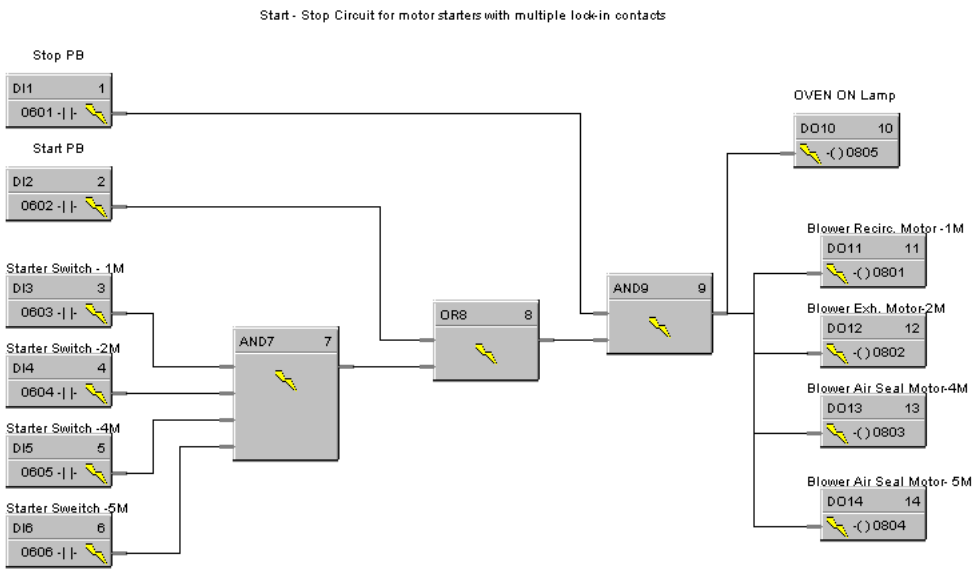
This relay logic is part of a furnace startup involving a series of motor starters. Each starter switch 1M thru 5M must be confirmed closed for continued operation and latch-in after the Start switch is pressed. The Stop switch is again shown normally closed. Internal motor overload contacts are in series with the starter switches, any one of which will cause shutdown or prevent startup.



Motor Starters with Permissives - HC900 Logic

This is the conversion from the relay ladder logic (the internal motor overload contacts are assumed to be wired in series at the motor, then to the starter switches). The multiple AND for the motor starter switch permissives, (IM, 2M, 4M, 5M) converted first, with that output ORed with the Start pusbutton switch, which is ANDed with the Stop pushbutton. The Stop pushbutton is wired as normally closed (push to opencircuit), therefore, is not negated. All outputs to the motors can be connected in common to the AND9 output.

14 function blocks

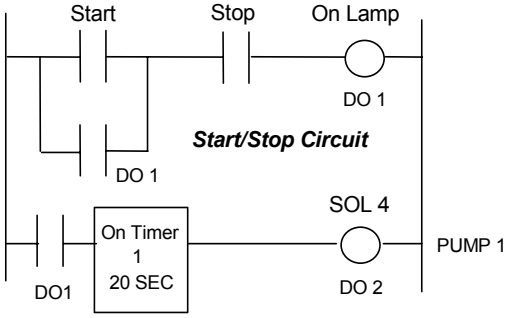


On and Off Delay Timers

Example 1 - Basic start/stop circuit with On delay timer

PLC Ladder Logic

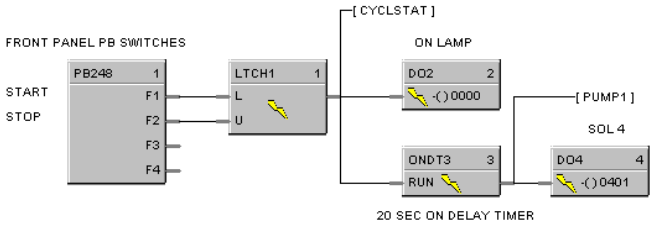
An ON Delay timer is added to a basic Start/Stop circuit which activates the ON Lamp. In ladder logic, the DO1 contact status is used to activate the timer and latch in the start pushbutton action. After 20 sec., SOL4 (DO2) is turned ON which is held as long as DO1 is ON.



HC900 Logic

The Start/Stop latch circuit is used since no external confirmation is needed. In this example, the Operator Panel pushbutton switches (F1 and F2) are used to substitute for panel switches. The Push Button function block is used to assign Start to F1 and Stop to F2. The latch output turns on the ON Lamp and starts the timer. After 20 sec., Solenoid 4 is activated. Note: the ON and OFF Delay timers are reset after timeout or if the logic state to the input goes to logic 0 (or low).

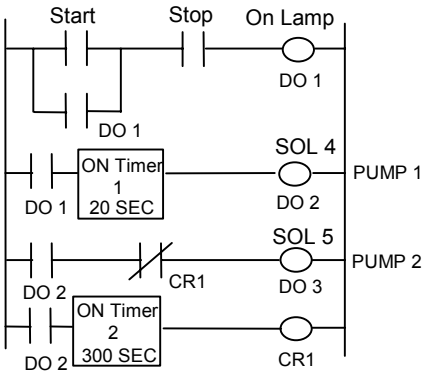
5 Function Blocks



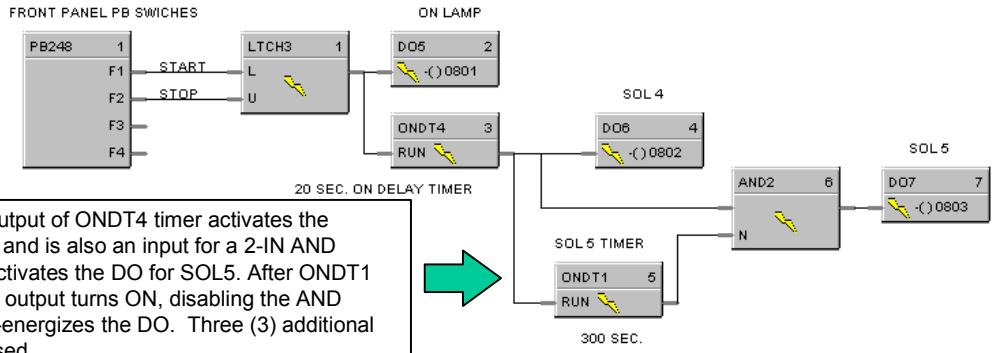
Example 2 - Using On delay timers for time duration

PLC Ladder Logic

The application requirement is to turn on a pump, a compressor, etc. for a fixed period of time - a common use for timers. This application, the turn on of Pump2 for 300 sec., requires two additional rungs of ladder logic. After SOL4 is turned ON, SOL 5 (Pump 2) is also turned ON since CR1 (NC) is OFF (logic true). When ON Delay Timer 2 times out after 300 sec., the CR1 coil is turned ON which turns off SOL 5.



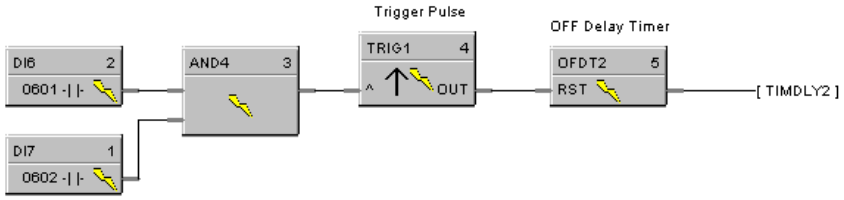
HC900 Logic

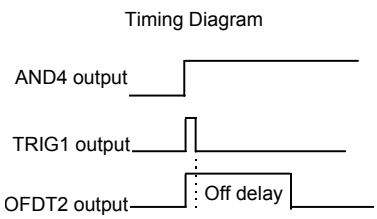


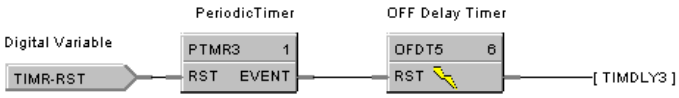
In HC900 logic, the output of ONDT4 timer activates the ONDT1 timer directly and is also an input for a 2-IN AND gate, whose output activates the DO for SOL5. After ONDT1 times for 300 sec., its output turns ON, disabling the AND gate output which de-energizes the DO. Three (3) additional function blocks are used.

Example 3 - Using Off delay timers for time duration

An OFF delay timer block output is ON as long as the RST input is logic HI (ON). It can be used for time duration but must be triggered by an ON to OFF transition on the Reset input. This can be accomplished using Trigger blocks to create one-shot pulses which last one scan cycle. The fast logic trigger pulse will last 100 ms. while the normal logic trigger pulse will last the complete scan cycle for analog blocks. Use according to application need. A Periodic timer output pulse may also be used to start the timer for the OFF delay.







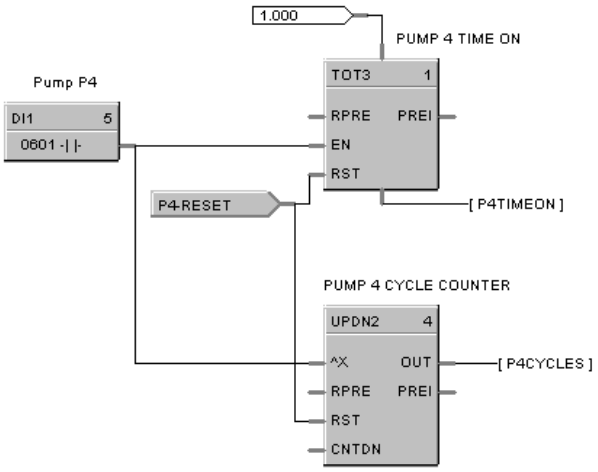
Retentive Timers/Counters Example

In HC900 ON Delay timers are not retentive - if the input is logic 0, the timer is reset. A retentive timer has an Enable and a Reset input. As long as the timer is not reset, time will be accumulated when the Enable Input is logic 1 (ON). This permits recording the time a device such as a pump has been on.

This example uses a Totalizer function block as a retentive timer. If a fixed input of 1 is provided to the block using a Numeric Constant, the totalizer will time up to 1 at the input rate selected (per sec, per min., per hr, or per day). For example, if the “per hr” rate were selected, the output would be 1.0 after 1 hour, 2.0 after 2 hours, etc, up to the Preset value.

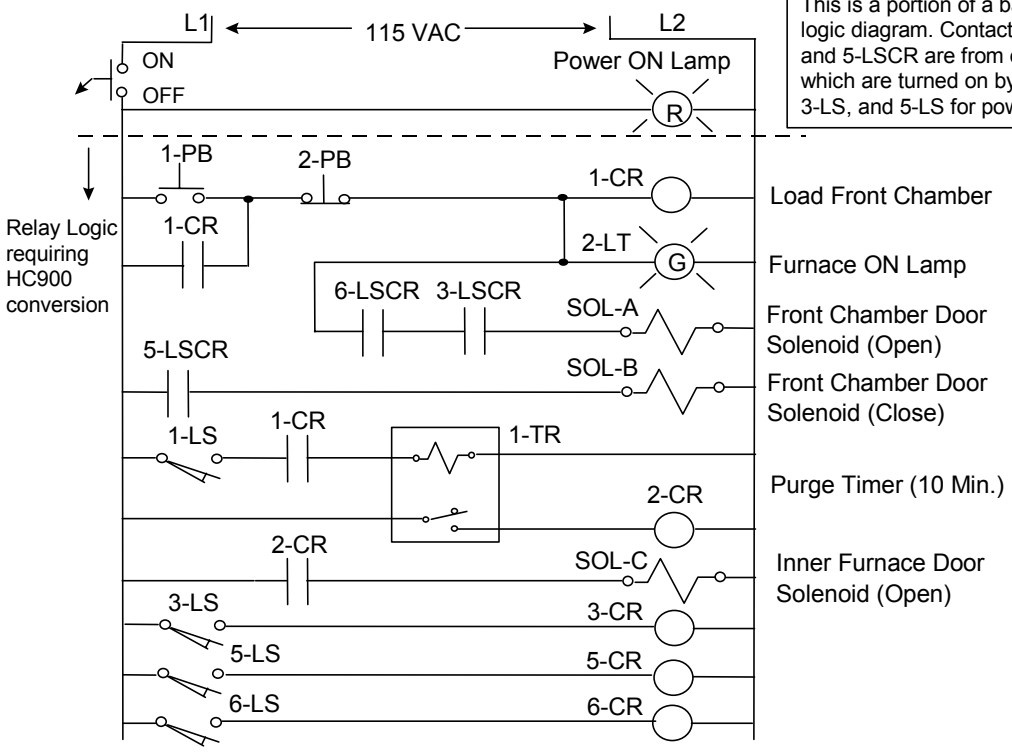
A counter is shown to count the number of pump cycles (On to OFF transitions).

The P4-RESET Digital Variable is used to reset the timer and counter



Furnace Relay Ladder Logic Conversion Example

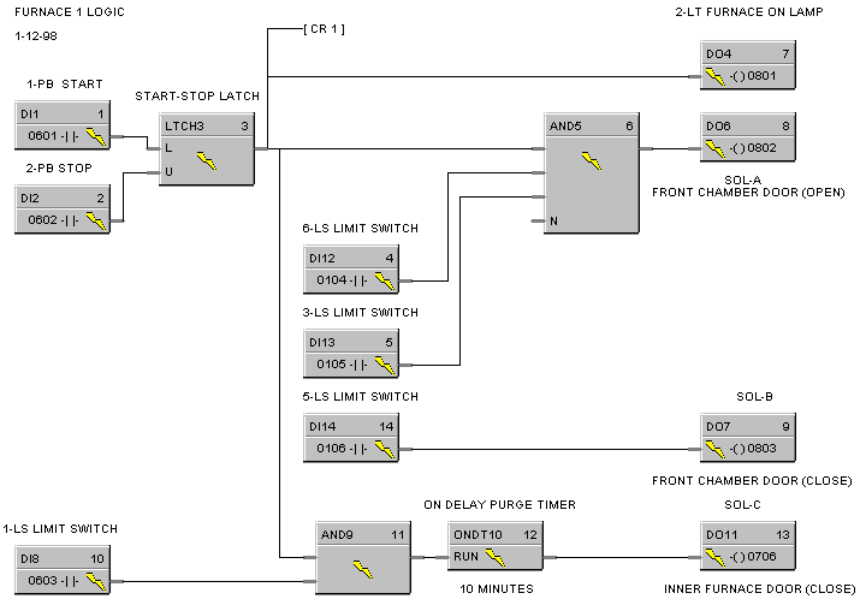
Furnace Relay Ladder Logic Diagram - Part A



This is a portion of a batch furnace relay logic diagram. Contacts 6-LSCR, 3-LSCR, and 5-LSCR are from external control relays which are turned on by limit switches 6-LS, 3-LS, and 5-LS for powering the solenoids.

A Latch block is used for the Start/Stop circuit replacing the external control relay for latch-in. This latch output connects directly to the 2-LT lamp output block plus the 4-In AND block which has two permissive limit switch inputs (6-LS and 3-LS) rather than the control relay contacts which are no longer required. The output of the AND block allows the SOL-A solenoid to be driven ON directly via the UMC 800 discrete output card, provided power requirements are met. The Latch output is also ANDed with the 1-LS limit switch input to activate an ON delay timer whose output directly drives the SOL-C solenoid. SOL-B is driven directly based on the 5-LS limit switch status.

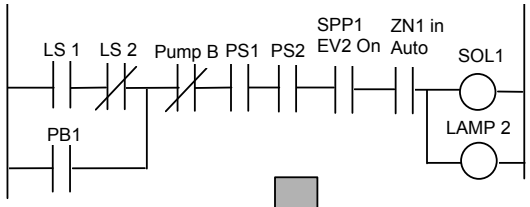
14 Function Blocks

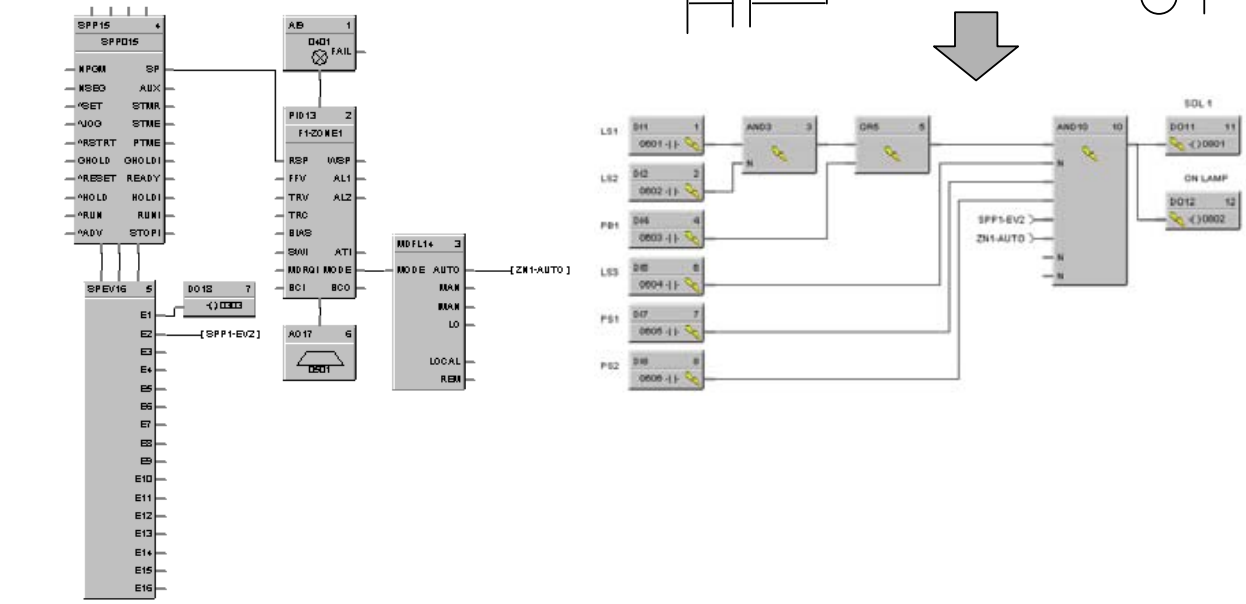


Loop and Logic Integration

Example 1 - Loop and logic integration

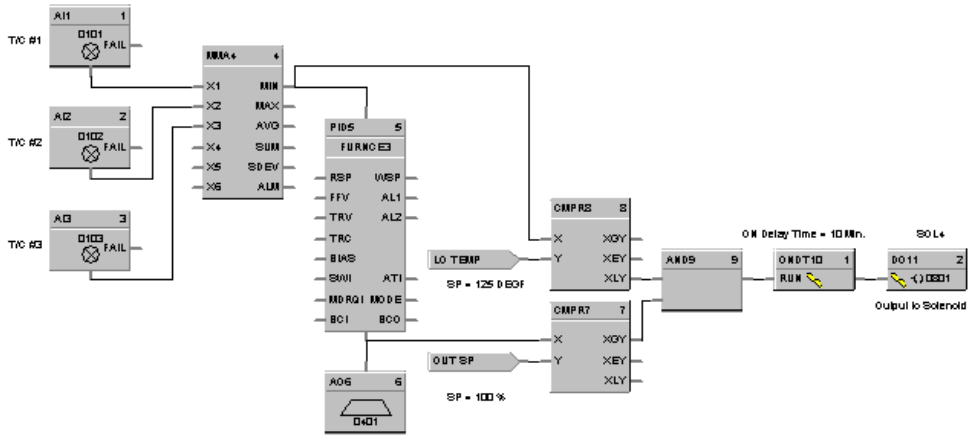
This alters Logic Example 3 to include interaction with statuses from the control loop and SP programmer events. These are shown as Signal Tags (loop auto status and event 2) with associated connectors to the AND block inputs. This is equivalent to direct soft wire connection.





Example 2 - Loop and logic integration

In this application, the base requirement is control off of the lowest of three thermocouples (a high fail-safe would be selected for T/C burnout for each analog input block) and provide a 4-20 mA output to a valve. If the lowest input is less than 125 Deg F, and the control output is greater than 100 % for 10 minutes, turn On Solenoid valve 4 to obtain more heat for the process.



Appendix B – Loop Application Examples

Overview

Introduction

The HC900 supports up to 32 control loops with PID or ON/OFF control action. Control loops may be configured to operate independently or in cascade.

When Ratio control is applied, a ratio and bias adjustment are provided.

When used with the supplementary loop control blocks, digital inputs may be used to set control mode, select the setpoint source, change control action, and perform other discrete actions.

A mode indication block provides digital outputs to facilitate integrating loop operation with other functions in the controller.

When configured for dual output (Heat/Cool), each output may be directed to different output types, for example: Current, Time Proportioning, etc. Two sets of tuning constants for heating and cooling are also provided.

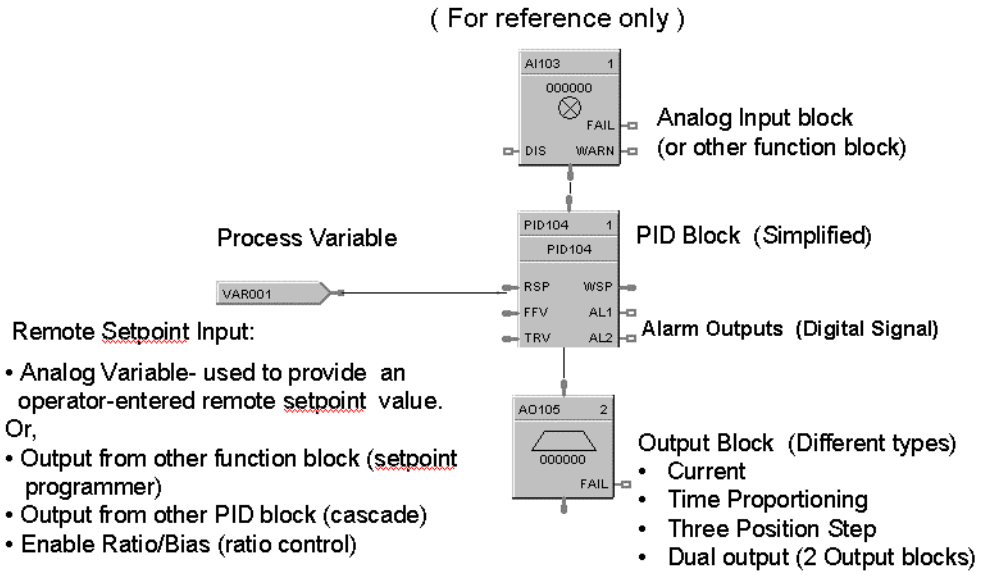
This section provides examples of Loop Control Applications.

What's in this section?

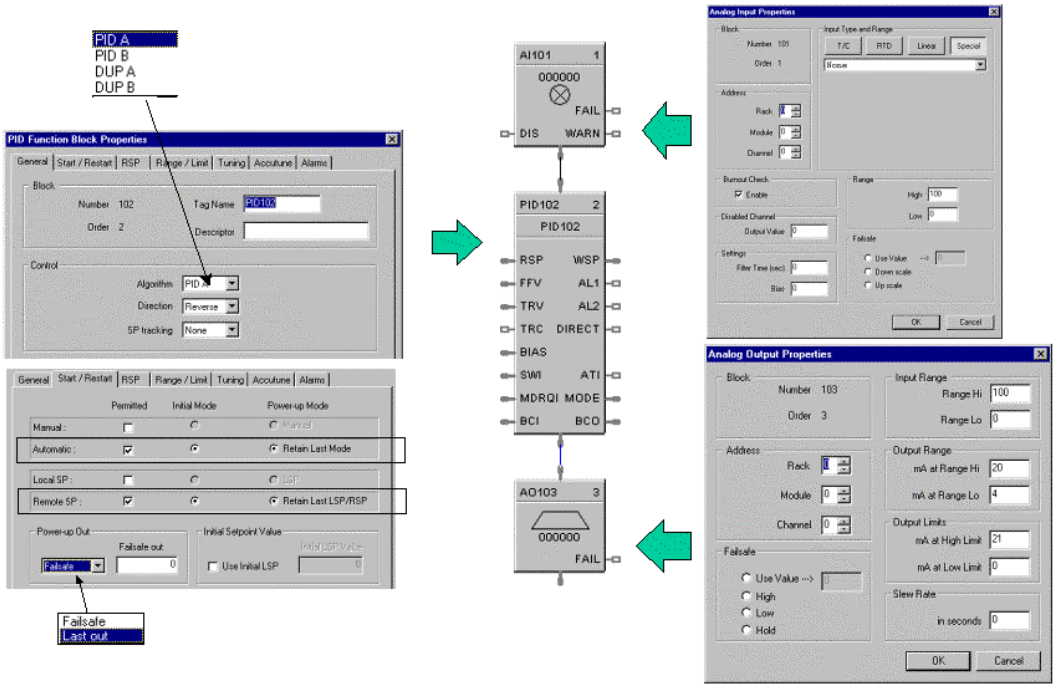
The following examples are covered in this section.

PID Block Examples

Example 1 - Simplified PID configuration (reference only)



Example 2 - PID block configuration - basic



PID Control Algorithms

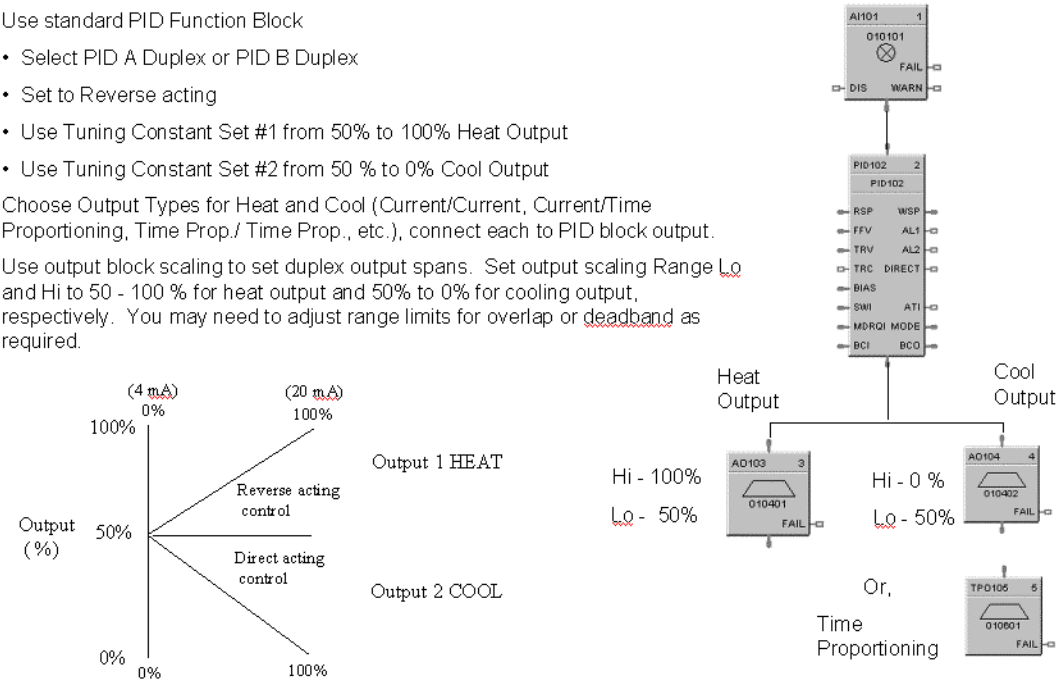
Example 1 - Duplex control - PID with heat/cool (duplex) output

Use standard PID Function Block

- Select PID A Duplex or PID B Duplex
- Set to Reverse acting
- Use Tuning Constant Set #1 from 50% to 100% Heat Output
- Use Tuning Constant Set #2 from 50 % to 0% Cool Output

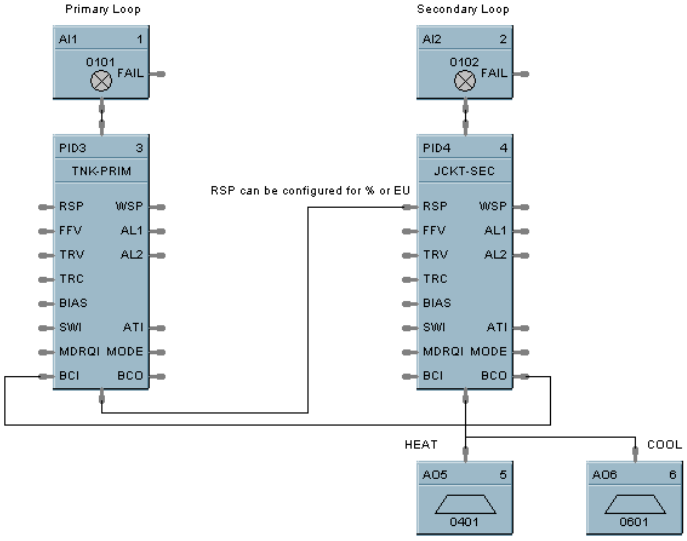
Choose Output Types for Heat and Cool (Current/Current, Current/Time Proportioning, Time Prop./ Time Prop., etc.), connect each to PID block output.

Use output block scaling to set duplex output spans. Set output scaling Range Lo and Hi to 50 - 100 % for heat output and 50% to 0% for cooling output, respectively. You may need to adjust range limits for overlap or deadband as required.



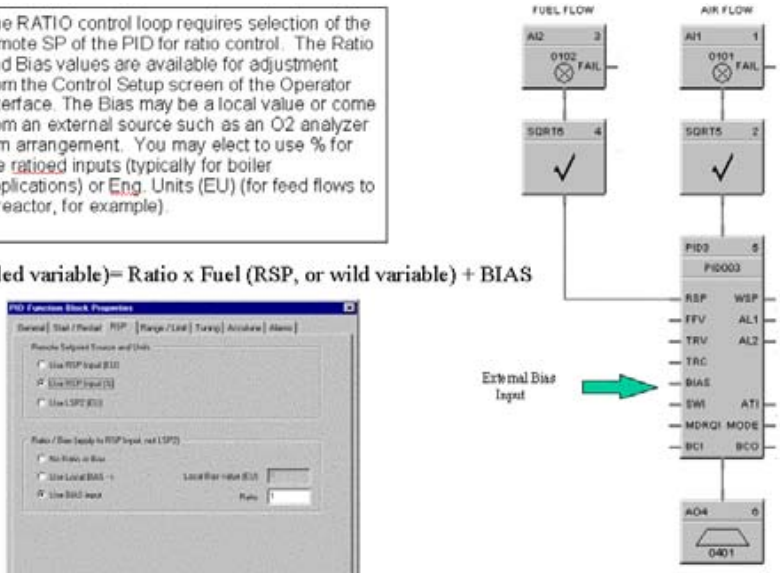
Example 2 - Cascade control

The Cascade Loop uses 2 PID blocks with the back calculation pin of the secondary connected to the primary loop. This transfers values back to the primary loop to adjust the PID for changes due to Manual control.
:



Example 3 - Ratio control

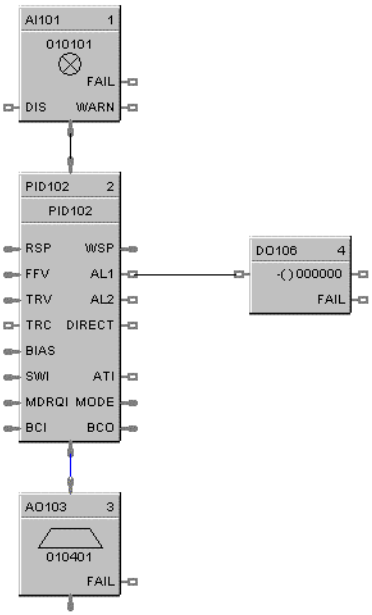
The RATIO control loop requires selection of the remote SP of the PID for ratio control. The Ratio and Bias values are available for adjustment from the Control Setup screen of the Operator Interface. The Bias may be a local value or come from an external source such as an O2 analyzer trim arrangement. You may elect to use % for the ratioed inputs (typically for boiler applications) or Eng. Units (EU) (for feed flows to a reactor, for example).



Air (controlled variable)= Ratio x Fuel (RSP, or wild variable) + BIAS

Example 4 - Assigning alarm relays to loop alarms

Digital output signal from PID block. AL1 will turn the Digital Output block ON & OFF for remote alarming. This output could be ORed with other alarm outputs if going to a common alarm relay.

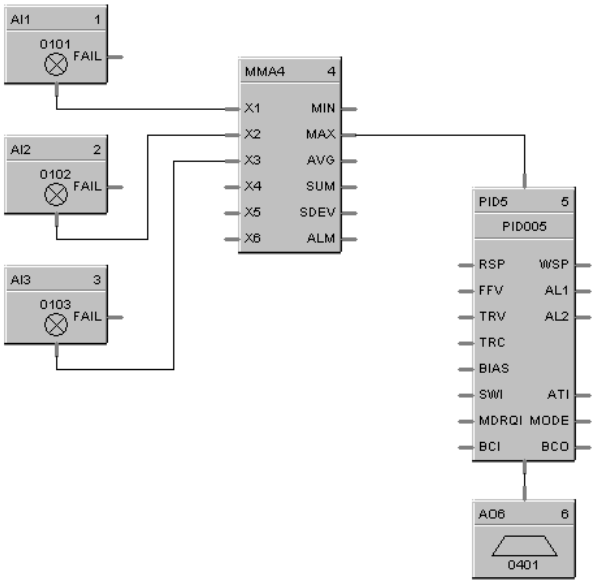


Example 5 - Hi or Lo input selection for PID control

In this application, control is determined by automatic selection of the lowest or highest sensor, such as a thermocouple. As shown, the MMA block is configured for highest (MAX).

Configure the analog input failsafe value (for T/C's), for proper selection if an open (FAIL) condition occurs.

Configuration of the MMA Block, (Minimum, Maximum, Average, Sum, or Std Dev) will require setting the number of inputs to be used.

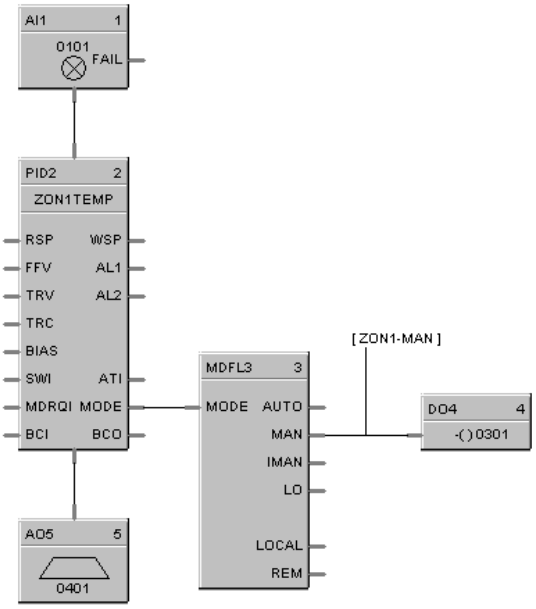


Example 6 - Transferring PID loop manual/auto status

The mode output of the PID Block is used exclusively with the MDFL (Mode Flags) Block.

Any of the status outputs may be referenced by a Signal Tag or may be transferred externally using a DO.

The output shown is ON when in Manual and OFF when in Automatic.



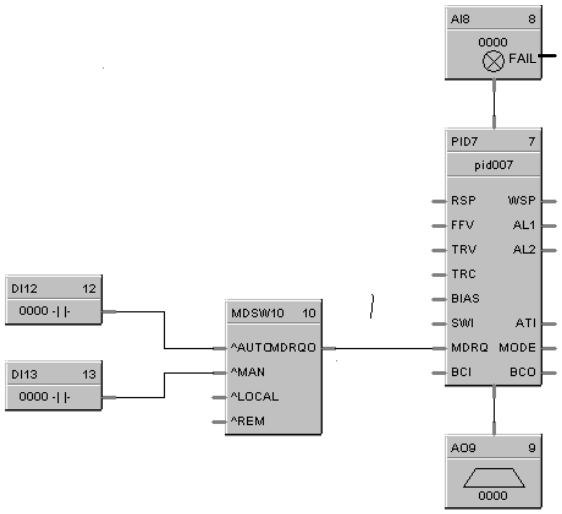
Example 7 - External selection of controller auto/manual mode

Application: External mode switching of the PID Block - changing a loop to MAN, to AUTO, to LOCAL SP, or REMOTE SP.

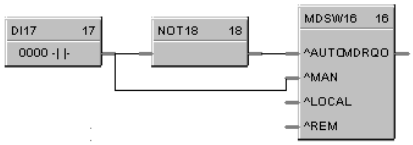
Note: Mode switching is also provided as a integral part of the Operator Panel, Loop Displays

The MDSW (Mode Switch) Function Block is used exclusively with the MDRQI (Mode Request Input) of the PID or ON/OFF Function Block. Its output provides encoded switch commands to the PID Block

All inputs are OFF to ON edge-triggered, requiring a separate input for each action. The example shows digital inputs as the transfer inputs but any digital status could be used.



Use a single input to place a loop in manual when the input is ON(1) and return to Auto when OFF(0).

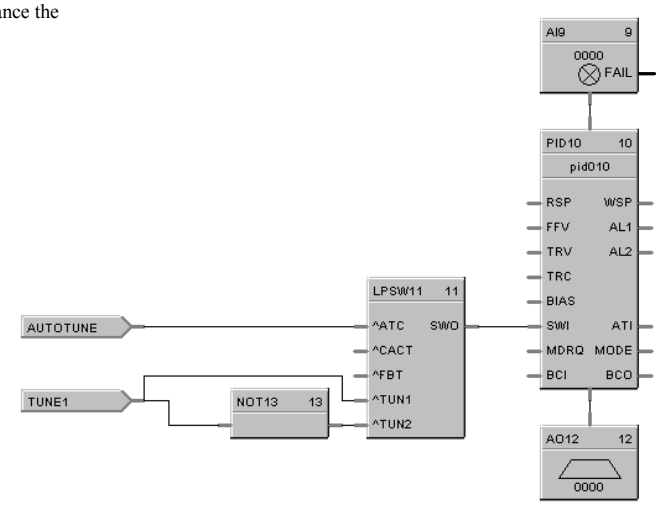


Example 8 - Remote switching of control action and tuning constants

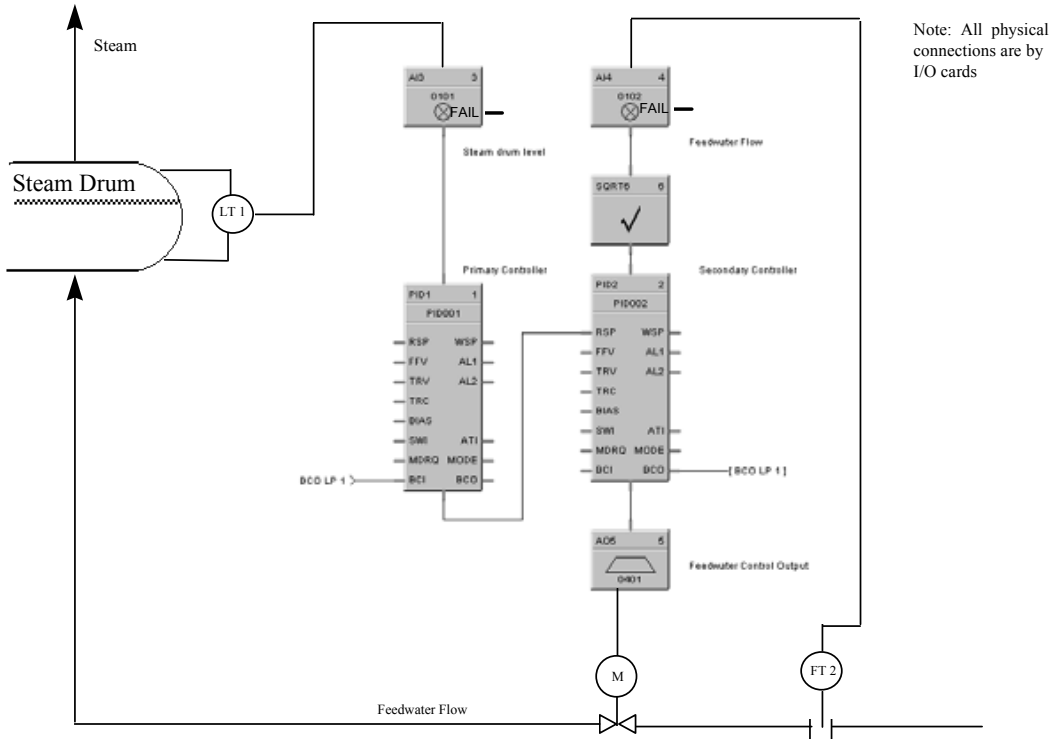
Loop Switch Function block

Function: Digital interface to initiate:

- Autotuning
- Change Control Action: Direct/Reverse Action
- Force Bumpless Transfer (rebalance the algorithm)
- Select Tuning Set #1
- Select Tuning Set #2

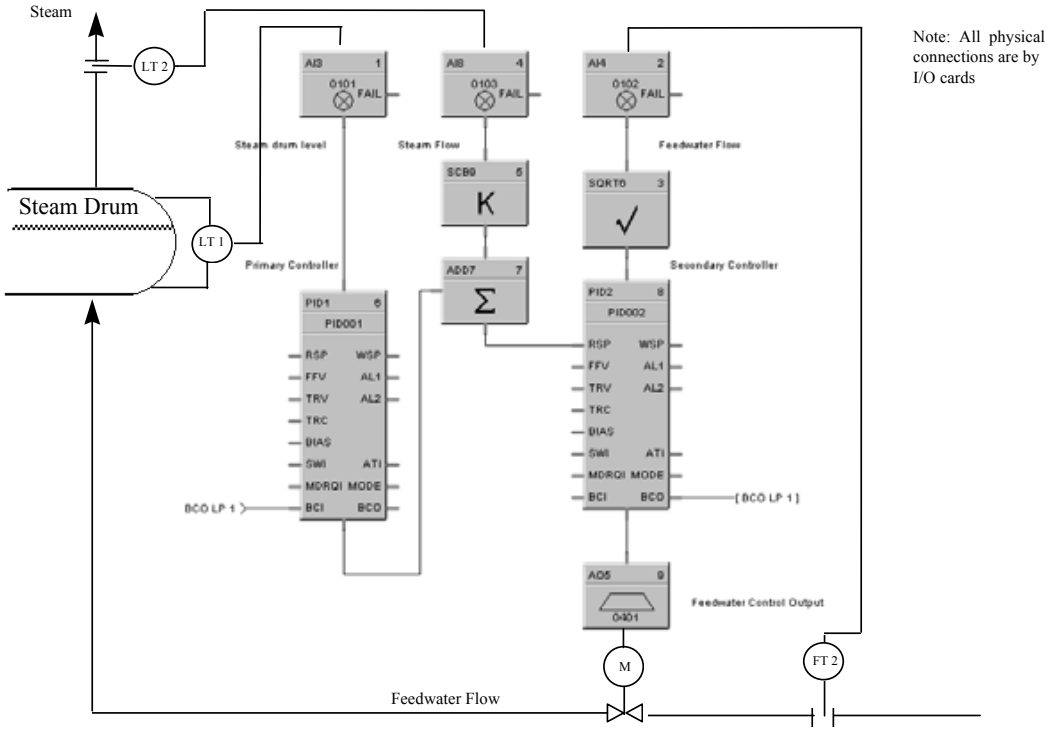


Example 9 - Cascade control of a boiler drum level - basic



Note: All physical connections are by I/O cards

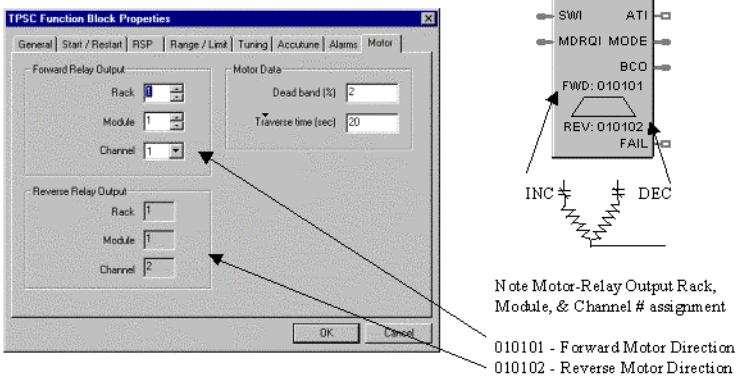
Example 10 - Cascade control of a boiler drum level - 3 element feedwater control



Note: All physical connections are by I/O cards

3 Position Step Control for Motor Positioning Example

3 position step control(without slidewire feedback) is accomplished by assigning the motor control relays physical address under the Motor Tab section of this block configuration. See example below:



Note Motor-Relay Output Rack, Module, & Channel # assignment

010101 - Forward Motor Direction
010102 - Reverse Motor Direction

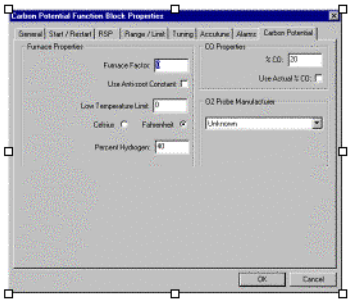
Carbon Potential Examples

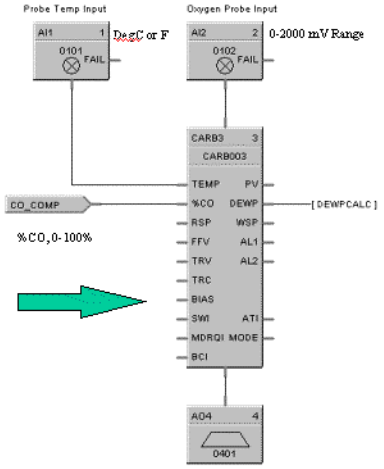
Example 1 - Carbon potential loop

Supports Zirconia Probes from:
Super Systems Inc.
Marathon Monitors
Furnace Control Corp.
Advanced Atmosphere

Uses a single block for %C calculation and PID control Supports CO Compensation from an Analyzer input or a fixed value (use 20% as default for Methane)

Calculates Dewpoint applied to separate output
Provides a Furnace Factor Bias adjustment (to adjust %C to match lab samples)
Provides Anti-sooting setpoint limiting
Probe burn-off using standard logic functions



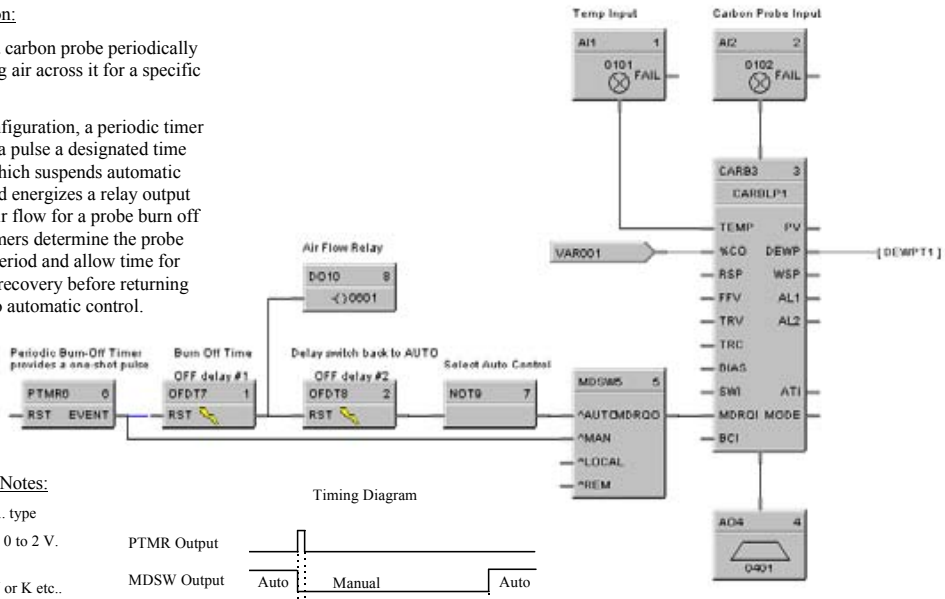


Example 2 - Carbon potential probe burnoff

Application:

To clean a carbon probe periodically by blowing air across it for a specific time.

In this configuration, a periodic timer generates a pulse a designated time interval which suspends automatic control and energizes a relay output to cause air flow for a probe burn off cycle. Timers determine the probe burn-off period and allow time for the probe recovery before returning the loop to automatic control.



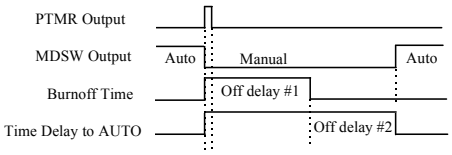
Configuration Notes:

Select probe Mfg.. type

O2 probe input: 0 to 2 V. (0 to 2000 range)

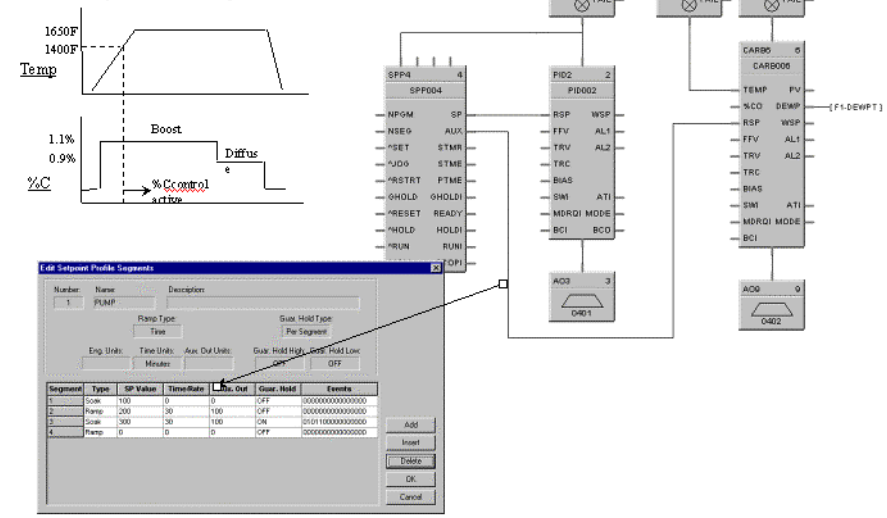
Select T/C type J or K etc..

Timing Diagram



Example 3 - Setpoint programmer application - carburizing cycle

The Auxiliary output of the Set Point Programmer (SPP) block can be used to drive the RSP of a % carbon control loop for a boost/diffuse carburizing cycle in an enclosed quench furnace. Using consequetive Ramp and Soak segments, idle, boost, and diffuse %C setpoints can be programmed. The carbon algorithm can be set to only start after reaching 1400F.

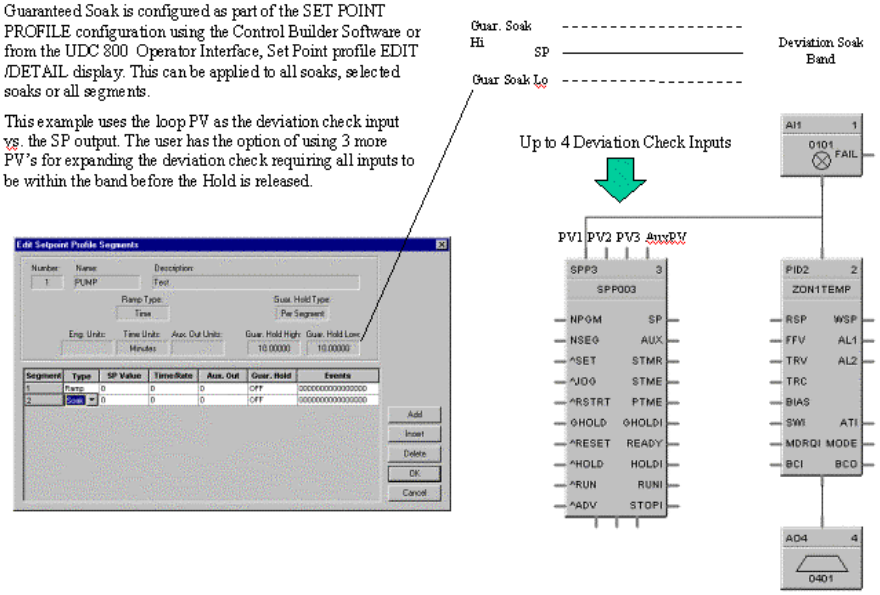


Setpoint Programmer Examples

Example 1 - PID with setpoint programmer and guaranteed soak

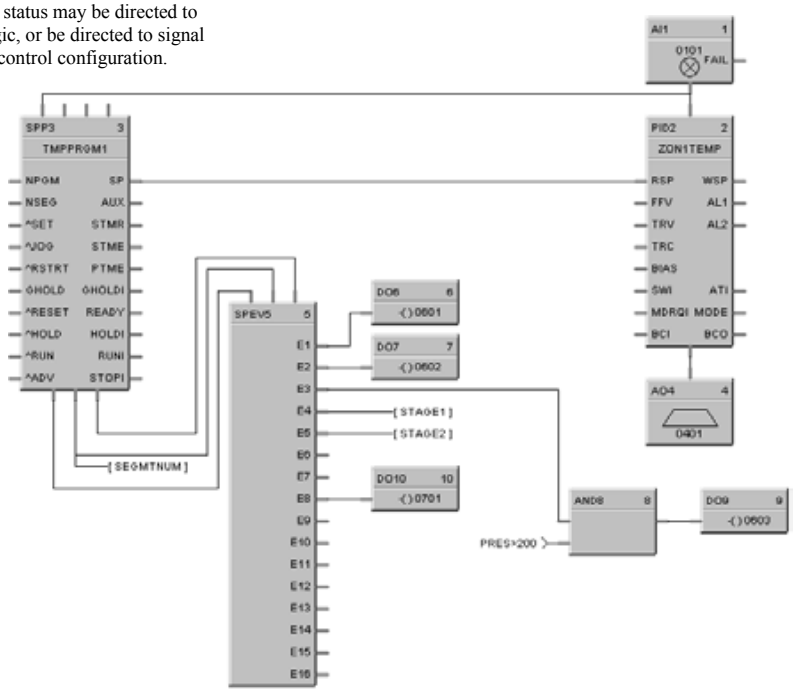
Guaranteed Soak is configured as part of the SET POINT PROFILE configuration using the Control Builder Software or from the UDC 800 Operator Interface, Set Point profile EDIT /DETAIL display. This can be applied to all soaks, selected soaks or all segments.

This example uses the loop PV as the deviation check input vs. the SP output. The user has the option of using 3 more PV's for expanding the deviation check requiring all inputs to be within the band before the Hold is released.



Example 2 - PID with setpoint programmer and event outputs

The SP programmer event output status may be directed to digital outputs, part of control logic, or be directed to signal tags for use anywhere within the control configuration.



Example 3 - Alternate methods for actuating SP programmer START/HOLD/RESET functions

Two methods are shown

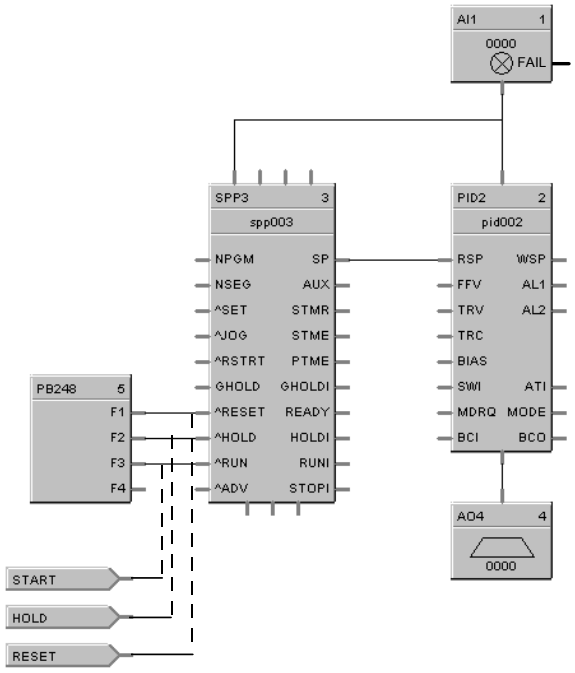
The pushbutton block will tie this function to the Pushbutton screen display. Pushbuttons will provide a one-shot output each time they are pressed.

Using the Digital variable block this function can be displayed on the OVERVIEW display.

Note: Since Digital variables are turned ON and OFF from the overview display, once turned ON they must be manually turned OFF, to be used a second time.

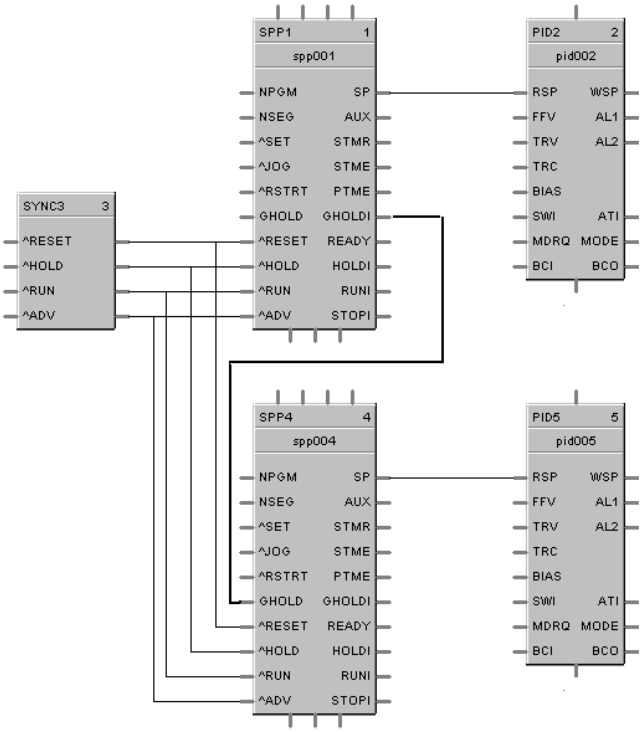
Note: Control Builder Software will not allow the output of two block to be tied together.

Connections are shown for DEMO only of an alternative connection.



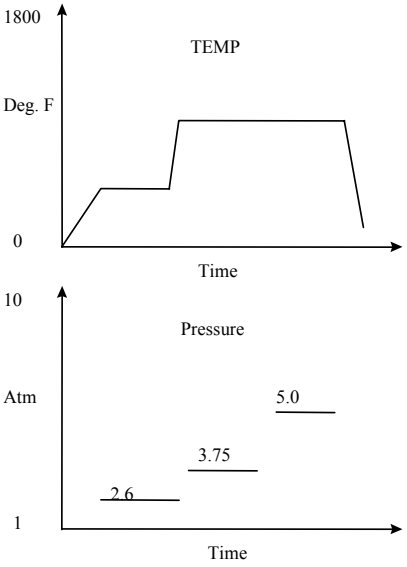
Example 4 - Using the setpoint programmer synchronize block

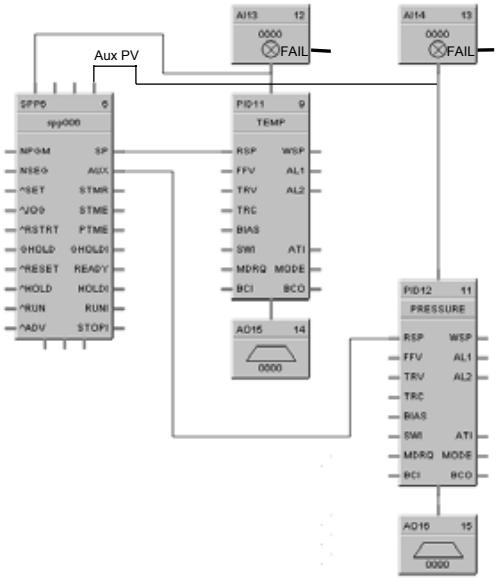
Function: Synchronizes changes in setpoint program state for multiple SPP function blocks when the state of any connected SPP is changed from the Operators panel or via a remote connection. (analog and digital I/O blocks required to complete this function are not shown)



Example 5 - Using the setpoint programmer AUX output

The Auxiliary output of the Set Point Programmer (SPP) block can be used to drive the RSP of a secondary PID control block on a level basis. This precludes the use of another SPP block. A different (or same) set point can be configured for each programmer step. This can be used to program pressure, %C, etc. for a second control loop. Both PID loops can be shown on the same SP Programmer display. The PV for the secondary PID block is connected to the top right pin of the SPP block to allow view of the PV on the SP Programmer display.



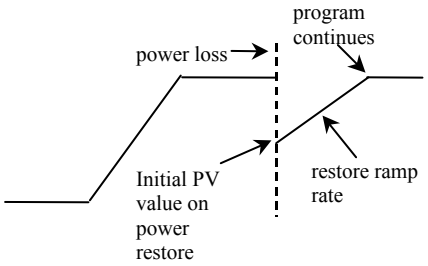


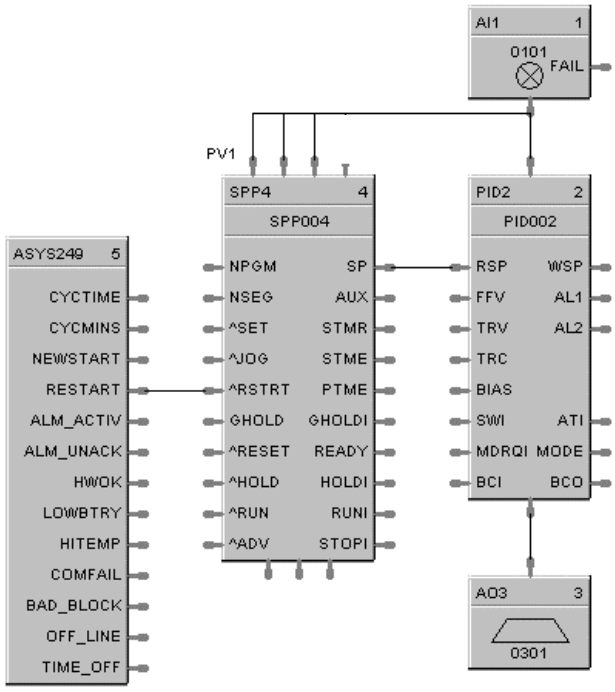
Example 6 - Controlled restart after power loss

SCENARIO A

To prevent stress to the work in a furnace on power up after a power loss, you may use the Restart feature of the SP programmer. This feature will use the PV (connected to PV1) as the initial starting point for the Setpoint and will use a configurable ramp rate for the profile. When the temperature gets to the original Setpoint prior to power down, the program will continue. You may gate this Restart input to the programmer to only apply after a certain time off and/or a certain segment if desired using Compare function blocks.

This example uses the System Monitor block to provide a restart pulse to the programmer Restart input after power restore. This will initiate the restart procedure.

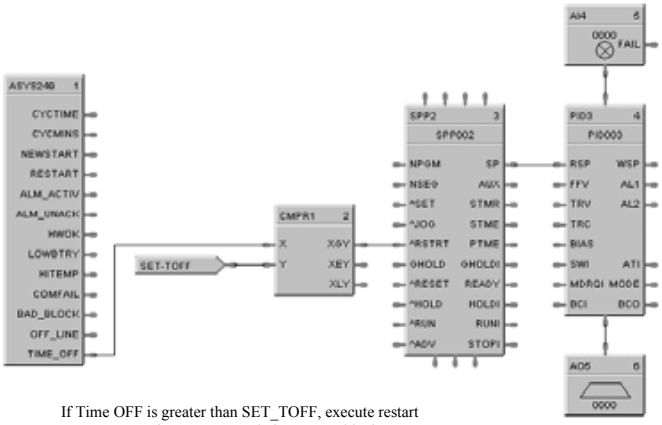




SCENARIO B

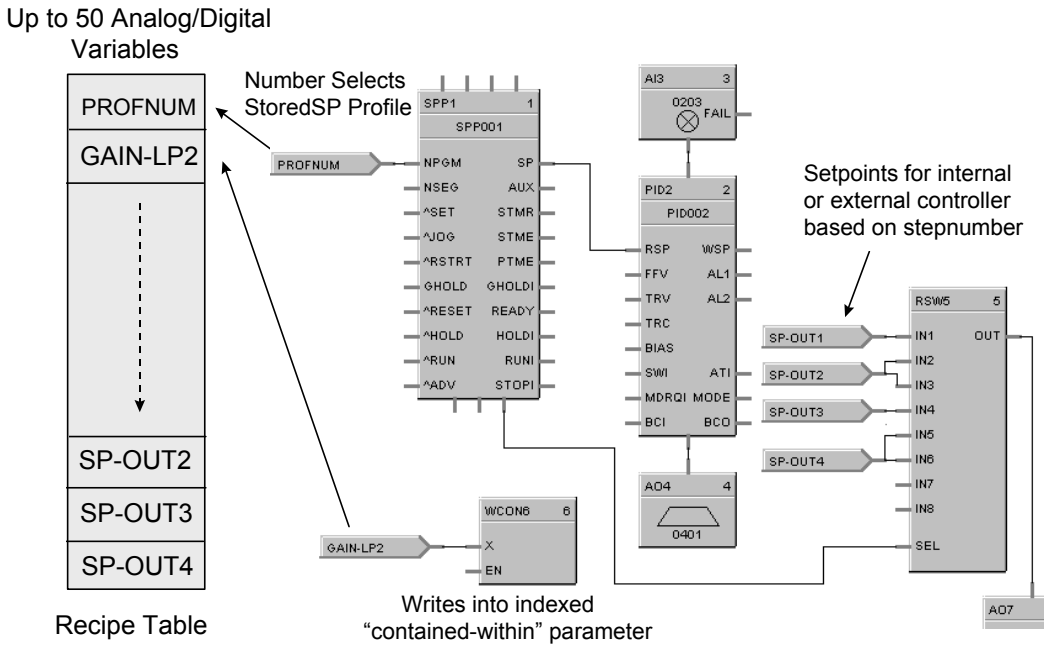
A System Monitor block output (RESTART) is on for the first scan cycle after a power loss plus TIME_OFF output indicates the time the power has been off. A Compare block can be used to evaluate the time off and cause an output to initiate the restart if greater than a set amount.

Time OFF is in seconds.



If Time OFF is greater than SET_TOFF, execute restart
NOTE: Execution sequence relative to SPP block

Example 7 - Setpoint programmer with recipe selection



Setpoint Scheduler Examples

Example 1

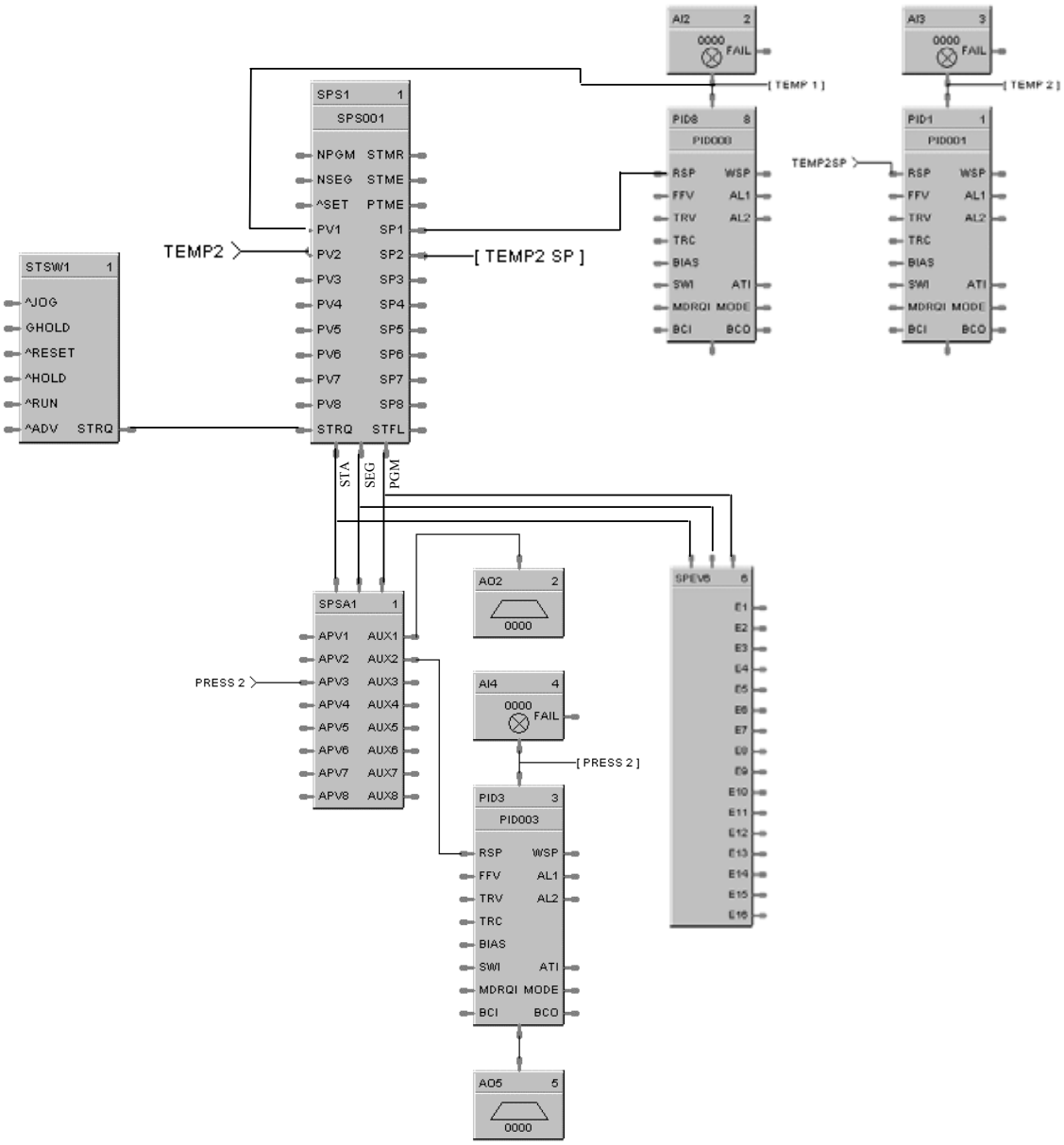


Figure 1 Setpoint scheduler example

Sequencer Example

The process controlled in this example is representative of many sequential batch operations. **See Figure 2**. The Sequencer function block's digital outputs are connected to the controller digital output function blocks to control the operation of the various field devices such as pumps, valves, solenoids and other equipment needed to execute the batch process function. The digital outputs may also be connected to other function blocks in the control strategy as needed.

In the example the auxiliary analog output (AUX) is connected to an analog output block to set the speed of an external device such as a variable speed drive.

The Sequencer function block can be started, held, advanced or reset from a Honeywell operator Interface or from digital signals as indicated in the example. The status of the Sequencer block may be monitored using block outputs such as current state number, current step number and mode from signals available on the block, or from the Honeywell operator interface.

The actual sequence to be executed is made up of two data sets. The first data set defines which digital outputs will be ON or OFF for each State of the function block, **See Figure 3**. Up to 50 States may be defined for the block. Each state also has a 12 character state label that is used by the Honeywell operator interface to indicate the active state. This data set also provides input fields to define two digital signals that may be used to cause the sequencer to exit the current state. The Tag names in the columns for Event Signal #1 and Event Signal #2 represent the digital signals of the control strategy that will be used to exit the associated state.

The second data set needed to execute a sequential control strategy is the actual sequence, **See Figure 4**. This data set has a series of steps, 1 through 64. Each step is setup to activate a specific State (set of digital outputs) from the function block. The sequencer will remain in the Step until a user specified time has elapse or one on the events for the specific State turns ON, causing the step to advance.

The next step in the sequence can be different depending on the action that causes the sequencer to exit the step. Time, event 1, event 2 and advance step each allow the user to specify a unique next step value. Depending on the item that occurs first, elapsed time, event 1, event 2, or advance, the sequencer will advance to the specified next step. This provides the flexibility to take alternate action if the expected action does not occur on schedule.

Up to 20 schedules may be stored in the controller (data specified in Figure 4) and be selected as part of a recipe or manually through a Honeywell operator interface.

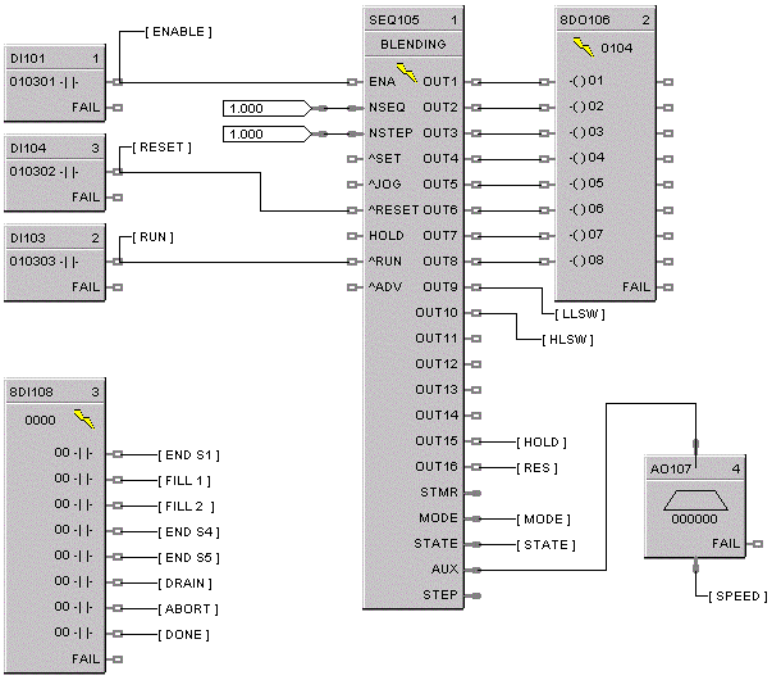


Figure 2 Sequencer function block example - Part 1

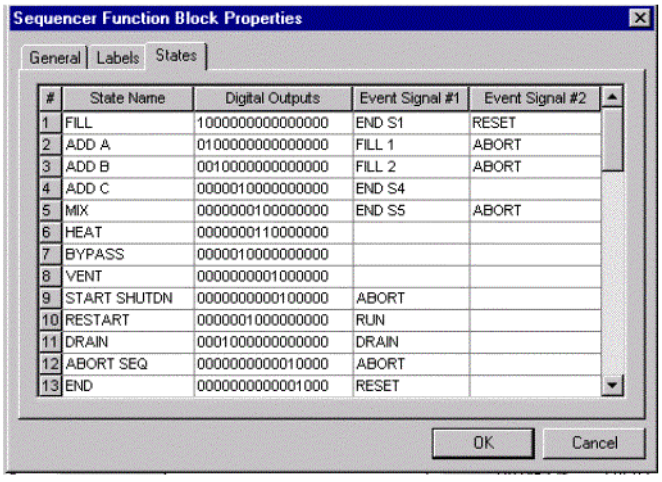
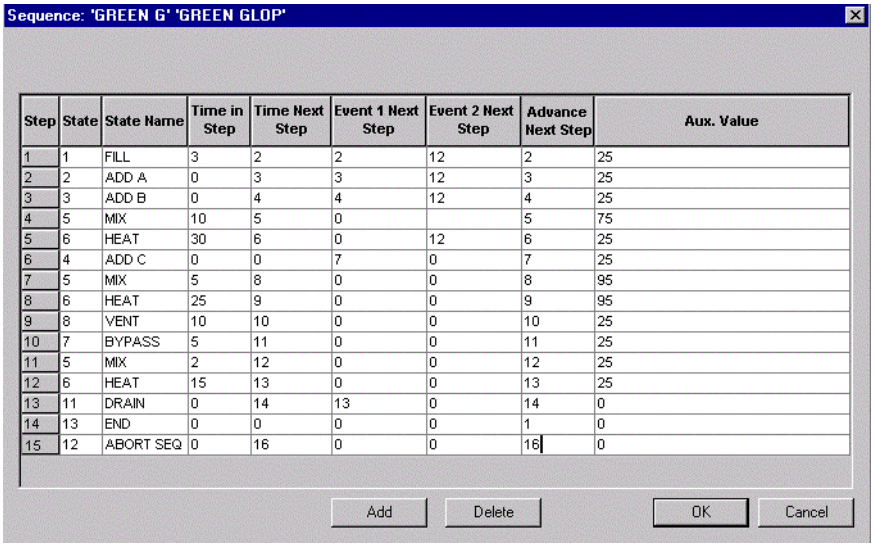


Figure 3 Sequencer function block example - Part 2



Step	State	State Name	Time in Step	Time Next Step	Event 1 Next Step	Event 2 Next Step	Advance Next Step	Aux. Value
1	1	FILL	3	2	2	12	2	25
2	2	ADD A	0	3	3	12	3	25
3	3	ADD B	0	4	4	12	4	25
4	5	MIX	10	5	0		5	75
5	6	HEAT	30	6	0	12	6	25
6	4	ADD C	0	0	7	0	7	25
7	5	MIX	5	8	0	0	8	95
8	6	HEAT	25	9	0	0	9	95
9	8	VENT	10	10	0	0	10	25
10	7	BYPASS	5	11	0	0	11	25
11	5	MIX	2	12	0	0	12	25
12	6	HEAT	15	13	0	0	13	25
13	11	DRAIN	0	14	13	0	14	0
14	13	END	0	0	0	0	1	0
15	12	ABORT SEQ	0	16	0	0	16	0

Figure 4 Sequencer function block example - Part 3

Appendix C – Alarm Group Configuration

Overview

Introduction

The Alarm Display Tag Group configuration tab provides a drop list of **Alarm** groups.

You can configure 20 Alarm Groups of 12 alarm points each. Each group contains a set of selected digital signal tags. An Alarm may be any Digital Signal Tag. There are up to 240 alarm points available. Each alarm point can be configured to generate an E-mail notification.

You can also select "Alarms" from:

- the EDIT menu on the Hybrid Control Designer Main Menus
- the FBD Worksheet toolbar button
  (when you **do not have** an OI and **do not** need to use
  Alarm Group logic in the control strategy)
- the FBD Worksheet by dropping an **ALMGR block** onto the configuration and either double-clicking on the block or right-clicking on the block and selecting the properties menu item on the context menu to bring up the 'Alarm Group Configuration" dialog box.
  (when you **do not have** an OI and **do** need to use
  Alarm Group logic in the control strategy)

For more information on "Alarm Configuration", see page 65.

Alarm Details

Select a tag in the "Selected Tags" area of the Alarm Group Configuration dialog box, then click on "Alarm Details' button. The **Alarm Details** dialog box opens and enables you to enter details for the selected tag.

The block number and output number are listed across the banner. The Tag number and descriptor is listed in field below the banner.

Details include:

Alarm Priority - used for routing alarms to Email (which Email addresses get which alarms)

E Mail Notification of alarms, by priority, on a point by point basis.

Detailed Text - appears on the Operator Interface.

Trigger Direction - rising or falling edge

Alarm Acknowledge - Group acknowledge

For more information on "Alarm Details", see page 69.

Example

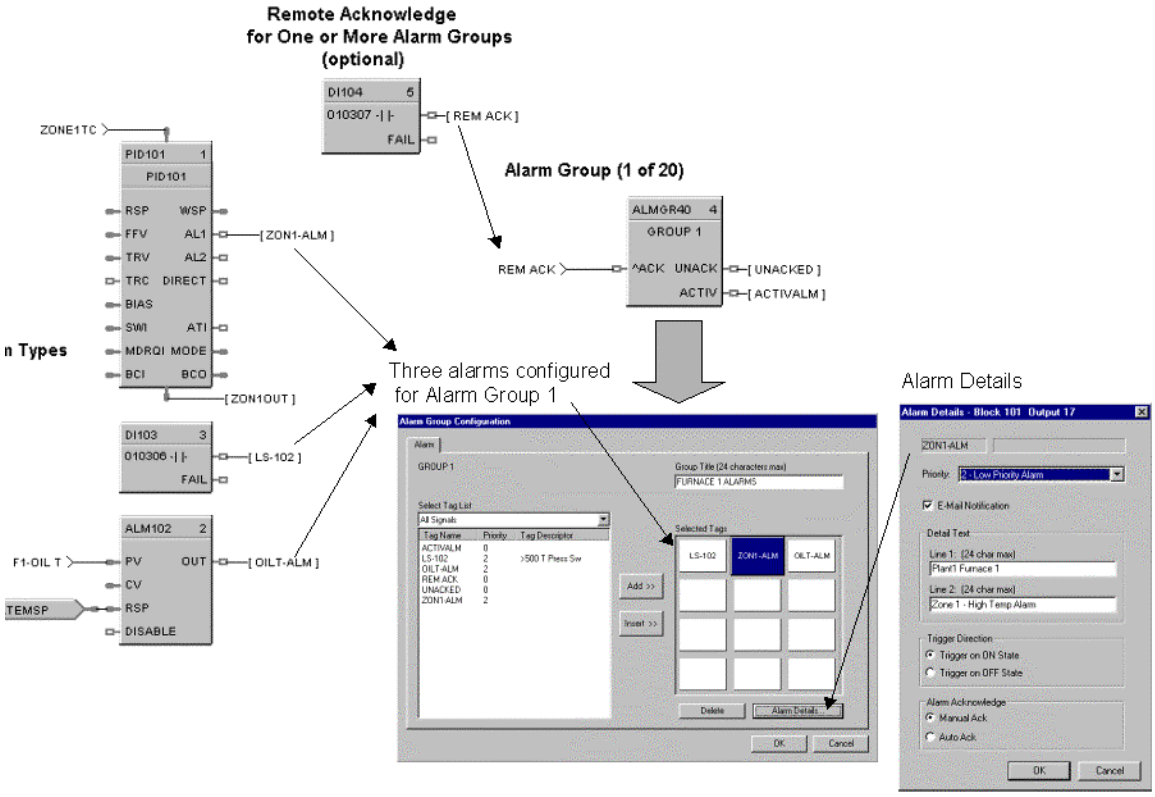


Figure 5 Alarm Group Configuration Example

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