



# User's Guide to PlantSim™

Version 4.1



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# Introduction to PlantSim™

## What is PlantSim?

PlantSim is a **full-scope, high fidelity training simulator in the form of an inexpensive, generic training simulator.**

PlantSim, by nHance Technologies, was developed in 2003 in an effort to bring the power of full-scope training simulators to customers who may not have the budget for a plant-specific simulator.

## PlantSim Capabilities

PlantSim models can be distributed in two ways:

1. On a **network of PCs** to simulate the control room environment, or
2. All of the functions can be combined onto a **single laptop PC** for convenient individual training.

In addition to the dynamic plant process model, PlantSim also includes the following:

- **Instructor Station:** Simulator runtime executive.  
Trending graphics are used to control the simulator events and observe the training session.
- **Operator Station:** Trainee interface to the simulator.  
The Operator Station uses emulated graphics for the DCS operator stations that mimic the plant control room.


The model is supplied with a complete set of Initial Condition (IC) files and malfunctions with plant startup and shutdown instructions.

## Using PlantSim



### Starting the Model

A model must be running before you can use the HMI. In order to start a model, the nHance security key must be properly installed on the machine (See the Security Key section in **Installation Instructions** document for details.)

To start the model, follow these steps:

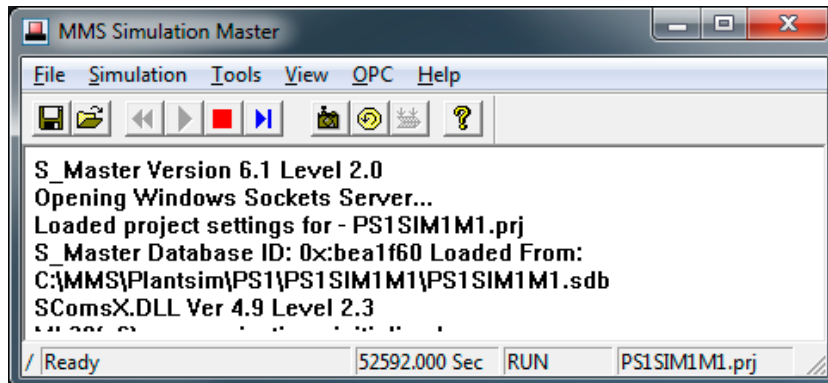
1. **Open  Simulation Master (S\_Master) from the Windows START menu.**  
Since S\_Master acts as a server application, Windows might display a security warning for S\_Master. If so, just select "Unblock."
3. **Load the Model project file (\*.prj).**  
The main window of S\_Master will show the currently loaded project. If no project is loaded or to select a different model, select **File → Load RunTime Model** from the main menu. Browse to .prj file and select Open (a typical location is c:\myMMS\Models\PS4\PS4Sim0\PS4SIM0.prj).

#### 4. Start/Stop the Simulation.

Once a model project file is loaded, you can control the simulation from the main menu by selecting **Simulation > Start** or **Stop**, or by clicking the green start button  or the red stop button .

\*The model may take several minutes to start depending on the speed of your machine.

5. When the model is running, the model status and run-time will be updated in the lower status bar as shown below:



**Figure 1:** Notice the status "RUN" in the bottom bar, and the run-time of 52592.000 Sec.

6. S\_Master will open an ACSL window that is referred to as the "ACSL run-time" window. S\_Master sends commands to the ACSL environment to control the model startup. Do not close this window. Closing the ACSL run-time window will close the model simulation.

## Starting the HMI

From the Windows start menu select "PlantSim HMI" to open the default MMI screen. The MMI Manager will load automatically and connect to the model.

## Controlling the Model

For step-by-step instructions on controlling the model once it is started, see the **Using the Action Center** section.

## Configuring PlantSim

Most of the required settings to start PlantSim are configured during installation. The PlantSim HMI consists of a collection of exe "screens" located typically in **C:\PlantSim\PS#\MMI** (where # is the PlantSim Unit number).

The PlantSim exe simply configures the appropriate personality settings for MMI manager and launches one or more MMI screen exe's (See Using Multiple Monitors with PlantSim below.)

The PlantSim shortcut is setup by the installation program.  
The following is intended for information only:

### Shortcut Properties:

- **Target:**  
<PlantSim Install Dir>\PlantSim.exe <Unit\_Number>
- **Start In:**  
<PlantSim HMI Dir>
- **PlantSim Install Dir.:**  
The location of PlantSim.exe
- **Unit\_Number:**  
The PlantSim Unit Number is a required command line parameter for PlantSim.exe to select the proper HMI
- **PlantSim HMI Dir:**  
The location of the HMI which is determined by the PlantSim installation program. This folder MUST contain all the HMI exe's as well as the configuration files used to start the HMI.

### PSConfig INI

The INI file is used to setup the registry with the proper data for the MMI32 program to locate the proper files. The INI file is named as: *PS<#>Config.INI* (# = PlantSim Unit Number) and has the following parameters:

- **WriteRegKey**  
Required data for MMI32
- **MMI\_Path**  
PlantSim HMI installed location
- **Menu\_Exe**  
Required data for MMI32
- **Toolba\_Exe**  
Required data for MMI32
- **DefScreen**  
Initial screen used to start the HMI (may be changed to display different screen on startup of the HMI) and may also include a DDN (or PC monitor number for multiple monitor systems) If no DDN number is supplied, the DDN will default to 1.

#### *For example:*

DefScreen = 4gmenu.exe 1

- **HMIstart1**  
Additional screens can be started by PlantSim by adding additional lines to the INI file starting with HMIstart1. The screen exe should be followed by the DDN.

#### *For example:*

HMIstart1 = 4cmenu.exe 2

HMIstart2 = 4AGM1.exe 3

HMIstart3 = ps4hp1.exe 4

### PlantSim.exe parameters

The PlantSim.exe has the following command line options for starting the HMI:

**1. PlantSim Unit number**

(1, 2, 3, or 4, depending on the PlantSim model you are using)

**2. Startup Mode (0 or 1)**

0 = normal, 1 = debug (verbose mode while starting PlantSim).

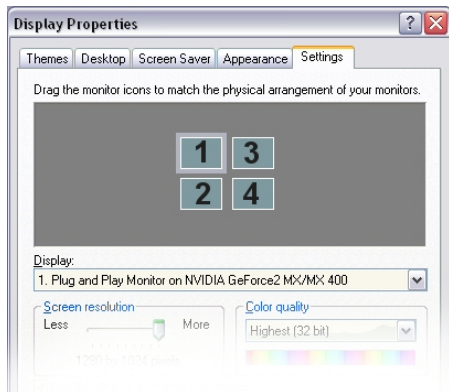
**3. Startup screen exe**

The initial screen used to start the HMI (NOTE: This will override the PSConfig INI setting DefScreen.)

**4. DDN for the screen**

## Using Multiple Monitors with PlantSim

The MMI32 application supports multiple monitor configurations using DDN numbers. (see Glossary)  
The DDN is a parameter passed to the MMI32 to control how an MMI screen is positioned. For example, a DDN of 2 would start the MMI screen on PC screen 2 as identified by the Windows Display Properties:



To start multiple screens when using PlantSim, modify the PSConfig INI file (described above) to add the following line (where *MMI\_screen* is the desired screen exe):

**HMIstart1 = <MMI\_screen>.exe 2**

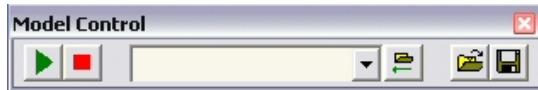
The Windows Display Properties settings must match the MMI Manager "Screen Layout." (See **Using MMI Manager** below.)

## Using Action Center

The Action Center is an instructor station software application used for traditional model control, activation of local operator actions, setting external conditions, and initiating malfunctions. The Action Center saves action variable files with the .avr file extension and action files with the .act file extension. In addition, the Action Center is capable of saving an ACSII log file with the .log file extension. This section is intended to provide a basic overview of model control. For additional information, see Action Center help; from the Action Center main menu, select **Help > Contents**.

## Action Center Start Up

When the Action Center is initially started, it attempts to connect to S\_Master. If this connection is complete, the model control toolbar is active:



If the model control toolbar is not active, the user should verify that S\_Master has been started, and that a model is running. If the model control toolbar is still not active, do the following:

Verify the proper settings in the **S\_Master → Socket Setup** window. When S\_Master is running locally, this setting should be 127.0.0.1:



Also select **S\_Master → Connect** to attempt a new connection.

Once connected to the model, the user should load up a set of action variables and actions as described below:

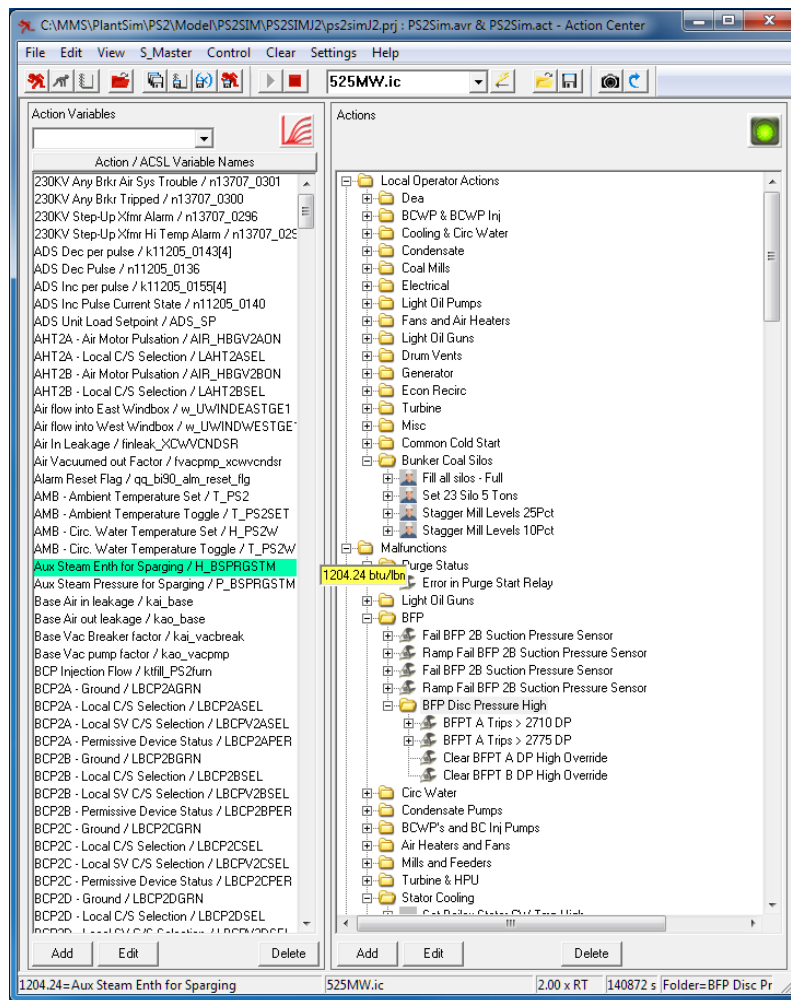
### Loading the AVR and ACT Files

From the Action Center main menu, select **File → Open**. The installed PRJ file should appear by default if the s:\ drive is mapped properly to the model folder (described below). If not then locate the \*.prj file and select **Open**. Opening the project file installed by PlantSim should open the associated AVR and ACT files.

To load an individual ACT or AVR file, select the **File → Open** again. This time, change the file type to action files (\*.act), or AVar files (\*.avr) and choose the desired file.

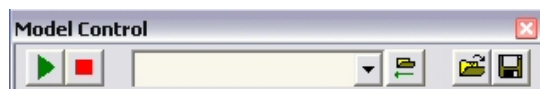
The Action Center supports three different views. A view can be thought of as what you are looking at in the Action Center Window. The main *Action* view (shown below) is active at startup. The *Pending* view is used to list all actions that are active or pending. The *Log* view is used to view a log of instructor station actions that have taken place since starting up the Action Center. The three different views are selected from the **View** menu item or by choosing one of the first three icons on the main toolbar.

*Action Center example on next page*



**Figure 2:** The Action Center.

## Model Control using Action Center



### Start/Stop the Model

Model Control is easily accomplished using the Model Control toolbar. The first two icons on this toolbar are used for starting and stopping the model:



**Start** button



**Stop** button



In addition to using the model control toolbar icons to start/stop the model, the Control menu can be used from the Action Center main menu, or the user may use the keyboard by selecting the **F3** key to start the model and the **F4** key to stop the model.

### Load Data Image (\*.ic file)

PlantSim comes packaged with Initial Condition files, which may be used to set the model to a pre-defined state.

Select **Control > Load Data Image > Initial Condition**, or use the Model Control toolbar:

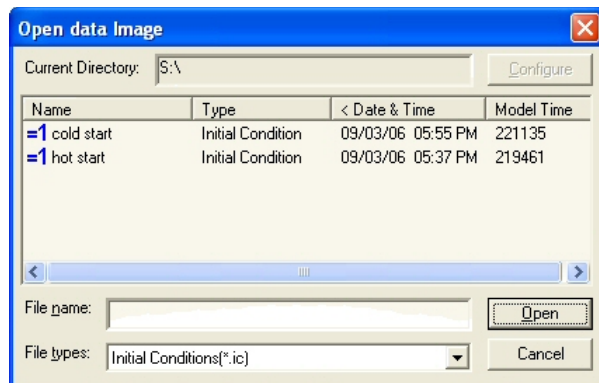


**Figure 3:** Use the drop-down box to select an IC, and click the button to load it.



**Figure 4:** Click the file open icon on the Model Control toolbar to select an image to load.

The open data image window is displayed below:



**Figure 5:** Open data Image window.

This window can be used to load \*.ic, \*.ssf, \*.spf, and \*.tbt files. See the Glossary or Using S\_Master for more information on these file types.

### Saving, Restoring, and Deleting Data Images

Data images can be saved and restored from the Action Center directly. Deletion of data images, however, must be performed via Windows Explorer as described below.

#### ● Saving

The easiest way to save a data image is to use the save icon on the Model Control toolbar. The "Save Data Image File" dialog box will be presented once this button is pressed. The proper data image type should be selected, and the file name entered in the appropriate field. Once all information has been entered, the user should press the "Save" button to save the data image.

## ● Restoring

The easiest way to load a data image is to use the open icon on the Model Control toolbar. The "Load Data Image File" dialog box will appear once this button is pressed. The proper data image type should be selected, at which point, a list of only those data images will be presented. The user should select the data image to be loaded and press the "Open" button to load the image.

## ● Deleting

Data images are deleted through Windows Explorer. If drive S: is properly mapped, then browse to the S: drive and select the desired data image files. After the particular data image file has been located, all files of that same name, but with the various different file extensions, should be deleted.



### Initiating Actions

Actions are sorted by file folders (or in a tree view). The first step in initiating an action is to locate the action by navigating through the action tree. Once the action has been located, highlight the action by single clicking on the action icon. Once highlighted, the action can be initiated by pressing the Green-light icon as shown above. The Green-light icon is located in the upper right-hand corner of the Action view window. These steps are sometimes referred to as selecting the action and pressing "go."



### Trending Action Variables

Action variables can be easily added to G\_Master for data collection and trending. Before this feature can be used, G\_Master must have been previously started. To add an action variable to G\_Master, simply highlight the action variable by clicking on it and pressing the G\_Master icon as shown above. These steps are sometimes referred to as selecting the action variable and pressing "link." If the link was successful, the first G\_Master document will start collecting data for the new variable.



### Configuring S\_Master from the Action Center

S\_Master, not the Action Center, is responsible for saving timed backtrack files and pacing the simulator to run at the user selected time interval. The Action Center can, however, configure S\_Master to perform these events via the **S\_Master → Config Setup** menu item. When this menu item is selected, the "S\_Master Configuration" dialog box is presented. From this dialog box, the user should configure the following events:

#### ■ Back Track Frequency & Number of Files

The backtrack feature can be turned on or off via the check box presented in the "S\_Master Configuration" dialog box. In addition, the user can select the frequency at which the timed backtracks are to take place and the number of files to store.

#### ■ Real Time Scale Factor

The real time scale factor adjustment is where the user can speed up or slow down the simulation. A factor of one indicates that the simulator calculations are performed at real-time, or in other words, one second of simulation time is equal to one second of clock time. A factor greater than one is faster than real time, and a factor less than one is slower than real time. For example, a factor of 2 is twice as fast as real time, or one second of simulation time will be

performed in 1/2 second of clock time. A factor of 0.5 is 1/2 as fast as real time, or one second of simulation time will be performed in 2 seconds of clock time. In all cases, the selection of the real time scale factor is only a desired simulation speed as the limits at which the simulator can be executed are governed by the available hardware, size of the model, etc.

## Security

Simulation managers have the ability to add/edit actions and action variables and can modify the setup configuration of the Action Center. Simulation Managers also have the ability to add/edit users and user permissions.

Simulation instructors have the ability to perform all of the traditional instructor station capabilities, such as start/stop the model, initiate malfunctions, etc. Instructors do not, however, have the ability to configure the Action Center, add/edit user permissions, or modify actions or action variables.

Simulation students' use of the instructor station is limited to basic model control and activation of local operator actions.



### Action Center Configuration

Action Center requires that the S:\ drive be mapped to the model folder. (A typical folder containing model files would be C:\PlantSim\PS4\PS4sim0.)

Action Center is configured by the PlantSim installation program to start up using a batch file that maps s:\ locally to the installed model folder.

## Using S\_Master

S\_Master's main function is to connect to the model and service client requests. The client requests include model commands, such as start/stop, save/restore state, etc. S\_Master also serves other requests, such as getting or setting individual variables or lists of variables. For additional information, see the S\_Master help. From the S\_Master main menu, select **Help → Contents**.

S\_Master saves simulator data images with the following file extensions .ic, .ssf, .tbt, and .spf. (See details in Data Images section.) In addition, S\_Master keeps log files that are automatically saved with the .slg file extension.

## Data Images

The term data image is used to describe all simulator run-time data. Thus, the different types of data images are Initial Condition (\*.ic) files, Saved Snapshot (\*.ssf) files, Timed Backtrack (\*.tbt) files, and Parameter (\*.spf) files. All of the data image types are binary files and are discussed below.

### Saved Snapshot File (.ssf)

The saved snapshot file is a file stored on disk that contains the state of the simulation at a given point in time. This image contains all simulator variables, including states and parameters.

### **Timed Backtrack File (.tbt)**

A timed backtrack file is a saved snapshot file that has been automatically saved by the simulator. The number of backtrack files saved and frequency in between file saves are user configurable. Timed backtrack files differ from saved snapshot files simply by the way they were saved. Timed backtrack files are saved automatically by the simulator while saved snapshot files have to be saved by a user.

### **Parameter Files (.spf)**

Parameter files are a subset of simulator data. The intent is that parameter files contain only simulator variables that do not change from one time-step to the next. An example of a parameter is an actuator time constant. Sometimes, however, it is difficult to define whether a variable is a parameter or not. Because of this difficulty, the distinction between parameter and non-parameter variables has been left up to the model developer.

### **Default Parameter File**

The default parameter file is a special parameter file that is always loaded with an initial condition. If the simulator detects that the default parameter file does not exist, it will automatically create one. The name of the default parameter file is user configurable.

### **IC's or Initial Condition Files (.ic)**

An IC file differs from a saved snapshot file in that after the IC is loaded, the default parameter set is restored. Thus, an IC can be thought of as a saved snapshot file with less parameters.

## **Using MMI Manager**

MMI manager is a Simulation Tool Application whose purpose is to coordinate information between the MMI screen(s) and the simulation executive application (S\_Master). To that end, the MMI Manager was designed to do the following:

- **Provide advanced communications** between the MMI screens and the Simulation Executive application
- **Provide screen to screen communication**
- **Provide personality dependent functions as shown below:**
  - Interface with personality keyboard and manage common keyboard functions
  - Manage MMI screen placement
  - Manage personality dependent alarms

The MMI Manager communicates with S\_Master through a set of standard message protocols that operate over TCP/IP.

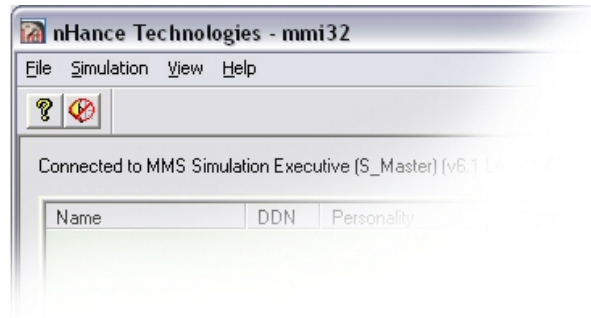
The MMI Manager starts automatically when one of the MMI screens is loaded.

For additional information, see MMI Manager Help. From the MMI Manager main menu, select **Help > Contents**.

## MMI Manager Configuration

MMI Manager starts automatically when an MMI screen is started. MMI Manager should be configured to run properly by the PlantSim installation program. Further configuration may be required to use multiple monitors or to connect to S\_Master across the network.

The MMI Manager menu is described below:



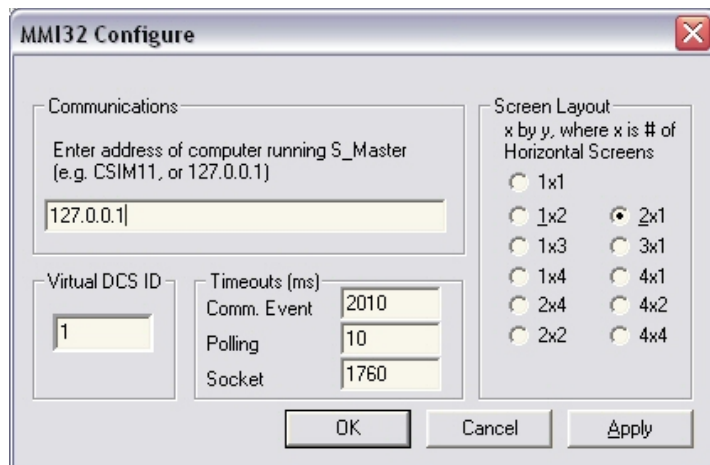
**Figure 6:** Select File > Exit.

### **File > Exit:**

This closes the MMI manager, and all open MMI screens registered. This does NOT close the simulation.

### **Simulation > Configure:**

This allows configuration of various options.



**Figure 7:** Simulation > Configure opens this window.

### **Configuration Options (from MMI32 Configure window)**

### **"Address of computer running S\_Master" (Communications)**

...Is the TCP/IP address of the PC running the model. It is recommended that the address be entered in "Dot" notation, such as 127.0.0.1, rather than symbolic name format (MYComputer). If, however, the computer running S\_Master has a dynamic IP address, you must use the symbolic name format. Your network administrator should be able to help with any questions on TCP/IP addressing.

### **Virtual DCS ID**

Modifying this entry allows you to select the Virtual DCS ID for this computer. The Virtual DCS ID is an identification tag assigned to an MMI manager computer to identify which DCS workstation the MMI manager represents. Various MMI Manager computers can share the same Virtual DCS ID, but one MMI Manager cannot have multiple Virtual DCS ID's.

### **Screen Layout**

The Screen layout defines how the MMI screens appear on the desktop. The screen layout **MUST** match the Display settings. In most cases for a single monitor system, select 1x1; for a dual monitor system with monitors side-by-side, select 2x1. The DDN for a multiple monitor setup starts at the top left for DDN 1 and continues top to bottom. See Glossary description of DDN.

The value chosen may also be dependent upon the resolution of the main MMI screen and the resolution of the current computer. For example, assume the MMI screens were designed for an 800x600 resolution monitor. If the computer currently executing the MMI Manager has a screen resolution of 800x600 pixels, then a 1x1 layout should be selected. If a dual monitor system is present, each monitor should be configured to display 800x600 pixels, and a 1x2 or 2x1 screen layout should be selected. If a single monitor system is present and configured to display 1600x1200 pixels, then a 2x2 screen layout option should be selected.

### **Timeouts**

The communication timeouts affect the communications between MMI32 and S\_Master; the default settings should not be changed for PlantSim.

#### **● Personality Config:**

The Personality Config menu item provides the means to configure all personalities loaded. Once this menu item is selected, the "Configure" method will be called for each personality in memory. Personalities are loaded only when a MMI screen has registered with the MMI Manager.

#### **● Communications:**

The Communications menu allows the user to connect and disconnect from S\_Master. The "*Communications/Reset All Coms*" menu item allows the user to reset the MMI Manager without having to exit the program.

#### **● Alarms:**

The *Alarms* menu item provides a mechanism to silence and sound all alarms horns. The functionality of this menu item is dependent upon the personality DLL's loaded.

### **View Menu**

The View Menu allows the user to turn on and off viewing of the Toolbar and Status bar.

### **Help Menu**

The Help menu allows the user to display the online help file. In addition, the "About" item in the help menu allows the user to display the current version and build time of the MMI Manager.

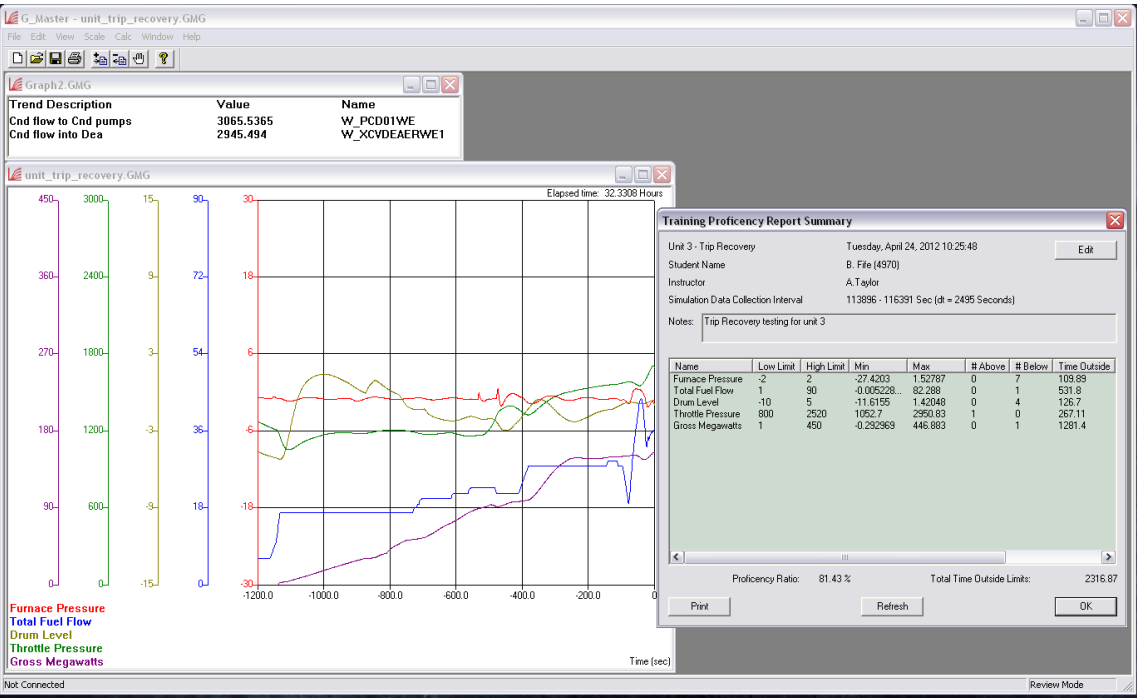
# Using G\_master

Graph Master or G\_Master is a real-time trending application. G\_Master communicates a list of variables to be trended to S\_Master. S\_Master, in return, responds with the current value of these variables at each S\_Master defined communication interval. G\_Master displays the data in a number of different formats, performs simple statistical calculations of the data, and has the capability to export the data for additional external processing. For additional information, see G\_Master help. From the G\_Master main menu, select **Help → Contents**.

G\_Master saves data files with the .gmg file extension. G\_Master can export its data in delimited ASCII text files with the .tmd file extension.

## G\_Master Startup

A blank document is created automatically when G\_Master is started. This blank document is essentially a trend chart that contains no variables to be trended. You can choose to add variables to trend to this graph, or you may decide to close this graph and open a pre-defined file. The Windows standard file/open menu items or toolbar icons can be used to open/save G\_Master data files.



**Figure 8: G\_Master Trend Display and Trainee Performance Review Results.**  
G\_Master allows the user to not only have complete control over which variables to trend, but also how to display them. The data can then be exported and imported into other programs.

### **Adding Trends to G\_Master**

Trends are added to G\_Master via the "Edit/Add Trend" menu item or the "Add Trend Icon" as presented at the beginning of this paragraph. Once the add trend option has been selected, the "Add Variable" dialog box will be presented. This dialog box contains fields for the ACSL variable name, a Description, and a Scale & Offset factor. If you are familiar with ACSL (the simulation language used in the process model) and MMS (the application used to build the process model), you can fill out this form by hand. If, however, you are not familiar with ACSL & MMS, you can obtain the list of predefined action variables from the Action Center. In order to obtain a list of action variables, the Action Center must be running on the same computer and have a set of Action Variables loaded. Once this condition is met, you can press the "Action Center" button on G\_Master's "Add Variable Dialog" box after "Add Trend" is selected. This button will present you with a list of action variables to choose from for trending.

### **Removing Trends From G\_Master**

Trends are removed from G\_Master via the "Edit/Remove Trend" menu item or the "Remove Trend Icon" as presented at the beginning of this paragraph. Once the remove trend option has been selected, the "Remove from List" dialog box will be presented. To remove trends, simply select the variables to remove from this list and press enter or the "OK" button.

### **G\_Master Views, Windows & Documents**

G\_Master allows for the viewing of trend data in one of three different ways. Each of these ways is called a view. The three views are Digital, Single Axis, or Multiple Axis. The digital view allows for viewing in numerical form the current value of any variable being collected. The Single Axis view allows for viewing all or a subset of variables being collected on a common axis. The multiple axis view allows for viewing each variable on its own axis. The three different views are selected under the "view" menu item.

Each view of the data can be seen at the same time by using three different windows. For example, if a digital display is currently being viewed, the "Window/New" menu item can be selected which will present a new window for that same data. Then, a different view can be selected for that window from the "View \ Graph - Multiple Axes" menu and variables can be selected from the "View \ Set Trend Visibility" menu. Thus two different views of the same data can be setup. There is no limit to the number of different windows that can be setup for each document.

A G\_Master document contains all the data collected for each variable added. G\_Master is a multiple document application so that multiple G\_Master documents can be opened at one time. When you save a G\_Master document into a .GMG file, you save the trend data, the configuration for each window opened, and the ranges and scales for each variable trended. The name of the document loaded is displayed on each window and followed by a colon and the window number.

### **Setting Trend Visibility**

Sometimes, it is not desirable to display all data collected on a G\_Master document in a particular graph. Thus, you must tell G\_Master what variables you want to be displayed when a new window is opened. You do this by choosing the "View/Set Trend Visibility" menu item. When you select the "Set Trend Visibility" menu item, you will be presented with a list of variables available for trending. You should select the variables you want to appear on the new window and press "OK." If a variable you want to trend is not in the list, it must be added to the document as described above.



### Changing Scales

The Scale menu item on G\_Master allows you to change the time scale, or y-axis scale. You must select from a series of pre-defined time scales but have flexibility in choosing the y-axis scale. If you want G\_Master to automatically scale the y-axis based upon the data available, choose "Auto." If you want to enter the upper and lower limits for the y-axis, choose "Manual." If the current view is a multiple axis view, you will have to select the trend for which the new scale applies.

### Printing From G\_Master

G\_Master prints trend data via the Windows Print functionality. Thus before G\_Master can print, a Windows printer must be installed. G\_Master is capable of printing in black & white or color to a local or network printer, depending upon the Windows NT printer setup. See the Windows NT documentation for installing printer drivers and printing to network printers. Once the printer has been installed, you can print any G\_Master window by selecting the window to be printed, re-sizing the window to get the desired aspect ratio, and pressing the print icon on the toolbar. Alternatively, you can choose the "File/Print Preview" menu item to preview the printed image. Printer settings are modified via the "File/Page Setup" menu item. Some printers require the "Print Text as Graphics" option be selected in order to print properly.

## Security

The simulation managers and instructors have full use of G\_Master. Students, however, have limited access. A student can execute the G\_Master application, but the student is not allowed to view the information or edit the information being collected. Because of these limitations, G\_Master will start up in a minimized state when initiated by a student. The student will not be able maximize G\_Master or perform any other actions except close.

# PlantSim Unit Startup Instructions

## Unit 1 Startup

See document:

**PlantSim1StartupInst.pdf**

## Unit 2 Startup

See document:

**PlantSim2StartupInst.pdf**

## Unit 4 Startup

See document:

**PlantSim4StartupInst.pdf**

# Glossary of Terms

## Action Center

The Action Center is a Simulation Tool application used for traditional model control, activation of local operator actions, setting external conditions, and initiating malfunctions. The Action Center saves action variable files with the .AVR file extension and action files with the .ACT file extension. In addition, the Action Center is capable of saving an ACSII log file with the .LOG file extension.

## Data Image

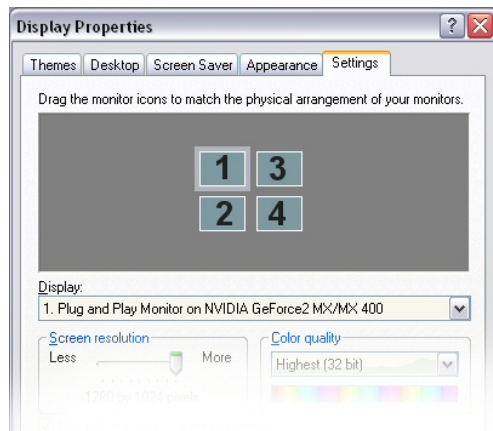
The term data image is used to describe all simulator run-time data. Thus, the different types of data images are Initial Condition (\*.IC) files, Saved Snapshot (\*.SSF) files, Timed Backtrack (\*.TBT) files, and Parameter (\*.SPF) files.

## DCS

Generally, the Distributed Control System is the hardware used to control a physical process. There are a number of different manufactures of DCS hardware, each of which uses its own proprietary Man Machine Interface to allow the operators to control the plant via the MMI.

## DDN

**DCS Desktop Number** Every DCS desktop on a PC is assigned a number. The DCS Desktop (PC monitor) in the upper left position is assigned the DDN of 1. The DDN is incremented for each DCS Desktop from top to bottom:



**Figure 9: DDN Numbering**

## G\_Master

Graph Master is a Simulation Tool component used for trending simulator data and trainee performance monitoring. G\_Master saves data files with the .GMG file extension. G\_Master is capable of exporting its data in delimited ASCII text files with the .TMD file extension.

## HMI

Human-Machine Interface is a collection of Graphical User Interfaces designed to simplify operator interaction with a computer process. Typically, this is used to describe the control screens operators use to control an industrial process (also known as MMI).

**IC (\*.ic File)**

This is an Initial Condition File used by S\_Master. This file differs from a saved snapshot file in that after the IC is loaded, the default parameter set is restored. Thus, an IC can be thought of as a saved snapshot file, less parameters.

**MMI**

Man-Machine Interface is a collection of Graphical User Interfaces designed to simplify operator interaction with a computer process. Typically used to describe the control screens operators use to control an industrial process (also known as HMI).

**MMI32**

MMI manager is a Simulation Tool Application whose purpose is to coordinate information between the MMI screen(s) and the simulation executive application (S\_Master).

**Personality**

The MMI Manager supports multiple "Personalities." A personality is simply a term used to represent DCS specific emulation requirements such as interfacing with a DCS keyboard, handling DCS specific alarm methods, etc. Using the personality approach, support can be provided to emulate different DCS MMIs by simply generating a DCS specific DLL rather than modifying the MMI Manager. For those applications where no specific DCS MMI is being emulated, the Generic Personality should be used.

**Personality DLL**

A Personality DLL is loaded by the MMI Manager and performs DCS specific emulation tasks such as interface with a DCS keyboard.

**Parameter Files (\*.spf)**

Parameter files are a subset of simulator data. The intent is that parameter files contain only simulator variables that do not change from one time-step to the next. An example of a parameter is an actuator time constant. Sometimes, however, it is difficult to define whether a variable is a parameter or not. Because of this difficulty, the distinction between parameter and non-parameter variables has been left up to the model developer.

**S\_Master**

Simulation Master is the simulation run-time executive. The S\_Master application runs on the main computer and among its many jobs, services communication requests from client applications such as G\_Master and the Action Center. S\_Master saves simulator data images with the following file extensions: .IC, .SSF, .TBT, and .SPF. In addition, S\_Master keeps log files that are automatically saved with the .SLG file extension.

**Saved Snapshot File (\*.ssf)**

The saved snapshot file is a file stored on disk that contains the state of the simulator at a given point in time. This image contains all simulator variables including states and parameters.

**Timed Backtrack File (\*.tbt)**

A timed backtrack file is a saved snapshot file that has been automatically saved by the simulator.