

Instructions for Installing and Using EESws (Extracted from Chapter 17 of Mastering EES)

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Introduction

EESws is an acronym for EES Web Server. This program is an extension to the EES – Engineering Equation Solver program that allows programs developed in EES to be run through a web browser program on the internet. An EESws program is an EES Distributable program that is internet enabled. This document provides instructions on how to create an EESws program.

Some background information is required to understand the capabilities of the EESws program. The Diagram Window in EES provides the capability to easily develop a user-friendly, graphical interface to an EES program. The Diagram Window can contain graphical items that are either drawn using the Diagram Window tools or pasted from another drawing program. Inputs to the calculations can be entered directly on the Diagram Window instead of using equations in the Equations Window and selected outputs can be shown at desired locations in the window. Calculations and other operations can be initiated and controlled from the Diagram Window. It is necessary to know how to use the Diagram Window in order to use EESws because the purpose of EESws is to run the Diagram window using a web browser program. The best source of information on the Diagram Window is Chapters 15 and 16 in the book *Mastering EES* (<http://fchart.com/ees/mastering-ees.php>).

It is necessary to have the Professional version of EES in order to use EESws. The Professional version of EES greatly extends the capabilities of the Diagram Window by allowing drop-down lists, radio button groups, check boxes, link buttons and live plots. In addition, the Professional version allows Distributable EES programs to be created. Distributable programs are special purpose EES programs that have been provided with a graphic user interface implemented using the Diagram Window. These programs can be freely provided to users who do not own EES and typically do not know the details of the analysis that is provided by the equations entered into the Equations Window. (In fact, the developer may not allow the user to access the equations at all for proprietary or other reasons.) Users will normally enter input information, initiate the calculations and view the results entirely from the Diagram Window in the Distributable program. The best source of information on creating Distributable programs is Chapter 17 in *Mastering EES*.

EESws takes the concept of the Distributable program to its next logical step. It allows a Distributable EES program to be run over the internet using a standard web browser program such as Internet Explorer, Safari, or Firefox. There are significant advantages to providing Distributable EES programs in this manner. The internet eliminates the need to physically deliver the program to the intended users. Rather, the program remains on a server that users access externally so that changes and updates to the program can be made easily and without user intervention. Also, the program can be stopped if desired at any time. Finally, it may be desirable to have users access your web site in order to use the program. However, there are a few disadvantages as well. EESws cannot do everything that a Distributable program can do. For example, at the time of this writing, EESws does not support child Diagram windows, hiding Diagram objects, slider controls, Greek symbols or subscripts. EESws supports almost all of the other capabilities provide in the Diagram Window.

EESws accesses a single EES Distributable program through a port on an internet server. EESws_8001 uses port 8001 and is provided at no cost. EESws_8001 can be downloaded from

<http://fchart.com/ees/eesws.php>. Contact F-Chart software (info@fchart.com) if you would like to purchase additional ports, which will allow more programs to be accessed through the internet.

Creating a Distributable Program

The first step in the process of making a EESws program is to create the Distributable program. This process is documented in Chapter 17 in the book *Mastering EES*. The Distributable program documented in Chapter 17 will be used in this document to create an EESws program. Note that EES version 9.470 or newer is required for this process.

Create a directory on your drive C:\ of your computer named C:\EESWS_8001. Open the file Throttle.ees, which can be found in the UserLib\Examples folder within the folder that EES has been installed. You can navigate to this file quickly using the Examples menu at the right of the menu bar. Select the Professional Version menu item and then open the file identified as **Distributable example – Throttle**. Select Diagram Window from the Windows menu or enter Ctrl-D to bring the Diagram Window to the front in Application mode. You should see the Diagram window shown in Figure 1.

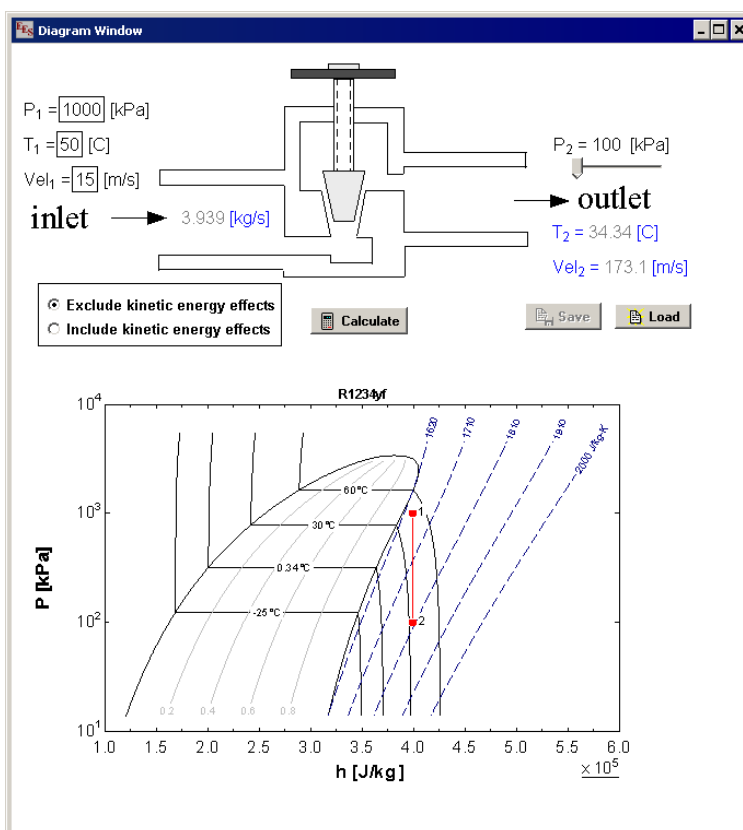


Figure 1: Diagram Window in file Throttle.ees in the Examples folder.

This Diagram window uses many of the features that we wish to make available over the internet, including graphics, input and output variables, a radio button control and a live plot. In addition, it contains Save and Load buttons to save and load input files. Save this file in the directory EESws_8001.

EESws does not provide all of the same capabilities as the EES Distributable program, so some changes will be needed. For example, EESws does not allow slider controls, which is used in the program Throttle.ees to enter the pressure P_2 . Enter Ctrl-D to place the Diagram Window into Development mode, with the tool bar visible. Right-click on the slider control to bring up the Modify Diagram Text Item dialog shown in Figure 2. Unselect the Slider Input check box and then click the OK button.

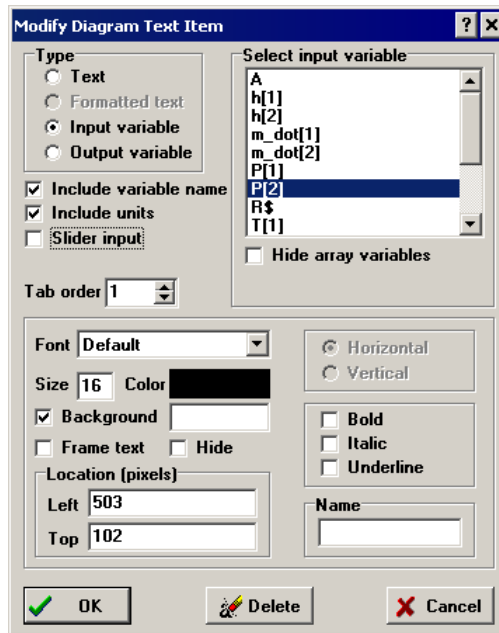


Figure 2: Modify Diagram Text Item dialog

EESws does provide support for the Save and Load buttons, which save and restore user inputs. However, when the Save button is clicked in the internet version, an edit box will appear to the right of the button in which you enter the name of the file that is saved. Unfortunately, that edit box will be covered by the Load button. To avoid this problem, move the Load button below the Save button, so the Diagram Window now appears as shown in Figure 3.

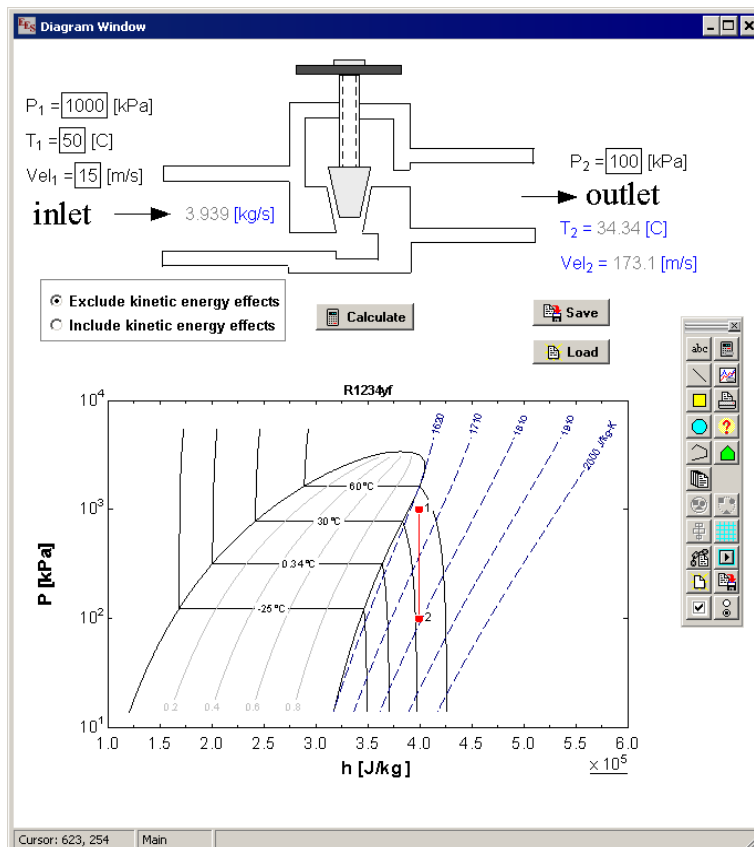


Figure 3: Diagram window with changes made for internet use

EESws also does not support Child Diagram windows or the use of variables to provide guess values and limits for other variables. Animation features in which objects on the Diagram window are hidden, shown, moved or rotated are also not supported. The file Throttle.ees does not use any of these features so it is now ready to be converted to an EESws internet program.

Select the Make Distributable Program menu item from the File menu. The message shown in Figure 4 will appear the first time that this command is used. Click the **I agree** button if you agree to the conditions in the message.

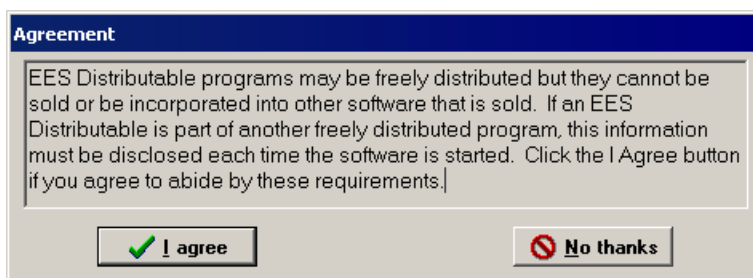


Figure 4: Confirmation that Distributable Programs cannot be sold by the developer.

The Distributable Program Setup dialog shown in Figure 5 will appear. Note that the executable file will be created in directory C:\EESws_8001 and will be named Throttle.exe. Modify the three lines of splash screen message as you wish; this message will be displayed when the program is started. Click the **Web Interface** check box, as shown in Figure 5.

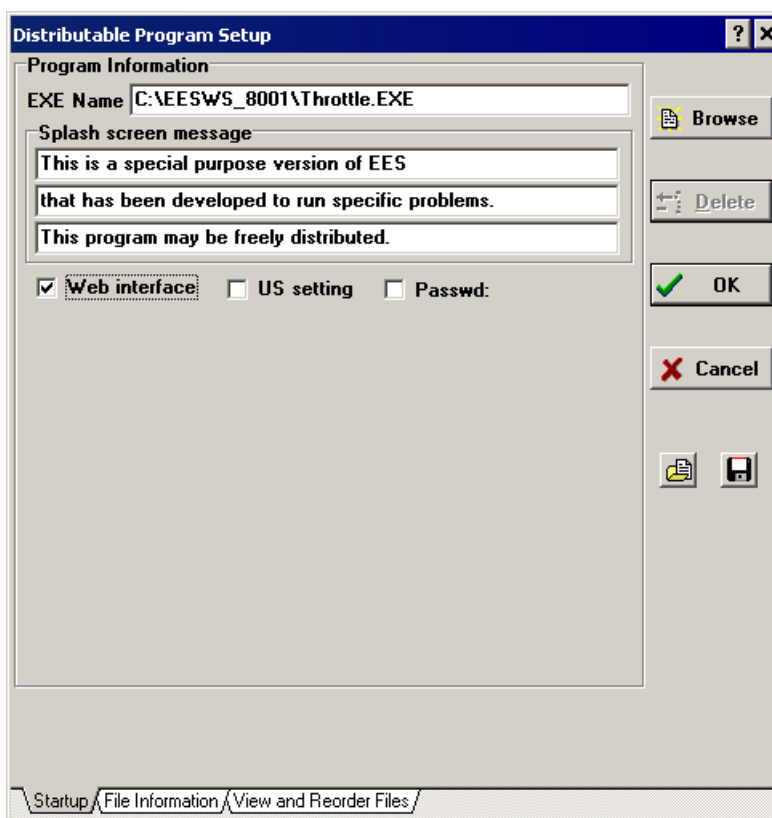


Figure 5: Distributable Program Setup dialog with Web Interface checked.

The expiration information, startup message and menu name options are not applicable for the internet version and they will be hidden when the **Web interface** button is checked. Click the OK button.

EES will next display a dialog with files that may need to be included with the Distributable program, as documented in Section 17.3 of *Mastering EES*. If the Distributable program you are developing uses any of these library files, they must be placed in the ..\USERLIB folder in the folder that the Distributable program is located. The Throttle.EES program does not use any additional libraries, so just click the OK button.

Open directory EESws_8001. The directory should contain the files shown in Figure 6. Note that, in addition to the Throttle.exe distributable program, EES has created the file Throttle.dly and the folder IMGS. The .dly file is a text file that provides information to the EESws program that allows it to translate the objects in the Diagram window of the distributable to a web page interface. The IMGS folder contains schematics, graphical objects and plots that will be displayed by the browser.





Name ^	Date modified	Type	Size
 IMGS	8/15/2013 2:04 PM	File folder	
 Throttle.DLY	8/16/2013 3:30 PM	DLY File	1 KB
 Throttle.EES	8/16/2013 2:59 PM	EES File	150 KB
 Throttle.EXE	8/16/2013 3:30 PM	Application	9,152 KB

Figure 6: Listing of files in the EESws_87001 directory after creating the Distributable program.

Test the Throttle.exe distributable program by double-clicking it. The Throttle.exe program will be accessed by the EESws web server, so it is necessary to ensure that it is working properly.

Installing the EESws Web Server on a Server Computer

It is next necessary to install the EESws web server program. The instructions that are provided in this section are specifically written for the Windows 7 operating system. However, the process will be similar for other Windows operating systems.

Download the file EESws_8001.zip from <http://fchart.com/ees/eesws.php>. If you have already done this step, it may not be necessary to repeat it. However, a new version of the EESws may be available and it would be best to use the latest version. Copy the EESws_8001.zip file into the EESws_8001 directory and unzip it. The directory contents should now appear as shown in Figure 7.










Name ^	Date modified	Type	Size
 IMGS	8/16/2013 5:29 PM	File folder	
 EESWS.pdf	8/16/2013 4:18 PM	Adobe Acrobat Doc...	417 KB
 EESWS_8001.exe	8/16/2013 3:52 PM	Application	16,739 KB
 EESWS_8001.exe - Install	8/14/2013 8:00 PM	Shortcut	1 KB
 EESWS_8001.exe - Uninstall	8/14/2013 8:00 PM	Shortcut	1 KB
 eesws_8001.zip	8/16/2013 5:29 PM	WinZip File	5,251 KB
 Throttle.DLY	8/16/2013 3:30 PM	DLY File	1 KB
 Throttle.EES	8/16/2013 2:59 PM	ees Document	150 KB
 Throttle.EXE	8/16/2013 3:30 PM	Application	9,152 KB

Figure 7: Listing of files in the EESws_87001 directory after unzipping EESws_8001.zip.

Right-click on the EESWS_8001.exe – Install file and select Run as Administrator (Figure 8).

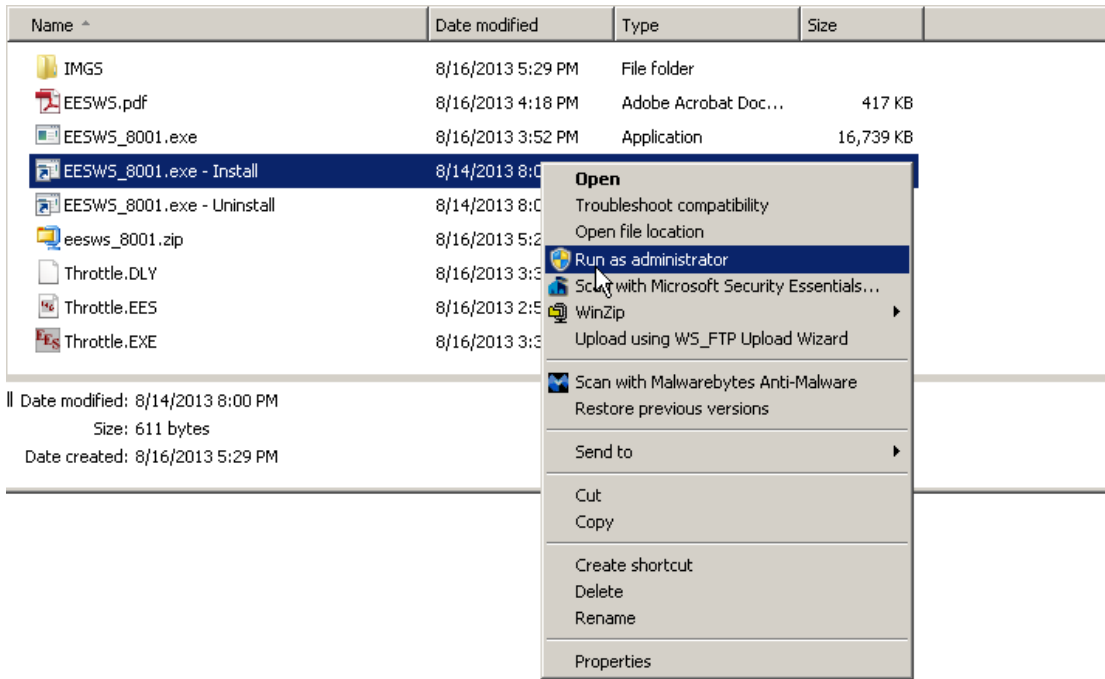


Figure 8: Installing the EESws server with administrator privileges.

A Windows system dialog (Figure 9) will appear asking for confirmation to install the program.

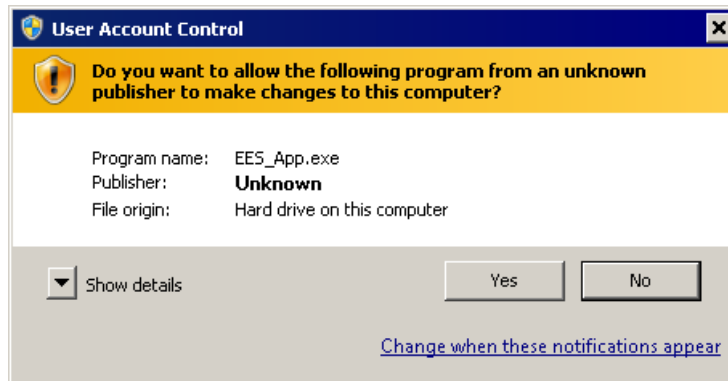


Figure 9: Windows system confirmation dialog.

Click Yes. You should next see a confirmation that the EESws_8001 service program has been installed.

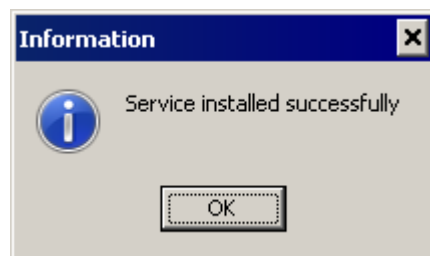


Figure 10: Confirmation that the EESws_8001 service program has been installed.

It is next necessary to start the service. This can be done by rebooting your computer. However, as an alternative to rebooting, you can do the following. Enter **cmd** in the edit box that appears when you click the Start button (Figure 11)



Figure 11: Entering cmd into the Start button edit box.

Hold the Ctrl and Shift keys down and then press the Enter button. This action will start the Command window with administrator privileges and the system dialog shown in Figure 12 will appear.

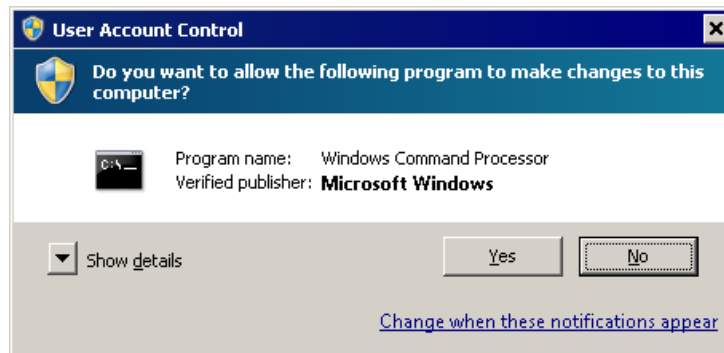


Figure 12: System confirmation dialog to allow administrator privileges.

Click the Yes button and you will be in the cmd window with Administrator privileges. Enter **net start EESws_8001** (Figure 13) and press the Enter key.

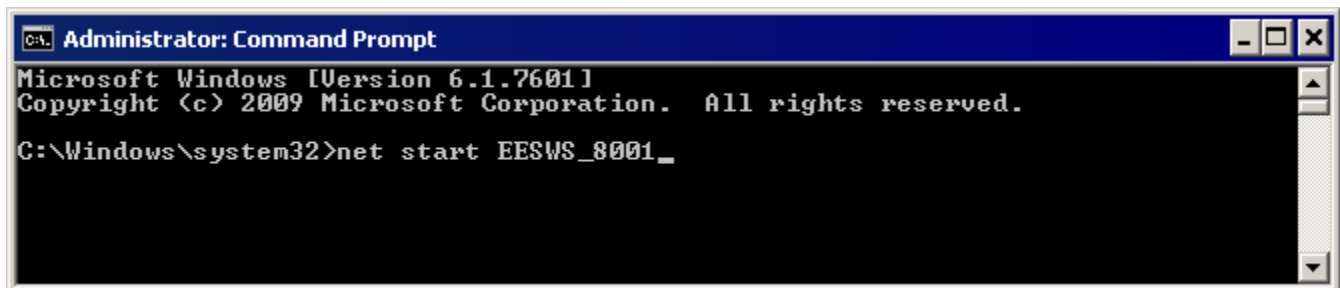


Figure 13: Command window with instructions to start the EESws_8001 web service.

You should see a confirmation that the EESws_8001 service has been started. Once the service is installed, it should not be necessary to repeat these instructions unless EESws_8001 is reinstalled.

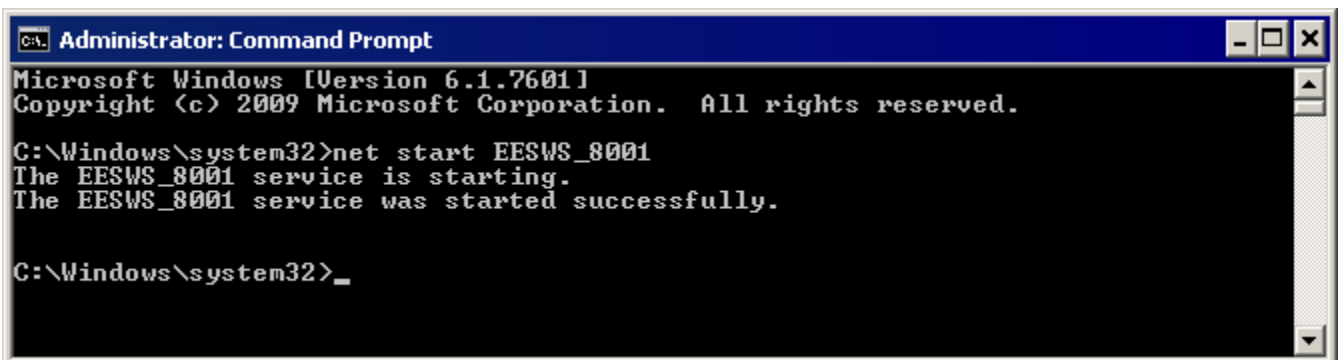


Figure 14: Command window showing a confirmation that the EESws_8001 service has been started.

Starting and Running EESws

It is necessary to know the IP address of the server in order to run the program through the internet. If you are testing the program on the server computer, you can use IP address 127.0.0.1, which is the address of the local computer's network adapter. However, you will surely want to access the program from a computer other than the server and will then need the server computer's IP address. The IP address can be found by entering **cmd** into the edit box that appears when you click the Start button to bring up the Command window, as shown in Figure 11. (It is not necessary to press the Ctrl and Shift keys). Enter **ipconfig** in the command window and press the Enter key. The IP address of the server is the series of numbers appearing to the right of IPv4 Address field, as seen in Figure 15. Write these numbers down as they will be needed to run your distributable program over the internet.

```
Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . :
    IPv6 Address . . . . .           :
    Temporary IPv6 Address . . . . . :
    Link-local IPv6 Address . . . . . :
    IPv4 Address . . . . .           : XXX.XXX.XXX.XXX
    Subnet Mask . . . . .           :
    Default Gateway . . . . .       :
```

Figure 15: Determining the IP address from the Command window.

EESws must be installed on the server, as indicated in the previous section. To start EESws, open a browser program (e.g., Firefox) and enter the IP address in the space for a URL followed by :8001/\$/ as shown in Figure 16. Replace XXX.XXX.XXX.XXX with your server IP address.

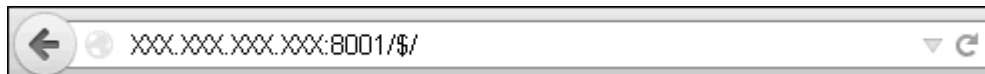


Figure 16: Starting the EESws program from port 8001 in a browser program.

Press the Enter key and EESws should start and display the header information seen in Figure 17. Click the Continue button to display the Diagram window.

EES Web Server Port 8001 Version 1.02
This is a special purpose version of EES
that has been developed to run specific problems.
This program may be freely distributed.

Continue

Figure 17: Header information displayed by the EESws program

If it does not start, you may have to modify parameters in your server firewall to allow access to port 8001, as described in the next section.

Modifying the Firewall Parameters

If you are running EESws from a computer other than your server and the browser hangs when starting EESws, the problem is likely that access to your server is restricted by your firewall. It will then be necessary to provide a rule to allow access to the server.

Open the Control Panel from the Start menu on the server computer (Figure 18). Select the System and Security item. Then click on Windows Firewall.



Figure 18: Control Panel dialog as it appears in Windows 7.

Click on the Advanced setting item at the left of window (Figure 19).

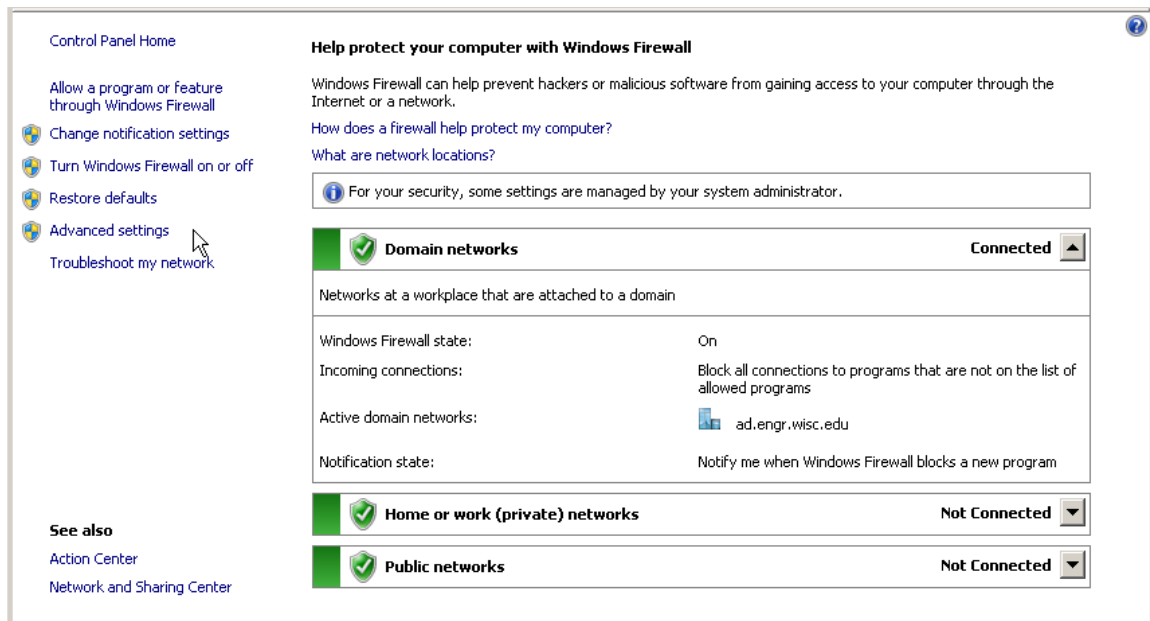


Figure 19: System and Security dialog in Windows 7.

Click on Inbound Rules in the panel at the left of the window. Now the Inbound Rules and Actions panels should be visible (Figure 20). Click on New Rule in the Actions pane.

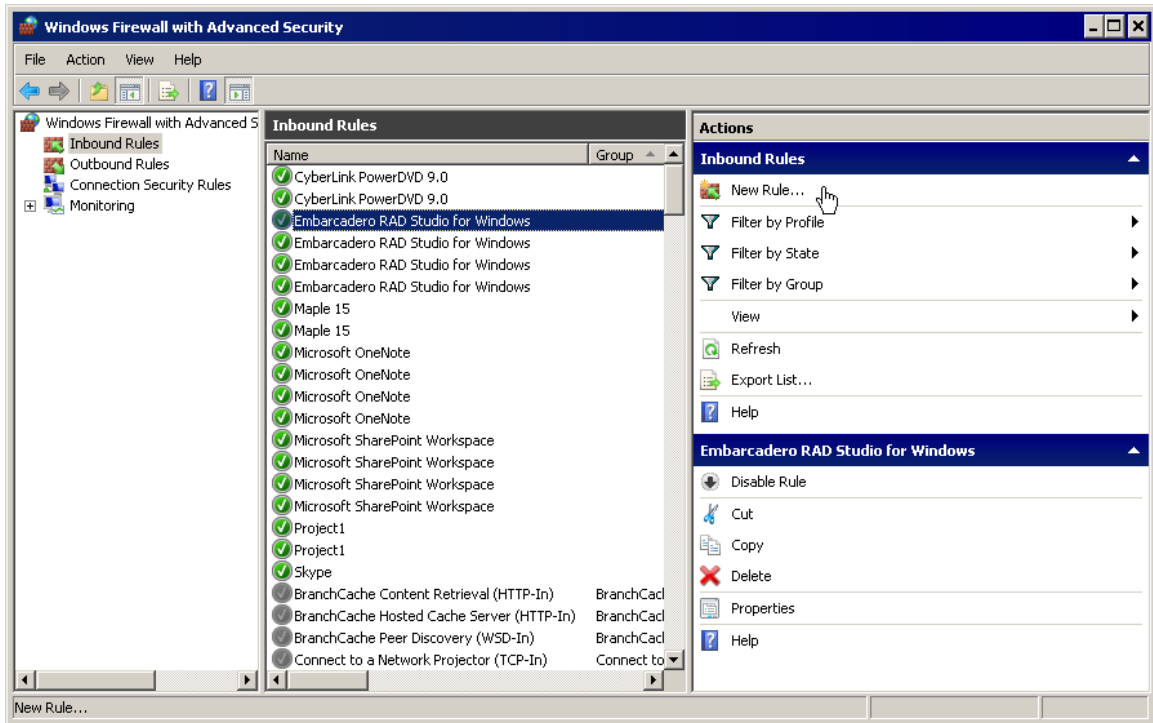


Figure 20: Firewall window showing Inbound Rules for Windows 7.

Select Port as the type of rule you want to create. Then click the Next button

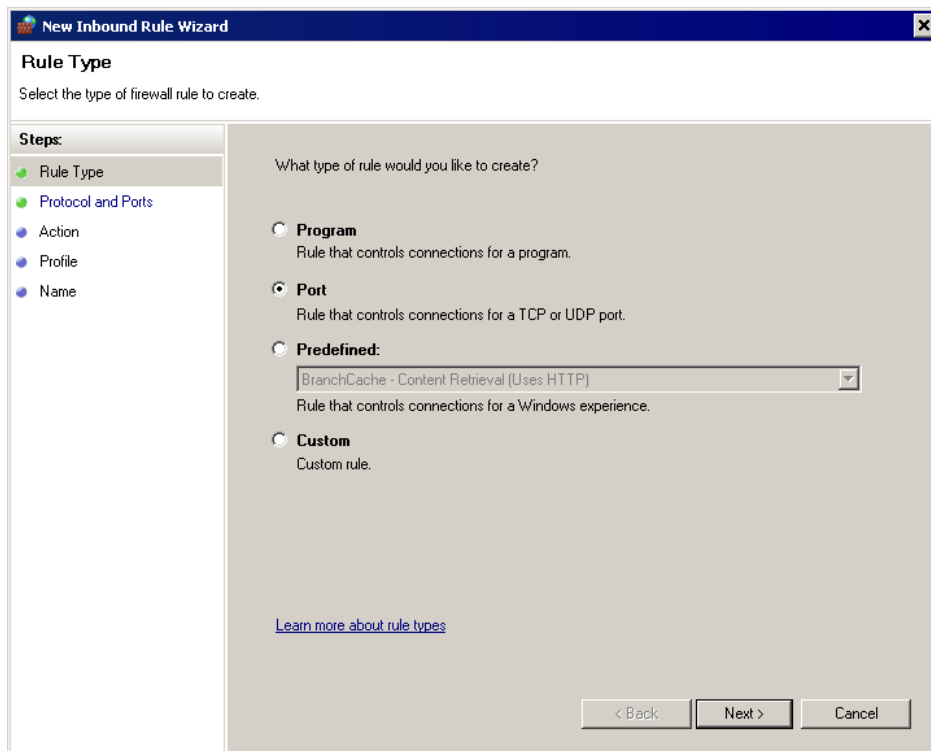


Figure 21: Inbound Rule Type dialog for Windows 7.

Click the Specific local ports button and enter 8001 (Figure 22). Then click Next.

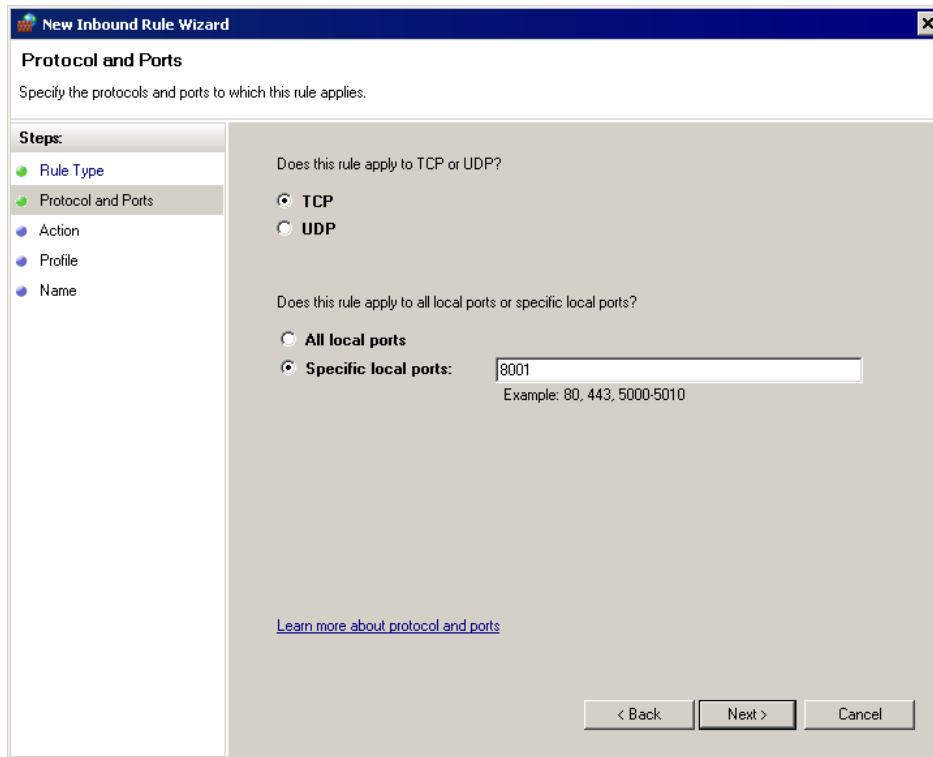


Figure 22: Specifying Port 8001 for the inbound rule.

Select Allow the connection (Figure 23). Then click the Next button.

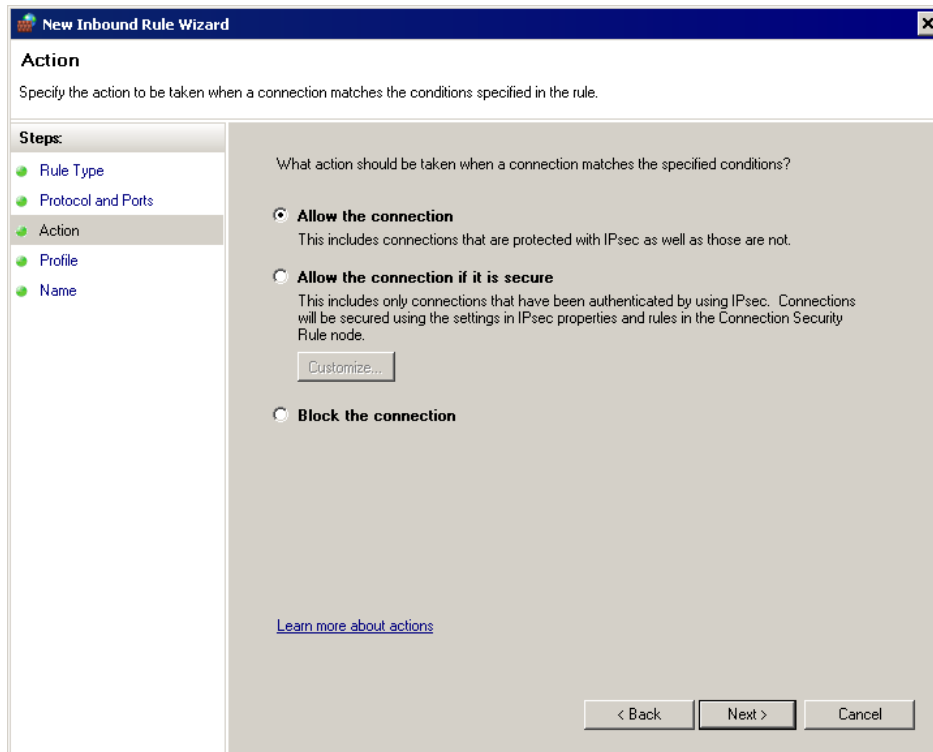


Figure 23: Specifying the Action for the inbound rule.

Check the boxes for when the rule will be applied for your needs (Figure 24). Click Next.

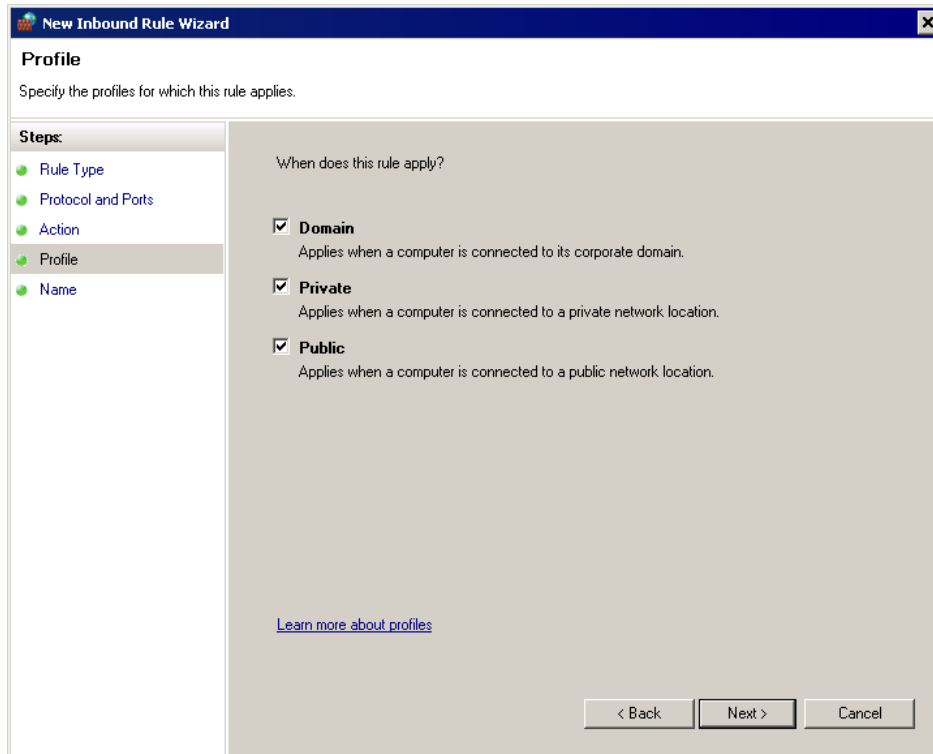


Figure 24: Specifying the Profile for the rule.

Enter EESws into the Name field and a description (Figure 25). Click Finish.

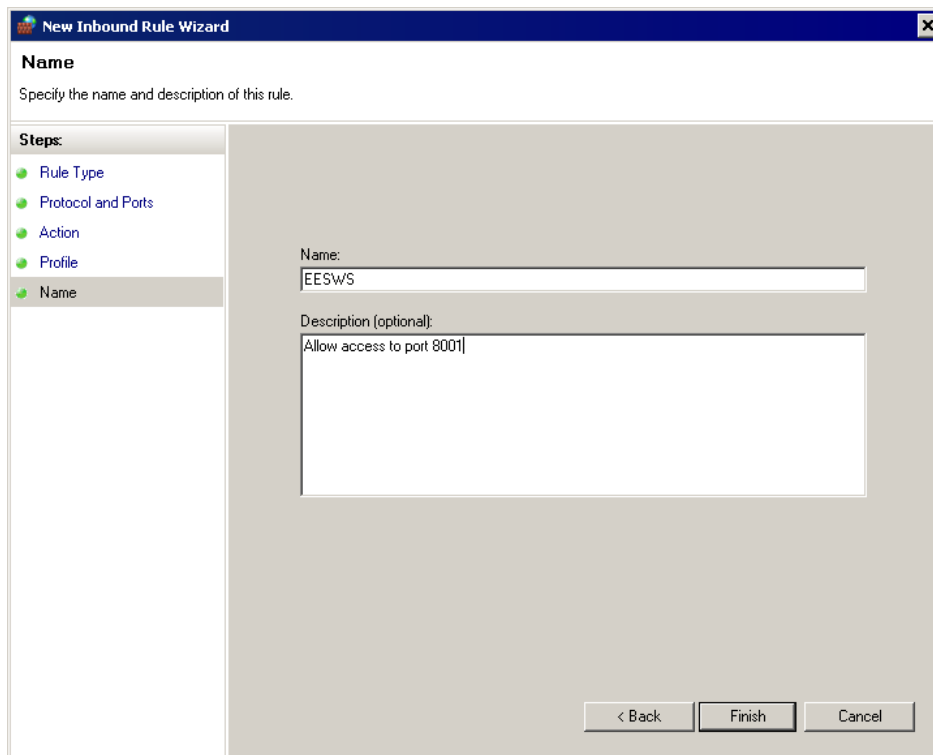


Figure 25: Specifying the Name and description of the rule.

Restart EESws by entering the IP number followed by :8001/\$/ in your browser as described above. If the firewall was the problem, EESws should now start and display its startup message.

Running a Distributable Program with EESws

Now that the EESws_8001 has been installed as a service and a rule has been provided to allow the service to operate, the distributable program should start when you enter the IP address, followed by :8001/\$/. A page will appear to identify the version of EESws and display the three lines of splash screen information entered in the EES Distributable Program Setup dialog (Figure 26).

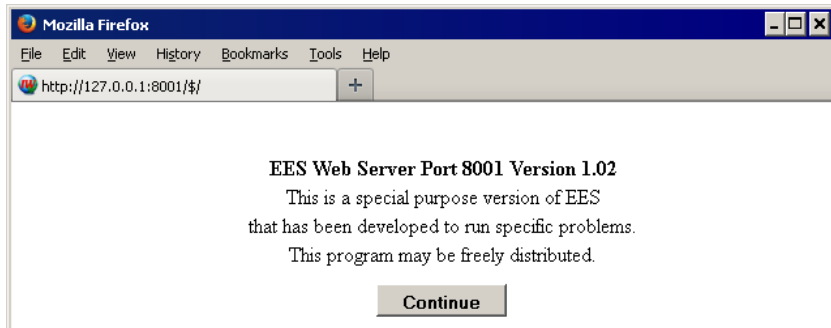


Figure 26: Appearance of the EESws program at startup.

Click the Continue button and the internet version of the Diagram Window will appear (Figure 27).

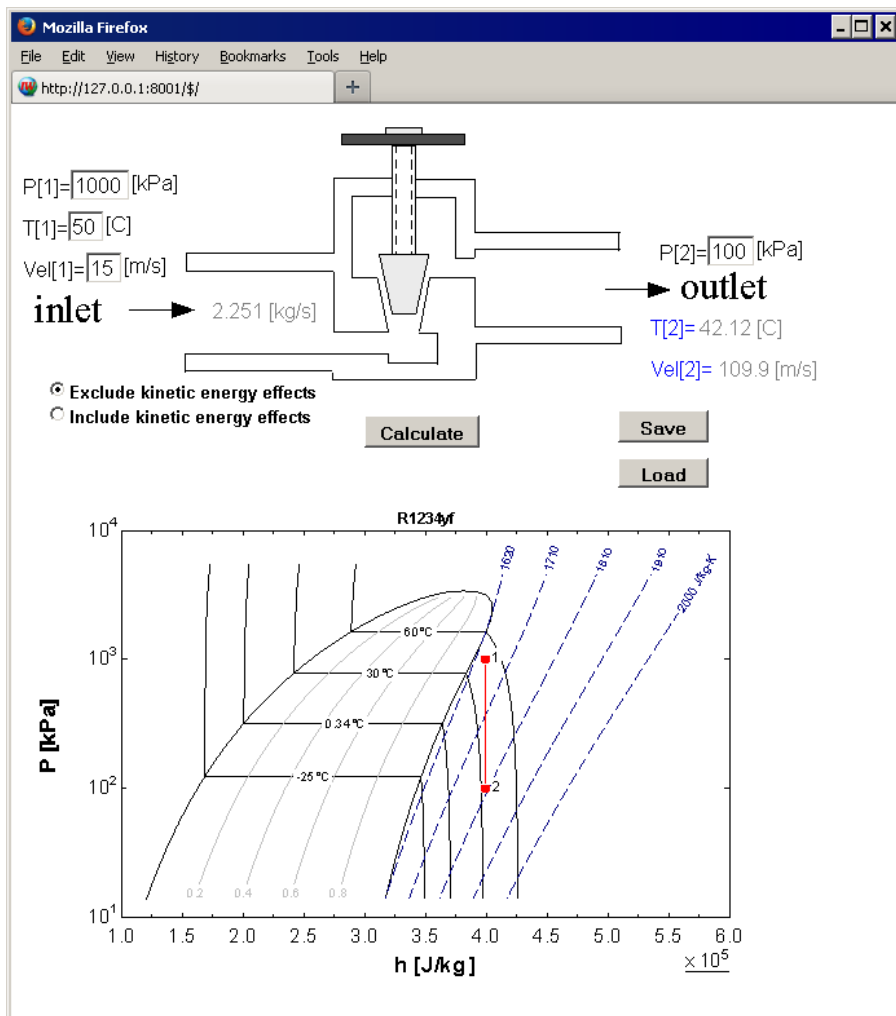


Figure 27: Diagram Window display in the browser window.

The window is intended to operate just like the Diagram Window in an EES program. Input values, such as the value of $P[1]$, are entered into the edit boxes or selected from drop down boxes (which are not used in the example). Outputs, such as $T[2]$, are displayed in gray font until the calculations are completed. When the Calculate button is clicked, EESws will collect all of the input information on the page and write it to a file on the server computer. Then it will start the Distributable program, which must reside in the same folder as the EESws program, here called EESws_8001. The Distributable program will run on the server in a hidden manner. When the calculations are completed, the Distributable program will write a file with output information and possibly update files in the IMGS folder. When EES is finished, EESws will open the files that EES has written and display them in the browser window.

The Save and Load commands operate slightly differently in EESws than they do in a Distributable program. When you click the Save button, an edit box will appear to the right of the Save button. The edit box initially contains the word FileName, as shown in Figure 28. The Save button saves all of the input values in the Diagram window in a file that is stored on the server computer. The file will appear within a folder named /DATA. The file name that is entered here (e.g., Data set 1) should not have any path information or file name extension. EESws will strip this information if it is entered. Clicking the Save button after the file name has been entered will save the file and close the file name edit box.



Figure 28: Edit box appears after clicking the Save button.

The Load button opens a previously saved input data file. It operates in a manner similar to the Save button. After clicking this button, a scrollable list box will appear to the right of the button. Click the arrow on the right side of the list box to display all of the files that have been previously saved (Figure 29). Select the desired file and then click the Load button again to load the file and hide the list box.

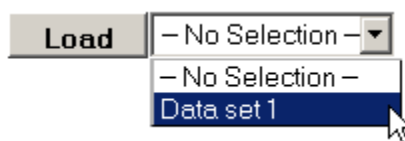


Figure 29: File list box that appears after clicking the Load button.

Unlike the Diagram Window in EES, the inputs in the EESws program are not checked until the Calculate button is clicked. Some error detection is provided within EESws, including checking the lower and upper limits on input variables. For example, the lower and upper limits for variable $P[1]$ were set to 100 kPa and 1200 kPa, respectively, in the EES Variable Information dialog. (Note that the bounds and guess value cannot be set with another variable when using EESws.) If you enter a value outside of this range then EESws will display an error message in a yellow status bar at the top of the window when the Calculate button is clicked, as shown in Figure 30.

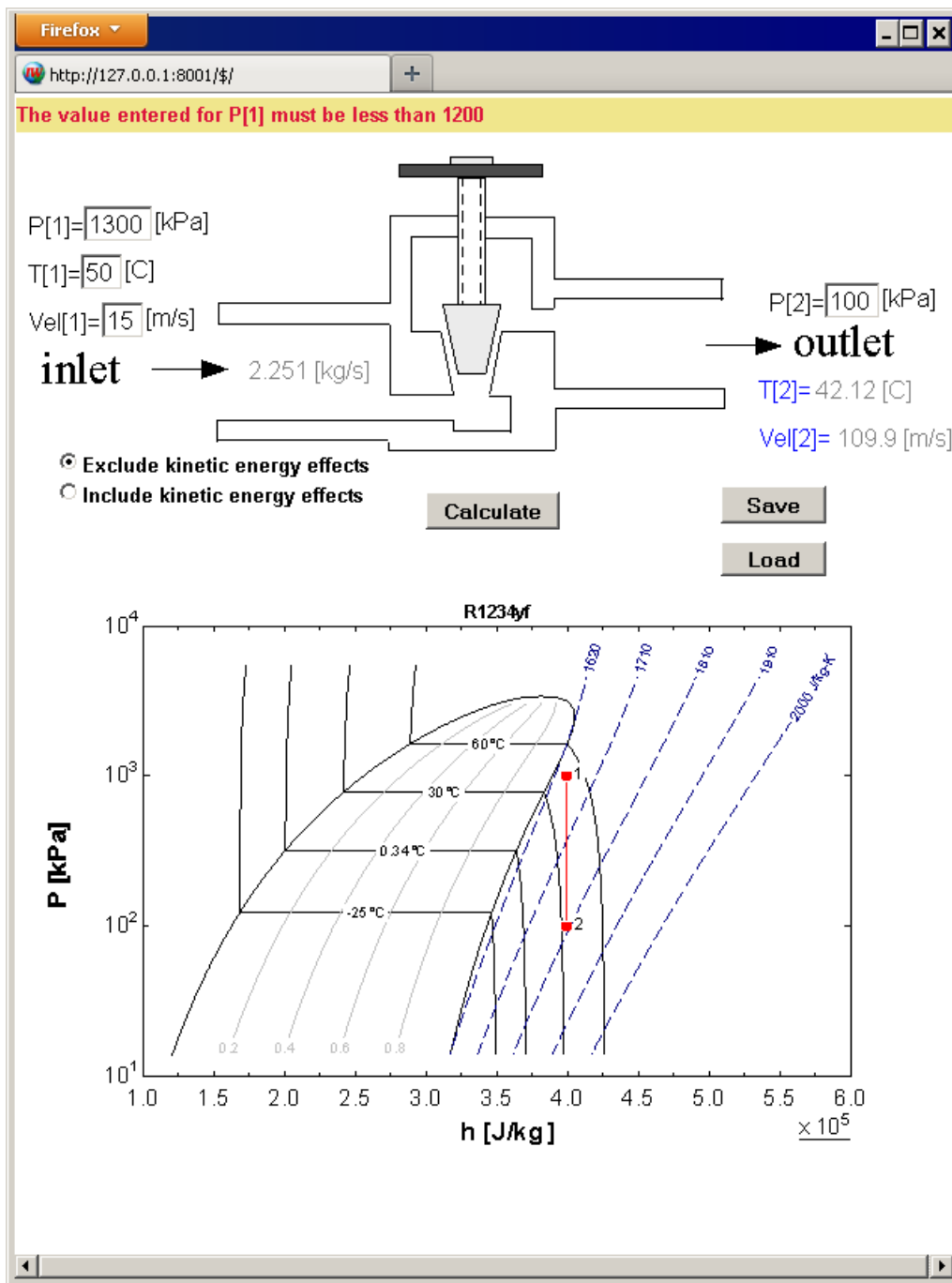


Figure 30: Error message resulting from entering a value for P[1] that is out of the specified bounds.

EES should also catch most typing errors. If, for example, you enter a non-numerical character in the input field, then the error will be reported in the status bar (Figure 31).

Illegal input for P[1] = 1A00

Figure 31: Error message displayed when a non-numerical character appears in an input field.

However, the error detection is not perfect and some unexpected inputs may cause the program to hang. See the Operating Tips and Trouble Shooting section for information on how to recover if EES or EESws hangs.

Uninstalling EESws

Follow these instructions if you no longer wish to use EESws and you want to completely remove it from your server computer.

1. Right-click on the EESws_8001.exe – Uninstall shortcut file that should exist in the EESws_8001 folder, as shown in Figure 7.
2. Select Run as Administrator from the pop up menu. Enter Yes in the User Account Control dialog. You should then see the confirmation dialog in Figure 32.

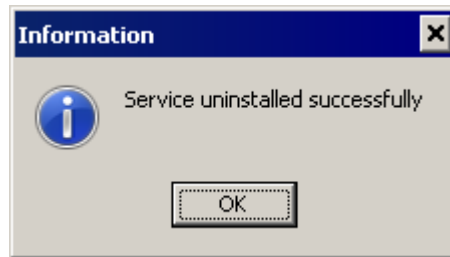


Figure 32: Confirmation that the service has been removed

3. If you entered a firewall rule, you should remove it by locating the EESws rule in the Input Rules panel of the Windows Firewall dialog. Click on rule then press the Delete key.
4. Restart your server computer.
5. Delete the EESws_8001 directory and its contents.

It is not necessary to completely delete EESws if you wish to temporarily stop the internet service or update the EESws_8001.exe program. In this case, all that is needed is to stop the service. This is most easily accomplished through the Windows command window. Enter **cmd** in the edit box that appears when you click the Start button (Figure 11). Hold the Ctrl and Shift keys down and then press the Enter button. This action will start the Command window with administrator privileges. The system dialog shown in Figure 12 will appear. Click the Yes button and you will be in the Command window with Administrator privileges. Enter **net stop EESws_8001** (Figure 33) and press the Enter key

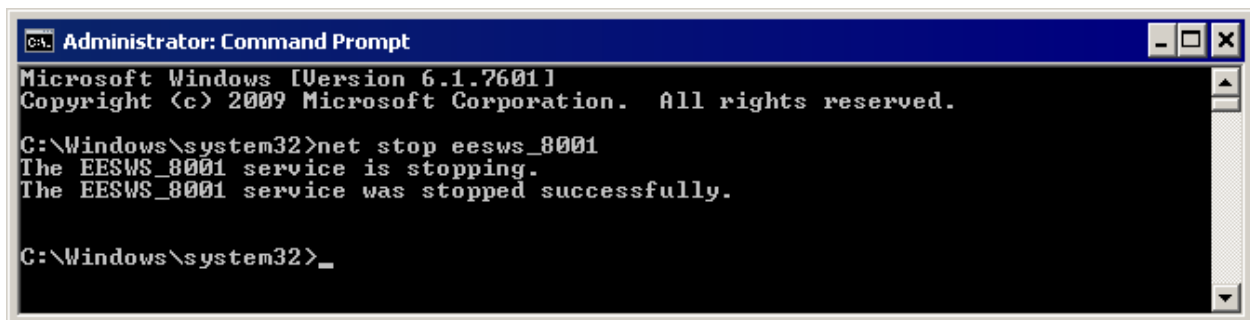
A screenshot of a Windows Command Prompt window titled "Administrator: Command Prompt". The window has a blue title bar with standard minimize, maximize, and close buttons. The main area is black with white text. The text displayed is: "Microsoft Windows [Version 6.1.7601] Copyright (c) 2009 Microsoft Corporation. All rights reserved. C:\Windows\system32>net stop eesws_8001 The EESWS_8001 service is stopping. The EESWS_8001 service was stopped successfully. C:\Windows\system32>_".

Figure 33: Stopping the EESws_8001 service from the Command window.

The EESws_8001 program will now be disabled and not accessible to users. This step is necessary if you need to update the EESws_8001.exe program, as otherwise it will be locked. To restart the service, enter **net start EESws_8001** in the Command window with administrator privileges (Figure 14).

Operating Tips and Trouble-Shooting

1. Only one EES Distributable program can be run from a single internet port. EESws_8001 is provided at no charge and it is designed to operate from port 8001. The EESws_8001 directory should contain only one file with a .dly file name extension and a matching file with an .exe file name extension. If you wish to have a different program available on port 8001, delete the .dly, and .exe files and the \IMGS folder from the EESws_8001 folder. Then create the new distributable program and copy the .dly file, the .exe file and the \IMGS folder to EESws_8001 folder. The new distributable program will appear when the browser is started with the appropriate URL.
2. If you need to have more than one distributable program available at the same time, you will need to purchase EESws programs for other ports. Contact F-Chart Software (info@fchart.com) for pricing and availability.
3. It is not necessary to install the program in the C:\EESws_8001 directory. However, if it installed in a different directory, it will be necessary to modify the EESws_8001.exe – install and EESws_8001.exe – uninstall shortcut files. To do so, right-click on the file and select Properties from the popup menu. Modify the director information in the Target and Start in fields shown on the Shortcut tab in Figure 34.

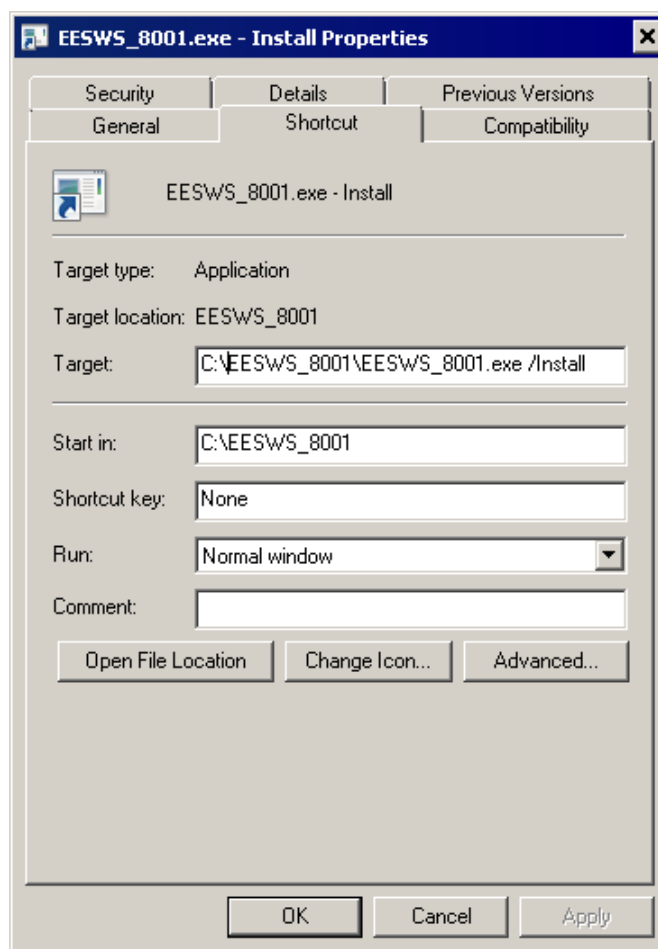


Figure 34: Shortcut EESws_8001.exe – Install file properties.

4. EESws allows up to 5 concurrent users. Have your users log out when they are not using the program. If a problem with concurrent users occurs, it can be reset simply by stopping and restarting

the service using the net start EESws_8001 and net start EESWS_8001 commands, respectively while in the Command dialog with administrator privileges.

5. If EESws hangs, it is possibly due to the EES Distributable program not being closed. The program will need to be reset on the server computer. The Task Manager provides the best way to determine if the Distributable program is running is to use Enter Alt-Ctrl-Delete to start the task manager. Click the Service tab to see if the EESws_8001 service is running, as seen Figure 35.

Name ^	PID	Description	Status	Group
Dhcp	348	DHCP Client	Running	LocalServic...
Dnscache	1328	DNS Client	Running	NetworkSer...
dot3svc		Wired Auto...	Stopped	LocalSyste...
DPS	1680	Diagnostic ...	Running	LocalServic...
EapHost		Extensible ...	Stopped	netsvcs
EESApp	1836	EESApp	Running	N/A
EESWS_8001	4456	EESWS_8001	Running	N/A
EFS		Encrypting ...	Stopped	
ehRecvr		Windows M...	Stopped	N/A
ehSched		Windows M...	Stopped	N/A
eventlog	348	Windows E...	Running	LocalServic...
EventSystem	528	COM+ Eve...	Running	LocalService
Fax		Fax	Stopped	N/A
fdPHost	528	Function Di...	Running	LocalService
FDResPub		Function Di...	Stopped	LocalServic...
FLEXnet Lic...		FLEXnet Lic...	Stooed	N/A

Figure 35: Services tab in the Task Manager showing the EEWS_8001 is running.

If the service is not running, it will be necessary to restart it following the directions in the Installing the EESws Web Server on a Server Computer section. If the service is running but access is still not possible, click the Processes tab in the Task Manager. Click the Show processes from all users button. Look for a process having the name of the EES Distributable program. If it exists, select it and click the End Process button.

6. When the Calculate button is clicked, the EESws will prepare a text file of inputs to provide to EES. The file will be named yourProgram@8001_XXXX.txt, where XXXX is a four digit number. These inputs provide the information entered from the web-based Diagram window. The EESws program normally deletes the input text file. If the program is not running properly, it may be helpful to review the list of inputs so, among other things, ensure that there are no duplicates. If you hold the Shift key down while pressing the Calculate button, EES will not delete the input file.