

Computation Server WEStation User's Guide

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Summary of Changes

This revision of “Computation Server User’s Guide” (U0-8600) has been updated to include information related to software releases 8.5 and later. These changes include the following:

- **Section 3. Computation Server Configuration** describes the functions and definitions of the WDPF Init Tool and WDPF Admin Tool for defining and configuring the Computation Server.
- **Section 4. Computation Server Redundancy Scheme** describes how to incorporate the CS Redundancy package onto a WEStation, and how to define redundant CS drops via the WDPF Init Tool.

Describes how to configure the Ethernet Monitor using the WDPF Admin Tool.

Section 4 was also changed to describe how software can programmatically cause a failover to occur. (Section 4-2.4)

- **Section 5. Using the Computation Server** describes how to add the CS Computation Server Scheduler package to a drop and how to access the Translators via the Admin tool.

Explains how to create and/or edit the process trigger specifications file.

Describes CS library functions that support application execution in determining scheduling priorities and cause of execution.

- **Section 6. Calculation Support Functions** describes how to access the Calc Support via the WDPF Init Tool.
- **Section 7. Watchdog Functions** adds the Computation Server Watchdog package to a drop using the Init and Admin tool. This section also describes the contents of the required tasks file, and how it is modified via the WDPF Admin Tool.
- **Appendix A. Adding a Software Package to a Drop** describes how to create and modify software packages using the WDPF Init Tool and WDPF Admin Tool.

Miscellaneous clarifications and corrections have also been incorporated.

Section 1. Introduction

1-1. Overview

The WEstation Computation Server provides an optionally redundant platform for the execution of calculation and predictive programs. The applications run on the Computation Server are dispatched based upon system events detected from the WDPF® Westnet II™ Data Highway, user intervention, or periodic scheduling. The purpose of the Computation Server software is to provide the tools to allow the application programs to be developed and dispatched based on the appropriate time or event.

The Computation Server provides the following features:

- Gives the user the ability to configure and build custom menus to initiate and control application processes through menu-based systems.
- Uses the Hot Standby redundancy scheme to lessen the impact of drop failure.
- Provides Calculation Support Functions that allow the user to specify application input and output in an off-line environment.
- Provides on-line application program support through the use of library calls. These library calls are used to set process-dispatching parameters (periodic or event-based), to request input and output data over the Data Highway, and to communicate application mode status for external operator/user monitoring.
- Provides a Watchdog function that monitors the execution status of critical processes.

1-2. Contents of this Document

This document is organized into the following sections:

- **Section 1. Introduction** briefly describes the purpose of the Computation Server and the organization of this manual.
- **Section 2. Computation Server Overview** describes the requirements of the Computation Server and some of its functions.
- **Section 3. Computation Server Configuration** describes the functions and definitions of the Init Tool and the Admin Tool for defining and configuring the Computation Server.
- **Section 4. Computation Server Redundancy Scheme** describes the Computation Server redundancy scheme and manual failover and start-up.
- **Section 5. Using the Computation Server** describes the Computation Server user interface for both Engineering on-line monitoring. It also describes the Computation Server library functions for getting and setting drop and application modes.
- **Section 6. Calculation Support Functions** describes the Computation Server support for developing and running algorithms and calculations.
- **Section 7. Watchdog Functions** describes the Computation Server Watchdog functions, used to ensure periodic execution of application software.
- **Appendix A. Adding a Software Package to a Drop** describes how to create and modify software packages using the WDPF Init Tool and WDPF Admin Tool.

1-3. Additional Reference Documents

Table 1-1 lists additional reference documentation which may be helpful while using this document.

Table 1-1. Reference Documents

Document Number	Title	Description
<u>M0-0003</u>	Self-Test Diagnostics	Lists the WDPF System fault codes.
<u>M0-8000</u>	WDPF System Planning and Highway Installation Manual	Describes installation of the WDPF highways.
<u>M0-8005</u>	Drop Installation Manual	Provides information on drop installation and configuration.
<u>U0-0131</u>	Record Types User's Guide	Describes all point types on the WDPF highway and their corresponding record fields.
<u>U0-8002</u>	WESAPI User's Guide	Provides information on SHC and SPD library routines.
<u>U0-8100</u>	Operator WEstation User's Guide	Provides information on the Operator WEstation menus and windows.
<u>U0-8110</u>	Operator WEstation Configuration Manual	Describes the procedures for creating menu windows.
<u>U0-8200</u>	Engineering WEstation User's Guide	Provides instructions for using Engineering WEstation utilities, including Software Server functions.
<u>U0-8205</u>	System Point Directory User's Guide	Describes the System Point Directory (SPD), a file that holds a master list of all the data points in the system. Redundancy configuration is set up through the database compiler.
<u>U0-8210</u>	WEStation Graphics Builder User's Guide	Describes the procedures for creating and editing process graphics using the Graphics Builder.

Table 1-1. Reference Documents (Cont'd)

Document Number	Title	Description
<u>U0-8211</u>	WEStation Graphics Language Reference Manual	Provides a reference to the graphics source language rules and commands.
<u>U0-8300</u>	Defining and Configuring WEStations	Provides instruction on performing configuration functions using the Init and Admin Tools.

In addition to the documents listed in Table 1-1, this manual may refer to “applicable vendor documentation” which is defined on a project basis. These documents may include:

- Operating system (UNIX/Solaris) manuals.
- Window manager (OpenWindows) documentation.
- Workstation hardware (Sun) documentation.
- Peripheral device documentation.

Man pages (standard UNIX on-line documentation) are also available for operating system functions and certain WDPF functions.

Section 2. Computation Server Overview

2-1. Section Overview

This section provides a brief overview of the Computation Server functions. The following topics are included:

- Definitions of terms ([Section 2-2](#)).
- Computation Server requirements ([Section 2-3](#)).
- Overview of Computation Server functions ([Section 2-4](#)).

2-2. Definitions of Terms and Modes

This section defines terms and phrases specific to the Computation Server. General WDPF terms are defined in the Glossary.

Table 2-1. Computation Server Terms

Term	Description
application mode	<p>The mode of the software tiered above the Computation Server Executive software (see Table 2-2). This mode is initially Undetermined, and is set to Primary, Backup, or Offline. (The software component responsible for setting this mode is determined by the ServerMonitor.ModeSetBy parameter in the monitor_defaults file. The user sets this parameter from the WDPF Admin Tool).</p> <p>On the Primary drop, the application mode should become Primary after completing its initialization.</p> <p>On the Backup drop, the application mode should only become Backup when the application is prepared to become Primary in the event of a failure on the Primary drop. To prematurely indicate Backup mode may cause a Manual failure of the Primary before the Backup is fully prepared to assume control.</p> <p>Offline indicates a failure or shutdown of the application.</p>
Data Highway mode	<p>Based on the <i>drop mode</i>, the Executive software will set the drop's Data Highway into Primary or Backup mode (see Table 2-2).</p> <p>Both mode settings allow the broadcast of the drop's status over the Data Highway.</p>
drop mode	<p>Executive software determines if a drop should be in Primary mode or in Backup mode (see Table 2-2).</p> <p>If an error (one that has been defined as appropriate to fail the drop) occurs, the drop is put into Offline mode.</p> <p>Refer to Section 4 for redundancy information, and to Section 7 for Watchdog information.</p>
Event/Periodic Checker	<p>A real-time process that checks time and events against internal tables of programs to be run. This process runs at 0.1 second intervals and queues dispatch request for the Dispatcher whenever an event or periodic trigger is detected.</p>

Table 2-1. Computation Server Terms (Cont'd)

Term	Description
Event/Periodic File Translators	Programs that create data files specifying events or time-based scheduling information for the Event/Periodic Checker software to monitor. This information is used by the WEStation Server Diagnostic window to display a list of processes. See the system man pages on cseft and cspft for more information.
Executive software	Software that controls system start-up, shutdown, application process dispatching, and health monitoring.
failover	Automatic or manual switching of a drop from Primary mode to Offline mode in the event of failure on the Primary server. A healthy Backup drop then assumes Primary mode, if available.
hot standby	The redundancy method chosen for redundant Computation Servers to allow Backup promotion quickly upon Primary <i>failover</i> . A Backup Computation Server's Data Highway will be in Backup mode, meaning application-originated data doesn't get onto the Data Highway. This means that, depending on specific application requirements, application software may run the same way on a Primary or Backup Computation Server, depending upon the Data Highway mode to either allow or prevent originated data from reaching the Data Highway.
redundancy	A configuration of two peer Computation Servers, where one drop serves as a Backup, providing a redundant platform in the event of failure of the Primary Computation Server.

Table 2-2 lists the possible selection of Computation Server modes:

Table 2-2. Computation Server Mode Determination

	Drop Mode	Data Highway Mode	Application Mode (Set by component named by <i>SERVER MONITOR MODE</i> <i>SETBY</i> parameter)
Initialization or Reboot	Initial	Backup	Undetermined
Executive Software Decides Primary or Backup	Primary or Backup	Primary or Backup	Highway: Primary or Backup Watchdog: Undetermined Application: Undetermined
Application Ready	No effect	No effect	Highway: No effect Watchdog: Primary or Backup when all required task file processes for the drop mode have registered. Application: Primary or Backup
Non-Critical Error Occurs	No effect	No effect	Highway: No Effect Watchdog: No effect Application: Decided by Application
Critical Error Occurs	Offline	Backup	Highway: Offline Watchdog: Offline Application: Decided by Application
Shutdown	Offline	Backup	Highway: Offline Watchdog: Offline Application: Decided by Application

The application mode can be set through Bits 3-4 of the Drop Status Record's field (Reference U0-0131).

2-3. Computation Server Hardware Requirements

The Computation Server drop consists of the following:

- Workstation connected to the WDPF Westnet II Data Highway.
- Connection to the Information Highway (Ethernet).
- Possibly an additional WDPF Westnet II Data Highway and Information Highway.

A Computation Server, along with additional application software, could support a gateway to transfer data from one WDPF Westnet II Data Highway to another.

For information on drop installation, see “Drop Installation Manual” (M0-8005).

2-4. Overview of Computation Server Functions

The WESation Computation Server provides an optionally redundant platform for the execution of calculation and predictive programs. It allows the user to dispatch applications using a configurable user interface, to specify input and output information in an off-line environment, to request input and output information in an on-line environment, to monitor the status of critical processes run on the Computation Server, and to communicate application mode status for external user/operator monitoring.

2-4.1. Redundancy Scheme

The Computation Server uses the “hot standby” form of redundancy, consisting of two workstations: a Primary drop and a Backup drop (Hot Standby). The Hot Standby drop can track data going to and from the Primary drop and can be ready to begin broadcasting data in case the Primary drop fails. During normal operation of the Computation Server, both Primary and Backup drops run all the required application programs. The Primary and Backup drops differ in that only the Primary server broadcasts information to the system. This allows fast failover in the event of Primary failure.

The Computation Server redundancy scheme is described in [Section 4](#).

2-4.2. Computation Server Processes

The **Initialization/Redundancy** function is a real-time process that starts the Event/Periodic Checker and Dispatcher processes, and runs at 0.1-second intervals thereafter, to provide redundancy control.

The **Event/Periodic Checker** is a real-time process that checks time and events against internal tables of programs to be run. This process runs at 0.1-second intervals and gives a dispatch request for the dispatcher whenever an event is detected.

The **Dispatcher** process is triggered by the Event/Periodic checker at 1-second intervals, dequeues dispatch requests made by the Event/Periodic Checker, and sends requests for execution of processes to the operating system.

The Computation Server also provides a set of library routines (described in [Section 5](#)) that may be used by application programs. These include functions that set or return information about the application, functions that control system redundancy, and functions that add or remove point specifications from the Event/Periodic tables.

2-4.3. User Interface

The Computation Server provides the following user interfaces:

- Event File Translator (**cseft**) and the Periodic File Translator (**cspft**) (available from the Engineering WEstation) create data files specifying events or time-based scheduling information for the Event/Periodic Checker software to monitor.
- WEstation Server Diagnostic window allows a user to request functions performed by the Computation Server.
- Request Generator generates requests for functions (such as starting an application program) to be performed by the Computation Server. These requests can be made from the user-built window, from a custom process diagram on the Operator WEstation, or from an applications-dependent menu.

The Computation Server windows are described in [Section 5](#).

2-4.4. Calculation Support Functions

Off-line Support Functions allow the user to describe a code template that performs some type of desired processing. The code template is described in terms of inputs, outputs, and execution frequency in an off-line environment.

Initialization Support Functions are functions that are performed when the calculation is initially activated in the Computation Server, such as converting a point name to a SID.

Run-time support functions support the on-line, periodic execution of a calculation, such as reading the current value of the referenced point.

Calculation Support Functions are described in [Section 6](#).

2-4.5. Watchdog Functions

The Watchdog function monitors the periodic execution of critical processes and may initiate certain corrective action, depending on the configuration and the current state of the process being monitored.

The Watchdog function is described in [Section 7](#).

Section 3. Computation Server Configuration

3-1. Section Overview

The Computation Server configuration will be performed through two utilities that are provided with the WDPF release and appear initially as two icons on a WEStation screen. These utilities are the Init Tool and the Admin Tool.

Definition of terms used in navigating through the WEStation Configuration Tools windows can be found in “[Defining and Configuring WEStations](#)” (U0-8300).

This section describes the functions and definitions of the Init Tool and the Admin Tool for Defining and Configuring the Computation Server.

3-2. Init Tool Functions

Use the following procedures to enter the Initialization Utility:

1. Use the mouse to select the **WDPF Init Tool** icon from the Engineering WEStation screen.
2. [Figure 3-1](#) provides an example of the WEStation Initialization Utility main window that will display on the screen.

[Table 3-1](#) defines briefly the functions available through this window. Access the Help menu item “Defining the Drop Configuration” for additional information on window functions.

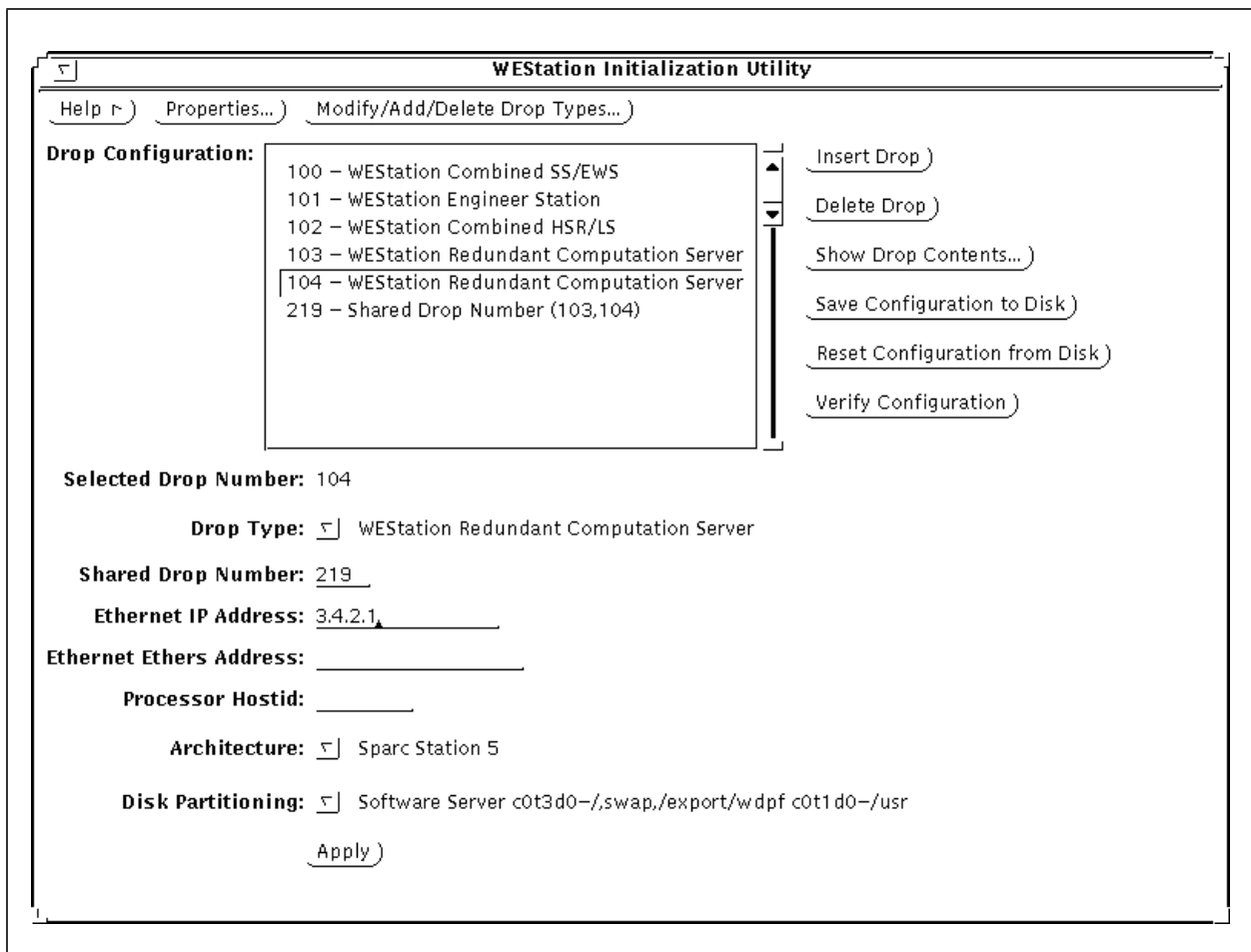


Figure 3-1. WEStation Initialization Utility Window

3. Make desired definition changes.

4. Select the **Save Configuration to Disk** button to save the changes to the disk.

The main window of the Init Tool contains the following functions:

Table 3-1. Initialization Utility Window Functions

Function	Description
Help Button	Displays a pull right menu that displays information Help pages for the Initialization Utility.
Properties Button	Accesses a pop-up window that displays the paths where the release software and the project software are located.
Modify /Add /Delete Drop Types Button	Accesses a pop-up window that allows the user to specify the software packages for each drop type, and to define new drop types.
Drop Configuration	Scrolling list that shows the drops that are currently defined in the project's configuration. Selecting a drop in this scrolling list will determine the drop type that is initially displayed when selecting the Modify/Add/Delete Drop Types function .
Selected Drop Number	Displays the drop number for the drop that is selected in the Drop Configuration list.
Drop Type	Displays the drop type for the drop that is selected in the Drop Configuration list. Also allows user to change selected drop's drop type.
Shared Drop Number	Displays the shared drop number for the drop that is selected in the Drop Configuration list. Redundant WEstations and DPU's with TDM Savings require three drop numbers: one for each drop and one drop that they share.
Ethernet IP Address	Displays the Internet Protocol (IP) address for the drop that is selected in the Drop Configuration list. If an address is not entered, one will be assigned automatically. For example, 192.9.200.157. Do not use leading zeros.
Ethernet Ethers Address	Displays the unique hardware address for each Ethernet port for the drop that is selected in the Drop Configuration list. Format is six two-digit hexadecimal numbers separated by colons. For example, 8:80:3f:f4:7:a9. To determine the Ethers address of a running WEstation, log in as root and enter the following: ifconfig -a
Processor Hostid	Displays the unique hardware address for each processor for the drop that is selected in the Drop Configuration list. Currently not required. To determine the Processor Hostid of a running WEstation, enter the following: hostid

Table 3-1. Initialization Utility Window Functions (Cont'd)

Architecture	Displays the hardware platform for the drop that is selected in the Drop Configuration list.
Disk Partitioning	Displays the disk partitioning for the drop that is selected in the Drop Configuration list.
Insert Drop Button	Adds a new drop to the configuration.
Delete Drop Button	Removes a drop from the configuration.
Show Drop Contents Button	Accesses a pop-up window that lists the software packages that are included on the drop that is selected in the Drop Configuration list.
Save Configuration to Disk Button	Writes the Configuration changes to the disk. This button is grayed out if there are no changes to be made to the configuration.
Reset Configuration from Disk Button	Erases configuration changes to the selected drop, and restores the last configuration for the selected drop that was to be saved to the disk.
Verify Configuration Button	Verifies that the system configuration is valid. Any errors are shown in a pop-up window.
Apply Button	Moves data from the bottom of the window into the scrolling list.

Note

Initialization Utility functions can be disabled by the System Administrator for security purposes. This will prevent unauthorized users from having write access to the configurable parameters (refer to [U0-8300](#)) for information on disabling functions).

3-3. Admin Tool Functions

Use the following procedures to enter the WEstation Admin Tool Utility:

1. Use the mouse to select the **WDPF Admin Tool** icon from the Engineering WEstation screen.
2. Figure 3-2 provides an example of the WEstation Admin Tool main window that will display on the screen. The window's contents will actually depend upon the software packages selected in the system. Table 3-2 defines briefly the functions available through this window. Access the Help menu item "Defining Configuration" for additional information on window functions.

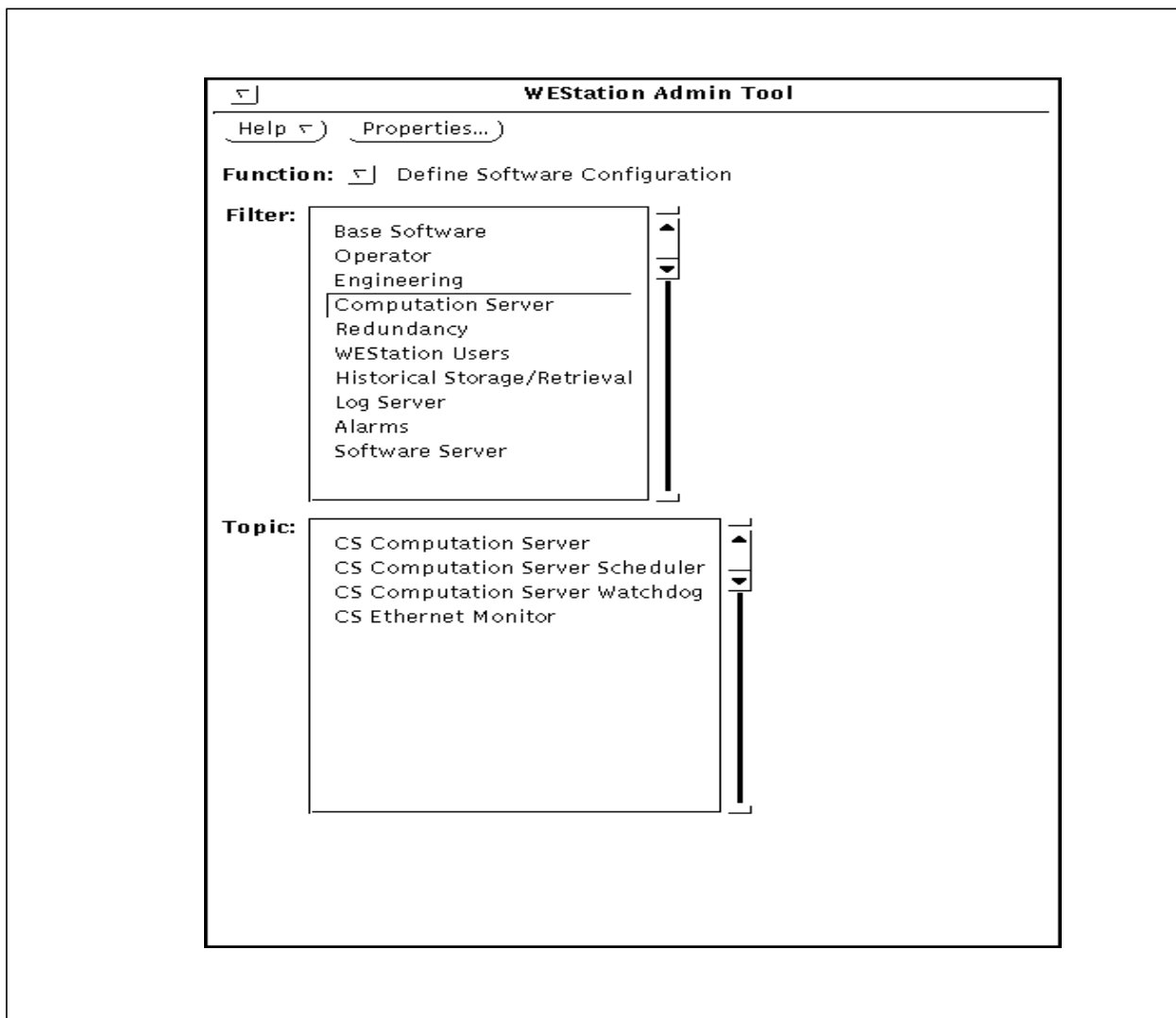


Figure 3-2. WEstation Admin Tool Utility Window

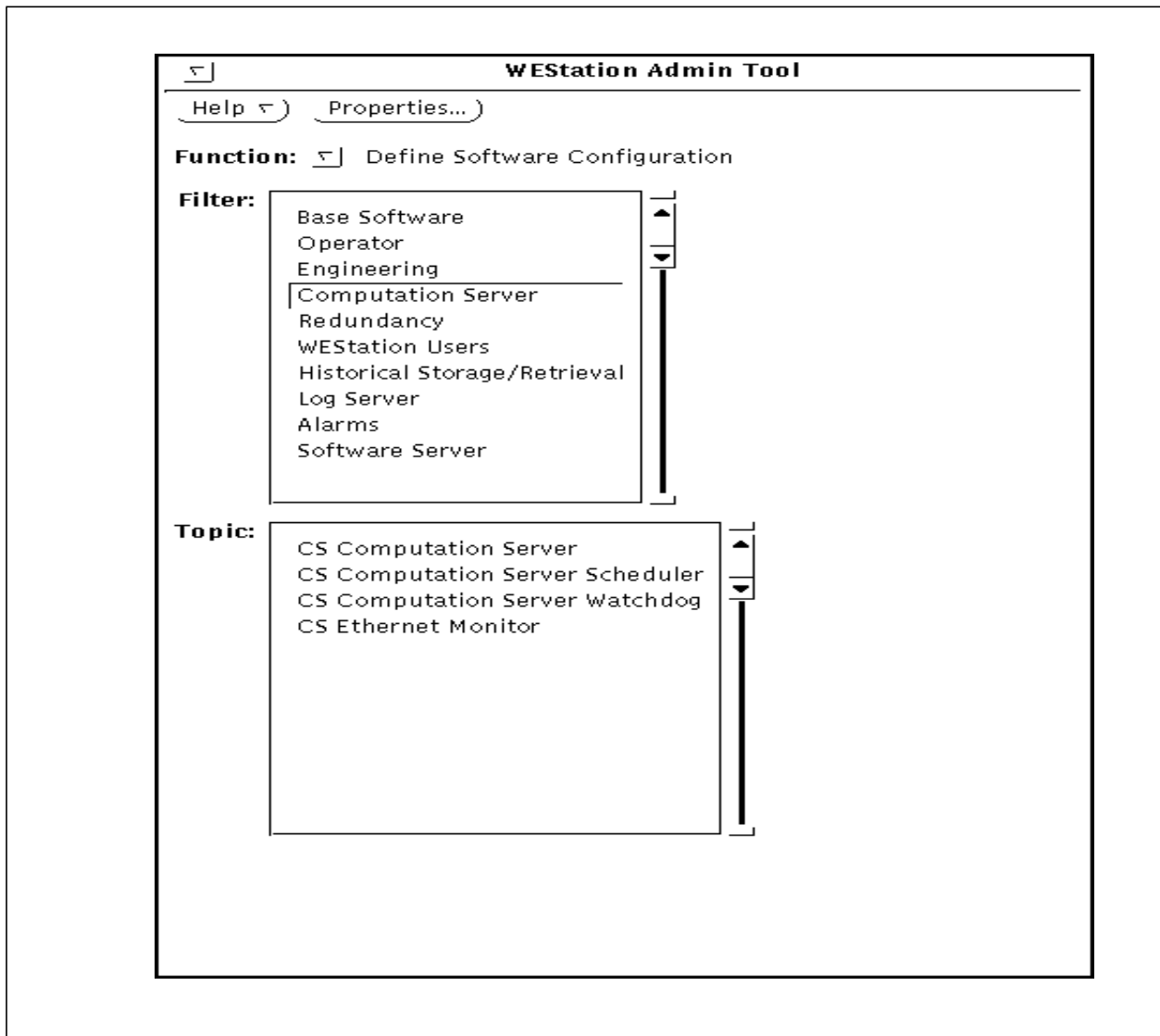
The main window of the Admin Tool contains the following functions.

Table 3-2. Admin Tool Window Functions

Function	Description
Help Button	Displays a pull right menu that displays information Help pages for the Admin Tool.
Properties Button	Accesses a pop-up window that displays the paths where the release software, configuration files, and project software are located. Also provides options to preview files before downloading, and whether the “Install” button modifies files, or just checks if the files would be modified.
Function Button	<p>Displays a pull right menu that provides these options:</p> <ul style="list-style-type: none"> Define Software Configuration Install Configuration on Software Server Maintain Project Data Download Configuration to Drops <p>Each option enables the user to perform different configuration tasks, and provides the applicable windows and buttons to perform these tasks.</p>
Filter Scrolling List	A scrolling list that allows the user to limit the number of items shown in the Topic scrolling list. Selecting items from the Filter Scrolling list will display the corresponding configuration parameters in the Topic scrolling list. The configuration parameters will appear in a GUI window when selected in the Topic scrolling list. If no items are selected in the Filter scrolling list, no items will appear in the Topic scrolling list.
Topic Scrolling List	A scrolling list of configurable topics that correspond to specific GUI windows. Selecting a topic displays a GUI window that corresponds to the Topic selected.

3-4. Computation Server Topics

Select only **Computation Server** from the **Filter** scrolling list to display a corresponding list of the available configuration parameters in the **Topic** scrolling list, as shown in the following example.



Refer to [Table 3-3](#) for a list of available Topics.

Table 3-3. Computation Server Filter Topics

Topic	Item	Description
CS Computation Server	Configuration for Drop Number	Select All drops or select from a list of drops to apply the Topic changes.
	Allow Drop to be Primary if a Bus List Revote	Designates if a drop can become Primary when it has been shed from the Bus List. (Redundant and non-redundant)
	Allow Drop to be Primary if an Update Time is Required	Designates if a drop can become Primary before it has received valid highway time. (Redundant and non-redundant)
	Allow Drop to be Backup if a Time Update is Required	Designates if a drop can become Backup before it has received valid highway time. (Redundant only)
	Application Mode Set By	Designates what software on the drop is responsible for setting the application mode (refer to Table 2-2).
CS Computation Server Scheduler	Configuration For Drop Number	Select All drops or select from a list of drops to apply the Topic changes.
	Maximum Number of Event Triggers	Specifies maximum number of event triggers. These triggers will be tested every .1 second. These are static triggers in that they are defined in the data file produced by the Event File Translator. (Section 5-2)
	Maximum Number of Periodic Triggers	Specifies maximum number of periodic static triggers. These triggers are defined in the data file produced by the Periodic File Translator. (Section 5-2)
	Maximum Number of Dynamic Event Triggers	Specifies maximum number of dynamic event triggers. These triggers are installed by calls to CS library functions.
	Maximum Number of Dynamic Periodic Triggers	Specifies maximum number of dynamic periodic triggers. These triggers are installed by calls to CS library functions.

Table 3-3. Computation Server Filter Topics (Cont'd)

Topic	Item	Description
	Number of Dispatch Queue Entries	Specifies depth of queue between the Scheduler and the Dispatcher.
	Number of Log Queue Entries	Specifies depth of queue between the Dispatcher and the Logger. (0 = Do not log actions)
	Number of Run List Queue Entries	Specifies maximum number of concurrently running processes triggered by the Scheduler.
	Maximum Number of Tasks to Dispatch Per Second	Limits the maximum number of processes that may be triggered by the Scheduler within one second.
CS Computation Server Watchdog	Configuration For Drop Number	Select All drops or select from a list of drops to apply the Topic changes.
	Required Tasks Filename	File that contains list of processes that must run within a configured amount of time, after Watchdog startup for the application to be considered healthy.
CS Ethernet Monitor	Configuration For Drop Number	Select All drops or select from a list of drops to apply the Topic changes.
	Frequency of Ethernet Check (secs)	Defines how often the Ethernet status is checked.
	Daily Failure Report (secs)	Defines the amount of time between a failure detection and a failure report.
	Fail drop on Ethernet Errors	Specifies if Ethernet failure should fail the drop.

Section 4. Computation Server Redundancy Scheme

4-1. Overview

This section describes the Computation Server redundancy scheme and how to restart the Computation Server following a Primary Computation Server drop failure. The following topics are included:

- Hot Standby redundancy scheme ([Section 4-2](#)).
- Ethernet Monitor ([Section 4-3](#)).
- Recovery and restart ([Section 4-4](#)).

Computation Server redundancy is based on the **pri_drop**, **bku_drop**, and **share_drop** statements in the Sun Database Compiler, **sdbcomp**. These statements define the respective drop numbers for the Primary and Backup drops and a jointly owned drop number. Refer to the [“System Point Directory User’s Guide” \(U0-8205\)](#) for details on using the database compiler for redundancy configuration.

Guidelines

Use the following guidelines when configuring drops for Hot Standby redundancy:

- The redundant drops cannot be timekeepers.
- Hot Standby redundant software cannot be combined with WEstation functions that assume available write access to the Data Highway.

For example, the Operator WEstation software would be unable to affect points’ scan/alarm status if running on a Backup drop. Putting the Backup drop into Primary mode on the Data Highway would prevent the Hot Standby redundancy from operating correctly.

- Each drop has a unique drop number assigned to it and a second number that is jointly owned by the pair of drops. This second drop record, the Drop Redundancy Record (DRR), is originated by whichever drop is currently operating as the Primary.
- The BAL (Bus Allocation List) is configured so that the dedicated drop numbers appear in DEM (broadcast on-demand) mode only, and the jointly-owned ID appears in both TDM (broadcast periodically) and DEM.

- The Backup drop may not originate any TDM data. The Backup drop broadcasts its DSR (Drop Status Record) in DEM mode by periodically setting the one-shot broadcast bit.

4-2. Hot Standby Redundancy Scheme

The Computation Server uses the “hot standby” form of redundancy, consisting of two workstations: a Primary drop and a Backup drop (Hot Standby). The Hot Standby drop tracks data going to and from the Primary drop, and can be ready to begin broadcasting data quickly in case the Primary drop fails.

During normal operation, both the Primary and Backup run all the required application programs. The Primary and Backup differ in that only the Primary server broadcasts information to the system. Since the drops do not run in lock step, minor differences may occur between the results calculated by the Primary and Backup servers.

The Primary server broadcasts calculated data on the WDPF Westnet II Data Highway. In the Backup server, all points originated by the Primary server are treated as **received** points. Therefore, the SHC functions that modify point records do not modify the records in the Backup server. This allows the sections of the application programs that modify point records to be identical in both the Primary and Backup servers.

Application programs that send data over the Information Highway may need to know whether they are running on the Primary or Backup Computation Server, and take the appropriate action (for example, do not send files or information if running on the Backup). A Primary/Backup/Offline status indication is available to the application programs via the DRR (Drop Redundancy Record), and a library routine (CS_get_drop_mode(3s)) returns this information.

If an application is responsible for setting the application mode on the drop, that application should be prepared to react to changes on the drop mode. This can be done by polling the drop mode through CS library calls or by installation of an application’s startup script in both the “hwy_init” and “hwy_mode” subdirectories of /usr/wdpf/init/ to be started at the appropriate time by the WDPF Manager function.

Note

For further details in creating a package for integration with the WDPF Manager, see your System Administrator or Westinghouse Representative.

4-2.1. Drop Redundancy Functions

The Computation Server redundancy software performs different functions depending on whether the drop is running in Primary or Backup mode.

Primary Drop

On the **Primary** drop, the redundancy software performs the following:

- Sends one-shot of its Drop Status Records (DSRs) and Drop Redundancy Records (DRRs) on all WDPF Westnet II Data Highways.
- Checks the WDPF Westnet II Data Highway status (using SHC software).
- Checks the status of the Information Highway (Ethernet).
- Checks the status of Watchdog-monitored application programs, including executive software (Checker, Dispatcher, Logger, and Ethernet Monitor), and registered application software.
- Fails to Offline mode, if needed (see [Section 4-2.2](#)).

Backup Drop

On the **Backup** drop, the redundancy software performs the following functions:

- Sends one-shot of its Drop Status Records on all WDPF Westnet II Data Highways.
- Checks for timed-out Drop Status Records (DSRs) and Drop Redundancy Record (DRR) on the Primary on all WDPF Westnet II Data Highways.
- Checks WDPF Westnet II Data Highway status (using SHC software).
- Checks the status of the Information Highway (Ethernet).
- Checks the status of Watchdog-monitored application programs, including executive software (Checker, Dispatcher, Logger, and Ethernet Monitor), and registered application software.
- Switches to Primary mode if needed.

4-2.2. Automatic Fail-over

The redundancy software determines the correct operating mode for the drop (Primary, Backup, or Offline) and switches modes if required. In the Primary server, it checks for partial failures in critical parts of the system (Information Highway communication failures, status of certain critical Computation Server processes, and so forth). If a failure in the Primary is detected, a drop alarm and fault code are generated, the Primary server fails to Offline mode, and the Backup server switches to Primary mode.

It takes the Backup server 3 to 4.2 seconds (optionally 0.3 to 1.5 seconds) to detect a Primary failure and initiate a fail. During some of this time, points originated by the Computation Server are not broadcast. For more information on failover, see “[System Point Directory User’s Guide](#)” (U0-8205).

4-2.3. Manual Fail-over

The current Primary drop may be manually failed by selecting the Fail Primary button from the **WEStation Server Diagnostics Window** (see [Section 5](#)). If healthy, the Backup drop will assume Primary mode.

Caution

The Fail Primary function will make the Primary drop fail even if no Backup drop is available.

4-2.4. Programmatic Failover

An application on the Primary drop may induce a failover by calling the `CS_cause_failover()` function in **libcs.so**. If the drop does fail to Offline mode, a fault will be reported.

The single parameter to this function specifies one of the following (these codes are defined in **CS_err.h**):

- **CONDITIONAL** - If a healthy Backup drop is available, switch the Primary to Backup and let the Backup drop assume the Primary role. If no healthy Backup drop is available, or the drop is non-redundant, do nothing.
- **UNCONDITIONAL** - Switch the current Primary drop to Backup. If a healthy Backup drop is available, it will assume the Primary role. If there is no Backup, the drop is automatically reassume the Primary role.

- UNCONDITIONAL_OFFLINE - Take the current Primary drop into Offline mode, without regard to Backup drop availability. Drop must be rebooted or have applications restarted to become Primary.

4-2.5. Configuring Computation Server (CS) Redundancy

The WDPF Init Tool is used to add the CS Redundancy package to a WEStation drop. There are three different methods that can be used, they are described in [Appendix A](#).

Specifying the Shared Drop Number

The TDM Savings feature reduces the number of time slices required by a redundant pair of DPUs to approximately half the number required if the feature is not used. With TDM Savings enabled, a new ‘shared’ drop number, instead of its normal (or natural) drop number, is used by whatever DPU partner is in control.

TDMs are then assigned to the one ‘shared’ ID rather than to two ‘natural’ IDs (as is required when TDM Savings feature is not used). This saves fifty percent of the TDMs.

Use the following procedure to add a Shared Drop Number:

1. Access the Init Tool as described in [Appendix A](#).
2. Insert a drop that contains the **Computation Server Redundancy** package.
This activates the **Shared Drop Number** entry.
3. Enter a number into the shared drop number field. The same shared drop number must be specified for both redundant **Computation Server** drops.
4. Insert a second drop that contains the **Computation Server Redundancy** package.
5. Enter the same shared drop number as was entered in the first drop.

This will create the entries shown in [Figure 4-1](#).

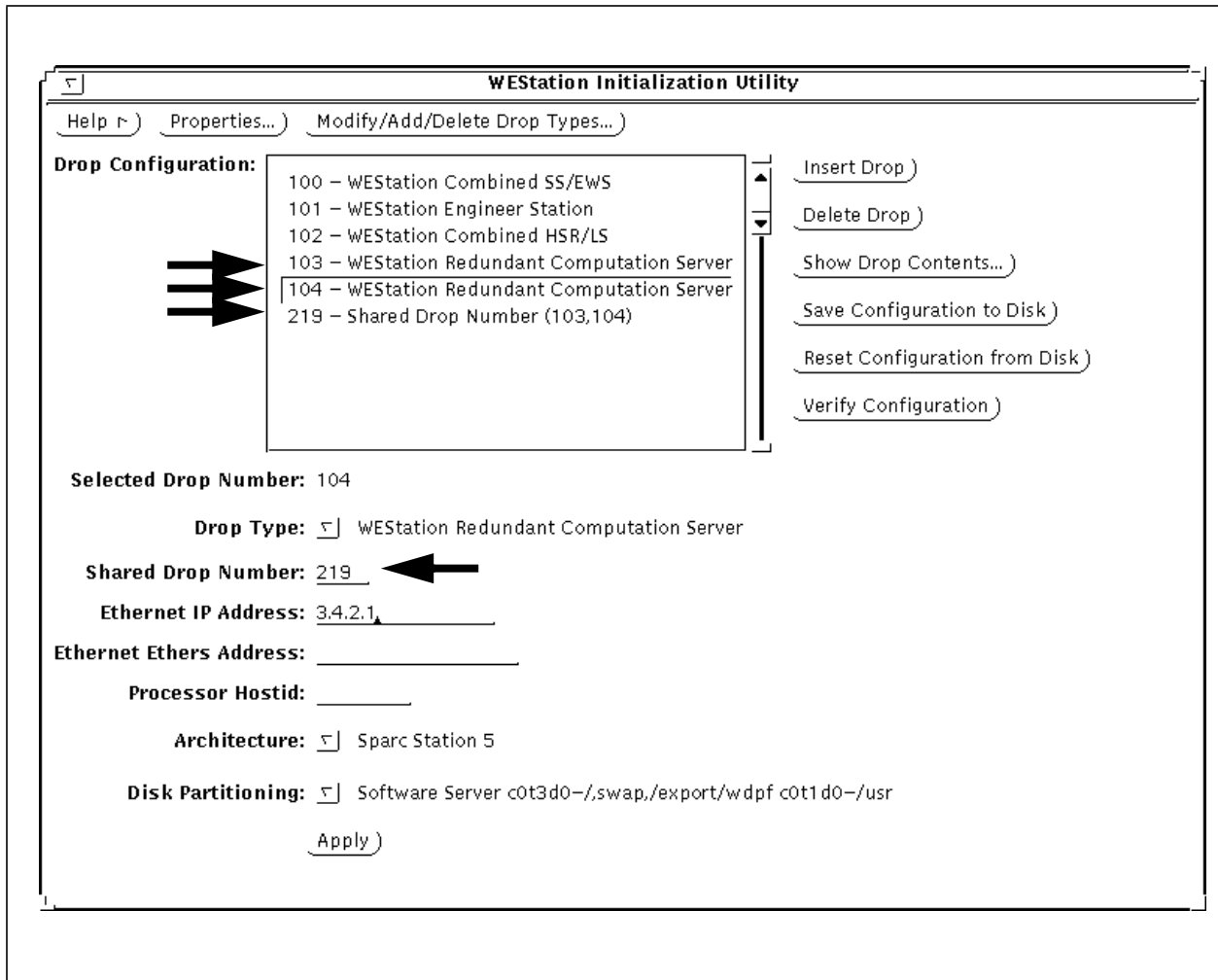


Figure 4-1. WEstation Init Tool Window

4-2.6. Drop Redundancy Configuration Options

The only CS pop-up window on the WDPF Admin Tool window actually related to redundancy is the **CS Computation Server** window, which is also applicable to non-redundant configurations. This window allows the user to decide under what conditions a CS drop may go to Primary and/or Backup mode for the drop (as shown in [Figure 4-2](#)).

To access the CS Computation Server pop-up window in the WDPF Admin Tool, follow the steps below:

1. Use the mouse to select the **WDPF Admin Tool** icon from the Engineering WEStation screen.
2. Select the **Define Software Configuration** from the pull-down Function menu.
3. Select the **Computation Server** from the Filter scrolling list.
4. Select the **CS Computation Server** from the Topic scrolling list.

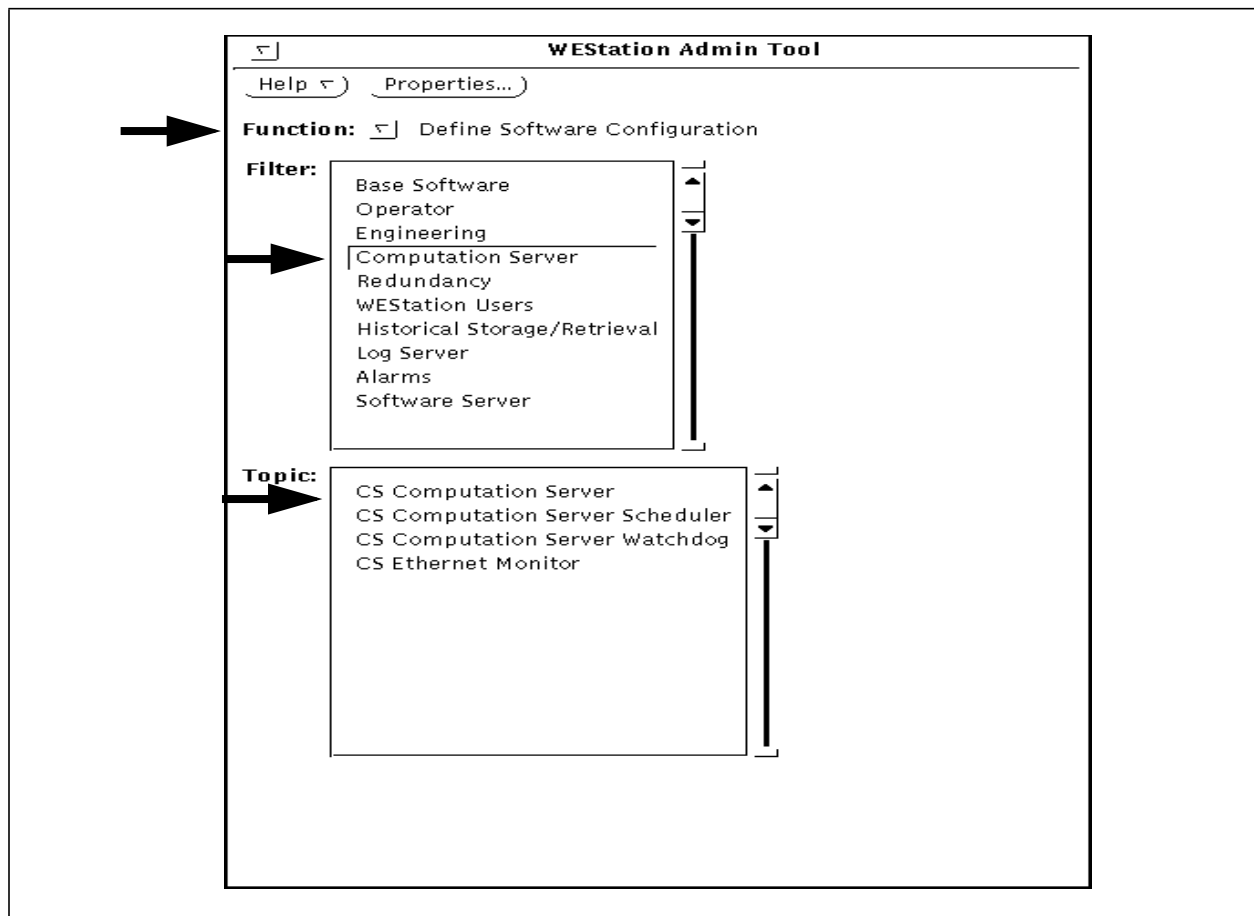


Figure 4-2. WEStation Admin Tool

The window for the **CS Computation Server** window appears (as shown below).

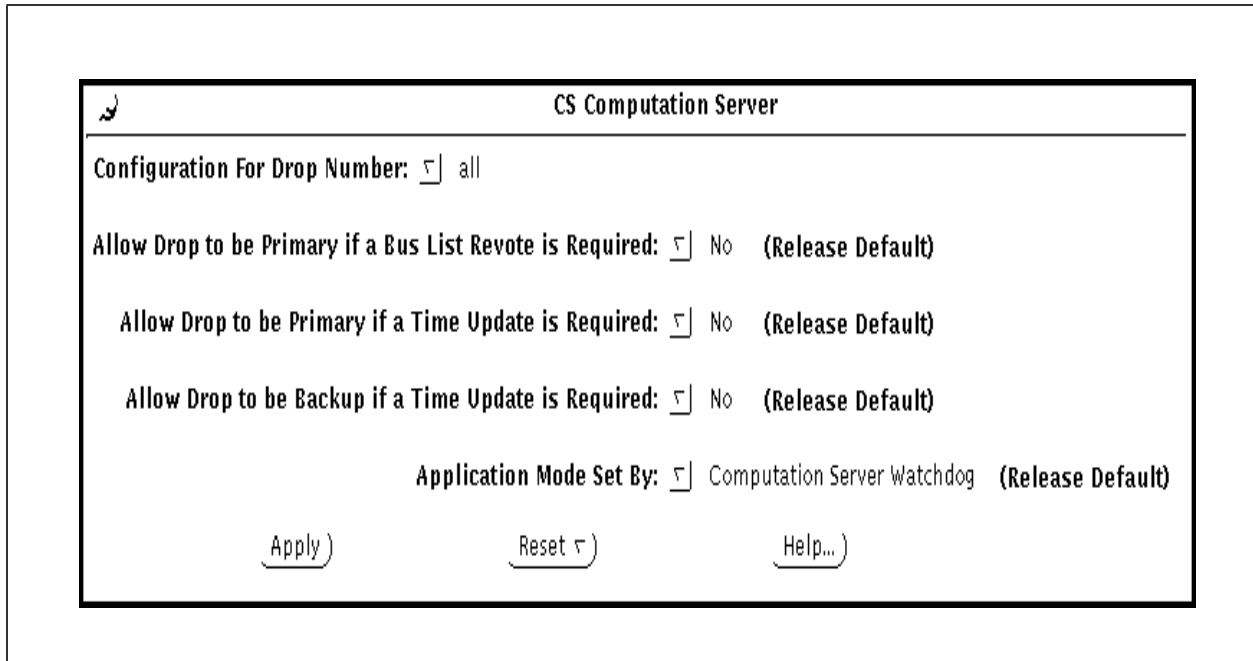


Figure 4-3. CS Computation Server Pop-up Window

Make the desired choices (described in [Table 4-1](#)) and select the **Apply** button to save the choices.

Table 4-1 lists the Items and the available Options for the **CS Computation Server Window**.

Table 4-1. CS Computation Server Window Functions

Item	Description	Setting Options
Configuration For Drop Number		All (Selects all drops to apply the changes for this Topic.)
		(Select from a list of drops to apply the changes for this Topic)
Allow Drop to be Primary if a Bus List Revote is Required	Designates if a drop can become Primary when it has been shed from the Bus List. (Redundant or non-redundant)	No (Default) Yes
Allow Drop to be Primary if a Update Time is Required	Designates if a drop can become Primary before it has received valid highway time. (Redundant and non-redundant)	No (Default) Yes
Allow Drop to be Backup if a Time Update is Required	Designates if a drop can become Backup before it has received valid highway time. (Redundant only)	No (Default) Yes
Application Mode Set By	Determines what function is responsible for setting the application mode on the drop. Application mode starts off in the Undetermined state, and thereafter may assume one of Primary, Backup, or Offline.	Computation Server Watchdog (Default) Data Highway Mode change Application

4-3. Ethernet Monitor

The Ethernet Monitor package monitors the local drop's Ethernet connection(s) for communication errors. It does so by trying to communicate with WEstation drops that are healthy on the Data Highway.

If three WEstations are found that are considered healthy on the Data Highway but are not responsive on the Ethernet, the Ethernet Monitor considers the local drop's Ethernet connection to be faulty. The following message is displayed and logged:

```
"Ethernet status check failing."
```

If no other WEstations are found on the Data Highway, the Ethernet Monitor is unable to determine whether communication errors on the Ethernet are due to problems with its own hardware/connection, or whether there are any available machines on the Ethernet with which to communicate. In this case, the following message is displayed:

```
"No other Suns on Data Highway - Ethernet hardware  
assumed OK"
```

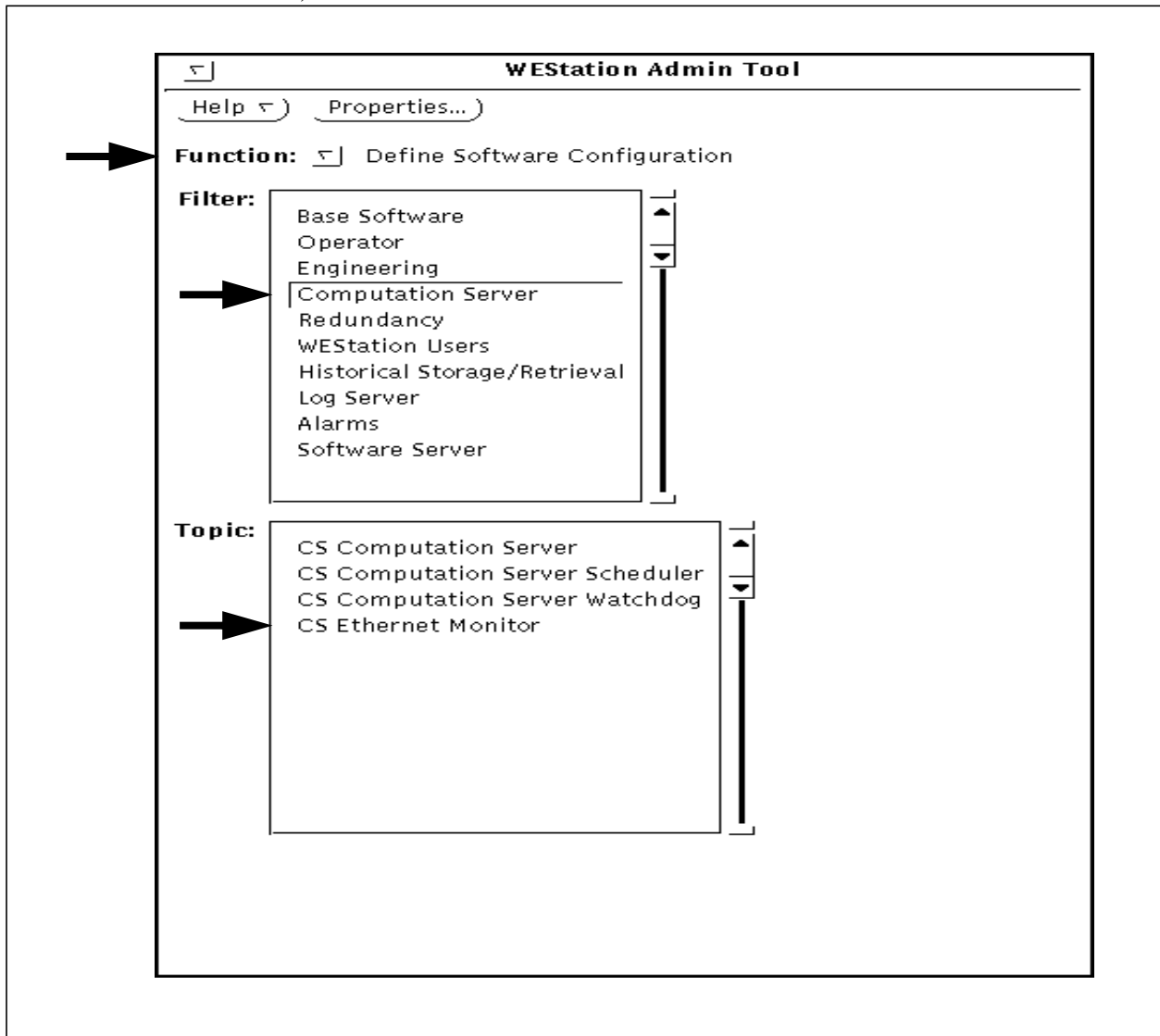
4-3.1. Configuring the Ethernet Monitor

The Ethernet Monitor's configuration is only available if a drop in the system contains the Ethernet Monitor package.

To access the **CS Ethernet Monitor** pop-up window in the **WDPF Admin Tool**, follow the steps below:

1. Use the mouse to select the **WDPF Admin Tool** icon from the Engineering WEstation screen.
2. Select **Define Software Configuration** from the Functions pull-down menu.
3. Select the **Computation Server** from the Filter scrolling list.

4. Select the **CS Ethernet Monitor** from the **Topic** scrolling list (as shown below).



The **CS Ethernet Monitor** window is displayed (as shown in [Figure 4-4](#)).

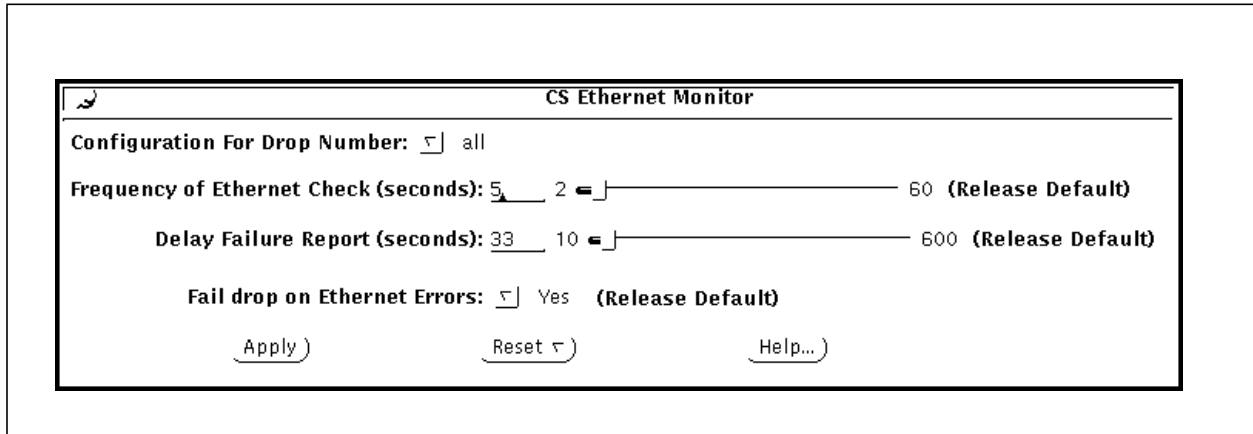


Figure 4-4. CS Ethernet Monitor Window

[Table 4-2](#) lists the available options for the CS Ethernet Monitor Topic.

Table 4-2. CS Ethernet Monitor Window Functions

Item	Description	Setting Options
Configuration For Drop Number		All (Selects all drops to apply the changes for this Topic.)
		(Select from a list of drops to apply the changes for this Topic)
Frequency of Ethernet Check (seconds)	Determines how frequently the Ethernet Monitor should test for Ethernet health.	5 (Default) (Set from scale bar for values from 2 through 60)
Delay Failure Report (seconds)	Defines the delay between a failure detection and the report of the failure. To prevent false indications of failures, this delay time should be larger than a) the time that it takes one drop to detect the failure of another on the WDPF Data Highway, and b) the switching time of the Information Highway software (if present on the drop).	33 (Default) (Set from scale bar for values from 10 through 600)
Fail drop on Ethernet Errors	Specifies whether or not to fail the drop upon detected failure of the Ethernet.	Yes (Default) No

4-4. Recovery and Restart

The Computation Server software, including drop configuration and redundancy software, is automatically started on boot-up. On boot-up, a drop will automatically assume Backup mode operation if its partner is already running. If its partner is **not** running, or if the drop is in a non-redundant configuration, the drop will assume Primary mode operation.

In a redundant configuration, if and when the Primary drop fails, the Backup drop, if healthy, assumes Primary mode. Use the following procedure to restore the drops to their original configuration.

In this procedure, Drop A is the original Primary drop that has failed. Drop B is the original Backup drop that has assumed Primary mode:

1. Correct the problem that caused the Primary Drop A to fail (see the System Administrator for assistance, if necessary).
2. Restart the failed drop (Drop A). Drop A starts running in Backup mode upon restart (Drop B is now running in Primary mode).
3. Verify that both drops are functioning and have no drop alarms. Optionally, verify that the disk programs and revision levels are the same using the **Download Preview** button on the WDPF Admin Tool Properties window. (See [“Defining and Configuring WEStations” \(U0-8300\)](#) for more details on this function and the Download function.)
4. After all the desired software packages are downloaded through the Download function, restart the software on the drops by using the **Restart Applications on Drops** button on the Admin Tool window. (If required by the application that one drop be in Primary mode, don't restart both drops simultaneously.)
5. If it is imperative that the Computation Server drops be configured the way they were before the initial failure of the Primary drop, wait until Drop A indicates its application mode is Backup. This means it is capable of assuming Primary mode. Fail the current Primary drop (Drop B) by choosing the **Fail primary** button from the **WEStation Server Diagnostics Window** (see [Section 5](#)). This will be seen as a failure by the current Backup drop (Drop A). Drop A will then re-assume Primary operation. Restart Drop B so it is then available as the Backup should Drop A fail.

Each application program using the Calculation Support software can use the **testinit** function to determine if the current execution is the first since bootstrap (see [Section 6](#)). Each application program is responsible for its own recovery and restart.

Caution

Changes made to local application data on the Primary drop are not automatically transmitted to the Backup drop by the Executive software. The application itself is responsible for updating the local data at the Backup drop so that data will be current if Failover occurs.

Section 5. Using the Computation Server

5-1. Overview

This section describes the Computation Server user interface and engineering tools. The following topics are included:

- File Translator programs ([Section 5-2](#)).
- WEStation Server Diagnostic window ([Section 5-3](#)).
- Custom application menus ([Section 5-4](#)).
- Request Generator and Request Handler ([Section 5-5](#)).
- Computation Server Library Functions ([Section 5-6](#)).
- Application Process Scheduling Configuration ([Section 5-7](#)).

5-2. File Translator Programs

Two text file translators, the Event File Translator (**cseft**) and the Periodic File Translator (**cspft**) are used to program triggers for dispatching application programs. The applications engineer writes a text file that specifies events or time-based scheduling information for the Checker software to monitor. Depending on whether the file contains event or time-based scheduling information, the Event File Translator or the Periodic File Translator reads the text file, and translates it to an internal representation that is used by the Event/Periodic Checker software.

5-2.1. Adding the File Translator Packages

The Event File Translator and the Periodic File Translator are available from the WDPF Admin Tool. To use the translators from the WDPF Admin Tool, the “Computation Server Scheduler” package must be active on at least one drop in the system.

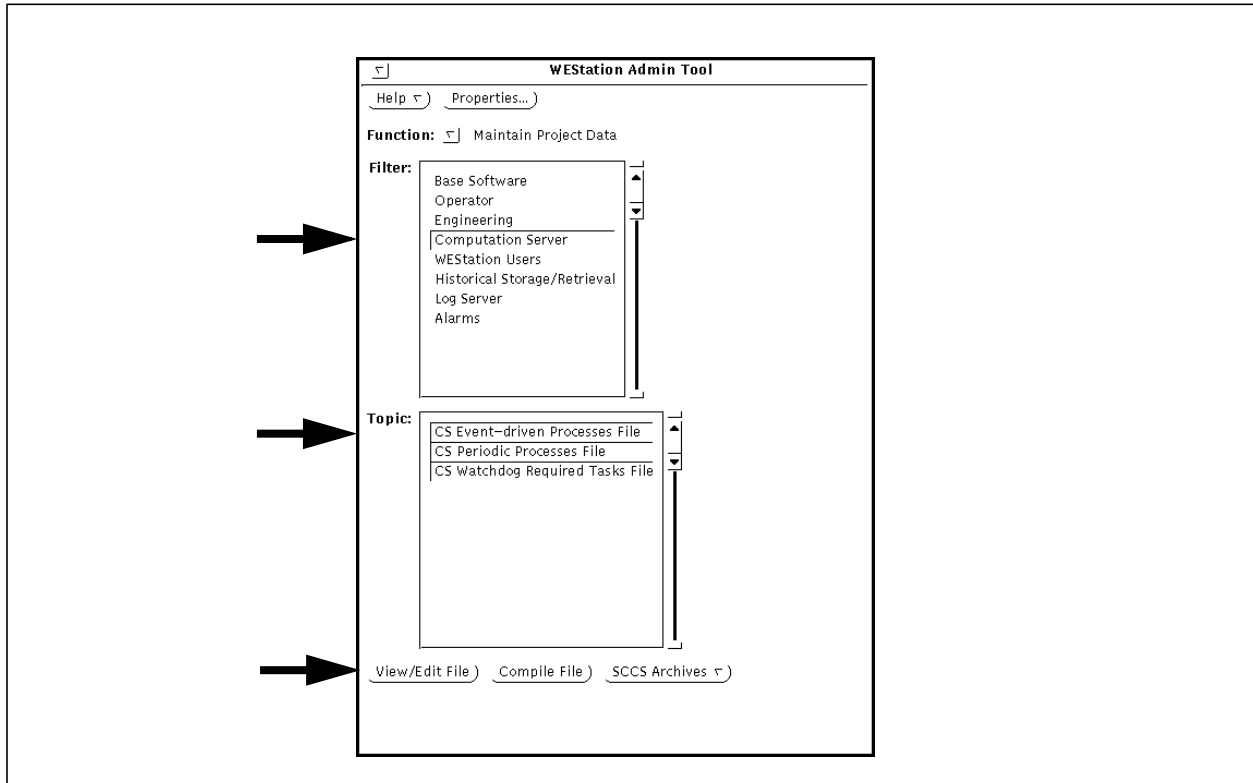
The WDPF Init Tool is used to add the Computation Server Scheduler package to a WEstation drop. There are three different methods that can be used to add a package to a drop. They are described in [Appendix A](#).

Accessing the Translators

Use the following procedure to access the translators in the WDPF Admin Tool:

1. Use the mouse to select the **WDPF Admin Tool** icon from the Engineering WEstation screen.
2. Select the **Maintain Project Data** from the pull-down Function menu.
3. Select the **Computation Server** from the Filter scrolling list.
4. Select **CS Event-driven Processes File**, or the **CS Periodic Processes File** from the Topic scrolling list.

5. Select **View/Edit File** (as shown below).



A pop-up window will appear (as shown in [Figure 5-1](#)).

Creating and Editing Process Trigger Specifications

Use the following procedure to create and/or edit the process trigger specifications file.

1. Select **Edit** from the Mode pull-down menu (as shown below).

This option will prompt the user to create a file or edit an existing file.

2. Select the **Drop** pull-down menu and select the drop which will use the file.
A selection of "All" means that the file is applicable to all drops that contain the associated package software.
3. Make edits.

4. Select the **Write to Disk** from the **File Utilities** pull-down menu as shown in [Figure 5-1](#).

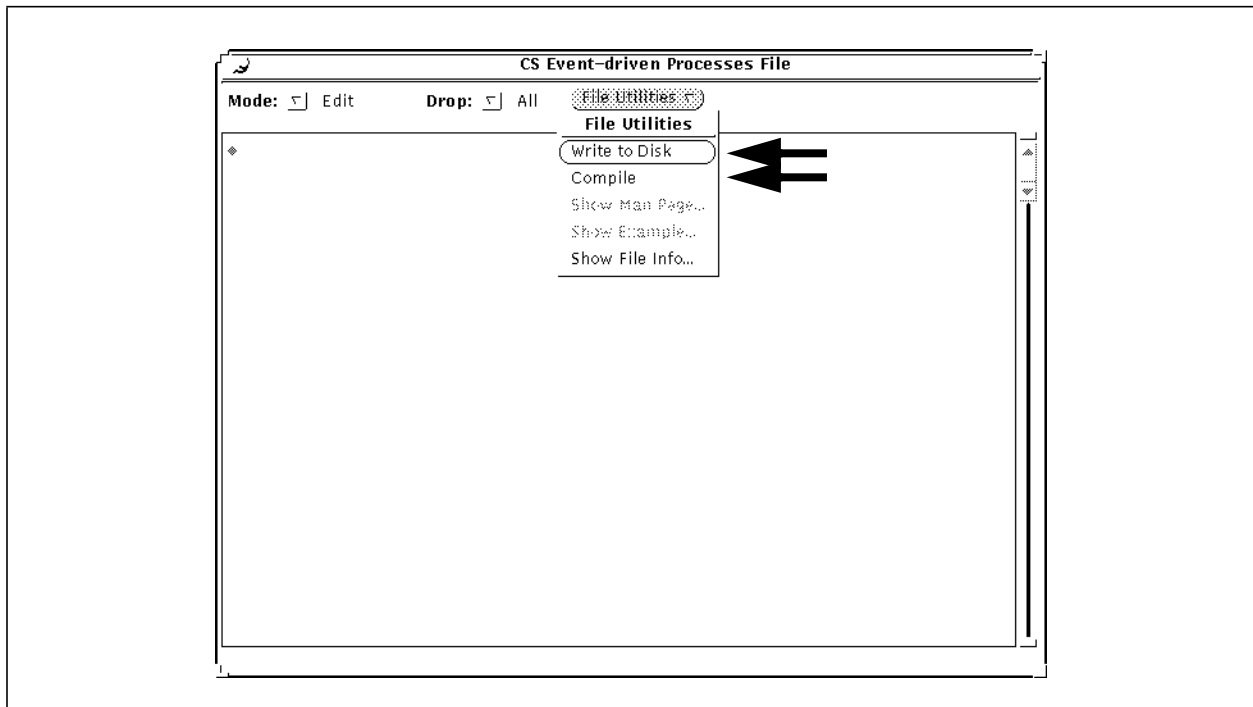


Figure 5-1. CS Event-driven Processes File

5. To translate the files choose **Compile** from the **File Utilities** menu. Only the file currently in the Edit window will be translated.

OR

Select the **Compile File** button on the WDPF Admin Tool's window (Maintain Project Data function screen). All files encompassed by the selected lines in the Topic scrolling list will be translated.

6. Query/Download the translated files (via the "Download Configuration to Drops" function on the WDPF Admin Tool) and restart the Computation Server drops applications to use the downloaded files.

OR

Choose "Reload File" on the WEstation Server Diagnostic Window (this is described in [Section 5-3.3](#)).

5-3. WEstation Server Diagnostic Window

The **WEStation Server Diagnostic** window allows a user to select from a set of pre-defined functions to be performed by the Computation Server. It uses files created by the Event and Periodic File Translators to generate a list of programs for the user to select. This function is available from both the as-released Engineering WEstation and the Operator WEstation. Configurable options determine which functions are available from a particular station. See [Appendix 5-3.1](#) for instructions on accessing the window from the Operator WEstation, and see [Appendix 5-3.2](#) for instructions on accessing the window from the Engineering WEstation.

This User Interface is only available on drops with the “Computation Server Client” package as part of the droptype.

5-3.1. Accessing the Diagnostic Window from the Operator WEstation

The number of options/buttons that are available on the Operator WEstation is a subset of the options available on the Engineering WEstation and is configurable using the **lockout.dat** file (see “[Operator WEstation Configuration Manual](#)” (U0-8110) for details on using this file).

The functions typically configured for the Operator WEstation and the Engineering WEstation are shown in [Table 5-1](#).

Note

These are as-released drop types.

Table 5-1. Processes Available by Workstation Type

Process	Operator WEstation	Engineering WEstation
List Processes	×	×
Dispatch Process	×	×
Dispatch Process (Primary)	×	×
Dispatch Process (Backup)	×	×
Fail Primary	×	×
Load New Tables (Reload File Button)		×

Table 5-1. Processes Available by Workstation Type (Cont'd)

Process	Operator WEstation	Engineering WEstation
Log All Dispatching (Dispatch log button)		×
Cancel All Log Dispatching (Dispatch log button)		×

To access the **WEStation Server Diagnostic** window from the Operator WEstation, follow the steps below:

1. Open the Data Analysis and Maintenance icon on the Operator WEstation to display the **Data Analysis and Maintenance** menu (see [Figure 5-2](#)).
2. Select **Device Maintenance** from the **Data Analysis and Maintenance** menu.

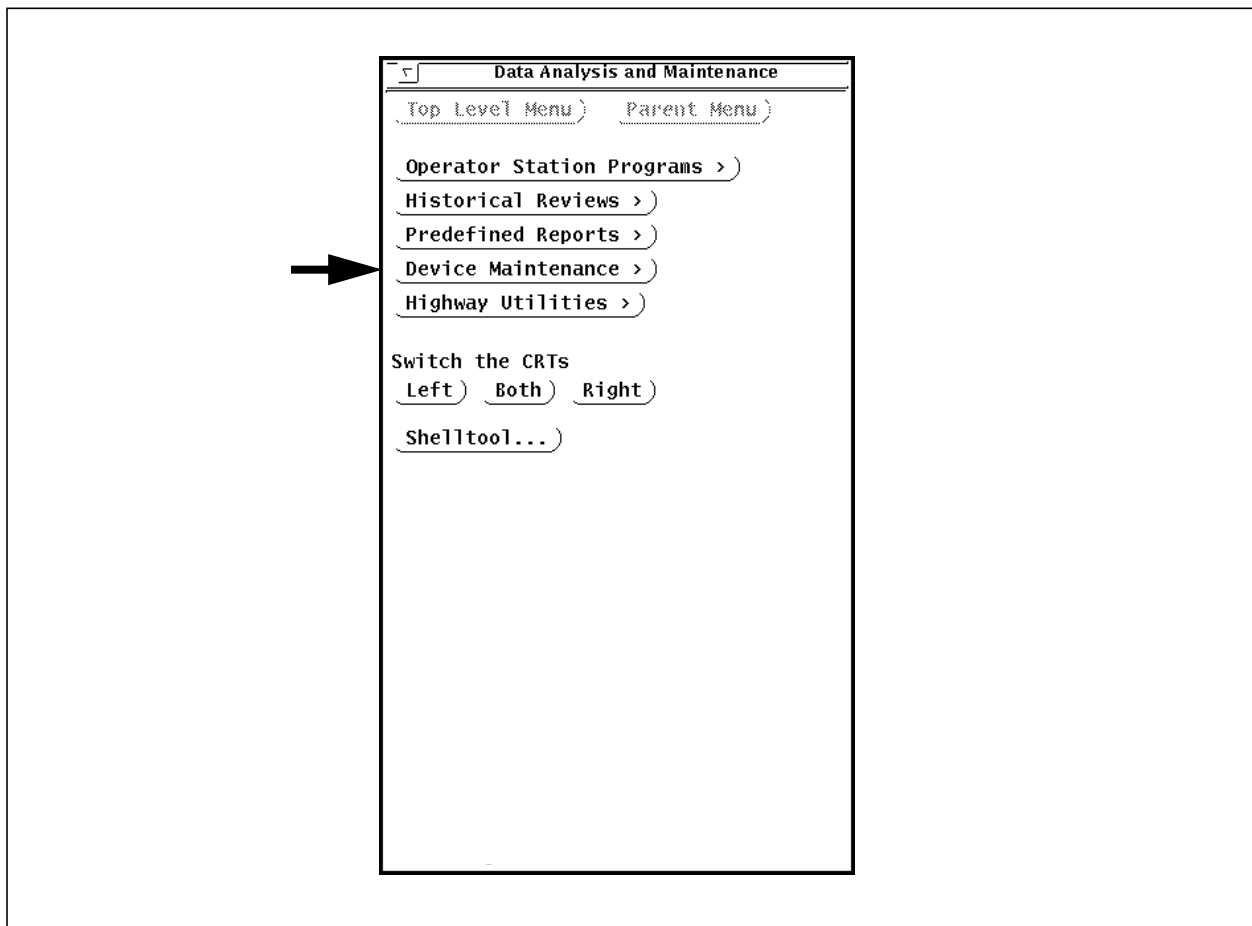


Figure 5-2. Data Analysis and Maintenance Window

The **Device Maintenance** menu displays (see [Figure 5-3](#)).

Note

The buttons that are displayed on the Data Analysis and Maintenance submenus depend on what software packages are loaded on the drop.

See [Appendix A](#) for instructions on using the WDPF Init Tool to select the desired software packages for drops.

3. Select the **Computational Server Manager** button from the **Device Maintenance** window.

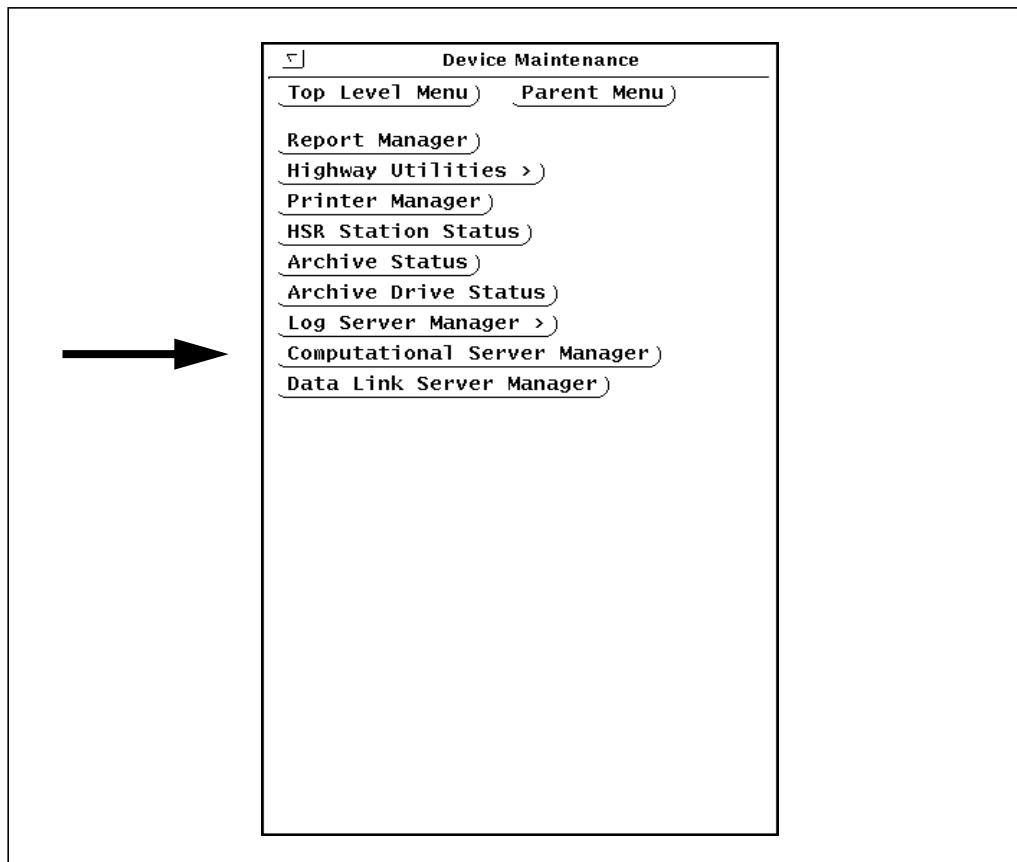


Figure 5-3. Device Maintenance Window

The **WEstation Server Diagnostic** window will display (as shown in [Figure 5-7](#)).

5-3.2. Accessing the Diagnostic Window from the Engineering WEStation

To access the **WEStation Server Diagnostic** window from the Engineering WEStation, follow the steps below:

1. Access the Engineering WEStation top-level menu according to the procedures in “Engineering WEStation User’s Guide” (U0-8200).
2. Select **Drop Functions** from the top level menu (see [Figure 5-4](#)).

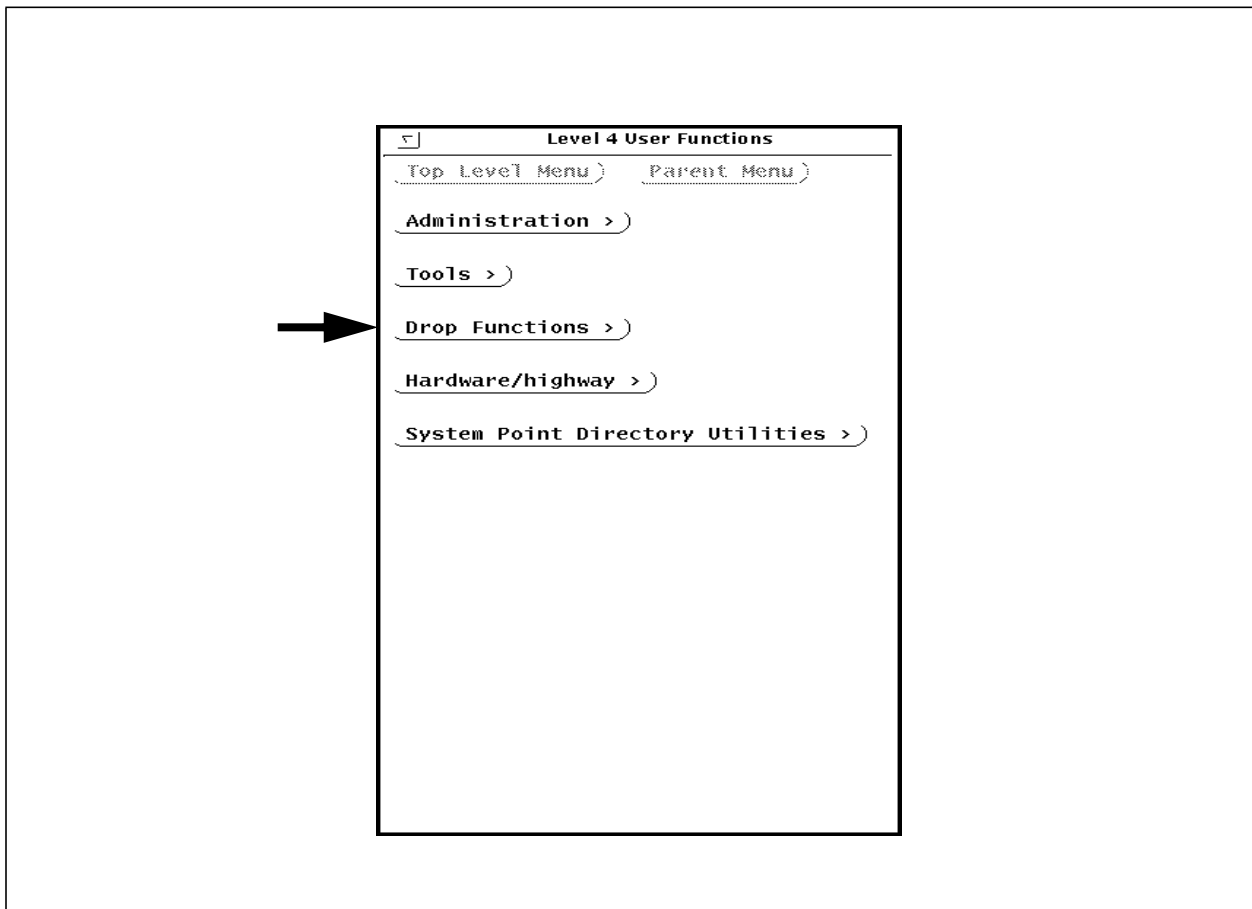


Figure 5-4. Level 4 User Functions Window

3. Select **Computation Server** from the **Drop Functions** menu (as shown in [Figure 5-5](#)).

Note

The existence of any button/submenu on this window is dependent upon the selection of software packages on the local drop.

The existence of the **Computation Server** button depends on whether the “**Computation Server Client**” or “**Computation Server Engineering Tools**” package has been selected and downloaded to the drop.

See [Appendix A](#) for instructions on using the WDPF Init Tool to select the desired software packages for drops.

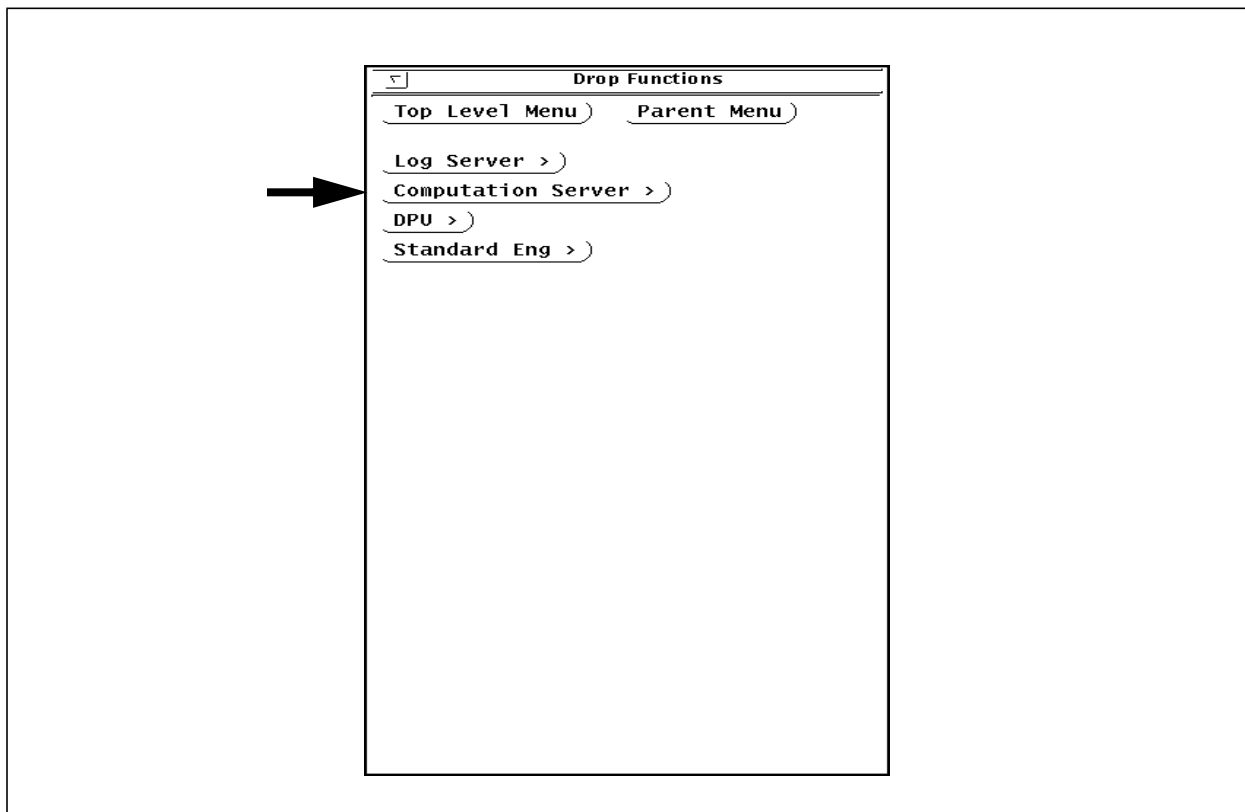


Figure 5-5. Drop Functions Window

The **Computation Server** menu displays (as shown in [Figure 5-6](#)).

4. Select the **User Window** from the **Computation Server** menu.

Note

The **Critical Task Monitor** and **User Window** buttons will be available if the **Computation Server Client** package has been selected. A **Calc Support** button will be available if the **Computation Server Engineering Tools** package is selected.

See [Appendix A](#) for instructions on using the WDPF Init Tool to select the desired software packages for drops.

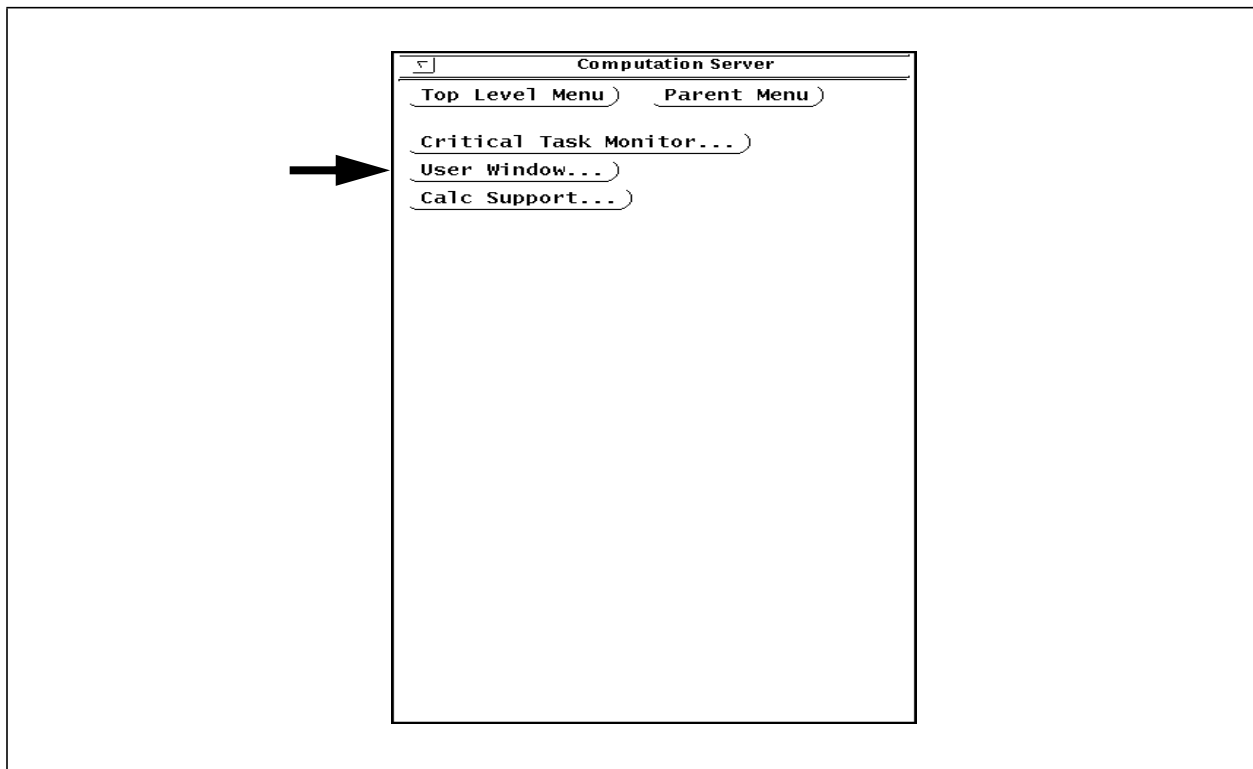


Figure 5-6. Computation Server Window

The **WEStation Server Diagnostic** window is displayed, as illustrated in [Figure 5-7](#).

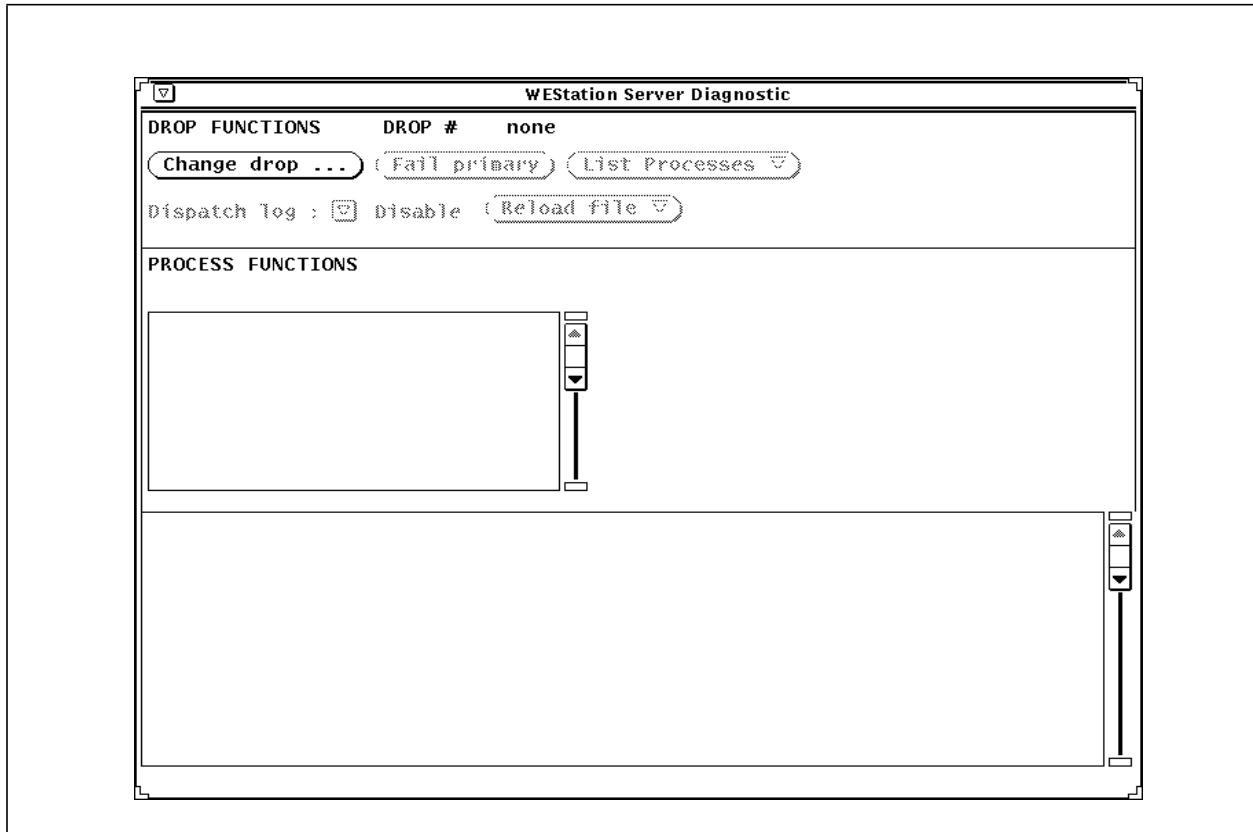


Figure 5-7. WEStation Server Diagnostic Window

The functions accessed by the **WEStation Server Diagnostic** window are discussed in [Appendix 5-3.3](#) and [Appendix 5-3.4](#).

5-3.3. WEstation Server Diagnostic Window Functions

The **WEStation Server Diagnostic** window (as shown in [Figure 5-7](#)) provides the following functions:

- **Change Drop** button displays the Change Drop window illustrated in [Figure 5-8](#):

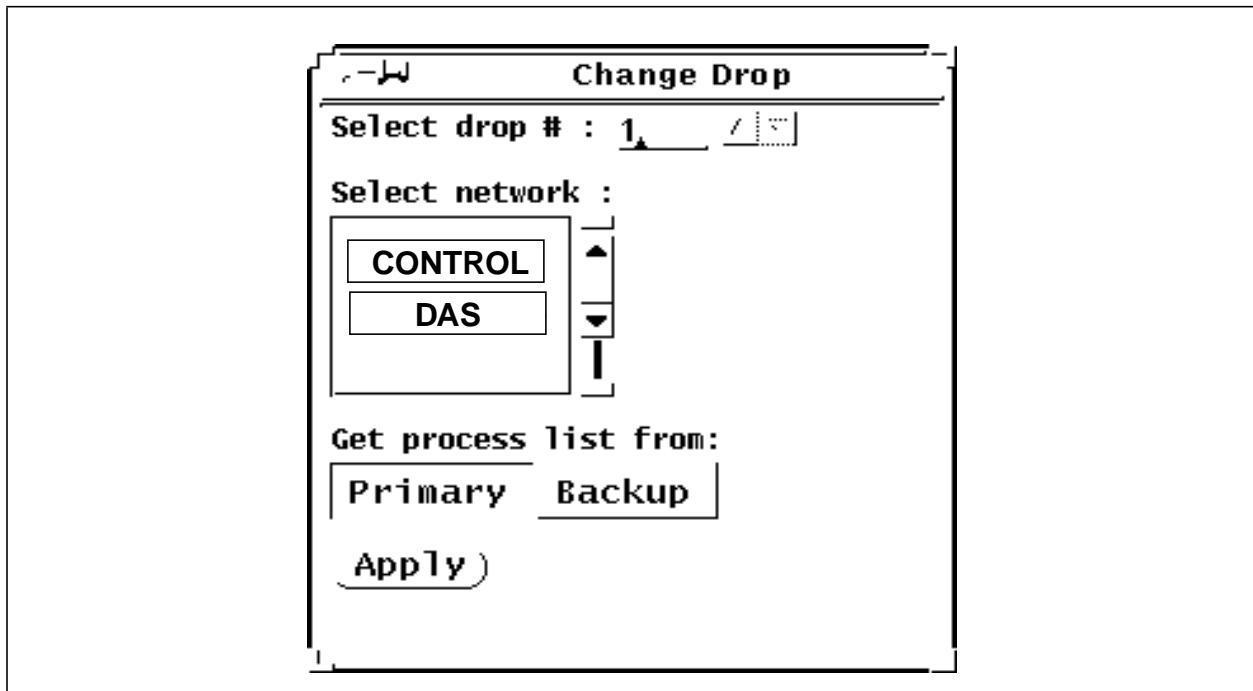


Figure 5-8. Change Drop Window

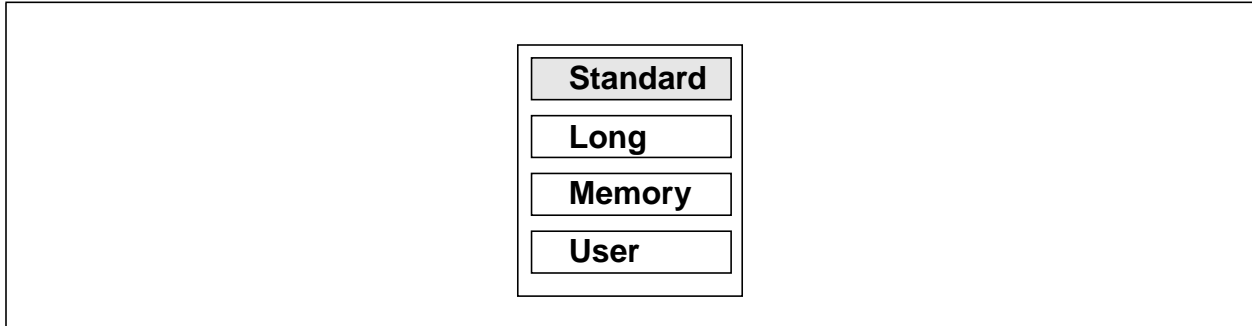
The **Change Drop** window allows the user to select the drop number of the Computation Server, the network on which the drop is running, and the drop from which to get the process list. The drop number, the drop number of its associated Primary or Backup (as configured), and the shared Drop Redundancy Record (DRR), if redundant, are displayed on the top of the **WEStation Server Diagnostic** window.

- **Fail primary** button allows the user to switch the Primary Computation Server to Backup. If the other Computation Server in the system is not able to assume Primary mode, the selected drop will re-assume Primary mode. This is a “conditional failover”. A pop-up menu is displayed, asking for confirmation of drop failure.

Note

This button cannot be selected in a non-redundant configuration.

- **List Processes** button provides the pull-down menu illustrated below. In a redundant configuration, each of the menu items will have a pullright menu to select from which drop to request data: the Primary drop, Backup drop, or Both drops (default).

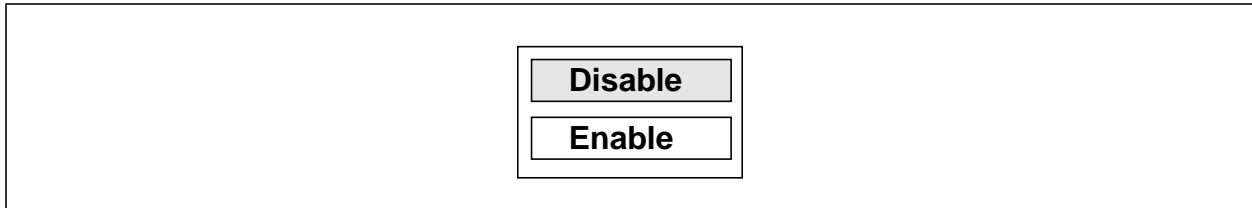


This option allows the user to view the list of all processes that are currently executing on the Primary or Backup Computation Server. These processes are listed in the bottom scrolling list on the **WEStation Server Diagnostic** window. The detail of information on the display list can be determined by selecting one of the menu items on the pull-down menu. These menu items are based on the options for the operating system **ps** command (see the man pages for more information on this command and its options). The menu items are:

- Standard** — Includes information about processes owned by others.
Includes processes with no controlling terminal.
Displays all processes.
Uses a wide output format (132 columns rather than 80).
- Long** — Includes information about processes owned by others.
Includes processes with no controlling terminal.
Displays all processes.
Displays a long listing, with fields F, PPID, CP, PRI, NI, SZ, RSS, and WCHAN
Uses a wide output format (132 columns rather than 80).
- Memory** — Includes information about processes owned by others.
Includes processes with no controlling terminal.
Displays all processes.
Displays user-oriented output.
Uses a wide output format (132 columns rather than 80).
- User** — Includes information about processes owned by others.
Includes processes with no controlling terminal.
Displays all processes.
Displays output version describing virtual memory information.
Uses a wide output format (132 columns rather than 80).

- **Dispatch Log button** provides the pull-down menu illustrated below.

In a redundant configuration, each of the menu items will have a pullright menu to select the drop where dispatch logging will be enabled or disabled: the Primary drop, Backup drop, or Both drops (default).

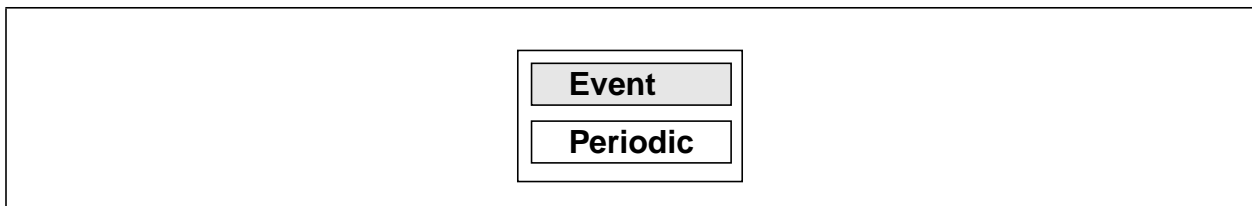


This menu allows the user to turn dispatch logging on (Enable) or off (Disable). When dispatch logging is enabled, the Dispatcher will record the time that it activates each process, and the time of each process's completion. The logfiles are stored in /usr/wdpf/cs/adm/<day of the week> (see [Table 5-2](#)).

In a redundant configuration, the dispatch logging action will be performed on both Computation Server drops.

- **Reload File button** displays the pull-down menu shown below.

In a redundant configuration, each of the menu items will have a pullright menu for choosing on which drop(s) to perform the reload: the Primary drop, Backup drop, or Both drops (default).



This menu allows the user to load tables containing new definitions for the event-based and periodic activations of processes.

Help is provided for each function using the **Help** key on the standard keyboard (see [“Drop Installation Manual” \(M0-8005\)](#) for more information on the standard keyboard).

5-3.4. Dispatching a Process

Use the following procedure to dispatch a process from the WEstation Server Diagnostic window:

1. Use the right mouse button to click on the **Computation Server processes** scrolling list. This will display the **Functions** menu (see [Figure 5-9](#)).

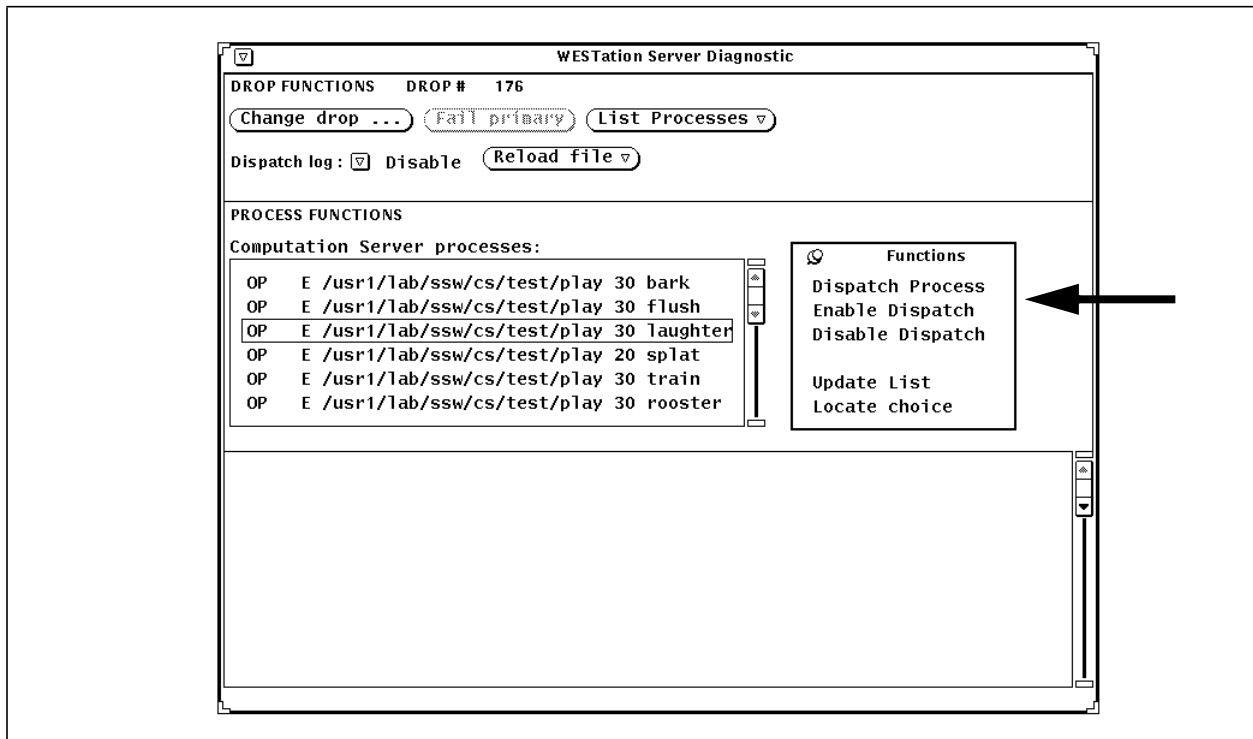


Figure 5-9. WEstation Server Diagnostic (Functions Menu)

2. Select **Update List** from the Functions menu to update the scrolling list with the processes available from the desired Computation Server (Primary or Backup). In a redundant configuration, there is a pullright menu available from the **Update List** menu item. Use it to select the appropriate Computation Server.
3. Select a process from the scrolling list.
4. Select **Dispatch Process** from the **Functions** menu. In a redundant configuration, there is a pullright menu available from the **Dispatch Process** menu item. Use it to select the appropriate Computation Server(s) (can dispatch on Primary, Backup, or Both (default)).

The selected process from the scrolling list will be executed.

The other options on the **Functions** menu allow the user to enable or disable the process or refresh the screen.

5-4. Custom Application Menus

From the **Data Analysis and Maintenance** menu (see [Figure 5-2](#)), custom-built menus can be used to dispatch specific Computation Server application programs. Because these menus are custom built on an application-by-application basis, they can be organized according to function. These application-specific menus are built using the standard Menu source language, and reside on both the Operator WEStation and the Engineering WEStation. See [“Engineering WEStation User’s Guide” \(U0-8200\)](#) and [“Operator WEStation Configuration Manual” \(U0-8110\)](#) for information on building custom menus.

The Maintain Project Data function allows the user to build, modify, and compile the project data files. Maintain Project Data is selected on the WEStation Admin Tool pull-down Function menu. See [“Defining and Configuring WEStations” \(U0-8300\)](#) for details on using this window.

5-5. Request Generator and Request Handler

The Request Generator software calls a remote program in the Computation Server to perform the user function requested using the **WEStation Server Diagnostic** window. The request generator software may also be called by custom process diagrams using poke fields, or by Menu programs on the Operator WEStation, to allow custom-application dependent program dispatching. The request can dispatch a program in the Primary server, the Backup server, or both.

The Request Handler software is initiated by the Request Generator software to perform the requested function.

5-6. Computation Server Library Functions

Application software running on a Computation Server has access to functions provided by the Computation Server library, **libcs.so**. These functions may be categorized as follows:

- Mode support functions ([Appendix 5-6.1](#))
- Application execution support functions ([Appendix 5-6.2](#))
- Calculation support functions ([Appendix 6](#))
- Watchdog functions ([Appendix 7](#))

5-6.1. Mode Support Functions

A Computation Server supports three different mode concepts: **Data Highway mode**, **drop mode** and **application mode**. These modes are described in [Appendix 2](#).

The **drop mode** is typically mirrored by the drop's Data Highway connection mode. However, a Computation Server in Offline mode (due to some type of software failure) may have its Data Highway card in Backup mode in order to inform other drops of its current status.

The **application mode** is tiered above the drop mode. A Computation Server drop that has determined it is to become the Backup Server does not imply that the application software running on the Server is fully in Backup mode. Many times, application software must undergo an initialization of its data prior to fully assuming Primary or Backup mode. Therefore, Backup drop mode will precede Backup application mode.

Application software in **Primary** mode implies it has completed any initialization and is fully functional. Application software in **Backup** mode implies it is capable of becoming Primary at any instant. The application mode is reported through Bits 3 and 4 of the drop's Drop Status Record's FB field (Reference [U0-0131](#)).

The following mode-related functions are available in the Computation Server library for application software to use. For more details, refer to online documentation (man pages) and the **CS_mode.h** header file.

Function	Description
CS_get_appl_mode	Returns the current application mode.
CS_get_appl_mode_str	Returns the current application mode as a string.

Function	Description
CS_set_appl_mode	Sets the drop's application mode.
CS_get_drop_mode	Returns the current drop mode.
CS_get_drop_mode_str	Returns the current drop mode as a string.

5-6.2. Application Execution Support Functions

Once an application has started execution, it can modify its operating system scheduling parameters (refer to the *priocntl(3)* man page for details on what scheduling parameters may be set by non-root (super-user) owned processes).

Processes can also query the CS Scheduler to determine what caused it to start executing.

Function	Description
CS_set_priocntl	Allows the user to have its operating system-level scheduling parameters to be set according to parameters set in the <i>wdpf_priorities</i> file.
CS_get_start_info	Returns to the user information on what caused the process to start executing. This information will be one of the following: <ul style="list-style-type: none"> • SID of a triggering point • Drop ID of an Operator WEstation if the process were dispatched by an operator action, • Start Time if a execution was triggered by time (periodic or one-time execution).

5-7. Application Process Scheduling Configuration

Components of the Computation Server Scheduler package are responsible for the scheduling, execution, and logging of application processes. These components are configurable, largely in the specification of data structures used during its operation.

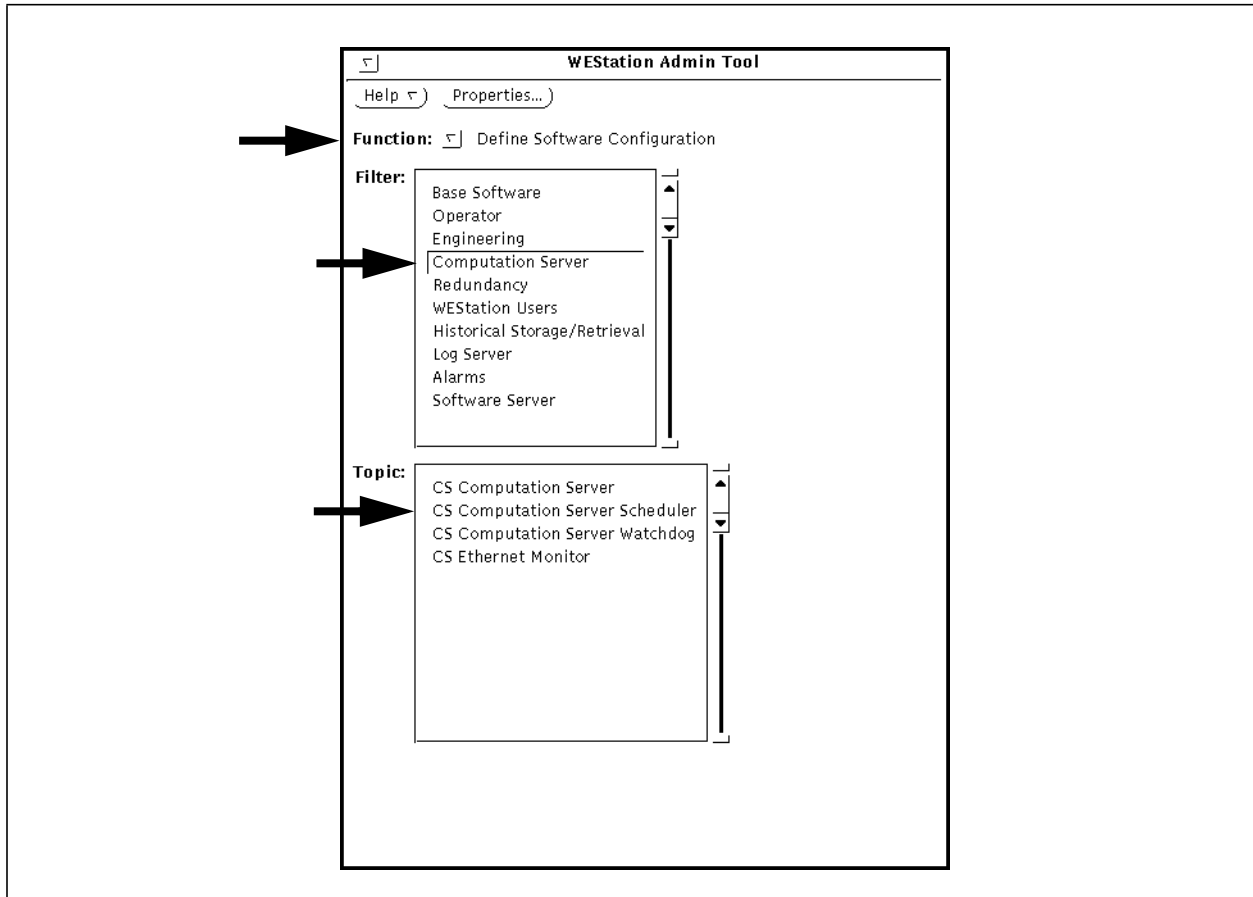
These configuration parameters are only available on the WDPF Admin Tool if the “Computation Server Scheduler” package is selected on at least one drop in the system.

Note

See [Appendix A](#) for instructions on using the WDPF Init Tool to select the desired software packages for drops.

1. Use the mouse to select the **WDPF Admin Tool** icon from the Engineering WEStation screen.
2. Select the **Define Software Configuration** from the pull-down Functions menu.
3. Select the **Computation Server** from the Filter scrolling list.

4. Select the **CS Computation Server Scheduler** from the Topic scrolling list (as shown below).



The **CS Computation Server Scheduler** pop-up window will appear (as shown in [Figure 5-10](#)).

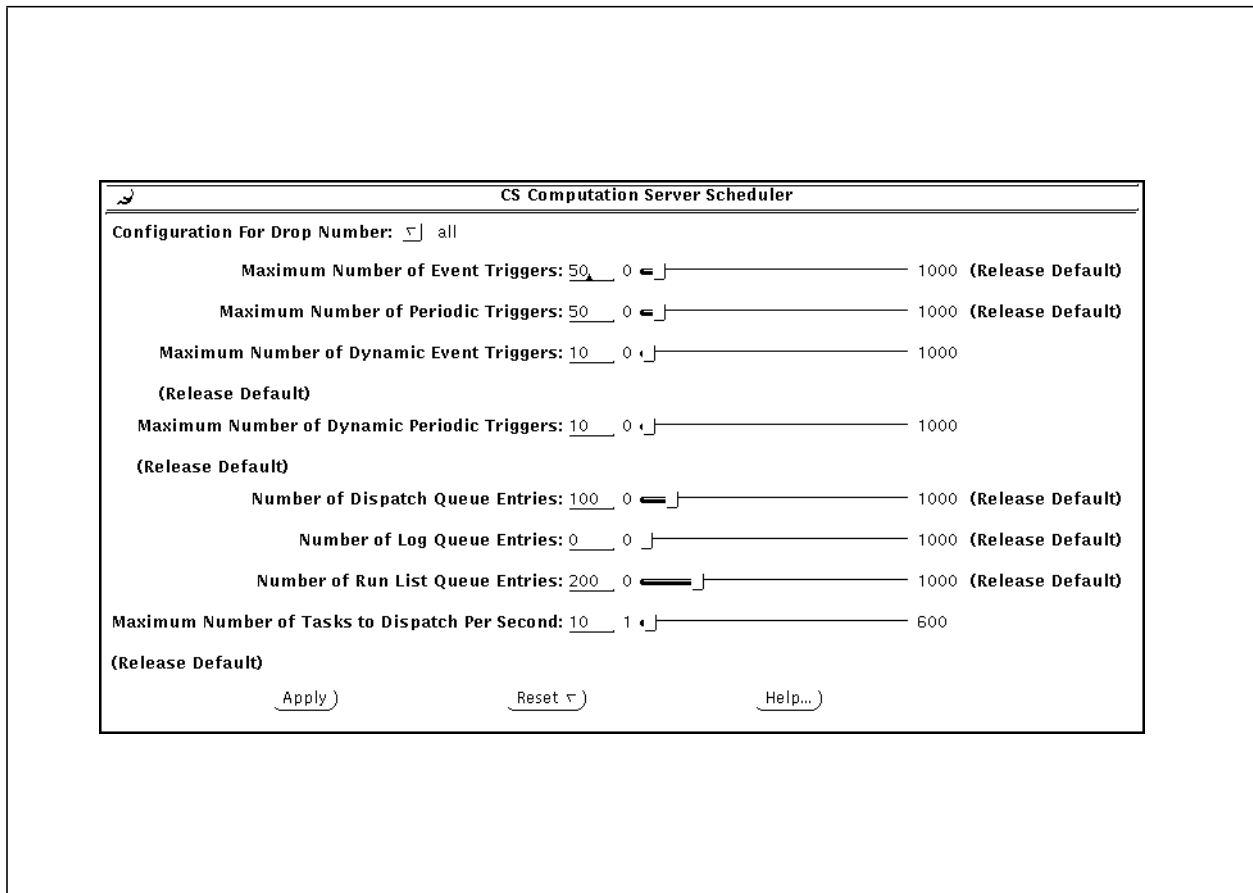


Figure 5-10. CS Computation Server Scheduler Window

5. Make the desired choices (described in [Table 5-2](#) and select the **Apply** button to save the choices.

Table 5-2 lists the items and the available Options for the **CS Computation Server Scheduler** pop-up window.

Table 5-2. CS Computation Server Scheduler Window Functions

Item	Description	Setting Options
Configuration For Drop Number		All (Selects all drops to apply the changes for this Topic.)
		(Select from a list of drops to apply the changes for this Topic)
Maximum Number of Event Triggers	Specifies the maximum number of static events that will be read from the CS Event-driven Processes File on the WES Admin Tool's "Maintain Project Data" window upon startup of the Scheduler package. For information on creating/modifying this file, refer to <u>Section 5-2</u> . Note that adding combination events in this file generates one event trigger entry per combination sub-event.	50 (Default) (On a scale bar for values from 0 through 1000)
Maximum Number of Periodic Triggers	Specifies the maximum number of static periodic process specifications that will be read from the CS Periodic Processes File on the WES Admin Tool's "Maintain Project Data" window upon startup of the Scheduler package. For information on creating/modifying this file, refer to <u>Section 5-2</u> .	50 (Default) (On a scale bar for values from 0 through 1000)
Maximum Number of Dynamic Event Triggers	Specifies the maximum number of events that may be added at runtime (via the library functions) to the CS Scheduler software. Note that adding combination events in this file generates one event trigger entry per combination sub-event.	100 (Default) On a scale bar for values from 0 through 1000)

Table 5-2. CS Computation Server Scheduler Window Functions (Cont'd)

Item	Description	Setting Options
Maximum Number of Dynamic Periodic Triggers	Specifies the maximum number of periodic process specifications that may be added at runtime (via CS library functions) to the CS Scheduler software.	100 (Default) (On a scale bar for values from 0 through 1000)
Number of Dispatch Queue Entries	Specifies the maximum number of processes whose trigger condition(s) have been met, but have not yet been dispatched at any point in time. An entry is placed in the dispatch queue when its periodic or event trigger has been satisfied. An entry is removed from the dispatch queue when it has been dispatched, i.e., has started executing.	100 (Default) (On a scale bar for values from 0 through 1000)
Number of Log Queue Entries	Specifies the maximum number of logged entries that are buffered until able to be written to the WESStation's disk. If dispatches are to be logged, the log files will be placed in the /usr/wdpf/cs/adm/ directory, in files named after the day of the week, i.e., <i>monday.log</i> , <i>tuesday.log</i> , etc. These files will therefore be overwritten each week.	0 (Default) (On a scale bar for values from 0 through 1000)
Number of Run List Queue Entries	Specifies the maximum number of application processes started by the CS Scheduler package that may be running at any one time.	200 (Default) (On a scale bar for values from 0 through 1000)
Maximum Number of Tasks to Dispatch per Second	To limit the Dispatcher's performance impact on system behavior, this parameter specifies the maximum number of dispatches the Dispatcher can perform per second. Those processes not dispatched will be queued first for dispatching the next second.	10 (Default) (On a scale bar for values from 1 through 600)

Section 6. Calculation Support Functions

6-1. Section Overview

This section describes Calculation Support Functions. These functions allow application developers to create their software for the Computation Server environment and describe it such that it may be utilized for different projects' needs.

The following support functions are discussed:

- **Off-line functions** that allow the user to define algorithms (and calculations based on those algorithms) in an off-line environment ([Section 6-2](#)).
- **Initialization** functions that support the initialization of calculations ([Section 6-3](#)).
- **Run-time functions** that support on-line periodic execution of calculations ([Section 6-4](#)).
- **Algorithm Example** ([Section 6-5](#)).

6-2. Off-line Support Functions

The off-line support functions allow the user to define algorithms (and calculations based on those algorithms) in an off-line environment.

An **algorithm** is a software module that processes Data Highway information and produces new Data Highway information. This new information is in the form of point field names and data types (such as digital, analog, or algorithm point fields). An algorithm is defined in template form, (that is, the number, types, and field names of input and output data are defined).

A **calculation** is an algorithm occurrence that supplies the point names for the algorithm's input and output points and point fields, as well as any optional algorithm records the calculation will use to tailor its activity.

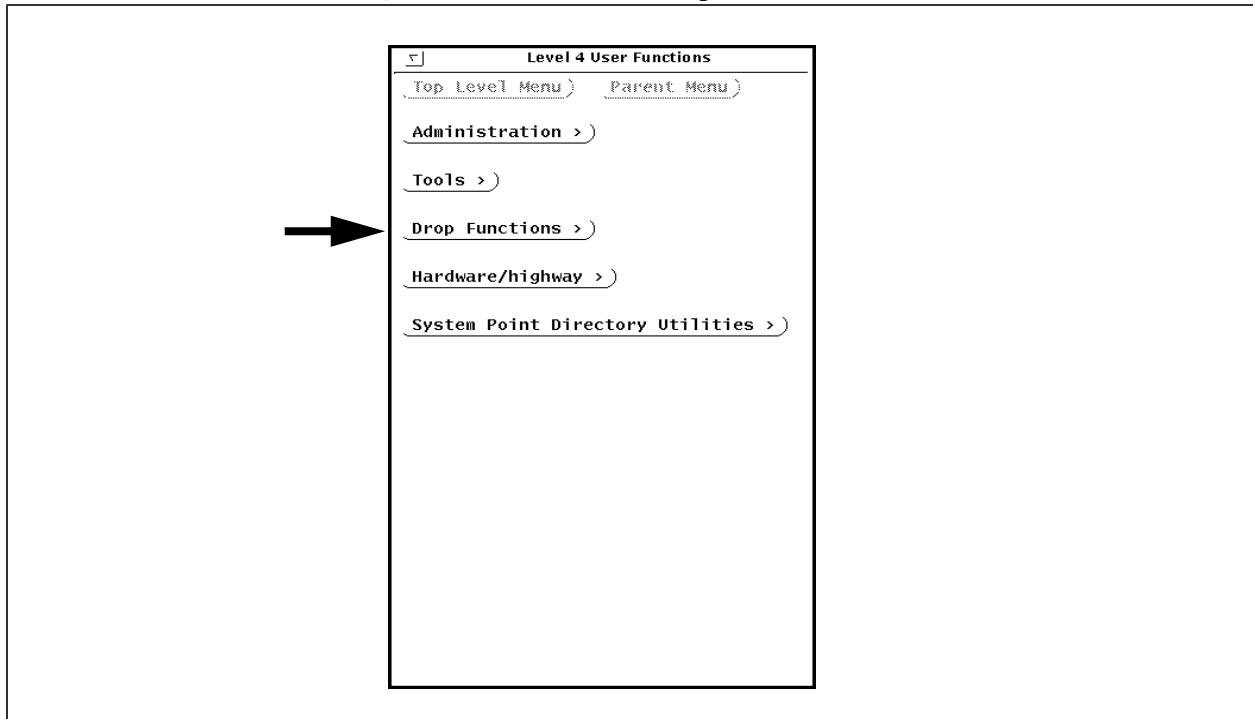
6-2.1. Accessing the Calculation Definition Window

The **Calculation Definition** window is used to load and store algorithm and calculation data. From this window, defined algorithms can be viewed and edited in the loaded file. Algorithms and calculations can also be created and deleted.

To access the **Calculation Definition** window, follow the steps below:

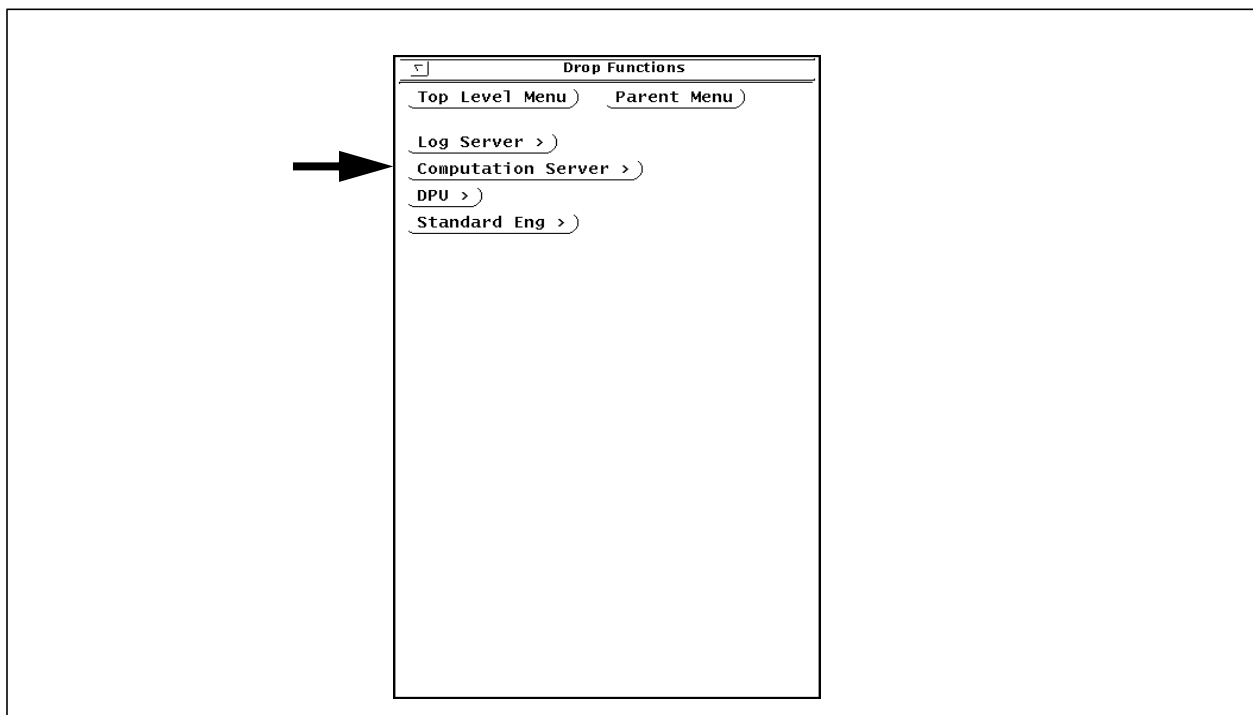
1. Access the Engineering WEstation top-level menu according to the procedures in “Engineering WEstation User’s Guide” (U0-8200).

2. Select **Drop Functions** from the top-level menu (as shown below).



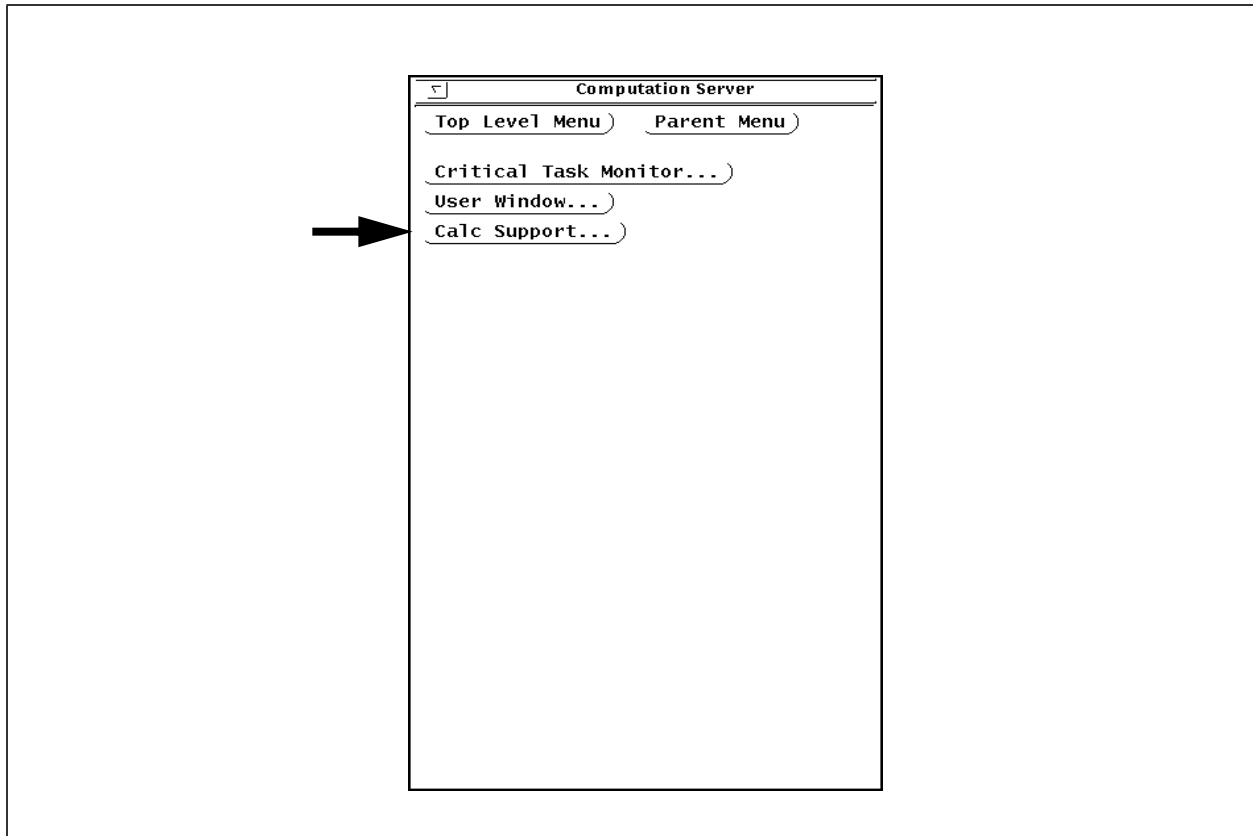
The **Drop Functions** menu displays as shown below.

3. Select **Computation Server** from the **Drop Functions** menu (as shown below).



The **Computation Server** menu displays (as shown below).

4. Select **Calc Support** from the **Computation Server** menu (as shown below).



Note

The **Calc Support** button will be available if the “Computation Server Engineering Tools” software package is selected for the drop.

The **Critical Task Monitor** and **User Window** buttons will be available if the “**Computation Server Client**” software package was selected for the drop.

See [Appendix A](#) for instructions on using the WDPF Init Tool to select the desired software packages for drops.

The **Calculation Definition** window appears (see [Figure 6-1](#)).

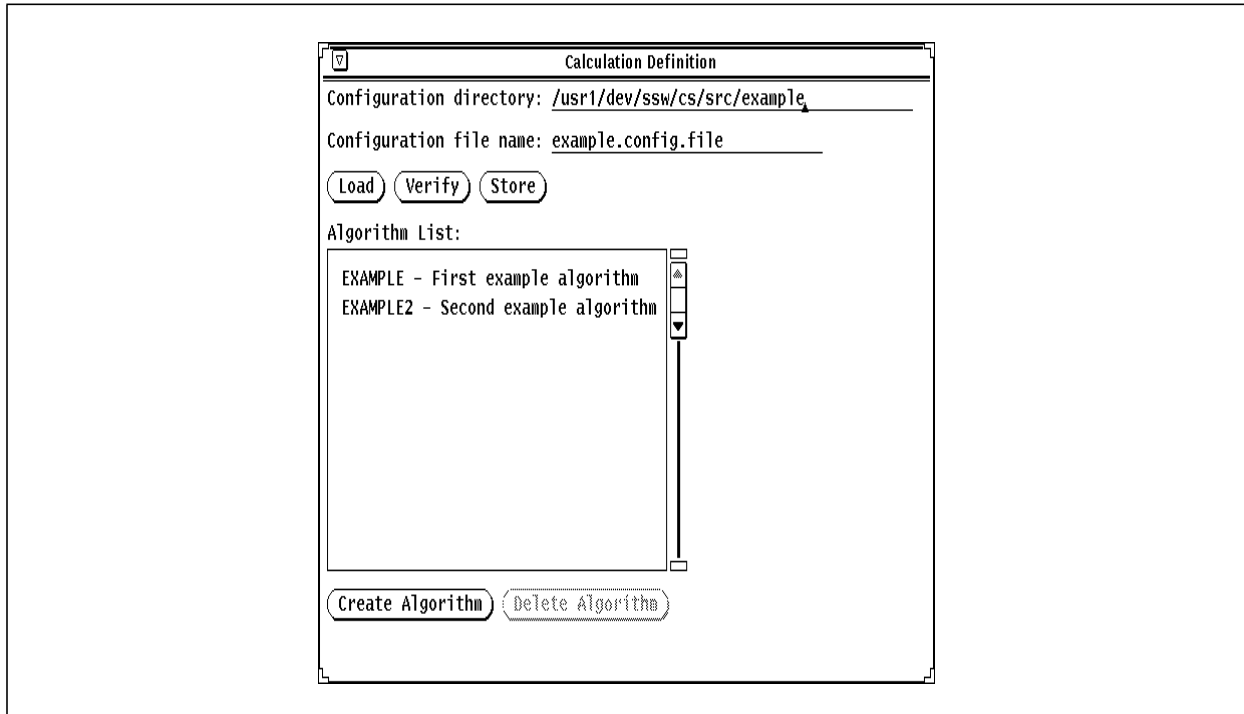


Figure 6-1. Calculation Definition Window

[Table 6-1](#) describes the fields and buttons on the **Calculation Definition** window:

Table 6-1. Calculation Definition Window Functions

Entry Field/Button	Description
Configuration directory	Specifies the directory where the algorithm and calculation data is/will be stored.
Configuration file name	Specifies the filename where the algorithm and calculation data is/will be stored.
Load	Loads data stored in the specified file into the Calculation Definition window (if the file exists).
Verify	Checks the data from the specified file for errors.
Store	Moves the data from the window back into the specified file.
Algorithm List	Scrolling list that displays the currently defined algorithms. To modify an existing algorithm, select the algorithm from the list.
Create Algorithm	Creates a new algorithm.
Delete Algorithm	Deletes the currently-selected algorithm from the scrolling list.

6-2.2. Creating and Modifying Algorithms

Use the following procedure to **create** an algorithm:

1. Access the **Calculation Definition** window (described in [Appendix 6-2.1](#)).
2. Select the **Create Algorithm** button to create a new algorithm.
The Algorithm Information window appears (as shown in [Figure 6-2](#).)

[Table 6-2](#) and [Table 6-3](#) describe the fields and buttons available through this window.

Use the following procedure to **modify** an algorithm:

1. Access the **Calculation Definition** window (described in [Appendix 6-2.1](#)).
2. Select an algorithm from the **Algorithm List** to modify.

The **Algorithm Information** window appears (as shown in [Figure 6-2](#).)

[Table 6-2](#) and [Table 6-3](#) describe the fields and buttons available through this window.

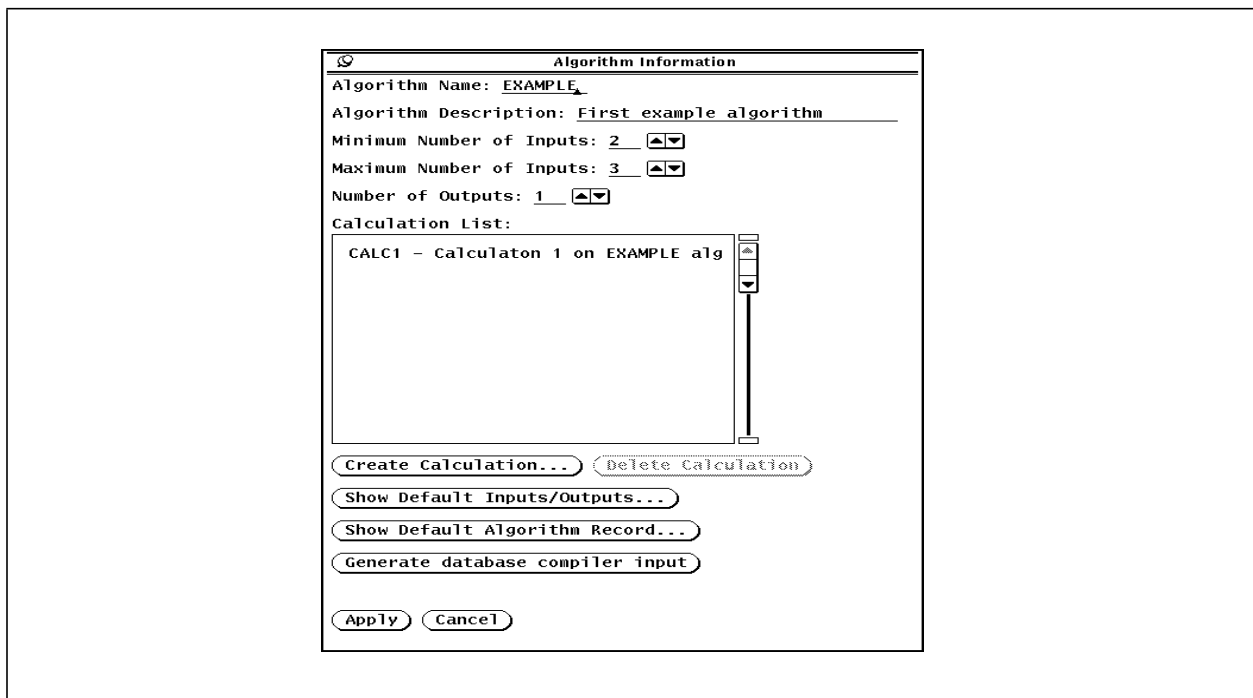


Figure 6-2. Algorithm Information Window

Note

For more detailed information on creating algorithms, contact a Westinghouse representative.

Table 6-2 describes the fields and buttons on the **Algorithm Information** window:

Table 6-2. Algorithm Information Window Functions

Entry Field/Button	Description
Algorithm Name	Specifies a name for the algorithm.
Algorithm Description	Describes the algorithm (up to a maximum of 30 characters can be entered).
Minimum Number of Inputs	Defines the minimum number of inputs for the algorithm. (May be zero.)
Maximum Number of Inputs	Defines the maximum number of inputs for the algorithm. (May be zero.) Must be greater than or equal to the Minimum.)
Number of Outputs	Defines the number of outputs for the algorithm. (May be zero.)
Calculation List	Provides a list of the calculations based on the algorithm. To modify existing calculations, select the calculation from the scrolling list. See Appendix 6-2.3 for information on creating and modifying calculations.
Create Calculation	Creates a new calculation.
Delete Calculation	Deletes the selected calculation from the scrolling list.
Show Default Inputs/Outputs	Allows the user to define the number and types of input and output points used by the algorithm. The information provided from the window shown in Figure 6-3 only provides a template . All calculations based on this algorithm template will provide the actual point names for those particular calculations.
Show Default Algorithm Record	Allows the user to define the number and types of input and output algorithm record fields, if used by the algorithm. The information provided from the window shown in Figure 6-5 only provides a template . All calculations based on this algorithm template will provide the point names for those calculations.
Generate database compiler input	Presents text that provides Sun Database Compiler (sdbcomp(1)) input text that defines all defined calculations' algorithm record fields as originated.

Table 6-2. Algorithm Information Window Functions (Cont'd)

Apply	Activates the settings on the Algorithm Information window. This button does not save the entered data permanently. Select the Store button on the main window (see Figure 6-1) for permanent saving of the data.
Cancel	Returns the settings on the Algorithm Information window to the last applied settings.

Caution

Modifying an algorithm's attributes (for example, number of outputs) is NOT reflected in calculations already-created from the algorithm.

As indicated in [Table 6-2](#), selecting the **Show Default Inputs/Outputs** button will display a window which is a template of the number and types of input and output (non-algorithm record) points used by the algorithm (see [Figure 6-3](#)).

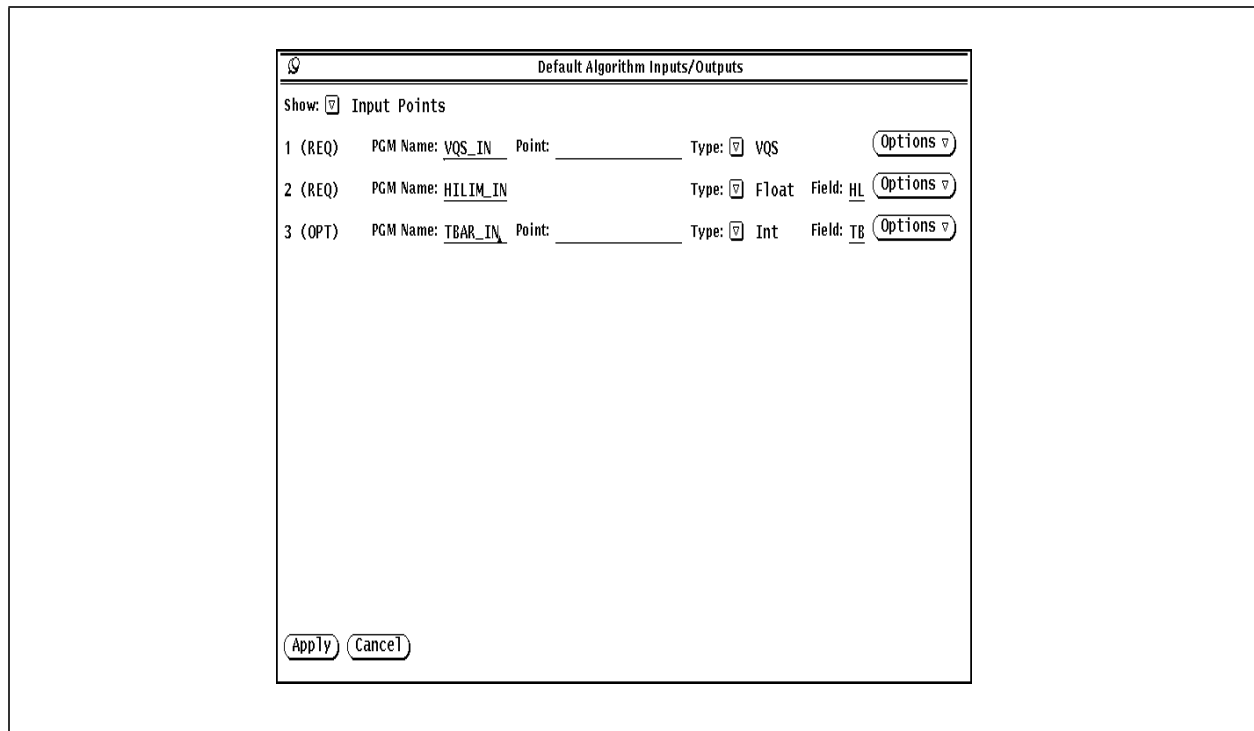
**Figure 6-3. Default Algorithm Inputs/Outputs Window**

Table 6-3 describes the fields and buttons on the **Inputs/Outputs** window:

Table 6-3. Default Algorithm Inputs/Outputs Window Functions

Entry Field/Button	Description
Show	Specifies input or output points for viewing. If input points are specified, the first column will contain (REQ) or (OPT) . (REQ) indicates a point is required and is listed for all input points until the Minimum Number of Inputs has been reached. (OPT) indicates a point is optional.
PGM Name	Name of the field used by the programmer to identify the input/output data displayed on the User Interface window (refer to <u>Appendix 6-5</u> for an example of the PGM Name field as it appears in an algorithm).
Point	<p>If a single, pre-determined point name is to be used for each calculation that is an occurrence of this algorithm, enter that point name. If each calculation uses a different point name (the more typical case), leave this field empty.</p> <p>This field may not be present, depending on the Options menu's current settings.</p>
Type	Specifies the type of point data. May be VQS (Value, Quality, and Status), Float , Int , or SID .
Field	<p>For Float and Int point fields, the point field name must be specified. This entry is not shown for VQS and SID types.</p> <p>This field may or may not be present, depending on the Options menu's current settings.</p>
Options Menu	<p>Menu that allows the user the following choices (see <u>Figure 6-4</u> and <u>Table 6-4</u> for additional information on choices):</p> <ul style="list-style-type: none"> - Require a point name - Use point name from previous field - Allow/Disallow changes
Apply	Activates the settings on the Default Algorithm Inputs/Outputs window. This button does not save the entered data permanently. Select the Store button on the main window (see <u>Figure 6-1</u>) for permanent saving of the data.
Cancel	Returns the settings on the Default Algorithm Inputs/Outputs window to the last applied settings.

The menu shown in [Figure 6-4](#) appears when the **Options Menu** is selected from the Default Algorithm Input/Output window:

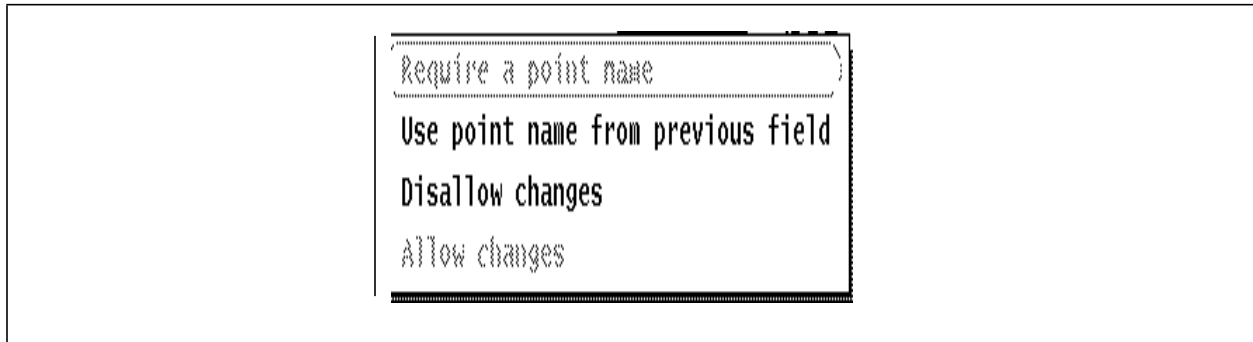


Figure 6-4. Default Algorithm Input/Output Options Menu

[Table 6-4](#) describes the options available from the Options Menu:

Table 6-4. Default Algorithm Input/Output Options Menu Functions

Function	Description
Require a point name	A different point name may be used for the next input/output field value. This option is required for the first point field.
Use point name from previous field	Multiple point fields may be read/written from/to the same point. By choosing this entry, the Point entry field will be removed. This option is not selectable for the first point field.
Disallow changes/ Allow changes	Provides/removes the point name and field name entry fields. These two fields toggle. If changes are currently allowed, the Disallow changes selection will be selectable and the Allow changes selection will not. The opposite is true if the Disallow changes selection is made.

As indicated in [Table 6-2](#), selecting the **Show Default Algorithm Record** button will display the **Algorithm Record Fields Information** window (see [Figure 6-5](#)).

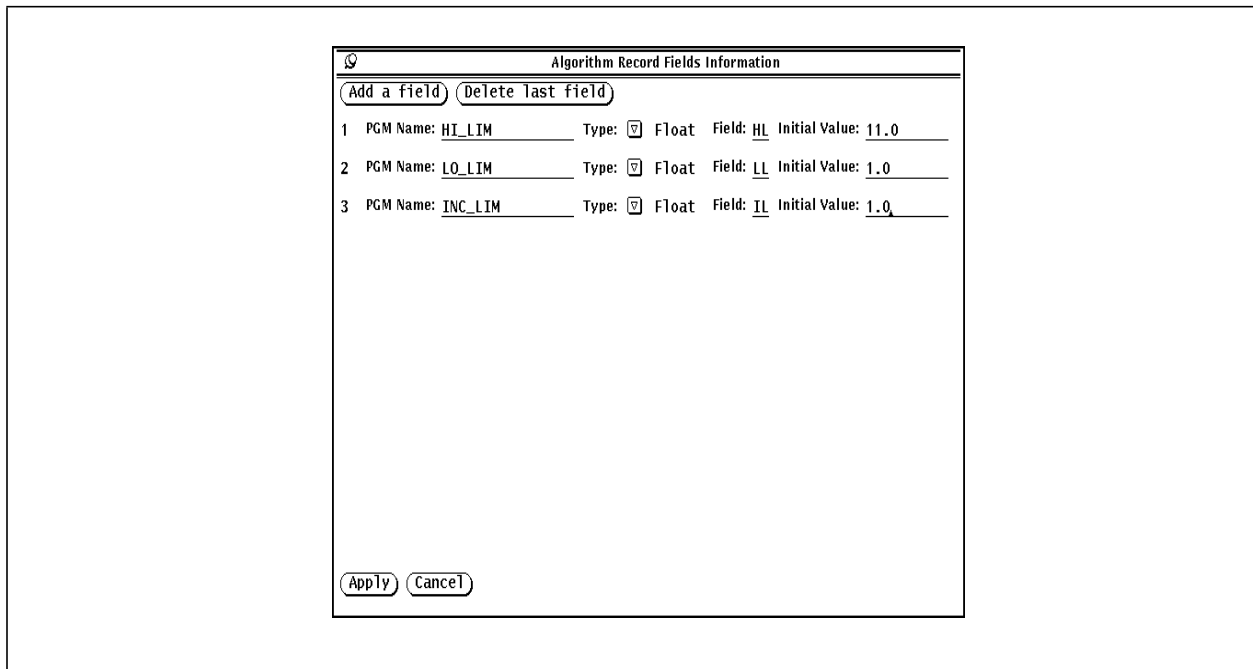


Figure 6-5. Algorithm Record Fields Window

[Table 6-5](#) describes the fields and buttons on the **Algorithm Records Fields Information** window:

Table 6-5. Algorithm Records Fields Information Window Functions

Entry Field/Button	Description
Add a field	Creates a new algorithm record field at the bottom of the field list.
Delete last field	Deletes the last algorithm record field.
PGM Name	Name of the field used by the programmer to identify the input/output data displayed on the User Interface window (refer to Appendix 6-5 for an example of the PGM Name field as it appears in the algorithm program).
Type	Specifies the algorithm record field's data. May be Float or Int .
Field	Specifies the algorithm record field name.
Initial Value	Optional initial value for the record field.
Apply	Activates the settings on the Algorithm Record Fields Information window. This does not save the entered data permanently. Select the Store button on the Calculation Definition window (see Figure 6-1) for permanent data saving.
Cancel	Returns the setting on the Algorithm Record Fields Information window to the last applied settings.

6-2.3. Creating and Modifying Calculations

Use the following procedure to create, modify, or delete a calculation:

1. Access the Algorithm Information window (described in [Appendix 6-2.2](#)).
2. Create a new calculation by selecting the **Create Calculation** button.

OR

Modify an existing calculation by selecting a calculation from the **Calculation List** scrolling list.

OR

Delete the selected calculation by selecting the **Delete Calculation** button.

If a calculation is to be created or modified, the **Calculation Information** window appears (as shown in [Figure 6-6](#)).

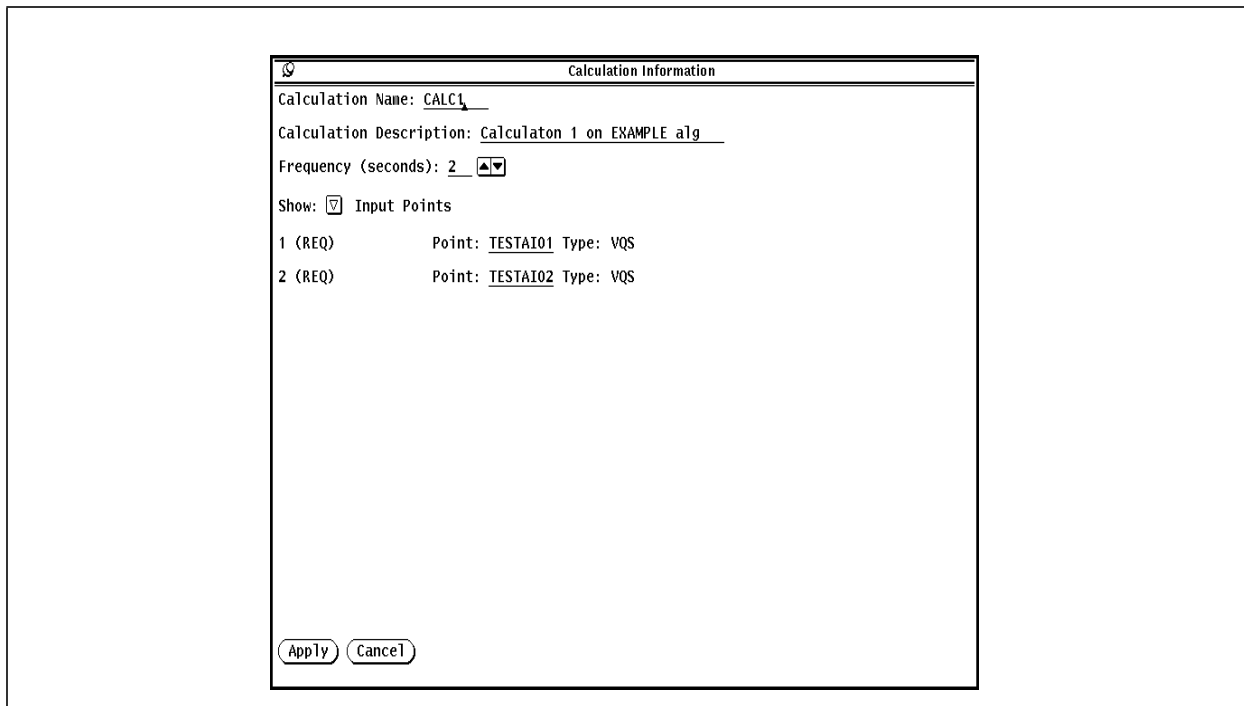


Figure 6-6. Calculation Information Window

The **Calculation Information** window allows the user to specify the information associated with a calculation.

Table 6-6 describes the fields and buttons on the **Calculation Information** window:

Table 6-6. Calculation Information Window Functions

Entry Fields/Buttons	Description
Calculation Name	Specifies a name for the calculation.
Calculation Description	Describes the function the calculation performs. Up to a maximum of 30 characters can be entered.
Frequency (seconds)	Defines how often (in seconds) the calculation is to be performed.
Show	<p>Can choose to display Input Points, Output Points, or Algorithm Record fields.</p> <p>The number and types of points/fields is determined by the template defined on the Algorithm Information window (see <u>Figure 6-2</u>).</p> <p>For input points, the first column will contain (REQ) or (OPT). (REQ) indicates a point is required and is listed for all input points until the Minimum Number of Inputs has been reached. (OPT) indicates a point is optional.</p>
Apply	Activates the settings on the Calculation Information window.
Cancel	Returns the setting on the Calculation Information window to the last applied settings.

Note

For more detailed information on creating calculations, contact a Westinghouse representative.

6-3. Initialization Support Functions

Initialization support functions are performed when a calculation is initially activated on the Computation Server. These functions are available in the Computation Server library, **libcs.so**. After a user develops an algorithm program, the Westinghouse-supplied subroutines (listed in [Table 6-7](#)) **must** be incorporated into the program to provide initialization support.

Table 6-7. Subroutines for Initialization Support

Subroutine	Description
CS_define_algorithm	This subroutine retrieves (from disk) the applicable algorithm information, including the calculation and point information that are referenced by that algorithm.
CS_do_algorithm	This subroutine never returns. It performs the periodic triggering of application calculation subroutines.

6-4. Run-time Support Functions

Run-time support functions support the on-line, periodic execution of the calculation. After a user develops an algorithm program, the following Westinghouse-supplied subroutines (listed in [Table 6-8](#)) will likely be useful for an application's runtime support.

Refer to on-line man pages and the **CS_algorithm.h** header file for syntax details.

Table 6-8. Subroutines for Run-time Support

Subroutine	Description
testinit	This subroutine returns a flag that indicates whether or not this is the first execution of the application since booting.
numinp	This subroutine returns the number of input points defined for the current calculation.
vqsget	This subroutine retrieves the current value, quality, and status for a single input point.
vqsput	This subroutine transfers the current value, quality, and status of a single output point to the Data Highway.
CS_get_algorithm_record	This subroutine retrieves a specified number of algorithm record fields from the Data Highway.

Table 6-8. Subroutines for Run-time Support (Cont'd)

Subroutine	Description
CS_put_algorithm_record	This subroutine transfers a specified number of algorithm record fields to the Data Highway.
CS_get_client_data	This subroutine returns the pointer previously saved within a calculation via CS_put_client_data().
CS_put_client_data	This subroutine stores the passed-in pointer/integer (32-bit value) with the calculation for later retrieval by CS_get_client_data(). This capability may be useful for communicating global data between different threads of execution within an application.

6-5. Algorithm Example

The following program is an example of an algorithm:

```
/* This algorithm uses four input points, one output */
/* point, and two algorithm record fields.          */

#include "CS_algorithm.h"

void
my_alg()
{
    int num_inputs, new_int, i;
    static int last_int = -1;
    struct vqs input[4];
    struct vqs output;

    /* The following can match PGM_NAME fields on the */
    /* Offline Calculation Support User Interface.    */
    #define NUM_ALG_FIELDS 2
    #define ALG_INT_FLD 0
    #define ALG_FLT_FLD 1

    Cs_alg_field_data algorithm_fields[NUM_ALG_FIELDS];

    num_inputs = numinp();

    /* Check for the first pass. */
    if (testinit()) {
        ... Initialization code ...
    }

    /* Get algorithm record field. */
    CS_get_algorithm_record(NUM_ALG_FIELDS, algorithm_fields);

    if (algorithm_fields[ALG_INT_FLD].digital != last_int) {
        /* Detected change in input. */

        /* Loop through all input points. */
        for (i=0; i < num_inputs; i++) {
            /* Get Value, Quality, and Status for input. */
            vqsget(i+1, &input[i]);

            ... do work with inputs and produce output ...

            vqsput(1, &output);
        }
    }
}
```

```

    /* Modify data for output algorithm record field. */
    algorithm_fields[ALG_FLT_FLD].analog++;

    /* Put algorithm record field. */
    CS_put_algorithm_record(NUM_ALG_FIELDS,
                          algorithm_fields);
}
last_int   = algorithm_fields[ALG_INT_FLD].digital;
last_float = algorithm_fields[ALG_FLT_FLD].analog;
}

main(argc, argv)
int argc;
char *argv[];
{
    char *config_file_name;

    if (argc != 2) {
        printf("usage: %s <configuration_file_name>\n", argv[0]);
        exit(1);
    }

    config_file_name = argv[1];

    if (SHC_open_memory() != SHC_OK) {
        printf("Unable to open the SHC memory\n");
        exit(1);
    }

    /* Set up to do the "MY_ALG" algorithm with my_alg(). */
    CS_define_algorithm(config_file_name, "MY_ALG", my_alg);

    /* Do calculations defined for the selected algorithms. */
    CS_do_algorithm();

    /******
    *   (CS_do_algorithm will never return - it loops forever
    *   *****/
}

```

Section 7. Watchdog Functions

7-1. Section Overview

This section describes the Computation Server Watchdog function. The following topics are included:

- Watchdog overview ([Section 7-2](#)).
- Application task component ([Section 7-3](#)).
- Watchdog user interface ([Section 7-4](#)).
- Required Tasks File ([Section 7-5](#)).

7-2. Watchdog Overview

The Watchdog function monitors the periodic execution of critical processes and may initiate certain corrective action, depending on the process being monitored.

The Watchdog maintains a list of the processes currently being monitored, and keeps track of the status of each process. Information is sent to the Watchdog using an Application Task Component (see [Section 7-3](#)) included in each process being monitored. This information indicates whether a process is currently alive, or if monitoring should be started or terminated.

When the Watchdog software starts, it may optionally be supplied a *required tasks file* that lists application processes that must check-in with the Watchdog within a prescribed amount of time after the Watchdog program starts. This file is described in [Section 7-5](#).

The Watchdog software contains a low-priority task that executes periodically. By monitoring the execution of this low priority task, the Watchdog verifies that no real-time task is looping and consuming all of the CPU resources.

When the Watchdog determines that a monitored process has not met its periodic requirement, corrective action is taken. Depending on the configuration, one or more of the following actions can be taken:

- Log a message recording the timeout (this is always done).
- Optionally fail the Computation Server. This will generate an alarm fault with a Fault Code (FC field) of 175, and a Fault ID (FK field) of 41.
- Optionally generate an alarm (Fault Code 175, Fault ID 41), indicating that the process has failed.
- Optionally terminate the failed task (with a non-catchable SIGKILL signal).

By default, when a process fails to check-in within its allotted period, the Watchdog will log a message and terminate the failed task.

7-3. Application Task Component

The Application Component of the Watchdog function is included in each task that is being monitored and informs the Watchdog that the application task should be monitored. It also periodically informs the Watchdog that the application task is operating normally.

This component consists of three subroutines that communicate with the Watchdog. These three subroutines indicate to the Watchdog that it should begin monitoring the application task, terminate monitoring, or declare that the application is still alive. These three subroutines are described below:

- **CS_start_monitoring (function, time_out_value, action_on_error)**

The user must enter information for this subroutine. This information includes a string describing what is being monitored, a time-out value (in seconds), and information defining what action is to be taken if a time-out occurs. The string is important if it is to match an entry in the `required_tasks_file`. This string is also displayed on the Watchdog User Interface (Section 7-4). An example is shown below:

```
CS_start_monitoring ("rmp", 60, CS_WDOG_DROP_ALARM);
```

In the example above, **rmp** is the function being monitored, the time-out value is **60** (seconds) and the corrective action is **CS_WDOG_DROP_ALARM**, meaning that it will generate an alarm should the task not check-in within its specified period.

- **CS_alive_message ()**

The user does not enter any information for this subroutine, which informs the Watchdog that the calling application is still running. Based on the above `rmp` example, this subroutine must be called by the `rmp` application before 60 seconds have passed since the last call. If 60 seconds pass between calls, the Watchdog will take corrective action (generate an alarm, in this example).

- **CS_terminate_monitoring ()**

The user does not enter any information for this subroutine, which is used to terminate the Watchdog monitoring of the calling process.

Application software can gain access to these function prototypes and associated type definitions through the `$WDPF_HOME/cs/inc/CS_wdog.h` header file and the Computation Server library (`libcs.so`). Additional details may be found in the on-line operating system help (man pages).

7-4. Using the Watchdog Interface

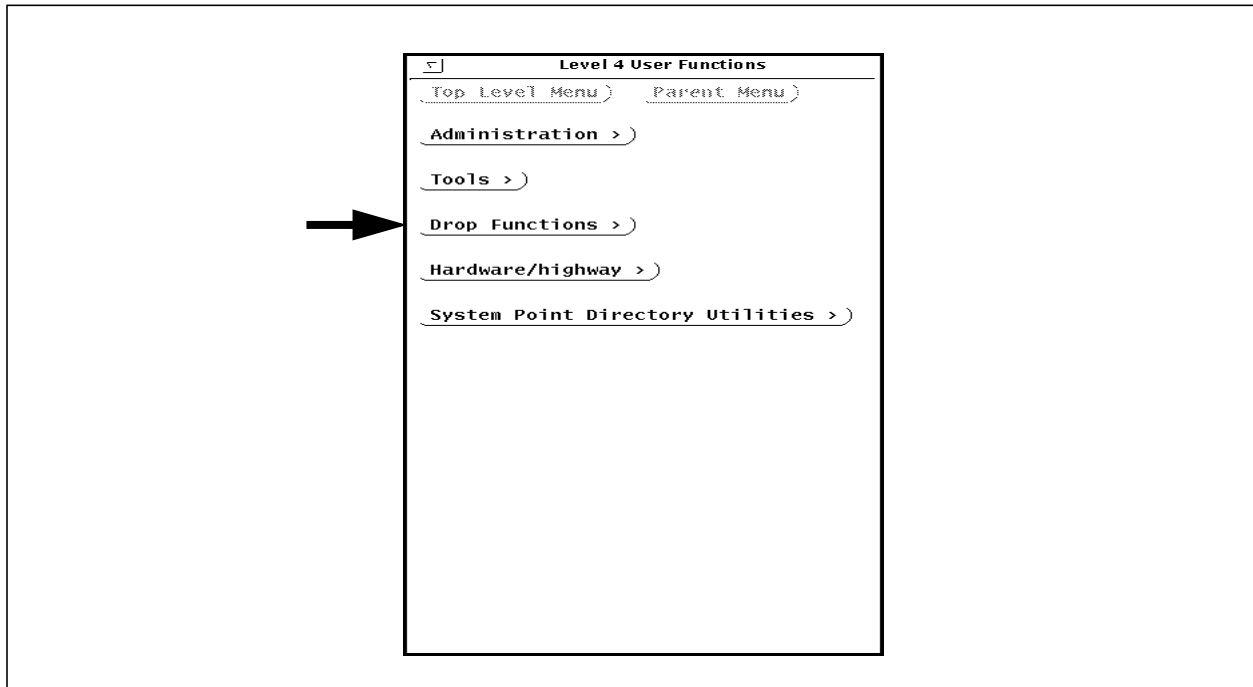
To view the list of processes monitored by the Watchdog and their current states, the **Watchdog Monitor** window can be used. To access the Watchdog Monitor, following the steps below:

7-4.1. Adding Computation Watchdog Package

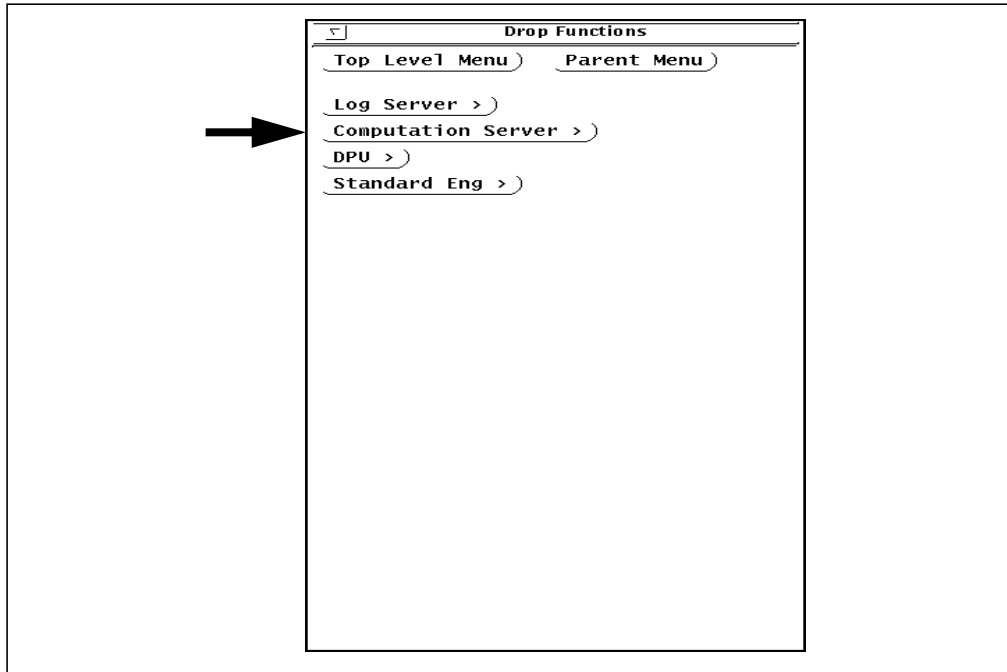
The Computation Server Watchdog Package can be added to a drop as described in Appendix A.

7-4.2. Accessing Watchdog Monitor Window

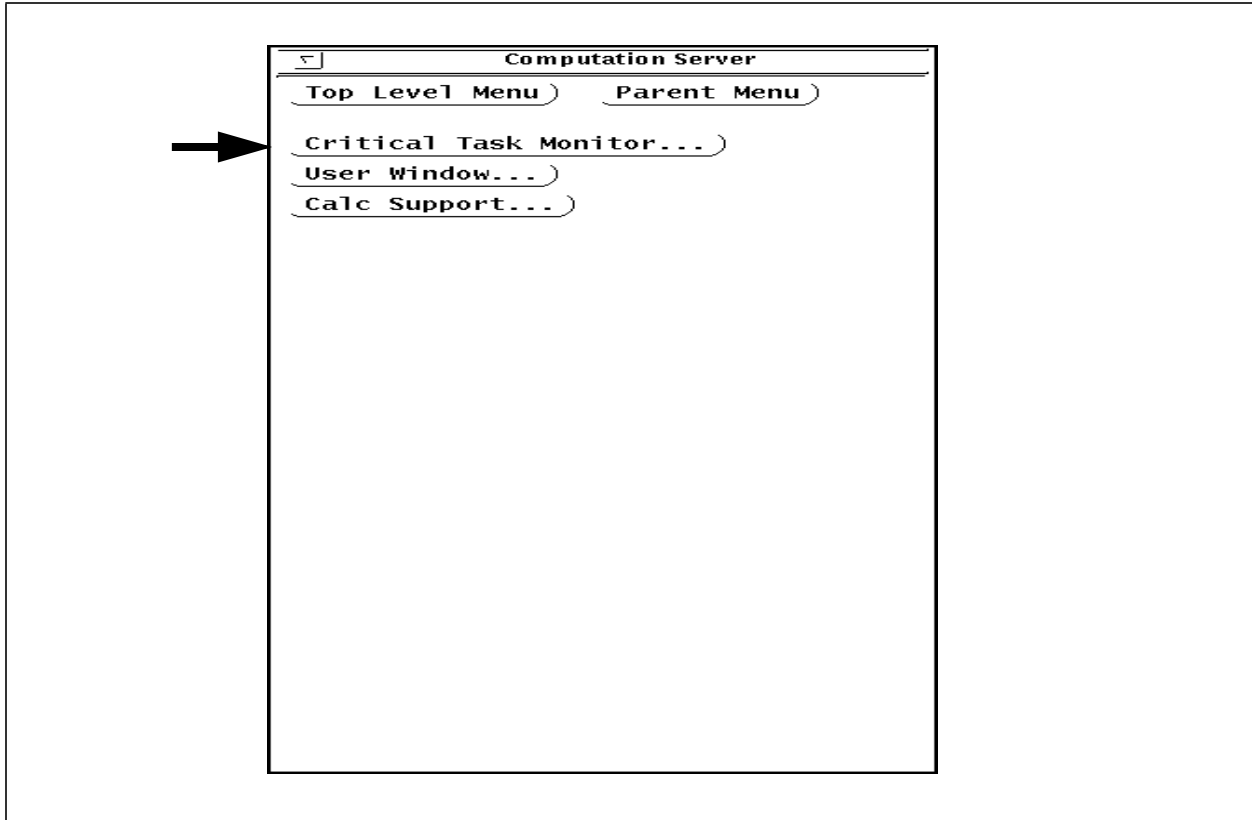
1. Access the Engineering WEStation top-level menu according to the procedures in “Engineering WEStation User’s Guide” (U0-8200).
2. Select **Drop Functions** from the top-level menu (see figure below).



3. The **Drop Functions** menu appears. Select **Computation Server** from the **Drop Functions** menu.



4. The **Computation Server** menu displays. Select **Critical Task Monitor** from the **Computation Server** menu.



Note

See Appendix A for instructions on using the WDPF Init Tool to select the desired software packages for drops.

The **Watchdog Monitor** window appears (see [Figure 7-1](#)).

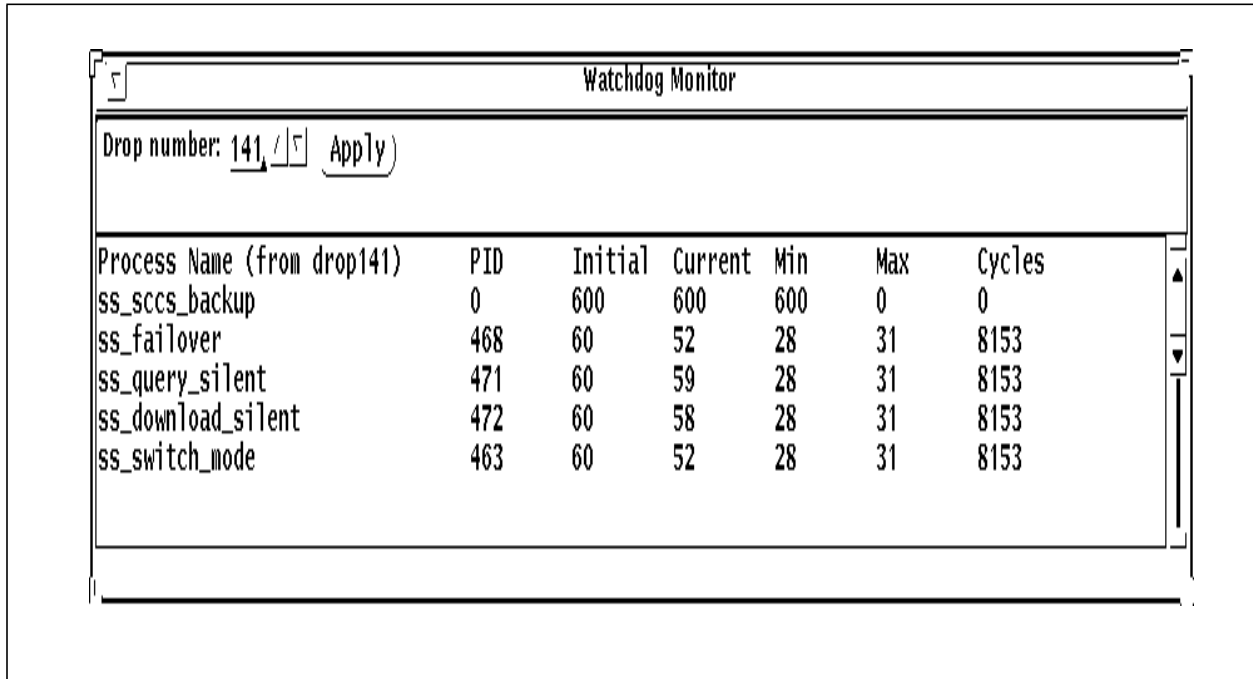


Figure 7-1. Watchdog Monitor Window

The fields on the **Watchdog Monitor** window are described in [Table 7-1](#):

Table 7-1. Watchdog Monitor Window Functions

Field Name	Description
Drop number	Drop being monitored by Watchdog Monitor. To change the drop being monitored, type in a valid drop number (or use the up/down buttons), and then select the Apply button.
Process Name	Name of the process being monitored.
PID	Process ID. If 0, the entry was entered from the required tasks file and the process has not yet registered with the Watchdog.
Initial	Value entered for the time_out_value for the CS_start_monitoring () subroutine (refer to Section 7-3).
Current	Current value of counter. A current value of 0 (zero) indicates the process has timed-out.
Min	Minimum value of counter for process. If 0, the process has timed-out.
Max	Maximum value of counter for process.
Cycles	Number of times CS_alive_message () has been called (refer to Section 7-3 for more information).

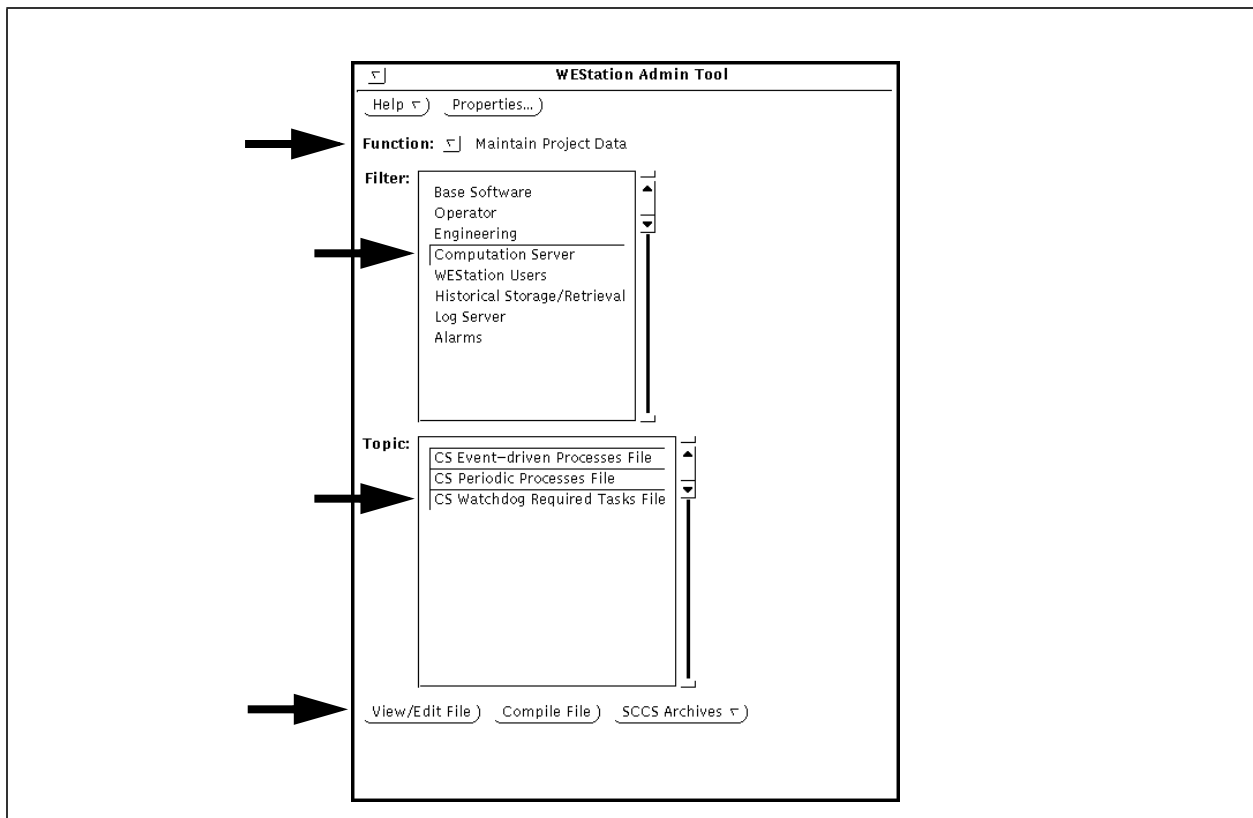
7-5. Required Tasks File

This file defines the tasks that must be running on a drop (containing the Watchdog package) for the drop to be considered operational.

7-5.1. Accessing the CS Watchdog Required Tasks File

To access the CS Watchdog Tasks file, follow the steps below:

1. Use the mouse to select the **WDPF Admin Tool** icon from the Engineering WEstation screen.
2. Select the **Maintain Project Data** from the pull down Function menu.
3. Select the **Computation Server** from the Filter scrolling list.
4. Select **CS Watchdog Required Tasks File** from the Topic scrolling list (as shown below).
5. Select View/Edit File (as shown below).



The following pop-up window will appear.

6. Select **Edit** from the Mode pull down menu. This option will prompt the user to create a file or edit an existing file.
7. Select the **Drop** pull down menu and select the drop which will use the file. A selection of “All” means that the file is applicable to all drops that contain the associated package software.
8. Make changes to the files content.
9. Select the **Write to Disk** from the File Utilities pull-down menu.
10. Use the “Download Configuration to Disk” WDPF Admin Tool function to download the modified file to all CS drops. “Restart Applications” or reboot the drop to use the modified files contents.

```

CS Watchdog Required Tasks File
Mode: Edit      Drop: All      File Utilities
#####
#@(#)required_task_file      1.1 16 Nov 1995
#####
#
#          PROPRIETARY INFORMATION
#
# This document is the property of and contains proprietary information owned
# by the Westinghouse Electric Corporation and/or its subcontractors and
# suppliers, is transmitted to you in trust, and is to be returned upon
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# publication may be reproduced, stored in a retrieval system, or transmitted
# in any form or by any means, electronic, mechanical, photocopying, recording
# or otherwise, without the prior written permission of Westinghouse Electric
# Corporation.
#####
#
#   This file defines that tasks that must be running on a drop
#   containing the Wxcswdog package if it is to be considered
#   operational.
#
#   Tasks are listed one per line. There are four fields on each line.
#   Fields are separated by spaces or commas. The characters between

```

File Syntax

Tasks are listed one per line. There are four fields on each line. Fields are separated by spaces or commas. The characters between a “#” and the end of a line are ignored.

Field 1 - Name of the task (should not include the directory).

This string must be matched by the string passed-in by an application upon call to the `CS_start_monitoring()` library function.

Field 2 - Maximum time (in seconds) after startup of the Watchdog for the task to initialize itself.

Field 3 - Action to take of the task fails to check in:

- 1 - Fail the drop
- 0 - Do not fail the drop

Field 4 - Mode in which the task should be operational:

- primary - only when the drop is in Primary mode
- backup - only when the drop is in Backup mode
- primary, backup - operational in both modes.

Note

There is not an option to set the drop into fault, just to fail the drop.

File Examples

```
xyz_task 1000 1 primary # this is a comment
```

Will fail the drop if *xyz_task* does not check in within 1000 seconds of startup of the Watchdog software when the drop is in Primary mode.

```
appl_exec 600 1 primary, backup # Application executive process.
```

Will fail the drop if *appl_exec* does not check-in within 600 seconds of startup of the Watchdog software when the drop assumes either Primary or Backup mode.

Appendix A. Adding a Software Package to a Drop

A-1. Section Overview

This section provides instructions for using the WDPF Init Tool and Admin Tool to add a software package to a WESStation drop.

There are three different methods that can be used (if necessary, refer to “[Defining and Configuring WESStations](#)”(U0-8300) for information on defining WESStation drops and the software packages for the drops):

- Use a **released** or **existing** drop type that already contains the desired package. ([Section A-2](#))
- Create a **new** drop type and choose the desired package. ([Section A-3](#))
- Modify an **existing** drop type and add the desired package. ([Section A-4](#))

Note

It is **not** recommended to modify the released WESStation drop types. If a modification to a released WESStation is desired, copy that drop type’s packages to a drop type with a **new** name, and then make the desired package changes.

This will maintain the original released drop type, while providing a new drop type with the desired additions or subtractions of packages.

A-2. Use a Released or Existing Drop Type

Use the following procedure to add a desired software package to a drop:

1. Use the mouse to open the **WDPF Init Tool** icon from the Engineering WEStation screen. The WEStation Initialization Utility main window appears (see [Figure A-1](#)).
2. Select the drop that is to be configured from the **Drop Configuration** list.
3. Select the drop type that contains the desired package from the **Drop Type** pull-down menu.
4. Select the **Apply** button. The desired package will be added to the selected drop.
5. Select the **Save Configuration to Disk** button (if there are errors in the system configuration, the user will be prompted whether or not to save the configuration).

A prompt will appear asking if the user wants to restart the Admin Tool. Select **Restart**.

A second prompt will appear that **strongly recommends** that the Admin Tool be used to re-install **all** the software packages. Due to the interaction of software throughout the system, installing only a few packages may result in inconsistent system operation.

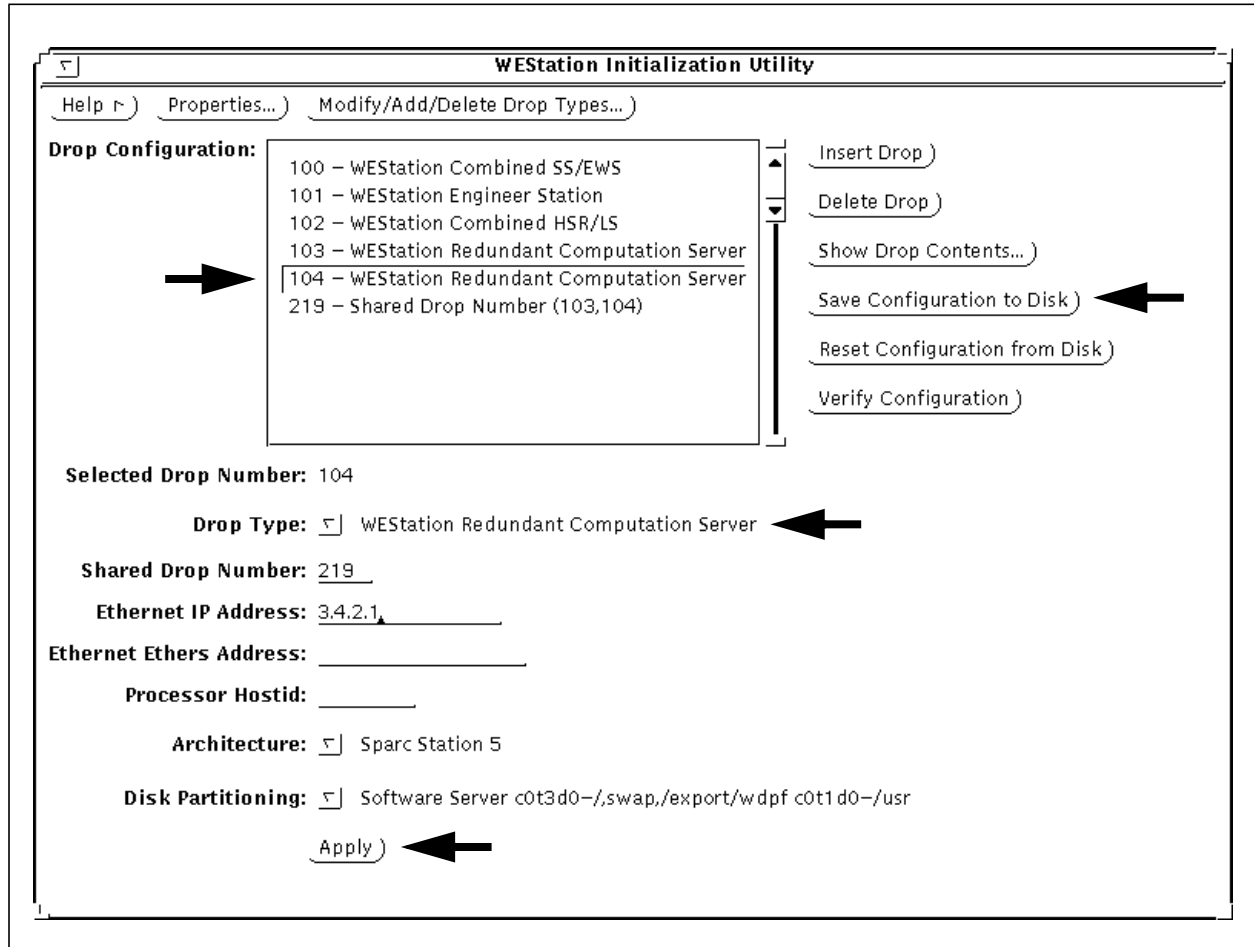


Figure A-1. WDPF Init Tool Main Window

- After all the desired changes have been made and saved to disk, access the **Admin Tool**.

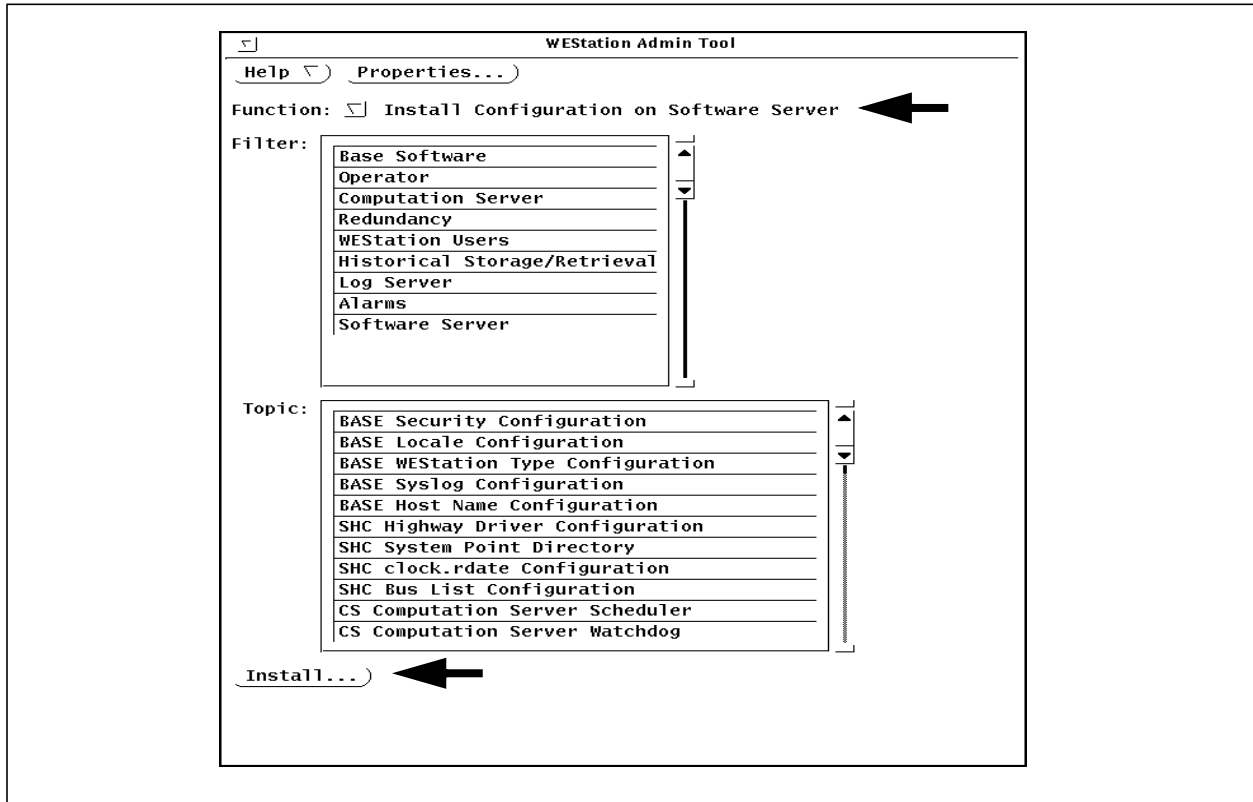


Figure A-2. Admin Tool Window

7. Select the **Install Configuration on Software Server** function (all choices should be selected in the **Filter** scrolling list and in the **Topic** scrolling list. This will occur automatically when the Admin Tool is restarted).
8. Select the **Install** button.
9. Upon the completion of the install operation, download the modified files throughout the system, since changes may have occurred in unexpected places. Refer to [“Defining and Configuring WEstations” \(U0-8300\)](#) for information on using the “Download Configuration to Drops” function.

A-3. Create a New Drop Type

Use the following procedure to create a new drop type that contains the desired software package and apply it to a WEStation:

1. Use the mouse to open the **WDPF Init Tool** icon from the Engineering WEStation screen. The WEStation Initialization Utility main window appears (refer to [Figure A-1](#)).
2. Select the **Modify/Add/Delete** button to access the **Modify /Add/Delete Drop Types** window (see [Figure A-3](#)).

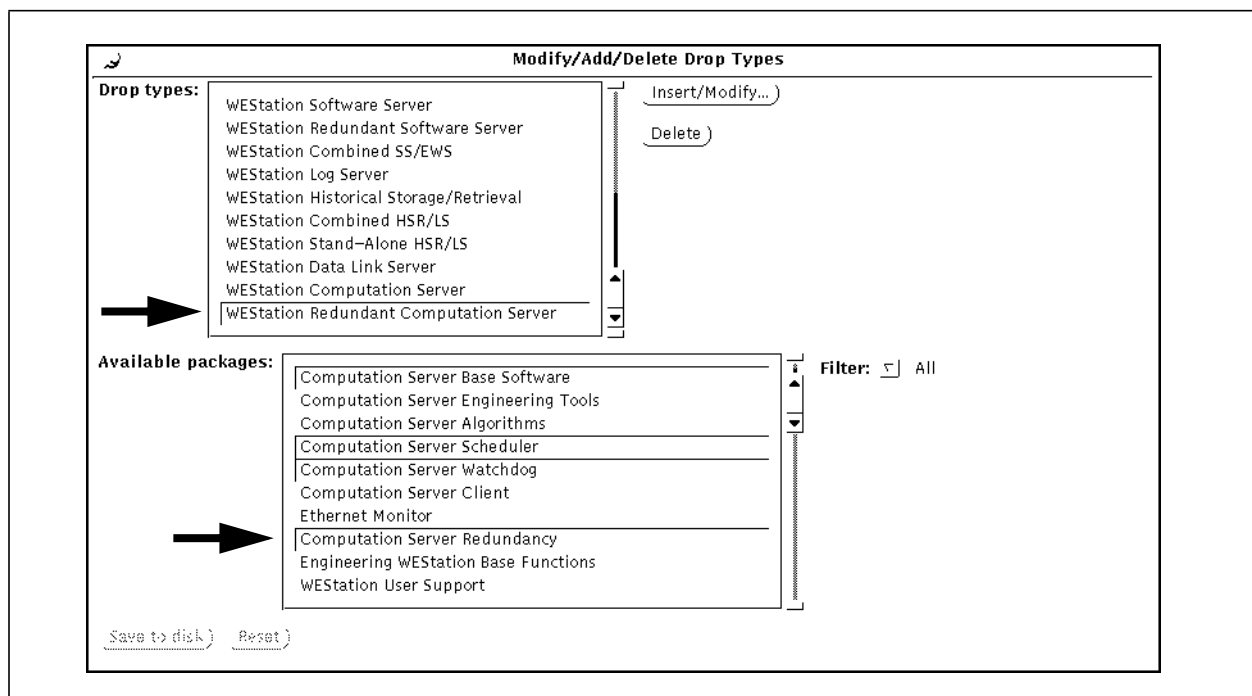


Figure A-3. Modify/Add/Delete Drops Types Window

3. Select a **drop type** (from the **Drop types** list) whose software packages most closely match the desired new drop type.

If necessary, use the **Filter** function or the **Package Details** pop-up menu selection to identify what software packages are contained on the selected drop type.

4. Select the **Insert/Modify** button. The **Insert/Modify Drop Type** window will appear with the selected drop type name in the Name entry field ([Figure A-4](#) illustrates this window and [Table A-1](#) describes the functions).
5. Change the drop type name.
6. Change the abbreviation, if desired.

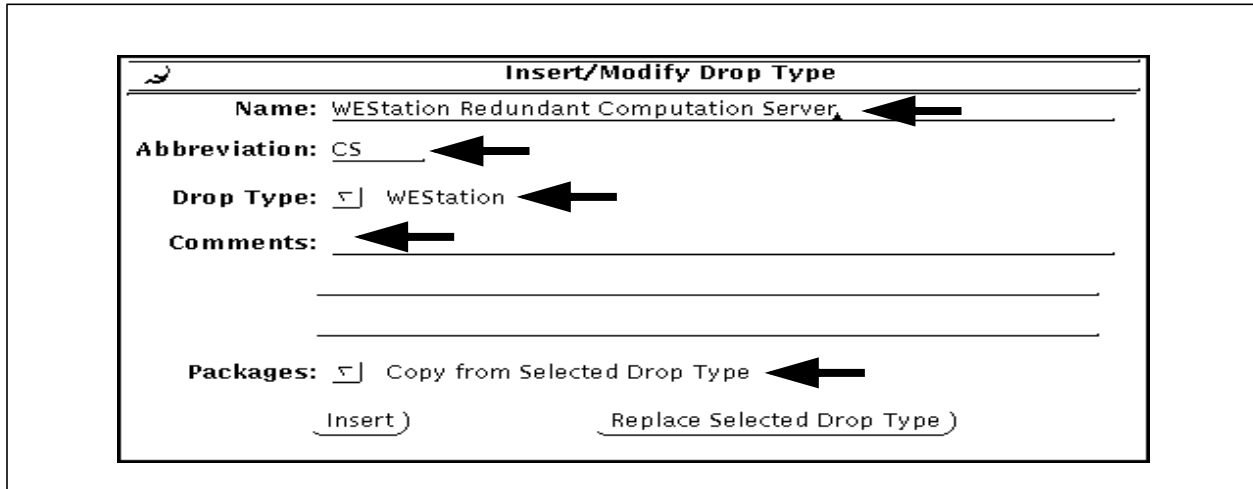


Figure A-4. Insert/Modify Drops Type Window

Table A-1. Insert/Modify Drops Types Fields

Fields	Description
Name Entry Field	Displays the name of the drop type as it will show throughout the WEStation Init Tool and Admin Tool lists. The name of the drop type must be unique.
Abbreviation Entry Field	Displays the abbreviation for the drop type that will be used on the System Status Display diagram.
Drop Type	Accesses a pull-down menu used to identify whether a drop is Non-WEStation or WEStation.
Comments Entry Field	Enters comments for user information only. This field is not used by the software.
Packages	Identifies which software packages are to be installed on the drop. Options are: Copy from selected Drop type = Selects the same software packages that are on the drop selected from the Drop Types scrolling list. Clear Selected Packages = Deselects all software packages on the drop.
Insert Button	Enters the information, creates a new drop type, and inserts it into the Drop types list in the Modify/Add/Delete Drop Types window.
Replace Selected Drop Type	Modify the info on the Insert/Modify window selected from the Drop Types scrolling list (in the Modify/Add/Delete Drop Types window) for the drop type. (Packages will not be changed.)

7. Select the **WEStation** drop type.
8. Enter any applicable comments (for user information only).
9. Use the **Packages** menu to copy the software packages contained on the selected drop type to the new drop type (**Copy from Selected Drop Type**).
10. Select the **Insert** button. This adds the new drop type to the Drop types list on the Modify/Add Delete window and returns to the **Modify/Add/Delete Drop Types** window (refer to [Figure A-3](#)).
11. Confirm that the new drop type from the **Drops types** list is selected (it will be at the bottom of the list).
12. Select/de-select the desired packages for the new drop from the **Available packages** list.
13. Once the selected choices are acceptable, select the **Save to disk** on the **Modify/Add/Delete window** (this saves the desired packages to the new drop type). A prompt appears asking whether to restart the Admin Tool. Select **Restart**.

OR

If the selected choices are not acceptable, select the **Reset** button to revert to the last saved selections.

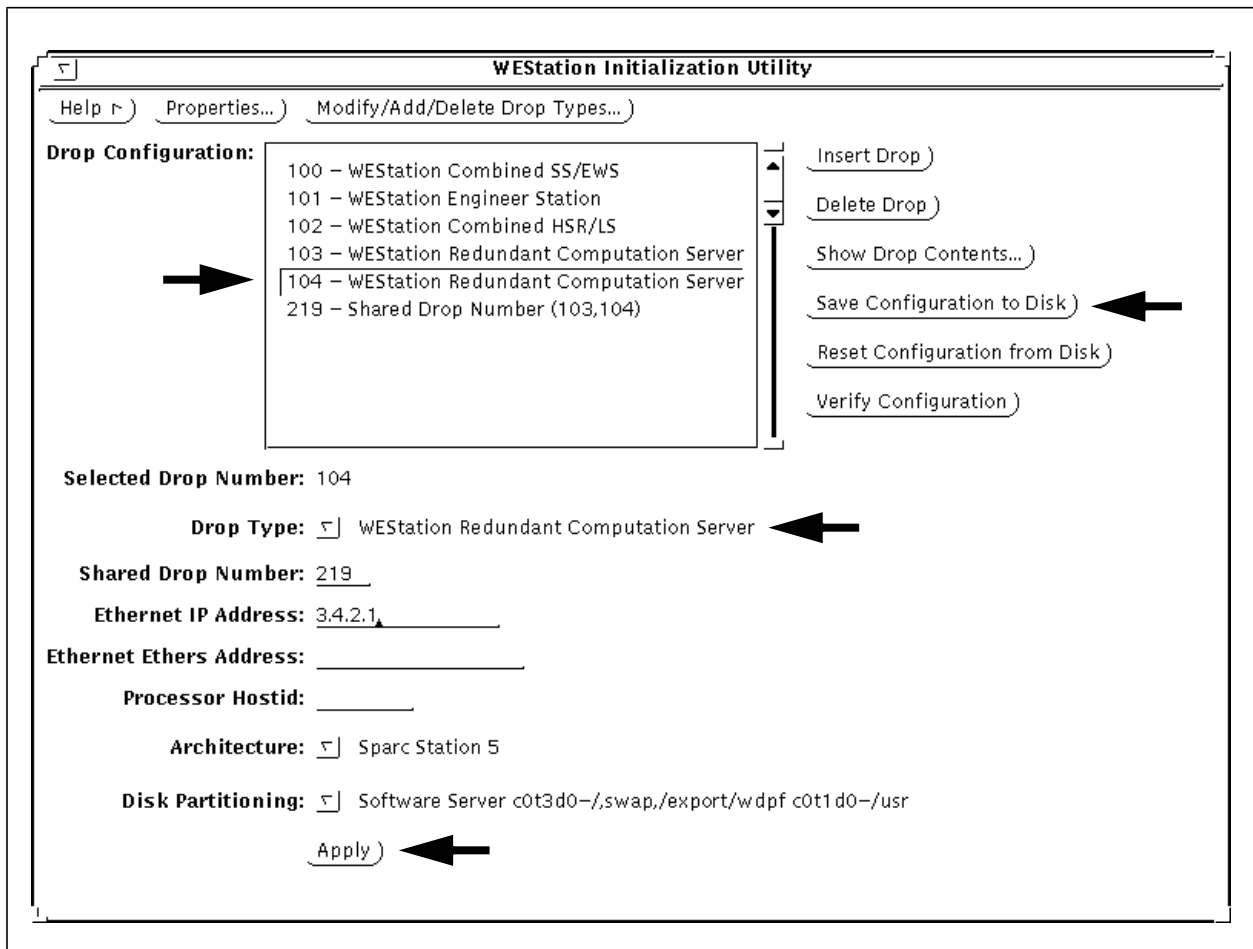
14. Return to the **Init Tool** main window and select the drop that is to be configured from the **Drop Configuration** list.
15. Select the newly-created drop type (it will be at the bottom of the list) that contains the desired package from the **Drop Type** pull-down menu.
16. Select the **Apply** button. The desired package will be added to the selected drop.

17. Select the **Save Configuration to Disk** button (if there are errors in the system configuration, the user will be prompted whether or not to save the configuration).

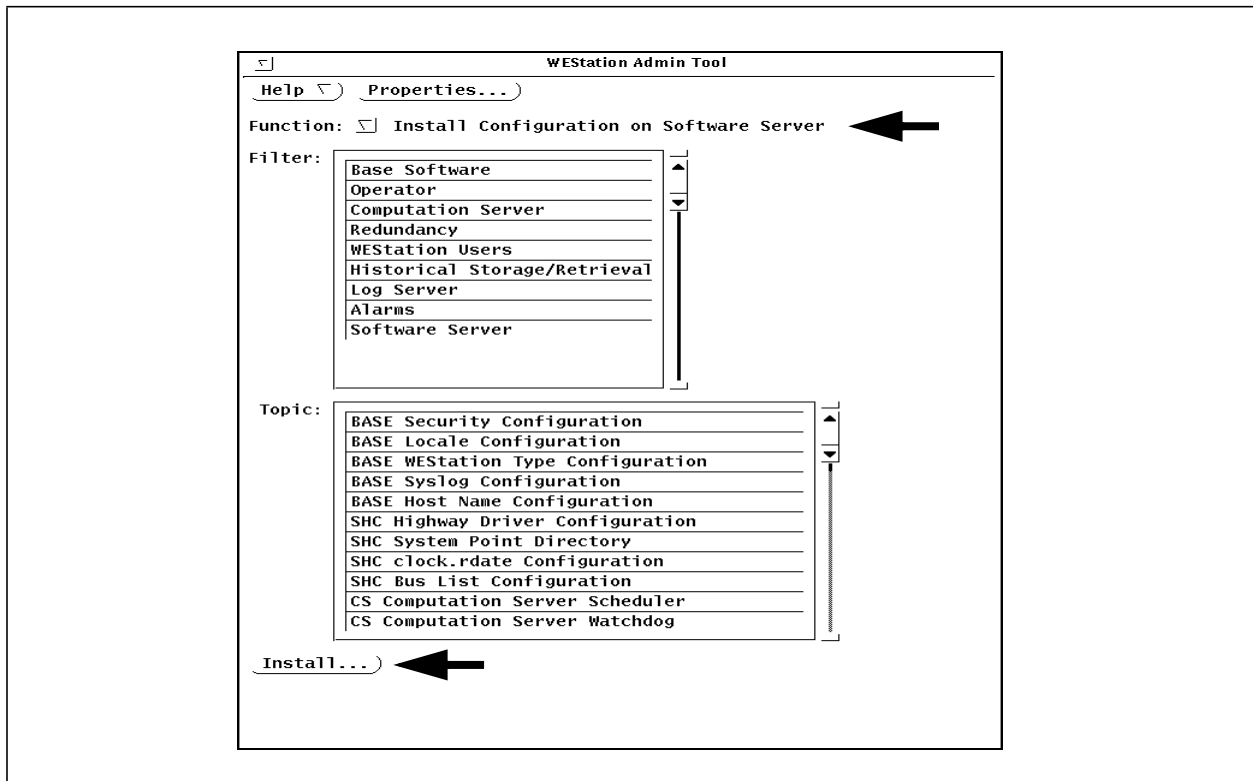
A prompt will appear asking if the user wants to restart the Admin Tool. Select **Restart**.

A second prompt will appear that **strongly recommends** that the Admin Tool be used to re-install **all** the software packages.

Due to the interaction of the system, installing only a few packages may result in inconsistent system operation.



18. After all the desired changes have been made and saved to disk, access the **Admin Tool**.



19. Select the **Install Configuration on Software Server** function (all choices should be selected in the **Filter** scrolling list and in the **Topic** scrolling list).
20. Select the **Install** button.
21. Upon completion of the install operation, download the modified files throughout the system, since changes may have occurred in unexpected places. Refer to “[Defining and Configuring WEStations](#)” (U0-8300) for information on using the “Download Configuration to Drops” function.

A-4. Modify an Existing Drop Type

Use the following procedure to modify an existing drop type by adding a desired software package:

1. Use the mouse to open the **WDPF Init Tool** icon from the Engineering WEStation screen. The WEStation Initialization Utility main window appears (refer to [Figure A-1](#)).
2. Select the **Modify/Add/Delete** button to access the **Modify/Add/Delete Drop Types** window (refer to [Figure A-3](#)).
3. Select the desired Drop type from the **Drop types** scrolling list.

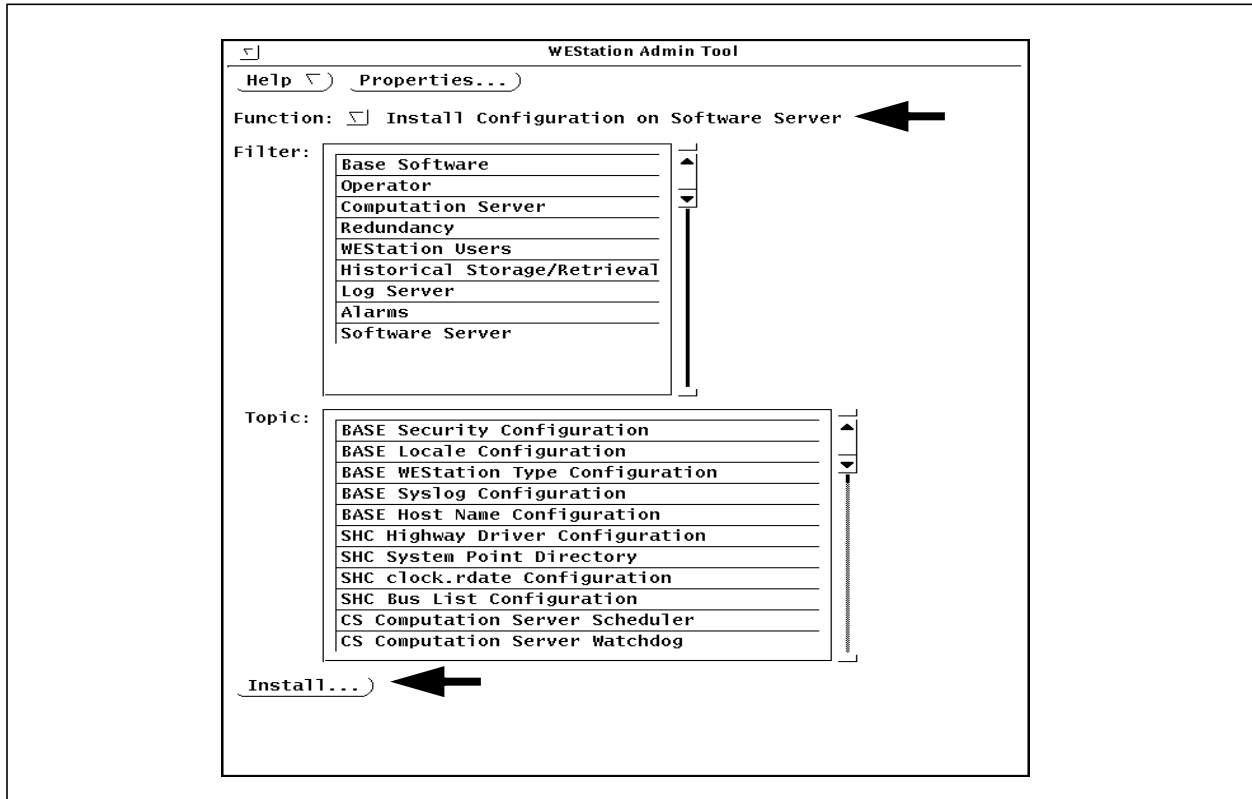
If necessary, use the **Filter** function or the **Package Details** pop-up menu selection to identify what software packages are contained on the selected drop type.

4. Select the desired package from the **Available packages** scrolling list.
5. If the selected choices are acceptable, select the **Save to disk** button on the **Modify/Add/Delete** window.

A prompt will appear asking if the user wants to restart the Admin Tool. Select **Restart**.

If the drop number to the drop type association is correct, no changes need to be made on the Init Tool main window.

- After all the desired changes have been made, access the **Admin Tool**.



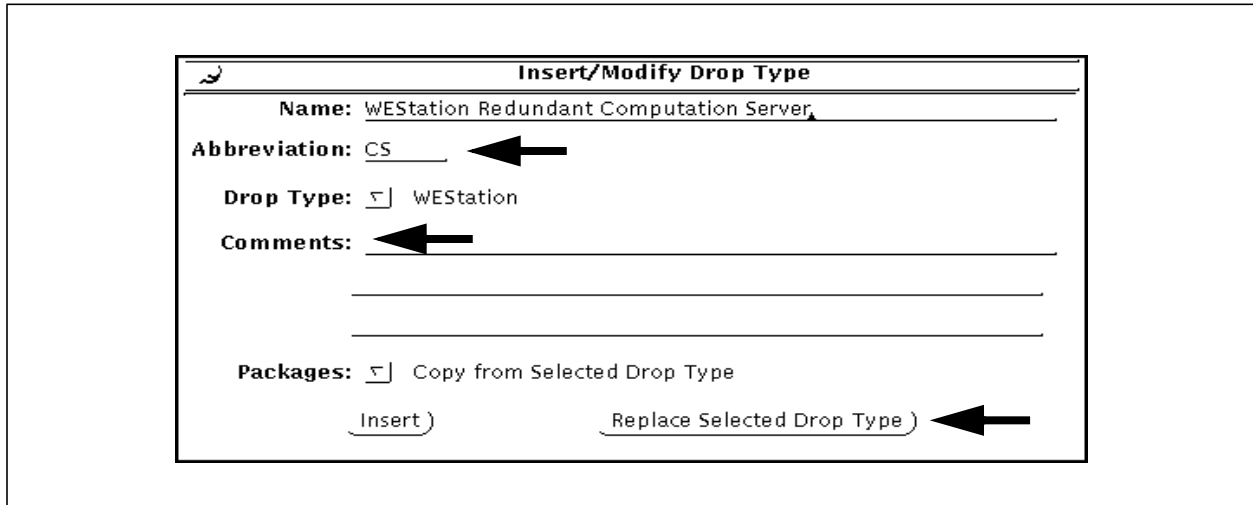
- Select the **Install Configuration on Software Server** function (all choices should be selected in the **Filter** scrolling list and in the **Topic** scrolling list. This will occur automatically when the Admin Tool is restarted).
- Select the **Install** button.
- Upon the completion of the install operation, download the modified files throughout the system, since changes may have occurred in unexpected places. Refer to “[Defining and Configuring WEStations](#)” (U0-8300) for information on using the “Download Configuration to Drops” function.

A-4.1. Changing Identifiers on an Existing Drop Type

Use the following procedure to modify high-level descriptive information about a drop type (for example, changing the drop type’s System Status Diagram abbreviation).

- Use the mouse to open the **WDPF Init Tool** icon from the Engineering WEStation screen. The WEStation Initialization Utility main window appears (refer to [Figure A-1](#)).

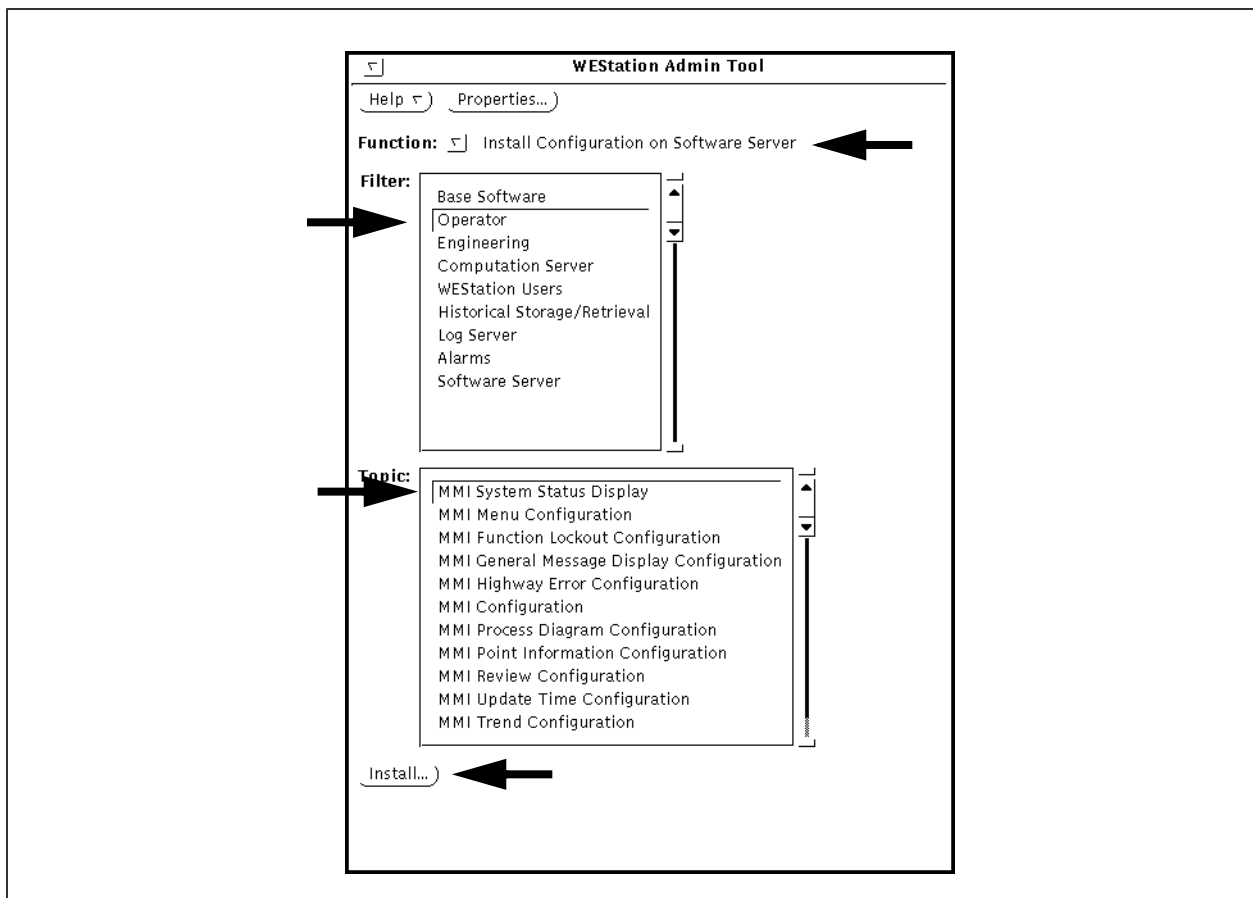
2. Select the **Modify/Add/Delete** button to access the **Modify/Add/Delete Drop Types** window.
3. Select the **Insert/Modify** button and the following pop-up window will appear.



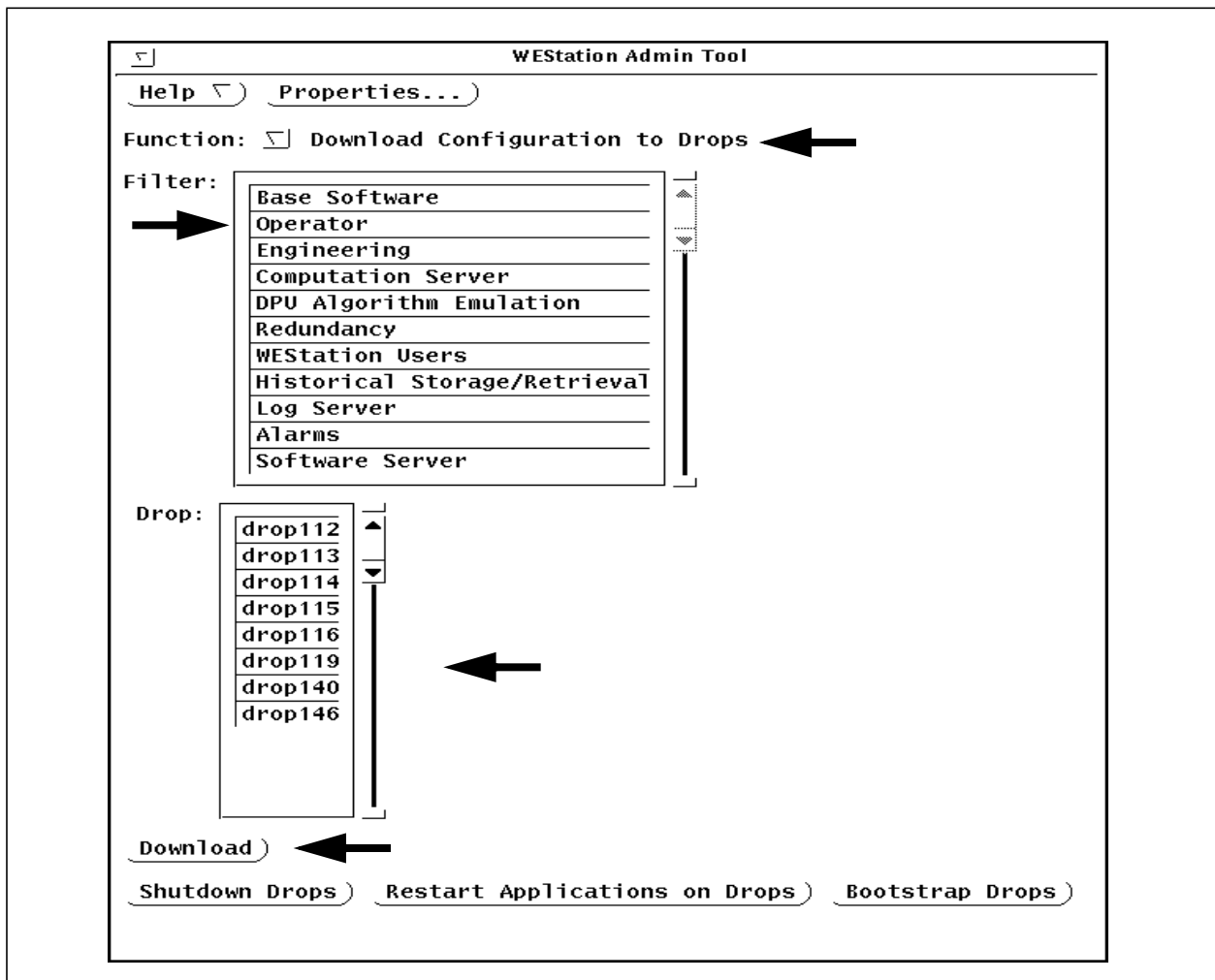
4. Modify information for the selected drop type.
5. Select **Replace Selected Drop Type** button. (Packages will not change.)
6. **Save to disk** on the **Modify/Add/Delete** window.

A prompt will appear asking if the user wants to restart the Admin Tool. Select **Restart**.

7. If the abbreviation is changed, do the following:
 - A. Access the **Admin Tool**.
 - B. Select the **Install Configuration on Software Server** from the Function menu.
Select the **Operator** from the Filter scrolling list.
Select the **MMI System Status Display** from the Topic scrolling list.
Select the **Install** button. The changes will be installed in the Software Server.



- C. Select the **Download Configuration to Drops** from the Function menu.
- Select the **Operator** from the Filter scrolling list.
- Select the applicable **drop(s)** from the Drop scrolling list.
- Select the **Download** button.



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