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1. Software License Agreement

The POS software is a copyrighted product of Neundorfer, Inc. and also contains purchased copyrighted modules. The Neundorfer Software License Agreement protecting Neundorfer and its suppliers specifies that each copy of the POS software provided by Neundorfer may be run on a single PC, with the allowances that copies may be made for backup purposes. The licensee may move, not copy, the POS software to a different PC than originally installed, but may not transfer the software to a different owner without written permission from Neundorfer, Inc.

2. Software Warranty Statement

1. The original manufacturer's warranty applies to all computer equipment, software and related hardware. Neundorfer, as the original purchaser of the hardware, may intervene on behalf of a customer to resolve warranty issues with the equipment. The customer will be required to pay all shipping costs to and from Neundorfer incurred in resolving the warranty issues with the equipment. Additional costs, including but not limited to parts and labor, which are not covered under the ORIGINAL EQUIPMENT MANUFACTURER'S WARRANTY shall be paid by the customer.
2. With regard to all POS Equipment manufactured by Neundorfer, reference should be made to Neundorfer's "Standard Terms and Conditions of Sales and Service".
3. Neundorfer does not warrant that the POS application will meet a customer's needs or that it will be free from defects.
4. Neundorfer shall not be held liable for any damages, data loss or product loss arising from a customer's use, misuse or inability to use the POS application.

3. POS Software Update & Upgrade Policy

Neundorfer will provide free software updates. Software updates are defined as small incremental improvements to fix defects and/or add limited additional functionality. Neundorfer will not automatically send software updates to all users. Neundorfer personnel may at their discretion and with a customer's approval, install software updates while at the customer site. Generally, software updates will only be supplied at the customer's request. On occasion software updates will require the purchase or upgrade of third party software. Charges for third party software will be passed on to the customer.

Neundorfer will provide upgrades at a customer's request as they become available, and charge for them. A software upgrade is defined as a major functional improvement of the software. These improvements may be in the form of add on modules to an existing version of POS or an actual new version of the POS application.



4. POS Basics

Components of Overall System

There are two major components of a typical POS control system. The first component is the POS application software that runs on personal computers running the Windows operating system. The second component is the hardware connected to the POS control system. This hardware may consist of Neundorfer equipment including MVC voltage controls, MicroRap rapper controls, along with PLC equipment for hopper evacuation, soot blowing, and flue gas conditioning systems.

Specific sub-component information for the Neundorfer MVC voltage controls, and MicroRap rapper controls can be found in their respective manuals.

POS Hardware Components

The Neundorfer controls are linked together via an RS-485 multidrop network. The RS-485 interface is built into the rapper controls and voltage controls. On POS computers, the interface may be an internal card or the output from the computer may be RS-232, which is then converted to RS-485 by an external converter. For specific details implementing this network refer drawings supplied with the system. Each device within a family of devices requires a unique address number on the multi drop network. The voltage control addresses are set on the voltage control front panel and range from 1 to 255. Each rapper control also requires a unique address number from 1 through 32, and is set via the hand held programmer supplied with the control. The POS computer is the master of this network, meaning it is the only device that can initiate a message. The voltage controls and rapper controls can only send messages after specifically addressed by POS using their control type and unit number. When the POS computer initiates communication with a control, POS will wait for one of two events to occur before sending another message. The first event is a valid response from the control and the second is a communication error. A communication error will occur if the addressed control does not respond within the allotted time or the message received is invalid.

For MVC4 voltage controls the data link between the POS computer and the voltage controls should be a fiber optic link. The fiber optic link is converted to RS-485 at the voltage controls. The fiber optic link is required to prevent ground loops between the grounded RS-485 cable's shield at the PC and the grounded voltage control cabinets.

Many POS software modules require external signals provided by other plant systems. These inputs can be hardware wired electrical signals such as a 4-20mA input or digital communications such as OPC or Modbus protocols. How these signals are brought into POS is very plant dependant and therefore built custom for your installation. There will be hardware drawings provided for and additional equipment provided for the interface of electrical signals.



POS Software Components

Data Logging

POS can be configured to log the following information to disk files:

- Voltage control operating parameters including primary and secondary voltages, power level, control status (communication error, running, tripped, etc.), spark rate, operating mode and IE ratio.
- Precipitator data including average and total voltage control operating parameters, opacity signal, load signal and power optimization information.
- Rapper actuations.
- Auxiliary analog and/or digital inputs.
- SO₃ Optimization actions.
- Soot blower actuations.

Actual data logged in your system will vary depending on which modules were purchased and how the system is configured.

Status Monitoring

POS monitors the status of individual rapper controls, voltage controls and each rapper in the system. In the overview screens, each item is color coded for quick identification of its status. The overview screen is also factory customized to reflect the actual layout of the units it is controlling. You can also view the voltage control's operating parameters via the remote face panel view, bar graphs and trend graphs. The remote face panel view of the voltage control also allows the user to view the control limits or set points. POS also displays the program number that is currently running in the rapper controls.

The 3D graph represents a plan view of the precipitator. This graph shows how the overall precipitator is operating by displaying the selected parameter of each voltage control as a 3D bar. This screen is useful for locating problem fields in a precipitator and verifying control setup parameters.

POS also can display the status information of soot blowers, hopper evacuation systems, and flue gas conditioning systems.

Remote Control and Programming

POS can also be used for remote control and programming functions. The functions can be password protected to allow only authorized users access to them. POS has the ability to start, stop and reset the voltage controls. Also, all the functionality available to the users at the control's face panel is also available in POS via the control's remote view.

Users can also remotely program the MicroRap via the Rapper Control Programming Module (RCPM). This module allows users to create and save an unlimited number of programs on the computers hard disk drive for later transfer into any of the six valid user programs of the MicroRap. Users also have the ability to remotely change which program number the rapper control is executing, reset failed rappers and reset rapper control alarms.

POS also can provide control capability for soot blowers, hopper evacuation systems, and flue gas conditioning systems.

Optimization

Performance optimization is probably the most powerful feature of POS. With this feature POS automatically adjusts the voltage control's operating limits based on one of two sets of parameters. The first set is stack opacity and load. With opacity and load optimization, POS continually adjusts the control's secondary current limit by a user set percentage of full power. The number of steps and timing of the steps are all user configurable. POS will lower the total power of the precipitator until one of three things happen. The first being POS reaching the end of the optimization program, the second is the opacity limit (user set) is reached which will either abort optimization altogether or cause optimization to take one step back in the program. The third item that can cause optimization to abort is a large change in the boiler load.

Performance optimization can also be configured to be based on stack opacity and precipitator power. This operates similar to opacity and load except precipitator power levels are used instead of boiler load levels. This type of optimization is most commonly used in cement plants.

MicroRap optimization allows the POS to automatically switch between the six stored MicroRap programs based on a set of conditions configured by the user.

In SO₃ optimization POS will adjust the PPM of SO₃ to improve precipitator performance. POS will then monitor the performance of the precipitator and when conditions warrant, it will begin tuning the PPM to improve precipitator operation. This system requires an interface to the SO₃ controls.

External Interfaces

We can supply POS with many types of external interfaces. The first is the analog and digital input/output interface (see hardware components above). This interface is where most POS installations receive the opacity and boiler load signals. Other analog and digital signals can be read by POS, displayed on screen, contain alarm set points and logged to disk. POS can also output total precipitator power to an analog 4 to 20 ma signal.

Another type of external interface is the Distributed Control System (DCS) interface. POS has the ability to communicate to DCS systems via an Allen-Bradley data highway, Allen-Bradley DF1, Modbus RTU, Modbus + and GE Series 9030 TCP/IP. These protocols are available from Neundorfer to customers who have purchased DCS interfaces.

POS can also communicate on a wide range of PLC networks. Contact Neundorfer with your specific requirements.

POS will also interface to SO₃ injection systems, soot blower control systems and hopper evacuation controls. All of these POS modules will interface to one or more PLC's used to control the related equipment. POS will provide status displays, control functions and in some cases optimize system performance. All of these interfaces are used with the precipitator information gather by POS to provide trouble shooting assistance, graphing capabilities, system alarming and fault indication.

5. Installation

The POS software comes pre-installed on the computer. This section should only be needed for a new installation or after a hard disk failure or system upgrade.

Text that is *italicized* is typed on the keyboard, text in **bold** represents screen, window titles or button names.

Installing VTS

- 1) Insert VTS CDROM into CD drive.
- 2) The VTS Installation Wizard should begin. If the Installation program does not begin, from the Windows **Start** menu select **Run**, type in *F:\SETUP.EXE* where F is the drive letter where the installation disk is located.
- 3) Follow the instructions of the Installation Program. The installation key required during installation of VTS can be found printed on the label of the VTS CDROM. Enter this number when prompted by the installation program.
- 4) In the **Destination** window the destination folder must be C:\VTS. POS will not operate properly if the path for VTS is not C:\VTS.
- 5) Follow all remaining steps as prompted by the Installation Program.
- 6) Continue to the next section to install the POS 7 software.

Installing POS Application

- 1) VTS must be installed and run as described above.
- 2) Insert Neundorfer POS 7 installation CDROM into CD Drive.
- 3) The Neundorfer Installation screen should appear. If it does not appear, on the Windows **Start** menu select **Run**, type in *F:\DEMO32.EXE* where F is the drive letter of the CDROM.
- 4) Select **Software**, and then **Install POS 7**. Follow the installation instructions on the screen. Application and configuration files will automatically be installed into the appropriate directories under the C:\VTS directory.

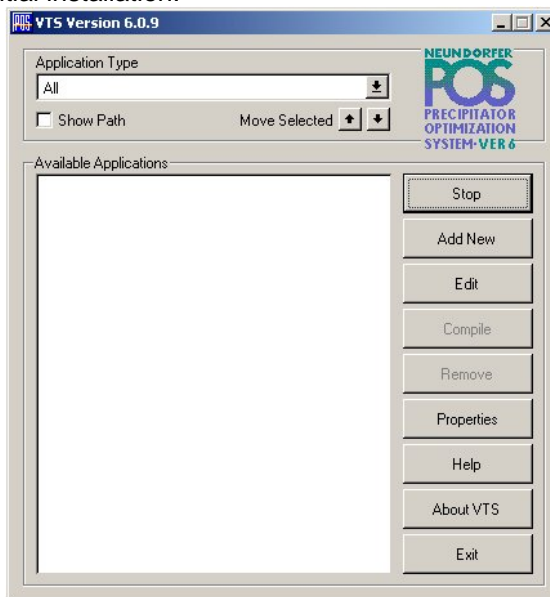
Adding POS to VTS

Adding POS to VTS need only be done after the initial installation.



Add New Application Window

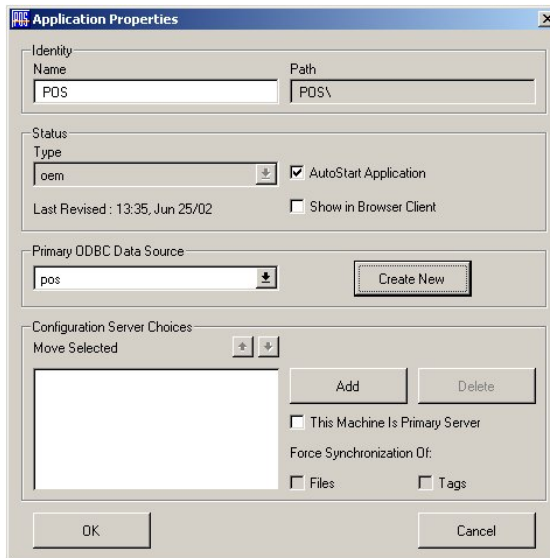
- 1) From the Desktop start VTS by double-clicking the VTS icon. When the VTS **Application Manager** appears, press the **Add New** button.
- 2) In the **Add New Application** window select **Find Existing**, then press **OK** button.
- 3) In the **Found Applications** window enter the path to read C:\VTS\POS7, and press the **Enter** key. Select the **POS** application and press the **OK** button.



VTS Application Manager

(OPTIONAL INSTRUCTIONS
FOR POS AUTOSTART)

- 4) In the **VTS Application Manager**, highlight the **POS** line, and press the **Properties** button.
- 5) In the **Application Properties** window click on the **AutoStart Application** box, then press the **OK** button.
- 6) In the **VTS Application Manager**, press the **Exit** button. Now POS will automatically begin running whenever the VTS program is started.



Application Properties Screen



Windows Display Settings

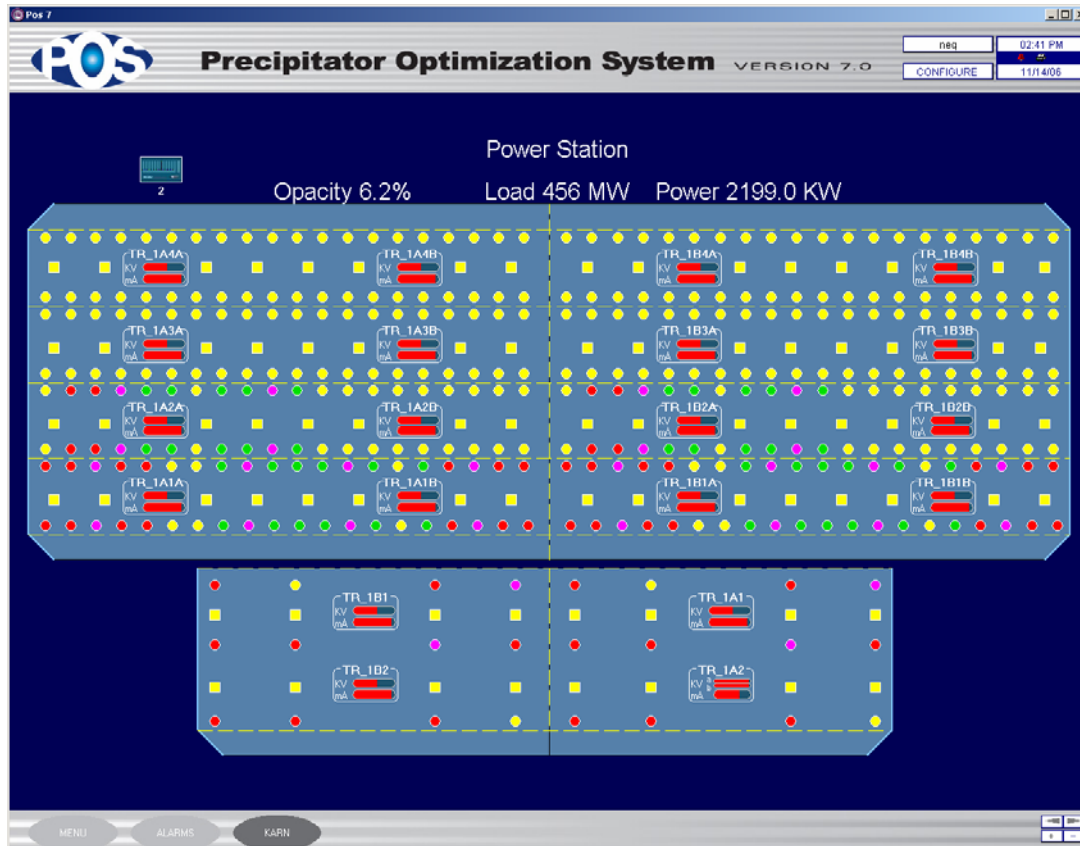
For POS screens to appear properly on the display the resolution must be set to no less than 1280 x 1024 and the color palette should be set to Highest (32 bit) setting. If the screen resolution is set to less than 1280 x 1024, then some POS items will be completely or partially off the display area. Color palettes other than Highest (32 bit) will result in screen items with unusual colors or no color at all.

Starting POS

From the Desktop or the Start menu run POS by double clicking the POS icon. If POS has been re-installed or upgraded you may have to click the VTS icon. If POS is not set to Auto-Start, highlight POS 7 in the **VTS Application Manager** menu and click the **Run** button.



6. Overview of POS



POS Main Display

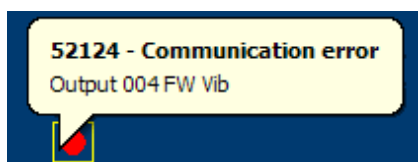
The POS main display is the screen that first appears when starting up your POS. There will be a page for each precipitator contain in your systems. Some larger precipitators will require more than one screen to display all the information. This display shows the status of voltage controls, rapper control, individual rappers and the opacity, load and secondary kilowatts of this precipitator. Note that the kilowatts are for the entire precipitator, not just the controls displayed on the single page.

The status of the rappers are color coded. The codes are as follows:

<i>Green</i> : Ready to rap	<i>Red</i> : Has rapped
<i>Magenta</i> : Rapper failed – shorted	<i>Yellow</i> : Rapper Failed – Open
<i>White</i> : Communication Error between POS and the rapper control	

This information is also available in the pop up as described in the next paragraph. The shape of the rappers typically denotes the types of rapper being displayed. Circle rappers represent plate rappers, square rappers represent wire rappers and diamond represent other types that could include sonic hors, inlet and outlet baffle rappers or motors type rappers.

All screen items are active, meaning you can right or left click on each item to access appropriate functions for each device. Hovering the mouse over the TR set, rapper, precipitator and the rapper control icons will activate a pop up for that device. The pop up will display at a minimum the device ID in the system and some additional information. The rapper icons will display its name, current status that corresponds to its displayed color, rapper control output number and the rapper type. The TR set pop up looks like the face panel of the TR control and contains live data log information. The aux display of this pop up contains the POS configured unit number for that device. Sample pop ups are displayed below.



Sample Tool Tip for Rapper Icon update



Sample Tool Tip for Voltage Control Icon

The Page Header, located across the top of the POS display, contains the POS logo and the **Logon** button. The **Logon** Button is located to the right of the Page Header with a time/date display and alarm indicator. Pressing the bell icon in the alarm indicator will take the user to the alarm page. Pressing the printer icon will print the currently displayed window to the default Windows printer.

The Menu - Page bar, across the bottom of the POS display, allows the user to switch between the various screens. The Menu Button allows the user to access all available screens.

The Page Bar is programmable to display the most used screens. The Page bar also has a **Page Back (<)** and **Page Next (>)** buttons on the right hand side of the button bar. These buttons page through the most recently displayed pages. The buttons to add or remove screen buttons from the Page bar are located to left of the page buttons and are labeled with + or -. Clicking these buttons adds or removes the currently visible page from the page bar.



7. Logon

- 1) Press the **Logon** Button.
- 2) Enter logon *Username* and press *Tab* key or click on the next line with the mouse.
- 3) Enter user *Password* and press *Enter* or click on the **OK** button with the mouse..

Press the **Cancel** button if a mistake has been made during log on.

After successfully logging on, the username will be substituted for **Logon** in the button.

POS ships with the default user name and password of NEQ. This will grant the user complete access to all POS functions.



Logon Window

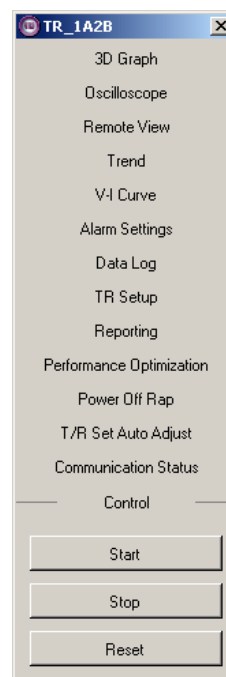
8. Micro Voltage Control

MVC Icons

On the Plan View window, each individual MVC is represented by an icon. The icons have two different drawing methods, the POS 7 style or the POS 6 style. The user can toggle between the two icon display types by right clicking on the TR set icon and selecting the *POS 7 icon style enable* line on the menu that appears. The POS 7 style icon has live bar graph displays of current operating data. The bar graphs are switched to text displays when the TR set is off, trip or not communicating.



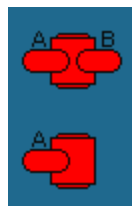
POS 7 Style icons



MVC Control Menu

The POS 6 style icons resemble the plan view of a TR set. The POS 6 icons are drawn with either one or both bushings active and in a position according to your individual precipitator's actual layout. If the rotation is not correct the user can change it by right clicking on the TR set and selecting *Properties* on the menu that appears. Select the *Display* tab once in the TR set properties and adjust the rotation as desired. The color of the POS 6 style icons represent it's current state and is set up as follows:

Green: Stopped	Red: Running
Yellow: Tripped	White: Communication Error



POS 6 style icons

POS determines wither the icon is a single or dual bushing TR set from the MVC configuration and adjusts the icon display appropriately. For a POS 6 style icon, if the secondary voltage of a bushing is below 1000 V then that bushing will be colored in the "Off" state.

Pressing the T/R icon will display the MVC control menu. The MVC name will appear in the window header. This window contains buttons for each POS feature used in monitoring or controlling a TR set. These features are discussed in the sections below.



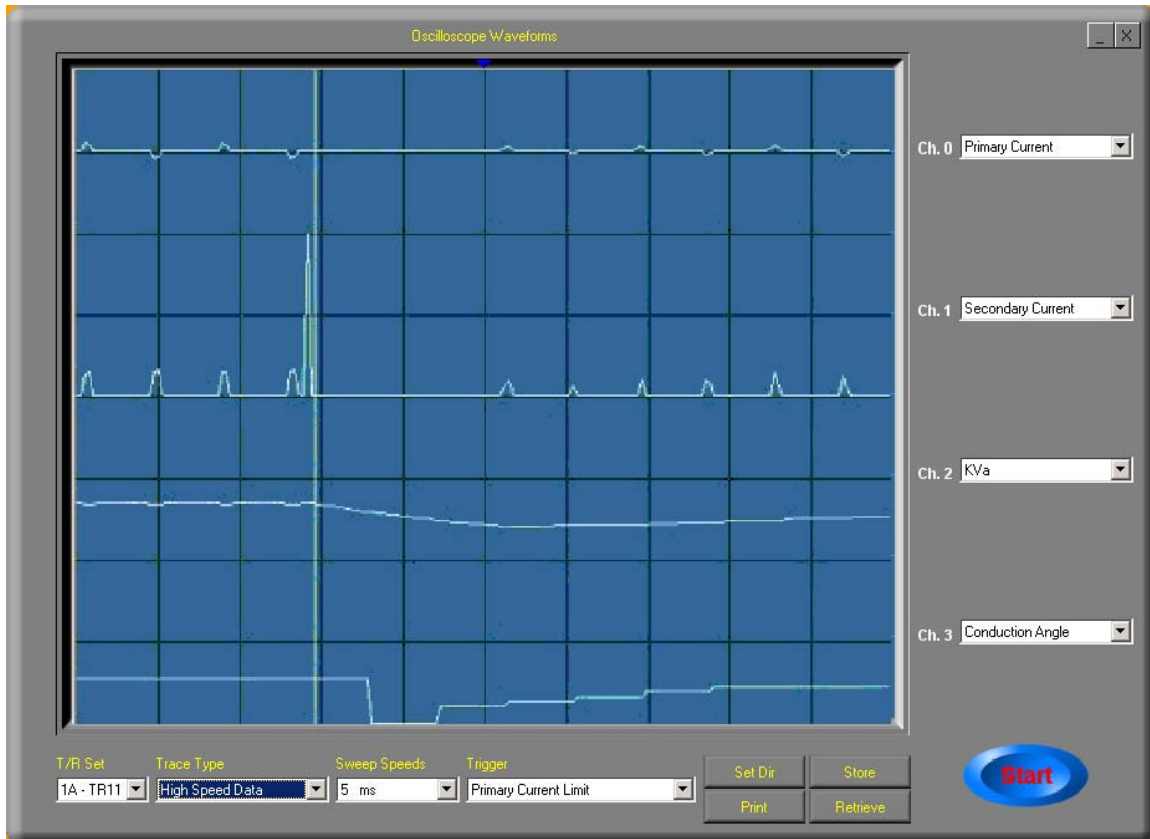
9. MVC Start Stop Control

The MVC controls can be started, stopped and reset from the control menu on an individual basis by pressing the appropriate button. The voltage controls and POS has interlocking set up so that if a control is stopped it must then be restarted from the same location, meaning if POS stops it then POS must start it or if stopped locally then it must be started locally. This is to prevent inadvertent start up of the control from another source if someone has shut it down to work within the cabinet. Controls can be started and stopped as an entire precipitator through the precipitator menu.



10. Oscilloscope

Pressing the **Oscilloscope** button on the MVC control menu. This window will display traces similar to those that may be captured by an actual oscilloscope.



The large grid area of the window is where POS plots the scope waveforms. The display contains four waveforms each one plotting the signal selected by the drop down lists along the right edge of the oscilloscope window. The white vertical line on the graph is the position of the trigger point when the data is plotted. Clicking the mouse button along the top edge of the graph will move the trigger point line.

The **Print** button opens a print preview window. In the print preview window the user can view what the printout will look like and choose to print a hardcopy using a configured windows printer.

Pressing the **Close** button closes the oscilloscope window.

The **Start** button begins the data capture and transfer from the voltage control to the POS computer. After pressing the **Start** the user can change the scope setup and begin another trace by pressing the start button again. This action aborts the running data capture and begins a new one. The line of text at the bottom of the trace contains a status message and the setup information for the displayed scope trace.

The **Select MVC** dropdown list contains a list of all the voltage controls on the precipitator. The control selected on this list is the control that will generate the oscilloscope traces.

The **Trace Type** drop down list lets the user select what type of data the user wants to display. **High Speed Data** displays traces like those captured with a traditional oscilloscope. The signals that can be graphed include **Primary Current, Primary Voltage, Secondary Current, Secondary KVa, Secondary KVb, and Conduction Angle**. The **Primary Averages** trace type is similar to a trend graph or a graph of face panel data except at a much higher data capture speed. The signals that can be graphed include **Primary Current, Primary Voltage, Secondary Current, and Conduction Angle**. The **KvMin/Max** plots a graph of the secondary voltage minimum and maximum values of each half cycle of the line. The signals that can be graphed include **Secondary Current, Secondary Kva min, Secondary KVb max, and Conduction Angle**.

The **Trigger** dropdown list is where the user selects which event the control will begin its data capture. The list includes **Primary Current Limit, Primary Over Voltage Limit, Secondary Current Limit, KV Limit, Conduction Angle Limit** and **Spark**. The trace generation is event driven and the user must select a trigger event that actually occurs in the MVC for the data capture to begin and be transferred to POS.

The **Sweep Speed** drop down list is where the user selects the rate at which the data will be gathered. This list will vary depending on the **Trace Type** selected.

Pressing the **Store** button saves the scope data to the CSV directory as a CSV file. The **Retrieve** button brings that data back into POS for display. You can load the raw scope CSV data into a spreadsheet application, the file is typically stored in the c:\vts\pos7\csv directory.

The **Print** button is used to send the graph image to any configured printer in the operating system.



11. Remote View

Pressing the **Remote View** button opens a window showing an MVC display panel with current operating values. This window operates identically to the actual voltage control display panel. Buttons that change operating set points are password protected. For MVC operation please refer to the user manual that shipped with the control.



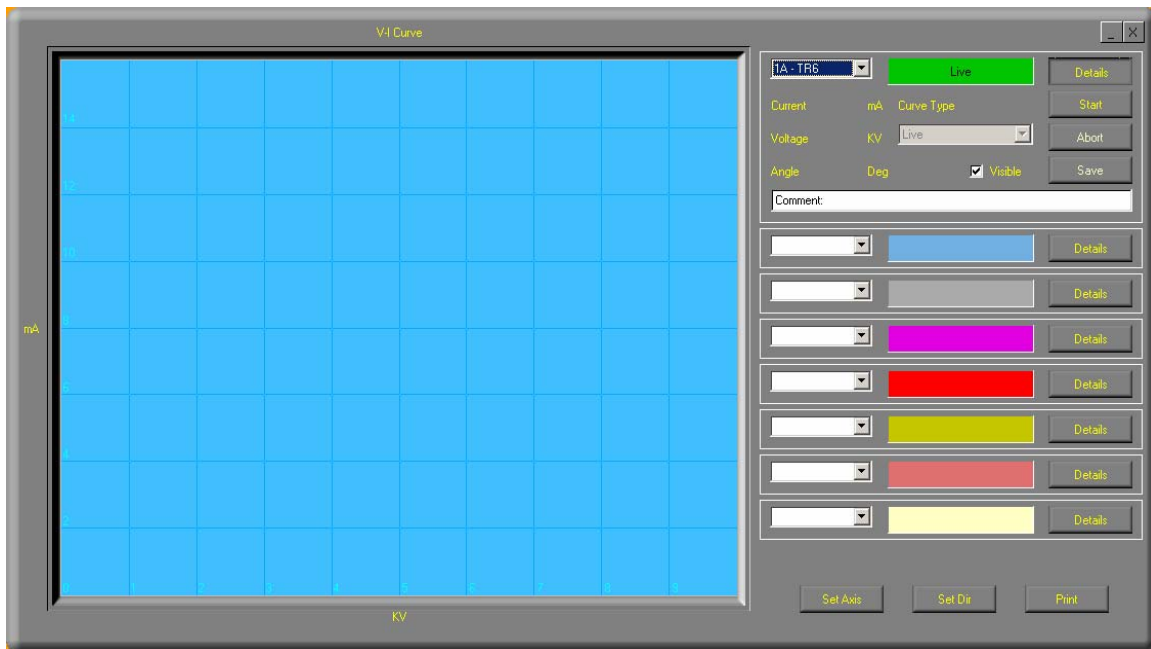
MVC Remote View



12. V-I Curve Generation

Pressing the **V-I Curve** button on the MVC control menu will open the VI curve window.

The T/R set initially selected on the plan view screen will be the default used to generate a V-I curve. Other TR sets can be added using the TR selection drop down list.



V-I Curve Window

To add additional T/R sets or change an existing T/R set using the **V-I Curve** window drop down list:

- 1) Press the arrow next to the pen **Status** box in your choice of color and a drop down list of T/R sets in the precipitator will be displayed.
- 2) Select the T/R set by highlighting the appropriate T/R set name.

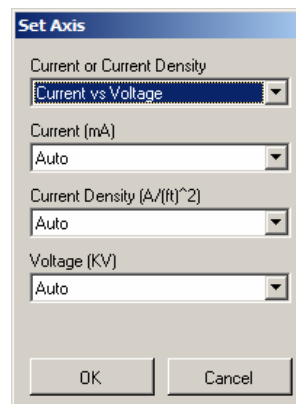
Pressing the **Set Axis** button opens a window that allows the user to change both current and voltage scales. The scales can be set to auto which causes the software to choose the scale to display the graph in or the can be set to pre-selected scales. The set axis window also allows the user to select the VI curve to graph in KV vs. mA or KV vs. current density. To utilize the current density option the user must enter the total collecting plate area for each TR in the TR set properties, described elsewhere in this manual.

Pressing the **Details** button to the right of T/R set's name expands the view area for that pen to display the details of that pen.

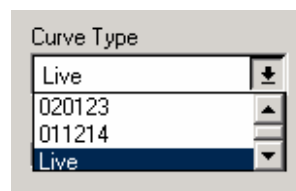
Pressing the **Curve Type** arrow will display a drop down list of live and saved V-I curves for the T/R set selected.

Pressing the **Start** button will start generation of the curve for the selected T/R set. Only one V-I curve should be generated at a time.

The status of the curve for a specific T/R set is indicated by text in the pen status box to the right of the T/R set's name and below the Curve Type box, other information regarding the selected T/R set is displayed in these areas also.



Set Axis Window



Sample Curve Types

The **Visible** check box will display the selected V-I curve when checked and hide it when blank. The **Comment** field allows the user to write a text message comment for the selected VI curve that will be displayed on the printout.

Pressing the **Abort** button will stop the curve generation.

Pressing the **Save** button will save the displayed V-I curve by date. The V-I curve data is saved to the CSV directory as a CSV file. You can load the raw V-I curve CSV data into a spreadsheet application, the file is typically stored in the c:\vts\pos7\csv directory.

Pressing the **Print** button opens a **Print Preview** window. The first page of the preview contains the curves displayed on the graph along with the comments. The remaining pages display tables of the primary current and secondary voltage of the T/R Set's that were recorded during the VI Curve generation. Pressing the **Print All** or **Print Page** button can print a hard copy. Pressing the **Close** button will close the window.



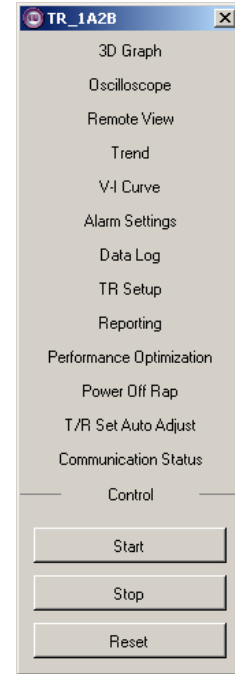
13. Start, Stop and Reset

The Start, Stop, and Reset functions are in the lower half of the MVC Control Menu. Again, this menu appears when you click on the appropriate MVC icon in the plan view of the precipitator.

Pressing the **Start** button will start the selected voltage control.
Pressing the **Stop** button will stop the selected voltage control.
Pressing the **Reset** button will reset the selected voltage control after a trip has occurred.

Starting and Stopping MVCs is a password protected function. You will have to log in before gaining access to this function.

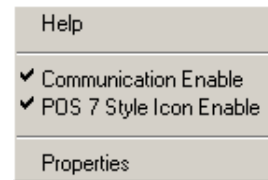
As a safety feature, the controls must be started from the same location in which they were stopped.



MVC Control Menu

14. Communication Enable

Right clicking the T/R set icon will display a configuration menu, with a Communication Enable check off item. When communication is disabled, POS will not attempt any communication with that control and icon will turn black or display DIS text within the icon. This is useful to free up data link time that would otherwise be used waiting for a nonfunctioning control to respond to POS messages.

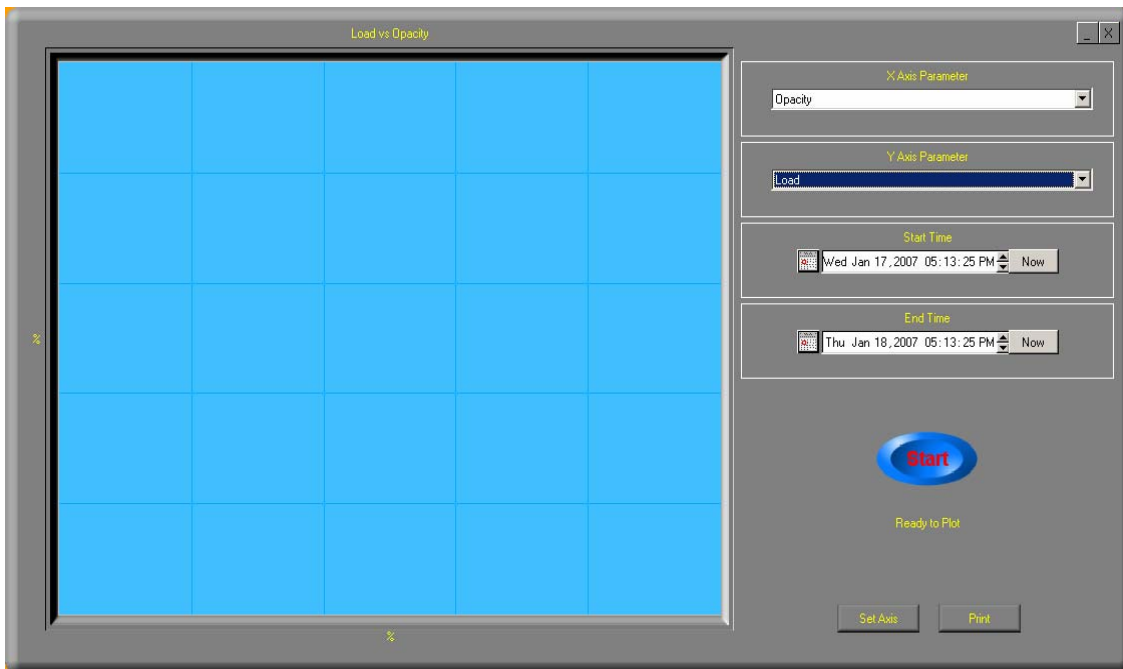


T/R Set Configuration



15. Scattergram

The scattergram function is accessible through the precipitator menu. The scattergram is a graph that shows how factors relate to each other on an XY plane. This is visual, not statistical, and is used when it is necessary to compare two factors that are related.



Scattergram Window

The **Scattergram** plot can graph the following precipitator parameters:

- Load
- Opacity
- primary average volts
- primary total amps
- primary total kilowatts
- secondary total amps
- secondary average Kva
- secondary average KVb
- secondary total KW
- secondary average angle
- secondary average sparks

These parameters may be selected for either the X-axis or the Y-axis via drop down lists.

The data is retrieved from Log files and can span any historical range. Select **Start** and or **End Times** by highlighting the time and/or date. Then use the arrows adjust the time and/or date settings to the desired setting. Pressing the **Start** button will retrieve data and display it as points on the screen.

The **Plot Status** is displayed below the **Start** button.

Pressing the **Print** button opens a **Print** Preview window. This window displays the graph and a table of values of the data points. Pressing **Print All** or **Print Page** buttons prints a hard copy of the curve for future use.

Pressing the **Set Axis** button opens a window that allows the user to set the scales to auto which causes to software to choose the scale to display the graph in or they can be set to pre-selected scales.



16. Alarm and Precipitator Configuration

Clicking on the **Alarm Settings** menu items in the rapper control, TR set and precipitator menus will open up the **Precipitator Data Display** window. This module is used to describe the precipitator to POS and configure all alarms for the precipitator, voltage controls and rapper controls.

Unit 1 - Precipitator Data Display										
Field Data		Precipitator Alarms		Global T/R Set Alarms		Individual T/R Set Alarms		Rapper Control Alarms		Function Start Interaction
Edit	Field Name	No of Gas Passages	Plate Spacing (inches)	Plate Height (feet)	Plate Length (feet)	Centerline to Outlet (feet)	Cross Sec Area (sq feet)	Gas Velocity (feet/sec)	Field Plate Area (sq feet)	Field Treatment Time (seconds)
1	Field 1	16	8	30	8	30	320.00		7680.00	X
2	Field 2	16	8	30	8	20	320.00		7680.00	X
3	Field 3	16	8	30	8	10	320.00		7680.00	X
4										X
5										X
6										X
7										X
8										X
9										X
10										X
11										X
12										X
13										X
14										X
15										X
16										X

Common Precipitator Data			
Total Gas Flow	Opacity Meter Delay Time (seconds)	SCA (sq feet / 1000 ACFM)	Precipitator Treatment Time (seconds)

Precipitator Data Display Window – Field Data Tab

Editing Field Data

Editing precipitator data is a password protected function. Users need to log in with the proper security level before making any changes. When finished be sure to press the **Accept** button to save changes. Pressing the **X** button to the right edge of the field clears all values from that field.

All of the information entered on this screen is used by POS to determine how much to offset the rapper actuations to allow for the time it takes the ash to travel from rapper location to the opacity meter.

Enter a name for the field in the **Field Name** field. This name will be used by POS to create the names for the fields in the **Rapper/Opacity Plot** and in the rapper properties.

Enter the number of gas passages in the field in the **Number of Gas Passages** field.

Enter the number of inches between plates in the field in the **Plate Spacing** field.

Enter the height of the plates in the **Plate Height** field.

Enter the length of the field in the **Plate Length** field.

Calculate the distance from the center of the field to the outlet of the precipitator. Enter this value in the **Centerline to Outlet** field.

The value for **Cross Sectional Area** is calculated by POS using the following equation:
$$\text{Number of gas passages} * \text{Plate Spacing} * \text{Plate Height}.$$

The value for **Gas Velocity** is calculated by POS using the following equation:
$$\text{Total Gas Flow} / \text{Cross Sectional Area}$$

The value for **Field Plate Area** is calculated by POS using the following equation:
$$\text{Plate Height} * \text{Plate Length} * \text{Number of Gas Passages} * 2$$

The value for **Field Treat Time** is calculated by POS using the following equation:
$$\text{Plate Length} / \text{Gas Velocity}$$

Enter a value for **Total Gas Flow** in ACFM (actual cubic feet per minute). This value will help determine other values such as the treatment time and SCA.

Enter a value for **Opacity Meter Delay Time** in seconds. This value should be the number of seconds it takes for gas to travel from the precipitator to the stack opacity meter.

The values for **SCA** and **Precipitator Treatment Time** are calculated by POS based on data entered in other fields.

Be sure to press the Accept button to save any changes.



Precipitator Alarm Settings

Click on the **Precipitator Alarm Settings** tab to view and edit precipitator alarms. These alarms are for the entire precipitator in which they are configured. You will need to set these in each configured system on the precipitator.

Precipitator Alarms Tab

Press the **Edit** button to make changes to the alarm settings.

Use the drop down lists to set the priority of the alarms. The priority can be one of the following:

- Disabled: The alarm condition is disabled. There will be no alarm.
- Event: The condition will cause a low priority event entry in the alarm log.
- Pop-Up: The condition will cause a pop-up window to appear and a low priority alarm.
- Medium: The condition will cause a medium priority alarm entry in the alarm log.
- High: The condition will cause a high priority alarm entry in the alarm log.

Enter a value in the **Opacity Above X %** to set an alarm condition when opacity rises above the entered value.

To alarm a specific change in opacity over a set time then enter values in the **Opacity increases X % in Y Hours** fields.

To alarm on a specific boiler load then set the drop down list to select **Greater/Less Than** and enter a load value in **Megawatts**.



The **Precipitator Power below X KW** is used to alarm on a minimum precipitator power level.

To alarm a specific change in precipitator power over a set time then enter values in the **Precipitator Power drops X KW in Y Hours** fields.

POS can be configured to e-mail alarms to users. The to and from addresses must contain a valid internet e-mail address, for example *user@domain.com*. The server entry should contain the name of your SMTP server or other server that you can authenticate to.



Global TR Set Alarm Settings

Click on the **Global TR Set Alarms** tab to view and edit TR Set alarms. These alarms are common across all TR set on the configured precipitator. You will need to set these in each configured precipitator.

The screenshot shows the 'Global T/R Set Alarms' configuration window. It contains the following settings:

- T/R Set/Com Port Communication Status: High
- T/R Set Trip Status: Event
- T/R Sets in a Lane off or Tripped: Event, 1
- T/R Sets in a field off or Tripped: Event, 1
- T/R Sets in a Precipitator off or Tripped: Event, 1
- T/R Set Control Tripped: Event, [] times in [] Hours
- T/R Set with Local/Remote Handswitch Change: Event
- T/R Set whose Power Changes from Precipitator by: Event, [] % in [] Hours
- T/R Set whose Spark Rate is: Event, [] % over Baseline Setpoint

Global TR Set Alarms Tab

The **TR Set/Com Port Communication** alarm priority setting is used to configure POS to alarm on any voltage control communication failures and communication port problems.

The **TR Set Trip Status** alarm priority setting is used to configure POS to alarm on a TR Set trip.

The **TR Sets in a Lane off or Tripped** setting configures POS to alarm after a specific number of TR sets in a precipitator lane have been turned off or tripped. This alarm uses the same lane information that is used to build the 3D graphs.

The **TR Sets in a Field off or Tripped** setting configures POS to alarm after a specific number of TR sets in a precipitator field have been turned off or tripped. This alarm uses the same field information that is used to build the 3D graphs.

The **TR Sets in a Precipitator off or Tripped** setting configures POS to alarm after a specific number of TR sets in a precipitator have been turned off or tripped.

The **TR Set Control Tripped X times in Y hours** configures POS to alarm if a control trips a specific number of times in a given time frame.



The **TR Set Local/Remote hand switch change** alarm setting configures POS to alarm when control is toggled between remote and local modes.

The **TR Set Power changes from Precipitator by X% in Y hours** alarm setting configures POS to alarm if a TR set power level drifts from the total precipitator power level in a given time frame.

The **TR Set Spark Rate is X% over Baseline Setpoint** configures POS to alarm if a voltage control is sparking a given percentage above its spark rate set point.

Individual T/R Set Alarm

Click on the **Individual TR Set Alarms** tab to view and edit TR Set alarms. This page allows you to configure alarms for TR electrical parameters for each individual TR. They can be set the same across the precipitator or individually for each TR set. You will need to set these in each configured precipitator.

The screenshot displays the 'Individual T/R Set Alarms' configuration window. At the top, there are tabs for 'Field Data', 'Precipitator Alarms', 'Global T/R Set Alarms', 'Individual T/R Set Alarms' (selected), 'Rapper Control Alarms', and 'Function Start Interaction'. The 'Configuration' section includes a dropdown for 'High' priority, a checked 'Alarm on' box with 'Voltage' selected, and a checked 'Set all controls equal' box. The 'Report Generation' section has an unchecked 'On Alarm, Create CSV File in' checkbox, a 'Browse' button, and dropdowns for 'Using data 1 hour(s) prior to the alarm' and 'Disable after 1 alarm(s) in an hour'. The main area contains a grid of individual TR set alarm configurations. Each configuration includes a title (e.g., '1A - TR9'), a 'Secondary' label, and three input fields for 'Voltage' (KV), 'Current' (mA), and 'Power' (KW). The 'Voltage' field for 1A-TR9 is set to 30. At the bottom, there are 'Locked', 'Accept', and 'Cancel' buttons.

Individual T/R Set Alarms Tab

To set up these alarms first select the edit button. Then in the Configuration section select the alarm priority that you would like. The Set all controls equal check box allows for the settings in one control to be set identically in all controls on this precipitator. Leaving this box unchecked

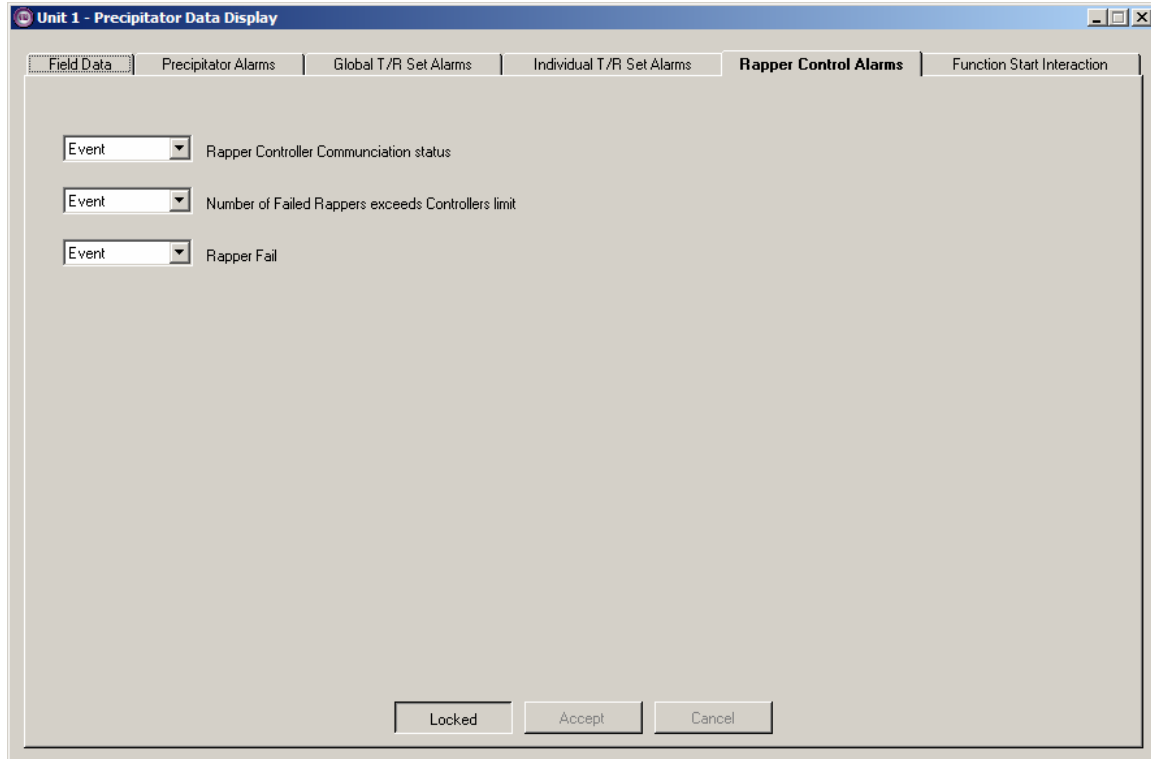
will require each control to be set individually. The drop list just below allows the user to set the alarm to trigger on an instantaneous value or a rolling average. The Alarm On check boxes allows the user to select which secondary electrical parameters to monitor. Put a check in one or more boxes and that will activate the checked parameter in the TR icons below. The alarm will activate anytime the selected parameter drops below the number entered into the edit field.

The individual TR Alarm type is unique from other alarms in that it can also generate a CSV file for reporting purposes. To configure the report put a check in the “**On alarm, create CSV file in**” checkbox. Enter the path statement for where POS will create the report in the field to the right on the checkbox. You can also select the path by pressing the **Browse** button. The spin box below selects how much data prior to the alarm that will be included in the CSV report. The **Disable after *n* alarm(s) in an hour** spin box allows the user to limit the number of CSV files that will be generated in an hour.



Rapper/Control Alarm Settings

Click on the **Rapper/Control Alarm Settings** tab to view and edit Rapper and MicroRap alarms.



Rapper Control Alarm Tab

The **Rapper Controller Communication Status** alarm priority setting is used to configure POS to alarm on any rapper control communication failures and communication port problems.

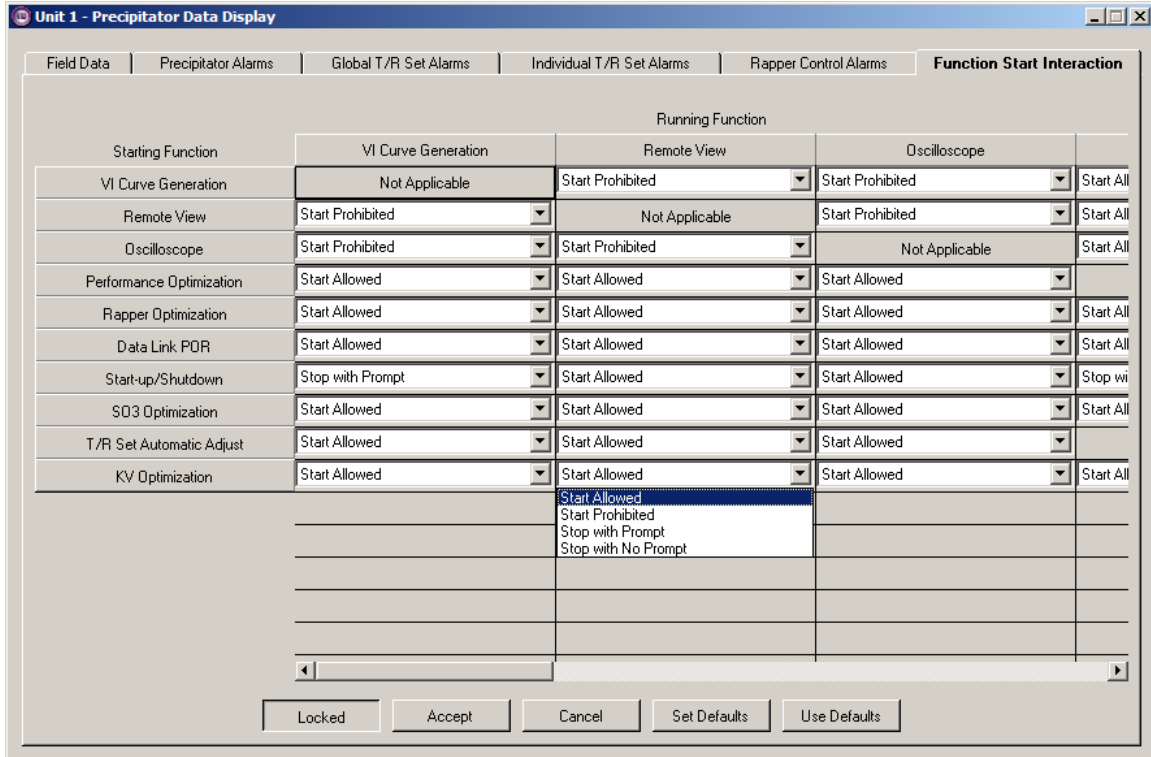
The **Number of Failed Rappers exceeds Controllers limit** will alarm when the actual number of failed rappers on a MicroRap control is greater than the number used to generate the MicroRap rapper fail alarm. The rapper fail alarm is a MicroRap generated alarm and the number of failed rappers is part of the MicroRap system configuration.

POS can be configured to alarm when the MicroRap activates the **Rapper Fail** alarm. The rapper fail alarm is a MicroRap generated alarm and the number of failed rappers is part of the MicroRap system configuration.



Function Start Interaction

Click on the **Function Start Interaction** tab to configure how different POS functions will interact with one another. These setting are designed specifically for different POS functions that may conflict with one another. For example, the performance optimization function lowers precipitator power while the rapper optimization may be using precipitator power to control rapping. Both of these function obviously conflict with each other and the user should consider how they want them to interact with one another.



Rapper Control Alarm Tab

The horizontal axis of this screen represents the running function and the vertical axis represents the starting function. Where the two axis meet on the grid is the interaction setting. The interaction settings are:

- Start Allowed** – This is the default setting for all functions in POS. This setting allows both functions to run simultaneously.
- Start Prohibited** – This setting will not allow the starting function to begin.
- Stop with Prompt** – This setting will stop the running function and will provide the user with a message stating that the running function will be stopped.
- Stop with No Prompt** – This setting will stop the running function and not provide the user with a message that the running function will be stopped.

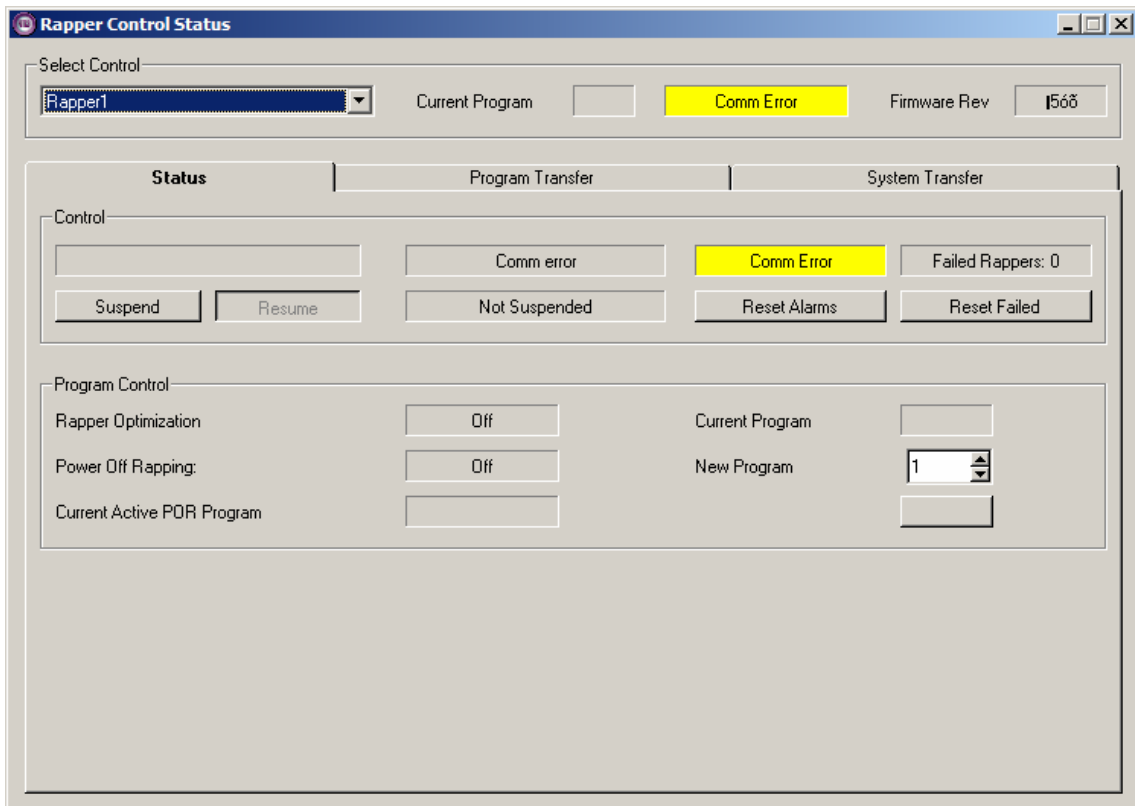


The **Set Defaults** button allows you to make your settings the default settings. The **Use Defaults** sets all the settings back to their default values that you created by pressing the set defaults button.

17. Rapper Control

Clicking on the **Status** item in the rapper control menu will display the **Rapper Control Status** window. The rapper control name will appear in the **select control** box.

Note: The program select thumb wheel switch on the MicroRap face panel must be in position 0 to remotely switch between the 6 stored MicroRap programs.



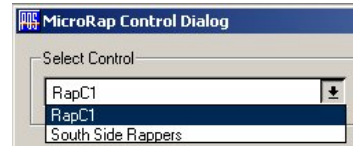
Rapper Control Status – Status Tab

Functionality

The **MicroRap Control Dialog** displays the status of the selected rapper Control. It can also be used for program switching, resetting control alarms, and viewing, editing, and creating rapping programs.



If there are more than one Rapper Controllers attached to your precipitator, use the **Select Control** dropdown list to select the correct rapper control. All functions used in the Control Dialog affect only the selected Rapper Controller.



Select Control Dropdown List



Status Tab

The **Status** tab displays current information about the selected **rappier controller**.

The screenshot shows a software interface with three tabs: Status, Program Transfer, and System Transfer. The Status tab is active. It contains a 'Control' section with a text box, 'Suspend' and 'Resume' buttons, 'Comm error' and 'Comm Error' (highlighted) buttons, 'Failed Rappers: 0' display, and 'Not Suspended', 'Reset Alarms', and 'Reset Failed' buttons. Below is a 'Program Control' section with 'Rapper Optimization' (Off), 'Power Off Rapping' (Off), 'Current Active POR Program' text box, 'Current Program' text box, and 'New Program' dropdown menu showing '1'.

Status Tab

The **Control** box contains the rapper control name, status and alarm indicators, and displays the number of failed rappers. The **Suspend** button can be used to pause the rapping program. Pressing the **Resume** button will resume rapping sequence where the program left off. External inputs from the DCS interface or through an additional digital input can also be used to suspend and resume rapping. Pressing the **Reset Alarms** button will reset the alarms actuated within the rapper control. The **Reset Failed** button resets the status of rappers that failed to operate properly in the last rapping cycle to a ready status for the next rapping cycle.

Note: Suspend/Resume rapping does not turn the actual control on or off. Users must use the MicroRap's On/Off switch if they are going to work on the control itself or individual rappers.

The rapper program number that is currently running is displayed in the **Current Program** display. To select a new program, use the up and down arrows to change the number in the **New Program** display box. If the program number you want to run is different than the program being currently run, then the button to the right has a **Start** label. Pressing the **Start** button will begin executing that program number. If the program number you want to run is the same as the program being currently run, then the button to the right has a **Restart** label. Pressing the **Restart** button will reload the active program from the MicroRap's EPROM only if the two programs are different. If the program being currently executed by the MicroRap is the same as the program stored in the MicroRap's EPROM, pressing **Restart** will have no effect.

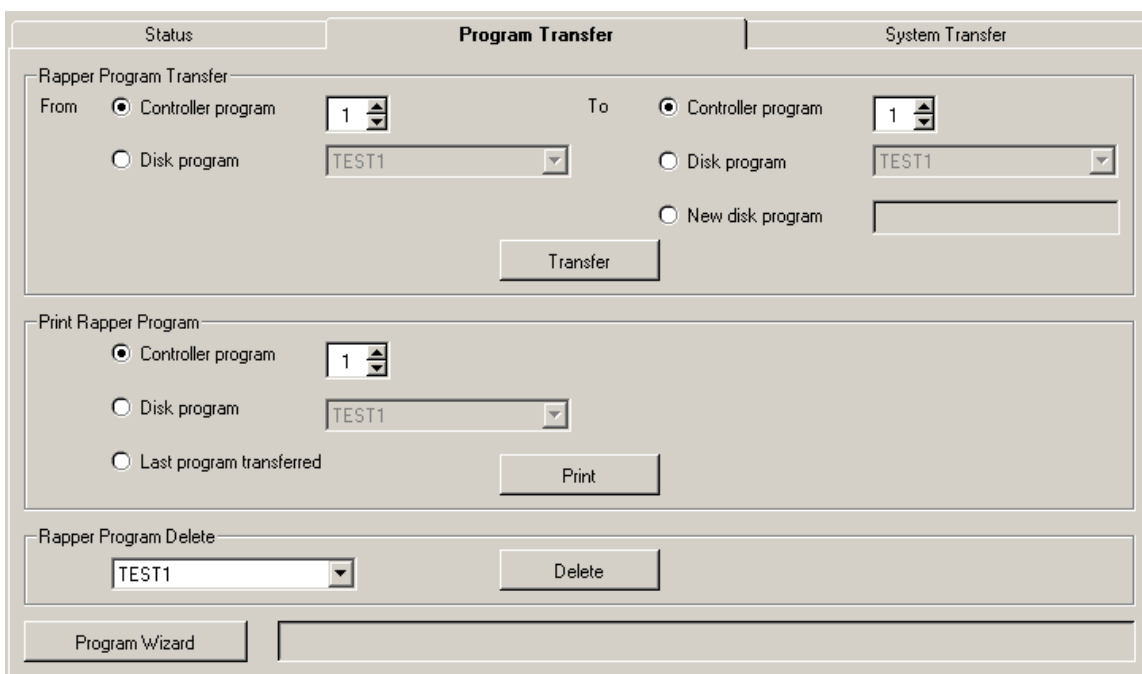
The **Rapper Optimization** and **Power Off Rapping** contains the ON/OFF status of those modules. The **Current Active POR program** field contains the POR program name of the currently active POR program. This field will be blank in no program is active.

Rapper Program Management (Program Transfer Tab)

The **Program Transfer** tab is used to manage the **Rapper Programs** on the selected rapper controller. This tab can be used to transfer programs from the controller or disk file to another program number in the controller, overwrite a disk file or create a new file. This is completed by selecting the appropriate **From** item and **To** item and then pressing the **Transfer** button.

These functions are used to transfer rapping program sequence and timing data between the rapper controller and the POS computer. The MicroRap only executes programs that are stored locally at the control. The current design of the MicroRap allows for six (6) programs to be stored at once. You need to specify which of the six (6) programs you wish to transfer to or from the computer.

Rapper programs stored on the hard drive of the POS computer can have any file name with the extension of .PGM and there is no limit to the number of programs that can be stored on disk. The default directory for POS programs is C:\VTS\pos7\pgm.



The screenshot shows the 'Program Transfer' tab with the following fields and controls:

- Rapper Program Transfer:**
 - From: Controller program (dropdown: 1), Disk program (dropdown: TEST1)
 - To: Controller program (dropdown: 1), Disk program (dropdown: TEST1), New disk program (empty text box)
 - Transfer button
- Print Rapper Program:**
 - Controller program (dropdown: 1), Disk program (dropdown: TEST1), Last program transferred
 - Print button
- Rapper Program Delete:**
 - TEST1 (dropdown)
 - Delete button
- Program Wizard button at the bottom left.

Program Select Tab

The **Print Rapper Program** allows you to print rapper programs from three different sources. These sources are a specific **Controller Program** number, a **Disk File** or the **Last Program Transferred** to or from the rapper control. Select the appropriate source and press the **Print** button. To delete a rapper program disk file, select the file name from the drop list in the **Rapper Program Delete** section and then press the **Delete** button.



The **Program Wizard** button takes you to the rapper control programming wizard described elsewhere in this manual.



System Parameter Transfer

The screenshot shows a software window with three tabs: 'Status', 'Program Transfer', and 'System Transfer'. The 'System Transfer' tab is active. It contains two main sections. The first section, titled 'Rapper Controller System Parameter Transfer', has two buttons: 'Get from Control' and 'Send to Control'. The second section, titled 'Rapper Controller Parameter Print', has three radio buttons: 'Controller Parameters' (selected), 'Disk Parameters', and 'Last Configuration transferred'. A 'Print' button is located to the right of these radio buttons. At the bottom left of the window is a 'Configuration Wizard' button.

System Transfer Tab

System Parameters are for the configuration of the rapper control setup information and is independent of rapper programs. System parameters include rapper type, the number of retries for failed rappers and line frequency. The system parameters can be edited by right clicking the rapper control icon and selecting properties from the menu or in the POS Points.MDB file.

When editing the system configuration it is always best to insure that the rapper types are still set correctly in the MicroRap. This can be done with the hand held terminal. If the rapper types are not correct, you run the risk of burning up rapper coils of impact type rappers.

Send to Control - Transfers system parameters from the POS computer to the rapper controller.

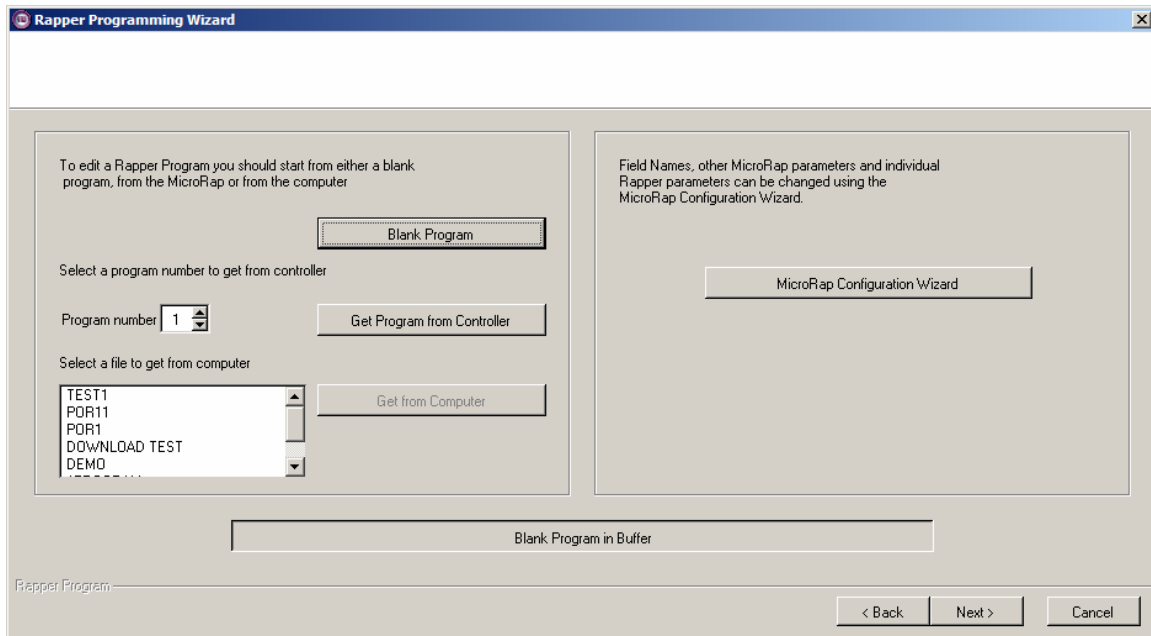
Get from Control - Transfers system parameters from the MicroRap to the POS computer.

If you would like to compare the POS and MicroRap system parameters before uploading or downloading them, we recommend that you print the system parameters out using the printing function. The **Rapper Controller Parameter Print** allows you to print rapper programs from three different sources. These sources are a specific **Controller Parameters** number, a **Disk Parameters** or the **Last Parameters Transferred** to or from the rapper control. Select the appropriate source and press the **Print** button.



18. Rapper Control Programming

As with all the wizards in POS, there is text on each screen that describes what needs to be set on that screen and its function. The first screen as shown below, the user must select what program to start with. If you want to start with a blank program then press the **Blank Program** button. The other sources are a disk file or from the controller. Pressing the MicroRap Configuration Wizard lets the user edit the MicroRap system parameter in a wizard format.



Field Data Section

This is where the timing and anti-coincidence parameters are set for each field in the rapper control. To edit a setting, click on that appropriate item and POS will provide the controls necessary to set a valid value.



Field #	Field Name	Enabled	Anti-coincidence	Interleave	Lane Wait	POR Lead	Start Delay	Average/Minimal	Field Repeat	Nominal Rap Interval	Minimum Rap Interval	Impact	Freq.
1	1PLATE	N	1	Off	Off	Off	Repeat	M	0 00:00:00.00	00:00:00	Not Used	1	1
2	2PLATE	N	1	Off	Off	Off	Repeat	M	0 00:00:00.00	00:00:00	Not Used	1	1
3	3PLATE	N	1	Off	Off	Off	Repeat	M	0 00:00:00.00	00:00:00	Not Used	1	1
4	4PLATE	N	1	Off	Off	Off	Repeat	M	0 00:00:00.00	00:00:00	Not Used	1	1
5	5PLATE	N	1	Off	Off	Off	Repeat	M	0 00:00:00.00	00:00:00	Not Used	1	1
6	6PLATE	N	1	Off	Off	Off	Repeat	M	0 00:00:00.00	00:00:00	Not Used	1	1
7	WIRES1	N	1	Off	Off	Off	Repeat	M	0 00:00:00.00	00:00:00	Not Used	1	1
8	WIRES2	N	1	Off	Off	Off	Repeat	M	0 00:00:00.00	00:00:00	Not Used	1	1
9	BAFFLE	N	1	Off	Off	Off	Repeat	M	0 00:00:00.00	00:00:00	Not Used	1	1
10	BAFFLE	N	1	Off	Off	Off	Repeat	M	0 00:00:00.00	00:00:00	Not Used	1	1
11	XXXXXX	N	1	Off	Off	Off	Repeat	M	0 00:00:00.00	00:00:00	Not Used	1	1
12	XXXXXX	N	1	Off	Off	Off	Repeat	M	0 00:00:00.00	00:00:00	Not Used	1	1
13	XXXXXX	N	1	Off	Off	Off	Repeat	M	0 00:00:00.00	00:00:00	Not Used	1	1
14	XXXXXX	N	1	Off	Off	Off	Repeat	M	0 00:00:00.00	00:00:00	Not Used	1	1
15	XXXXXX	N	1	Off	Off	Off	Repeat	M	0 00:00:00.00	00:00:00	Not Used	1	1
16	XXXXXX	N	1	Off	Off	Off	Repeat	M	0 00:00:00.00	00:00:00	Not Used	1	1

Rapper Program: _____

< Back Next > Cancel

The **Field Enable** parameter is used by the MicroRap to enable and disable rapping in a particular field. You must have valid sequence data to enable a field.

Note: This must be set to Y for the field to run.

Lane Wait, if turned on, prevents two rappers in the same lane from rapping at the same time. The **Lane Wait** sets the time delay for rapper sequencing in a lane. Use the drop down list to set the **Lane Wait** time from 0.5 Sec to 53 Sec or to off.

POR Lead Time sets the time between activation of the **Power Off Rapping** signal sent to the Micro Voltage Control and the signal sent to operate the rapper. Use the drop down list to set the **POR Lead Time** from 0.5 Sec to 53 Sec or off to disable lead time.

Start Delay sets a delay between the time the field is to begin rapping and when the program is first begun. Use the drop down list to set **Start Delay** from 1 Sec to 270 Min. or to repeat.

AG (Anti-coincidence) Group, if enabled, prevents two rappers in a designated grouping from operating at the same time. The **Global AG** check box enables the AG grouping to span multiple rapper controllers. Use the drop down list to set the **AG Group** number of a field. The maximum number of AG Groups is 6.

AG Interleave enables the controller to rap two or more fields in the same AG Groups at the same time, while preventing simultaneous rapper operations. Interleave time is the duration between the operation of any two rappers in different fields in the same AG group. Use the drop down list to set the **AG Interleave** time delay from 0.5 Sec to 53 Sec or to turn **AG Interleave** off.

The **Field Repeat Time** sets the time between the start of a field rapping and when that field will start rapping again. Selecting the **Minimum** or **Average** will determine how the repeat time interval is applied. If the repeat time is set to be average, the controller will attempt to catch up if it falls behind in the rapping sequence by using the time set in the **Minimum** drop down list instead of the time set in the **Nominal** drop down list. If the repeat time is set to be minimum, the

control will not attempt to make up time if it happens to fall behind in the rapping sequence. Anti-Coincidence considerations can cause rapping to fall behind schedule.

The **Minimum** sets the minimum time between rappers when the **Repeat Time** is set to **Average**.

The **Nominal Time** sets the time between rappers in the field.

Impact Control:

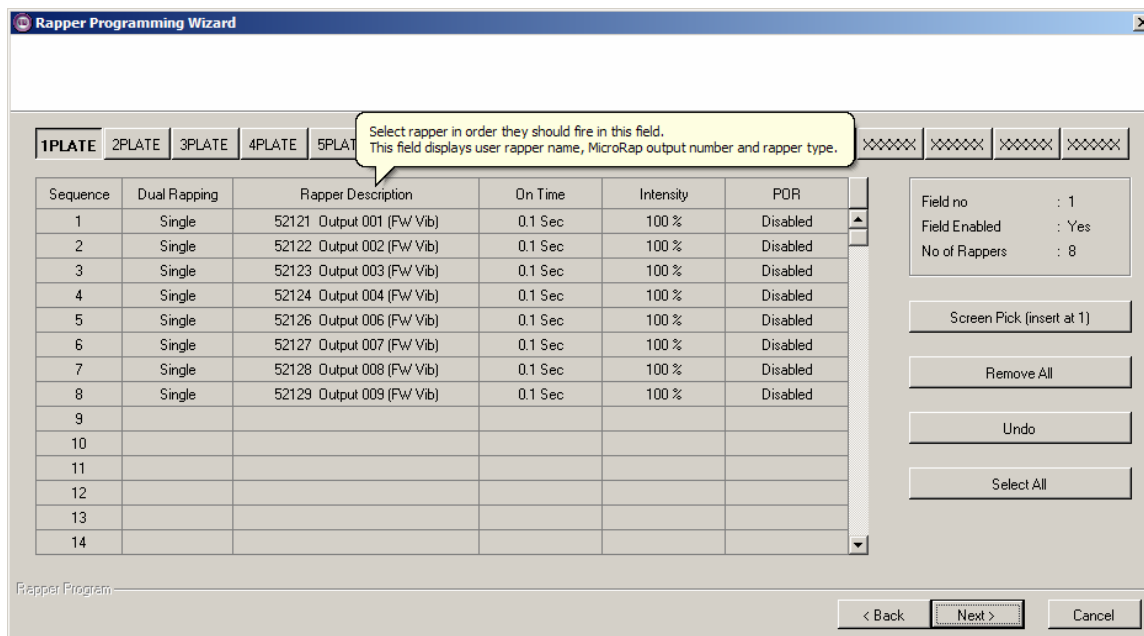
No. Use the up and down arrows to set the number of strikes per rapping event.

Frequency Use the up and down arrows to set the frequency of impacts for multiple impact rappers.

Note: Both of these settings are for electric impact rappers only. Settings will be ignored for other device types.

Rapping Sequence

This is where the device rapping order is set for selected field. The scroll list displays the rappers' names in order of rapping sequence. Rappers can be added, inserted and deleted. To delete a single rapper select the rapper by clicking on its sequence number and pressing the **Remove** button. You can insert rappers into the sequence by selecting the location to insert it by clicking on the sequence number and pressing the **Screen Pick (Insert at #)** button. Change which field sequence you are viewing by clicking on the field buttons across the top of the page. Buttons with bold text have rappers in their sequence.



Sequence	Dual Rapping	Rapper Description	On Time	Intensity	PDR
1	Single	52121 Output 001 (FW Vib)	0.1 Sec	100 %	Disabled
2	Single	52122 Output 002 (FW Vib)	0.1 Sec	100 %	Disabled
3	Single	52123 Output 003 (FW Vib)	0.1 Sec	100 %	Disabled
4	Single	52124 Output 004 (FW Vib)	0.1 Sec	100 %	Disabled
5	Single	52126 Output 006 (FW Vib)	0.1 Sec	100 %	Disabled
6	Single	52127 Output 007 (FW Vib)	0.1 Sec	100 %	Disabled
7	Single	52128 Output 008 (FW Vib)	0.1 Sec	100 %	Disabled
8	Single	52129 Output 009 (FW Vib)	0.1 Sec	100 %	Disabled
9					
10					
11					
12					
13					
14					

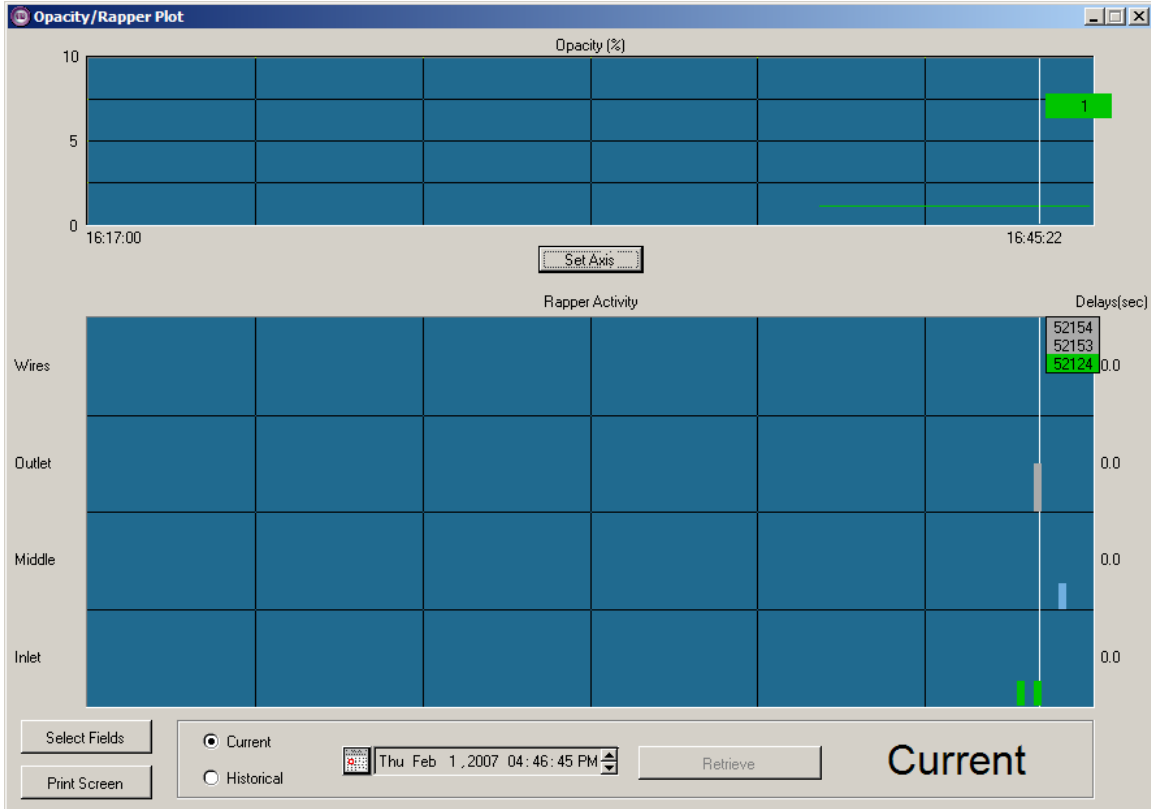
Select the **Dual Rapping** field to allow the controller to energize two rappers in unison. Select the **POR Enable** field to enable the Power Off Rapping output for that rapper. The MicroRap will send out a POR signal to the MVC according to the **POR Lead Time** parameter. Use the **Rapper On Time** drop down list to set the on time for impact rappers in half-cycles and in seconds for vibrators. Use the **Intensity** drop down list to set the conduction angle of the phased-fired outputs.

Click the **Select All** button before making any changes to have your changes apply to all rappers in the sequence for the selected field.



19. Opacity/Rapper Plot

Clicking on the **Opacity Plot** menu item on the Rapper Control menu opens the **Rapper/Opacity Plot** window. This window displays rapper actuations in correlation with opacity. Rappers are displayed by field. Soot Blower actuations can also be displayed on the rapper/opacity plot. Viewing the rapper actuations can be useful in troubleshooting opacity problems due to rapper re-entrainment in the precipitator.



Rapper/Opacity Plot Window

Functionality

The Rapper opacity plot displays data over a 30, 60 or 90 minute interval. By default the window opens displaying current live data but it can also display historical data. The time interval to display and the Y axis opacity scaling can be set by pressing the **Set Axis** button.

To display historical data:

1. Select the **Historical** radio button.
2. In the **Historical Time** Selection box select a time parameter and use the up and down arrows to set the end of the time interval.
3. Press the **Retrieve** button to get the data to display.

Moving the mouse over the graph displays a line through both the Opacity and rapper actuation plot. The time is displayed under the opacity plot. The pop-up windows display the names of the rappers that fired and the opacity at that time.

Pressing the **Print** Screen button prints the screen.

Setting Up Rapper Opacity Plot Field Display

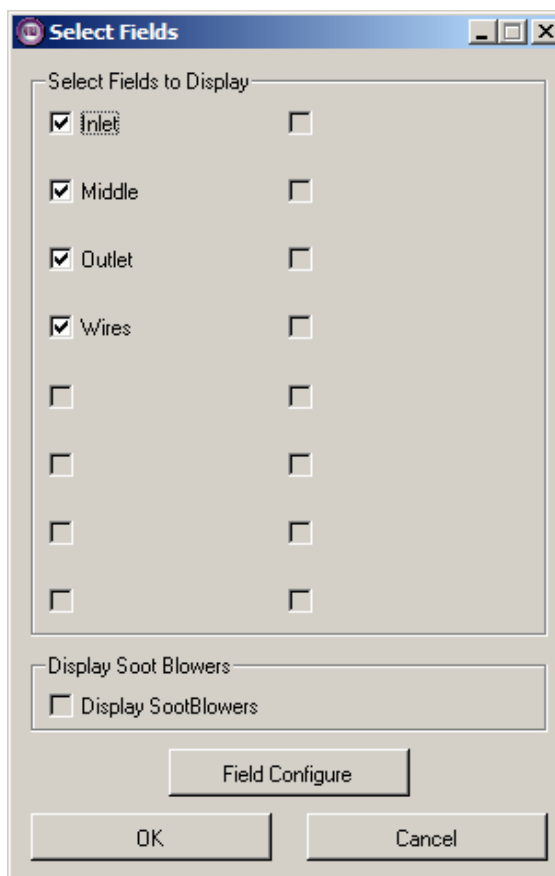
The **Rapper/Opacity Plot** can display all rapper activity or rapper activity in individual fields. To set up the screen press the **Select Fields** button. This will open the **Select Fields** window.

The **Select Fields to Display** box is used to select what fields appear on the plot. Select the checkbox for the corresponding fields that you would like to appear on the rapper plot.

If there is a soot blowing system connected to POS you can display soot blower actuations on the rapper/opacity plot. Select the **Display Soot Blowers** checkbox to display soot blower information. If there are no soot blowers interfaced with POS the checkbox will be grayed out.

The **Field Configure** button takes you to the precipitator data entry screen where the fields can be configured. This process is described elsewhere in the manual.

Press the **OK** button to close the window.



Select Fields Window

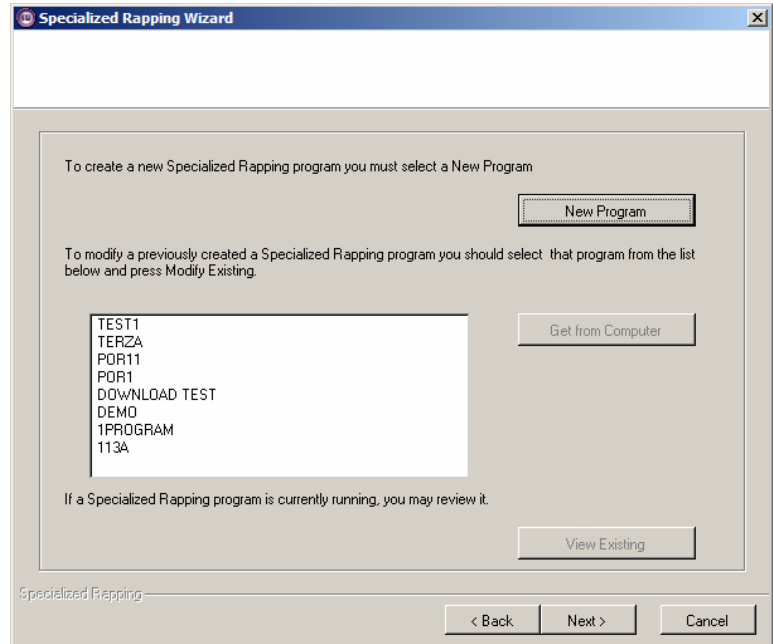


20. Specialized Rapping

Clicking on the **Specialized Rap** menu item on the rapper control menu opens the **Specialized Rapping Wizard**. A specialized rapping program is usually used to run a short hard rapping program to clean part of the precipitator. Normal rapping is suspended while the specialized rapping program is being run by the MicroRap rapper controller. When the special program is complete the original program resumes where it had left off.

Program Select

As with all the wizards in POS, there is text on each screen that describes what needs to be set on that screen and its function. The first screen as shown to the right, the user must select what program to start with. If you want to start with a blank program then press the **New Program** button. The other source is a disk and is accessed by selecting the file name and pressing the **Get From Computer** button.



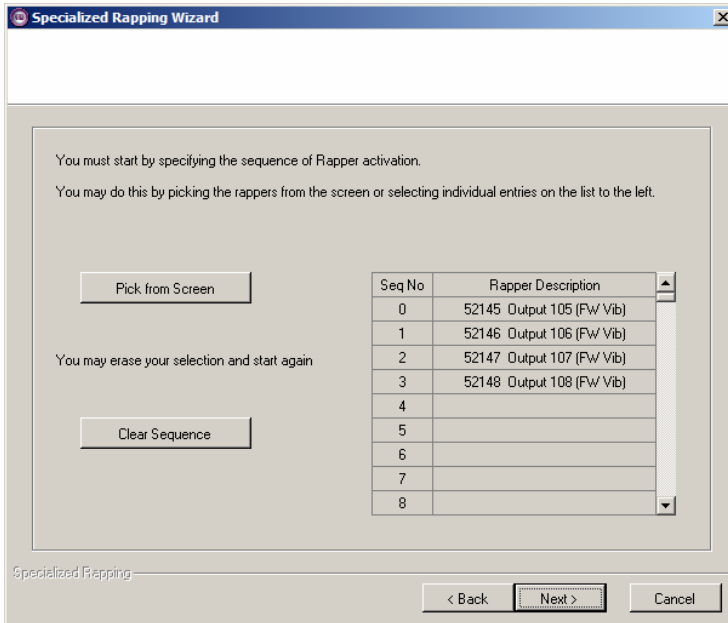


Sequence

This is where the device rapping order is set for the program. The list displays the rapper names in the order which they will rap. Rappers can be added to and deleted from the sequence.

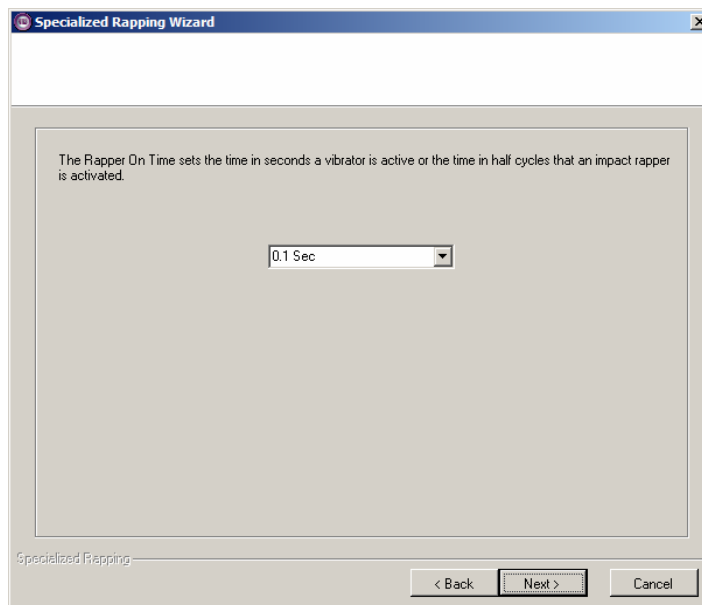
To add rapper to the sequence you can pick then from the screen in the order you would like them rapped by pressing the **Pick From Screen** button. You can also click on the sequence display and select the rapper you would like to add from the list of available rappers.

To remove all rappers from the sequence press the **Clear Sequence** button.



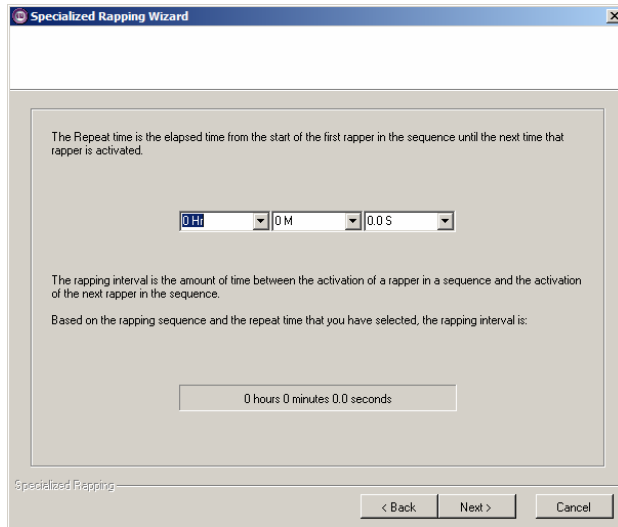
On the next screen, use the dropdown list to set the **Rapper On Time**. The **On Time** sets the time in seconds that a vibrator is active or the time in half-cycles that an impact rapper is on.

NOTE: The same On Time value will be used for all rappers in the program and will correspond to the rapper type of the first rapper in the sequence.





Repeat Time



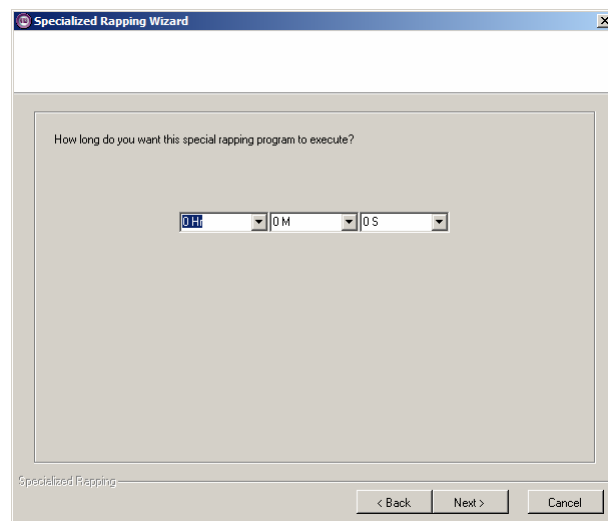
The **Repeat Time** represents the time it takes to go through the program one time; the elapsed time from the start of the first rapper in the sequence until the next time that rapper is activated.

Use the drop down lists to set the **Repeat Time** for the **Specialized Rapping** program.

POS calculates the **Rapping Interval**. This time represents the average amount time between the activation of one rapper in the sequence and activation of the next rapper in the sequence. These times are based on calculations using the rapping sequence data and the repeat time that the user enters.

Duration

The **Duration** is used to set the running time of the program. Use the drop down lists to set a length of time the specialized rapping program will run.



Execution

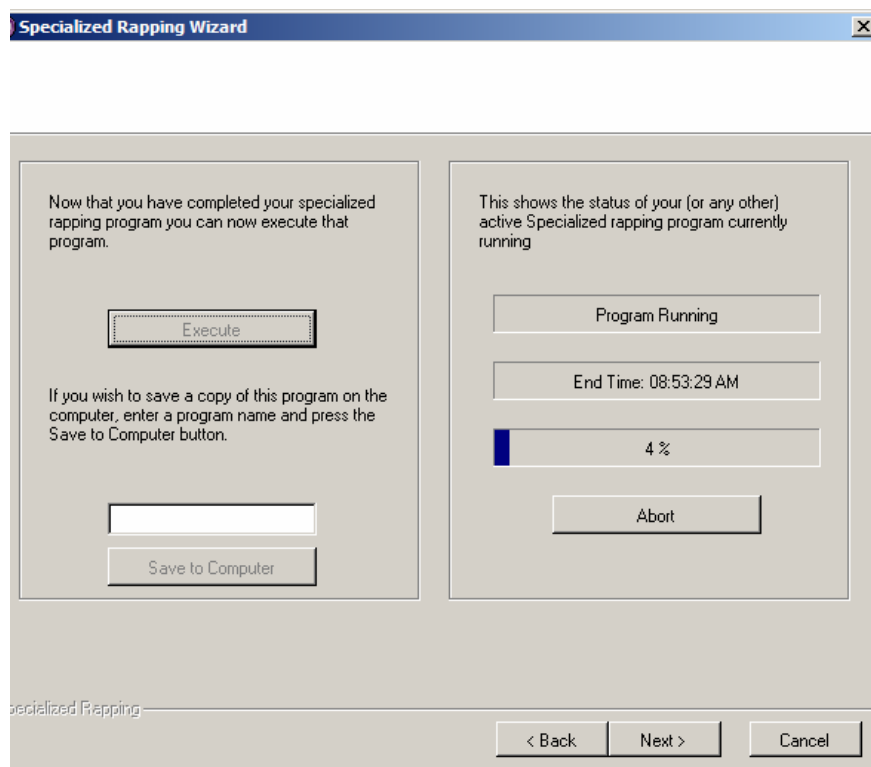
Once you have finished creating the specialized rapping program you should be at the **Execution** screen.

The **Status** bars display the status of the Specialized Rapping program, timing information and a bar graph of its progress.

Press the **Execute** button to begin running the Specialized Rapping Program.

To save the program, enter a program name in the field provided and press the **Save to Computer** button.

While a program is running press the **Abort** button to stop execution.





21. Rapper Optimization

Selecting the **Rapper Optimization** button on the rapper control menu will open the **MicroRap Optimization** window. When enabled, **MicroRap Optimization** can automatically change between rapper control programs running on the selected MicroRap based on logic conditions set by the user. A prioritized set of six different logic conditions use **Opacity**, **Load**, **Precipitator Power**, or **Time of day** to determine what program will run. When a condition becomes true the associated program will be started and when that condition goes false optimization will continue to run that program until another condition becomes true.

MicroRap Optimization Window

Functionality

MicroRap Optimization is password protected and users will have to log in before turning optimization on/off or editing the conditions or configuration.

Use the drop down list to select the **Rapper Controller** you want to optimize.

Pressing the **On** button starts optimization.

Pressing the **Off** button stops optimization.

The **Status** box displays messages relevant to the operation of MicroRap Optimization.

The **program** box displays the program currently running on the selected Rapper Controller.



Pressing the **Configure** button opens a window to change configuration settings for the selected MicroRap. Pressing the **Edit** button allows the user to edit the conditions. When in **Edit** mode, pressing the **Accept** button saves the changes made. When in **Edit** mode, pressing the **Cancel** button does not save any changes that were made, and all conditions will return to the way they were before the **Edit** button was pressed.

Conditions

Each logic condition can trigger on any combination of **Load**, **Opacity**, and **Precipitator Power** signals. Alternately, the condition can be set to trigger a program change depending on the **Time of day**. A condition can be based either on the analog signal parameters **OR** on the time of day but not both together.

Setting a condition based on **Time of day**:

1. Select the **Time of day** checkbox.
2. Click on the time parameter to edit and use the up and down arrows to edit that value. This is completed for the **Start Time** and **End Time**.
3. Use the up and down arrows to select the program in the **Start MicroRap program #** box.

Condition 1

Load < 0 %

Opacity < 0 %

Precipitator Power < 0 KW

Time of day: Start 12:00:00 AM

End 12:01:00 AM

Logical:

And

Or

Start MicroRap program # 1

Example Condition

If optimization is active when the **Start Time** is reached the condition will become true and the selected program will begin. When the **End Time** is reached the condition will become false. If another condition is true it will then switch to that program for that condition.

Setting a condition based on analog values:

1. Click the checkbox to select each parameter that will be used.
2. Enter a value in the given field.
3. If more than one parameter is selected use the **Logical** radio button to select **And** or **Or**. Selecting **And** will require all selected parameters to be true for the condition to become true. Selecting **Or** will require only one of the selected parameters to be true for the condition to become true.
4. Use the up and down arrows to select a program in the **Start MicroRap program #** box.

If optimization is on when the parameters become true, the condition will become true and the selected program will begin. If the parameters become false, the condition will become false.

The conditions are taken into consideration in priority order with **Condition 1** having the highest priority and **Condition 6** having the lowest priority. If more than one condition is true, optimization will switch to the program associated with the highest priority condition.

MicroRap Optimization Configuration

Clicking on the **Configure** button will open the **MicroRap Optimization Common Parameters** window. This window contains important configuration settings for **MicroRap Optimization**. This section is password protected and users will have to log in to make any changes to the configuration settings.

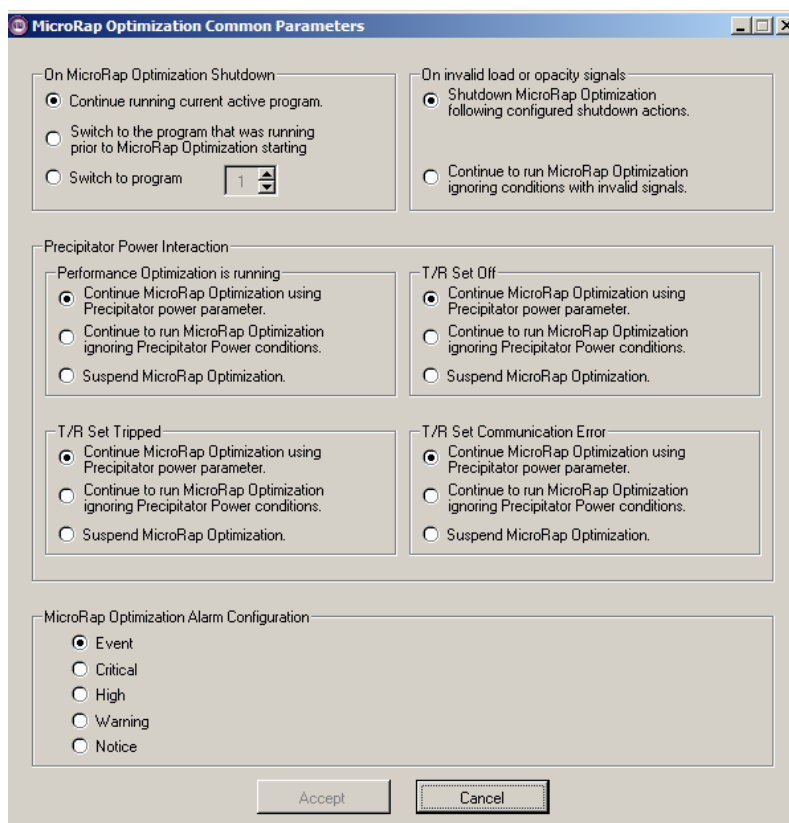
Shutdown Parameters

Use the radio button to select what will happen when **MicroRap Optimization** is turned off.

Select **Continue running current active program** to make the rapper control continue running the current program when optimization is turned off.

Select **Switch to the program that was running prior to MicroRap Optimization starting** to make the rapper control switch back to the program that was running when optimization was first turned on.

Select **Switch to program** and select a program number using the up and down arrows in the box to make the rapper control run the selected program when optimization is turned off.



MicroRap Optimization Common Parameters Window

Invalid Signals

Use the radio button to select what **MicroRap Optimization** will do when a **Load** or **Opacity** signal is invalid.

Select **Shutdown MicroRap Optimization following configured shutdown actions** to have optimization shut down when the **Load** or **Opacity** signals become invalid.

Select **Continue to run MicroRap Optimization ignoring conditions with invalid signals** to have optimization ignore any conditions that are based on the invalid **Load** or **Opacity** signals.

Precipitator Power Interaction

The options in this section determine how **MicroRap Optimization** will operate in situations where precipitator power is not stable. These situations can be a result of running the **Power Optimization** module or any of the following events: **MVC Off**, **MVC Tripped**, or **MVC Communication Error**. Use the radio buttons in each section to select what action **MicroRap Optimization** will take when these situations occur in each situation.

Select **Continue MicroRap Optimization using Precipitator Power Parameters** to have optimization function as if there was no change.

Select **Continue running MicroRap Optimization ignoring Precipitator Power Conditions** to have optimization continue running but ignoring all conditions using **Precipitator Power Parameters**.

Select **Suspend MicroRap Optimization** to have optimization temporarily suspend during the situation. When the situation is resolved optimization will resume running as normal.

Alarm Configuration

MicroRap Optimization triggers an alarm when it is turned on or off and when a condition becomes true causing a program change. The user can set the alarm priority or choose to disable the alarms by clicking on the appropriate radio button.

Select **Disabled** to disable alarms. **MicroRap Optimization** will not send any messages to the alarm log if alarms are disabled.

Select **Event** to have any optimization change cause an event to be logged in the alarm log.

Select **Pop Up** to have any optimization change cause POS to create a low priority alarm and a pop up window for the alarm message.

Select **Medium** to have any optimization change cause POS to create a medium priority alarm for the alarm message.

Select **High** to have any optimization change cause POS to create a high priority alarm for the alarm message as well as an audible indicator.



22. Power Off Rapping Over Data Link

Pressing the **Power Off Rapping** button on the MicroRap and TR set menus opens the **Data Link POR** window. **Data Link POR (Power Off Rapping)** is a method of implementing power off rapping through POS without having to hardwire the rapper controls POR output to the voltage controls POR input.

The screenshot shows the 'Data Link POR' window with the following elements:

- POR Control:** A dropdown menu set to 'Rapper1', 'On' and 'Off' buttons, and a 'Status' field.
- Configure:** 'Configure', 'Edit Program', and 'Print' buttons.
- POR Schedule:** A grid showing a 24-hour schedule for Feb 1-7. Red and green vertical bars indicate scheduled events.
- Disable Conflict Checking:** A checkbox.
- Table:**

POR Name	Color	T/R Set	Setpoint	Program Name	Next Start Time	Duration	Repeat Time	Enable	
TR1 POR	Green	TR1A	10 %	DEMO	Thu Feb 1, 2007 11:30 AM	10 Min	1 day	Yes	Delete
TR2 POR	Red	TR2A	0 %	DEMO	Thu Feb 1, 2007 11:19 AM	10 Min	1 day	Yes	Delete
- Buttons:** 'Locked', 'Add POR', 'Accept', and 'Cancel'.

Data Link POR Window

Power off rapping is a process used to reduce the power of individual TR Sets for a small amount of time while executing a specialized rapping program. This is useful to periodically remove excess particulate from the collecting plates in a precipitator without the electrical force of the TR set holding it on the plate. **Data Link POR** allows the user to configure any number of independent POR programs that can be scheduled to run at set time intervals while reducing the power to a TR Set.

Functionality

The **Data Link POR** window displays configured POR programs and a schedule of POR programs over a seven-day period for the selected rapper controller.

Data Link POR is a protected function and users will have to log in before starting and stopping **POR**, changing configuration settings, or editing POR programs.



POR Control

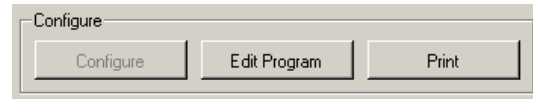
Select the rapper controller that you would like to use **Data Link POR** from the dropdown list.

Pressing the **On** button starts **Data Link POR**.
Pressing the **Off** button will stop **Data Link POR**.



POR Control

Pressing the **Configure** button opens the **POR Common Parameters** window where changes to the **Data Link POR** configuration can be made.



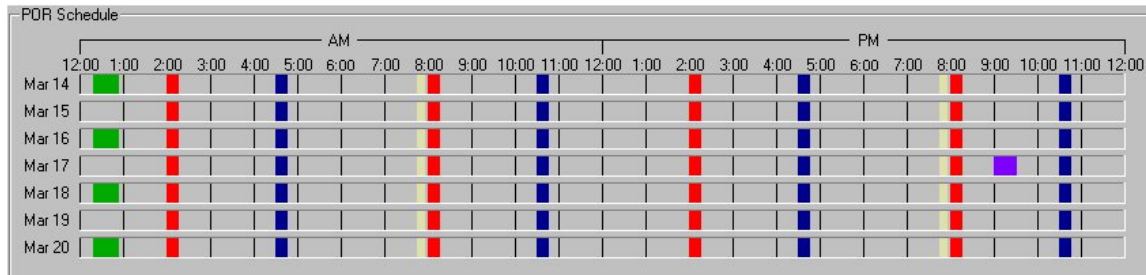
Configure Box

Pressing the **Edit Program** button opens the **MicroRap Control Dialog** window. From this window you can create, edit, and save rapper control programs for use with POR.

Pressing the **Print** button will open a **Print Preview** display showing all information found in the select program box for every POR program associated with the selected rapper control along with the rapper control name.

POR Schedule

The **POR Schedule** displays in graphical form the schedule for each POR program. Each different color marker identifies a different program. The placement of the markers indicates at what time the program will run.



POR Schedule



POS setup table

The POR setup table contains all the POR programs and their setup/schedule information for the selected MicroRap control.

POR Name	Color	T/R Set	Setpoint	Program Name	Next Start Time	Duration	Repeat Time	Enable	
test1		TR1A	10 %	DEMO	Thu Feb 1, 2007 11:30	10 Min	1 day	Yes	Run Now
test2		TR2A	Off	DEMO	Thu Feb 1, 2007 11:19	10 Min	1 day	Yes	Run Now

Selected Program Box

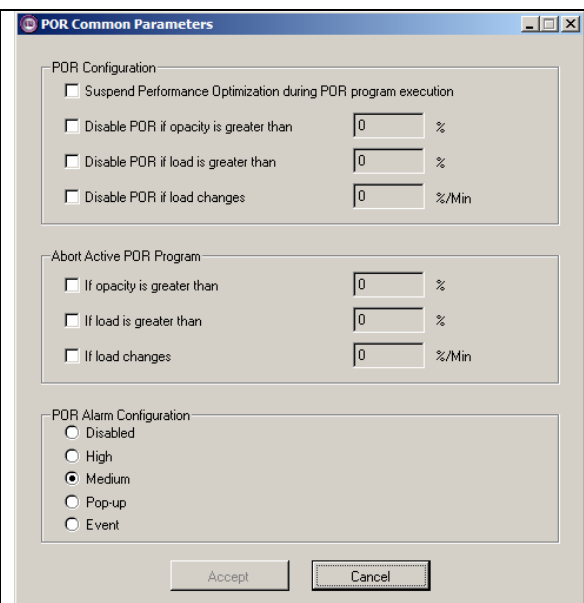
To delete the selected POR program, click on the **Delete** button at the far right of the programs line. When a program is deleted it is removed from the list of POR programs associated with the selected rapper control.

When **Data Link POR** is on, clicking on the **Run Now** button immediately starts the selected program. The **Run Now** button is not available if a POR program is currently running.

- Color:** Press the **Select** button to open the color palette pop up window. Choose a color from the palette and press the **OK** button. If you do not want to change the color press the **Cancel** button. The newly selected color will be used to identify the **POR Program** on the schedule.
- TR Set:** Use the dropdown list to select the TR Set that the POR program will reduce power.
- Setpoint:** Enter a value or use the up and down arrows to set the percentage that will be used as the reduced power for the duration of the POR Program.
- Program name:** Use the drop down list to select the Rapper Program you want to run for the duration of the POR sequence.
- Next Start Time:** Click on the day, hour, or minute display and use the up and down arrows to select the start time for the POR Program.
- Duration:** Enter a value or use the up and down arrows to select how long the program will run. Values must be between 1 and 60 minutes.
- Repeat Time:** Use the drop down list to select how often the POR program will run. The choices are once every 4 hours, 6 hours, 8 hours, 12 hours, or 1-7 days.
- Enable:** Click the check box to enable the POR program. If a POR Program is not enabled it will not appear on the schedule and will not run.

Configuration

Use the settings in the **POR Common Parameters** window to specify how **POR** will interact with the rest of POS and to set **POR** alarm status. After making any configuration changes press the **Accept** button to save your changes before exiting. To exit without saving any configuration changes press the **Cancel** button.



POR Common Parameters Window

POR Configuration Box

If the **Suspend power optimization** check box is checked and a POR program begins running, power optimization will suspend for the duration of the POR program. If power optimization is not suspended during POR program execution, POS will use the lower of the two power settings.

Check the **Disable POR if Opacity is greater than** box and enter a value in the % field. If this box is checked **POR** will be disabled when the opacity is greater than the specified value.

Check the **Disable POR if load is greater than** box and enter a value in the **MW** field. In Power plant installations if this box is checked **POR** will be disabled when the boiler **Load** is greater than the specified value.

Check the **Disable POR if load changes** box and enter a value in the **MW/Min** field. In Power plant installations if this box is checked **POR** will be disabled when the boiler **Load** changes at a rate equal to or greater than the number of Mega Watts per Minute entered in the **MW/Min** field.

Abort Active POR Program Box

Check the **If Opacity is greater than** check box and enter a value in the % field. If this box is checked the current running POR Program will abort if **Opacity** becomes greater than the specified value.



Check the **If load is greater than** check box and enter a value in the **MW** field. In power plant installations if this box is checked the current running POR Program will abort if **Load** becomes greater than the specified value.

Check the **If load changes** check box and enter a value in the **MW/Min** field. In power plant installations if this box is checked the current running POR Program will abort if **Load** changes at a rate greater than the specified value.

POR Alarm Configuration Box

When POR is turned ON or OFF and when a POR program begins, messages are written to the POS alarm log. Use the radio buttons to select the priority of the message.

Select **Disabled** to disable alarms. **Data Link POR** will not send any messages to the alarm log if alarms are disabled.

Select **Event** to have any change cause an event to be logged in the alarm log.

Select **Pop Up** to have any change cause POS to create a low priority alarm and a pop up window for the alarm message.

Select **Medium** to have any change cause POS to create a medium priority alarm.

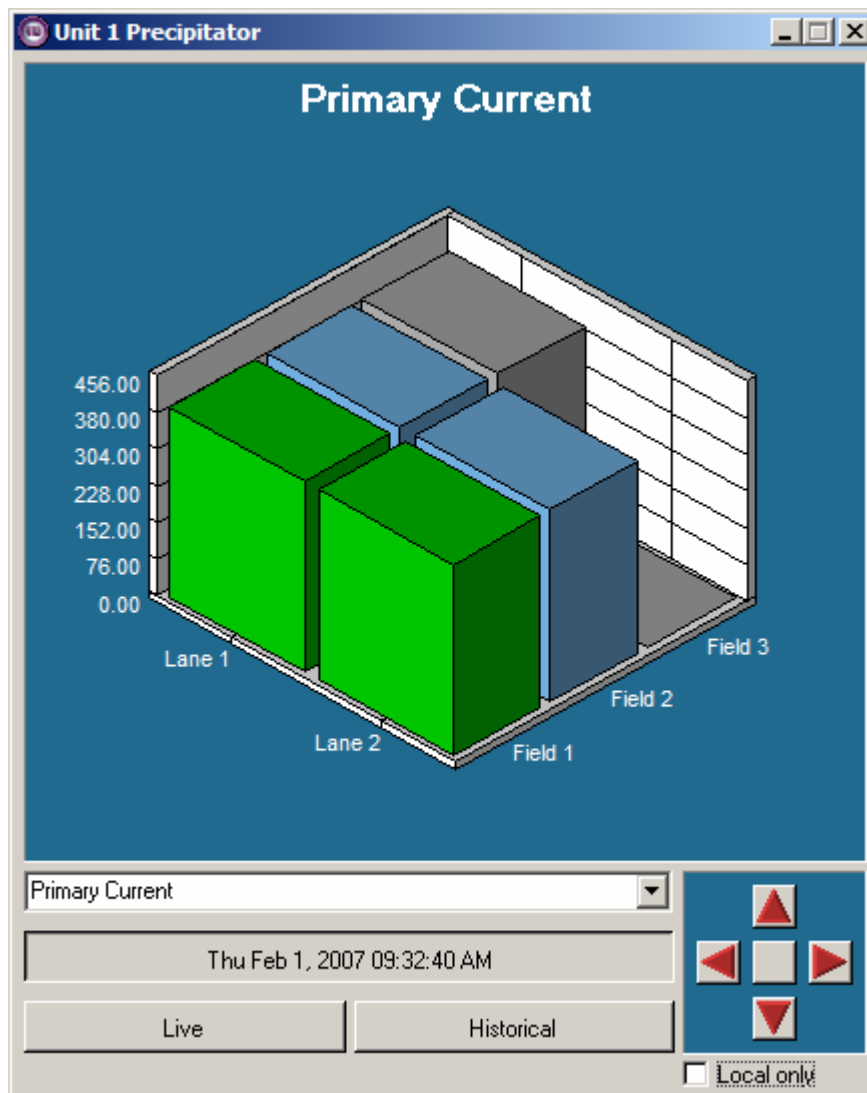
Select **High** to have any change cause POS to create a high priority alarm.



23. 3D Graph

Pressing the **3D Graph** button on the precipitator or TR set menu opens the **3D Graph** window.

The **3D Graph** window displays a 3D rotating graph of electrical data or set points from each MVC associated with the Precipitator. Each bar represents a voltage control and the layout is similar to the precipitator layout.



3D Graph Window

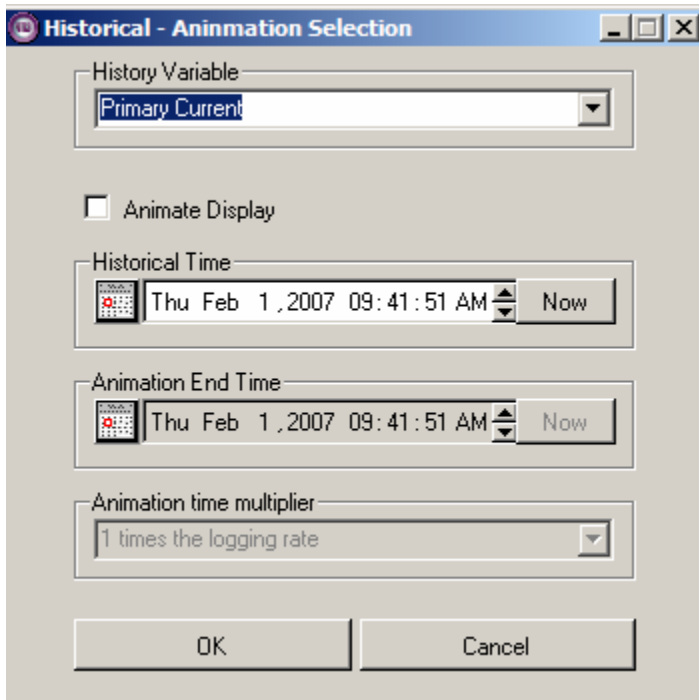
The graphs can be rotated simultaneously using the four arrows. Pressing the button in the center returns the graphs to their original orientation. If the graphs are rotated and then the



window is closed, the graphs will hold their position for the next time the window is opened. The 3D graph is a dockable window and multiple 3D graphs can be opened and docked simultaneously. A window is docked by dragging it to the left side or bottom edge of the screen.

The **3D Graph's** default to display **Primary Current**. The **3D Graph** can be set to any of the parameters in the drop down list below the graph. Click on the arrow, scrolling through the list, and highlight the desired item to be viewed.

Double Clicking on a bar displays the Lane and Field location of the TR Set it represents and the value of the data displayed.



Historical – Animation Selection Window

The **Historical** button allows the user to access historical data to be displayed on the graph. When pressing this button the Historical – Animation window opens. The **History Variable** drop list allows the user to select which operating parameter will be graphed. The **Animate Display** checkbox toggles the display from displaying a single point in time or to animate the display through a period of time. The **Historical Time** selection sets which time you want to display on the historical graph. If you are animating a period of time then this selection is the start time of the animation. The **Animation End Time** sets the time at which the animation will end and must be later than the start time. The **Now** buttons set the times to the current time and date. The Animation Time Multiplier allows the animation to run at real time or faster rate.

The following data can be displayed on the **3D Graphs**:

Live Data:

Primary Current - T/R sets Primary Current
Primary Volts - T/R sets Primary Volts
Secondary Current - T/R sets Secondary
Secondary KVa - T/R sets Secondary Kilovolt A bushing
Secondary KVb - T/R sets Secondary Kilovolt B bushing
Primary KW - T/R sets Primary Kilowatt
Secondary KW - T/R sets Secondary Kilowatt
SCR Angle - SCR Conduction Angle
Actual Sparks /Min - Sparks per minute

Set points and limits:

Sparks Sensitivity – How the control responds to sparks
Optimization Percent - Optimization Percent
Secondary Current Limit - Voltage Control Secondary Current Limit
IE Ratio - Number of On and Off Half Cycles
Primary Current Limit - Voltage Control Primary Current Limit
Primary Over Volts Limit - Voltage Control Primary Over Voltage Limit
Primary Under Volts Limit - Voltage Control Primary Under Voltage Limit
Secondary Current Limit StPt - Secondary Current Limit Set by POS
Rap Limit - Secondary Current Limit Set for Power Off or Reduced Rapping
Secondary KV Limit - Voltage Control Secondary Kilovolt Limit
Spark Baseline Rate - Voltage Control Sparks per minute Set Point
Spark Response Mode - Voltage Control Spark Mode
SCR Cond Angle Limit - Voltage Control SCR Conduction Angle Limit
MVC Device Number - Voltage Control Address
Back Corona Setup Code - Voltage Control Back Corona Detection Setup Code
IE Ratio POS Set Point Code - IE Ratio POS Set Point Code Set by POS
Full Scale Secondary Current – Voltage Control Full Scale Secondary Current in Milliamps
Secondary Current Density – Ratio of Secondary Current over collecting plate size



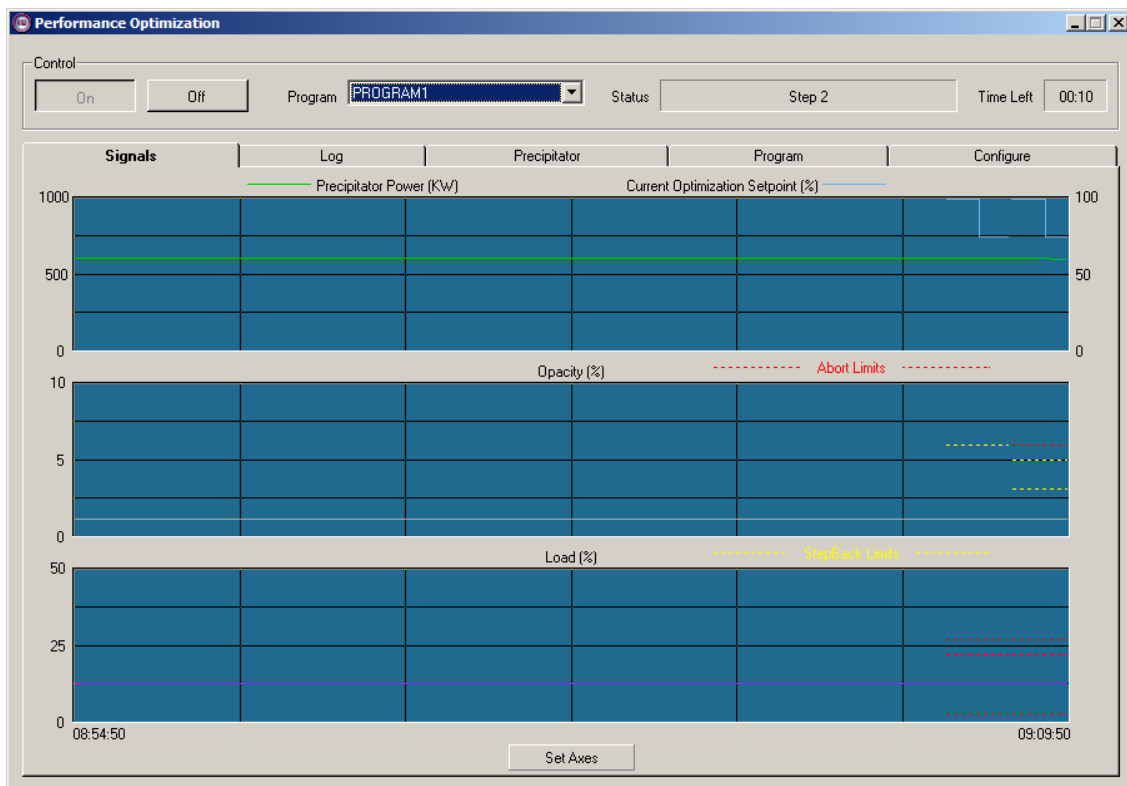
24. **Trending Window Functions**

The trending screens can be accessed through the precipitator and voltage control menus by clicking on the trend item. More information will be forthcoming in this manual. Complete information can be found in the VTS Operator guide by clicking on the Help button on the VTS application manager window and search for historical data viewer.



25. Performance Optimization

Pressing the **Performance Optimization** button in the TR set or precipitator menu will open the **Performance Optimization** window. Optimization control is used to change power levels of selected T/R sets in relation to changes in opacity and load levels, or opacity and precipitator power levels. The program will reduce the power levels of the precipitator while monitoring opacity levels to remain in compliance with user configurable opacity limits and will reset the opacity base line to insure optimum opacity is achieved at all load or power levels.



Optimization Window

Performance optimization is password protected and users will need to log in before being able to start or stop optimization.

Before running optimization you need to first create an optimization program and set the abort, step back and timing parameters. A basic optimization program contains a series of steps taken at specific time intervals (step time). Each step of the optimization program adjusts the voltage control's secondary current limit to a certain percentage of the controls full-scale limit. A step can adjust any number of voltage controls on the precipitator. Limits are set on the opacity and load

or precipitator power levels that will cause optimization to abort to 100% power and start the process over or cause optimization to step back one step in the program before proceeding further. These limits and others are defined in the configuration portion of the manual.

Auto Optimization suspension function provides an auxiliary input to optimization that will reset voltage controls to full power when the signal is present. POS will remember the program step it was executing when the signal was applied. When the signal is removed, POS will step through the optimization program at an accelerated rate until it reaches its previous location in the optimization program. When it reaches the previous location POS will revert to its default step time. The accelerated step time is user configurable and a parameter in optimization properties. If POS has to step back three times on a single program step when it is executing the optimization program at an accelerated rate, POS will revert to the default step time.

Starting/Stopping Performance Optimization



Optimization Controls

Pressing the **On** button turns on selected optimization program and optimization begins.

Pressing the **Off** button turns off optimization program and voltage controls go to full power.

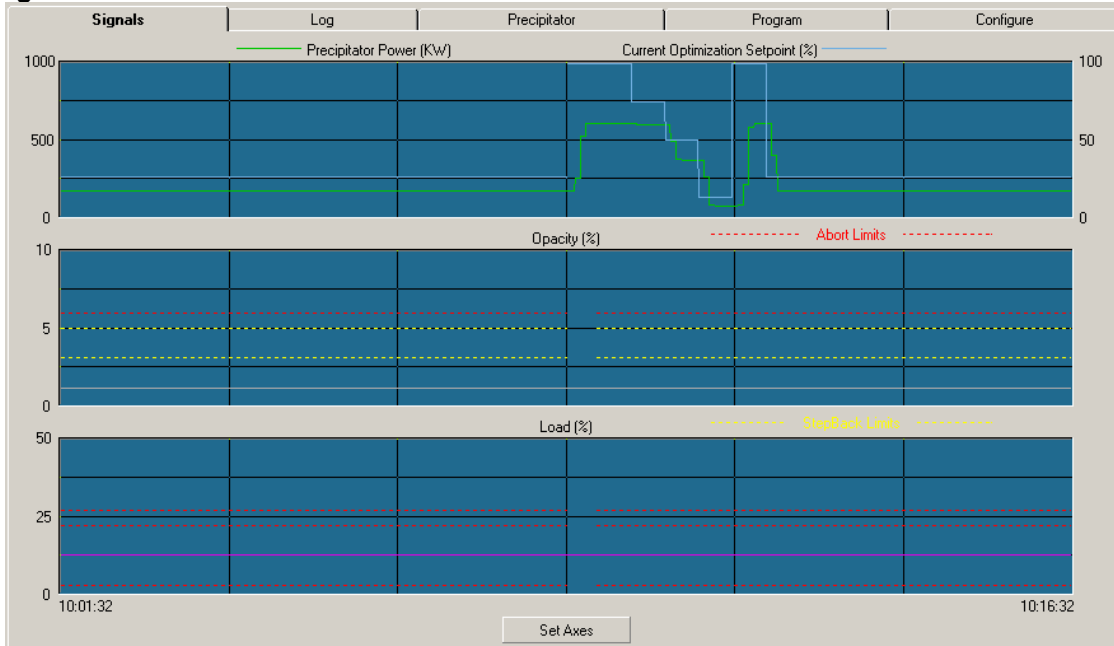
The **Program** drop list allows the user to select what optimization program to run.

The **Status** field contains information regarding the operation of optimization. Messages such as current step, optimization started, stopped, step back, step number, last step and aborted, among others, will be displayed here.

The **Time Left** displays the time that is remaining in the current program step.



Signals Tab



Signals Tab

The **Signals** tab displays a trend graph of precipitator power and the optimization set point on the upper graph, the opacity and its abort or step back values on the middle graph and load with its abort values on the lower. This view of the optimization window is dockable. A window is docked by dragging it to the left side or bottom edge of the screen. Limits that cause a program abort are shown in red on this graph. Limits that cause the program to step backwards are shown in yellow on this graph.

The **Set Axis** button allows the user to manually set the y-axis for each graph individually and to change the x-axis scale for the three graphs combined.



Log Tab

Signals	Log	Precipitator	Program	Configure
	Time	Performance Optimization Event		
	Feb 2, 2007 10:12:00 AM	PROGRAM1 Last Step		
	Feb 2, 2007 10:11:30 AM	PROGRAM1 Step 5		
	Feb 2, 2007 10:11:00 AM	PROGRAM1 Step 4		
	Feb 2, 2007 10:10:30 AM	PROGRAM1 Step 3		
	Feb 2, 2007 10:10:00 AM	PROGRAM1 Step 2		
	Feb 2, 2007 10:09:30 AM	PROGRAM1 Step 1		
	Feb 2, 2007 10:09:03 AM	PROGRAM1 Started		
	Feb 2, 2007 10:09:02 AM	PROGRAM1 ShutDown - Operator		
	Feb 2, 2007 09:11:30 AM	PROGRAM1 Last Step		
	Feb 2, 2007 09:11:00 AM	PROGRAM1 Step 5		
	Feb 2, 2007 09:10:30 AM	PROGRAM1 Step 4		
	Feb 2, 2007 09:10:00 AM	PROGRAM1 Step 3		
	Feb 2, 2007 09:09:30 AM	PROGRAM1 Step 2		
	Feb 2, 2007 09:09:00 AM	PROGRAM1 Step 1		
	Feb 2, 2007 09:08:59 AM	PROGRAM1 Started		
	Feb 2, 2007 09:08:48 AM	PROGRAM1 ShutDown - Operator		
	Feb 2, 2007 09:08:30 AM	PROGRAM1 Step 2		
	Feb 2, 2007 09:08:00 AM	PROGRAM1 Step 1		
	Feb 2, 2007 09:07:34 AM	PROGRAM1 Started		

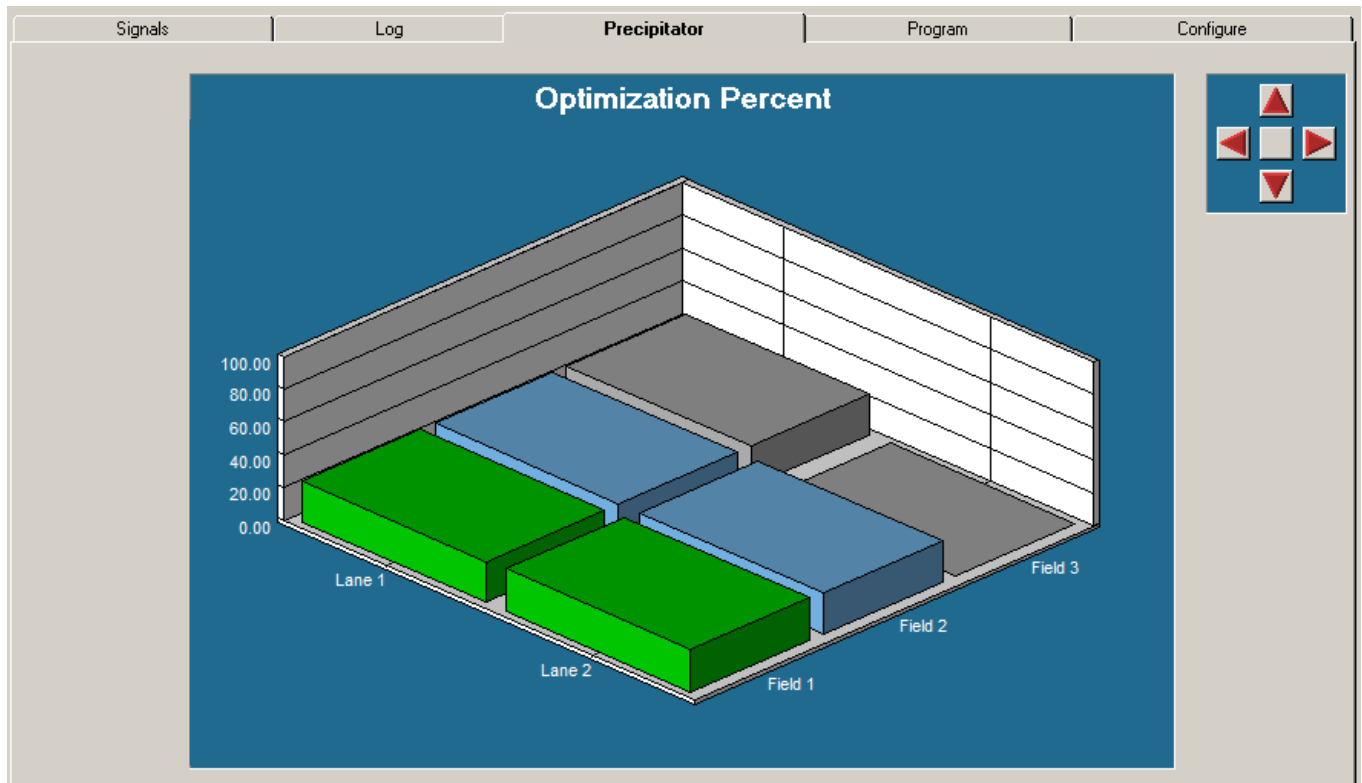
Fri Feb 2, 2007 Today

Optimization Log Tab

This tab contains a text log of the performance optimization actions that were taken. Historical action can be viewed by selecting the date to view on the lower right corner of the screen. Pressing the Today button exits the historical mode and displays live data.



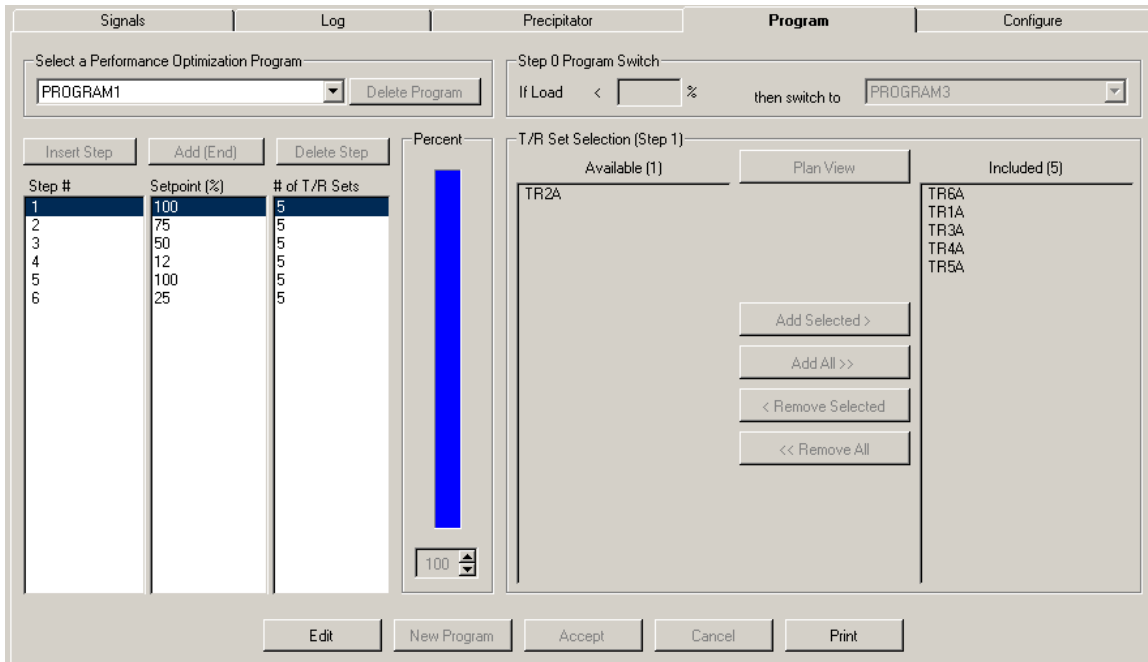
Precipitator Tab



Precipitator tab

The precipitator tab displays a 3D bar graph layout of the precipitator voltage controls showing each T/R set. The bars represent the current optimization percentage of each TR set. The ordering and positioning of the bars in the display are dependent on the lane and field information provided from the C:\VTS\POS\Points.mdb file. The graph can be rotated using the arrows on the upper right corner of the window.

Optimization Programming



Program tab

Creating a new optimization program or making adjustments to an existing program can be done in the Program tab. This functionality is password protected and users will need to log in before being able to load an existing optimization program or editing a program.

To create a new program press the **Edit** button and then the **New** program button. After pressing the New button the performance optimization wizard will open and walk the user step by step through the program creation.

To edit an existing program, select the program from the list at top left of the screen and press the **Edit** button.



This section of the screen lists the number of steps (in order of execution), the step back percentage, and the number of voltage controls in the step.

The **Insert Step** button will insert a step at the selected location.

The **Add** button will insert a new step at the end of the program.

The **Delete Step** will delete the selected step.

The step back percentage can be adjusted by selecting a step and then adjusting the **Percent** bar. The percent bar can be adjusted by clicking and dragging the bar, pressing the up and down arrows or typing a number in the numerical readout below the graph. The **Percentage Bar** represents a percentage of full secondary current for the TR Set.

Step #	Setpoint (%)	# of T/R Sets
1	100	5
2	75	5
3	50	5
4	12	5
5	100	5
6	25	5

This is where T/R sets can be added or removed from the step currently highlighted in the **Step Selection** box.

The **Available** list shows all TR sets for this precipitator that can be included on this step of the program. The **Included** box displays the unit names for the selected T/R sets in this particular optimization step.

In the **T/R Set Selection** box you can add or delete voltage controls used in this optimization step. There are two methods of adding controls. The first method is visually from the **Plan View** window. The other is by selecting T/R sets from the **Available** box.

T/R Set Selection Box



To add controls using the **Plan View** window press the **Plan View** button. The precipitator overview screen will appear. Click on the TR sets that you want included in this step.

To add controls by selecting from the **Available** box:

Select the control you would like to add from the **Available** box by highlighting it. Multiple controls can be selected by holding down the **Ctrl Key** on the keyboard while selecting or de-selecting an MVC. Then you can press the **Add Selected >** button. The MVC's you selected will now be displayed in the **In Step** box. Pressing the **Add All>>** button will add all the controls remaining in the **Available** box to the **In Step** box.

To remove a selected control from the step, highlight the control in the **In Step** box. Multiple controls can be selected by holding the **Ctrl Key** on the keyboard while selecting or de-selecting controls. When you press the **<Remove Selected** button the selected controls will be removed from the **In Step** box and added to the **Available** box. All controls can be removed from the **In Step** box to the **Available** box by pressing the **<<Remove All** button.

When you have finished editing a program, pressing the **Accept** button will automatically save the program.

The Performance Optimization module can be set to look at load when the program is on step 0 and determine the best program to run. This is configured in the **Step 0 Program Switch** area of the screen. This is configured by first setting up your series of optimization programs. Each

Program can then be configured to switch to another program while it is on step 0.

Step 0 Program Switch
If Load < % then switch to PROGRAM3

With each program having its own setting you would set up a circular loop so that it would stop based on the current load % of full value. For example, we could have three programs configured as follows:

Program 1 switches to program 2 if load is less than 75% full value.

Program 2 switches to program 3 if load is less than 50% full value.

Program 3 switches to program 4 if load is less than 25% full value.

Program 4 switches to program 1 if load is greater than 75% full value.

Optimization Configuration

Access to these properties is password protected and users may need to log in before being able to make any changes.

Signals	Log	Precipitator	Program	Configure
<input checked="" type="radio"/> Performance Optimization based on process load <input type="radio"/> Performance Optimization based on precipitator power		Total Load Change Abort (%) 15	Step Load Change Abort (%) 10	
		Minimum Power Stepback (KW) 	Minimum Power Abort (KW) 	
		Maximum Opacity Abort (%) 6	Abort Delay Time ▼	
		Maximum Step Opacity Stepback (%) 2	Maximum Total Opacity Stepback (%) 4	
		Step Time 0.5 minutes ▼	Accelerated StepTime ▼	
Total KW-hr 20468 Reset		KW-Hr Cost(\$/KW-Hr) 		
Lifetime Cost Savings(\$) 0 Reset				
<input type="button" value="Locked"/> <input type="button" value="Wizard"/> <input type="button" value="Accept"/> <input type="button" value="Cancel"/>				

Configure tab – Set Optimization Properties

To make changes to the limits and settings, you must first press the **Edit** button in the lower left-hand corner of the tab. There are two ways to set these values. You can use the wizard by pressing the **Wizard** button. The wizard will walk you through the setup step by step and explaining each step along the way. If you understand all the settings you could also enter them directly on this screen. When you are finished with your changes, pressing the **Accept** button will write them to the database file.

The optimization can run based on process load or precipitator power. Almost all plants run it based on process load. The plants that run optimization based on precipitator power typically select this option because they must maintain a specific power level in the precipitator to burn waste fuel. This option is selectable based on the radio buttons in the upper left portion of the screen.

The **Max Load Change** field sets the percentage change in load since the start of optimization that will cause optimization to abort and restart the program from the beginning. This parameter is checked continuously and will abort at any time while optimization is running. This parameter is only used when optimization is based on process load.

The **Max Step Load Change** field sets the percentage change in load since the start of the current optimization program step that will cause optimization to abort and restart the program from the beginning. This parameter is checked at the end of a step and will only abort at the end of a step. This parameter is only used when optimization is based on process load.

When the precipitator power levels fall below the number entered in the **Minimum Power (Stepback)** field, the optimization program will step back 1 step. This number is a percentage of the full-scale power. This parameter is only checked at the end of a step and is only used when optimization is based on precipitator power.

When the precipitator power levels fall below the number entered in the **Minimum Power (Abort)** field, the optimization program will abort back to full power. This number is a percentage of the full-scale power. This parameter is checked continuously and will abort at any time while optimization is running and is only used when optimization is based on precipitator power.

If the opacity level exceeds the number entered in the **Max Opacity** field, optimization will abort and all controls will return to full power. This parameter is continuously monitored and optimization will abort at any time during the program.

The **Abort Delay Time** sets the time delay for optimization abort commands. When a limit is exceeded, optimization will wait this time period, if the limit is still out of range after the time frame, then optimization will abort. This is useful to prevent optimization from aborting during brief opacity excursions, such as those caused by rapping.

If the precipitator opacity levels change by the number of percentage points entered in the **Max Step Opacity Change** field during a single step, then optimization program will step back 1 step. This parameter is only checked at the end of a step.

If the precipitator opacity levels change by the number of percentage points entered in the **Max Total Opacity Change** field since the start of optimization, then optimization program will step back 1 step. This parameter is only checked at the end of a step.

The **Step Time** field sets the length of time for each optimization program step. The values listed on this drop list are even multiples of the data log interval of POS.

The **Accelerated Step Time** field sets a multiplier that affects the step time. This new step time is used after optimization has been suspended. This step time will be used until optimization returns to the program step it was running before suspension or until optimization has to step back in the program a configurable number of times. This number defaults to three, but it can be configured in the config.ini file.

The **KW-HR Cost** is where the user enters the cost per kilowatt hour in dollars. This value is used to calculate the **Lifetime Cost Savings** in dollars which is displayed in the lower left of the screen. Just above this display is the **Total KW-Hr** display that shows the total power saved. Both of these values can be reset by pressing the **Reset** button next to them.



26. Start Up / Shut Down Module

Pressing the **Start Up / Shut Down** button on the precipitator menu will open the **Start Up Shut Down Program** window. The Start Up Shut Down module is used to set TR set operating levels based on analog and/or digital inputs to POS. A start up program will take TR sets from the 'Off' state to full power. A shut down program takes the TR sets from normal operating levels to the 'Off' state. The programs manipulate TR set operating levels by adjusting secondary voltage or SCR conduction angle.

Controlling Inputs:

Users can select analog and digital inputs to be used as the controlling parameters. Users have the option to use one or both types of inputs. The analog input selects which program step is active. The digital inputs can be used as an enable, abort and end signal. Digital inputs, if used, have priority over analog values.

Program:

The program will be a series of steps with one or more voltage controls set to a specific operating level on a step. The module advances through the steps based on the values of the analog inputs. If no conditions for any step are true then the module will maintain its current program step until the next condition becomes true. When the program reaches the final step or all controls are set to full power then the start up module will go to the 'off' state. When the program reaches the final step or all controls are set to off then the shut down module will go to the 'off' state.

Minimize Sparking / Minimize Opacity

Each step will have the option of minimizing sparks or minimizing opacity. Spark minimization will be handled by each MVC. When an MVC detects a spark it will adjust the secondary voltage operating level to avoid further sparks until the next program step is executed.

Note: Minimize sparking mode will not eliminate 100% of the sparks. When a spark occurs, the voltage control will attempt to prevent another spark from occurring.

To minimize opacity, POS will increase the voltage control operating levels by a user selectable percentage at a user selectable rate any time opacity is above a specific percentage. When opacity is below that percentage, the power levels remain steady. POS can not minimize opacity if the control is trying to minimize sparks. If POS has increased the power levels of the voltage controls to minimize opacity it will maintain those power levels when it advances to the next step if the new step is also set to minimize opacity and the new power level set points are greater than the prior set points but lower than the actual power levels. For example, step 1 sets the controls to 30% and the step is in minimize opacity mode. Because opacity had risen POS increased the controls to 36% power. Conditions go true for step number 2. Step number 2 is in minimize opacity mode and is configured to advance the controls to 35% power. Since both steps are in minimize opacity mode and step 2 was to raise power levels then POS will compare the actual set point to the new set point. POS will then maintain the actual 36% set point since it is greater than the new 35% set point.

Interaction with other modules:



When the start up / shut down module is running POS will not allow performance optimization, VI curves or SO3 optimization programs to run. If those modules are running when the start up / shut down mode is started, POS displays a message window that informs the user that these modules will be stopped. This window will give the users the option to continue start up / shut down or cancel. If the user tries to start those modules while in start up / shut down mode, POS will display a window informing the user that they can not run while in start up / shut down mode.



Control Box

Pressing the **Start** button begins selected program.

Pressing the **Stop** button turns off the selected program. When stopping a program prior to completion, users will have the option of leaving the controls at their current set points, going to full power or turning the controls off.

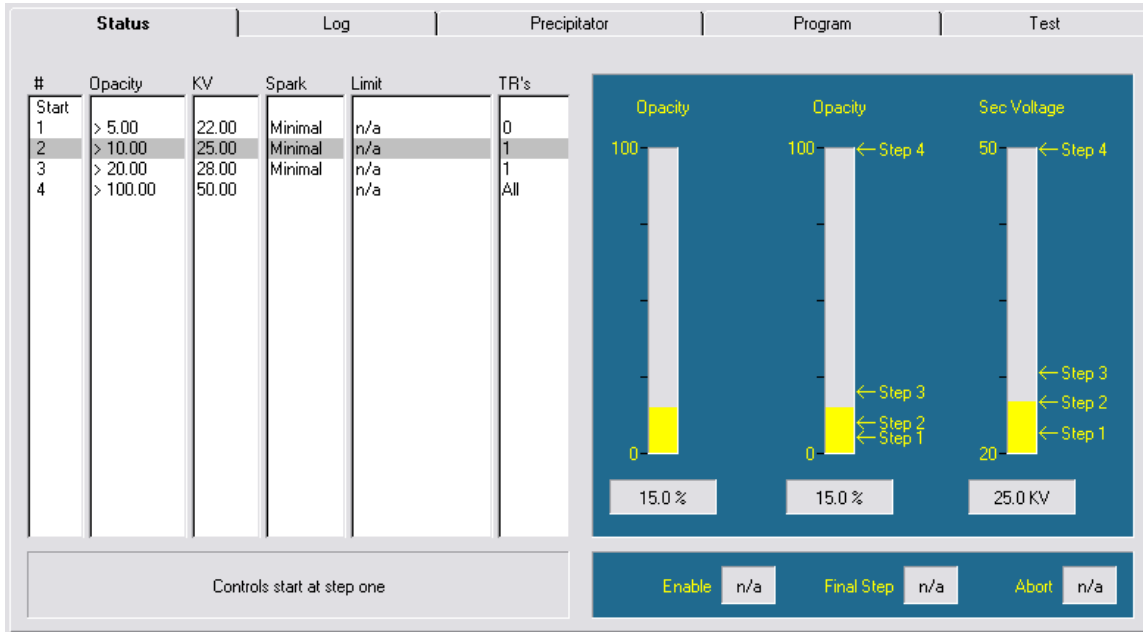
The **Type** box displays the type of program, start up or shut down, that you have selected in the drop list.

The **Step** display shows the current program step number.

The **Setpoint** display shows the current voltage control operating levels for the controls contained in the current step.



Status Tab



Status Tab

The status tab contains a display showing the step configuration of the currently selected program. The columns of this display contain, from left to right; the step number, analog input control value, voltage control set point, spark rate setting, opacity limit for that step and number of controls in step. If the program is running, then the step that is currently true will be highlighted.

The graphic portion of the displays contains bar graphs for the current opacity value, the analog input control value and the voltage control set point. Each step of the program is represented on the graph with an arrow and the step number.

The area below the bar graphs contains the status of the digital inputs for enable, final step and abort.



Log Tab

Status	Log	Precipitator	Program	Test
	Time	Start-up/Shutdown Event		
	Jun 10, 2003 04:24:36 PM	STARTUP2 Aborted (Controls turned Off)		
	Jun 10, 2003 02:27:51 PM	STARTUP2 Step 2(Up) Setpoint: 25 KV		
	Jun 10, 2003 02:27:30 PM	STARTUP2 Step 1(Up) Setpoint: 22 KV		
	Jun 10, 2003 02:27:30 PM	STARTUP2 Started		
	Jun 10, 2003 02:26:44 PM	STARTUP2 Completed		
	Jun 10, 2003 02:26:44 PM	STARTUP2 Step 3(Up) Setpoint: 28 KV		
	Jun 10, 2003 02:26:44 PM	STARTUP2 Step 2(Up) Setpoint: 25 KV		
	Jun 10, 2003 02:26:44 PM	STARTUP2 Step 1(Up) Setpoint: 22 KV		
	Jun 10, 2003 02:26:28 PM	STARTUP2 Started		

Log Tab

Fri Feb 2, 2007 Today

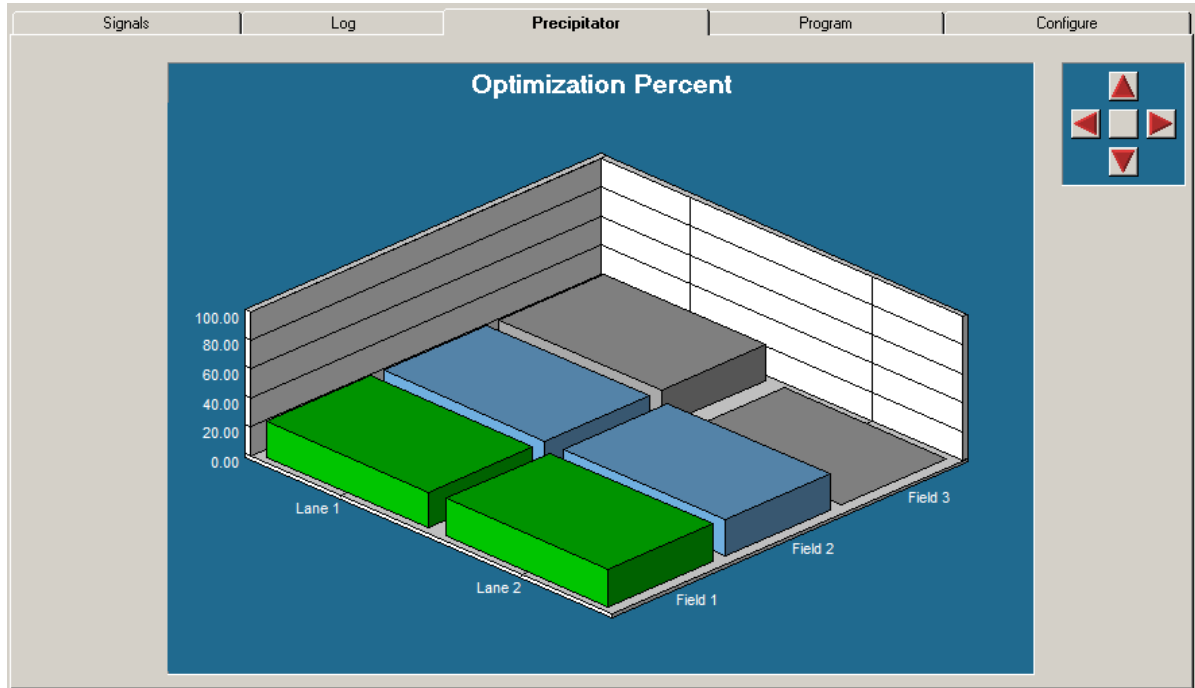
Start Up Shut Down Module actions are displayed on the log tab. When you first open this window, data is displayed for the current day. If the data has a blue background then it is *live* data. Data on the yellow/green background is historical.

You can navigate the historical data with the scrollbar, the scrollbar arrow buttons, or the time selection box in the lower right area of the window. Up-arrow buttons point backwards in time.

The scrollbar itself is used to navigate within the current day. The single-arrow scrollbar buttons change the time by one day; the double-arrow buttons change it by a week. To use the time selection box, highlight the month, date, year, or time, and then make the adjustment with the arrow keys. Press the **Today** button to return to the present time.



Precipitator Tab



Precipitator tab

The precipitator tab displays a 3D bar graph layout of the precipitator voltage controls showing each T/R set. The bars represent the current operating level of each TR set based on the percent of the secondary current limit. The ordering and positioning of the bars in the display are dependent on the lane and field information provided from the C:\VTS\POS\Points.mdb file. The graph can be rotated using the arrows on the upper right corner of the window.



Program Tab

#	Opacity	KV	Spark	Limit	TR's
1					6
2	< 41.00	29.00	Minimal	n/a	6
3	< 25.00	68.00		n/a	All

Program Tab

The program tab is where start up and shut down programs are created and edited.

The **Select Program** area is where users can choose which program to edit via the drop list. Click the **New** button to create a new program. POS will walk you through creating a new program use the programming wizard. The **Program Type** radio buttons are used to select the program type as either start up or shut down.

The **MVC Control** area is where users select the voltage control parameter to adjust during the start up or shut down program. The options are secondary voltage and conduction angle.

The **Analog Control** area is where users select the analog value to control the advancement through the start up or shut down program. The drop list contains all of the analog inputs configured within the POS application. The Precipitator Opacity and Precipitator Load items on the drop list are the values used within the POS precipitator point. These values are used within POS for other load and opacity controlled functions. The other load and opacity items on the drop list are the raw analog values coming into POS. The **Increase** and **Decrease** radio buttons configure the start up shut down program to look for an analog value that is going up or going down. The **Deadband** entry is used to create a range around the analog value in which the program will not move forward or backwards through the program. This will prevent the program from bouncing into and out of a step because of small fluctuations in the analog value.

The **Digital Control** area is where users can configure digital inputs for use in the start up shut down programs. The inputs can be used with or with out an analog value. If they are used with an analog value then the digital inputs will take higher priority. The **Enable** input allows the

program to begin advancing through the steps. The **Abort** input is used to abort the start up or shut down process. The **Final Step** input will cause the program to advance to the last step and then terminate.

The step edit section is where the actual steps of a program are created and edited. Pressing the insert step button will add new steps to the program. The initial parameters used will be the halfway point between the step prior to and after the step just entered. For example, if the prior step has a value of 10 and the following step has a value of 20. Then the new step would have a value of 15 for that parameter. During a start up program, if step one does not contain any voltage controls, then all controls will remain off until step 2 becomes true. If step 1 does contain voltage controls then those controls will turn on immediately upon the start of a start up program. To change the parameters of step, highlight the step and press the step edit button.



Test Tab

The screenshot shows the 'Test' tab interface. At the top, there are tabs for 'Status', 'Log', 'Precipitator', 'Program', and 'Test'. The 'Test' tab is active. On the left, there is a 'Select Program' section with a dropdown menu showing 'STARTUP2', 'Start' and 'Abort' buttons, and a 'Start-up' button. Below this is the 'Input Simulation' section with a 'Load' input field containing '25', and checkboxes for 'Enable Input' (checked), 'Final Step Input', and 'Abort Input'. The main area is a table titled 'Steps' with columns: '#', 'Load', 'KV', 'Spark', 'Limit', and 'TR's'. The table has 5 rows: 'Start', '1', '2', '3', and '4'. Row 1 is highlighted. To the right of the table is a section titled 'Simulated TR Sets Step 1' with an empty box.

#	Load	KV	Spark	Limit	TR's
Start					
1	< 500.00	22.00	Minimal	n/a	0
2	< 10.00	25.00	Minimal	n/a	1
3	< 20.00	28.00	Minimal	n/a	1
4	< 0.00	50.00		n/a	All

Test Tab

The **Test** tab is used to test your start up program without effecting your actual precipitator operation.

In the **Select Program** area of the screen users can pick which program to test from the drop list. The **Start** button begins the testing of the program. The **Abort** button stops the testing of the program.

The **Steps** area displays the currently selected program. The columns of this display contain, from left to right; the step number, analog input control value, voltage control set point, spark rate setting, opacity limit for that step and number of controls in step. The step that is currently true will be highlighted. The **Simulated TR Sets** section shows a listing of the TR set names that will be adjusted on the active program step.

The **Input Simulation** section is where the values are entered to simulate the program. Both analog and digital values can be entered here.

27. POS Data Logging

POS collects data from many different sources. One type of data log file contains all the operating data for each individual Voltage Control. There is a separate file created for each control on each day. The filenames begin with the control name and a dash (-) character, followed by the year, a two-digit month code and then a two-digit day code. For example, the data in the file

A5-20020417.DAT would be for voltage control A5 on April 17, 2002. Another important data log contains all the precipitator data including the analog load and opacity signals along with optimization parameters and average electrical readings from the precipitator. There is a separate file created each day for each precipitator on the system. The filenames begin with the precipitator name and a dash (-) character, followed by the year, a two-digit month code and then a two-digit day code. For example, the data in the file PRECIPB1-20020417.DAT would be for precipitator B on April 17, 2002.

Data is also logged for each SmartSense, MicroRap Rapper Controller, soot blower, and flue gas conditioning unit connected to the POS system. Like the voltage controls and precipitator log files, a file is created every for each module attached to POS beginning with the unit name and a dash (-) character, followed by the year, a two digit month and then a two digit day code.

All of the data logs also has a matching “.LOG” file. This file contains the time and date information the POS uses internally to get historical data.

Data File Locations and Maintenance

Since there is one file generated each day for each voltage control, precipitator, and any other module on the system, regular maintenance is required to prevent the possibility of filling up the computers hard disk drive. There will be a different directory for each month of data that stores the *.DAT files. The files are stored in the C:\VTS\POS\LOG\year-month# directory. If you require extended historical data, we recommend you back these files up using the **POS Back-Up Utility**. The files can then be transferred to a removable media such as a tape drive or CD Burner.

Viewing Data

Data that has been logged by POS can be displayed in two different ways.

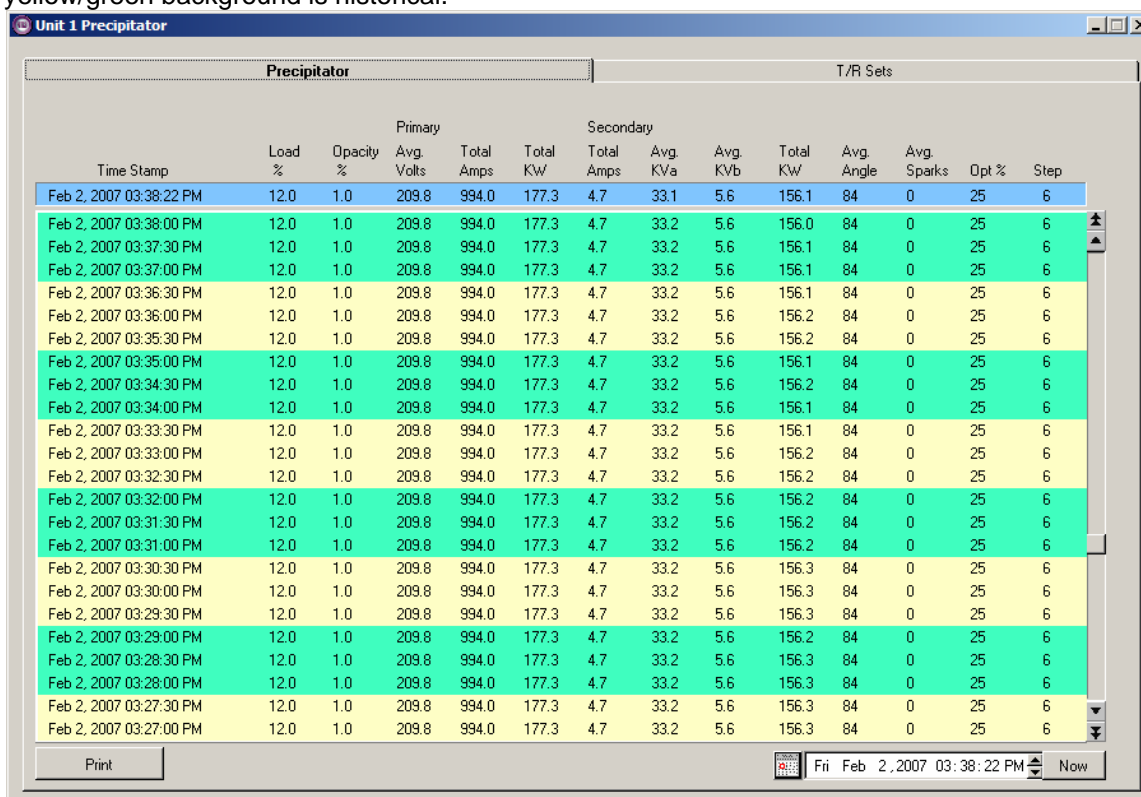
- 1) Live and historical data for precipitators (and voltage controls in the current precipitator) can be viewed using the **Precipitator Log**.
- 2) Data can be used to generate custom reports that can be saved, printed, displayed on-screen or even emailed using the **Report Generator**.

Data Log Screens

Pressing the **Data Log** menu item on the precipitator or TR set menu opens the **Data Log** window. This window has two tabs that display current and historical data POS has logged for the precipitator: live and historical **Precipitator** data and electrical averages and live and historical data for individual **TR Sets**.

Precipitator Data Screen

Precipitator data is displayed on the first tab. When you first open this tab, data is displayed for the current day. The top line of the tabulation (blue background) is *live* data. Data on the yellow/green background is historical.



Time Stamp	Load %	Opacity %	Primary			Secondary			Total KW	Avg. Angle	Avg. Sparks	Opt %	Step
			Avg. Volts	Total Amps	Total KW	Total Amps	Avg. KV/a	Avg. KV/b					
Feb 2, 2007 03:38:22 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.1	5.6	156.1	84	0	25	6
Feb 2, 2007 03:38:00 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.0	84	0	25	6
Feb 2, 2007 03:37:30 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.1	84	0	25	6
Feb 2, 2007 03:37:00 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.1	84	0	25	6
Feb 2, 2007 03:36:30 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.1	84	0	25	6
Feb 2, 2007 03:36:00 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.2	84	0	25	6
Feb 2, 2007 03:35:30 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.2	84	0	25	6
Feb 2, 2007 03:35:00 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.1	84	0	25	6
Feb 2, 2007 03:34:30 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.2	84	0	25	6
Feb 2, 2007 03:34:00 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.1	84	0	25	6
Feb 2, 2007 03:33:30 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.1	84	0	25	6
Feb 2, 2007 03:33:00 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.2	84	0	25	6
Feb 2, 2007 03:32:30 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.2	84	0	25	6
Feb 2, 2007 03:32:00 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.2	84	0	25	6
Feb 2, 2007 03:31:30 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.2	84	0	25	6
Feb 2, 2007 03:31:00 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.2	84	0	25	6
Feb 2, 2007 03:30:30 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.3	84	0	25	6
Feb 2, 2007 03:30:00 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.3	84	0	25	6
Feb 2, 2007 03:29:30 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.3	84	0	25	6
Feb 2, 2007 03:29:00 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.2	84	0	25	6
Feb 2, 2007 03:28:30 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.3	84	0	25	6
Feb 2, 2007 03:28:00 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.3	84	0	25	6
Feb 2, 2007 03:27:30 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.3	84	0	25	6
Feb 2, 2007 03:27:00 PM	12.0	1.0	209.8	994.0	177.3	4.7	33.2	5.6	156.3	84	0	25	6

Data log Window - Precipitator Tab

You can navigate the historical data with the scrollbar, the scrollbar arrow buttons, or the time selection box in the lower right area of the window. Up-arrow buttons point backwards in time.

The scrollbar itself is used to navigate within the current day. The single-arrow scrollbar buttons change the time by one day; the double-arrow buttons change it by a week. To use the time selection box, highlight the month, date, year, or time, and then make the adjustment with the arrow keys. Press the **Now** button to return to the present time. Press the **Print** button to open a print preview of the on-screen data. Pressing the **Print Page** button will print one page. Pressing the **Print All** button will print all historical data. Note: Historical data may span up to 80 pages!!



MVC Data Screen

Select the **MVCs** tab to view live or historical data for each TR Set in the precipitator.

The screenshot shows a software window titled "Unit 1 Precipitator". It displays a table of data for five TR Sets (TR2A, TR1A, TR3A, TR4A, TR5A). The table is organized into columns for Primary and Secondary parameters, along with other operational metrics. The data is as follows:

T/R Set	Primary			Secondary			Sparks	Mode	IE Ratio	Angle	Dpt %	Status	
	Amps	Volts	KW	mAmps	KVa	KVb							
TR2A	194.0	210.0	34.6	900.0	33.1	0.0	29.9	0.0	1.0	0.00	84	25	Running
TR1A	24.0	209.0	4.3	220.0	33.4	33.4	6.8	0.0	1.0	0.00	84	25	Running
TR3A	194.0	210.0	34.6	900.0	33.1	0.0	29.9	0.0	1.0	0.00	84	25	Running
TR4A	194.0	210.0	34.6	900.0	33.1	0.0	29.9	0.0	1.0	0.00	84	25	Running
TR5A	194.0	210.0	34.6	900.0	33.1	0.0	29.8	0.0	1.0	0.00	84	25	Running

Additional information from the screenshot: The window title is "Unit 1 Precipitator". The main display area shows "Precipitator" and "T/R Sets" tabs. The date and time are "Feb 2, 2007 03:43:01 PM". The load is "12.0 %" and opacity is "1.0 %". At the bottom, there are buttons for "Print" and "Trip Log Report", and a status bar showing "Fri Feb 2, 2007 03:43:01 PM" and a "Live" button.

MVCs Tab

Each row of this table represents data for one TR set. The TR sets are listed in the first column. By default this tab opens to show *live* data. The scrollbar itself is used to navigate within the current day. The single-arrow scrollbar buttons change the time by one day; the double-arrow buttons change it by a week. To use the time selection box, highlight the month, date, year, or time, and then make the adjustment with the arrow keys. Press the **Live** button to return to the present time. Press the **Print** button to open a print preview of the on-screen data. Pressing the **Print Page** button will print one page. Pressing the **Print All** button will print all historical data. Note: One days worth of data may span up to 80 pages!!

The Trip Log Report is accessed by selecting a TR while viewing historical data and pressing the **Trip Log Report** button. This report will let the users know how many times the control has tripped that day.



28. TR Set-Up

The **TR Set-Up** module displays the configuration parameters for each MVC in the precipitator. This module is accessed by clicking on the TR setup item on the TR set menu. The names of the T/R Sets appear across the top of the tab.

T/R Set Name	TR2A	TR1A	TR3A	TR4A	TR5A
Communication #	2	2	2	2	2
Primary					
Size code	5	0	5	5	5
Current limit	456	70	456	456	456
Over voltage	476	480	476	476	476
Under voltage	64	80	64	64	64
Secondary					
Size code	5	1	5	5	5
Current limit	3400	850	3400	3400	3400
Current rapping limit	0	540	0	0	0
KV limit	51.2	62	51.2	51.2	51.2
KVa under voltage limit					
KVb under voltage limit					
Spark					
SPM setpoint	80	80	80	80	80
Post spark setpoint	5	20	5	5	5
Response mode	1	1	1	1	1
Other					
Angle limit	170	170	170	170	170
Back corona control	0	0	0	0	0
IE Ratio setpoint	1.00(0.00)	1.00(0.00)	1.00(0.00)	1.00(0.00)	1.00(0.00)
Handswitch position	Remote	Remote	Remote	Remote	Remote
Automax control					
Logic firmware	2.8a2	2.8a2	2.8a2	2.8a2	2.8a2

Display Saved Data

Value changed from Default | Save as Default | Print | Trend | Mon Feb 5, 2007 04:09:46 PM | Live

Limits and Setpoint Tab

Both the **Limits and Setpoints** and the **Configuration and Calibration** tabs can be used to quickly view any changes in **MVC** set points and limits. Use the **Display Saved Data** check box to toggle between the **Saved Data** reference configuration and the current **Live Data**. Not all parameters are available in each TR control. Refer to the voltage control manual for descriptions of each parameter.

Configurations can be saved for reference. If POS detects any parameter on any T/R Set is changed to a value different than the saved configuration, the parameter will be outlined in red. To update the saved configuration with the current configuration press the **Save as Default** button.

The **Trend** button allows the user to trend the TR controls settings for the controls that have the parameter logging function enabled. Parameter logging is enabled and disabled in the TR set properties, described elsewhere in this manual. Logged historical data can be viewed using the date selection on the lower right corner of the screen.



Press the **Print** button to open a **Print Preview** of the on-screen data. Pressing the **Print Page** button will print one page. Pressing the **Print All** button will print all pages of the current configuration data.



29. Report Generation

Clicking the **Reporting** item on the precipitator or TR set menus will open the **POS Report Wizard**. This module can be used to create custom reports using data logged by POS. Reports can be customized in terms of length of report, data interval, specific data sources included in the report, how the report is displayed, and how the report is triggered.

Report Name	Start Time	Duration	Output Type	Size	Email	
Iclient test report	Manual	0 days 01:00	Screen Display	2 Pages	No	Run Now

Select a report by left-clicking it's name and choose an option

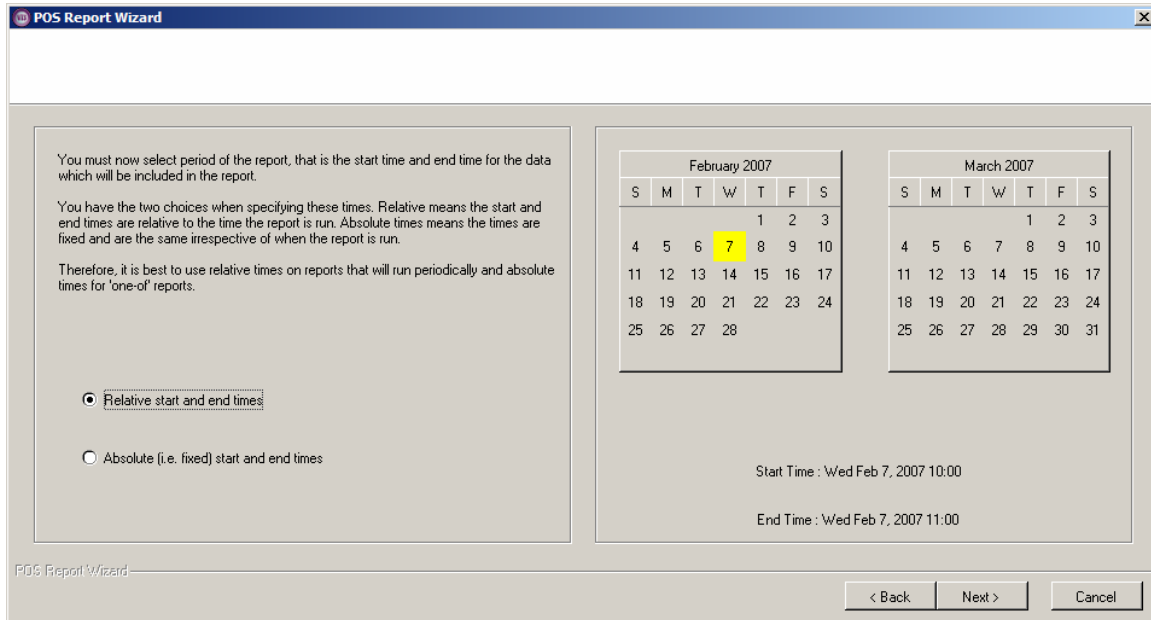
Create a new report Modify selected report Copy selected report Delete selected Report

< Back Next > Cancel

Initial Reporting Wizard Window

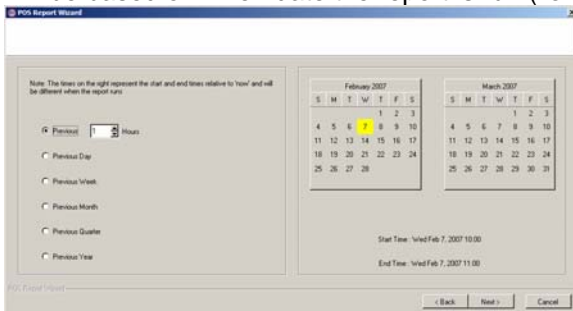
The initial reporting window is used to managing and run existing reports and to create new reports. To run an existing report press the **Run Now** button to the right of the report line. To delete an existing report, first click on the reports line to select it and then click on the **Delete selected Report** button. To modify an existing report, select the report and then click on the **Modify selected report** button.

To create a new blank report, click the **Create a new report** button. To create a new report using an existing report as a starting point, first select the report in the report list then press the **Copy selected report** button.

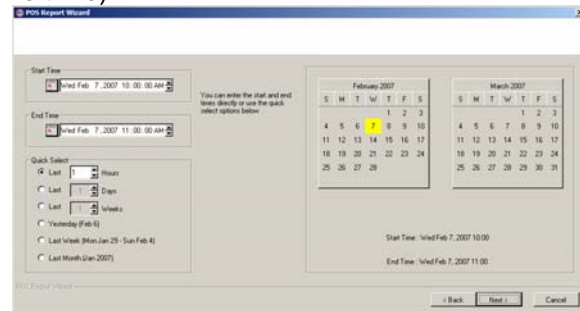


Report Generator Wizard – Absolute / Relative times selection

The first item to select when creating or modifying a report is to choose whether the report will use the same date range each time the report is run (**absolute time**) or if the dates used in the report will be based on when date the report is run (**relative time**).



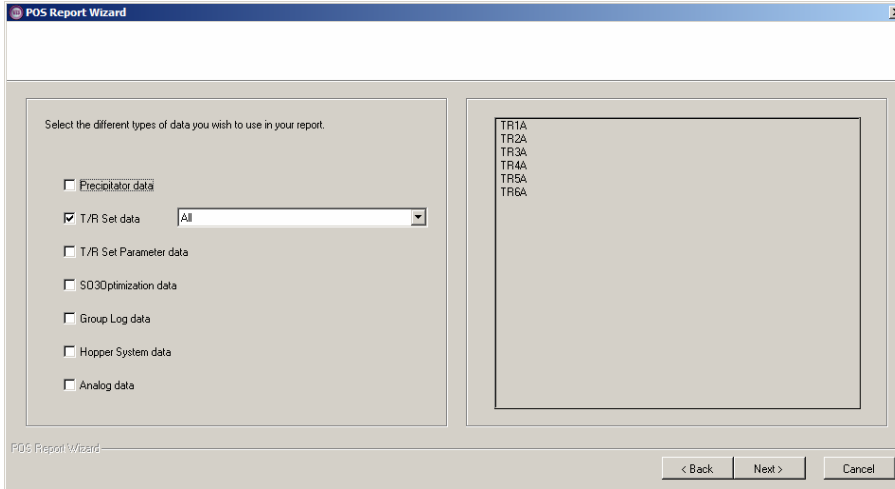
Report Generator Wizard – Relative times selection



Report Generator Wizard – Absolute time selection

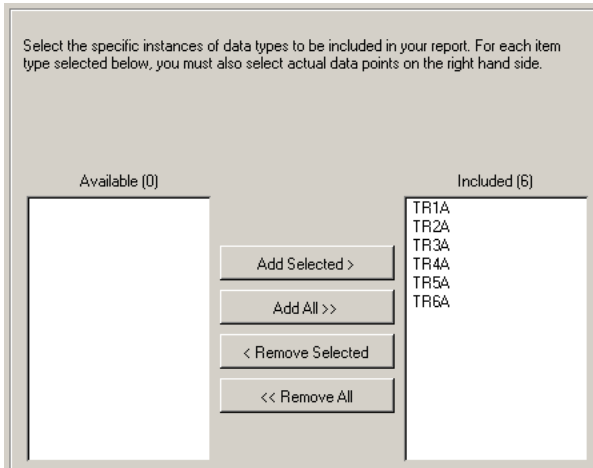
The next screen layout varies based on the selection of relative time or absolute time in the prior screen. They both are time selection screens. For relative time select the time frame you would like the report to be generated. The selections are previous n hours, previous day, week, month, quarter or year.

Since the user has to select a specific date range the absolute time screen is a little more complex. The quick select options on this screen are just that, a quick method to select a time range. The user can keep the quick select time or after selecting it he can then refine it using the start and end time selections.



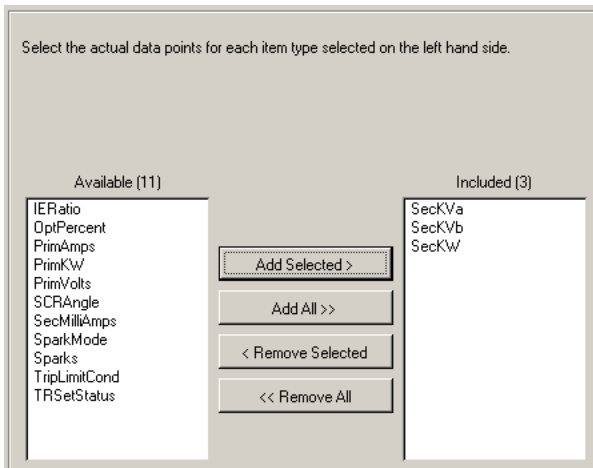
Report Generator Wizard - Data Source

The **Data Source** screen is where you select what data goes into the report. You can select data logged from MVCs, Precipitators, or other components such as the hopper system or SO3 Optimization. Put a check in all the data sources that you would like to be available in your report.



The next screen you first select the individual devices from each of the prior selected data sources that you want included in the report. For example, on the data sources screen you selected TR sets. On this screen you select which of the TR sets you want in the report.

In the **Available** list highlight the items you would like add to the report. Multiple items can be selected by holding down the **Ctrl Key** on the keyboard while selecting or de-selecting. Press the **Add Selected** button. The items you selected will now be displayed in the **In Report** box. Pressing the **Add All** button will add all the items remaining in the **Available** box to the **In Report** box.



Also on this screen you select the desired parameters from each of the prior selected devices that you want included in the report.

In the **Available** list highlight the items you would like add to the report. Multiple items can be selected by holding down the **Ctrl Key** on the keyboard while selecting or de-selecting. Press the **Add Selected** button. The items you selected will now be displayed in the **In Report** box. Pressing the **Add All** button will add all the items remaining in the **Available** box to the **In Report** box.



To remove selected items from the above selections, highlight the items in the **Included** box. Multiple items can be selected by holding the **Ctrl Key** on the keyboard while selecting or de-selecting items. Press the **Remove Selected** button. The selected items will be removed from the **In Report** box and added to the **Available** box. All items can be removed from the **In Report** box by pressing the **Remove All** button.

POS Report Wizard

You must now select how the raw data will be used to generate the individual lines in your report.

You may use the raw data as individual records at a specified interval. You may also average the raw data over a specified period of time or average the data for an entire day.

Use Raw Data at Min. Intervals

Use Min. Moving Average

Use Average of an Entire Days Data

You may select to have all data for a given time appear on one line or data will be grouped by tag types resulting in multiple lines for a given time

Output single line per data point

Given your selection for data type and the start and end times entered previously, your report will contain:

72 lines (i.e. 2 Pages)

Given your selection, your report will contain : 5 Columns

POS Report Wizard

< Back Next > Cancel

Report Generator Wizard - Data Handling

Use the radio buttons to select the type of data:

Select **Use Raw Data at** and use the up and down arrows to set the interval time. The report will display the actual recorded data for the time intervals.

Select **Use *n* Min. Moving Average** and use the up and down arrows to set the number of minutes. The report will display data that has been averaged over the chosen interval.

Select **Average of an Entire Days Data** and the report will display data that has been averaged over a 24-hour period. This is useful for looking at data over a long period of time.

The **Output single line per data point** is used to format the report as one line of data for a given time instance (box checked) or multiple lines per time grouped by device (box not checked). Generating one line of data is useful when generating CSV files for import into other applications.

This screen also gives an estimate of the number of pages the report will produce and the number of columns required given your chosen format.



You can select this report to run periodically as specified below. You can also trigger this report on a false to true transition of a field input signal.

If you specify a manual trigger only, the report can only be run via this wizard.

Manual Trigger Only

Daily at : 12:00:00 AM

Weekly at : 12:00:00 AM On Mon

Monthly at : 12:00:00 AM On 1

By digital input : OpacCall

By analog input : Load < [] %

Report Generator Wizard – Trigger Selection

The next window lets users set the trigger to use for report generation.

Use the radio buttons to select the trigger method:

Select **Manual Trigger Only** to only have the report run when the **Run Now** button is pressed on the page of the report generator function.

Select **Daily at:** and enter a time. The report will run every day at the set time.

Select **Weekly at:** and set a day and time. The report will run every week at the selected time on the selected day.

Select **Monthly at:** and use the up/down arrows to select a day. The report will run every month on the selected day at the set time.

Select **By Digital Input:** and select a digital input from the dropdown list. The report will run when the digital input is toggled.

Select **By Analog Input:** and select a analog input from the dropdown list. The report will run when the analog input is greater than or less than the value specified.



Report Generator Wizard – Output Selection

The next report wizard screen configures the type of output for the report. There are many options with each described below.

Screen Display will display the report on the screen without saving it as a file. This is useful for previewing reports before they are printed or saved.

Default Printer outputs the report generated to be printed on the windows default printer.

Printer outputs the report generated to be printed on the windows printer chosen by pressing the **Select Printer** button.

Text File outputs the generated the report to an ASCII text format file. These files are saved in the output directory specified in the above right field and can be easily opened, viewed, and printed outside of POS at a later time. The filename will follow this format:
(reportname)(yyyymmdd datestamp).txt EXAMPLE: *Precip_Data20020710.txt*

CSV File outputs the generated the report to an CSV (Comma Separated Values) format. These files are saved in the output directory specified in the above right field and are usually opened in spreadsheet applications for graphing or further analysis. The filename will follow this format:
(reportname)(yyyymmdd datestamp).csv EXAMPLE: *Precip_Data20020710.csv*

Direct to Excel opens an instance of Microsoft Excel and outputs the data directly to this application.



Check the **Email to:** checkbox and enter an email address to have POS email the report to when it is run. The **Report Generator** will email the report when this checkbox is selected and send it to the other selected print or file output format. Multiple email addresses can be specified if they are separated by a semicolon “;”. The E-mail server is configured in the precipitator alarm set up screen.

The screenshot shows the 'POS Report Wizard' window. It contains a table with the following data:

Report Name	Start Time	Duration	Output Type	Size	Email
lclient test report	Manual	0 days 01:00	CSV File	2 Pages	No

Below the table, there is a message: "Changes must be saved before running your report". Below this message is a button labeled "Save Changes". At the bottom of the window, there are three buttons: "< Back", "Next >", and "Cancel".

Report Generator Wizard – Save Report

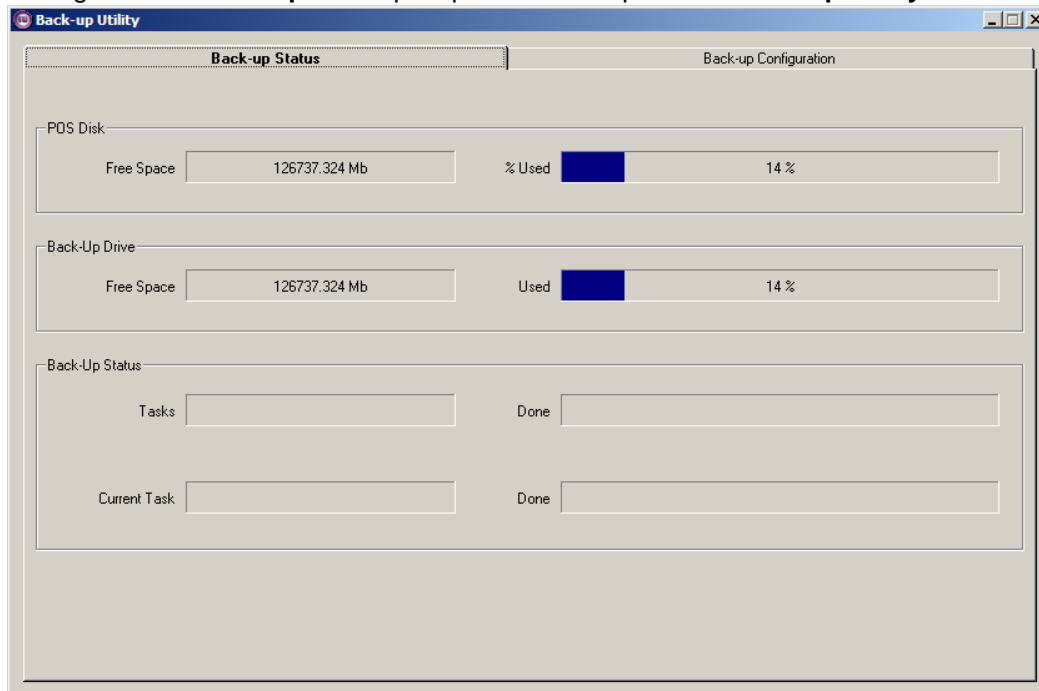
The final report generator screen displays a summary of the report just configured and the existing reports that have already been configured and saved. Pressing the **Save Changes** button saves the just configured report in the system. After pressing the **Save Changes** button you will go to the first page of the report generator where you can begin creating or modifying another report or run an existing report.



30. Back-Up Utility

As described in **POS Data Logging**, POS logs data in .DAT files. Each day a file is created for every MVC, MicroRap, Precipitator, and other modules in POS. While the files are relatively small, they add up to a large amount of data over time. The **Back-Up** utility can be used to remove files from the POS data log directory and store them elsewhere as a CSV file or to delete the files without storing them elsewhere. The location you want the files backed up to must be accessible with a standard path statement such as c:\data backup\.

Selecting the **Data BackUp** on the precipitator menu opens the **Back-Up Utility** window.



Back-Up Utility Window – Back-Up Status Tab

Back-Up Status Tab

The **Back-Up Status** tab displays an overview of the back-up utility.

The **POS Disk** box displays the **Free Space** remaining on the hard drive on which POS is installed and what percentage of that disk is used.

The **Back-Up Drive** box displays the **Free Space** remaining on the drive where the selected back-up directory is located and what percentage of the drive is full.

When a back-up is in process, the **Back-Up Status** box displays the tasks remaining in the percentage of the total tasks completed. It also displays the current task and the percentage completed.



Back-Up Configuration Tab

The screenshot shows the 'Back-up Utility' window with the 'Back-up Configuration' tab selected. The window is divided into several sections:

- Back-up Configuration:**
 - Enable Automatic Clean-up/Back-Up of POS history files
 - Delete/back-up files daily > 10 days old
 - Delete/back-up files monthly > 2 months old
 - Time of Back-Up: 1 Day of the Month at 12:00:00 AM
 - Back-Up Drive\Directory: c:\WTS\POS7\LOG\back-up\
 - Estimated Space (Mb): 54.6
 - Alarm Configuration: Critical
 - POS drive at: 25 %
 - Back-Up drive at: 37 %
- Actions of Scheduled Back-Up:**
 - Delete T/R Set data without a CSV conversion
 - Delete T/R Set Parameter data without a CSV conversion
 - Delete Precipitator data without a CSV conversion
 - Delete Analog Tag data without a CSV conversion
 - Delete Group Log data without a CSV conversion
 - Delete SO3 Optimization without a CSV conversion
 - Delete Hopper Data without a CSV conversion
 - Delete Ash Collection data without a CSV conversion
- CSV File Format:**
 - Time Format: 2 11:16:01
 - Date Format: 2 02/22/07

Buttons at the bottom: Edit, Wizard, Accept, Cancel.

Back-Up Configuration Tab

The **Back-Up Configuration** tab allows you to configure when backups should occur and what should happen during the backup. To make changes to the configuration press the **Edit** button. When you are finished, press the **Accept** button to save changes or the **Cancel** button to exit without saving. The **Database Status** box displays messages concerning database interaction. Pressing the **Wizard** button walks you step by step through the configuration of the backup utility.

Check the **Enable Back-Up** check box to enable the back-up utility to run when scheduled.

Select the **Back-Up Files daily more than XX days old** option and set the number of days using the up and down arrows. Use the up and down arrows to select a time of day. This will make the Back-Up Utility run at the specified time every day and act on files that are older than the specified number of days.

Select the **Back-Up Files more than XX months old** option and set the number of months using the up and down arrows. Use that up and down arrows to select the **Day of the Month** and time of day. This will make the Back-Up utility run once a month on the specified time/day and act on files that are older than the specified number of months.

The **Estimated Space (Mb)** is an estimate of the amount of space necessary for the backup.

The **Back-Up Drive\Directory** shows the path of the back-up directory specified on the **Data Directory Configuration** tab. The user can enter the text into the edit field or press the **Browse** button to select the directory.

Alarm Configuration

The **Back-Up Utility** writes an event in the Alarm Log every time a back-up is made. It can also send a message when the POS drive or the Backup Drive is getting too full.

Use the up and down arrows to set the percentage full limit for the **POS Disk**

Use the drop down list to set the priority of the alarm:

Select **Disabled** to disable alarms. The **Back-Up Utility** will not send any messages to the alarm log if alarms are disabled.

Select **Event** to have any changes cause an event to be logged in the alarm log.

Select **Pop Up** to have any change cause POS to create a low priority alarm and a pop-up window for the alarm message.

Select **Medium** to have any change cause POS to create a medium priority alarm.

Select **High** to have any change cause POS to create a high priority alarm.

Actions for Scheduled Back-Up

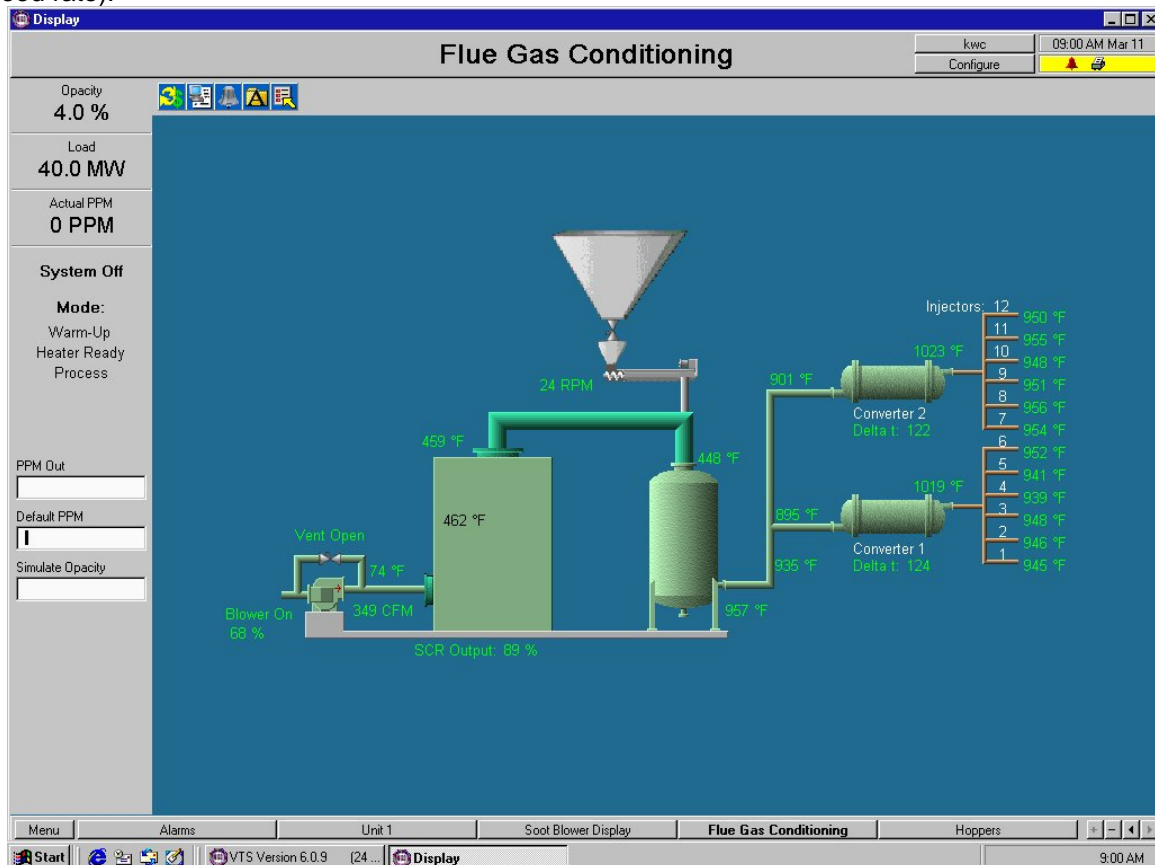
Use the checkboxes to select what actions will occur during a scheduled back-up.

Select the **Delete ... Data without a CSV conversion** checkbox to have POS delete the files from the POS\LOG directory. This option does not back up the data, it only deletes the files.



31. Flue Gas Conditioning

The **Flue Gas Conditioning Display** shows a graphic layout of a SO₃ system. The different parts of the system are displayed and laid out to look like your plants system. Many pieces of the system are labeled with a value corresponding to that parts current *live* status (i.e. temperature or feed rate).



Flue Gas Conditioning Screen

Current **Opacity** is displayed on this screen. Pressing this button will display a **Trending** window

Current **Load** is displayed on this screen. Pressing this button will display a **Trending** window.

The **Actual PPM** of Sulfur being fed into the system is displayed on this screen. Pressing this button will display a **Trending** window.

The status of the system is shown below the **Actual PPM**. The system can be turned on or off from the **System Control Window**.



Functionality

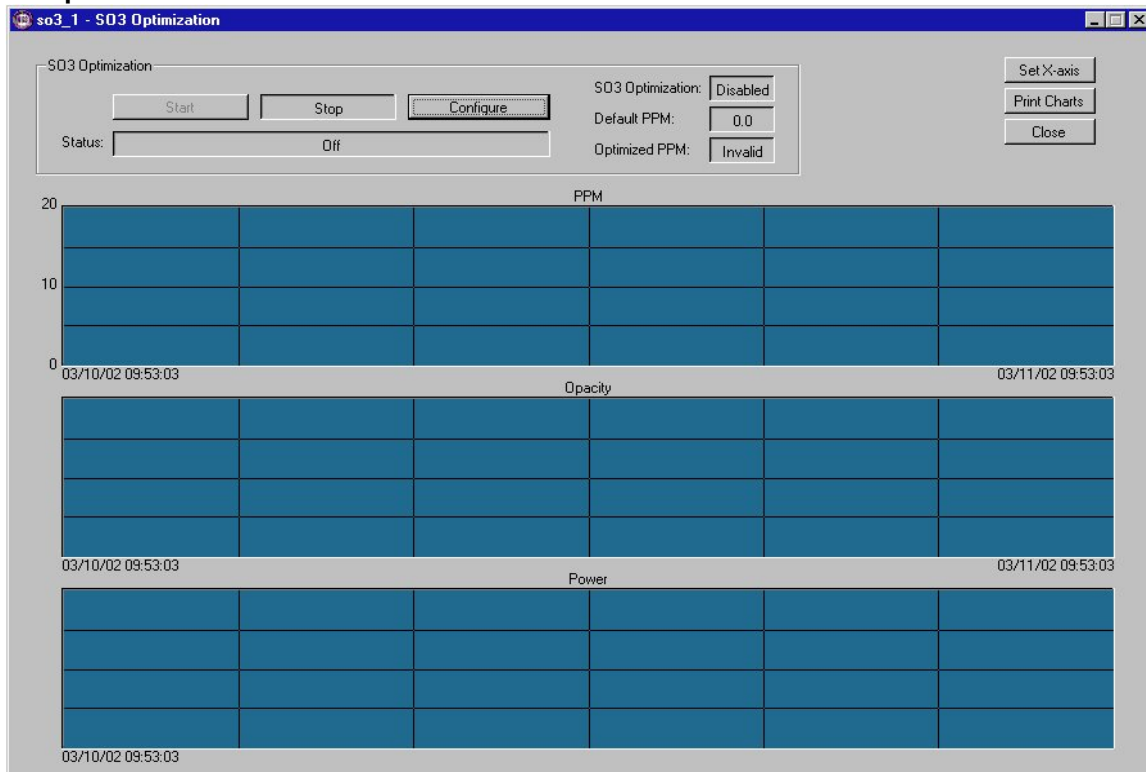


SO3 Optimization – Opens the **SO3 Optimization Window**



SO3 Data Log – Opens the **Data Log Window** for the SO3 System

SO3 Optimization



SO3 Optimization Window

The SO3 Optimization function in POS automatically adjusts the SO3 feed rate for lowest possible opacity. SO3 Optimization then monitors precipitator performance to maintain optimum conditioning. SO3 Optimization will re-tune itself when process conditions change or precipitator performance degrades. SO3 Optimization requires an interface to the SO3 control PLC.

All uses of opacity and power within this module are rolling averages over the “wait time” time frame. Voltage control power readings are not added to the rolling average while its power has been reduced for power off rapping.



Power optimization is not permitted to run while SO3 optimization is tuning the feed rate. If power optimization is running, it will abort back to the first step and remain there until the SO3 optimization module concludes the tuning process. When power optimization is re-enabled, it will start the program at the first step and proceed through the program at its normal rate. The controls selected in the SO3 optimization module for power monitoring will not have their power levels adjusted by power optimization while the SO3 optimization module is running.

SO3 optimization actions will be logged to disk anytime SO3 optimization is turned on in POS. The log will be the traditional file per day per point format. Each log entry contains the time and date stamp, SO3 enable input, PPM input, opacity (rolling avg.), load (rolling avg.) and power reading (rolling avg.). Each log entry will also contain text describing the action it has performed. The log interval will be the same as the "Wait Time" setting.

When a user turns off SO3 optimization, POS will restore the SO3 PPM to the default feedrate.

The **PPM Graph** displays a trend graph of the PPM of Sulfur fed into the system over time.

The **Opacity Graph** displays a trend of Opacity over time.

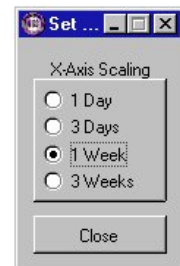
The **Power Graph** displays a trend of the **Power Parameter** selected in the **System Settings Window**.

Set Axis

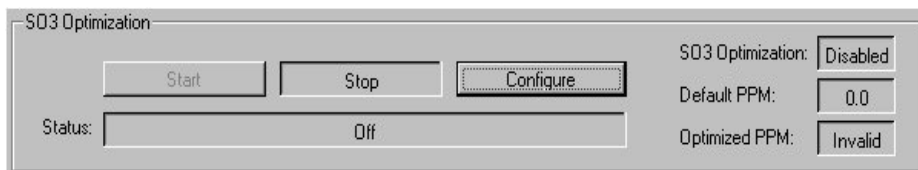
The **Set Axis** button opens the **Set Axis window**. To change the **X-Axis Scaling**, click on the corresponding radio button to display 1 Day, 3 Days, 1 Week, or 3 Weeks of data at a time.

Print Charts

The **Print Charts** button will open up a **Print Preview** window that will allow you to print the **PPM**, **Opacity**, and **Power** graphs displayed on the screen.



Set X-Axis Window



When **SO3 Optimization** is enabled, the **Start** button can be used to begin the optimization process. The window displays whether SO3 Optimization is enabled, the **Default PPM**, and the **Optimized PPM**. Pressing the **Configure** button opens the **Configuration Window**.



SO3 Optimization Configuration Window

This window allows users to change the settings for the **SO3 Optimization**.

PPM Adjustment – Tells the optimization program to make adjustments to the feed rate by 1 or ½ PPM

Wait Time – Sets the amount of time the program waits to set the opacity and Power dead bands.

Opacity Dead Band – sets the opacity dead band.

Power Dead Band – sets the power dead band in the units of the selected power parameter.

Power Parameter Selection – Select the Power Parameter the program will monitor.

PLC PPM Adjustment – When checked, this option allows POS to reset the default PPM in the control PLC when a better default PPM is achieved.

Monitored Controls – Use the dropdown list(s) to select the control(s) the program will use to monitor the power parameter.

To save any changes press the **Accept** button before closing the **Configuration Window**.

SO3 Optimization Configuration



SO3 Data Log

Index	Time Stamp	SO3 Enable	Action	Load	Opacity	Power	PPM
0	Mar 12, 2002 08:21:50 AM	1	Off				0.0
1880							
1881							
1882							
1883							
1884							
1885							
1886							
1887							
1888							
1889							
1890							
1891							
1892							
1893							
1894							
1895							
1896							
1897							
1898							
1899							
1900							
1901							
1902							
1903							

SO3 Optimization Data Log Window

Clicking on the **Data Log Icon** opens the **Data Log** window. When you first open this window, data is displayed for the current day. The top line of the tabulation (blue background) is current or *live* data. Data on the yellow/green background is historical.

You can navigate the historical data with the scrollbar, the scrollbar arrow buttons, or the time selection box in the lower right area of the window. Up-arrow buttons point backwards in time.

The scrollbar itself is used to navigate within the current day. The single-arrow scrollbar buttons change the time by one day; the double-arrow buttons change it by a week. To use the time selection box, highlight the month, date, year, or time, and then make the adjustment with the arrow keys. Use the **Now** button to return to the present time, and the **Print** button to print.

32. Alarm Management

POS logs alarms and events that have been configured by the user. The **Alarm Page** can be used to view past and present alarms and events to help troubleshoot the precipitator. To open the **Alarm Page**, click the **Menu** button in the lower left area of the screen, and then select 'Alarm Page'. Or, you may press the red bell in the upper right area of the screen (directly below the time display). When it is opened the alarm page displays a list of **Current** alarms. The alarms displayed in the list can be specified using the **Alarm Page** toolbar.



Alarm Page Toolbar

Configuring Alarms

The alarm page only displays alarms that have been configured by the user. Refer to the section of the manual pertaining to the function to learn more about how to configure the alarms available for that specific function.

Using the Alarm Page (Actions)

The alarm log holds up to a thousand alarm and event messages. It is important to know what messages are for current alarm situations. When an alarm occurs an alarm message is logged. This alarm remains **Active** until it is **Acknowledged**.

To **Acknowledge** an **Alarm** select the alarm message from the list and press the **Ack One** button. To **Acknowledge** all unacknowledged alarms press the **Ack All** button.

High priority alarms cause and audible alarm. To silence an individual alarm select the alarm message and press the **Silence** button. The alarm remains active and unacknowledged but it no longer makes noise. To make it so no alarms make noise press the **Mute** button. This will silence all current alarms and cause all future audible alarms to be silent alarms.

Note: The **Ack All**, **Ack One**, **Silence**, and **Mute** buttons control password protected functions. Users may need to log in before using the functions.

Pressing the **Clear Log** button will mask the alarm log and only alarms that occur after that point will be displayed. Right clicking on the **Clear Log** button will cause all logged alarms to reappear. This only applies to the full alarm log. **Active**, **Current** and **Unacknowledged** alarms will still appear in their respective lists.

Customizing the Alarm Page

Using the alarm page toolbar you can create a variety of log listings. Listings can be limited by priority, status, type, time, and area.

Alarms can be sorted by **Priority**. Alarms are color coded to provide easy recognition of higher priority alarms. Priority color coding applies to all of the logged alarm items as follows:

RED	High Priority	Very important alarm, Should be serviced immediately.
YELLOW	Medium Priority	Important alarm, Should be given attention soon.
GREEN	Pop-up Alarm	Simple notification of alarm condition.
WHITE	Event	Non critical events such as logons

To sort Alarms by priority select the check box that corresponds to that priority. To display all alarms regardless of priority press the **All** button.

List Options

The buttons in the **List Options** box changes the types of alarms displayed:

Pressing the **Log** button lists the sequential log of all the alarms and system events that have occurred since the log was last cleared. It gives their current state (active or acknowledged), the type of event, and when it occurred. The alarm area and the message are noted too. Active alarms are highlighted. Other events (logons, control transfers, initializations, etc.) are also included in this listing.

Pressing the **Active** button lists all the alarms that are current alarms which have not been acknowledged (i.e. they are in the active state). The size of this list will vary as alarms are activated and cleared.

Pressing the **Unack** button lists all the alarms that have not yet been acknowledged whether they are current alarms or not.

Pressing the **Current** button lists the alarms that have occurred and the alarm condition still exists. These alarms may or may not have been acknowledged by a user. For an alarm to be removed from this list it must be both acknowledged by a user and the alarm condition must no longer be present in the system.

Pressing the **Disabled** button displays a list of the alarm conditions that are available in POS but are currently not set up to log alarm data.

Pressing the **List All** button lists all the possible alarms on the POS system that are configured to cause alarm data to be logged, their current status and their priority.

As noted above, you can **sort** the alarm listings by **Event** or by **Time**. These can be used with any **List Option** with the exception of the **Log** itself, which is by definition ordered sequentially by time. By default the alarms in all list options are sorted by time. Press the **Sort** button in the **Event** box to sort alarms by the alarm event. Press the **Sort** button in the **Time** box to display alarms sorted sequentially by time.

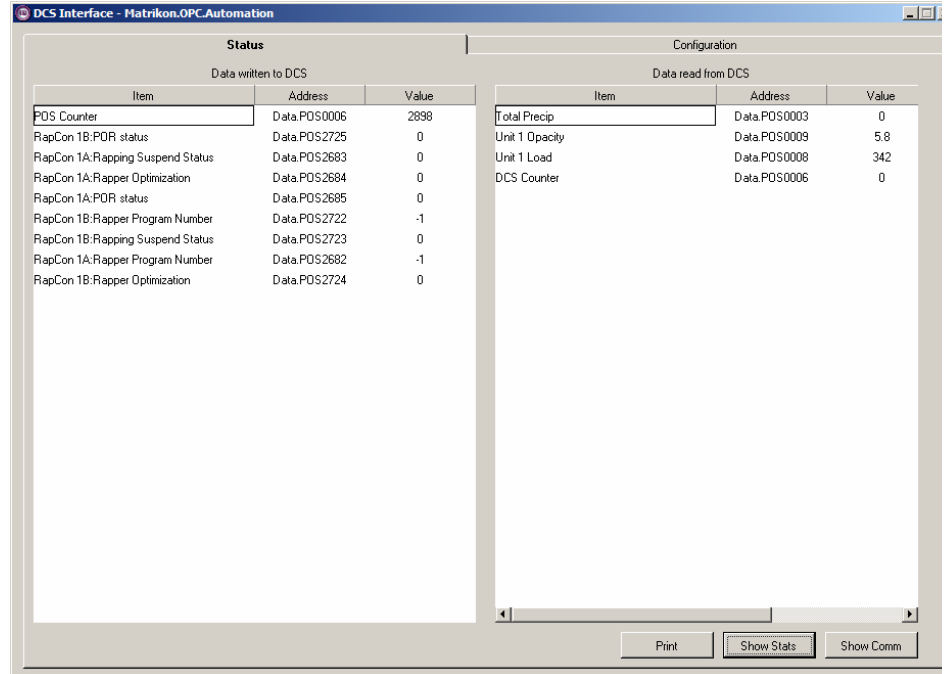
Alarms can also be organized by **Type** or **Event**. Use the dropdown list and select a specific **Type** or **Area** to display the alarms sorted by type of alarm or by area where the alarm originated.



33. DCS Status

Pressing the DCS Interface item on the precipitator menu opens the DCS status and configuration window.

The **Status** tab shows the configured DCS addresses and its current value in the POS. The left field displays data that POS is writing out to the DCS interface. The right field is the data that is configured to coming in from the DCS.



DCS Interface – Status Tab

Driver Statistics

Pressing the **Show Stats** button opens the **Driver Statistics** window which displays a summary of the communications between the DCS and POS. The first three lines display the DCS interface driver information. **Counts** – The number of messages received or sent.

Time Stamp and **Date Stamp** – Shows the time and date of the last message.

Dt – Is the time between reads.

Error – If there is currently a read or write error, this line displays the error number.

Error Mess – Displays a brief message describing the error.

Last Error – Displays the error number of the last error that has occurred.

Last Error Mess – Displays a brief message describing the last error that has occurred.

Error Counts – The number of errors that have occurred.

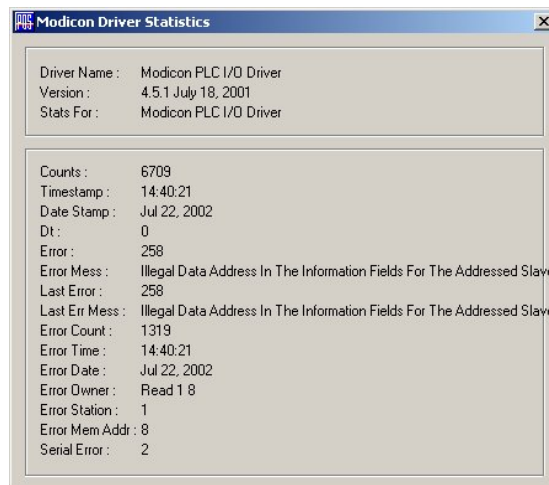
Error Time and Error Date – Displays the time and date that the last error occurred.

Error Owner – Shows the read or write statement that generated the error.

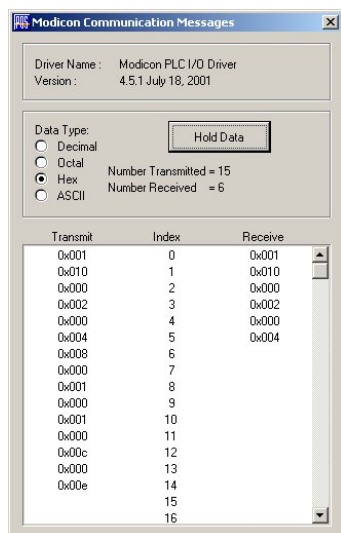
Error Station – Displays the PLC address of the station that generated the error.

Error Mem Addr – Displays the memory address or register number that generated the error.

Serial Error – If there is an error with the serial port, the error number will be displayed here.



DCS Statistics Window



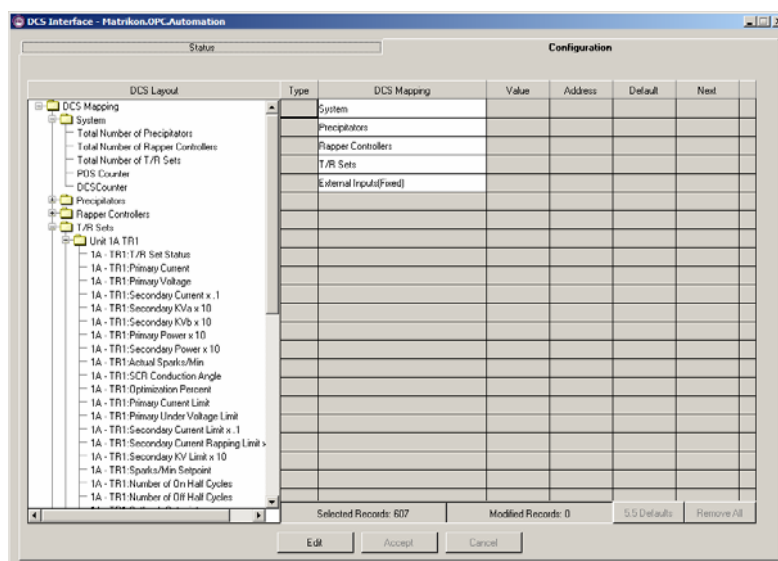
DCS Communication Messages

The **Show Comm** button opens a window that displays the Communication Messages window displays the actual messages being sent and received through the DCS port. The **Hold Data** button freezes the screen so that users may analyze the messages received and sent. The **Data Type** selection allows the user to change the method the data is displayed.

To understand what is being displayed in this window it is best to think of the DCS interface as a separate application than POS. Messages shown in this display are messages originating from POS being written to the DCS Interface and messages originating from the DCS being written to the DCS Interface.

Configuration Tab

The **DCS Layout** section of the **Configuration** tab functions the same as **Windows Explorer** in that sections can be expanded and collapsed by clicking on the plus and minus icons next to each folder. Each section contains its relevant output points for the DCS. When you select a section that has parameters that can be configured for output the individual output parameters will display in the chart on the right side of the screen. The **Value** section of the chart shows the actual value that will be written to the DCS interface. The **Address** section is the address that that value will be written to. If the address field is empty then that value will not be written to the interface.



DCS Interface – Configuration Tab

There are multiple options to configure the address field. For all options the **Edit** button must be pressed to configure the DCS addresses. The **5.5 Button** loads the POS versions 5.5 and 6 default addresses.

To Configure an Entire Section

Select the section you want to configure on the DCS Layout portion of the screen. Then press the **5.5 Defaults** button on the lower right portion of the screen. To clear an entire section press the **Remove All**. The **DCS Mapping** section can be selected to configure or remove every entry on the DCS interface. Select sections further down the list to edit smaller sections .

To Configure Individual Addresses

With the parameter you would like to configure displayed on the right hand chart the user could click on the address field and manually type in the address desired. The user could also press the **Default** button to use the POS 5.5 default address. Pressing the **Next** button uses the next sequential address in interface. After all the addresses have been configured press the **Accept** button to save the changes.



Appendix A – DCS Specification