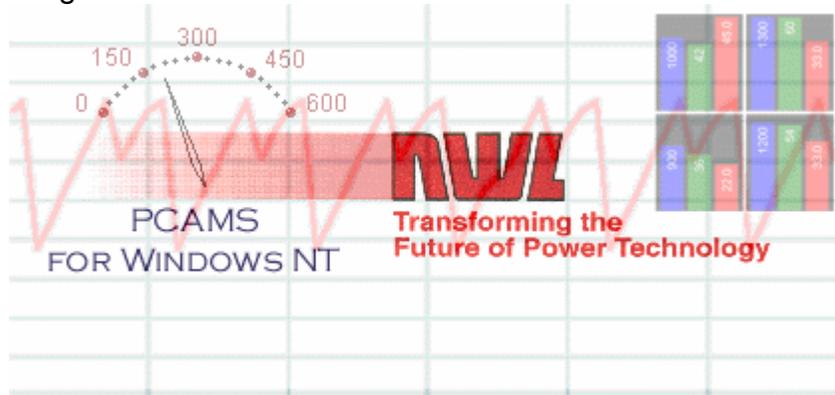


PCAMS for Windows NT

Program Documentation



revised 12/2005

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PCAMS System

PCAMS is short for Precipitator Control And Management System. Which is a hardware/software solution for monitoring and controlling your NWL Precipitator Power Supplies, NWL Rapper Controllers, and various Auxiliary I/O devices. Along with monitoring and control, PCAMS can also be configured to run energy Management Algorithms, Trend historical data, Generate reports and make the same real-time data available on your network via the OPC ethernet standard protocol.

System Requirements

Minimum System Requirements:

- 300Mhz Pentium
- 64 Megs of Ram
- 10 Megs of Hard Disk Space
- Available Serial Port(s), RS485 Port(S), or Ethernet Card to support Precipitator(s) configuration
- Video card and monitor to support 800 x 600 resolution

Recommended System Requirements:

- 1.0 Ghz Pentium III or better
- 512 Megs of Ram
- 40 Megs of Hard Disk Space
- Available Serial Port(s), RS485 Port(S), or Ethernet Card to support Precipitator(s) configuration
- Video card and monitor to support 1024 x 768 resolution

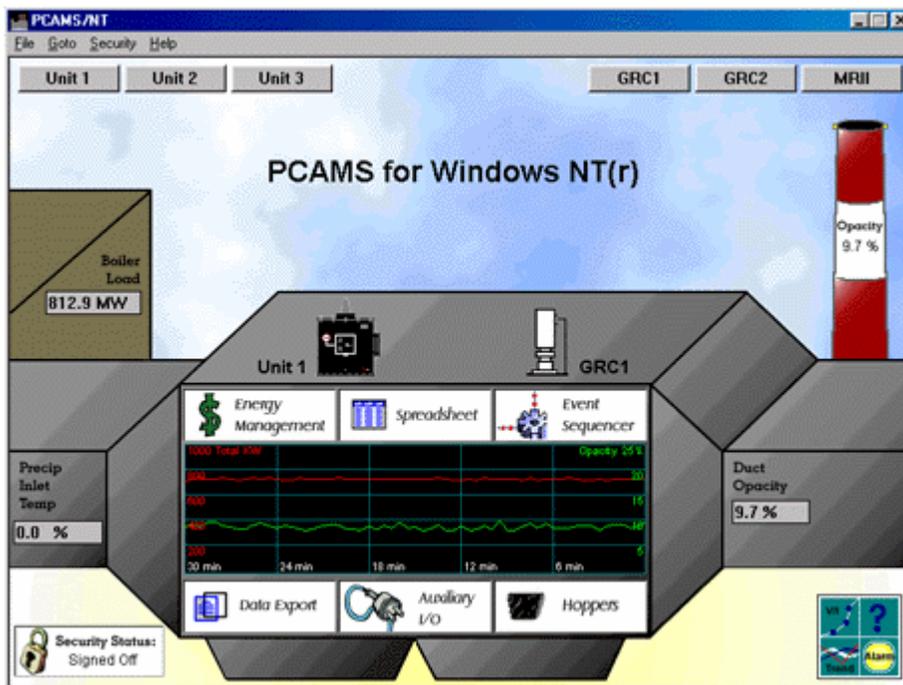
Operating Systems:

- Windows NT(SP6a)
- Windows 2000
- Windows XP Professional

The Main Screen

Display overview

Almost everything you want to know about your precipitator-based particulate control system appears on the PCAMS main screen. The display provides this vital information about your system and links to easily maneuver to other parts of the program. You will notice many readouts located around the screen and a resizable opacity and total KW trend in the center of the main screen.



Selecting the active precipitator or rapper controller

To the top of the screen there are precipitator buttons to the left and rapper controller buttons to the right. Use these buttons to select the precipitator or rapper controller you wish to use throughout the program. This is the only place where you can select the current precipitator or rapper controller.



You will notice the currently selected precipitator or rapper is left depressed while the others available are raised, indicating that they are not selected.

Using the toolbar

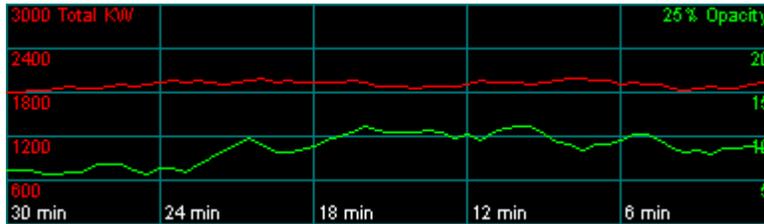
From the toolbar, located in the bottom right hand corner of the main screen, you can jump to other utilities included with the PCAMS.



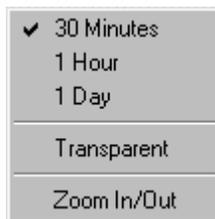
You can open one copy of Trend and Alarm with the toolbar. Each consecutive use will switch to the already open copy however with V/I curve you can open multiple copies from the toolbar.

Graphical trending

The graphical trend is located in the center of the main screen and trends Opacity and Total KW.



Right-click on the graph to bring up the context menu.



Changing time interval

The graph can trend information in 3 different time intervals: 30 minutes, 1 hour and 1 day. To set a new time interval, simply select it from the context menu. The graph will reset when the interval is changed and the time axis will be updated to reflect the new time interval.

Making the graph transparent

The graph can be made transparent if it is not in full-screen mode, by selecting "Transparent" from the context menu. Selecting this again will return the graph to its opaque state.

Resizing the graph

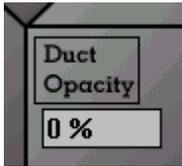
You can zoom in the trend, making it full-screen, by selecting "Zoom In/Out" from the context menu (right click on the graph). To reduce the graph size to its original state simply select "Zoom In/Out" from the context menu again.

Navigating

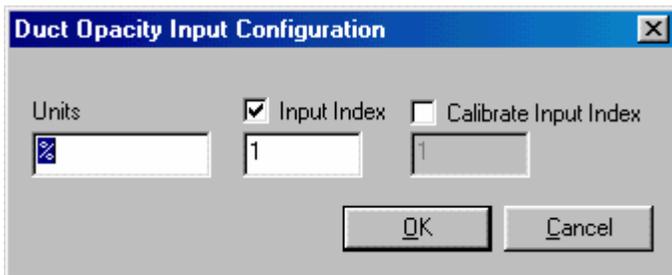
Once you have selected the current precipitator and rapper controller, clicking on various context-sensitive sections of the main screen will "zoom in" to that section. For example, clicking on the "Energy Management" bitmap button above the trend on the main screen will zoom in on the energy management section of the precipitator you selected. While the main screen is a summary of your system, each time you click on an option in a window you are zooming in to that part of the precipitator or rapper controller. Many of these detailed screens require adequate security to enter or to make modifications. Your security is determined by the password you used to sign-on with.

Input Configuration

If you have signed on with an administrator password, you will be able to edit input configurations for: Boiler Load, Precip Inlet Temp, Opacity and Duct Opacity.



Place the mouse cursor over the label for each of these input configurations and a black box will surround the label. A click of the mouse will then bring up the input configuration window for the label you clicked on.



To change any setting, highlight the box and overwrite the setting with the new value. Select "OK" or "Cancel" to register or discard the new settings.

Pulldown Menu Options

Pulldown Menu Overview

File menu options

From the file pulldown menu, you can open the system properties window and exit PCAMS. The properties window allows you to view and set information about your site, version of PCAMS and license code. You need property security clearance to shut down and exit PCAMS.

Goto menu options

The goto pulldown menu allows you to navigate through PCAMS sections using the keyboard. This menu is provided for convenience to users who prefer to use the keyboard. All the sections listed under this menu may also be navigated to by clicking on the appropriate graphical icon on the main screen.

Security menu options

The security pulldown menu also provides a keyboard shortcut to the sign on / off PCAMS function. PCAMS administrators also may launch the password editor from this menu.

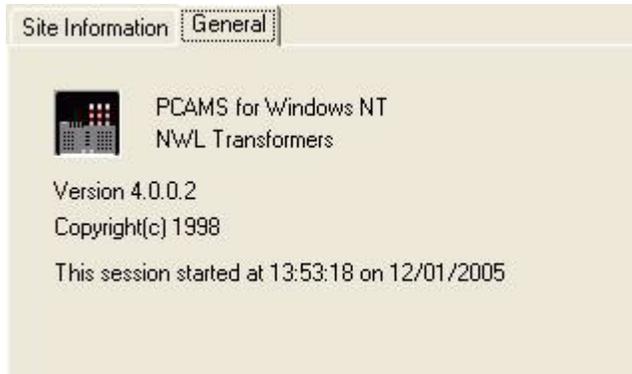
Help menu options

The help pulldown menu will launch the online help application and allow you to view the About box, which contains copyright information as well as listing several ways you can contact NWL.

Properties window

Two property pages are found on the main properties window, General and Site Information.

The General property page displays your site name, which you may edit from the Site Information tab, the version number of PCAMS/NT, and the time this session of PCAMS/NT was started on.



The Site Information property allows you to edit your site name and license key and view your license privileges. This is where you enter the license key given to you by an NWL representative. Without this key, your copy of PCAMS/NT is severely crippled. Your license key is specific to your site and should not be shared with any other site. It unlocks sections of PCAMS that you have purchased and contains your registered site name. This information is stored in the key itself and cannot be altered.

Site Information | General

Site Name Line 1
PCAMS for Windows NT(r)

Site Name Line 2
NWL Transformers

License Key

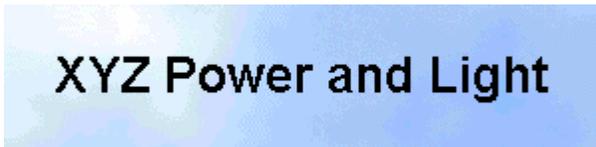
Key

Licensed to:

You are licensed for:

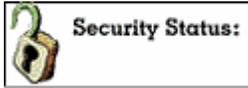
| | | | | | |
|---------------------|----------------------------------|------------|----------------------------------|---------------|----------------------------------|
| Precips: | <input type="text" value="8"/> | EMS: | <input type="text" value="Yes"/> | OPC/Keypware: | <input type="text" value="Yes"/> |
| Total T/Rs: | <input type="text" value="120"/> | Trend: | <input type="text" value="Yes"/> | | |
| Rapper Controllers: | <input type="text" value="4"/> | V/I Curve: | <input type="text" value="Yes"/> | | |
| Data Export: | <input type="text" value="Yes"/> | Hoppers: | <input type="text" value="Yes"/> | | |
| Event Sequencer: | <input type="text" value="Yes"/> | ESPer: | <input type="text" value="Yes"/> | | |

The information you provide in the Site Name lines is what is displayed on the main screen. Select "OK" or "Cancel" to register or discard the new settings.



Security

Security Overview



Many sections of PCAMS require password authorization to enter or to modify settings on. The sign-on process keeps unauthorized people from changing the parameters of your particulate control system or turning components on or off. PCAMS will let you monitor the system and use its print functions even without signing on but if you are authorized to make changes, you must sign on and enter your password before you can do so.

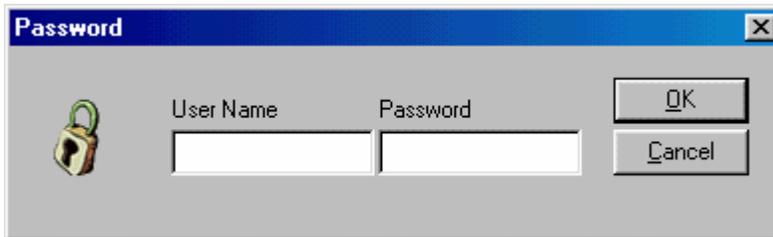
Your level of access depends on the user account you signed on with and the level of access that user account was set up with by your PCAMS administrator.

Signing on and off

To sign on or off the system, click on the security status box in the lower left hand corner of the main screen or select "Sign On/Off" from the "Security" pull down menu. This will bring up the Sign On dialog box which asks you for a user name and password.



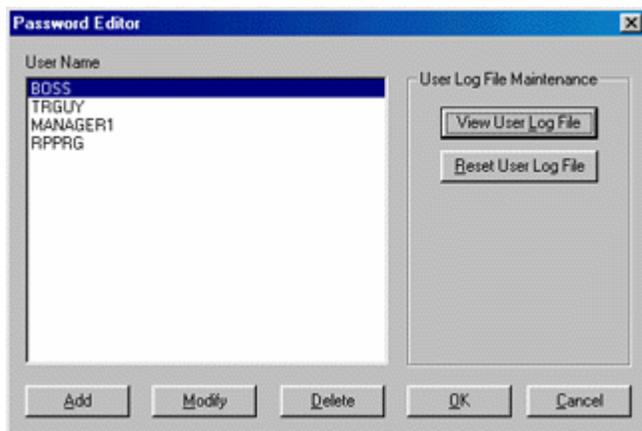
Enter your name and password and click OK to sign on. The characters you type in the password edit box will be substituted with asterisks so that your password will remain hidden from anyone standing around you. If you mistype your name or password or enter an invalid password, PCAMS will notify you there was an error, clear the password edit box and allow you to try again. Once signed onto the system, the level of access you have depends on the level of access your system administrator has assigned to the specific password you signed on with.



Password Editor

Password Editor Overview

With system administrator access you can define user names and passwords and the access levels associated with them. You can add new users and modify or delete existing passwords. You can also view and reset the user log file. You must have system administrator access to enter the Password Editor section.



When you have completed editing users, click OK to save your changes and return to PCAMS or Cancel to disregard any changes you have made and return to PCAMS.

Adding, modifying and deleting users

To add a new user, click the "Add" button in the Password Editor dialog box. This inserts a new password and puts you in the Modify Password dialog box to modify the new password you created.

To modify a password, click the "Modify" button in the Password Editor dialog box.

The screenshot shows the 'Modify Password' dialog box. The 'User Name' field contains 'TRGUY'. The 'Timeout' is set to 15 minutes. The 'Password' field is masked with asterisks. The 'Password Privileges' section is organized into several categories with checkboxes:

- Administrator:** Setup, View Controller Level Codes, Exit PCAMS/NT (all unchecked).
- Precipitator:** Energy Management, Hoppers (both unchecked).
- T/R:** Setup (Parameters), HV, Alarm, V/I (all checked).
- Rap / Vib:** Setup, ACG, Alarms, Auto Program Select, Program Editor, Troubleshooting, POR (all unchecked).
- I/O:** Setup, Data Export, Event Sequencer (all unchecked).

The Add / Modify Password dialog box (showed above) appears. Enter the name of the password you wish to create in the password edit box. Passwords will automatically time-out, that is expire, after a specified amount of idle time. Enter the amount of idle time before automatic sign-off in the timeout edit box. Check off all the privileges you wish the password to have in the Password Privileges groupbox. Remember that giving someone Administrator Setup access enables them to enter the Password Editor and change their own access and the access of other passwords.

When you have completed your entry and are satisfied, click OK to accept the entry and return to the Password Editor dialog box. If you no longer wish to add this password, click Cancel to abort the entry and return to the Password Editor.

Deleting passwords

To delete a password, select it by clicking on the password once in the Password Editor and then click the Delete button. Once a password is deleted it cannot be restored.

T/Rs

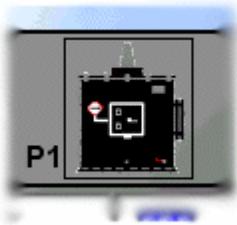
Layout

T/R Layout Overview

PCAMS continually monitors each Power Supply. From the T/R layout you can

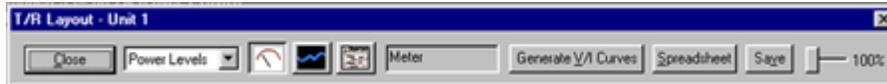
- Display operating conditions for every power supply
- Act as an alert for alarms
- Let you set electrical and opacity parameters.

You get to the T/R layout by clicking on the T/R icon on the main screen.



The T/R icon is displayed above with the currently selected precipitator name to the left. The black box around the icon indicates that the cursor is over it and if the left mouse button is clicked it will bring up the T/R layout.

Layout control bar



The top section of the T/R Layout window is called the Layout Control Bar. The first drop down window is used to select the default layout for the Precipitator roof layout. The options are as follows:

'Layout' which shows the Power Supplies as Icons with labeled with their respective name.

'Detail' which displays the Power Supplies as blocks with numerical electrical readings.

'Power Levels' which displays vertical bar graphs of each Power Supply's kVDC, mADC and kW readings.

The next 3 Icons are used like radio buttons as in only one can be selected.

These icons are used to set the type of window that will be displayed when you click on an individual Power Supply. Selecting the first Icon will set PCAMNT to display the Meter screen when clicking on a Power Supply. Selecting the middle Icon will set PCAMNT to display the Graphical Monitor screen when clicking on a Power Supply. Selecting the last Icon will set PCAMNT to display the Parameters screen when clicking on a Power supply. The gray window just to the right of the Icons displays the current choice.

Generate V/I Curve

This button is used to start and run the V/I curve generation algorithm.

Spreadsheet

This button will display the Precipitator Power Supply Spreadsheet. This window will list all Power Supplies and their respective readings/ setpoints.

Save

Only available for Optimizer or PowerPlus controls. This button will display a tabbed window similar to the Spreadsheet window and will give you the option of saving the precipitator's power supply configuration to a disk file for backup and restoring.

0-100% slider bar

This slider steps the T/R roof layout zoom modes of 33, 50 and 100%.

Views

The T/R Layout can be viewed in three different ways. To switch views, click on the combo-box in the upper left hand corner of the layout and select your view.

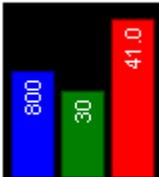
Layout view - displays an icon for each Power Supply with the unit's name printed inside the icon.



Detail view - displays a box for each Power Supply containing information about that Supply such as VAC, AAC, KVDC, mADC and KW.

| |
|-----------|
| 320 VAC |
| 160 AAC |
| 48 KVDC |
| 1100 mADC |
| 28.0 KW |

Power levels view - displays a graph for each Power Supply, plotting mADC, KVDC and KW.



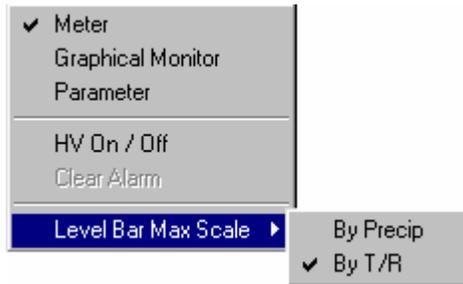
In layout and detail view, the label color changes to indicate status:

| | | |
|-----------|--------|----------|
| 380 VAC | 0 VAC | 240 VAC |
| 200 AAC | 0 AAC | 120 AAC |
| 60 KVDC | 0 KVDC | 36 KVDC |
| 1300 mADC | 0 mADC | 900 mADC |
| 33.0 KW | 0.0 KW | 34.0 KW |

Red = High Voltage on
Green = High Voltage off
Yellow = alarmed

Context menu

Right click on any Power Supply Icon on the layout to bring up the context menu. You can select one of the first three items to set your detail mode. The currently selected detail mode will have a checkmark next to it.



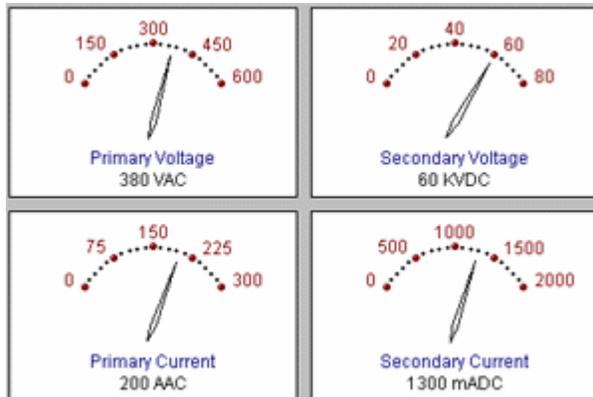
The next two items may be disabled, or grayed-out, if you do not have appropriate access to the functions to toggle the HV status of a Power Supply or to clear alarms.

The last item is only available when the T/R Layout view is set to 'Power Levels'. When available and selected the menu will fly out to allow you to select the Max Level Bar Scale. Selecting 'by Precip' will set ALL of the Power Supplies Max Level Bar Scale equal to the highest possible obtainable level of any individual power supply. Therefore all level bars will have the same graphical scale. Selecting 'by T/R' will set each individual Power Supplies Max Level Bar Scale equal to it's individual highest possible obtainable level. In this mode there may be NO graphical relationship between any two Power Supplies Level Bars.

Detail Screens

Meters screen

From the meters screen you'll see the unique PCAMS electrical gauge display. It duplicates the look of an NWL power supply control cabinet, including graphics of analog meters.

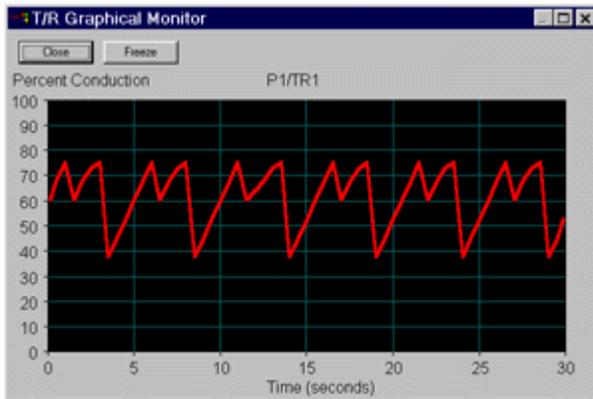


For each precipitator the display also shows:

- Precipitator identifier and Power Supply Name
- Alarm condition
- control status (when "Local" is displayed, the power Supplies voltage controller has been configured to operate independently, without input from PCAMS)
- crucial electrical readings including Spark Rate, Arc Rate and Power.
- operating mode ('ramping', 'Current Limit', 'Voltage Limit', etc.)

Monitor screen

From the monitor screen you will see a graph of percent conduction or duty cycle over time in seconds. This graph is updated once every second. You can freeze the display by clicking the "Freeze" button. The caption will then change to "Unfreeze" and clicking on that will reset the graph and resume plotting.



Parameters screen

Setpoints

You may want to change setpoints to fine-tune the performance of your particulate control system, or to compensate for some unusual conditions.

Setpoint Changes

- <Spit Setback (%)> determines how far T/R power will be set back in response to "spit-sparks," transitory sparks that usually extinguish themselves. (Micropack III only)
- <Spark Setback (%)> sets the same response for longer sparks, with a 1% to 30% range. Typical settings range from 5% to 15%.
- <Quench >
 - 60 hz Power Supply (cycles) - extinguishes potentially damaging arcs by setting an "off" time (conduction angle equals 0 degrees) for the T/R set of 1 to 10 power cycles. Typical figures are 3 - 6 cycles.
 - PowerPlus (mSec) - extinguishes potentially damaging arcs by setting an "off" time for the PowerPlus of 0 to 20 mSec. Typical figures are 1 - 5 cycles.
- <Spark Ramp> may be any of the following: Linear, 3 Slope or 4 Slope. (60 hz only)
- <Fast Ramp >
 - 60 hz Power Supply - is the time it takes in cycles to raise SCR conduction to the setback level. The fast ramp range runs from 2 to 20 cycles, with 8-12 being typical.
 - PowerPlus - is the time it takes in mSec to raise duty cycle to the setback level. The fast ramp range runs from 2 to 20 mSec, with 1 being typical.
- <Slow Ramp (Sec.)> shows how long the system will take to reach the previous spark level after a setback, a more gradual process. 5-15 seconds is typical. (Micropack III only)

Undervoltage Settings

Four of the setpoints deserve a closer look, since we did not examine them in previous chapters. All deal with power control.

The first two provide a defense against potentially damaging sparking or shorting conditions.

1. <U.V. Trip (KVDC)> is the level at which the T/R controller determines there is an undervoltage condition in the secondary, indicating a short circuit or excessive sparking. It will shut off power to protect the T/R set under these conditions.
 - Typical values are 10 KVDC
 - Setting <(U.V. Trip)> to 0 KV disables it. This is dangerous and should be done only for diagnostic purposes.
2. <U.V. Delay (Sec.)> dictates how long the T/R will tolerate a U.V. condition before powering down.

- Typically you should not set this longer than 30 sec.

Power Modes

PCAMS can run precipitator T/Rs through their T/R controllers in different power modes. PCAMS lets you configure your T/R for running under the pre-set conditions.

1. <Current Limit (%)> lets you automatically maintain a pre-set primary current limit value at the T/R. It is a percentage of the T/R's current rating.
 - The safe range is from 30% to 110% of the T/R's primary rating
 - However, with PCAMS you can go below 30%. Be aware that setting <Current Limit (%)> to under 30% disables <U.V. Trip>, risking damage to the T/R set. Use low settings only for diagnostic purposes.
2. <Voltage Limit (%)> works the same way, but sets the secondary voltage limit as a percentage of the T/R's voltage rating. Its control ranges:
 - Under secondary voltage feedback: 10% to 110%
 - Under primary voltage feedback (used only when secondary voltage feedback is not available): 10% to 110%. (60 hz only)
 - Typical setting: 100%

Modes

You may want to change the modes to fine-tune the performance of your particulate control system, or to compensate for some unusual conditions.

- <F.R.>, Fast Spark Recovery, optimizes precipitator performance after heavy sparking and multiple setbacks. These conditions would normally cause very slow recovery but F.R. will restore power quickly if there is no further sparking for 10 seconds.
- <I.E.>, Intermittent Energization mode, enhances collector efficiencies by pulsing the SCRs. This reduces energy consumption while maintaining opacity.

Back Corona Readings

Back Corona (B.C.) can cause poor precipitator performance. When Back Corona occurs, applying more power to the T/R produces no corresponding increase in the secondary voltage -- in some cases the voltage actually drops. The Modes spreadsheet shows settings for a special feature that detects Back Corona and corrects for it, in both cases by temporarily reducing power. This feature is only available for controllers configured for secondary voltage feedback.

- <Back Corona> shows whether the feature is active.
- <Time (Sec)> determines how long the T/R set stays at the lower power level before checking for Back Corona again.
- <Incr. (%)> shows how much the power is increased (Incr stands for Increment) at each step until it reaches maximum or another Back Corona condition.
- <P.B. (%)> is the amount of Phase Back applied to detect or correct a Back Corona.
- <Delay (Sec.)> is the amount of time the T/R set stays at a lower power level during the Back Corona detection phase.

Manual Operation

One other feature appears in the spreadsheet: Manual Operation.

- <Manual> shows whether the controller is in manual mode.
- <Manual Cond. >
 - 60 hz Power Supply (Deg) - shows how much of the full power you are using. Maximum with a 60 Hz T/R set is 160 degrees.
 - PowerPlus (% duty cycle) - shows how much of the full power you are using. Maximum with a PowerPlus set is 100 percent duty cycle.

In Manual Operation the controller continues to respond to alarms, sparks and arcs, and limits.

Configuration

You may want to change the configuration to fine-tune the performance of your particulate control system, or to compensate for some unusual conditions. The ratings and conduction angle specifications are self-explanatory. Definitions of the other items:

- <Max. C.L. (%)> is the Maximum Current Limit, the highest current setting permitted by the controller.
- <Setback Offset Mode> turns Setback Offset on and off.
- <Setback Offset (%)> applies only when Setback Offset is on. It is the fixed percentage of current reduction added to the operator programmable setback value on the first half cycle of operation after sparking.
- <Level 2 Code> and <Level 3 Code> let you see the passwords in use at the T/R set's local controller.

Event Summary

The event summary keeps track of how many times certain conditions occur. You can clear these values by clicking on the "Clear" button next to the event you wish to clear.

| Event | Count | Action |
|-------------------|-------|--------|
| On/Off Starts | 0 | Clear |
| Over Voltage | 0 | Clear |
| Line Over Current | 0 | Clear |
| Sec Over Current | 0 | Clear |
| Undervoltage | 0 | Clear |
| Open Circuit | 0 | Clear |
| Line VAC Abnormal | 0 | Clear |
| Vbus Abnormal | 0 | Clear |
| Cold Resets | 0 | Clear |
| Warm Resets | 0 | Clear |
| Over Temperature | 0 | Clear |

Aux Alarms

The Aux Alarms parameter page allows you to edit logic, type and count information for 4 auxiliarm alarms for each T/R.

- <Name> this is the name of the Aux Alarm, it can be up to 20 characters.
- <Logic> can be Normally Closed or Normally Open
- <Type> can be Disabled, Display, Disp/Relay, Disp/Relay/Cont
- <Count> stores integer values

This screen will only appear if your precip is configured for the optimizer protocol.

Parameters for PowerPlus: TR9 - Unit 1

Setpoints | Modes | Configuration | Event Summary | Auxiliary Alarms | Hammers

Aux. Alarm 1

Name: AUX ALARM 1

Logic: Normally Open

Type: Disabled

Count: 0

Aux. Alarm 2

Name: AUX ALARM 2

Logic: Normally Open

Type: Disabled

Count: 0

Aux. Alarm 3

Name: AUX ALARM 3

Logic: Normally Open

Type: Disabled

Count: 0

Aux. Alarm 4

Name: AUX ALARM 4

Logic: Normally Open

Type: Disabled

Count: 0

OK Cancel

Hammers

The Hammers parameter page allows you to edit mode, feedback and timing information for 4 hammers for each T/R.

- <ID> 6 character name for the hammer
- <Mode> has the following options: Off, Prog. Run, Prog. w/ Clean, Continuous
- <Feedback> has the following options: No Feedback, Input Closed, Input Open

This screen will only appear if your precip is configured for the optimizer protocol.

The screenshot shows a software window titled "Parameters for PowerPlus - DSP: TR7 - Unit 1" with a close button in the top right corner. The window has several tabs: "Setpoints", "Modes", "Configuration", "Event Summary", "Auxiliary Alarms", and "Hammers". The "Hammers" tab is selected. The window is divided into four quadrants, each representing a hammer configuration:

- Hammer 1:** ID: HAMMR1, Initial Wait: 00:00:00, Mode: Off, Duration: 00:00, Feedback: No Feedback, Wait: 00:00:00, Clean: 00:00:00.
- Hammer 2:** ID: HAMMR2, Initial Wait: 00:00:00, Mode: Off, Duration: 00:00, Feedback: No Feedback, Wait: 00:00:00, Clean: 00:00:00.
- Hammer 3:** ID: HAMMR3, Initial Wait: 00:00:00, Mode: Off, Duration: 00:00, Feedback: No Feedback, Wait: 00:00:00, Clean: 00:00:00.
- Hammer 4:** ID: HAMMR4, Initial Wait: 00:00:00, Mode: Off, Duration: 00:00, Feedback: No Feedback, Wait: 00:00:00, Clean: 00:00:00.

At the bottom right of the window are "OK" and "Cancel" buttons.

DVC (60 hz GVC-Optimizer Only)

The DVC parameter page allows you to edit DVC Settings.

- <VAC Low and High> Minimum / Maximum VAC before Attention light turns ON
- <AAC Low and High> Minimum / Maximum AAC before Attention light turns ON
- <KVDC Low and High> Minimum / Maximum KV before Attention light turns ON
- <mADC Low and High> Minimum / Maximum mA before Attention light turns ON
- <KW Low and High> Minimum / Maximum KW before Attention light turns ON
- <SPM High> Maximum SPM before Attention light turns ON
- <APM High> Maximum APM before Attention light turns ON
- <Line 2 Val1> DVC Line 2 value, first value displayed on DVC line 2
- <Line 2 Val2> DVC Line 2 value, second value displayed on DVC line 2

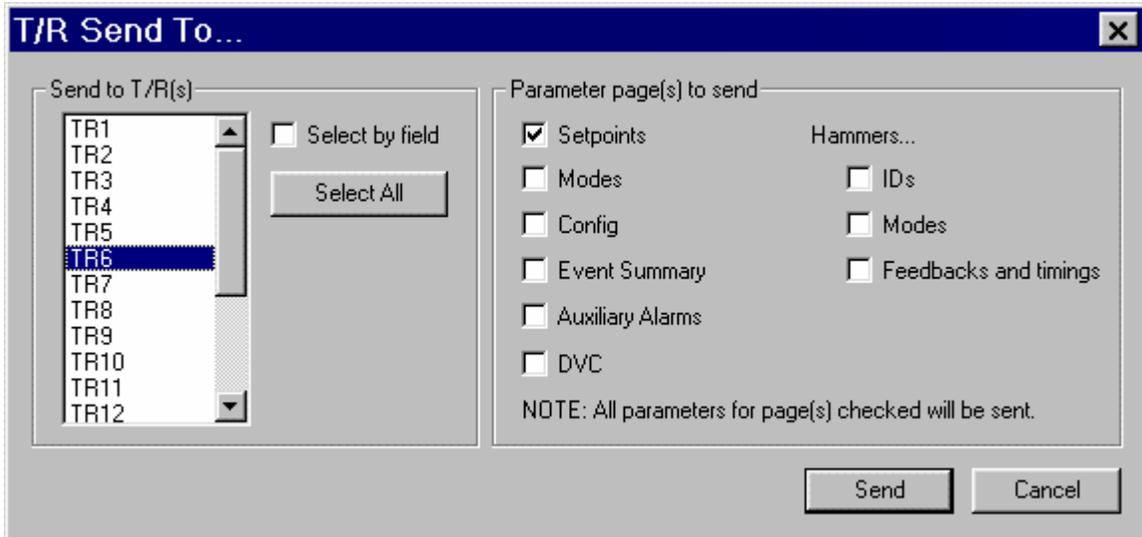
Permissives

- <Current Limit> Determines if current limit can be changed from the DVC
- <Voltage Limit> Determines if voltage limit can be changed from the DVC
- <Manual Conduction> Determines if manual conduction can be changed from the DVC
- <Manual Mode> Determines if manual mode can be changed from the DVC
- <IE Mode> Determines if IE mode can be changed from the DVC
- <BC Mode> Determines if BC mode can be changed from the DVC
- <HV Power Up> Determines if High Voltage Power Up mode can be changed from the DVC

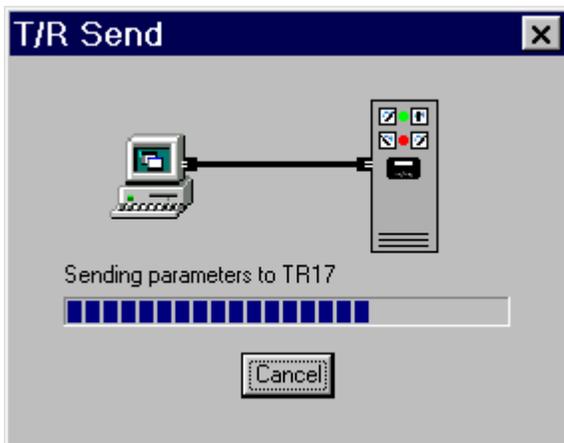
This screen will only appear if your precip is configured for the optimizer protocol.

Sending to multiple TRs

The T/R Send To... dialog box allows you to select which Power Supplies or fields to set up with your current settings. You can select specific fields within the precipitator, or individual Power Supplies. There is even a short-cut button to select all power supplies. With it you configure all of the high voltage power supplies in the precipitator with a single click!



To use this window, make any changes to the power supplies settings in the various tabs and then click "OK." Once you have selected the T/R's or fields you wish to send to, click "Send."



While sending the parameters to the selected T/R's, the above screen displays a progress bar while this takes place.

Selecting a detail screen

Clicking on a T/R zooms to the next level of detail for that power supply. There are 3 different detail modes and two ways of selecting a detail mode.

You can select a detail mode from the context menu by right-clicking on any power supply. From this menu you can select a detail mode. There are three modes:

- Meter
- Monitor
- Parameter

You can also use the button bar at the top of the layout to select detail mode.



The edit box to the right displays the currently selected detail mode. When the cursor is over a power supply it will change to an arrow with one of these icons next to it signifying the detail screen that will appear if the power supply is clicked on.

Either way you use to select the detail mode will be reflected in both places.

Spreadsheet

Electrical readings

The spreadsheet shows readings on whatever precipitator you have chosen. A scroll bar next to the spreadsheet lets you move down the list of power supplies so you can see readings for any supply that doesn't fit in the display.

1. <T/R Name> identifies the power supplies in the precipitator.
2. <Prim. Voltage (VAC)> for 60 hz supplies indicates the voltage being applied to the primary of the transformer. For PowerPlus units this value indicate the actual incomming line voltage.
3. <Prim. Current (AAC)> displays the actual curreent being consumed by the power supply.
4. <Sec. Voltage (KVDC)> displays the actual kVDC output of the power supply.
5. <Sec. Current (mADC)> displays the actual mADC output of the power supply
6. <Spark Rate (SPM)> and <Arc Rate (APM)> show how many times per minute these events occur:
 - 5 to 30 times per minute is a typical range for sparks, depending on gas flow conditions.
7. <Cond. Angle / Duty Cycle> indicates the current level of output the power supply is at. For 60 hz supplies it displays Cond. Angle in degrees which is how long each SCR (rectifier) in a 60 hz T/R control cabinet is conducting on its half of a sine wave. Maximum is 160 degrees for a 60 Hz unit, 159 degrees for a 50 Hz. For PowerPlus supplies it displays Duty Cycle in percent, 0 being Minimum and 100 being Maximum.
8. <Sec. Power (KW)> shows the power supply output in kilowatts.

Setpoints

The Setpoints spreadsheet shows you the safe operation limits currently in effect for the current precipitator. These setpoints all relate to specific control functions.

Sparks

Three of the setpoints deal with the control of sparking within the precipitator.

This screen shows the currently active settings for automatic adjustments in the T/R power supply to stop sparks.

- <Spit Setback (%)> determines how far T/R power will be set back in response to "spit-sparks," transitory sparks that usually extinguish themselves. (Micropack III only)
- <Spark Setback (%)> sets the same response for sparks, which are longer but still cause less than half of a power cycle of precipitator performance disruption.
- <Sparks Per Minute> shows the desired end value

Since the T/R controller constantly monitors secondary voltage and current to detect these sparks, it can phase back the SCRs' conduction angle slightly in the next half-cycle to stop the sparking.

Arcs

System response to arcs - disruptions in performance that last longer and are inherently more serious than sparks - is similar. But because arcs pose a larger threat to precipitator operation, the remedies are stronger.

- <Quench (Cycles or mSec)> extinguishes arcs by setting an "off" time after an arc has been detected.
 - 60 hz Supplies (degrees) - conduction angle equals 0 degrees of 1 to 10 power cycles.
 - PowerPlus (mSec) - 0 to 20 mSec of off time.
- <Fast Ramp (Cycles / mSec)> is how long it takes to raise output to the setback level, from which it will be boosted back to full power on a slow ramp.
 - 60 hz Supplies (Cycles) - Fast ramp range runs from 2 to 20 cycles.
 - PowerPlus (mSec) - Fast Ramp range runs from 0 to 20 mSec.
- <Slow Ramp (Sec.)> shows how long the system will take to reach the previous spark level after a setback, a more gradual process. 5-15 seconds is typical. (Micropack III only)

Modes

The Modes spreadsheet shows current PCAMS settings for operating your T/Rs under special conditions. These modes can reduce operating costs, handle major disruptions, avoid back corona, even operate the T/R manually without losing alarm functions and automatic response to undesirable situations.

- <F.R.> (PTC) Fast Spark Recovery, optimizes precipitator performance after heavy sparking and multiple setbacks. These conditions would normally cause very slow recovery but F.R. will restore power quickly if there is no further sparking for 10 seconds.
- <I.E.> (MEP) Intermittent Energization mode, enhances collector efficiencies by pulsing the output. This reduces energy consumption while maintaining opacity.

Back Corona Readings

Back Corona (B.C.) can cause poor precipitator performance. When Back Corona occurs, applying more power to the T/R produces no corresponding increase in the secondary voltage -- in some cases the voltage actually drops. The Modes spreadsheet shows settings for a special feature that detects Back Corona and corrects for it, in both cases by temporarily reducing power. This feature is only available for controllers configured for secondary voltage feedback.

- <Back Corona> shows whether the feature is active.
- <Time (Sec)> determines how long the T/R set stays at the lower power level before checking for Back Corona again.
- <Incr. (%)> shows how much the power is increased (Incr stands for Increment) at each step until it reaches maximum or another Back Corona condition.
- <P.B. (%)> is the amount of Phase Back applied to detect or correct a Back Corona.
- <Delay (Sec.)> is the amount of time the T/R set stays at a lower power level during the Back Corona detection phase.

Manual Operation

One other feature appears in the spreadsheet: Manual Operation.

- <Manual> shows whether the controller is in manual mode.
- <Manual Cond. (Deg / % Duty)> shows how much of the full power you are using. Maximum with a 60 Hz T/R set is 160 degrees and maximum of 100% with a PowerPlus supply.

In Manual Operation the controller continues to respond to alarms, sparks and arcs, and limits.

Configuration

Each controller is configured to match conditions at its site. The Configuration spreadsheet specifications show the configuration of power supply set in every precipitator.

The ratings and conduction angle specifications are self-explanatory. Definitions of the other items:

- <Max. C.L. (%)> is the Maximum Current Limit, the highest current setting permitted by the controller.
- <Setback Offset Mode> turns Setback Offset on and off.
- <Setback Offset (%)> applies only when Setback Offset is on. It is the fixed percentage of current reduction added to the operator programmable setback value on the first half cycle of operation after sparking.

This information is more than a reminder of current settings or a resource for the graphing functions. It also gives you a convenient reference for configuring new power Supplies.

Event Summary

You can get a tabular report of alarms that indicate potential power supply problems on the T/R Spreadsheet - Event Summary screen. It contains much of the same information found in the Event Summary screen under T/R Electrical Readings however the spreadsheet does not allow you to change settings. The spreadsheet is strictly informational and focused on one type of information only.

Status

To see whether the power supply for the selected precipitator are on or off, the serial address, controlled locally or by PCAMSNT, and have communications enabled or not, click the Status tab of the T/R Spreadsheet. This brings up a small spreadsheet that gives you this information at a glance.

The status spreadsheet also shows you

- <Level 2 Code> and <Level 3 Code> let you see the passwords in use at the Power Supplies local controller.
- <Software Ver> shows the software version of the PowerPlus, Optimizer or MicroPack controller.

Aux alarms

The Aux Alarms spreadsheet shows logic, type and count information for 4 auxiliarm alarms for each Power Supply. This spreadsheet gives you this information at a glance.

This screen will only appear if your precip is configured for the optimizer protocol.

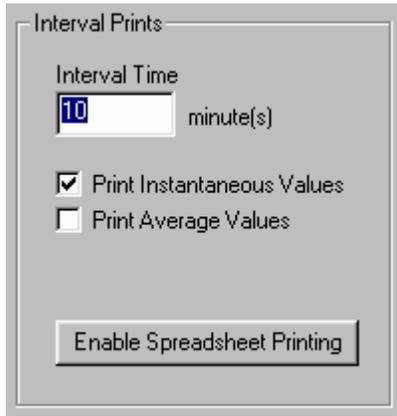
Hammers

The Hammers spreadsheet shows mode, feedback and timing information for 4 hammers for each Power Supply. This spreadsheet gives you this information at a glance.

This screen will only appear if your precip is configured for the optimizer protocol.

Printing a spreadsheet

You can configure PCAMSNT to print the electrical readings at a specified interval or print any spreadsheet instantly. These functions are available from the "Print" tab of the T/R Spreadsheet.



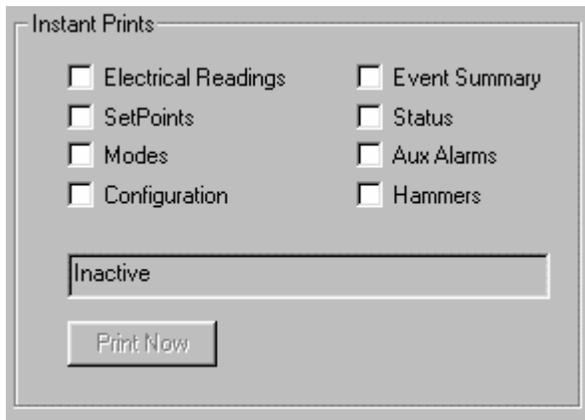
Interval Prints

Interval Time
10 minute(s)

Print Instantaneous Values
 Print Average Values

Enable Spreadsheet Printing

You can print instantaneous or average values, or both. Check those the selections you wish to print. Then enter the interval time, in minutes. This is the length of time PCAMSNT will wait before printing another spreadsheet. Click "Enable Spreadsheet Printing" to start this process. PCAMSNT will automatically print the spreadsheets in the background while you explore the rest of the program. To stop this process, return to the "Print" tab of the T/R Spreadsheet and click "Disable Spreadsheet Printing."



Instant Prints

Electrical Readings Event Summary
 SetPoints Status
 Modes Aux Alarms
 Configuration Hammers

Inactive

Print Now

Select all the spreadsheets you would like to print and then click "Print Now." (The button will become enabled after you have selected at least one spreadsheet to be printed) This instantly sends the selected spreadsheets to the printer.

V/I Curve Generation

V/I Curve Generation Overview

PCAMSNT will collect real-time information on each precipitator's power usage and collection efficiency on demand. It will store this information in tables for as many days as you need it, up to the limits of your disk space.

The V/I Curves function draws on this information, allowing you to

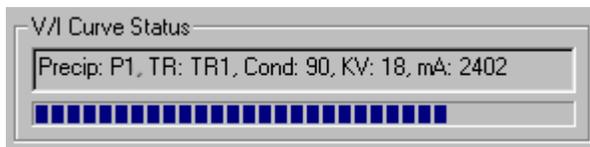
- chart voltage versus current
- store the resulting curves in individual files
- get printouts of any of these charts

Generating V/I curves

To generate a V/I Curve

- 1 Click on the Power Supply icon from the main screen
- 2 Click the "Generate V/I Curves" button
- 3 Select the Power Supplies you wish to generate curves for in the list box (you can use the "Select / Deselect All" button as a shortcut)
- 4 Set the increment and wait time
- 5 Click "Start"

A progress bar at the top of the V/I Curve Generation window indicates the percent completion of the generation of all Power Supplies selected.



The status groupbox also shows the current precip, Power Supply and conduction/duty cycle, KV and mA samples.

V/I curve generation occurs in the background so you don't have to wait at the V/I Curve Generation window for the process to complete. To cancel the generation process, you can return to the generation window and click the "Stop" button (the "Start" changes to "Stop" when the generation process has been started)

Viewing V/I curves

V/I curves can be viewed by an external program, V/I Curve. This program can be launched directly from PCAMS.



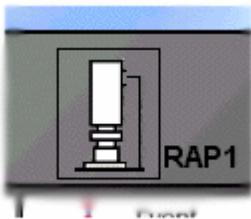
Just click on the V/I curve icon, the top-left icon on the toolbar on the main screen.

Rappers

Layout

Rapper layout window

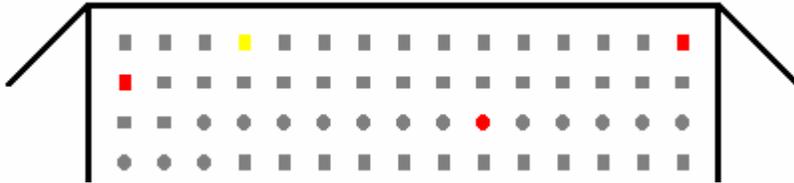
PCAMSNT lets you monitor rappers and vibrators as easily and thoroughly as T/R sets. The rapper layout screen shows you how the rappers are physically arranged, which ones are firing, and which ones have had trouble - all in a single glance.



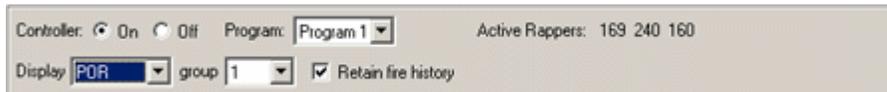
You get to the rapper layout by clicking on the rapper icon on the main screen.

Layout display

The graphic layout is not just a picture. It lets you know what each rapper is doing at any given time.



- Rappers that are firing appear in red
- Rappers with activated alarms appear in yellow
- If selected, rappers that have already fired appear in green



Controller

Use this to set controller operation on or off.

Program

Select the active program. This also displays the program currently running.

Active Rappers

The active rappers, shown in red, are also displayed in the active rapper caption at the top-right of the layout.

Display / Group

If you wish to display rappers in a program group, POR group, or ACG group, in a different color, select the type here, or *None*. Then select the group you wish to display. Note: Megarap controllers can only display Program groups.

Retain fire history

When checked, all rappers that have already fired since the Rapper Layout window has been open, will be displayed in green. Uncheck this to clear all rappers that have been painted green.

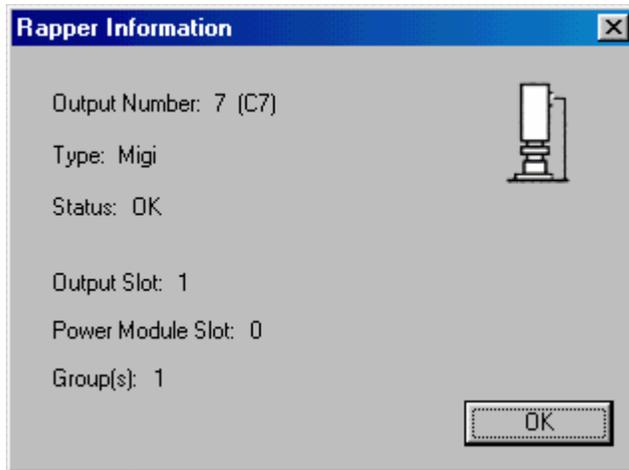
Rapper protocols

The remainder of the rapper layout documentation will be divided into two sections, one for each rapper controller type. Older systems using MegaRap I or II rapper controllers use a communications protocol that does not allow for some of the newer features available with the graphical rapper controller (GRC). Because of that, the rapper layout window functions differently for the two types.

Megarap Controller

Rapper information screen

Click on any rapper image and you'll bring up a Rap/Vib Information screen. The contents of this screen will depend on the rapper controller type you are using.



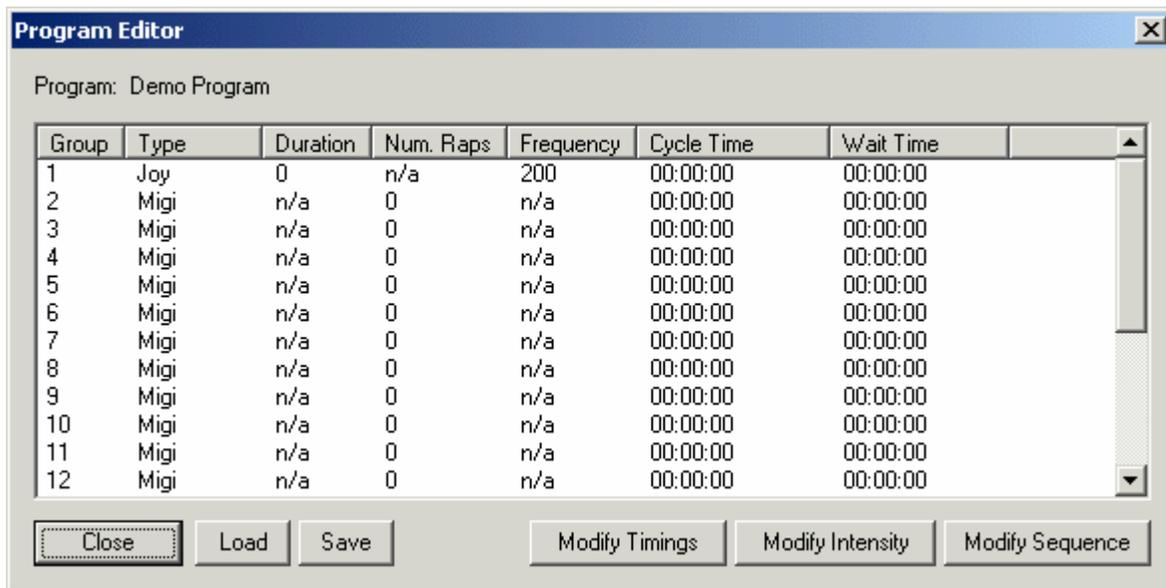
This window shows the following information for the selected rapper:

- the output number
- its type
- its status: whether it is enabled or alarmed
- the output slot the rapper is in
- the power module belongs to

Program Editor

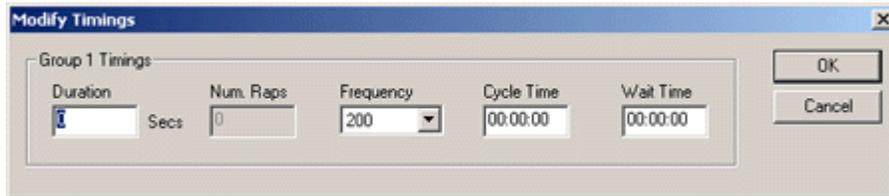
Program editor window

The most important aspect of a rapper controller is the creation of optimum rapping programs. Rapper programs consist of timing values, lift information, etc. and are all important to achieving optimum performance. Either through experience or trial and error, operators can fine tune programs to produce the most effective results in the precipitator.



Modifying timings

The *Modify Timings* window allows you to enter rapper timing mode information. The rapper timing mode is used to update the various timing parameters for each rapper group.



Duration

This value is used for vibrator type "rappers" and is not used for the MIGI, ENELCO, or rotating hammer rapper types. The value controls the time that each rapper will stay energized within group x. It is programmable from 1 to 59 seconds.

Num. Raps

This value is used only for MIGI and ENELCO rapper types. It is the number of times each rapper will be repetitively energized and is programmable from 1 to 99.

Frequency

This value is used only for the JOY rapper type. It is the frequency at which the JOY rappers in group x will be operated.

Cycle Time

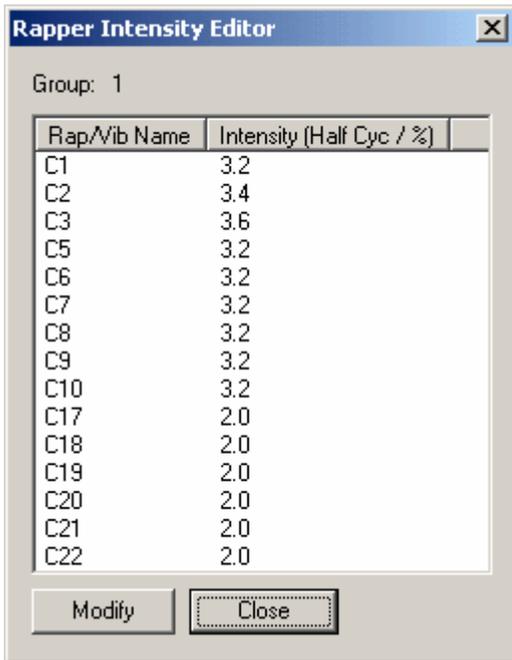
This value is the amount of time a group's entire timing sequence will take (assuming that the group's wait time equals zero). It is programmable from 00:00:00 to 23:59:59. Entering a time equal to zero will effectively disable the group.

Wait Time

The group's wait time is added to the amount of time between the last rapper and the first rapper in a group's sequence. It is programmable from 00:00:00 to 23:59:59.

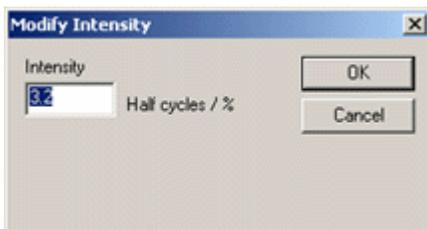
Modifying intensities

The *Rapper Intensity Editor* permits the user to modify all of the rapper intensities in a group, or set the intensity for an individual rapper. These values do not apply to rotating hammer or NAVCO type rappers.



Intensity control for rappers is accomplished through the use of system power modules. The power modules provide excitation to one or more output modules when intensity control is required. Intensity control is accomplished by varying both the number of exciting line half cycles and by varying the conduction angle of the cycles. To protect the system step down transformer, the system will always energize rappers / vibrators such that the first half cycle is opposite in polarity from the last half cycle output.

To modify the intensity for a rapper, click on the rapper, then click *Modify*.

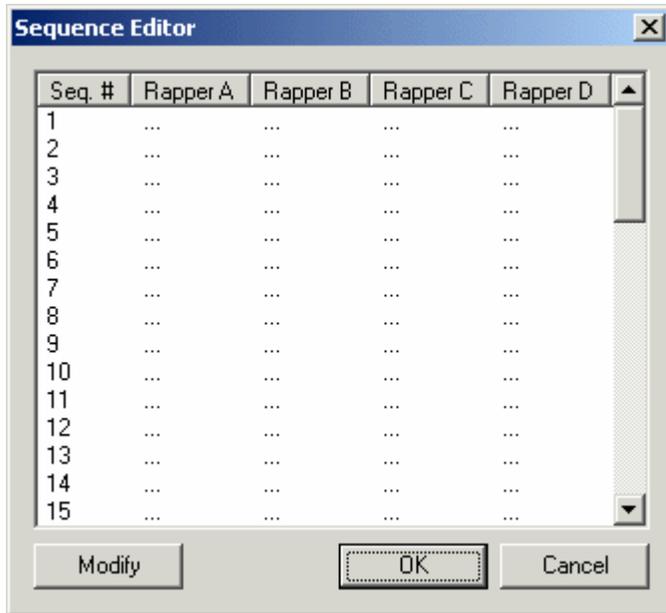


For AC type vibrators, intensity control is achieved by varying the conduction angle of each half cycle applied to the device. The intensity for a vibrator is programmable in 5% increments from 0 to 100% providing accurate control of the power applied to the device.

Sequence Editor

Sequence editor window

The Mega-Rap System is capable of firing as many as four (4) devices simultaneously. The devices must be assigned to separate power modules. Navco and rotating hammer devices do not use power modules and can always be simultaneously energized.



Modifying sequences

To modify rappers for a sequence, choose the sequence number, then click *Modify*.



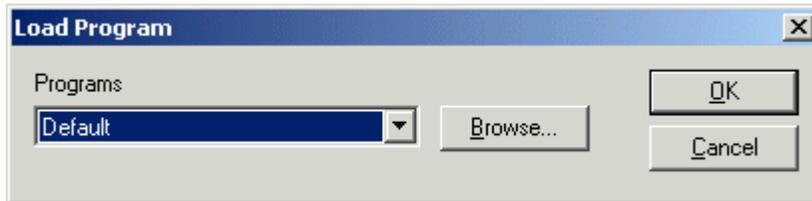
| Seq. # | Rapper A | Rapper B | Rapper C | Rapper D |
|--------|----------|----------|----------|----------|
| 1 | None | None | None | None |

OK Cancel

Select the rappers you wish to fire simultaneously, for this sequence. You may make up to four selections. Select *None* to indicate no rapper selection.

Loading programs

To load a previously saved program, from disk or from the MegaRap, click *Load* to bring up the *Load Program* window.



Programs

You can select one of the 4 programs stored on the MegaRap, or any programs that have been saved to disk, and are located in the PCAMSNT directory, from this combo-box.

Browse

To load programs saved to file, stored in a directory other than the PCAMSNT directory, or from floppy, use the *Browse* button to locate and load the file.

Saving programs

To save a program to file or to be stored in the MegaRap, click *Save Program*.



Programs

You can select one of the 3 user programs stored on the MegaRap, or any programs that have already been saved to disk, and are located in the PCAMSNT directory, from this combo-box.

Save To File

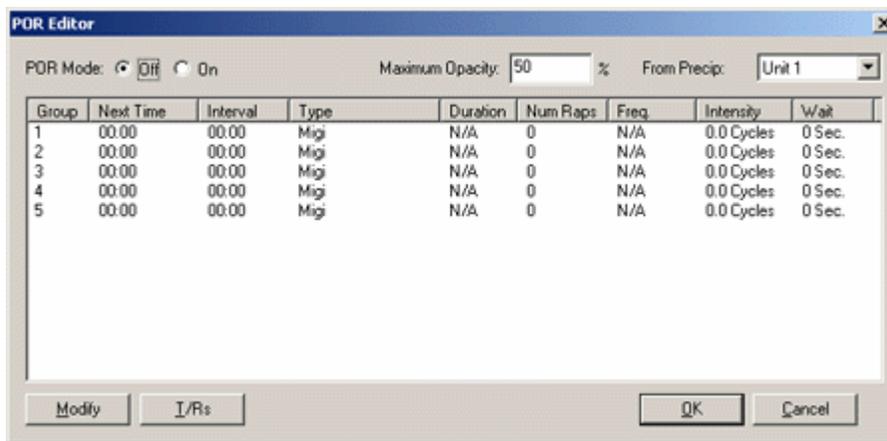
To select a new filename to save to, use the *Save To File* button.

POR Program Editor

POR editor window

Power off rapping (POR) or reduced power rapping is a process used in industry to clean the collecting plates in a precipitator when normal rapping is not sufficient. This is usually necessary when highly resistive ash has built up on a plate. To remove this ash, it is required to reduce the electric force being exerted on the particles and then heavily rapping the plate.

The precipitator products manufactured by NWL Transformers may be controlled by PCAMS/NT, which commands the Mega-Rap to perform POR and the Micro-Pack T/R controller to change its power level.



The screenshot shows the 'POR Editor' window. At the top, there are controls for 'POR Mode' (radio buttons for 'Off' and 'On'), 'Maximum Opacity' (a text box with '50' and a '%' sign), and 'From Precip' (a dropdown menu with 'Unit 1'). Below these is a table with the following data:

| Group | Next Time | Interval | Type | Duration | Num Raps | Freq | Intensity | Wait |
|-------|-----------|----------|------|----------|----------|------|------------|--------|
| 1 | 00:00 | 00:00 | Migi | N/A | 0 | N/A | 0.0 Cycles | 0 Sec. |
| 2 | 00:00 | 00:00 | Migi | N/A | 0 | N/A | 0.0 Cycles | 0 Sec. |
| 3 | 00:00 | 00:00 | Migi | N/A | 0 | N/A | 0.0 Cycles | 0 Sec. |
| 4 | 00:00 | 00:00 | Migi | N/A | 0 | N/A | 0.0 Cycles | 0 Sec. |
| 5 | 00:00 | 00:00 | Migi | N/A | 0 | N/A | 0.0 Cycles | 0 Sec. |

At the bottom of the window are buttons for 'Modify', 'I/Rs', 'OK', and 'Cancel'.

POR Mode

Use this to turn POR operation on or off.

Maximum Opacity

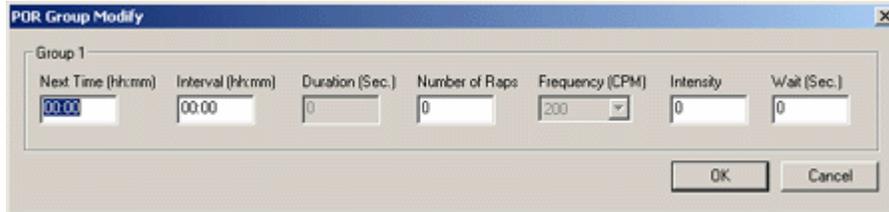
Set the maximum opacity condition allowable in order to run POR. If this opacity is reached, POR will be suspended.

From Precip

Set the precip you wish to use for the opacity reading.

Modifying a POR group

To modify a POR group, select the group you wish to modify, then click *Modify*.



Next Time

Enter the next time you want POR to start for this group. Programmable in hours and minutes from 00:00 to 23:59.

Interval

Enter the time interval in which POR should take for this group. When this interval has elapsed, the *Next Time* value will be incremented by this value.

Duration

This value is used for vibrator type "rappers" and is not used for the MIGI, ENELCO, or rotating hammer rapper types. The value controls the time that each rapper will stay energized within group x. It is programmable from 1 to 59 seconds.

Num. Raps

This value is used only for MIGI and ENELCO rapper types. It is the number of times each rapper will be repetitively energized and is programmable from 1 to 99.

Frequency

This value is used only for the JOY rapper type. It is the frequency at which the JOY rappers in group x will be operated.

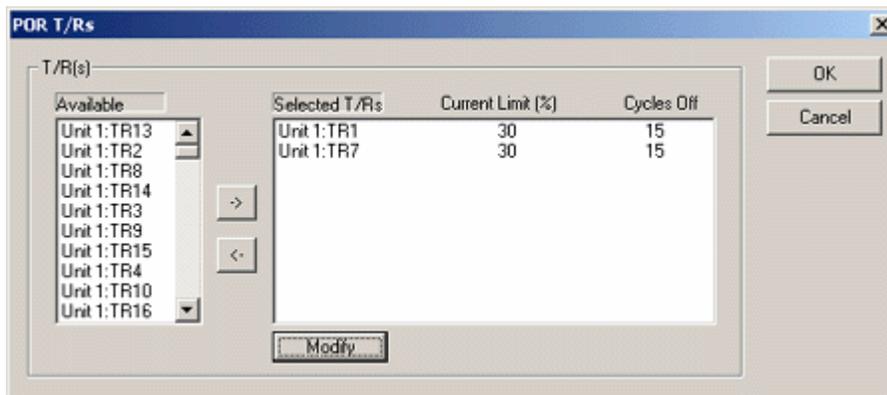
Wait

The group's wait time is added to the amount of time between the last rapper and the first rapper in a group's sequence. It is programmable from 00:00:00 to 23:59:59.

POR T/Rs

POR T/Rs window

To select which power Supplies to power down during POR for a group, click on the group, then click *T/Rs*.



Available

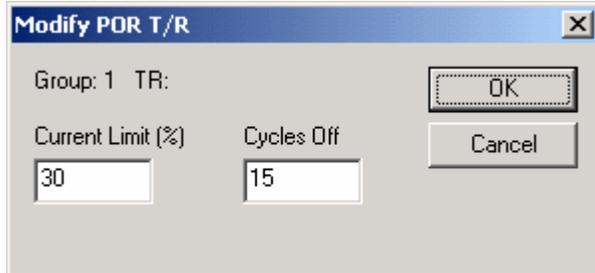
Select from the list of all available Power Supplies on this precipitator.

Selected Power Supplies

The power Supplies in this list are those that you have selected from *Available* power supplies that will be powered down as you configure during POR for this group.

Modify T/R

To modify a T/R, click on it in the *Selected T/Rs* list, then click *Modify*.



The screenshot shows a dialog box titled "Modify POR T/R". It has a close button (X) in the top right corner. The dialog contains the following elements:

- Text: "Group: 1 TR:"
- Text: "Current Limit (%)" with an input field containing "30".
- Text: "Cycles Off" with an input field containing "15".
- Buttons: "OK" and "Cancel".

Current Limit

Enter the current limit to power this T/R down to during POR.

Cycles Off

If operating in IE mode, enter the cycles off to power this T/R down to during POR.

Program Manager

Program manager window

PCAMS can also control automatic program selection, remotely, from the PCAMS Program Manager. The Program Manager works by walking down the list of steps configured until the first range approached is satisfied. It then switches to the program specified in that step. If current conditions lie within the range configured in step 1, the program in step 1 will be activated, even if conditions also satisfy other steps' ranges, because they have lower priority.

The screenshot shows the 'Program Manager' window. At the top, there are two sections: 'Program Manager Mode' with radio buttons for 'Off' (selected) and 'On', and 'Primary Program' with radio buttons for 'Default' (selected), 'User 1', 'User 2', 'User 3', and 'Editor'. Below these is a 'Configure' button. The main area is a table with 5 rows and 5 columns: 'Step', 'Program', 'Control', 'Time Range', and 'Boiler Load Range'. Each row contains a dropdown menu for 'Program', a dropdown menu for 'Control', and two input fields for 'Time Range' and 'Boiler Load Range'. At the bottom are 'OK', 'Cancel', and 'Apply' buttons.

| Step | Program | Control | Time Range | Boiler Load Range |
|------|---------|---------|----------------------|-------------------|
| 1 | Default | None | 00:00:00 to 00:00:00 | 0 to 0 |
| 2 | Default | None | 00:00:00 to 00:00:00 | 0 to 0 |
| 3 | Default | None | 00:00:00 to 00:00:00 | 0 to 0 |
| 4 | Default | None | 00:00:00 to 00:00:00 | 0 to 0 |
| 5 | Default | None | 00:00:00 to 00:00:00 | 0 to 0 |

Program Manager Mode

Turn PCAMS Program manager operation on or off using these buttons.

Primary Program

When none of the event ranges currently exist, the program selected here will run.

Step

The order each range should be evaluated in, when selecting a program to run.

Program

The program to run if current conditions lie within the range configured for this step. Programmable to Megarap programs *Default*, *User 1 - 3*, or *Editor*.

Control

Determines which set of ranges to use for evaluating this step. Programmable to time, boiler load, or none to skip this step.

Time Range

The time range in which the program for this step should run.

Boiler Load Range

The boiler load range in which the program for this step should run.

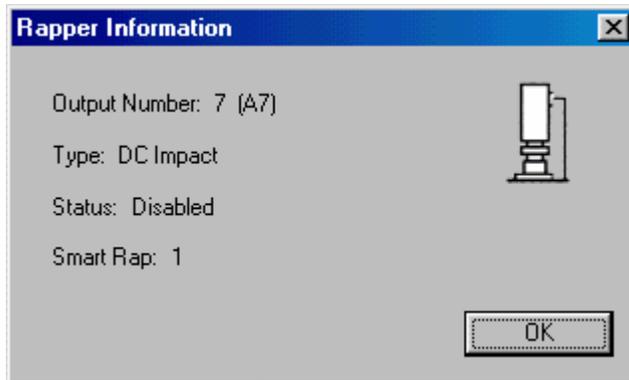
Apply

To apply these settings without closing the window, click Apply. This has the same affect as clicking on *OK*.

Graphical Rapper Controller (GRC)

Rapper information screen

Click on any rapper image and you'll bring up a Rap/Vib Information screen. The contents of this screen will depend on the rapper controller type you are using.



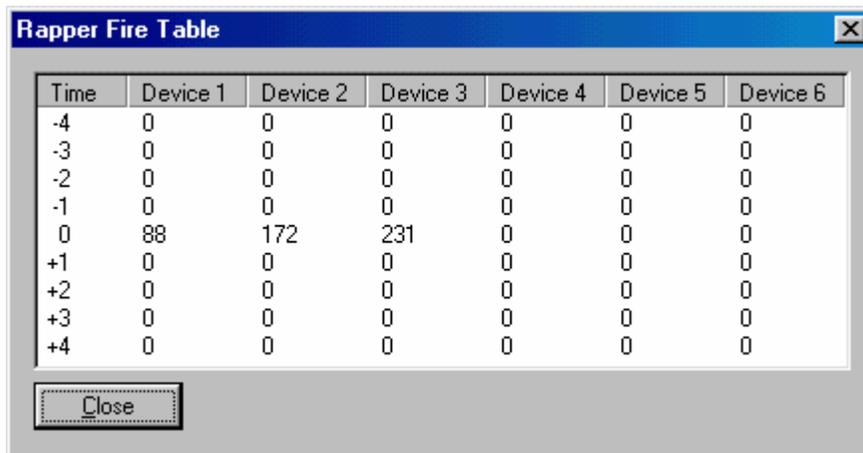
This window shows the following information for the selected rapper:

- the output number
- its type
- its status: whether it is enabled or alarmed
- the Address of the Smart Rap card it is controlled by

Monitoring

Fire table

You can monitor the current status of the rapper controller in real-time. The monitor window provides operators with a 9-second window of the GRC System's rapper activity. Up to 6 rappers can be energized in 1 second. Use the "Monitor" pulldown menu to select any of the following screens:

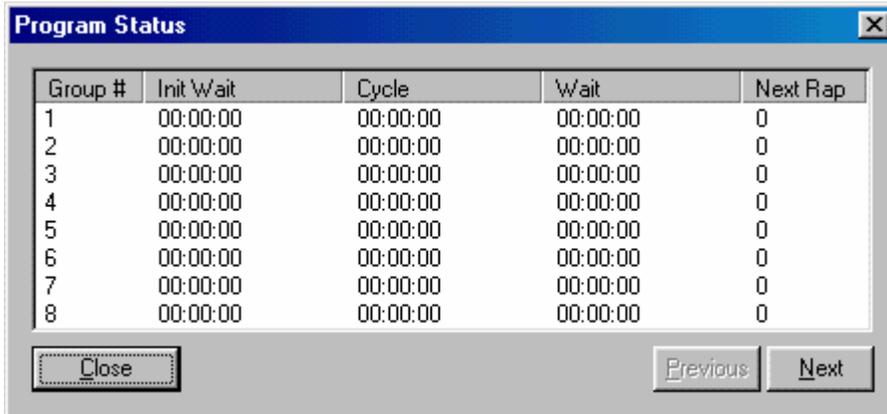


| Time | Device 1 | Device 2 | Device 3 | Device 4 | Device 5 | Device 6 |
|------|----------|----------|----------|----------|----------|----------|
| -4 | 0 | 0 | 0 | 0 | 0 | 0 |
| -3 | 0 | 0 | 0 | 0 | 0 | 0 |
| -2 | 0 | 0 | 0 | 0 | 0 | 0 |
| -1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 88 | 172 | 231 | 0 | 0 | 0 |
| +1 | 0 | 0 | 0 | 0 | 0 | 0 |
| +2 | 0 | 0 | 0 | 0 | 0 | 0 |
| +3 | 0 | 0 | 0 | 0 | 0 | 0 |
| +4 | 0 | 0 | 0 | 0 | 0 | 0 |

The fire table monitoring window shows you which devices are firing now, which devices have fired up to 4 seconds ago, and which devices are about to fire within 4 seconds.

Program status

The program status monitoring window shows you details about the current program while it is running. You are able to view the countdown of initial wait, cycle and wait time, and view the next rapper in the queue.



| Group # | Init Wait | Cycle | Wait | Next Rap |
|---------|-----------|----------|----------|----------|
| 1 | 00:00:00 | 00:00:00 | 00:00:00 | 0 |
| 2 | 00:00:00 | 00:00:00 | 00:00:00 | 0 |
| 3 | 00:00:00 | 00:00:00 | 00:00:00 | 0 |
| 4 | 00:00:00 | 00:00:00 | 00:00:00 | 0 |
| 5 | 00:00:00 | 00:00:00 | 00:00:00 | 0 |
| 6 | 00:00:00 | 00:00:00 | 00:00:00 | 0 |
| 7 | 00:00:00 | 00:00:00 | 00:00:00 | 0 |
| 8 | 00:00:00 | 00:00:00 | 00:00:00 | 0 |

Group #

Shows the current rapper group (1 - 64)

Init Wait

Displays the amount of initial wait time remaining for a rapper group. If this value is at 00:00:00, the rapper group is in either cycle or wait time mode.

Cycle

Displays the amount of cycle time remaining between rappers in a group. When the cycle time counts down to 00:00:00, the NextRap will be energized.

Wait

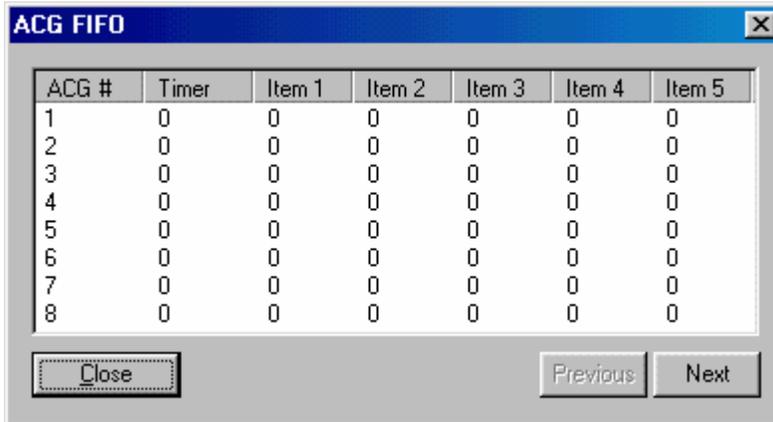
After completing a rapper sequence, a group will enter a wait period (if programmed to do so). Once the wait time counts down to zero, the group will re-enter the cycle mode and start to energize rappers again.

Next Rap

This field shows the next rapper scheduled to fire for the group

ACG FIFO

During normal rapper program operation, an Anti-coincidence scheme can be setup to prevent "gas-flow" rapping and eventual re-entrainment. The Anti-coincidence (ACG) FIFO (First In First Out) monitoring window will display rappers that are currently held due to ACG conflicts.



| ACG # | Timer | Item 1 | Item 2 | Item 3 | Item 4 | Item 5 |
|-------|-------|--------|--------|--------|--------|--------|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 0 | 0 | 0 | 0 | 0 | 0 |

ACG #

Shows the anti-coincidence group number (1 - 64)

Timer

Indicates the amount of time remaining for the ACG. When this time counts down to 0, the next device in the FIFO will be scheduled to fire and has priority over the normal rapper activity.

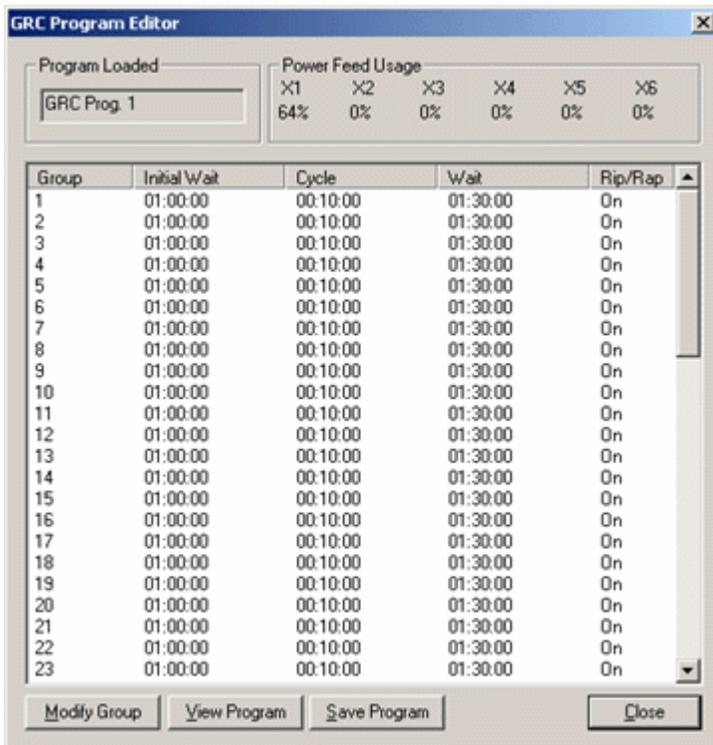
FIFO

FIFO, or First In First Out, shows the list of devices that have been held due to a ACG conflict. As the name implies, the first rapper entered into the list is the first to be removed.

Program Editor

Program editor window

The most important aspect of a rapper controller is the creation of optimum rapping programs. Rapper programs consist of timing values, lift information, etc. and are all important to achieving optimum performance. Either through experience or trial and error, operators can fine tune programs to produce the most effective results in the precipitator. The GRC System supports what the industry considers a "time-based" rapper controller. This type of controller is more flexible than older style "sequence-based" rapper controllers. Independent groups of rappers can be assigned different timing values. This is important for rapping inlet fields more often than center fields, and center fields more often than outlet fields. The GRC offers the most complex program capabilities in the industry. Up to 64 groups, 48 rappers per group, individual settings per rapper, and no limitation on assigning rappers to more than one group provide the user with the flexibility to create just about any program they desire.



Power Feed Usage

The GRC System allows up to 6 separate power feeds. Each power feed is assigned to one or more S-Rap slots. PCAMS will not allow you to save a program in which any one power feed's usage level is greater than 100%.

Modifying a group

To modify a group, click on the group number, then click *Modify*. The Modify window will appear.

The screenshot shows a 'Modify' dialog box for 'Group: 1'. It features a 'Timing' section with three time input fields: 'Initial Wait' (01:00:00), 'Cycle' (00:10:00), and 'Wait' (01:30:00). Below this is a 'Rip/Rap' dropdown menu currently set to 'ON'. At the bottom of the dialog are three buttons: 'Group Firing Sequence', 'OK', and 'Cancel'.

Group #

Shows the current group number (1 - 64).

Init Wait

The initial wait time of a group is defined as the "one-time" delay before initiating rapper activity. The initial wait time is useful for offsetting groups of rappers with identical timing.

Cycle

The cycle time of a group is defined as the amount of time it takes to completely "cycle" through all of the rapper sequences assigned to this group. Rappers will be evenly spaced throughout a group's cycle time.

Wait

The wait time of a group is defined as the amount of time to delay after the completion of a cycle period before restarting the cycle mode.

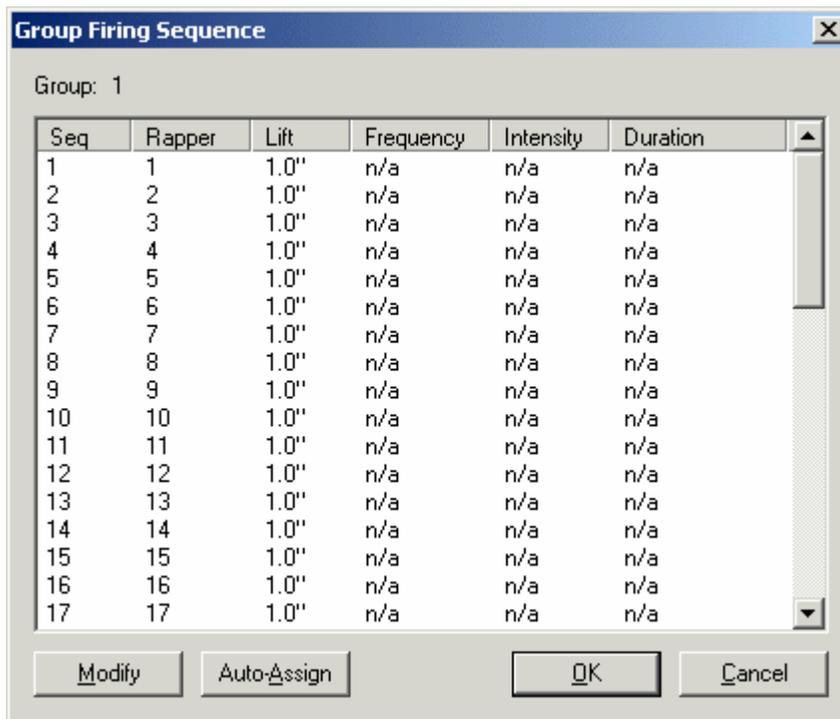
Rip/Rap

When the Rip/Rap field is On, DC Impact devices will be fired using the Rip/Rap algorithm. Four "Rips" of power with increasing energy are applied to the rappers with the fourth "Rip" equal to the assigned lift. The groups cycle time will allow for 2 seconds for each DC Impact device when Rip/Rap is enabled. Programmable as On and Off.

Group Firing Sequence

Group firing sequence window

To view or modify group firing sequences, click *Group Firing Sequence* from the rapper group modify window.

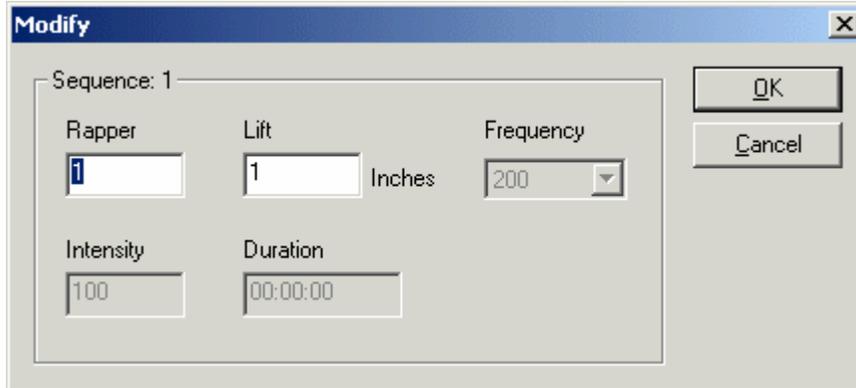


Group

Shows the current group number (1 - 64) of the sequence information being displayed.

Modify group firing sequence

To modify a sequence, click on the sequence number and then click *Modify*.



The screenshot shows a 'Modify' dialog box with the following fields and values:

| Field | Value |
|-----------|----------|
| Sequence | 1 |
| Rapper | 1 |
| Lift | 1 Inches |
| Frequency | 200 |
| Intensity | 100 |
| Duration | 00:00:00 |

Sequence

Shows the current sequence number you are editing (1 - 48).

Rapper

This field represents the rapper output number to fire when this sequence member is scheduled. Assigning a rapper number of 0 to a sequence will insert a cycle time slot but not fire a rapper. Doing this will essentially insert a pause into the group firing cycle equal to *cycle time / number of sequences in the group*. The rapper numbers can be auto-assigned by clicking on the *Auto-Assign* button.

Lift

If the rapper assigned for this sequence member is a DC Impact type device, enter the desired lift in inches. Otherwise, this field is ignored. Programmable from 0 to 16 inches, in .5 inch steps.

Freq

If the rapper assigned for this sequence member is a Multi-Impact type device, enter the desired frequency in cycles per minute. Programmable in 13 preset steps from 200 to 600.

Intensity

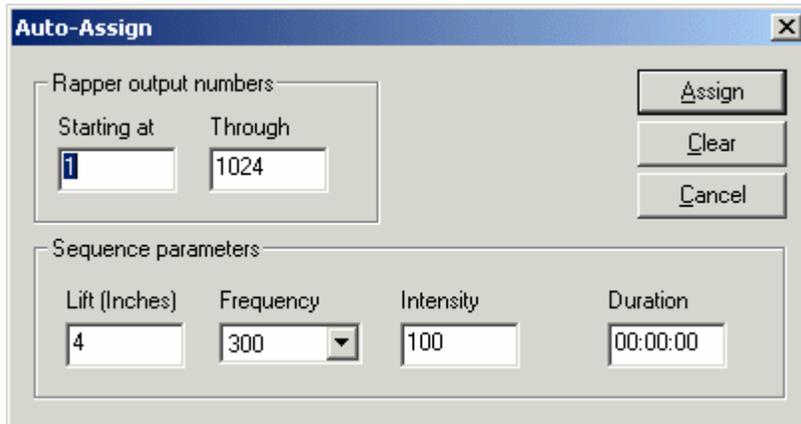
If the rapper assigned for this sequence member is a Vibrator or Multi-Impact type device, enter the desired intensity value in percentage. Programmable from 0 - 100%. Changes to the intensity less than 100% will result in ½ cycles of power applied at less than full conduction.

Duration

If the rapper assigned for this sequence member is a Vibrator, Multi-Impact, or Motor type device, enter the desired duration value in seconds. Programmable from 00:00:00 to 23:59:59. For DC Impact type devices, verify this value is 00:00:00 to prevent inaccurate results to the program timing check.

Auto-assigning sequences

To automatically assign rapper numbers, click on the sequence number you wish to start assigning from, then click the *Auto-Assign* button.



Starting At

This is the rapper number to start assigning at. The sequence number you clicked on will receive this value.

Through

This is the rapper number to end assigning at. For example, if you clicked on sequence number 5, and enter 1 for *Starting At* and 10 for *Through*, then sequences 1 - 4 will remain empty (or unchanged) and sequences 5 - 15 will contain rapper numbers 1 - 10, respectively.

Sequence parameters

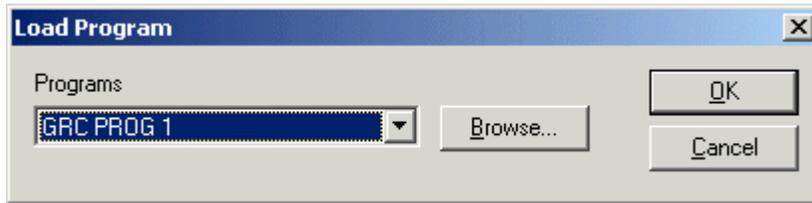
These are the same parameters you can manually modify from the *Group Firing Sequence* window. For convenience, the sequences you wish to auto-assign will take on these values by default. You may change these values later by modifying each sequence separately.

Clear

Use this function to clear the entire sequence list, rapper numbers and sequence parameters.

Viewing programs

To view a previously saved program, from file or stored in the GRC, click *View Program*.



Programs

You can select one of the 5 programs stored on the GRC, or any programs that have been saved to disk, and are located in the PCAMS directory, from this combo-box.

Browse

To load programs saved to file, stored in a directory other than the PCAMS directory, or from floppy, use the *Browse* button to locate and load the file.

Saving programs

To save a program to file or to be stored in the GRC, click *Save Program*.



Programs

You can select one of the 5 programs stored on the GRC, or any programs that have already been saved to disk, and are located in the PCAMS directory, from this combo-box.

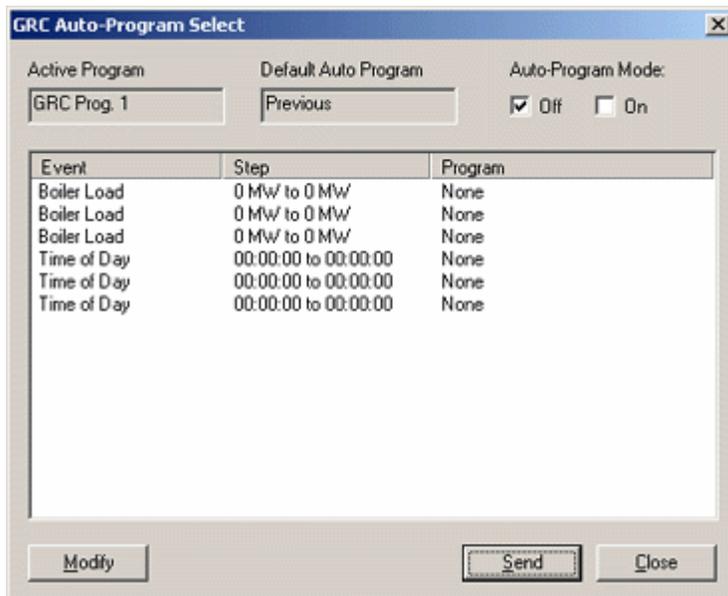
Save To File

To select a new filename to save to, use the *Save To File* button.

Auto-Program Select

GRC Auto-program select window

This window configures the Auto-Program Select features of the GRC System. Therefore once configured, it will continue to operate regardless of whether PCAMSNT is operational or not. This feature may require that the user supply and configure a 4-20ma signal for boiler load wired to the GRC backplane. Automatic changes to the active operating program can be triggered either by boiler load or time of day. This eliminates the need for operators to make constant program changes throughout the day or when load changes occur in the precipitator. Experience shows that different boiler loads require different operating programs to maintain an optimum level of performance.



Active Program

The program that is currently running.

Default Program

When the S-CPU performs the auto-program select algorithm and no matches are found, the default program will be used.

Auto-Program Mode

Use the checkboxes to turn auto-program operation on or off.

Boiler Load .. to .. Program

Set the minimum and maximum boiler load ranges and the associated operating program. The S-CPU will then automatically make the changes for you as the boiler load changes. In order to enable this feature, the 4 - 20mA boiler load signal must be connected to the S-CPU module.

Time .. to .. Program

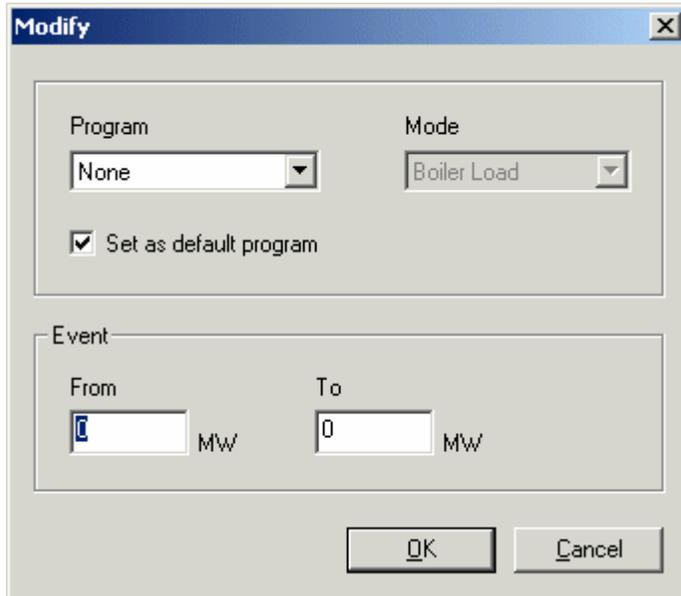
Automatically switch to a "faster" program at midnight or switch programs at each

shift change. Simply set the time ranges and associated program and the changes will automatically occur. Verify that the S-CPU time is set correctly.
Send

To send your auto-program configuration to the GRC, click *Send*.

Modifying an auto-program

To modify an item in the *GRC Auto-Program Select* window, click on the item you wish to modify, then click *Modify*.



Program

Select the GRC Program (1 - 5) you wish this event to trigger, or *None* to make this event non-effective.

Mode

Displays the event type. This is determined by the event you clicked on in the *GRC Auto-Program Select* window.

Set as default program

Check this to make the program you selected the default program. When the S-CPU performs the auto-program select algorithm and no matches are found, the default program will be used.

From

If you are editing a boiler load event, enter the starting MW range. If you are editing a time of day event, enter the starting time range.

To

If you are editing a boiler load event, enter the ending MW range. If you are editing a time of day event, enter the ending time range.

PCAMS Program Manager

Program manager window

PCAMS can also control automatic program selection, remotely, from the PCAMS Program Manager. The Program Manager works by walking down the list of steps configured until the first range approached is satisfied. It then switches to the program specified in that step. If current conditions lie within the range configured in step 1, the program in step 1 will be activated, even if conditions also satisfy other steps' ranges, because they have lower priority.

| Step | Program | Control | Time Range | Boiler Load Range |
|------|------------|---------|----------------------|-------------------|
| 1 | GRC PROG 1 | None | 00:00:00 to 00:00:00 | 0 to 0 |
| 2 | GRC PROG 1 | None | 00:00:00 to 00:00:00 | 0 to 0 |
| 3 | GRC PROG 1 | None | 00:00:00 to 00:00:00 | 0 to 0 |
| 4 | GRC PROG 1 | None | 00:00:00 to 00:00:00 | 0 to 0 |
| 5 | GRC PROG 1 | None | 00:00:00 to 00:00:00 | 0 to 0 |

Program Manager Mode

Turn PCAMS Program manager operation on or off using these buttons.

Primary Program

When none of the event ranges currently exist, the program selected here will run.

Step

The order each range should be evaluated in, when selecting a program to run.

Program

The program to run if current conditions lie within the range configured for this step. Programmable to GRC programs 1 - 5.

Control

Determines which set of ranges to use for evaluating this step. Programmable to time, boiler load, or none to skip this step.

Time Range

The time range in which the program for this step should run.

Boiler Load Range

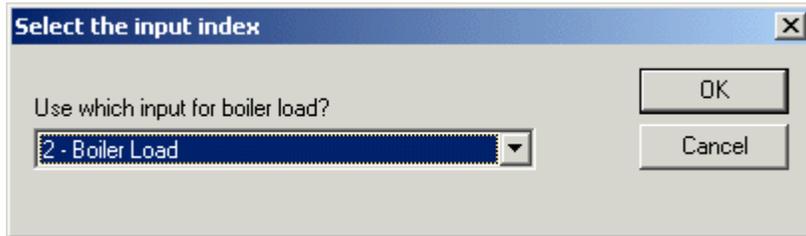
The boiler load range in which the program for this step should run.

Apply

To apply these settings without closing the window, click Apply. This has the same affect as clicking on OK.

Configuring the boiler load input index

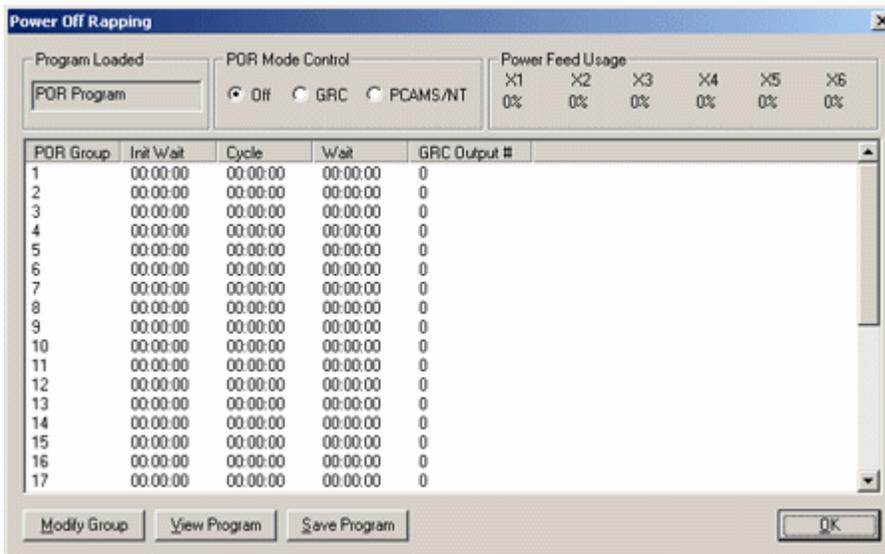
To select the auxiliary I/O input index to use to determine the boiler load signal, click on the *Configure* button and choose the appropriate input index from the combobox.



POR Program Editor

Power off rapping

Separate from the normal operating programs, rappers can be scheduled to fire while power is removed or reduced from T/R sets. This type of rapping provides a more effective cleaning especially in situations with "sticky" fly ash. An output can be assigned to each Power Off Rapping (POR) group to signal third party T/R's to reduce or remove power while POR occurs. PCAMS/NT will monitor the GRC for POR activity and automatically reduce power to the associated NWL ESP Power Optimizer T/R controller. The GRC System supports up to 32 POR groups with 48 sequence members per group.



Power Feed Usage

The GRC System allows up to 6 separate power feeds. Each power feed is assigned to one or more S-Rap slots. PCAMS will not allow you to save a program in which any one power feed's usage level is greater than 100%.

POR Mode Control

To have the GRC control POR operation, select *GRC*. To have PCAMS/NT control POR operation, select *PCAMS/NT*. To turn POR off, select *Off*.

Modifying a POR group

To modify a POR group, click on the group and then click *Modify Group*.

The screenshot shows a dialog box titled "POR Group Modify". At the top left, it says "POR Group: 1". To the right is a text box labeled "POR Output #" containing the number "0". Below this is a section titled "Timing" which contains three text boxes: "Init. Wait" with "00:00:00", "Cycle" with "00:00:00", and "Wait" with "00:00:00". At the bottom of the dialog are three buttons: "Group Firing Sequence", "OK", and "Cancel".

POR Group

Shows the current POR group number (1 - 32).

Init Wait

The initial wait time of a POR group is defined as the "one-time" delay before initiating rapper activity. Programmable from 00:00:00 to 23:59:59.

Cycle

The cycle time of a POR group is defined as the amount of time it takes to completely "cycle" through all the assigned rappers. Programmable from 00:00:00 to 23:59:59.

Wait

The wait time of a POR group is defined as the amount of time to delay after the completion of a cycle period before restarting the cycle mode. Programmable from 00:00:00 to 23:59:59.

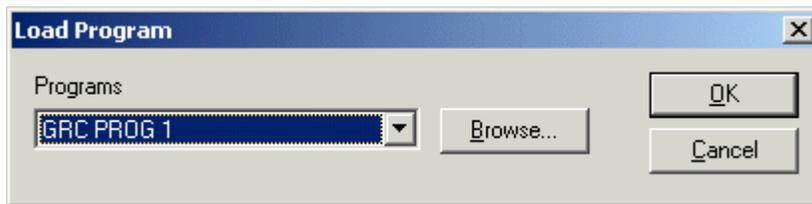
POR Output #

The output number is used to notify third-party T/R controllers prior to initiating rapper activity for a POR group. Programmable from 0 to 1024. Note, the output number must be an output located on a Smart-Rap card configured for POR output.

Group Firing Sequence

Viewing programs

To view a previously saved program, from file or stored in the GRC, click *View Program*.



Programs

You can select to load the GRC POR Program, stored on the GRC, or any programs that have been saved to disk, and are located in the PCAMS directory, from this combo-box.

Browse

To load programs saved to file, stored in a directory other than the PCAMS directory, or from floppy, use the *Browse* button to locate and load the file.

Saving programs

To save a program to file or to be stored in the GRC, click *Save Program*.



Programs

You can select to save the GRC POR Program, stored on the GRC, or any programs that have already been saved to disk, and are located in the PCAMS directory, from this combo-box.

Save To File

To select a new filename to save to, use the *Save To File* button.

ACG

ACG window

Each of the GRC System's program groups operates with individual timers and sequences. In order to prevent rappers within the same precipitator lane to fire together, anti-coincidence groups (ACG) must be configured. The GRC System supports up to 4 ACG's for each rapper.

| Rapper | 1st ACG | 2nd ACG | 3rd ACG | 4th ACG |
|--------|---------|---------|---------|---------|
| 1 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 |
| 4 | 0 | 0 | 0 | 0 |
| 5 | 0 | 0 | 0 | 0 |
| 6 | 0 | 0 | 0 | 0 |
| 7 | 0 | 0 | 0 | 0 |
| 8 | 0 | 0 | 0 | 0 |
| 9 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 0 |
| 11 | 0 | 0 | 0 | 0 |
| 12 | 0 | 0 | 0 | 0 |
| 13 | 0 | 0 | 0 | 0 |
| 14 | 0 | 0 | 0 | 0 |
| 15 | 0 | 0 | 0 | 0 |
| 16 | 0 | 0 | 0 | 0 |
| 17 | 0 | 0 | 0 | 0 |
| 18 | 0 | 0 | 0 | 0 |
| 19 | 0 | 0 | 0 | 0 |
| 20 | 0 | 0 | 0 | 0 |

While the system is operating, the ACG FIFO's can be viewed from the *Monitor* window by selecting ACG FIFO.

ACG Time

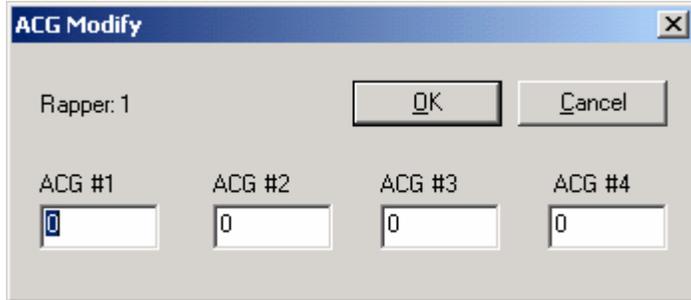
When the S-CPU detects a conflict between rappers of the same ACG, it will delay the higher number device by the preset *ACG Time*. Typically, this is configured as the amount of time it takes for fly ash to completely pass through the precipitator. A value of 0 disables the ACG algorithm. Programmable from 0 to 99 seconds.

Send

Click this to send this information to the GRC System.

Modifying ACG

To modify ACG settings, click on the rapper number, then click *Modify*.



The screenshot shows a dialog box titled "ACG Modify" with a close button (X) in the top right corner. The dialog contains the following elements:

- A label "Rapper: 1" on the left.
- Two buttons, "OK" and "Cancel", positioned to the right of the "Rapper: 1" label.
- Four input fields labeled "ACG #1", "ACG #2", "ACG #3", and "ACG #4" arranged horizontally.
- Each of the four input fields contains the number "0".

Rapper #

Shows the current rapper number (1 - 1024).

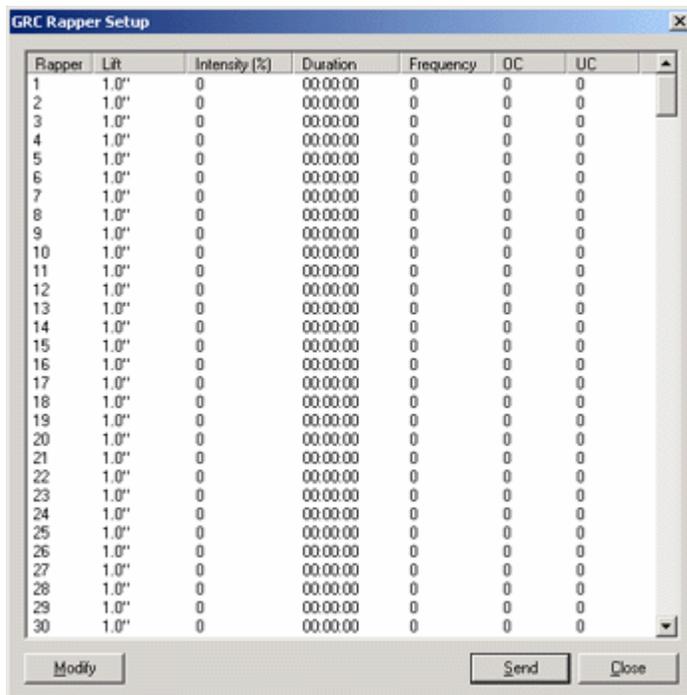
ACG 1 - 4

The four fields represent the anti-coincidence group assignments. The GRC System supports up to 64 ACG's.

Rapper Setup

Rapper setup window

When a S-RAP module is configured to operate in "stand-alone" mode, the information used for firing the rappers is setup in this window. In addition to stand-alone operation, the GRC System S-Rap module will automatically initiate firing rappers with these settings in the occurrence of a S-CPU failure.



| Rapper | Lit | Intensity (%) | Duration | Frequency | OC | UC |
|--------|------|---------------|----------|-----------|----|----|
| 1 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 2 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 3 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 4 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 5 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 6 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 7 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 8 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 9 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 10 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 11 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 12 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 13 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 14 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 15 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 16 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 17 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 18 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 19 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 20 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 21 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 22 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 23 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 24 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 25 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 26 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 27 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 28 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 29 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |
| 30 | 1.0" | 0 | 00:00:00 | 0 | 0 | 0 |

Modifying a rapper

To modify a rapper's setup, click on the rapper number, then click *Modify*.

The screenshot shows a 'Modify Rapper' dialog box with the following fields and values:

| Field | Value | Unit/Label |
|---------------|----------|------------|
| Lift | 1 | inches |
| Intensity | 0 | % |
| Duration | 00:00:00 | |
| Frequency | 200 CPM | |
| Over Current | 0 | AMPS |
| Under Current | 0 | AMPS |

Rapper #

Shows the rapper output number.

Lift

Sets the lift in inches for DC Impact type rappers. This value is used in stand-alone and auto-redundant modes only. Programmable from 0 - 16 inches.

Intensity

Sets the intensity percentage for Vibrator and Multi-Impact type devices. Programmable from 0 - 100%. Changes to the intensity less than 100% will result in $\frac{1}{2}$ cycles of power applied at less than full conduction.

Duration

Sets the duration in seconds of Vibrator, Multi-impact, and Motor type devices. Programmable from 00:00:00 to 23:59:59.

Frequency

Sets the frequency in cycles per minute for Multi-Impact type devices. Programmable in 13 preset steps from 200 to 600 CPM.

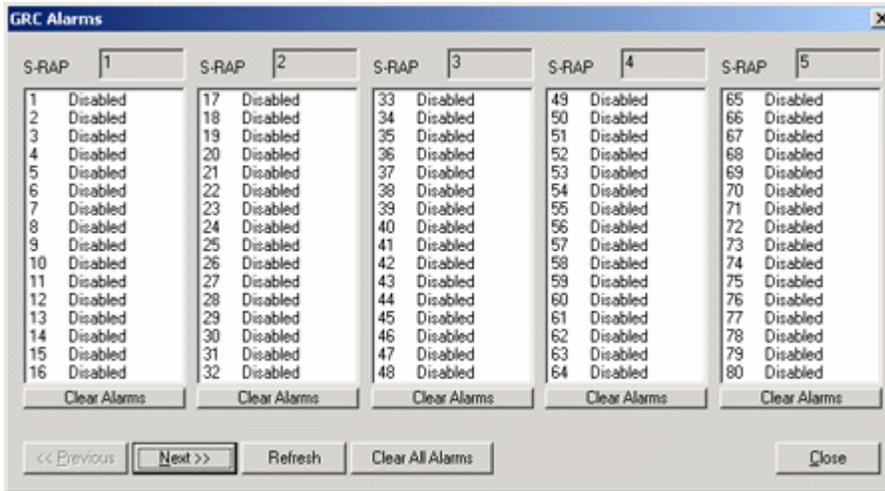
OC/UC

Each rapper output can be assigned current low and high alarm levels. When the S-Rap module detects 2 consecutive $\frac{1}{2}$ cycles of current lower than the *UC* setting, it will flag the rapper output. Two consecutive failures will result in the output to be alarmed and removed from normal firing activity. The same will occur when the S-Rap detects a single $\frac{1}{2}$ cycle of current higher than the *OC* setting. Programmable from 0 to 40 ampres.

Alarms

GRC alarms window

PCAMS/NT will continuously monitor for S-Rap alarms. The GRC Alarms window shows you if there are any alarms in each rapper, grouped by S-Rap.



Next / Previous

Click the *Next* button to scroll across to other S-Rap cards that could not fit on this screen. Use the *Previous* button to return to viewing previous S-Rap cards.

Refresh

Some rapper alarm conditions may have changed since you opened the GRC Alarms window. Click *Refresh* to update the current list of rappers.

Toggling rapper state

If a rapper is disabled in the list, double-click on it and you will have the option to enable it. Conversely, if a rapper is enabled in the list, double-click on it and you will have the option to disable it.

Clearing alarms

To clear all rapper alarms on this rapper controller, click *Clear All Alarms*. To clear all rapper alarms for a certain S-Rap card, click *Clear Alarms* under the S-Rap card you wish to clear. If you want to clear a specific rapper alarm, double-click on that rapper in the list and confirm to clear the alarm.

S-CPU configuration window

The S-CPU module requires setup of several values for proper system operation.

The screenshot shows the S-CPU Configuration window with the following settings:

- Flow Delay: 1 sec
- Boiler load full scale rating: 0
- Num alarms before activating relay: 1
- Opacity Spike: 1 % over avg
- Password: Pw
- Alarm relay logic: N.O. N.C.
- Program Restart Mode: Continue Restart

Flow Delay

The flow delay is defined as the amount of time it takes for gas to completely travel through the precipitator. This value is used for determining which devices are suspected of causing opacity spikes. Programmable from 0 - 99 seconds.

Num alarms before activating relay

Being notified of every alarm may eventually become a nuisance. By setting the number of alarms value to something other than 1, the S-CPU will delay activation of the alarm relay until that number of alarms occurs. Programmable from 0 - 99.

Opacity Spike

The GRC System has a unique feature that identifies which rappers are suspected of causing opacity spikes. This value defines what percentage of an increased in sudden opacity is required to enable a opacity spike scan.

Programmable from 0 - 99%.

Password

To prevent unauthorized or accidental parameter entry, the HHP requires an operator to sign on with a proper password. The password is a 2 digit alphanumeric value. Programmable from 00 - ZZ. If a user with appropriate access is not signed on, the value will display **.

Boiler Load Full Scale Rating

If the boiler load 4 - 20mA signal is connected to the S-CPU, the scale value represents what value should be displayed at 20mA or full scale. Programmable from 0 - 9999.

Alarm Relay Logic

When the number of rapper alarms (Num Alarms) is reached, the S-CPU will activate the alarm relay. This relay can be used to notify operators in a control room, sound an alarm horn, or simply light an indicator. The logic of the relay is

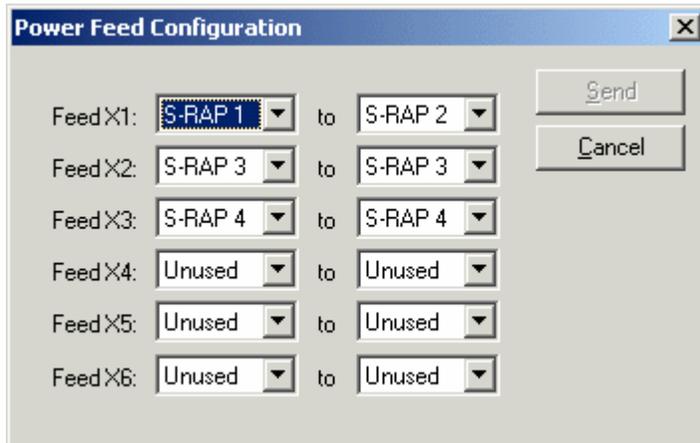
programmable from N.O. (normally open - closes on alarm), or N.C. (normally closed - opens on alarm).

Program Restart Mode

When the operating program is turned on, the S-CPU will either re-start the program or continue from where it previously left off. Re-starting the operating program causes all timers to be initialized at 0 and the sequence pointer returns to the start of the rapping sequence. Programmable as Continue or Restart.

Power feed configuration window

The *Power Feed Configuraiton* window defines which slots are connected to each power feed.



The screenshot shows a window titled "Power Feed Configuration" with a close button (X) in the top right corner. The window contains six rows of configuration options, each labeled "Feed X1" through "Feed X6". Each row has two dropdown menus separated by the word "to". The first dropdown menu in each row is highlighted with a blue selection box. The connections are as follows:

| Feed | Left Dropdown | Right Dropdown |
|----------|---------------|----------------|
| Feed X1: | S-RAP 1 | S-RAP 2 |
| Feed X2: | S-RAP 3 | S-RAP 3 |
| Feed X3: | S-RAP 4 | S-RAP 4 |
| Feed X4: | Unused | Unused |
| Feed X5: | Unused | Unused |
| Feed X6: | Unused | Unused |

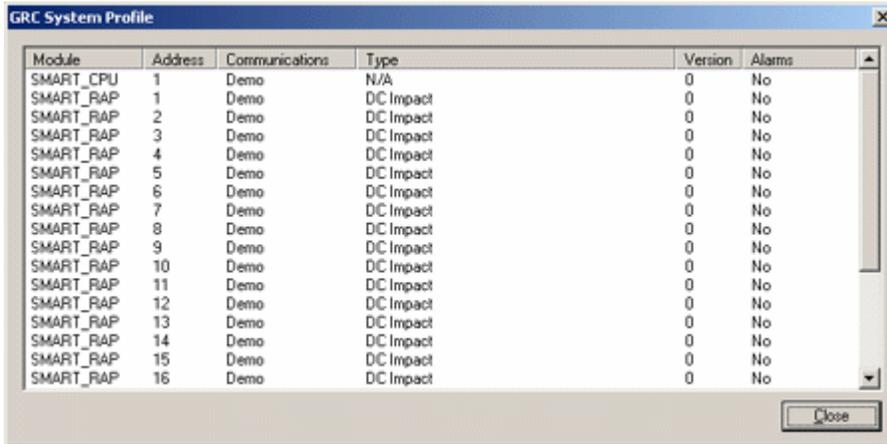
On the right side of the window, there are two buttons: "Send" and "Cancel".

Send

Click *Send* to send this information to the GRC System.

GRC system profile

Within a few seconds, operators can get a "picture" of the operating status of each of the S-Rap modules. PCAMS/NT will poll each device and display the status in the fields described below.



The screenshot shows a window titled "GRC System Profile" with a table containing the following data:

| Module | Address | Communications | Type | Version | Alarms |
|-----------|---------|----------------|-----------|---------|--------|
| SMART_CPU | 1 | Demo | N/A | 0 | No |
| SMART_RAP | 1 | Demo | DC Impact | 0 | No |
| SMART_RAP | 2 | Demo | DC Impact | 0 | No |
| SMART_RAP | 3 | Demo | DC Impact | 0 | No |
| SMART_RAP | 4 | Demo | DC Impact | 0 | No |
| SMART_RAP | 5 | Demo | DC Impact | 0 | No |
| SMART_RAP | 6 | Demo | DC Impact | 0 | No |
| SMART_RAP | 7 | Demo | DC Impact | 0 | No |
| SMART_RAP | 8 | Demo | DC Impact | 0 | No |
| SMART_RAP | 9 | Demo | DC Impact | 0 | No |
| SMART_RAP | 10 | Demo | DC Impact | 0 | No |
| SMART_RAP | 11 | Demo | DC Impact | 0 | No |
| SMART_RAP | 12 | Demo | DC Impact | 0 | No |
| SMART_RAP | 13 | Demo | DC Impact | 0 | No |
| SMART_RAP | 14 | Demo | DC Impact | 0 | No |
| SMART_RAP | 15 | Demo | DC Impact | 0 | No |
| SMART_RAP | 16 | Demo | DC Impact | 0 | No |

Module

Shows if the address refers to a S-CPU or S-Rap module.

Address

Shows the address of the associated S-CPU or S-Rap module.

Communications

This field indicates whether the associated S-Rap module is communicating with PCAMS/NT.

Type

This field shows the current "type" configuration of the associated S-Rap module. Valid types are "DC Impact", "AC Vibrator", "AC/DC Motor", "Multi-Impact", "DC Vibrator", and "POR Output".

Version

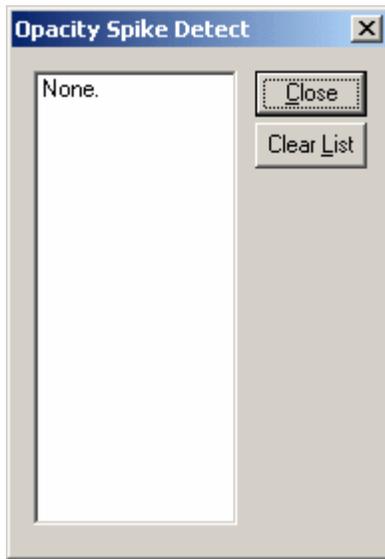
Shows the software version of the associated S-CPU or S-Rap module.

Alarms

This field shows whether any of the 16 outputs for the associated S-Rap module are in alarm status.

Opacity spike detect

Using the opacity spike detect list, operators can fine tune rapper operating programs to minimize re-entrainment caused by specific rappers. Verify the *Flow Delay* and *Opacity Spike* values are configured in the S-CPU window for proper operation.



Clear List

Clear the current contents of the opacity spike detect list with this button.

Repeat devices

The *Repeat Devices* window is a useful tool for technicians when checking the operating status of the GRC System. It can be used to fire a single device or multiple devices.

The screenshot shows the 'GRC Troubleshooting' window with the following settings:

- Repeat Range:** Devices: Repeat single device; Output number: 1
- Repeat Parameters:** Lift: 1 inches; Intensity: 5 %; Frequency: 200 CPM; Duration: 00:00:10 Seconds; Repeat Interval: 10 seconds between firing
- Status:** Device, S-RAP, Device status, Current, Repeat status (all empty)

Repeat Range

Devices

Select from *Repeat single device*, *repeat group*, and *repeat range*.

Output number / group / From .. To

Enter the output number, group, or range, depending on your selection of *Devices*.

Repeat Parameters

Lift

This value is used for repeating or firing DC Impact type devices when repeat mode is enabled. Programmable from 0 to 16 inches in .5 inch steps.

Intensity

This value is used for repeating Vibrator and Multi-Impact type devices. Programmable from 0 to 100%.

Frequency

This value is used for repeating or firing DC Impact type devices when repeat mode is enabled. Programmable from 0 to 16 inches in .5 inch steps.

Duration

This value is used for repeating Vibrator, Multi-Impact, or Motor type devices. Programmable from 0 to 59 seconds.

Repeat Interval

This value determines how many seconds to wait between firing rappers.

Status

Device

This field shows the last device being fired in repeat mode.

S-RAP

This field shows the address of the S-Rap module that contains the last device fired.

Device status

This field shows the operating status of the last device fired. Devices that fail on an alarm condition in repeat mode will not be removed from normal program firing.

Current

This field represents the current (in amperes) of the last device fired.

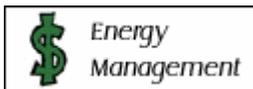
Repeat Status

This field shows the operating status of the last device fired. Devices that fail on an alarm condition in repeat mode will not be removed from normal program firing.

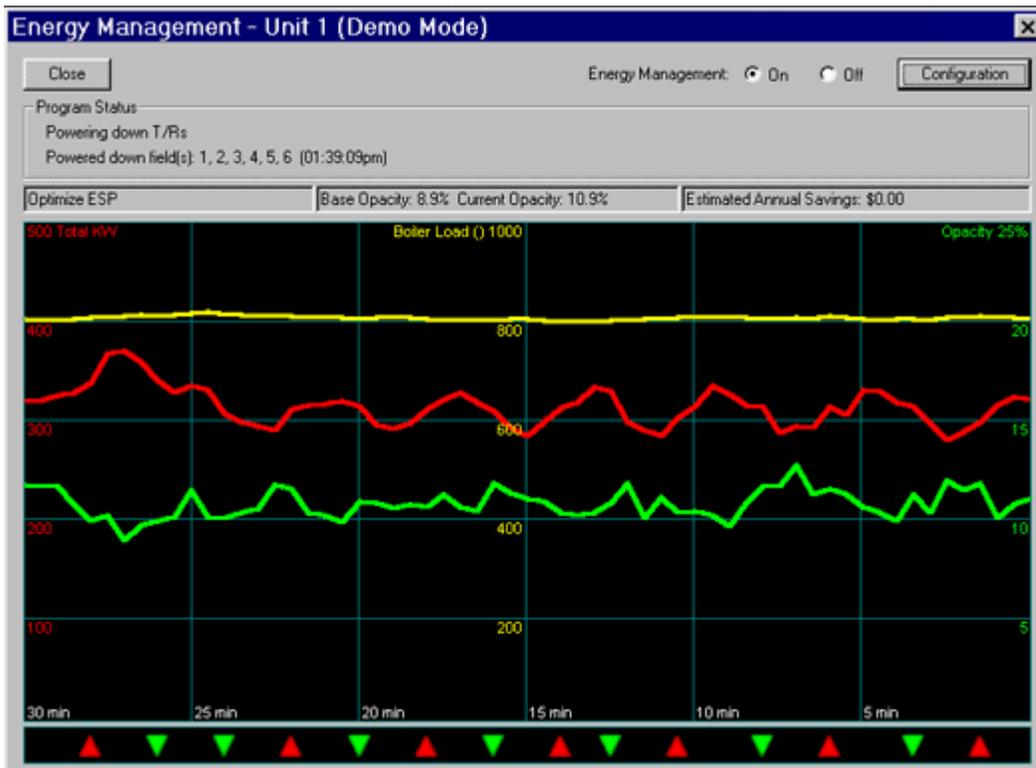
Energy Management

Energy management window

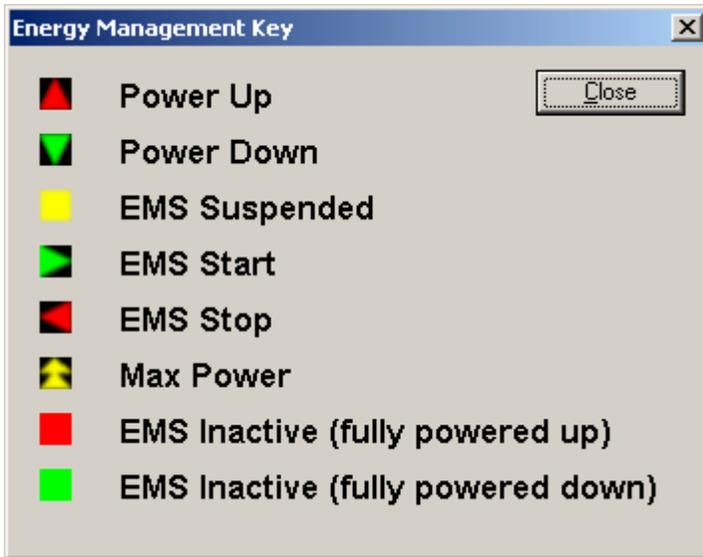
The energy management window makes it possible for you to control how PCAMS controls opacity and saves energy. To access the energy management window, you click on the Energy Management bitmap button on top of the graphical trend on the main screen.



You must have signed on with appropriate access. The energy management process maintains low opacity while using less power, saving you money. The Energy Management window displays a trend of boiler load, total KW and opacity. At the bottom of the graph is a status bar marked with symbols representing different energy management events.



Click anywhere on the graph area to bring up a key for these symbols.



Click directly on the symbol itself if you wish to obtain more information about that event.



The Energy Management Event Information window displays the event symbol you clicked on, a description of the event and the time it occurred.

Configuration

Click on the "Configuration" button on the Energy Management window to get to the Energy Management Configuration window. The following screen will appear.

The screenshot shows the "Energy Management Configuration" dialog box with the following settings:

- Energy Management Mode:** Optimize, Maintain Opacity Setpoint (10 %)
- Process Time:** 1 Minutes (slider)
- Power Reduction Method:** All Fields, Cascade Fields
- Estimated Savings:** KW-Hour Rate \$ 0
- Opacity:** Opacity High Setpoint 15, Opacity Delta 2
- Max Power Discrete Input:** Input Index 999
- Opacity Source:** Stack Monitor, Duct Monitor
- Extended Full Power Condition:** Re-establish Base Opacity
- EMS Mode on Pcamsnt Startup:** Startup Mode Off (dropdown)
- Full Power Timer:** 10 Number of Process Cycles

Buttons at the bottom: Field Configuration, OK, Cancel.

Energy Management Mode

Optimize

This is the preferred method of opacity control. Use it if you can. With Optimize ESP, PCAMSNT will keep adjusting power supply output levels and taking opacity readings to give you the best balance of low opacity and low power usage. The result: a good balance between energy efficiency and particulate emissions control. In fact, Optimize ESP often yields the lowest and most consistent opacity possible - much better than with manually set controls and often better than with setpoint methods.

Maintain Opacity Setpoint

Maintain Opacity Setpoint, the second opacity control method, is usually less effective than Optimize ESP, but sometimes you have no choice. Use Setpoint when regulatory guidelines require you to hold opacity to a specific percentage. PCAMSNT will seek to maintain the setpoint at the lowest possible power. The procedure for setting up this method is virtual the same as for the optimize

ESP method. First, click on the "Maintain Opacity Setpoint" checkbox. A check will appear in the box. The edit field next to the checkbox will now be enabled. In it, enter the opacity setpoint you would like PCAMS to maintain.

Power Reduction Method

Power reduction method tells PCAMSNT how to phase power back by fields. We can generally divide a precipitator into inlet, center, and outlet collector fields. PCAMSNT can phase back power on all fields at once. Or it can cascade the reductions from one field to another, to keep sparking at a minimum and opacity spikes down.

All Fields

If you select *All Fields* you may get higher opacity and more sparking, since every collector field in the precipitator will phase back at the same time.

Cascade Fields

Normally choose *Cascade Fields* for minimal system upset. This phases back one field at a time in the order you have selected.

Opacity

Opacity High Setpoint

This is energy management's "emergency break." If at any time during the energy management process, the opacity reaches the opacity high setpoint that you specify, all T/Rs will return to full power and energy management will restart.

Opacity Delta

Opacity readings are often erratic and vary slightly even when power levels are constant. To compensate for this inconsistency, set the opacity delta to usually 1 or 2 degrees allowable variance.

Opacity Source

Stack Monitor

Selecting this radio button will configure PCAMSNT to use the opacity value supplied by the stack monitor for all EMS algorithms

Duct Monitor

Selecting this radio button will configure PCAMSNT to use the opacity value supplied by the duct monitor for all EMS algorithms

EMS Mode on Pcamsnt Startup

Startup Mode

Setting this to OFF will ensure that when Pcamsnt is restarted all EMS algorithms will remain stopped. Setting this to ON will configure Pcamsnt to restart all Precip EMS algorithms that were running prior to the previous Pcamsnt shutdown.

Process Time

The process time is the interval between opacity comparisons and power level actions. Set this time length high enough for a change in power level to affect the opacity reading.

Estimated Savings

KW-Hour Rate

This is the rate used to estimate the dollar amount of savings gained by using the energy management system. It should be your cost for a kilowatt hour.

Max Power Discrete Input

Input Index

This is the index of the discrete input which tells PCAMS to set all T/Rs to full power. It is an index from 0 to 256, as set up in the Auxiliary I/O window. Set this value to 999 if a max power input index is not used.

Extended Full-Power Condition

This function, for Optimize mode only, allows you to re-establish base opacity after a set number of consecutive process cycles that expire with the precip at full power.

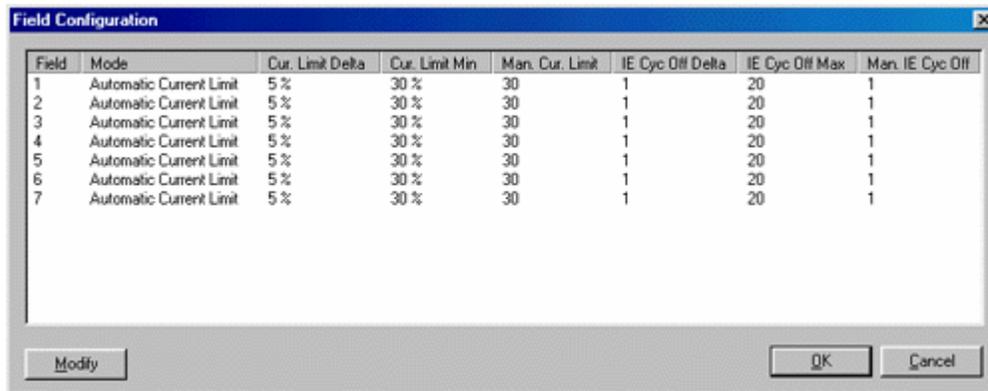
Field Configuration

Click the "Field Configuration" button to open the Field Configuration window.

Field Configuration

Field configuration window

You can change operating parameters for individual fields through the "Field Configuration" window. To access the window, click the "Field Configuration" button at the bottom of the energy management configuration window.



The screenshot shows a window titled "Field Configuration" with a close button (X) in the top right corner. The window contains a table with 8 columns: Field, Mode, Cur. Limit Delta, Cur. Limit Min, Man. Cur. Limit, IE Cyc Off Delta, IE Cyc Off Max, and Man. IE Cyc Off. There are 7 rows of data, all with "Automatic Current Limit" as the mode. At the bottom of the window, there are three buttons: "Modify", "OK", and "Cancel".

| Field | Mode | Cur. Limit Delta | Cur. Limit Min | Man. Cur. Limit | IE Cyc Off Delta | IE Cyc Off Max | Man. IE Cyc Off |
|-------|-------------------------|------------------|----------------|-----------------|------------------|----------------|-----------------|
| 1 | Automatic Current Limit | 5 % | 30 % | 30 | 1 | 20 | 1 |
| 2 | Automatic Current Limit | 5 % | 30 % | 30 | 1 | 20 | 1 |
| 3 | Automatic Current Limit | 5 % | 30 % | 30 | 1 | 20 | 1 |
| 4 | Automatic Current Limit | 5 % | 30 % | 30 | 1 | 20 | 1 |
| 5 | Automatic Current Limit | 5 % | 30 % | 30 | 1 | 20 | 1 |
| 6 | Automatic Current Limit | 5 % | 30 % | 30 | 1 | 20 | 1 |
| 7 | Automatic Current Limit | 5 % | 30 % | 30 | 1 | 20 | 1 |

The Field Configuration window contains a spreadsheet showing each field in the precipitator and its current settings and lets you access a screen where you can modify these settings.

Modifying a field

To change settings on an individual field or range of fields, highlight the fields you wish to edit with the mouse, then select the "Modify" button. The "Field Configuration Modify" window appears.

The screenshot shows a dialog box titled "Field Configuration Modify" for "Field: 1". It contains several settings:

- Energy Management Mode:** A dropdown menu set to "Automatic Current Limit".
- Cascade Order:** A numeric input field set to "1".
- Current Limit:** A group box containing three input fields: "Delta" (5%), "Min" (30%), and "Manual Current Limit" (30%).
- IE Cycles Off:** A group box containing three input fields: "Delta" (1), "Max" (20), and "Manual IE Cycles Off" (1).
- Buttons:** "OK" and "Cancel" buttons are located in the top right corner.

Mode

The mode selection lets you choose whether or not to put this field under the control of the PCAMS energy-saving function. Choose "Disabled" to set the T/R for operation under its local control parameters. Its power level is no longer controlled by PCAMS. Choose "Automatic I.E." or "Automatic Current Limit" if you want PCAMS to handle opacity reduction and power control for this field. Select "Manual I.E." or "Manual Current Limit" to lock the T/R at a user-defined power level. The mode parameter may only be changed while energy management is off. The combobox will appear grayed-out if the energy management process is on.

Cascade Order

If you have selected Cascading Fields as the power reduction method, this edit box will be enabled. Use it to enter the order you want energy management to process each field. Several fields may share the same cascade order number if you wish them to process at the same time. (i.e. Making all fields have a Cascade Order number of 1 is equivalent to selecting All Fields as your power reduction method)

Current Limit

The Current Limit group box will only be enabled if you have selected Automatic or Manual Current Limit mode. You may set the minimum current limit that energy management may set T/Rs in this field to. The delta is the amount by which energy management will add or subtract to current limit when powering up or down T/Rs. To change any setting, highlight the box and over type the setting with the new one.

IE Cycles Off

The IE Cycles Off group box will only be enabled if you have selected Automatic or Manual IE Cycles mode. You may set the maximum cycles off that energy management may set T/Rs in this field to. (Maximum cycles off is minimum power) The delta is the amount by which energy management will add or subtract to cycles off when powering up or down T/Rs. To change any setting, highlight the box and over type the setting with the new one.

Spreadsheet

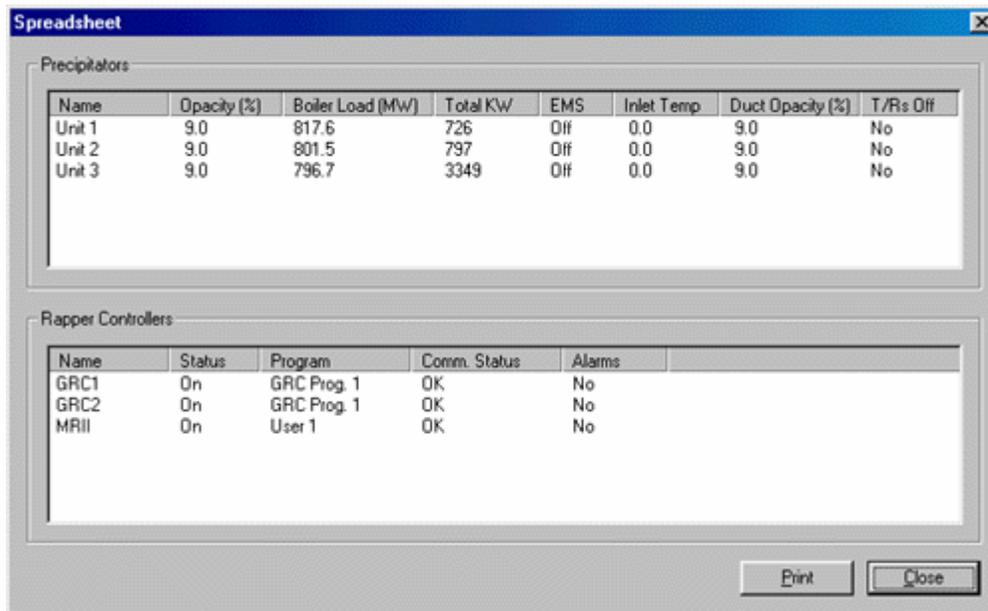
Spreadsheet window

The main screen spreadsheet provides information about all the precipitators and rapper controllers on your system.

To access the Spreadsheet window, click on the Spreadsheet bitmap button on top of the graphical trend on the main screen.



The spreadsheet window will appear.

A screenshot of a software window titled "Spreadsheet". The window contains two tables. The first table is titled "Precipitators" and has columns for Name, Opacity (%), Boiler Load (MW), Total KW, EMS, Inlet Temp, Duct Opacity (%), and T/Rs Off. The second table is titled "Rapper Controllers" and has columns for Name, Status, Program, Comm. Status, and Alarms. At the bottom right of the window are "Print" and "Close" buttons.

| Precipitators | | | | | | | |
|---------------|-------------|------------------|----------|-----|------------|------------------|----------|
| Name | Opacity (%) | Boiler Load (MW) | Total KW | EMS | Inlet Temp | Duct Opacity (%) | T/Rs Off |
| Unit 1 | 9.0 | 817.6 | 726 | Off | 0.0 | 9.0 | No |
| Unit 2 | 9.0 | 801.5 | 797 | Off | 0.0 | 9.0 | No |
| Unit 3 | 9.0 | 796.7 | 3349 | Off | 0.0 | 9.0 | No |

| Rapper Controllers | | | | |
|--------------------|--------|-------------|--------------|--------|
| Name | Status | Program | Comm. Status | Alarms |
| GRC1 | On | GRC Prog. 1 | OK | No |
| GRC2 | On | GRC Prog. 1 | OK | No |
| MR11 | On | User 1 | OK | No |

This is a read-only window.

Printing the spreadsheet

To print the main screen spreadsheet, simply click the "Print" button at the bottom of the window. Make sure your printer is turned on and ready to print.

Event Sequencer

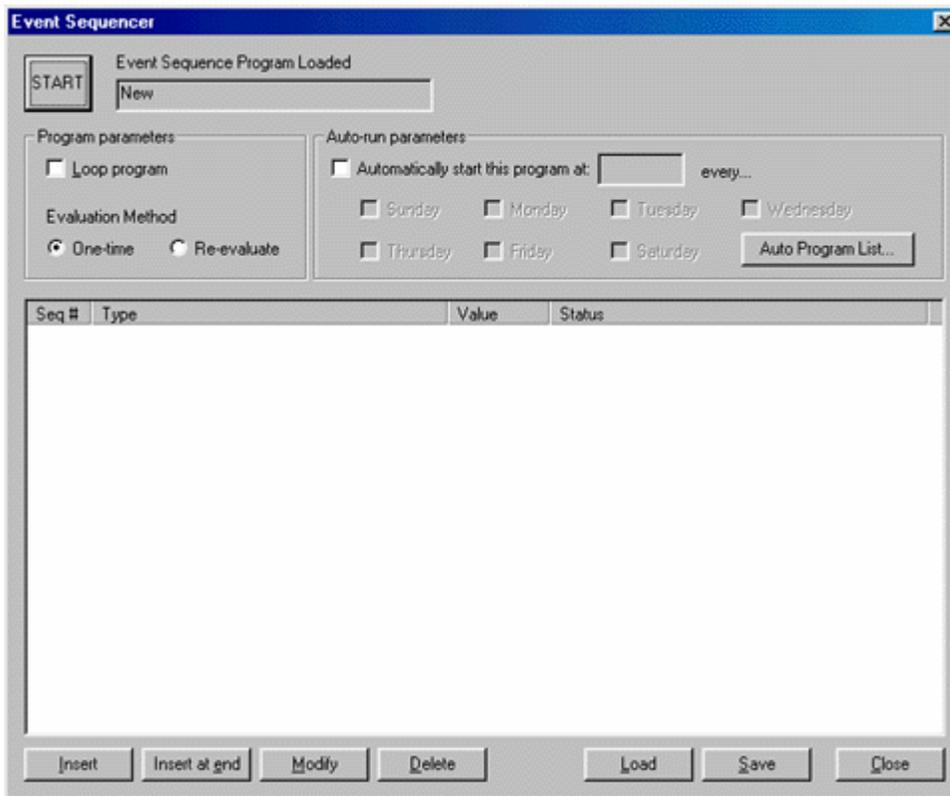
Event sequencer window

The Event Sequencer window allows you to configure events and the values that trigger them.

To access the Event Sequencer window, click on the Event Sequencer bitmap button on top of the graphical trend on the main screen.



The event sequencer window will appear.

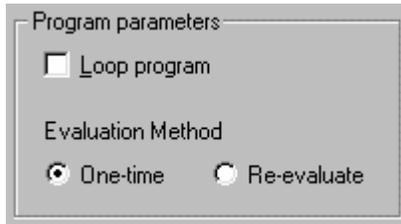


To turn the process on, press the large "Start" button in the upper left hand corner of the window. The caption of the button will change to "Stop" once the program has started.

When you have finished viewing or modifying settings, click "Close" to leave this window. The event sequencer program will continue to run if you have started the process.

Program parameters

The program parameters groupbox is located at the top-left of the event sequencer window.



Looping

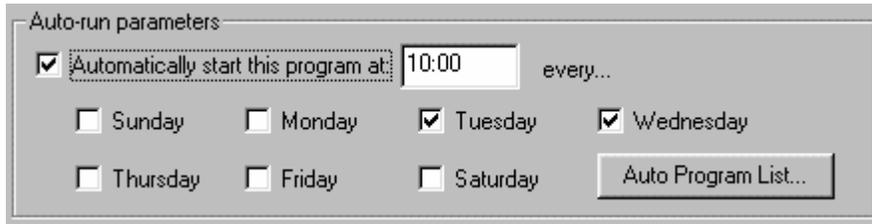
If you would like your program to infinitely loop, check the "Loop program" checkbox in the program parameters groupbox.

Evaluation Method

If you select one-time evaluation, each conditional sequence is checked only once. After the condition is satisfied, the event sequencer moves on to the next sequence. If you select re-evaluate, all conditional sequences up to the current position must be satisfied before moving on to the next action sequence. If the program has moved on to sequence 4, in re-evaluate mode, conditional sequences 1 and 2 must remain satisfied.

Auto-run parameters

The Auto-run parameters groupbox is located at the top-right of the event sequencer window.



Auto-run parameters

Automatically start this program at: 10:00 every...

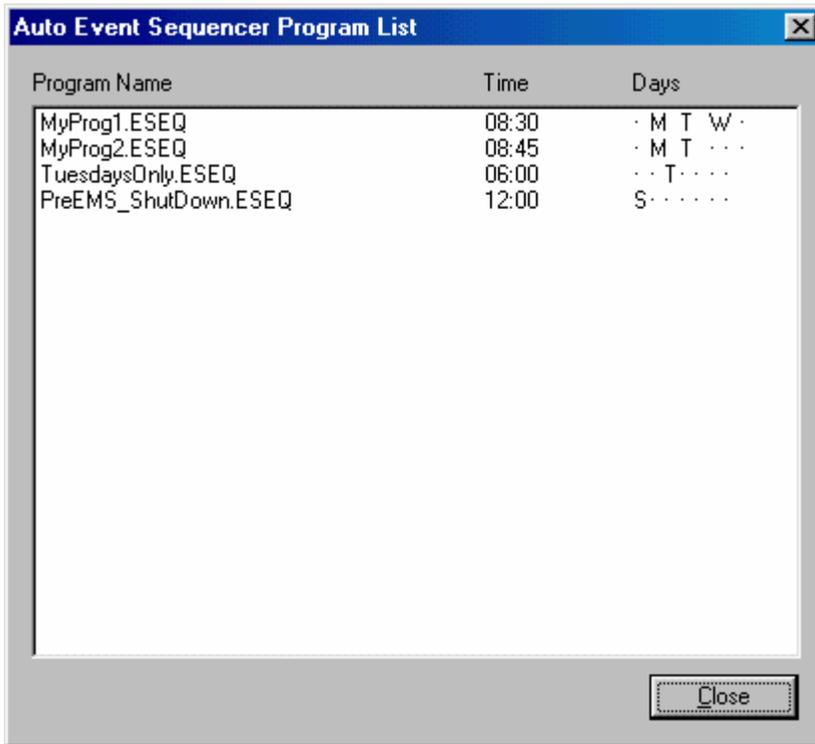
Sunday Monday Tuesday Wednesday

Thursday Friday Saturday

If you would like the currently loaded program to automatically run at specified weekly or daily intervals, check the "Automatically start this program" checkbox. You then fill in the time the program should start at, and check off each day of the week you would like the program to run at this time. Once you save your program the auto program manager will automatically run your program at the times you specified.

Auto-program list

To view a list of all event sequencer programs saved on your computer which are marked to automatically run, click the "Auto Program List" button in the Auto-run parameters groupbox.



The screenshot shows a window titled "Auto Event Sequencer Program List" with a close button in the top right corner. The window contains a table with three columns: "Program Name", "Time", and "Days". The table lists four programs: "MyProg1.ESEQ" (08:30, days M T W), "MyProg2.ESEQ" (08:45, days M T), "TuesdaysOnly.ESEQ" (06:00, days T), and "PreEMS_ShutDown.ESEQ" (12:00, days S). A "Close" button is located at the bottom right of the window.

| Program Name | Time | Days |
|----------------------|-------|---------------|
| MyProg1.ESEQ | 08:30 | · M T W · |
| MyProg2.ESEQ | 08:45 | · M T · · · |
| TuesdaysOnly.ESEQ | 06:00 | · · T · · · · |
| PreEMS_ShutDown.ESEQ | 12:00 | S · · · · · · |

The window shows the filename of each sequencer program set to auto-run, as well as the time and days of the week it will execute.

Inserting, modifying, and deleting sequences

To insert a blank sequence, click the "Insert" button. If you had already selected a sequence in the list, this will insert before that sequence. If no sequences exist, or you did not select one, this will insert at the end of the list.

To insert a sequence at the end of the list when you currently have a sequence selected, click the "Insert at end" button.

To modify a sequence, select it by clicking on the sequence number in the list box and then click the "Modify" button. This will bring you to the modify sequence window for the sequence you selected.

To delete a sequence, select it and click the "Delete" button. You will not be asked for confirmation so be sure to verify that the sequence you have selected is the one you wish to delete.

Modifying sequences

The modify sequence window allows you to select the type of sequence (action or conditional), the resources your selected type refers to, and the value you wish to assign or test against.

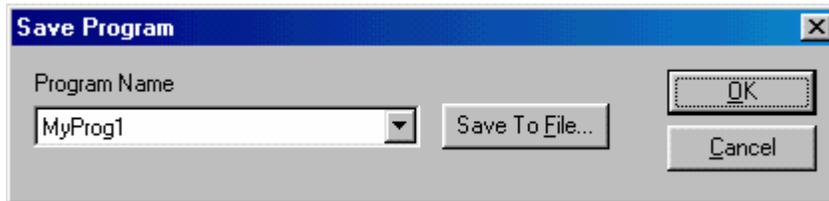
The screenshot shows a 'Sequence Modify' dialog box with the following fields and options:

- Seq #: 1
- Buttons: OK, Cancel
- Type: Discrete Input (dropdown)
- Resources section:
 - Precip: Unit 1 (dropdown)
 - T/R: TR1 (dropdown)
 - Rapper Controller: GRC1 (dropdown)
 - Auxiliary I/O Input: 17 - Opacity Calibrate (dropdown)
- Value section:
 - Integer: 0 (text input)
 - Boolean: True (dropdown)
 - Time: 00:00:00 (text input)

When you select a sequence type, only the appropriate controls are enabled, to simply your decision.

Loading and saving programs

Once you have configured your program, you can save it by clicking the "Save" button at the bottom of the window.



You can select an existing filename in the combo-box on the left, or click "Save To File" to select a new filename. Then click "OK" when you are finished. To load a previously saved program, click the "Load" button at the bottom of the window.



You can select a saved program located in the PCAMS directory from the combo-box to the left, or find a program in another directory or on another drive by pressing the "Browse" button.

Data Export

Data export window

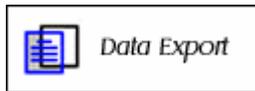
PCAMS included many features to help you analyze precipitator performance.

But you're not limited to its built-in functions.

You can export PCAMS data into a standard comma-delimited ASCII format.

Virtually any spreadsheet or database program will process and analyze PCAMS data provided in this format. You can also export PCAMS data to Microsoft Access (.mdb) form.

To use the export facility, click on the Data Export bitmap button on the bottom of the graphical trend on the main screen.



You must have signed on with appropriate access to use this feature. The Data Export window will appear.

Data Export [X]

Precipitator Database Process

Enable database process Enable Daily 1AM DB Compact

365 Number of days in History Compact Database Now

Write to Parallel Database

2nd DB Target location and filename

c:\pcamsnt3x\database\rep.mdb

File Generation - ASCII Comma Delimited File of Precip and T/R Info

Enable Data File Generation Data file directory

Process Time \PCAMSNT\EXPORT

1 Minutes One File Separate file for each field

File Generation - Dynamic Electrical Readings

Enable T/R file generation

Process Time Target location and filename

0 Seconds \PCAMSNT\EXPORT\DYNTTRDATA.DAT

OPC / Kepware Interface

Enable Pcams OPC / Kepware Interface

E-Mail Report Generation

Enable E-Mail Report Generation E-Mail every:

8 Hours 24 Hours

E-Mail Address Determining if system is MAPI Compliant

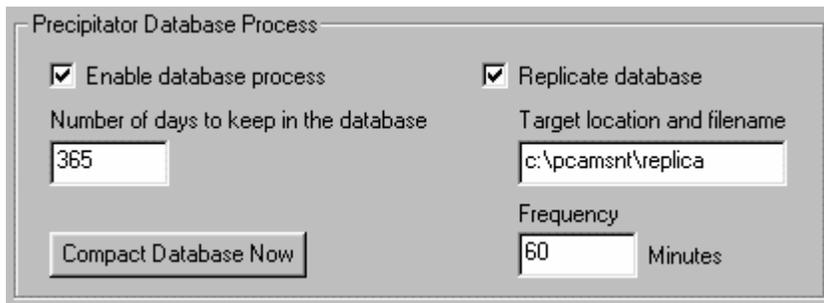
[Empty text box]

ESPert Config OK Cancel

This window does not have to be open for the export program to run. Once you have enabled the process, it will work in the background. Don't keep in running constantly, however, as this could use up all your hard disk space.

Database process

The database process enables PCAMS to export to Microsoft Access database format.



The screenshot shows a dialog box titled "Precipitator Database Process". It contains the following controls:

- Two checked checkboxes: "Enable database process" and "Replicate database".
- A text input field labeled "Number of days to keep in the database" with the value "365".
- A text input field labeled "Target location and filename" with the value "c:\pcamsnt\replica".
- A text input field labeled "Frequency" with the value "60" and the unit "Minutes" next to it.
- A button labeled "Compact Database Now".

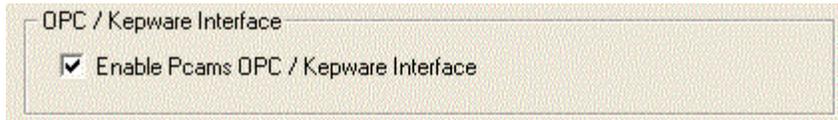
To enable this process, simply check the "Enable Database Process" checkbox in the Database Process group. Uncheck this to disable the process. You may specify how many days of data to store in the database. The more days you store the bigger the database file size becomes. The database technology utilized in PCAMSNT has a 1gigabyte maximum filesize. To prevent database corruption cause by exceeding the 1Gb limit, PCAMSNT will display a warning when the database size exceeds 900 MB. If the database continues to grow and exceeds 950 MB PCAMSNT will backup the current database and restart saving data into a new empty database. You can compact the database file on demand by clicking the "Compact database now" button. Compacting the database decreases the size of the file without loosing any data.

Replication

To replicate the PCAMS database, check the "Replicate database" checkbox and enter the pathname and frequency to replicate.

OPC Kepware Interface

The OPC / Kepware interface is used to activate the PCAMS-OPC communication interface. This interface is an optional feature and its availability is controlled via the License key.



If licensed, to enable this process, simply check the "Enable Pcams OPC / Kepware Interface" checkbox in the OPC / Kepware Interface group. Uncheck this to disable the process.

When enabled, the Pcams OPC process will transmit data to the installed KepServerEX OPC Server via the NWL Pcams Driver. This data will then be available network wide via the OPC ethernet standard protocol. For more information on OPC, please visit www.opcfoundation.org. For more information on KepServerEx, please visit www.kepware.com.

E-mail report generation

The E-Mail report generation lets you automatically send a report through email at a specified time interval, to whoever you want. This feature will only work on systems that are MAPI compliant. PCAMSNT will determine if your system is MAPI compliant and display its results in the last line of the groupbox.

En/Disabling Report Generation

To enable the generation and sending of E-Mail reports, place a check in the "Enable E-Mail Report Generation" box by clicking in it. To disable this process, click in the box again to remove the check.

E-Mail interval

You can choose either an 8 or 24 hour interval to automatically send the generated E-Mail report. Place a check next to one of these options to make your selection.

E-Mail address

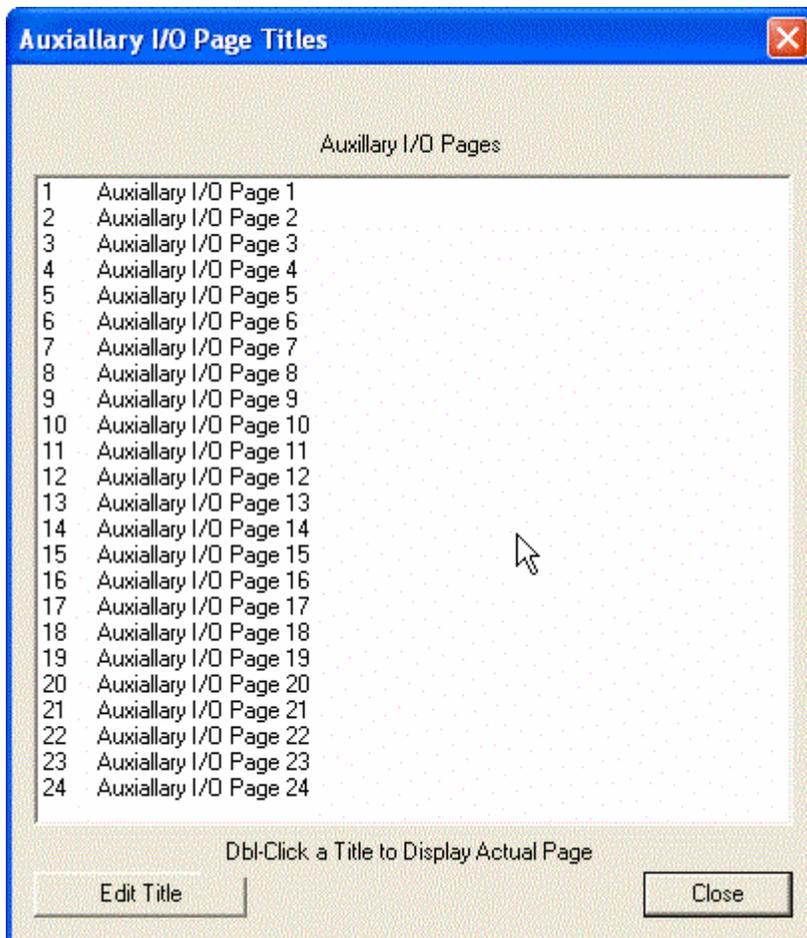
In the edit box provided for E-Mail address, enter a valid internet E-Mail address that you would like the reports sent to.

Auxiliary I/O

Auxiliary I/O window

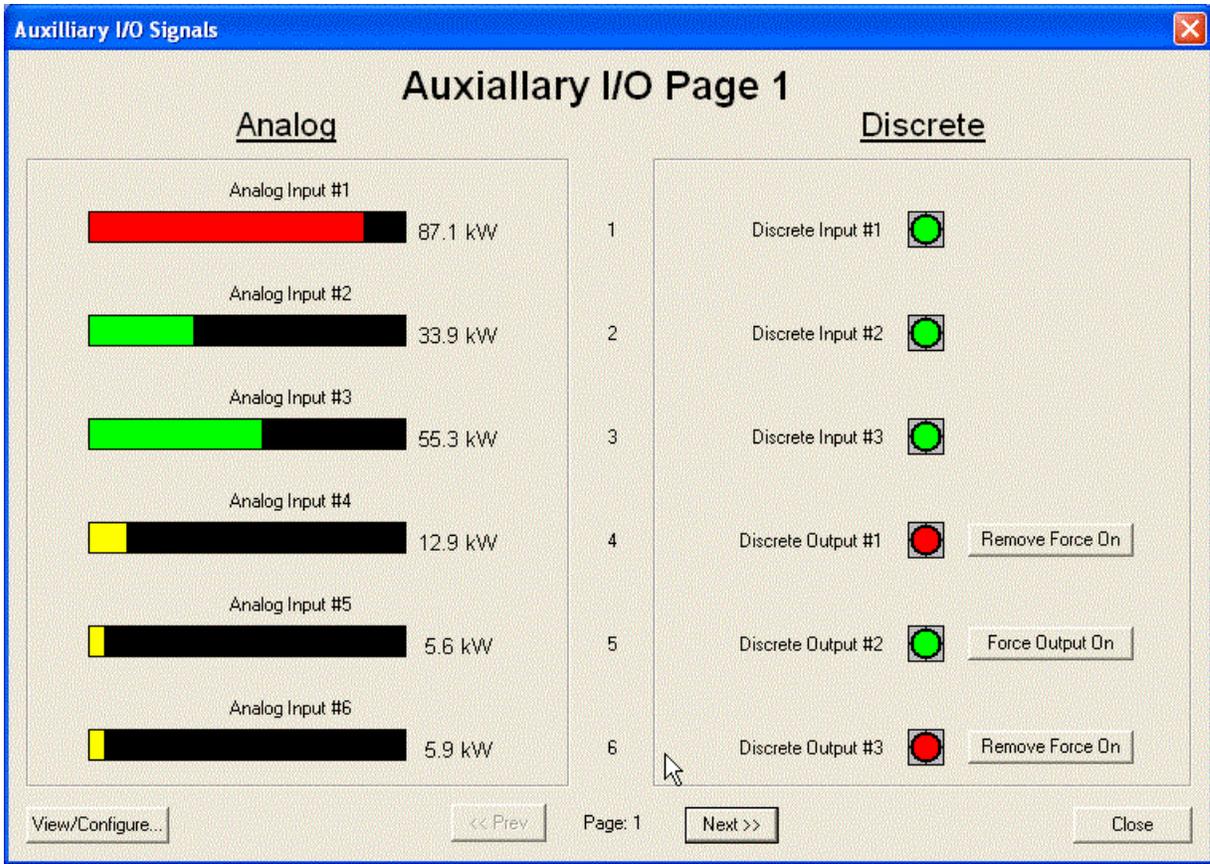
The Auxiliary I/O Module of PCAMS allows a user to bring in and categorize both Analog Input and Discrete Input/Output signals into the Pcams software. These signals are used for various defined I/O like Opacity and Boiler load signals, Alarm indication, MAX Power Input, etc.

The use of Auxiliary I/O pages are available for a user to categorize signals into logical display pages. These pages can display both defined Pcams signals or any signal configured within the Aux I/O module.



Clicking on the 'Edit Title' button allows the user to enter customized titles for each of the available pages.

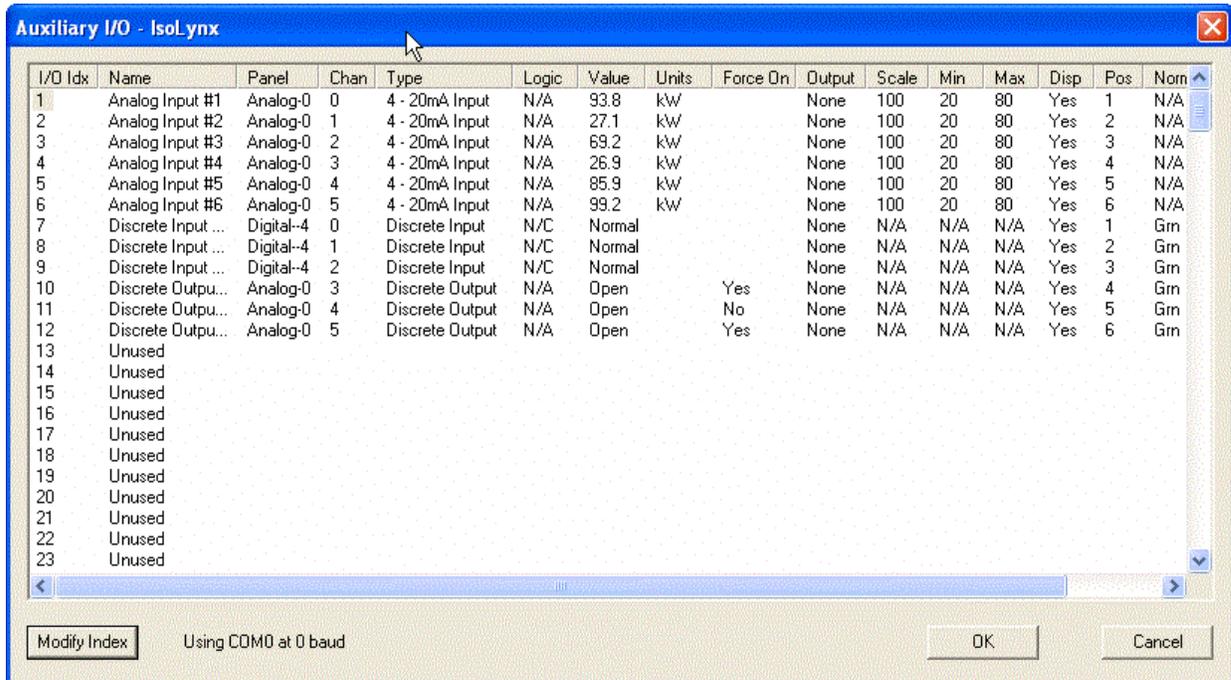
Double-clicking on a page will open the respective page for viewing.



When viewing a particular Aux I/O page, clicking on the '<<Prev' or 'Next>>' buttons enables the user to navigate to alternate pages. If one of the Discrete signals is configured for a Discrete OUTPUT, a toggle button will be displayed allowing the user to force the respective output ON or remove the Force On condition if it already exists. Clicking on the 'View/Configure...' button will take the user to the configuration windows used to configure the individual inputs.

Configuring a signal

The first window in the View/Configure process presents the user with a spreadsheet style summary of the I/O indexes.



| I/O Idx | Name | Panel | Chan | Type | Logic | Value | Units | Force On | Output | Scale | Min | Max | Disp | Pos | Norm |
|---------|--------------------|-----------|------|-----------------|-------|--------|-------|----------|--------|-------|-----|-----|------|-----|------|
| 1 | Analog Input #1 | Analog-0 | 0 | 4 - 20mA Input | N/A | 93.8 | kW | | None | 100 | 20 | 80 | Yes | 1 | N/A |
| 2 | Analog Input #2 | Analog-0 | 1 | 4 - 20mA Input | N/A | 27.1 | kW | | None | 100 | 20 | 80 | Yes | 2 | N/A |
| 3 | Analog Input #3 | Analog-0 | 2 | 4 - 20mA Input | N/A | 69.2 | kW | | None | 100 | 20 | 80 | Yes | 3 | N/A |
| 4 | Analog Input #4 | Analog-0 | 3 | 4 - 20mA Input | N/A | 26.9 | kW | | None | 100 | 20 | 80 | Yes | 4 | N/A |
| 5 | Analog Input #5 | Analog-0 | 4 | 4 - 20mA Input | N/A | 85.9 | kW | | None | 100 | 20 | 80 | Yes | 5 | N/A |
| 6 | Analog Input #6 | Analog-0 | 5 | 4 - 20mA Input | N/A | 99.2 | kW | | None | 100 | 20 | 80 | Yes | 6 | N/A |
| 7 | Discrete Input ... | Digital-4 | 0 | Discrete Input | N/C | Normal | | | None | N/A | N/A | N/A | Yes | 1 | Gm |
| 8 | Discrete Input ... | Digital-4 | 1 | Discrete Input | N/C | Normal | | | None | N/A | N/A | N/A | Yes | 2 | Gm |
| 9 | Discrete Input ... | Digital-4 | 2 | Discrete Input | N/C | Normal | | | None | N/A | N/A | N/A | Yes | 3 | Gm |
| 10 | Discrete Outpu... | Analog-0 | 3 | Discrete Output | N/A | Open | | Yes | None | N/A | N/A | N/A | Yes | 4 | Gm |
| 11 | Discrete Outpu... | Analog-0 | 4 | Discrete Output | N/A | Open | | No | None | N/A | N/A | N/A | Yes | 5 | Gm |
| 12 | Discrete Outpu... | Analog-0 | 5 | Discrete Output | N/A | Open | | Yes | None | N/A | N/A | N/A | Yes | 6 | Gm |
| 13 | Unused | | | | | | | | | | | | | | |
| 14 | Unused | | | | | | | | | | | | | | |
| 15 | Unused | | | | | | | | | | | | | | |
| 16 | Unused | | | | | | | | | | | | | | |
| 17 | Unused | | | | | | | | | | | | | | |
| 18 | Unused | | | | | | | | | | | | | | |
| 19 | Unused | | | | | | | | | | | | | | |
| 20 | Unused | | | | | | | | | | | | | | |
| 21 | Unused | | | | | | | | | | | | | | |
| 22 | Unused | | | | | | | | | | | | | | |
| 23 | Unused | | | | | | | | | | | | | | |

Clicking on a particular I/O index followed by clicking on the 'Modify Index' button will open the 'Modify I/O Index' dialog.

Modifying an IO index

Within this dialog is where the user configures the individual I/O channel for Description, Type, Hardware Properties and various other scaling/alarm properties. In the 'Display Properties' group is where the user configures which I/O pages and location to display this particular signal on. Note each page is limited to 6 analog and 6 discrete signals.

Modify Auxiliary I/O

I/O Index: 1

Identification

Name: Analog Input #1

IsoLynx Panel: Analog-0

Type: Analog Input

IsoLynx Channel: 0

Discrete Properties

Logic: N/C

Force output to on

4 - 20mA Scaling

4mA = 0

20mA = 100

Units: kW

Actions

Enable Alarm

Output Index: 0

Low Setpoint: 20

High Setpoint: 80

Display Properties

Display

Display Position: 1

LED Colors

Normal: Green

Active: Blue

OK Cancel

I/O Index

Displays the input index number that you are editing.

Name

The name of this input index. Use names to describe what this input index is used for.

Type

The card type. This is determined by the type of card you added using *Add Card*.

IsoLynx Panel

Designates which IsoLynx module the index exists on.

IsoLynx Channel

Designates which IsoLynx channel of the above module.

Discrete Input Properties***Logic***

This can be set to TRUE or FALSE. A TRUE setting will activate a configured output and/or an alarm when the input has a closed contact or supplied voltage depending on the type of hardware being used. A FALSE setting will operate in the opposite manner.

Force Output to ON

Checking this box will enable the Output regardless of any configuration settings.

4-20 mA Scaling

4mA =

Enter here the actual value that 4mA represents for this reading (normally = 0).

20mA =

Enter here the actual value that 20mA represents for this reading.

Units =

Enter the Units abbreviation for the signal (ie. KW)

Actions***Enable Alarm***

Check this to enable alarm logging for this input index. For Analog Inputs you must enter a Alarm Low setpoint and Alarm High setpoint values to trigger the alarm / output.

Output Index

Check this and enter a valid Discrete Output Index to turn on an Output when required.

Display Properties***Display***

Check this to display this index on a Auxillary I/O page.

Display Position

Set this to a value equal to the position on a page. Each page can handle 6 positions, therefore setting this value to 7 will display this particular index in the top position of Aux I/O page 2.

Led Colors

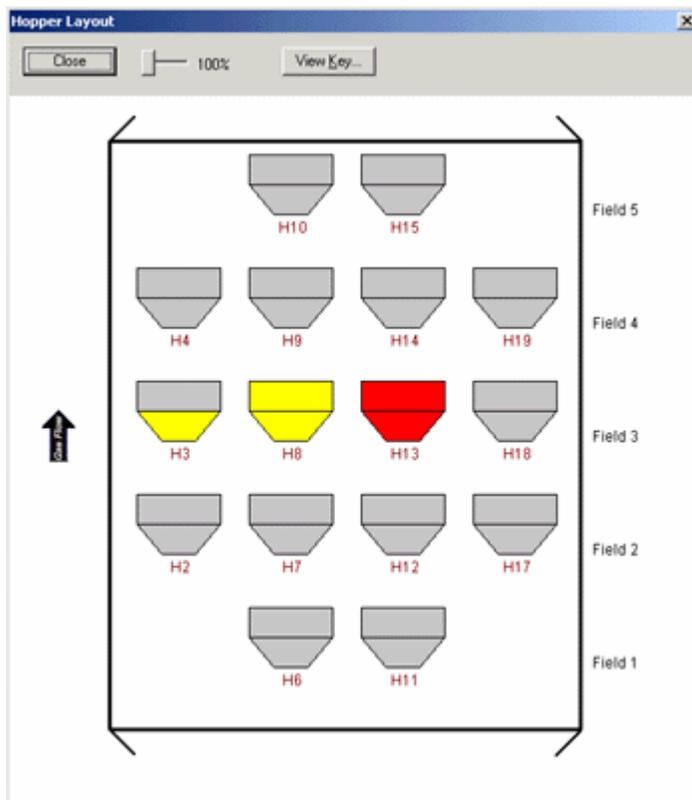
Here a user can designate the respective colors displayed for a Discrete signal to visually indicate Active or Inactive state.

Hopper Layout

Hopper layout window

PCAMS includes a graphical representation of your hopper layout. The layout identifies each hopper that collects particulates from a given precipitator. The hopper appears as an icon with its identifying properties.

To display the hopper layout screen, click on the Hopper Layout bitmap button on the bottom of the graphical trend on the main screen.



Hopper icons are divided into two sections. A Hi Hi Input is represented by the coloration of the top half of the hopper icon, while the Hi Input is represented by the bottom half.

The color indicates status:

Gray = Normal, input not signaled, output not enabled

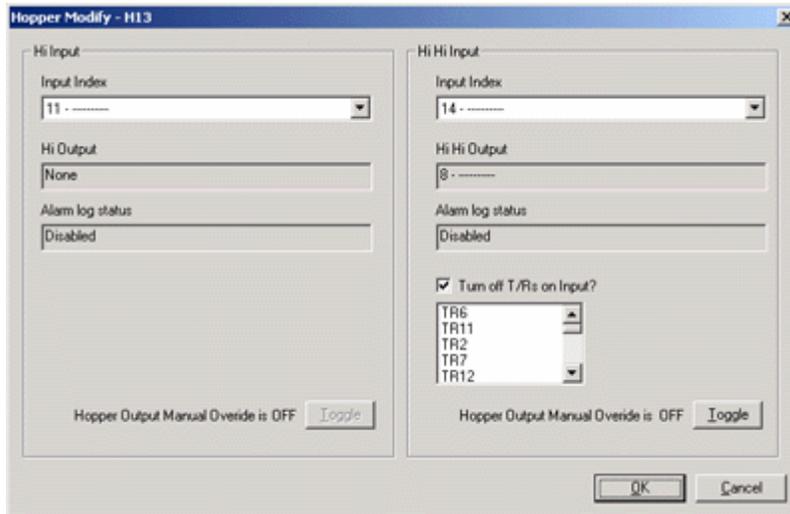
Red = Alarmed and output enabled

Yellow = Alarmed (Input Signaled)

You can view the hopper key, detailing this information, by clicking on the *View Key* button at the top of the window.

Modifying a hopper

To view or modify a hopper's settings, click on that hopper with the mouse. The Hopper Modify window will display.



Input Index

Select the input index to use to signal for Hi and Hi Hi Input conditions.

Vib Output

The vibrator output channel is configured from the Auxiliary I/O window for the input index you selected.

Alarm log status

The alarm log status is also configured from the Auxiliary I/O window.

Turn Off T/R

If a Hi Hi condition is reached you may choose to turn off the T/R associated with this hopper. To turn off a T/R, select it from this dropdown, otherwise select "None".

Hopper is...

You can toggle the operating state of the hopper by clicking on the *Toggle* button.

