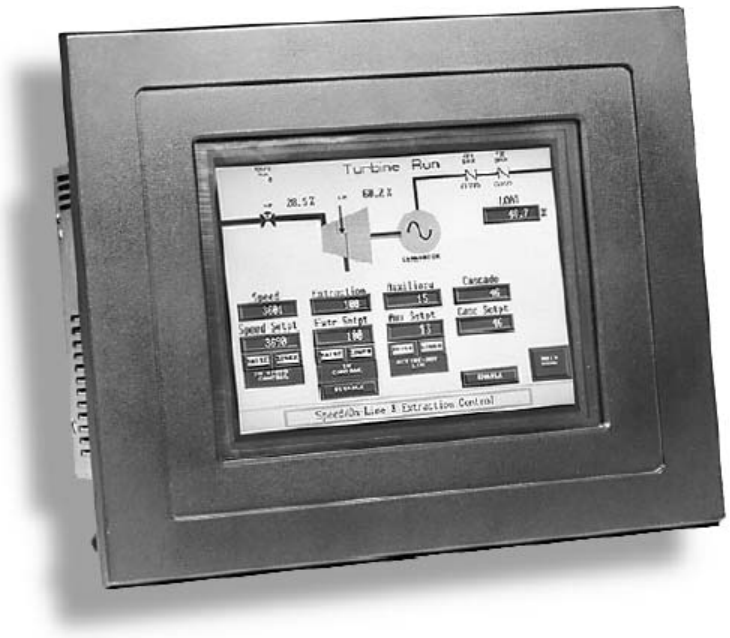
WOODWARD

**Product Manual 85580V4**
**(Revision J)**
**Original Instructions**




# MicroNet TMR® 5009 Digital Control System

## Volume 4
## OpView™ Interface Manual

**Manual 85580 consists of 4 volumes (85580V1, 85580V2, 85580V3, 85580V4).**

**General Precautions**

**Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment.**

**Practice all plant and safety instructions and precautions.**

**Failure to follow instructions can cause personal injury and/or property damage.**

**Revisions**

**This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, check manual *26311* , *Revision Status & Distribution Restrictions of Woodward Technical Publications*, on the *publications page* of the Woodward website:**

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**Proper Use**

**Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.**

**Translated Publications**

**If the cover of this publication states "Translation of the Original Instructions" please note:**

**The original source of this publication may have been updated since this translation was made. Be sure to check manual *26311* , *Revision Status & Distribution Restrictions of Woodward Technical Publications*, to verify whether this translation is up to date. Out-of-date translations are marked with ⚠. Always compare with the original for technical specifications and for proper and safe installation and operation procedures.**

**Revisions—Changes in this publication since the last revision are indicated by a black line alongside the text.**

# Contents

# Illustrations and Tables

# Warnings and Notices

## Important Definitions

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

- **DANGER**—Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING**—Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION**—Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
- **NOTICE**—Indicates a hazard that could result in property damage only (including damage to the control).
- **IMPORTANT**—Designates an operating tip or maintenance suggestion.

**⚠WARNING**

**Overspeed / Overtemperature / Overpressure**

**The engine, turbine, or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.**

**The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.**

**⚠WARNING**

**Personal Protective Equipment**

**The products described in this publication may present risks that could lead to personal injury, loss of life, or property damage. Always wear the appropriate personal protective equipment (PPE) for the job at hand. Equipment that should be considered includes but is not limited to:**

- **Eye Protection**
- **Hearing Protection**
- **Hard Hat**
- **Gloves**
- **Safety Boots**
- **Respirator**

**Always read the proper Material Safety Data Sheet (MSDS) for any working fluid(s) and comply with recommended safety equipment.**

**⚠WARNING**

**Start-up**

**Be prepared to make an emergency shutdown when starting the engine, turbine, or other type of prime mover, to protect against runaway or overspeed with possible personal injury, loss of life, or property damage.**

**⚠WARNING**

**Automotive Applications**

**On- and off-highway Mobile Applications: Unless Woodward's control functions as the supervisory control, customer should install a system totally independent of the prime mover control system that monitors for supervisory control of engine (and takes appropriate action if supervisory control is lost) to protect against loss of engine control with possible personal injury, loss of life, or property damage.**

**NOTICE**

**Battery Charging Device**

**To prevent damage to a control system that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.**

# Electrostatic Discharge Awareness

**NOTICE**

**Electrostatic Precautions**

**Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:**

- **Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).**
- **Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.**
- **Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.**

**To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual *82715*, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.**

Follow these precautions when working with or near the control.

1. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as much as synthetics.
2. Do not remove the printed circuit board (PCB) from the control cabinet unless absolutely necessary. If you must remove the PCB from the control cabinet, follow these precautions:
   - Do not touch any part of the PCB except the edges.
   - Do not touch the electrical conductors, the connectors, or the components with conductive devices or with your hands.
   - When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. Immediately after removing the old PCB from the control cabinet, place it in the antistatic protective bag.

# Regulatory Compliance

Part numbers 8236-513, 8236-617, 8236-701, and 8236-703 are suitable for use in Class I, Division 2, Groups A, B, C, and D or non-hazardous locations only.

Field wiring must be rated at least 75 °C for operating ambient temperatures expected to exceed 50 °C.

Peripheral equipment must be suitable for the location in which it is used.

Wiring must be in accordance with Class I, Division 2 wiring methods and in accordance with the authority having jurisdiction.

**⚠WARNING**

**EXPLOSION HAZARD—This equipment is not suitable for use in Class I, Division 2 hazardous locations if an F/T Relay module is installed in the cabinet. It is to be used in Ordinary or non-hazardous locations only.**

**Substitution of components may impair suitability for Class I, Division 2.**

**Do not remove or install power supply, modules, or other equipment while the circuit is live unless area is known to be non-hazardous.**

**Do not connect or disconnect equipment while circuit is live, unless area is known to be non-hazardous.**

**⚠AVERTISSEMENT**

**RISQUE D'EXPLOSION—La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, Division 2.**

**Ne pas enlever ni installer l'alimentation électrique, les cartes, ou d'autre équipement pendant que le circuit est sous tension avant de s'assurer que la zone est non dangereuse.**

**Ne pas raccorder ni débrancher tant que l'installation est sous tension, sauf en cas l'ambiance est décidément non dangereux.**

**⚠WARNING**

**If the equipment is used or applied in a manner not specified here-in, the protection provided by the equipment may be impaired.**

**⚠WARNING**

**HIGH VOLTAGE—If 125 Vdc is present on the DTM terminal blocks, there will be 125 Vdc on the discrete module cables. If power cannot be removed from the DTM, extreme care must be taken to avoid contact with the cables.**

***NOTICE***

**To comply with CE Marking under the European Low Voltage Directive (LVD), the maximum external circuit voltage for both the Discrete Inputs and Relay Output circuit are limited to 18–32 Vdc maximum.**

# Chapter 1.
# General Information

The technical documentation for the 5009 Control System consists of the following volumes:

**Volume 1**—provides information on system application, control functionality, fault tolerant logic, control logic, PID setting instructions, and system operation procedures.

**Volume 2**—provides hardware descriptions, mechanical and electrical installation instructions, hardware specifications, hardware troubleshooting help, and basic repair procedures.

**Volume 3**—provides installation procedures for the 5009 control's personal computer based interface software program (PCI), information on all PCI features and modes (Program, Service and Run), and a lists of the control's Modbus® * registers and DDE tag names.

*—Modbus is a registered trademark of Schneider Automation Inc.

**Volume 4**—provides details on installation and operation of the OpView operator control station, if provided with your system.

The Woodward OpView™ Operator Interface was developed for use with the MicroNet TMR® 5009 Digital Governor for steam turbines. This manual includes installation instructions, description and operating procedures.

This manual does not contain instructions for the operation of the complete turbine system. For turbine or plant operating instructions, contact the plant-equipment manufacturer.

The following part numbers are covered in this manual:

| Part Number | Screen Type | Com B Port | Rating |
|---|---|---|---|
| 8236-354 | COLOR | 25-pin | |
| 8236-513 | COLOR | 25-pin | Class I, Division 2 |
| 8236-616 | COLOR | 25-pin | |
| 8236-617 | COLOR | 25-pin | Class I, Division 2 |
| 8236-700 | COLOR | 9-pin | |
| 8236-701 | COLOR | 9-pin | Class I, Division 2 |
| 8236-1001 | COLOR | 9-pin | |

# Chapter 2. Description

The OpView™ Operator Interface is a touch screen workstation that functions as an annunciator and operator control panel for Woodward's MicroNet TMR® 5009 digital control. This workstation allows an operator to remotely view operating points, vary control setpoints, and issue run mode commands. The OpView is comprised of an industrialized touchscreen hardware package and a Woodward developed software program. This standard software program allows the OpView to automatically select the correct interface screens based on how the 5009 control has been configured. No field configuration is necessary. The hardware package selected is the PowerStation from Computer Technology Corporation (CTC). Please review the PowerStation manual provided from CTC. Even though the PowerStation is fully tested and programmed before it is packaged with the 5009, the manual contains basic maintenance information and a users guide.

The OpView is connected to the J3 communication port of the SIO Module in Kernel A, of the 5009 control. Once communications between the OpView and the 5009 control have been established, the OpView will automatically configure its screens to match the configuration of the control. Depending on how the 5009 control is configured, all 5009 run mode operations can be monitored and performed through the OpView. If the 5009 control is not programmed to accept commands from the respective Modbus port, the OpView functions in a system monitor mode only (refer to Local/Remote section of this manual and Volume 3 of the 5009 manual).

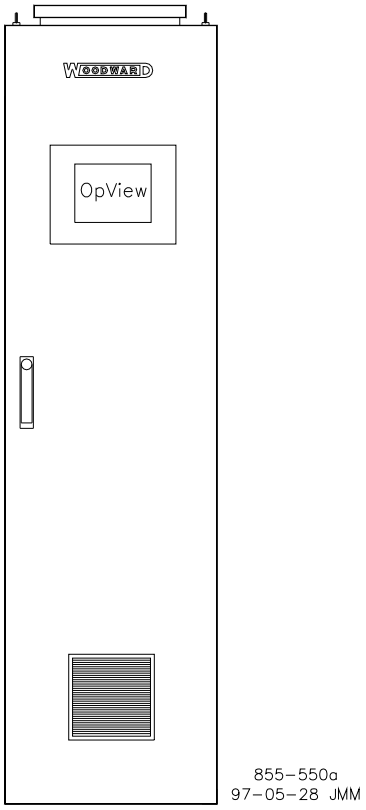


Figure 2-1. 5009 System

A selection of touchscreens allow operators to monitor, control, and troubleshoot a system. These screens display:

- All controlling parameters
- Starting sequence status
- Turbine related information
- Generator related information
- Speed, Extraction, Aux, Casc, and Limiter information
- Analog input/output information
- Discrete input status
- Discrete output status
- System alarm and shutdown information

These screens also allow access to:

- Dynamic Adjustment
- Overspeed test
- Valve calibration
- A Controlled shutdown

The OpView provides an alarm log that displays and time tags(with one second resolution), all 5009 alarms and trips. Connection to an optional serial printer provides a hard-copy of the alarm/trip log. Refer to Figure 2-2 for port locations.

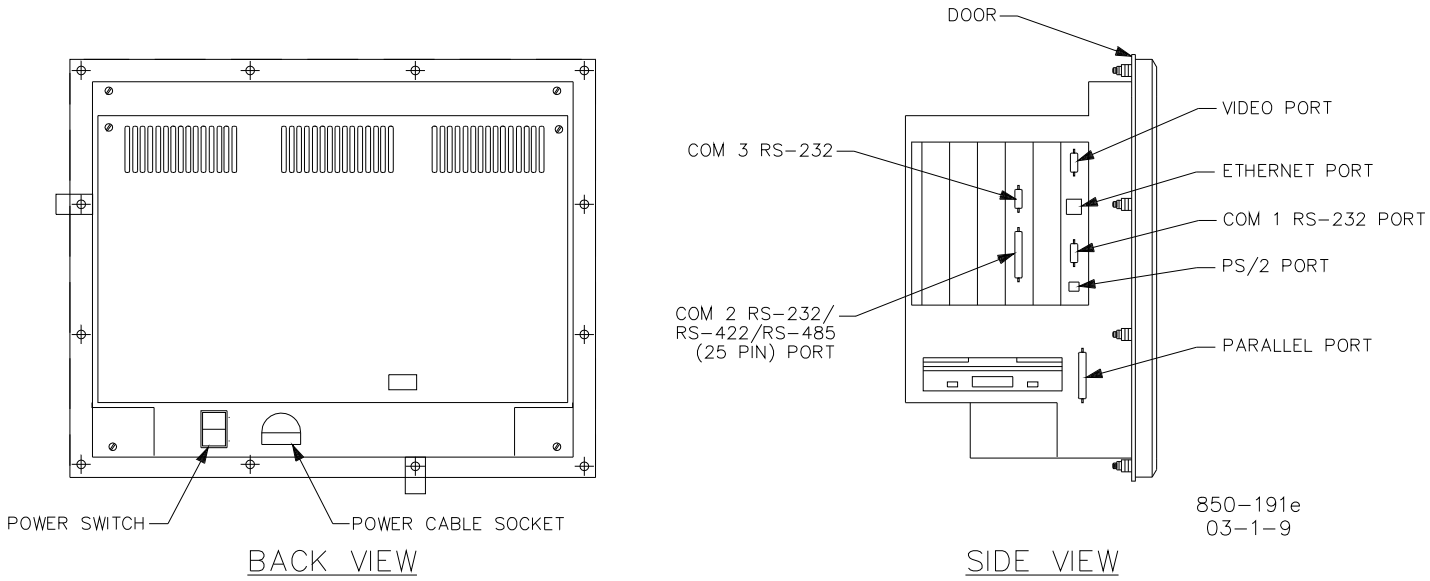


Figure 2-2. Layout Reference (8236-616 & 8236-617)

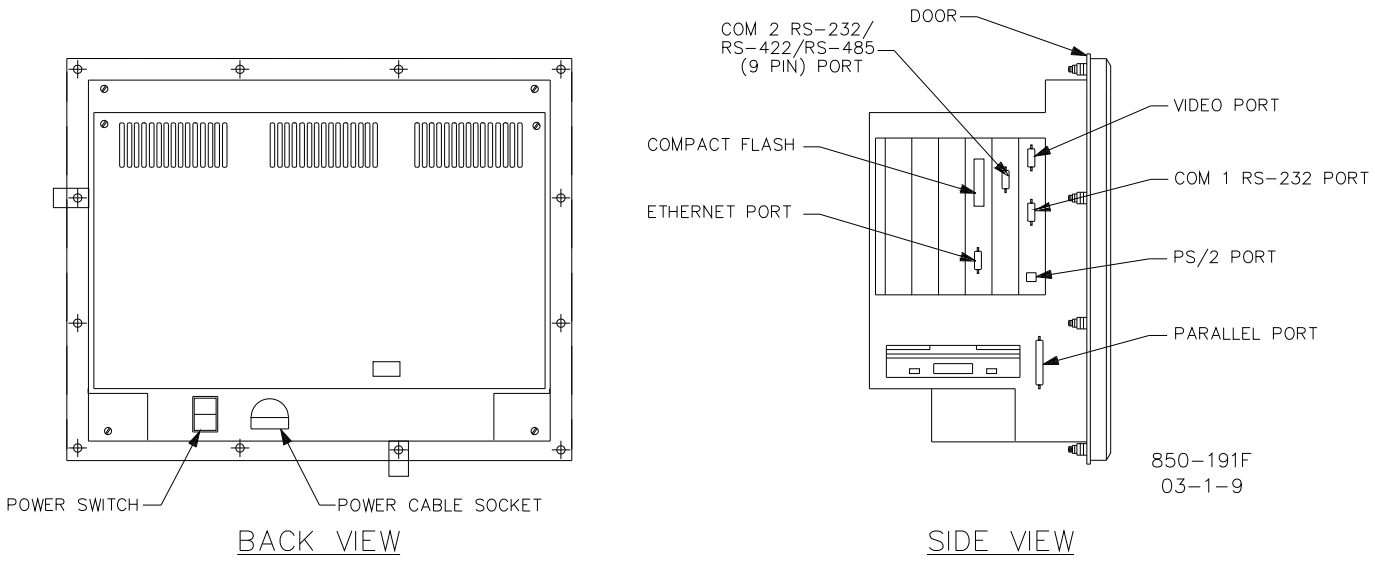


Figure 2-3. Layout Reference (8236-700 & 8236-701)

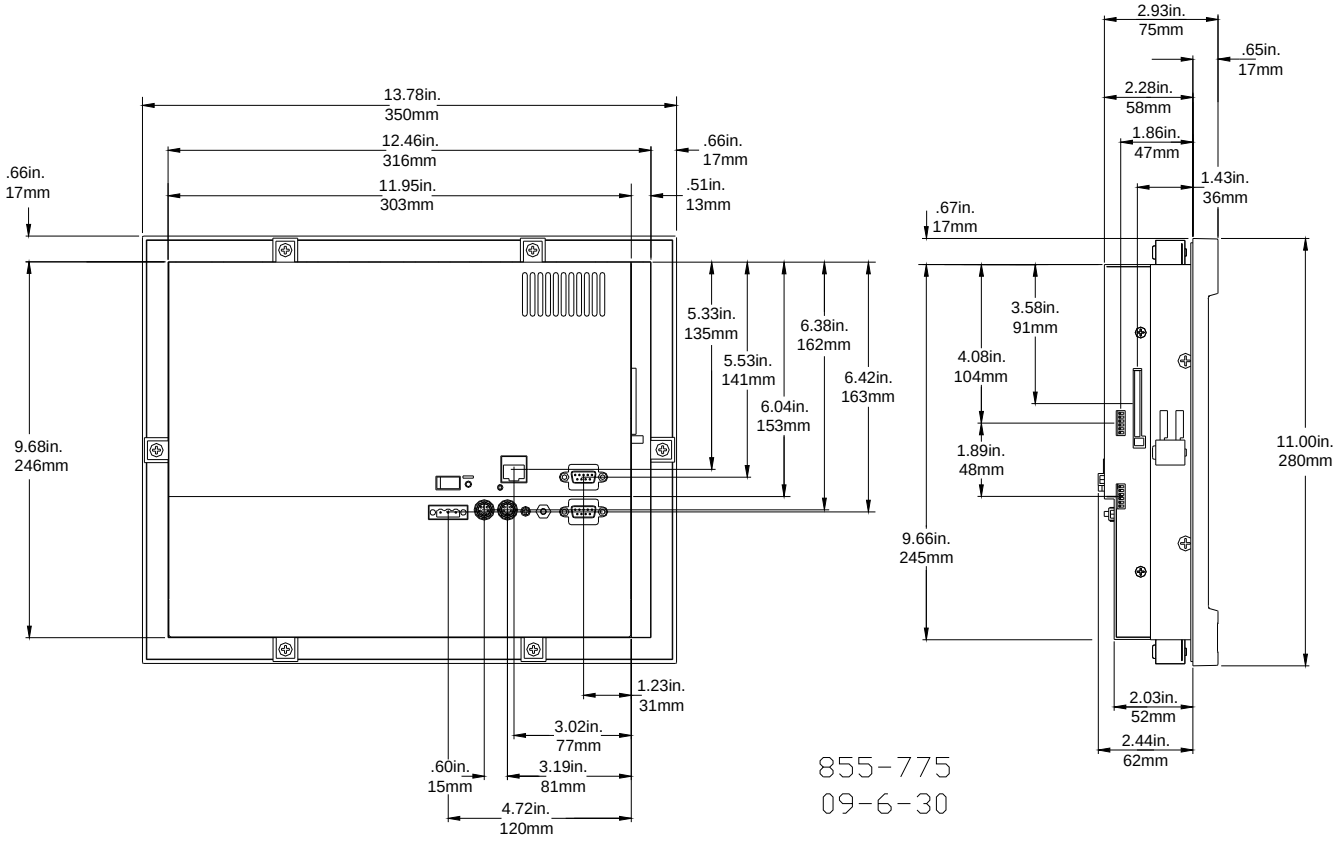


Figure 2-4. Layout Reference (8236-1001)

# Chapter 3.
# Installation Procedures

## Introduction

This touchscreen workstation is designed for industrial applications for panel mounting. The face plate has a NEMA 4 rating, and the temperature rating is 0 to 50 °C (32 to 122 °F). The OpView™ weighs 6.9 kg (15.2 lb). The OpView is secured into the cabinet with 12 mounting studs or 6 mounting clips, depending on model number.

The unit must be installed in an enclosure or panel mounted so that the back shell of the unit is protected from airborne contaminates. The installation must also provide adequate air flow for the unit. To provide for this, a minimum of two inches must be provided around the sides of the unit to insure proper air flow. When installing the unit, enough room should be left in the back for ease of wiring.

For more information on the environmental restrictions, consult the PowerStation manual that was included with the hardware package of the OpView.

Figures 3-1and 3-2 show the dimensions of the of the OpView.

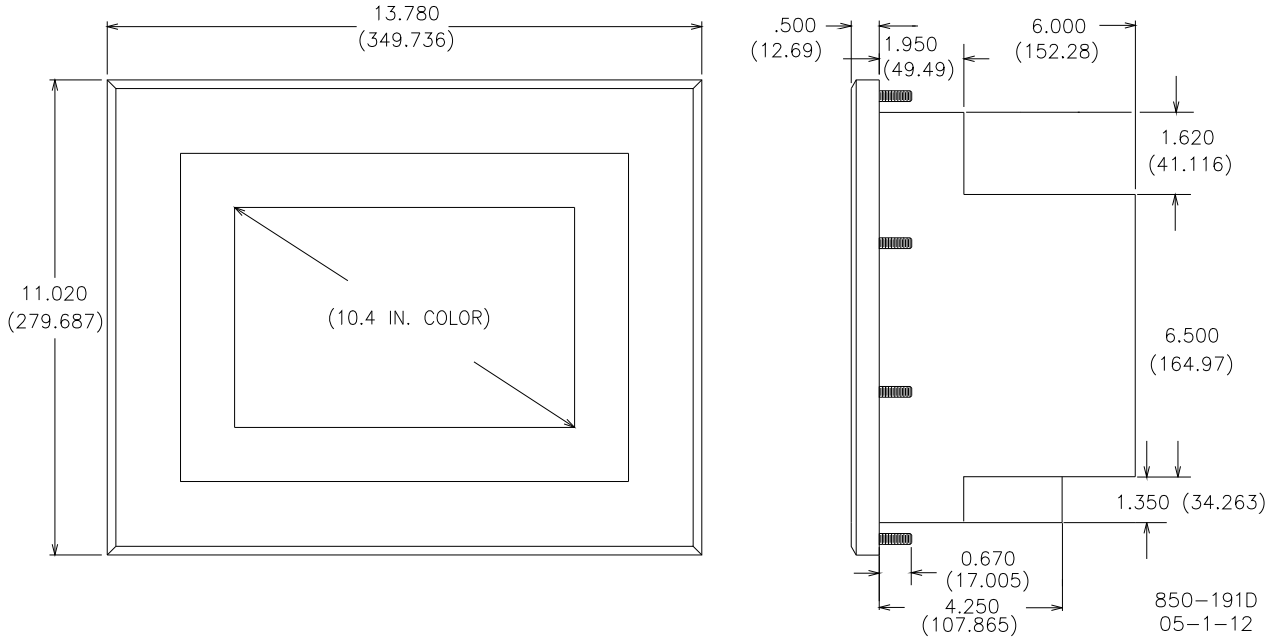


Figure 3-1. Outside Dimensions (8236-617, 8236-700, & 8236-701)

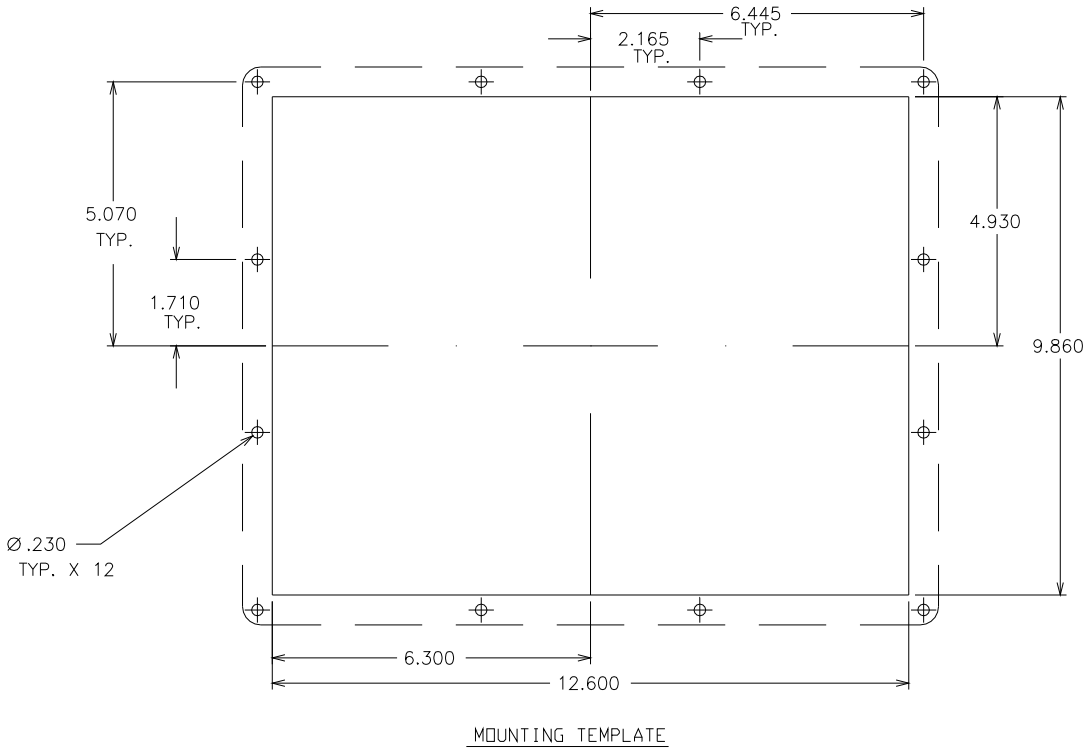


Figure 3-2a. Mounting Template (8236-617, 8236-700, & 8236-701)

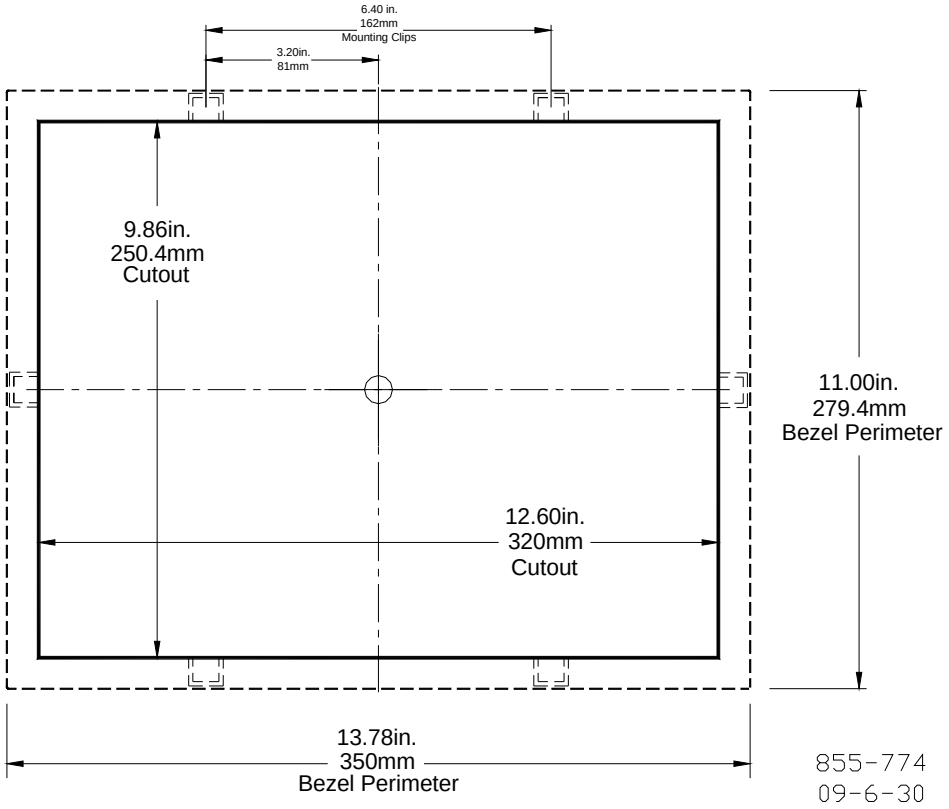


Figure 3-2b. Mounting Template (8236-1001)

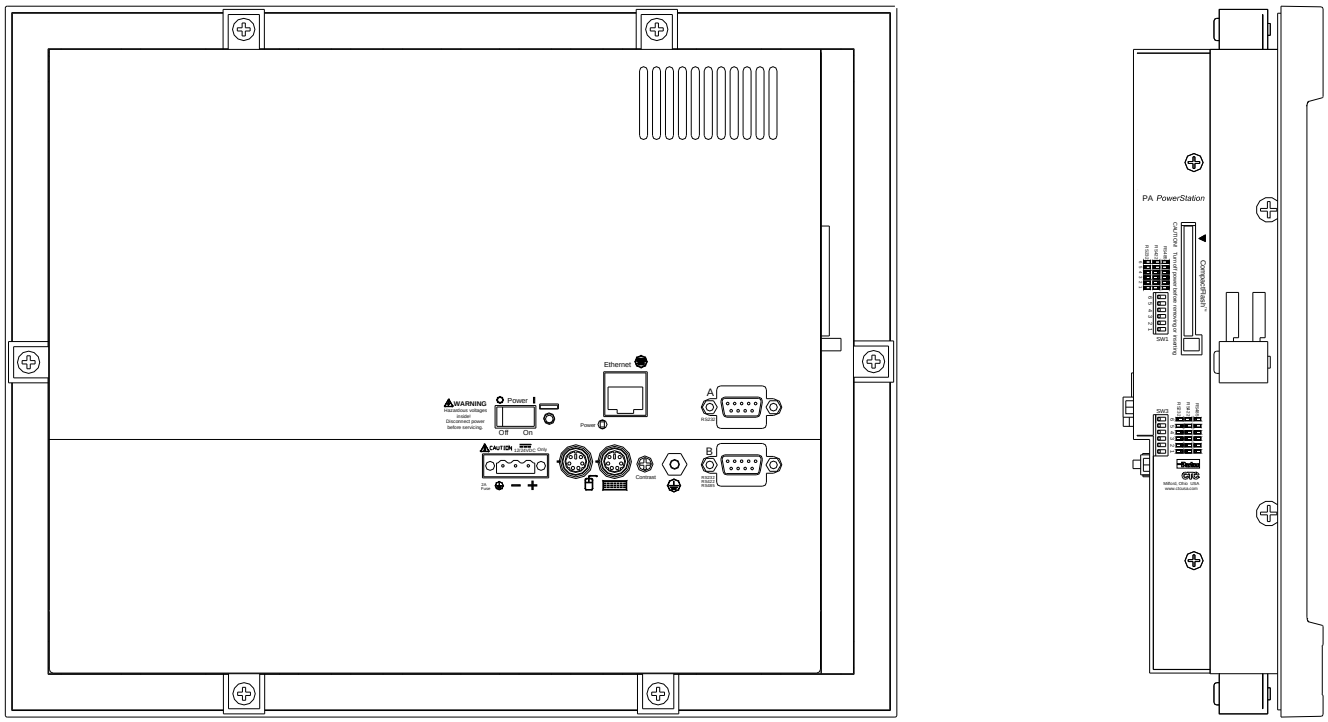


Figure 3-2c. Port Identification (8236-1001)

## Communications

The OpView has multiple communication ports (see Figures 2-2 through 2-4). The OpView's "Com B" communication port is used for 5009 to OpView communications. The Com A and Com B ports are not used with this application.

The OpView's Com B port can communicate via standards; RS-232, RS-422, or RS485. The distance between the 5009 control and the OpView will determine the communication standard used. RS-232 communications should not be used if the distance between the devices is greater than 15 m (50 ft). RS-422 and RS-485 communications can be used up to a distance of 1200 m (4000 ft).

Depending on the OpView platform purchased, the OpView's Com B port may utilize a 9-Pin connector or a 25-Pin connector.

The OpView platform which uses a 25-Pin connector for Com B is configured for RS-232, RS-422, or RS-485 communications by jumpering specific pins on the Com B connector. Refer to Figures 3-3, 3-5, 3-7, 3-9, and 3-11 for cabling connection requirements.

The OpView platform which uses a 9-pin connector for Com B is configured for RS-232, RS-422, or RS-485 communications by positioning jumpers within the OpView itself. Refer to the CTC - Power Station - User Guide for Com B protocol selection DIP switch positions and locations. Refer to Figures 3-4, 3-6, 3-8, 3-10, and 3-12 for cabling connection requirements.

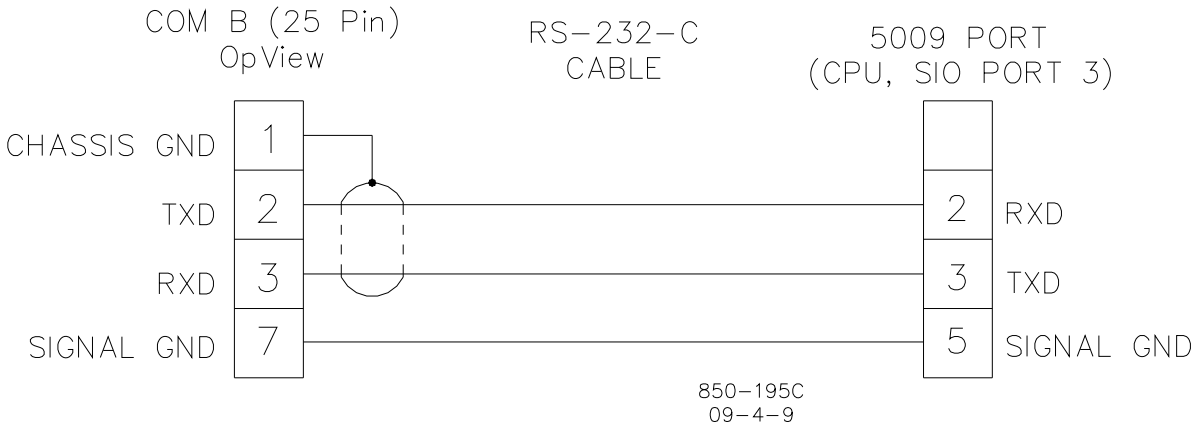


Figure 3-3. RS-232 Communications (OpView Com B; 25 Pin)

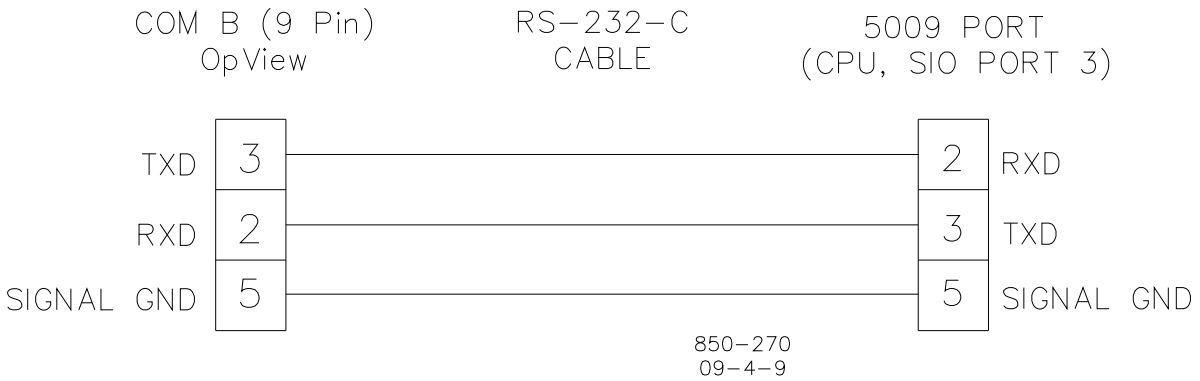


Figure 3-4. RS-232 Communications (OpView Com B; 9 Pin)

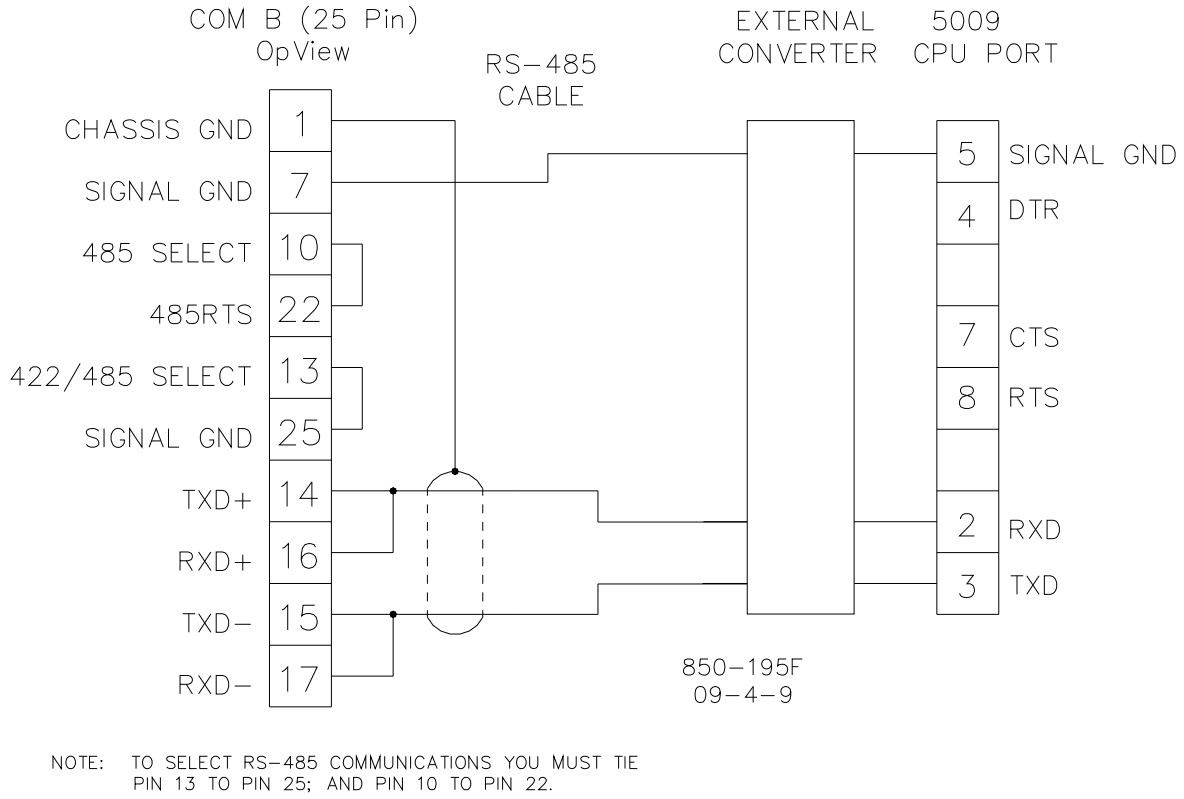


Figure 3-5. RS-485 Communications (OpView Com B; 25 Pin)

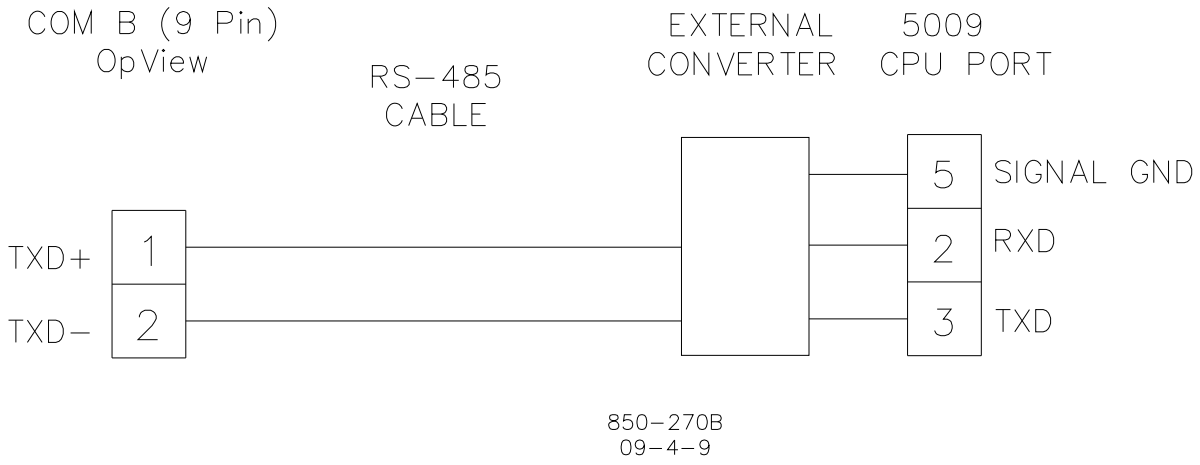


Figure 3-6. RS-485 Communications (OpView Com B; 9 Pin)

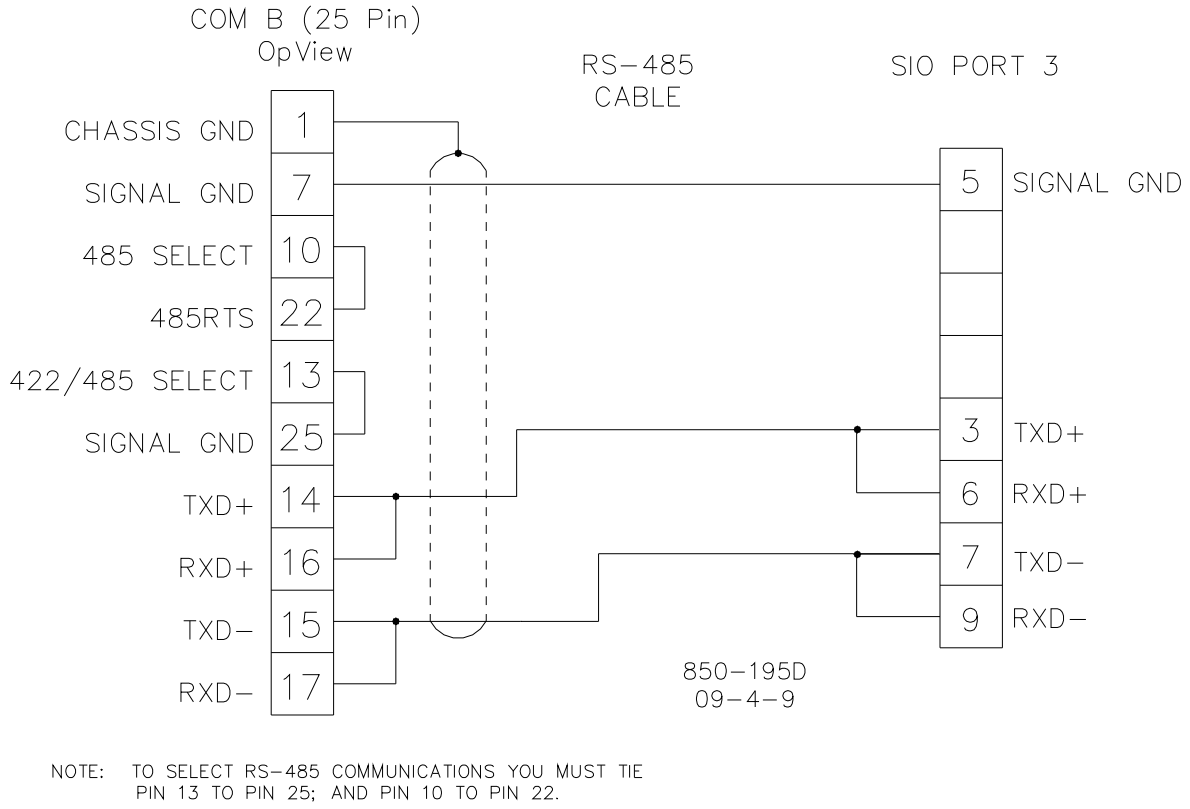


Figure 3-7. RS-485 Communications SIO Port 3 to OpView Com B: (25 Pin Port)

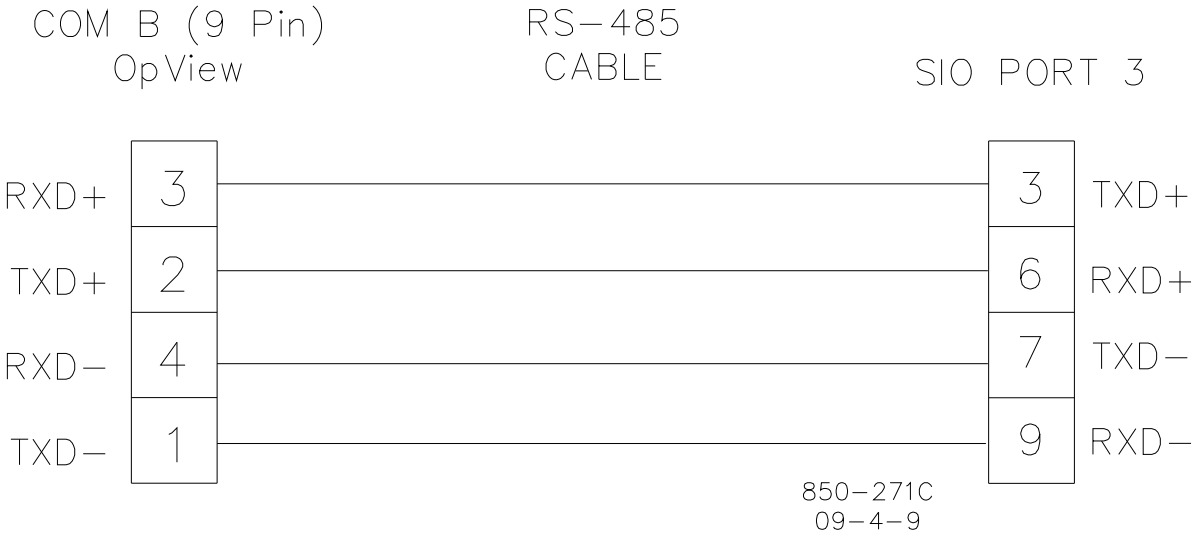


Figure 3-8. RS-485 Communications SIO Port 3 to OpView Com B: (9 Pin Port)

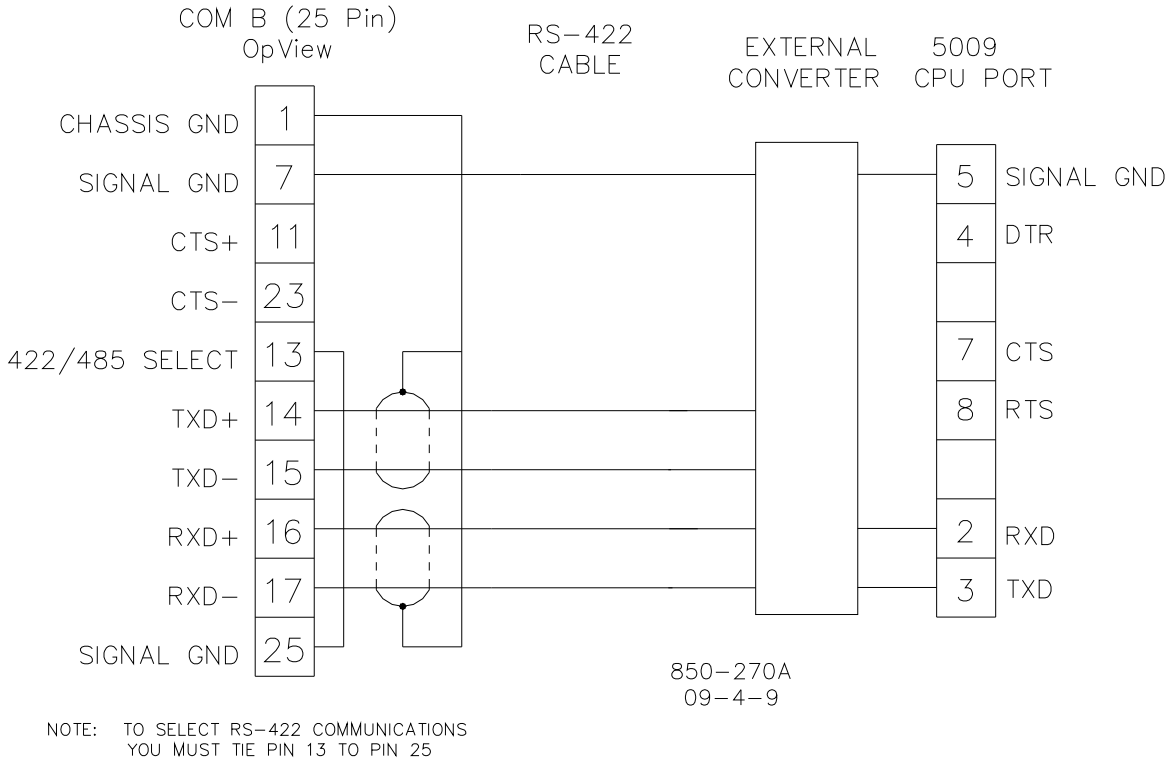


Figure 3-9. RS-422 Communications To CPU Port (OpView Com B; 25 Pin)

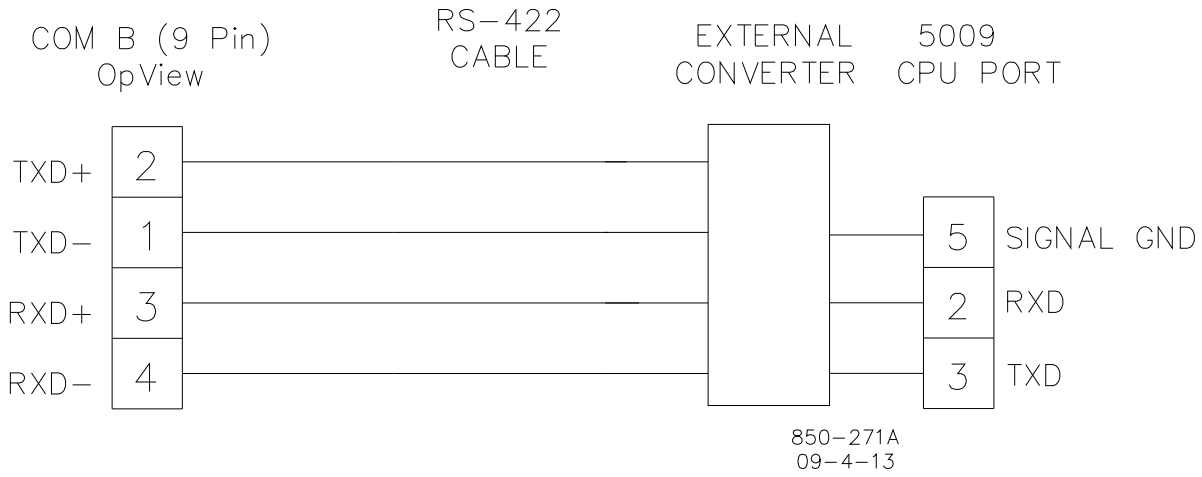


Figure 3-10. RS-422 Communications To CPU Port (OpView Com B; 9 Pin)

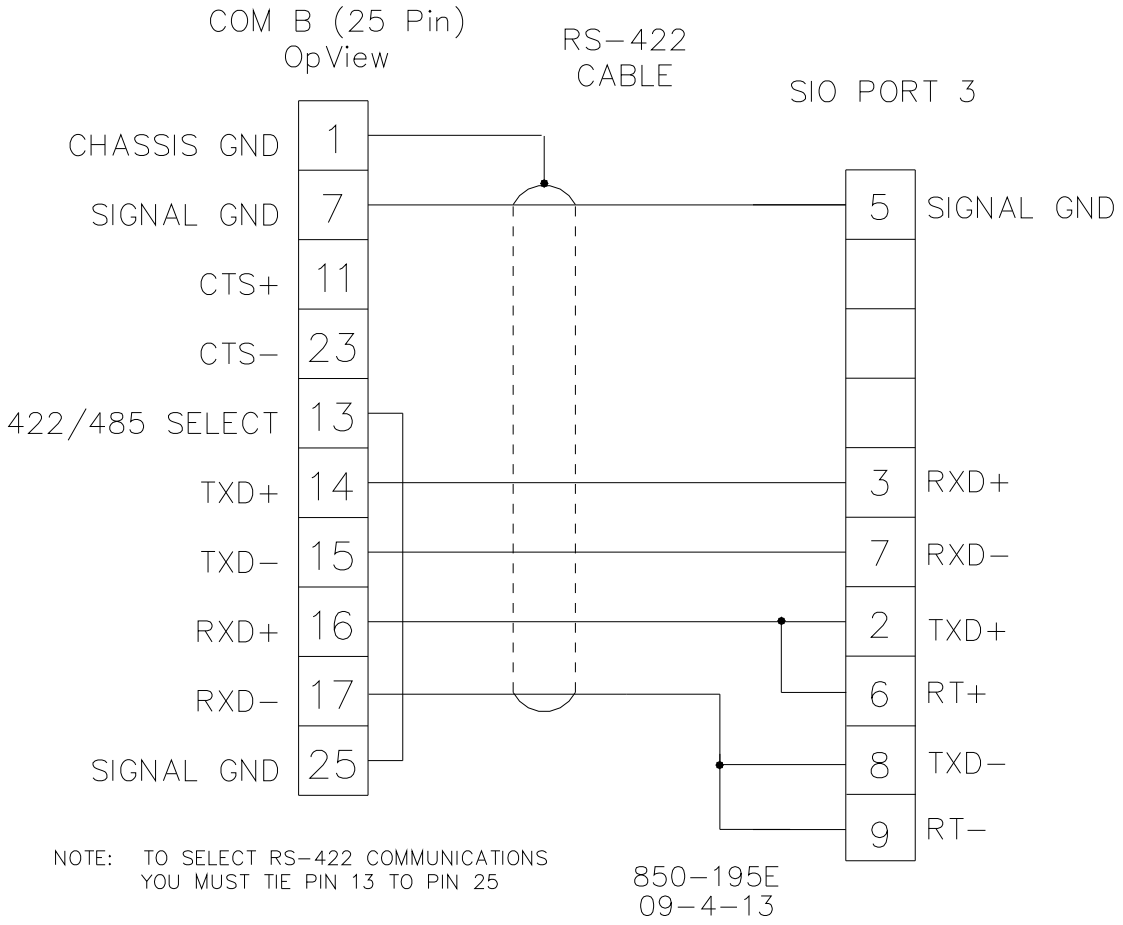


Figure 3-11. RS-422 Communications to SIO Port 3 (OpView Com B; 25 Pin)

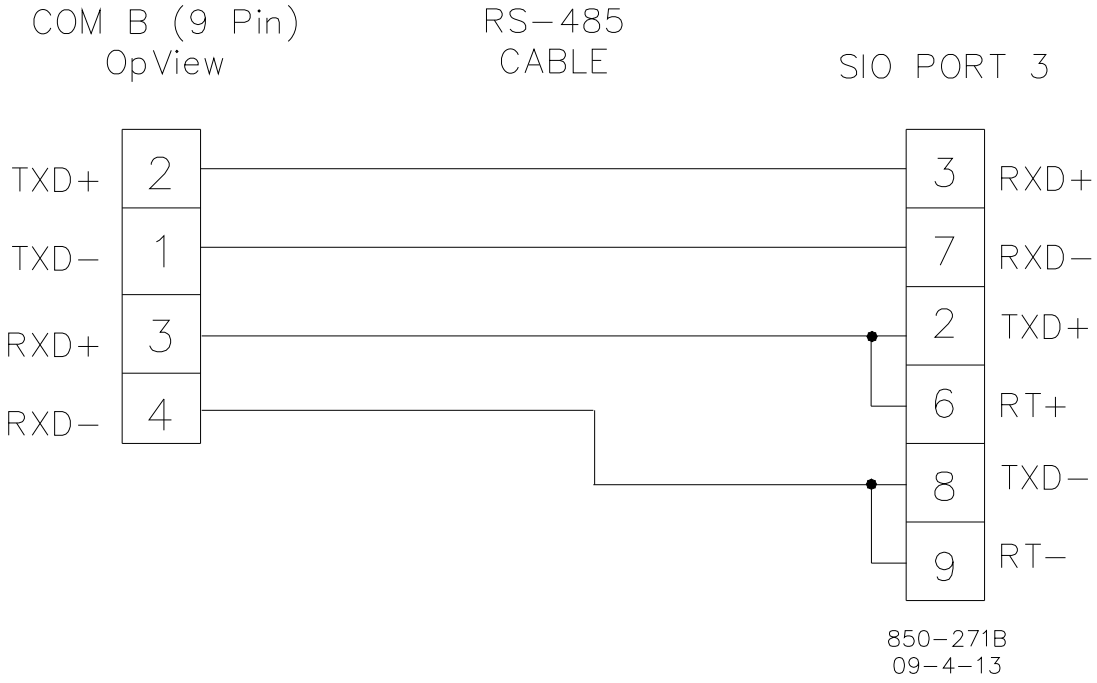


Figure 3-12. RS-422 Communications to SIO Port 3 (OpView Com B; 9 Pin)

Any 5009 control serial port configured for Modbus communications can be used to communicate with the OpView. For successful Modbus communications the respective 5009 Modbus port's settings must configured to match the OpView's communication port settings. The OpView's Com B port communication settings are defaulted to the following:

| | |
|---|---|
| Protocol Type: | RTU |
| Device Number: | 1 |
| Baud Rate: | 19200 |
| Stop Bits: | 1 |
| Parity: | NONE |

If the 5009 port settings have been changed from these defaults the OpView will not communicate. Refer to Volume 1 of the 5009 manual for further information on setting the communication ports.

## Printer Setup

If a parallel printer is to be used with the OpView to print out the alarm log, it must be connected to the OpView's parallel port. See Figures 2-2 through 2-4 for the location of the port. Use a standard IBM based parallel cable to connect the printer to the OpView.

The printer must be programmed for the following protocol settings:

| | |
|---|---|
| Baud Rate | 9600 |
| Parity | NONE |
| Data Bits | 8 |
| Stop Bits | 1 |

## Initial Setup

Upon power up, the OpView performs a set of diagnostic tests before it switches to its Run mode and is ready for operation. These diagnostic tests take several minutes to perform, in which time the application screens will not be visible. If the OpView is not communicating with the 5009 control, it may take up to 20 minutes before application screens are visible.

After all diagnostic tests are passed the application's Main Menu screen will appear. If a "LOST COMMUNICATION" message is displayed across the top of the screen verify that the 5009-to OpView communications cable connections are correct and that the 5009 ports settings are correctly set.

When the OpView is in the Run Mode, the operator can then go to any of the operational screens and view and/or change the 5009 controls running parameters. If the 5009 is not communicating to the OpView, the operator will still be able to go to the screens, but will not be able to issue any commands or view 5009 parameters.

It is recommended that the OpView's time and date be set as part of the OpView's initial setup. Refer to the "Setting Time and Date" procedure below for setting instructions.

## Setting the Time and Date

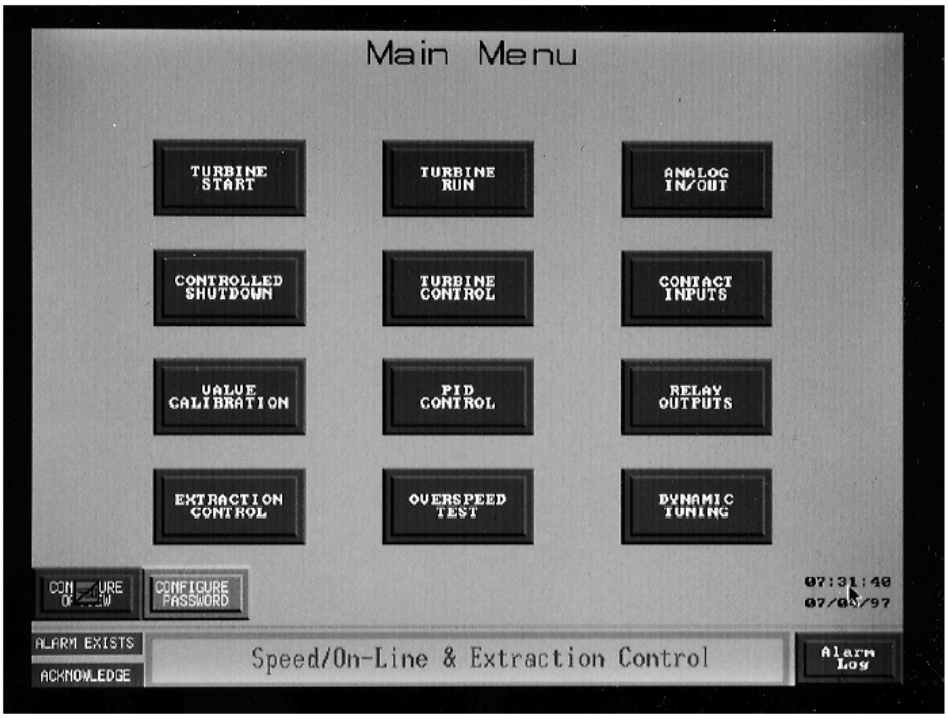


Figure 3-13. Main Menu

1. From the Main Menu screen press the CONFIGURE PASSWORD button.
2. Enter the proper password with the keypad (see Appendix A for passwords) and then Enter.
3. Press Configure OpView button
4. Press Time and Date button from the Application Manager menu.
5. Press Set Time button
6. Enter the correct time. (Format: hour:minute:second)
7. Press the Enter button.
8. Press Set Date button or Previous Menu button and go to step 11
9. Enter the correct date and then Enter. (Format: day:month:year)
10. Press Previous Menu button.
11. Press Change User button from the Application Manager menu.
12. Enter the 5009 user level password with the keypad and then Enter.
13. Press Go To Module button.
14. Press PTM Module.
15. The OpView will return to the Main Menu screen.

**NOTICE**

**Some of the options under the shell menu will erase the program in the OpView. The OpView will then have to be reprogrammed by Woodward personnel.**

**Communications between the OpView and the 5009 are halted while in the shell menu.**

The OpView has now been modified as much as needed. The procedures may be repeated for Daylight Savings Time or other date/time changes. The other options in the Application Manager and the Shell Menu are explained in more detail in the PowerStation manual provided by CTC. Woodward strongly recommends that the customer exercise caution if any of the other options are used.

# Chapter 4.
# Operating Procedures

## General Operating Procedures

This chapter describes the options and features that are available through the OpView™. This manual should not be used as an operational manual for the turbine control. Refer to Volume 1 of the MicroNet TMR® 5009 manual for more information on the operation and control functions of the 5009 control.

The OpView is an industrial hardened touchscreen workstation. Several "screens" with graphics, monitor boxes, and push buttons have been set up for ease of turbine operation. The graphics are self describing and show pictures of valves, turbines and other standard plant equipment. The monitor boxes show references, inputs, outputs and other measurements in easy to read numerical format. The push buttons are used to raise or lower setpoints, enable or disable functions, or to move from one screen to the another. The push buttons will change intensity or color when selected to inform the operator when they have been received by the touchscreen of the OpView.

If the 5009 control is configured to receive commands from the OpView, all control operations can be performed through the OpView. If not, the OpView can serve as a system monitor.

### Notes Regarding This Chapter

**Visibility**—This term is used to reference when a gauge or function is displayed on the OpView (such as enable / disable buttons). Visibility largely depends on how the 5009 is configured. For example, if configured for a single valve turbine, no extraction type gauges will appear.

**ENABLE/DISABLE buttons**—These are 'active' buttons which change once they are pressed. i.e. If the button says ENABLE the function will be enabled when pressed, the button will then change to DISABLE.

**Load Gauges**—Load is displayed in KW or MW depending on 5009 configuration. If the KW analog input has failed, the gauge will change to percent which is calculated in the 5009 control.

**Remote Setpoints**—Are only on the Turbine Control screen.

**Entered Setpoints**—Are only on the Turbine Control screen.

### Lost Communication

If the OpView is not communicating to the 5009 a large 'LOST COMMUNICATION' message will appear on every screen. Screens can still be paged through, however, all control variables will be corrupt and gauges that were previously hidden will appear.

Upon loss of communications between the OpView and the 5009 control, the 5009 will generate an alarm. Turbine control will not be effected. No commands from the OpView will be executed until the communications link is restored.

Once communications have been re-established all commands from the OpView will be accepted except 'entered' values (see Turbine control Screen Description). The 5009 alarm (communications failed) must be reset before 'entered' values are accepted.

## Units

The OpView will display the units of measure that have been configured in the Program Mode of the 5009 control for each function.

## Local/Remote

The 5009's Local / Remote function allows an operator to disable some or all remote operator panels.

If the 5009 is configured to accept a Local/Remote input from the OpView, a Local/Remote push button will appear on the MAIN MENU and DYNAMICS / TREND MENU screen. It displays the action which will take place if the button is pressed (same as enable / disable buttons). There is also a status indication on all screens (except Trend screens) signifying Local/Remote status.

Refer to 'Local / Remote' of Volume 1 and 'CPU Communications' of Volume 3 of the MicroNet TMR 5009 manuals for more information.

## Emergency Trip

The 5009 control is defaulted to not accept an emergency shut down (ESD) command from the OpView. If the 5009 is configured to accept an ESD from the OpView, the ESD command button is displayed in the top right corner of all screens. The OpView emergency trip utilizes a two step process to avoid accidental shutdowns. The following procedure explains the two step emergency trip. Refer to Figure 4-2 for location of the ESD buttons.

1. Press the Emergency Trip (ESD) button.
2. Press the Verify Emergency Trip button, within five seconds (different screen location).
3. The 5009 will shutdown immediately.

The Verify button will appear on top of the screen title. After five seconds, the Verify button will disappear from the screen and the first step will have to be reinitiated.

## General Screen Functions

Depending on how the 5009 is configured, complete system control to simple monitoring can be accomplished at the touch of the screen. There are basic functions which can be performed or viewed from all of the OpView screens (except where noted):

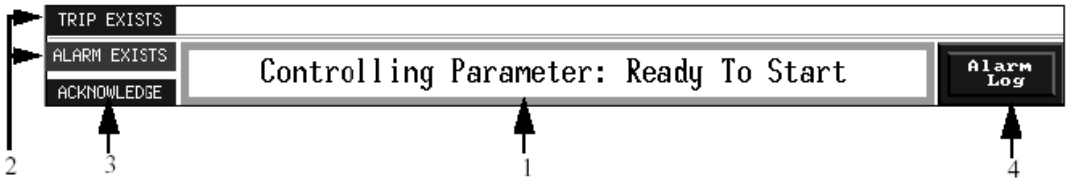


Figure 4-1. General Functions

**General Functions**

1 Display Controlling Parameter (except on the Alarm Log or the Alarm History screens)
2 Alarm/Trip Status (except TREND screens)
3 Alarm Acknowledge (if an unacknowledged alarm exists) (except TREND screens)
4 Go To Alarm Screen (if an alarm exists) (except TREND screens)

# Detailed Operating Procedures

The following section describes OpView buttons and status indications, their function, and when they appear on the OpView (visibility). Items contained under General Screen Functions in the previous chapter are not described in this section. Visibility for all command buttons (buttons which communicate to the 5009 control to perform a function) is dependent on the Modbus being enabled. Refer to volume one and volume three of this manual series for additional information on Modbus addresses and enabling / disabling the Modbus (local / remote).

## Main Menu

The Main Menu screen is used as a focal point to access the other screens. In most cases it is required to return to the Main Menu to proceed to another screen. It contains push buttons to access the other screens and the Dynamics / Trend menu.

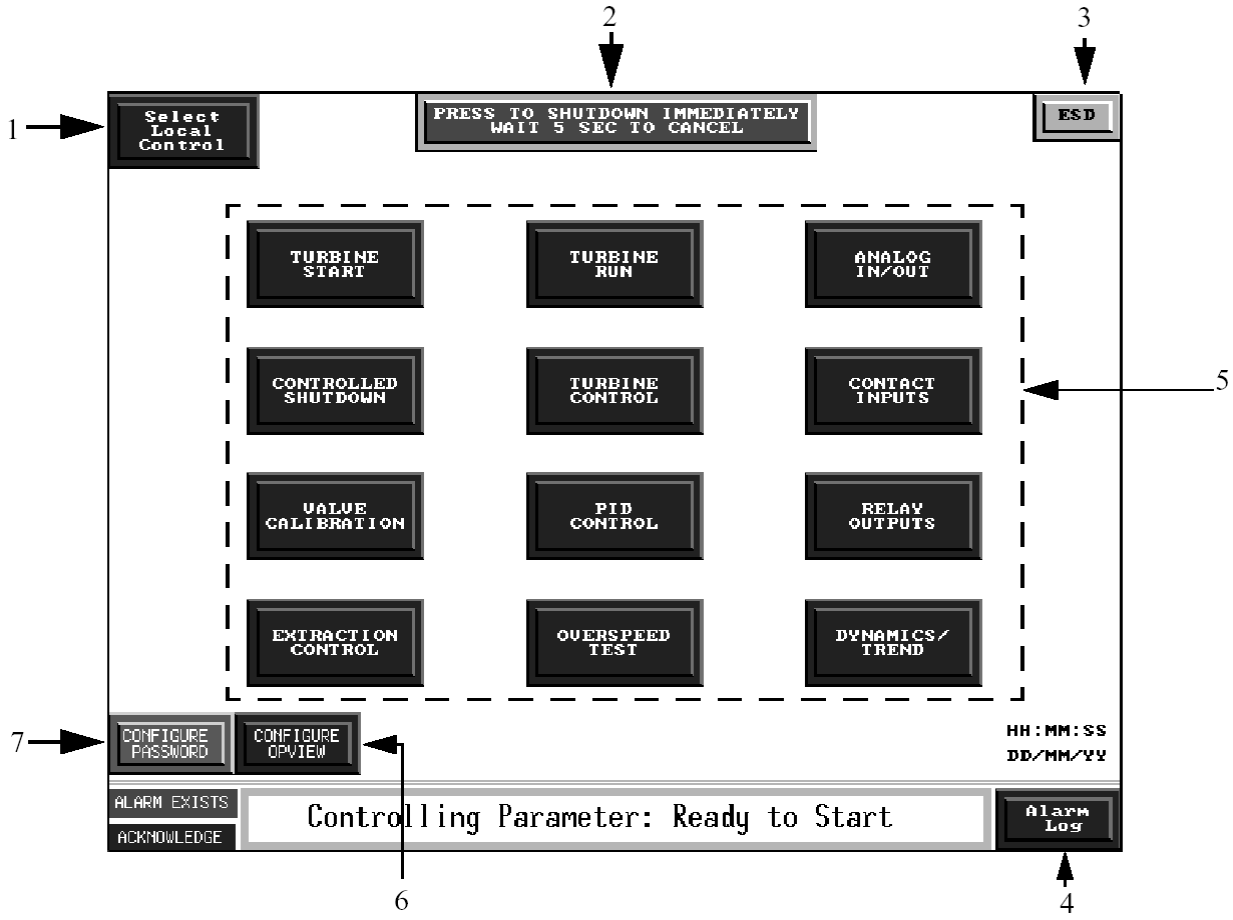


Figure 4-2. Main Menu

Table 4-1. Main Menu Functions

| Button / Display | Function | Visibility |
|---|---|---|
| 1. Local / Remote | Toggles Local / Remote function | Local / Remote Configured |
| 2. ESD Verification | Verifies ESD and issues a shutdown command | ESD button is pressed, configured for two step trip from Modbus |
| 3. ESD | Issues emergency shutdown command | Configured for ESD from Modbus |
| 4. Alarm Log | Link to the Alarm Log Screen | Always |
| 5. Change Screen | Changes to the specified screen | Always except: Extraction, Admission, Extr/Adm based on configuration. Controlled Shutdown - Modbus enabled |
| 6. Configure OpView | Accesses the Application Manager | Password protected |
| 7. Configure Password | Displays pop-up keypad for password entry | Always |

The Configure Password (found only on the Main Menu) generates a pop-up keypad which is used to enter the password for the supervisory mode. Once the password has been accepted, the Configure OpView button will appear. The Configure OpView button will access the Application Manager menu which is described earlier in this manual.

The Alarm Log button is always visible on the Main Menu where as on other screens it is only visible if an alarm exists. Once pressed, the Alarm Log screen is brought up.

## Turbine Start Screen

This screen is used to start the turbine and ramp to rated speed or the minimum controlling speed. The Turbine Start screen displayed will be different depending upon the Idle To Rated Routine programmed in the 5009 control. The three Start Screen options are Idle/Rated, No Idle Used (Manual Raise / Lower Only) and Auto Start Sequence.

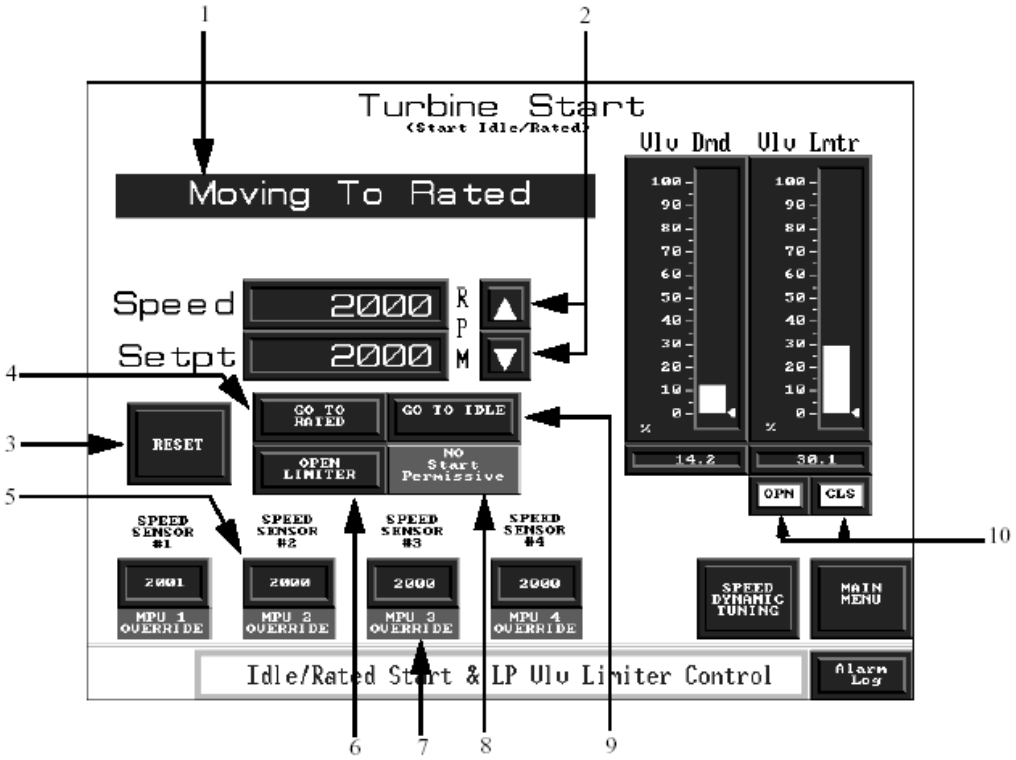


Figure 4-3. Turbine Start (Idle / Rated)

Table 4-2. Turbine Start Functions

| Button / Display | Function | Visibility |
|---|---|---|
| **1. Status*** | Indicates status of configured start sequence | Always |
| **2. Raise / Lower** | Raise or Lower Speed Setpoint | Speed Raise / Lower permissible |
| **3. RESET** | Reset 5009 alarms / trips | Shutdown exists |
| **4. GO TO RATED*** | Selects rated | Turbine started & Rated Permissible |
| **5. Speed Sensors** | Displays speed sensed by each speed sensor | Based on how many speed sensors configured |
| **6. OPEN LIMITER** | Automatically increases HP/V1 valve limiter | Ready for Open Limiter (turbine started, initial V1 position configured and limiter at initial value) & HP/V1 limiter not at max |
| **7. MPU OVERRIDE** | Indicates speed sensor override | Based on 'Zero Speed Override' |
| **8. NO START PERMISSIVE** | Indication of start permissive contact input | Start perm configured & turbine not started |
| **9. GO TO IDLE*** | Selects idle | Turbine started & Idle Permissible |
| **10. OPN / CLS Valve Limiter** | Opens and closes HP/V1 valve limiter | Turbine run initiated |
| **RESUME AUTOSEQ*** | Continues Auto Start Seq. | Auto Start Seq. is halted and not completed, HP/V1 limiter is not at minimum and turbine not shutdown |
| **START** | Initiates a start command | Turbine not started & shutdown does not exist |
| **HALT AUTOSEQ*** | Halts Auto Start Seq. | Auto Start Seq. is not halted or completed, HP/V1 limiter is not at minimum and turbine not shutdown |
| **AUTO SEQ GRAPHIC *** | ink to Auto Start Seq. graphic screen | Configured for Auto Start Sequence |

*** Based on 5009 configuration**

## Auto Start Sequence Graphic

This screen is available if the Auto Start Sequence is configured in the 5009 control and accessed by pressing the 'Auto Seq Graphic' button on the Turbine Start screen. It shows the Auto Start Sequence in a graphical form and contains most of the same functions of the Turbine Start page.

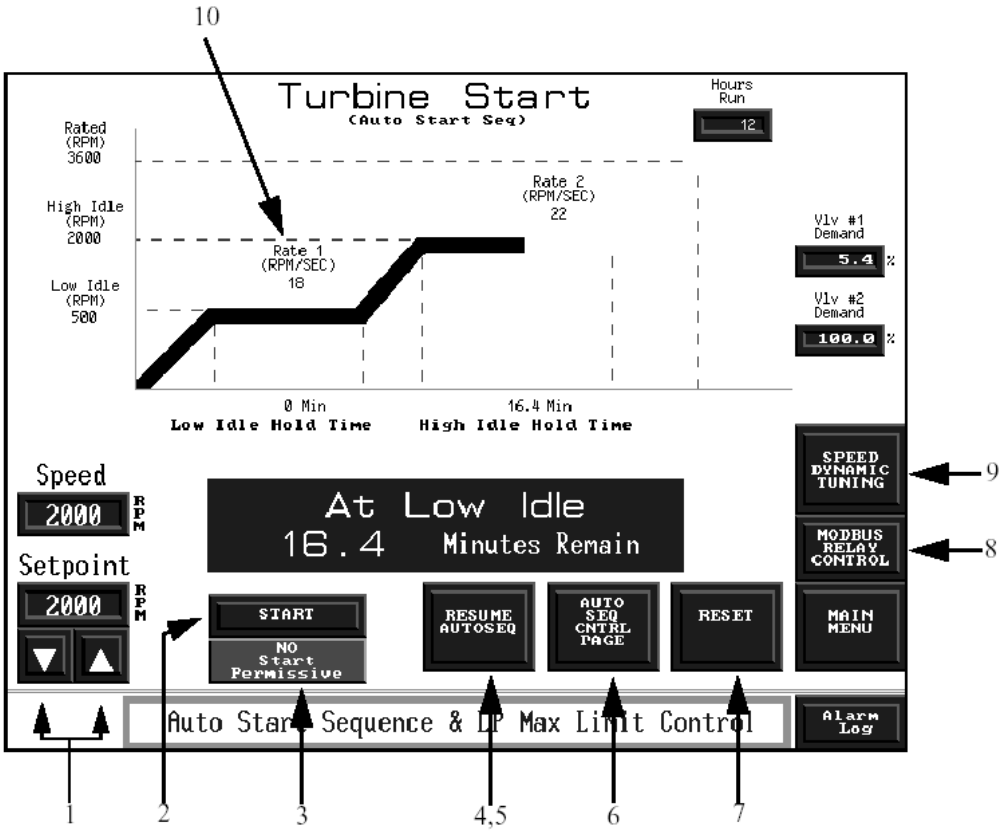


Figure 4-4. Auto Start Sequence Graphical

In addition to start sequence status and speed, the graphical screen displays ramp rates and Idle Hold times as calculated in the 5009 control. To move back to the Auto Start screen push the AUTO SEQ CNTRL PAGE button. Access to the Speed Dynamic tuning screen is available by pushing the SPEED DYNAMIC TUNING button.

Table 4-3. Auto Start Sequence Functions

| Button/Display | Function | Visibility |
|---|---|---|
| 1. Raise / Lower | Raise or Lower Speed Setpoint | Speed Raise/Lower permissible |
| 2. START | Initiates a start command | Turbine not started & shutdown does not exist |
| 3. NO START PERMISSIVE | Indication of start permissive contact input | Start perm configured & turbine not started |
| 4. RESUME AUTOSEQ | Continues Auto Start Sequence | Auto Start Seq. is halted and not completed, HP/V1 limiter is not at min and turbine not shutdown |
| 5. HALT AUTOSEQ | Halts Auto Start Seq. | Auto Start Seq. is not halted and not completed, HP/V1 limiter is not at min and turbine not shutdown |
| 6. AUTOSEQ CNTRL PAGE | Link to Auto Start Sequence screen | Always |
| 7. RESET | Reset 5009 alarms/trips | Shutdown exists |
| 8. MODBUS RELAY CONTROL | Link to Modbus Relay Control | Modbus relays configured |
| 9. SPEED DYNAMIC TUNING | Link to Speed Dynamics screen | Always |
| 10. Rate 1 Rate 2 | Calculated rate of increase | Always |

## Turbine Run Screen

A graphic representation is displayed according to turbine type and application as configured in the 5009. Setpoints can be adjusted and control functions may be enabled / disabled from this screen. This screen gives indication of all configured setpoints and inputs as well as breaker status (generator config.), valve demand(s) and hours run / tripped. Frequency arm / disarm, synchronizer and load share functions also appear on this page.

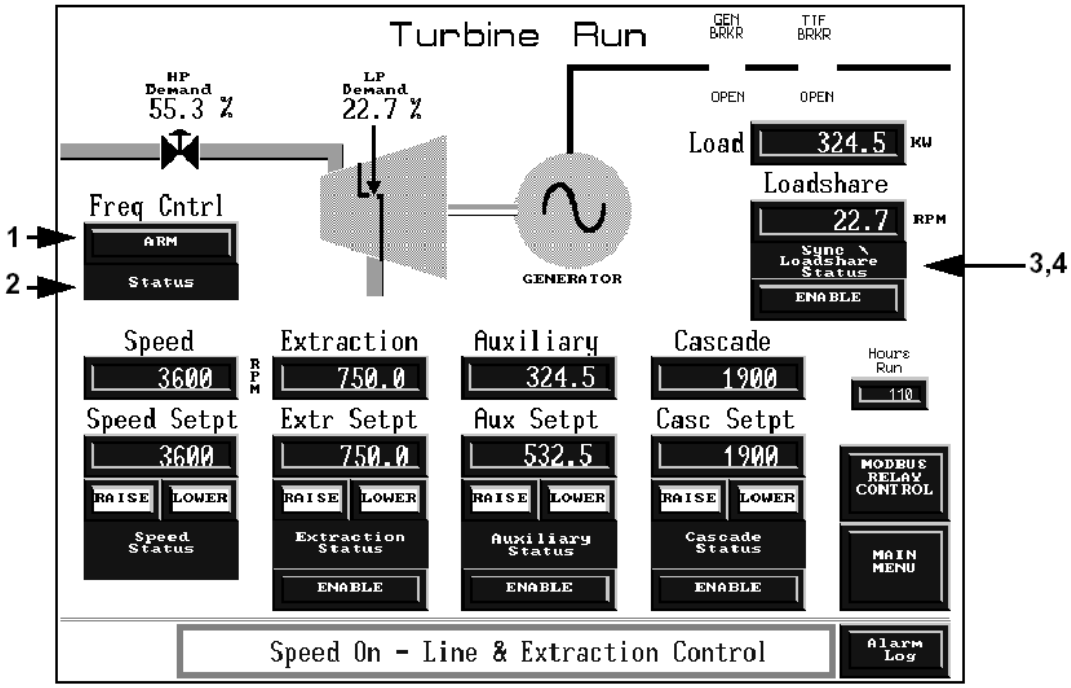


Figure 4-5. Turbine Run (Extraction and Generator Configured)

Table 4-4. Turbine Run Functions

| Button / Display | Function | Visibility |
|---|---|---|
| 1. ARM / DISARM | Frequency Control arm / disarm | Frequency control arm/disarm configured |
| 2. Frequency Control Status | Current status of frequency control | Frequency control arm/disarm configured |
| 3. ENABLE / DISABLE | Enable / disable bias from loadshare input | Configured for loadshare and tie breaker not closed |
| 4. ENABLE / DISABLE | Enable / disable bias from synchronizer | Configured for sync input and generator breaker not closed |

## Analog Input/Output Screen

Analog In / Out is monitor screen which displays configured analog inputs and outputs in units and mA format as well as speed sensors and actuator drivers. This screen is very useful for troubleshooting.

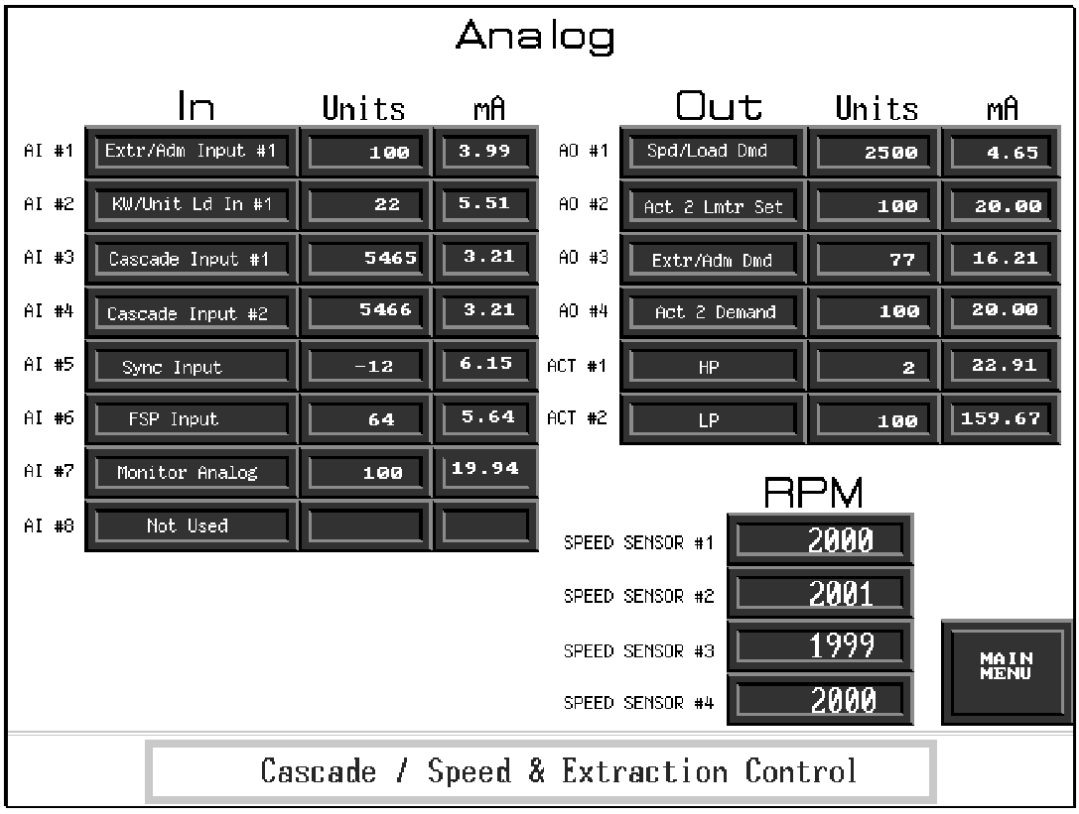


Figure 4-6. Analog In/Out

## Controlled Shutdown Screen

The operator can initiate, monitor and abort the 5009 controlled shutdown sequence from this screen.

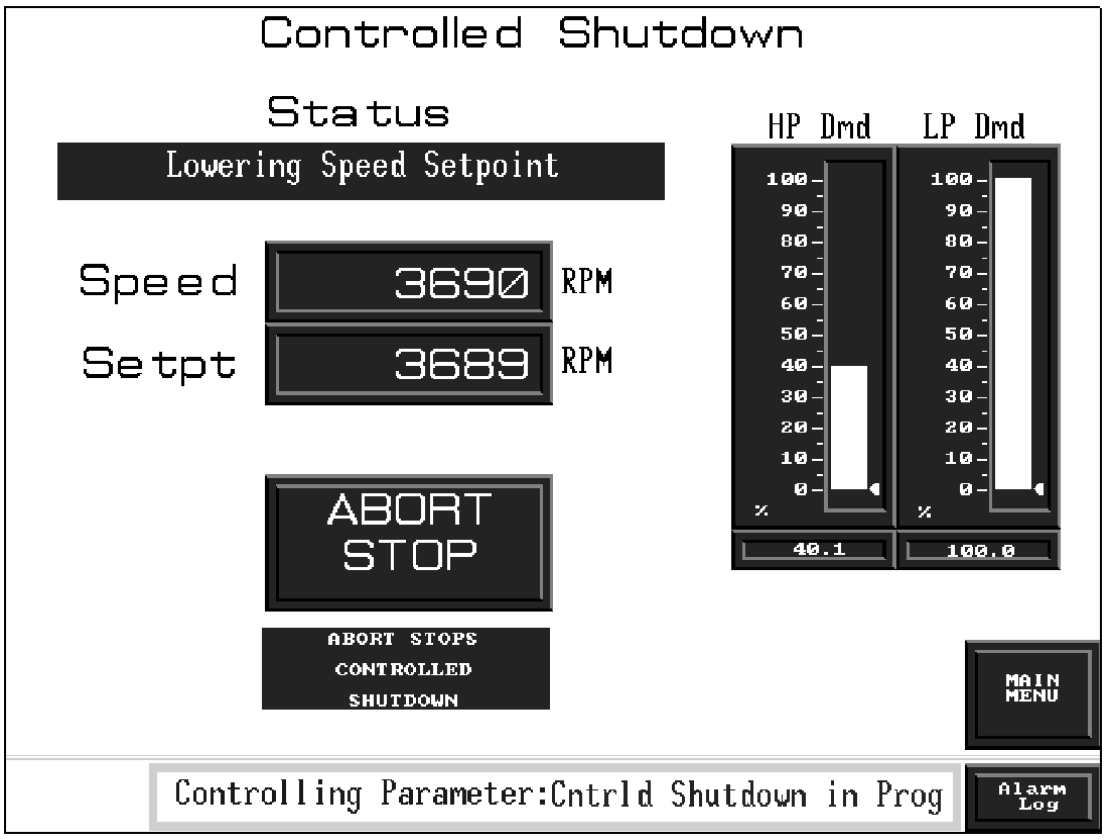


Figure 4-7. Controlled Shutdown

## Turbine Control Screen

Setpoints can be adjusted and control functions may be enabled / disabled from this screen. Setpoints may also be directly 'entered' through this screen using a pop-up keypad. This is screen is used to monitor and enable / disable all remote setpoints. Valve demands, load or first stage pressure may also appear on this page depending on configuration.

**Entering a setpoint**

- Press the set button. A keypad will pop-up. The keypad may be shifted to the right or left side of the screen using the < > buttons.
- Enter the desired setting.
- Press ENTER. The setpoint will ramp to the entered setting at the 'entered rate' (defaulted to the 'slow rate') and the keypad will disappear.

This process can be aborted by simply pressing the cancel button on the keypad. The MAX and MIN which appear on the keypad are limitations of the keypad - not the limitations of the function. If a setpoint is entered that exceeds the maximum or minimum of the range available, the setpoint will ramp to the extent of the available range. i.e. If the maximum speed setting (Max Control Setpoint) were 3780 rpm and 4000 was entered, the setpoint would be limited to 3780. The 5009 will not allow the entered speed value within a critical band.

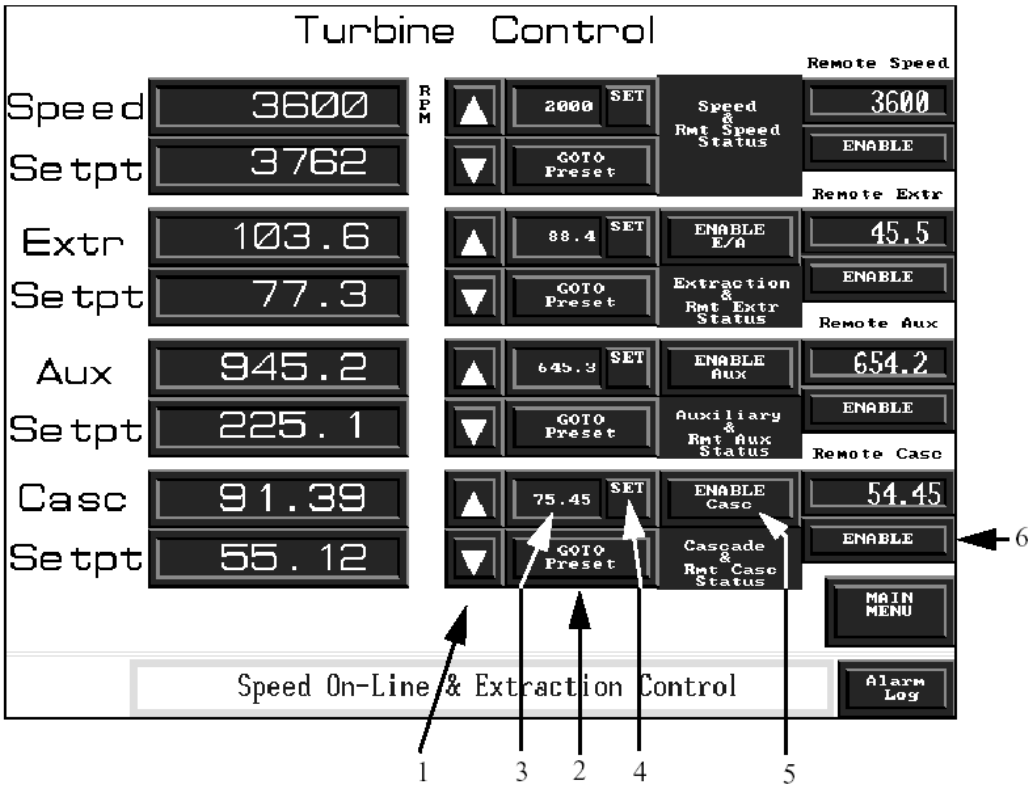


Figure 4-8. Turbine Control

Table 4-5. Turbine Control Functions

| Button / Display | Function | Visibility |
|---|---|---|
| 1. Raise / Lower | Raise or Lower the setpoint | Setpoint adjustment permissible. |
| 2. GOTO Preset | When pressed the setpoint will ramp at the 'entered rate' to the value displayed in entered setpoint gauge. | Setpoint adjustment permissible. |
| 3. Entered Window | Displays last entered value | Setpoint adjustment permissible. |
| 4. SET | Pops up a keypad to enter in a specific setpoint. | Setpoint adjustment permissible. |
| 5. ENABLE / DISABLE | Enables or disables the respective function | Function not inhibited |
| 6. ENABLE / DISABLE | Enables or Disables remote setpoints for the respective function | Function not inhibited |

Controllers (speed, ext, auxiliary, cascade) have the highest priority as far as what is displayed on the Turbine Control and PID screen. If one of these controllers is not used then load, FSP, or valve demand(s) may appear on this screen.

## Contact Input Screen

Contact input configuration and status is displayed. This screen is very useful for troubleshooting.

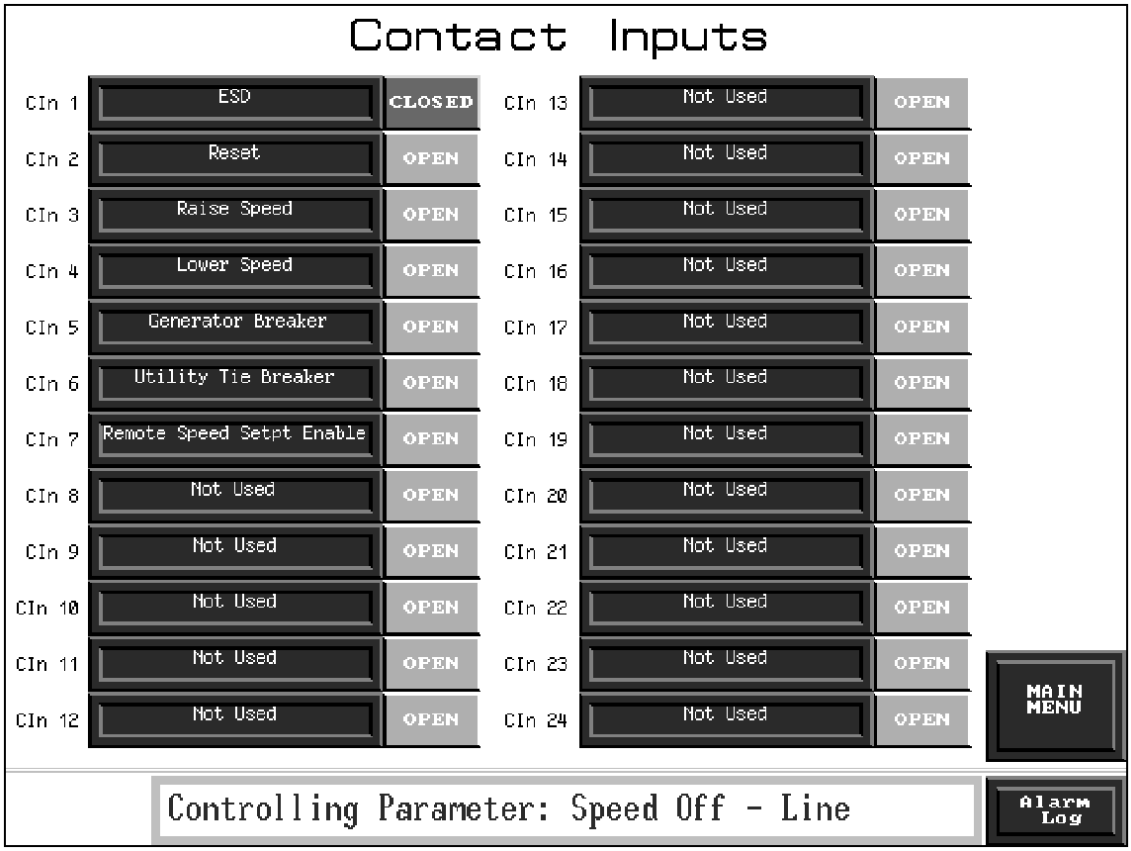


Figure 4-9. Contact Input

## Valve Calibration

The valves can be calibrated / stroked from this screen as long as system permissives are met and the calibration password has been entered.

In order for the actuator valves to be calibrated, several permissives must be met. The 5009 control must be in a shutdown mode and the speed of the turbine must be below 1000 RPM. The calibration ENABLE button(s) remain hidden until the Calibration Password is entered. Optionally, the 5009 can be configured to not allow valve calibration through the Modbus. Refer to Volumes 1 and 3 for more information regarding valve stroke procedures.

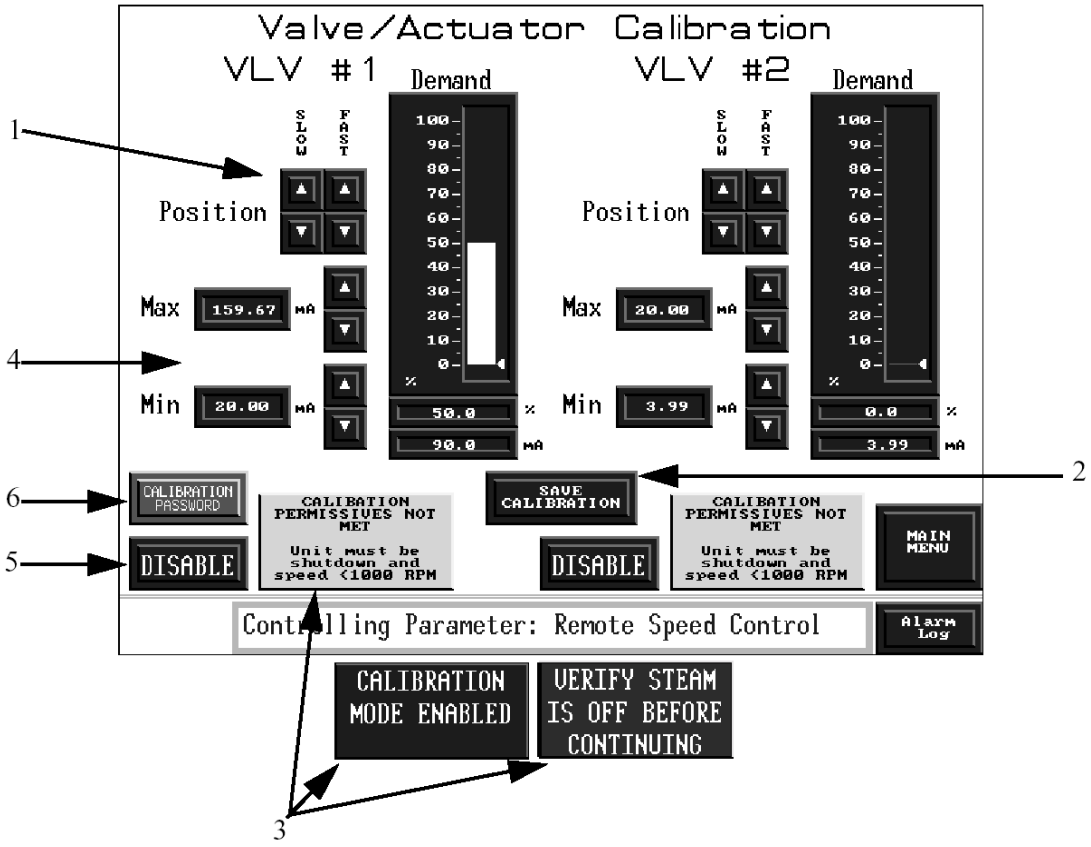


Figure 4-10. Valve Calibration

Table 4-6. Valve Calibration Functions

| Button / Display | Function |
|---|---|
| 1. Position | Increase or decrease the Valve Demand Fast or Slow rates |
| 2. SAVE CALIBRATION | Saves changes made to calibration settings |
| 3. Calibration Perms | Displays calibration Perms |
| 4. MIN / MAX | Maximum and minimum mA settings |
| 5. ENABLE / DISABLE | Enables / disables calibration mode |
| 6. Calibration Password | Allows entry of the calibration password |

If the permissives are met the control can be taken into calibration mode by pressing ENABLE. The SLOW and FAST buttons labeled “Position” will adjust the valve from the minimum stop to the maximum stop with respect to the controlling output. By raising and lowering the Min and Max mA settings for each output, the valve can be adjusted to its minimum stop setpoint (normally 0 steam flow at 0%) and at its maximum stop setpoint (normally full steam flow at 100%). Once the valve has been calibrated, the SAVE CALIBRATION button will store the new values into the 5009 control Once the DISABLE button is pushed calibration is complete and normal operation can continue. Also, the password should be returned to the 5009 user level to prevent unauthorized valve calibration.

## PID Control Screen

The PID Control screen shows all of the configured 5009 PID outputs and setpoints in a bar graph form. Setpoints can be adjusted and control functions can be enabled and disabled. This screen is particularly useful in viewing how the different control loops interact with one another.

Bar Graphs display process value (PV), setpoint (SP) and load or valve demand(s). The bar graph is displayed in percentage. The numerical display on the bottom of the gauge is actual units for control parameters and percentage for valve demands. The OP gauge displays the PID's output.

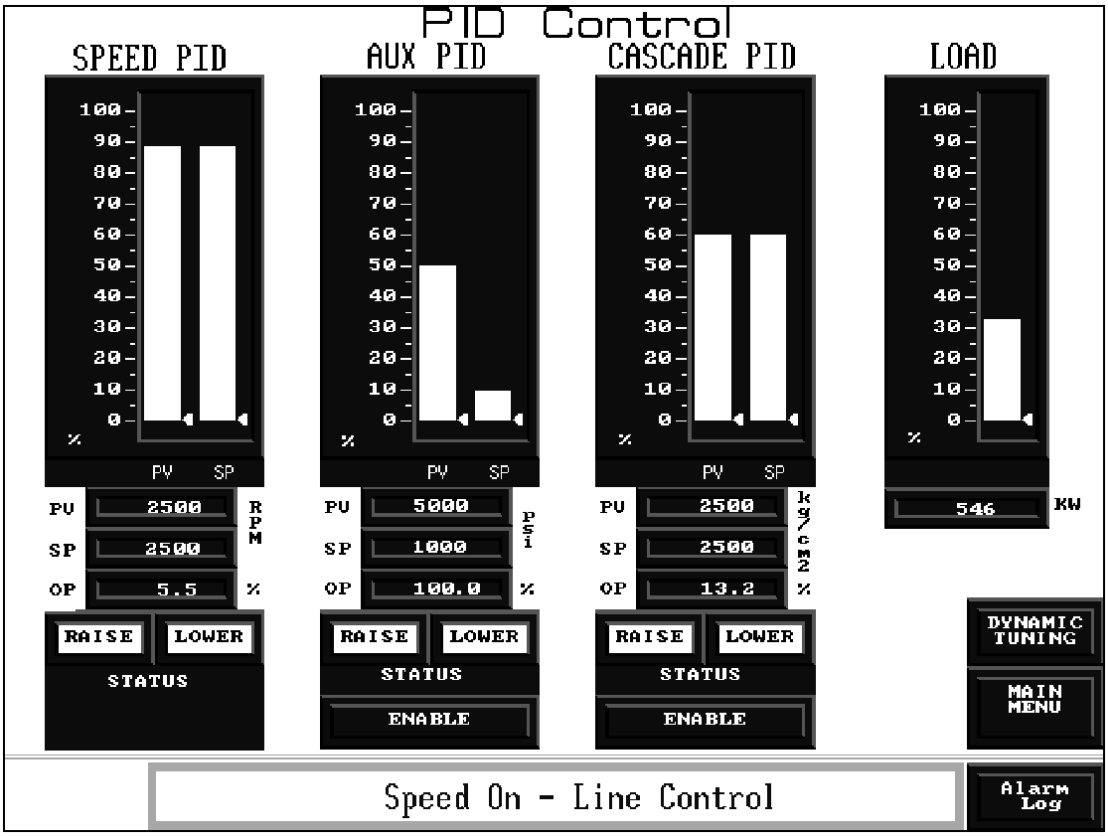


Figure 4-11. PID Control

## Relay Output Screen

Relay configuration and status is displayed. The 5009 control can be configured to allow an external DCS to control any of the 10 configurable Relays through a Modbus communication port. If Modbus relays are programmed the Modbus Relay screen can be accessed from this screen.

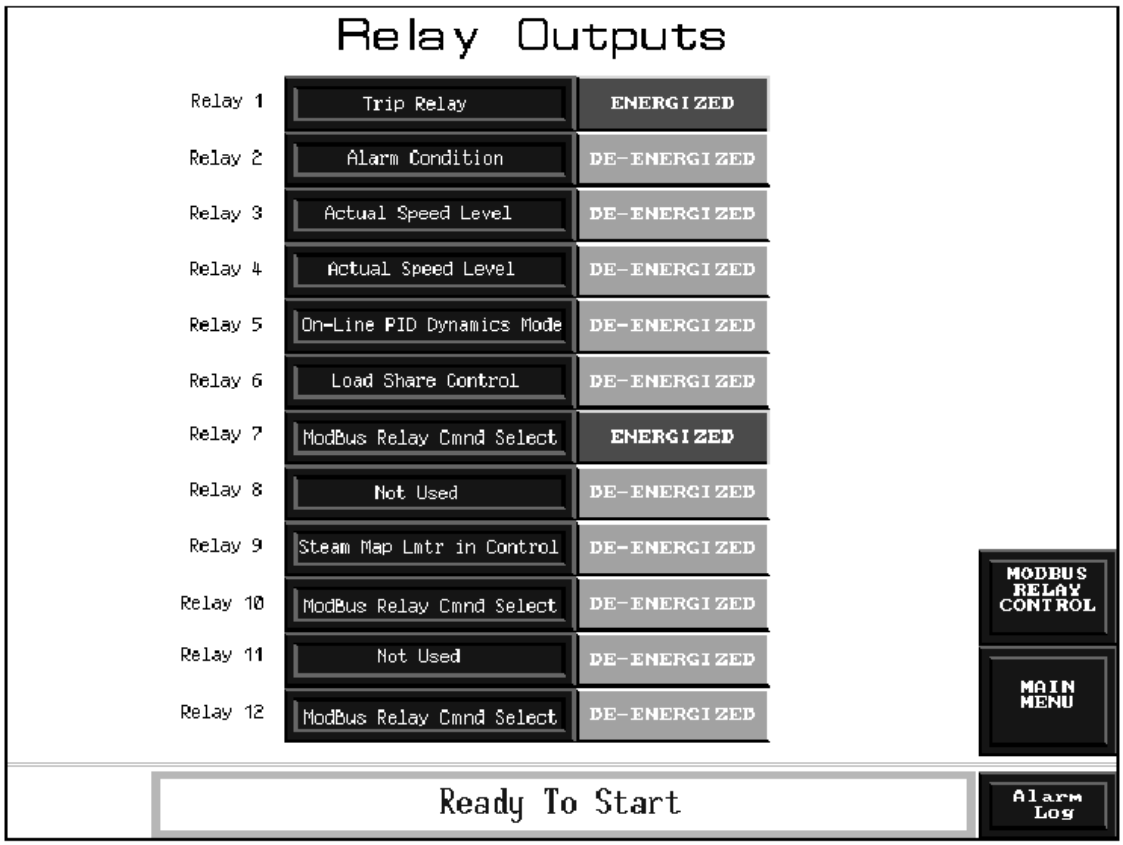


Figure 4-12. Relay Outputs

## Modbus Relay Screen

(Access for this screen is located on Turbine Start, Turbine Run and Relay Outputs screen if Modbus relays are configured)

Each configured Modbus relay can be energized or de-energized (or momentarily energized) from this screen. The status of each Modbus Relay is shown.

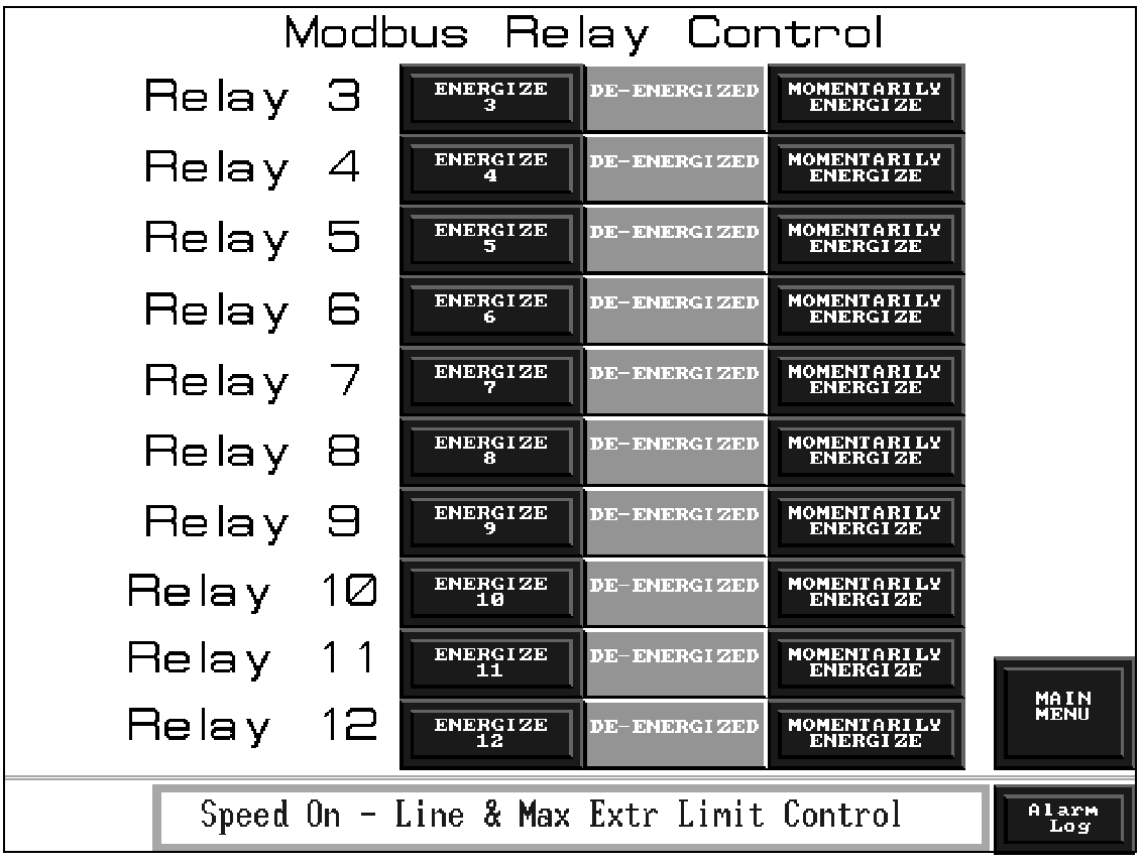


Figure 4-13. Modbus Relay Outputs

## Extraction, Admission, EXTR/ADM Control (If programmed for Extraction and/or Admission)

This screen contains functions used when enabling extraction, admission, or extr/adm (depending on config). Priority select is also on this screen (if configured for priority switching).

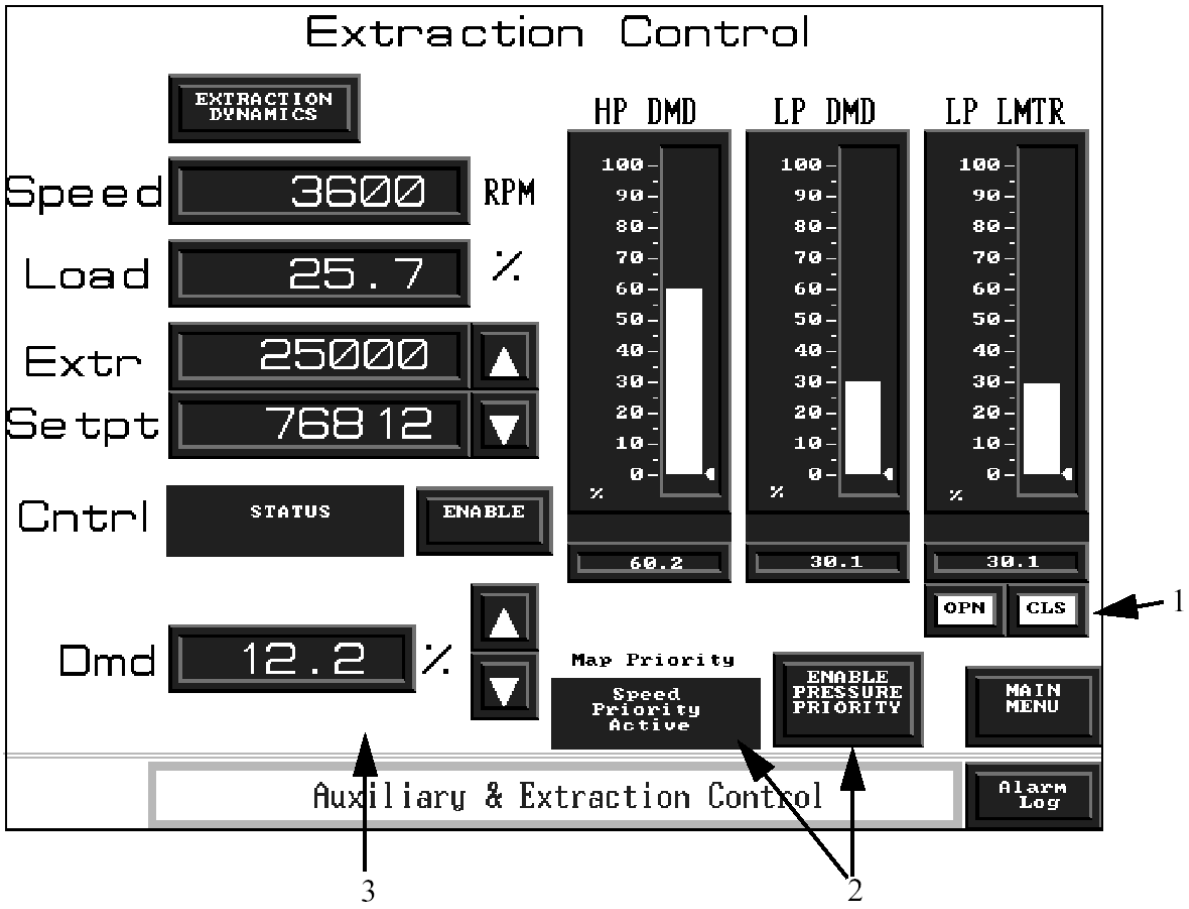


Figure 4-14. Extraction Control

Table 4-7. Extraction Control Functions

| Button / Display | Function | Visibility |
|---|---|---|
| 1. OPN / CLS | LP valve limiter open / close | Open Close permissives met |
| 2. Priority Transfer | Selects map priority | Configured for priority transfer |
| 3. Dmd | Admission demand setting | Configured for any admission |

## Overspeed Test

Testing of the mechanical and electrical overspeed devices can be completed through this screen.

In order to initiate the test, the speed set point must be at the maximum controllable setpoint as configured in the 5009 control. The turbine must be in speed control, and all other control functions must be disabled. At that time, three buttons will appear. Pushing the DISABLE TRIP button at any time will cause the speed set point to ramp down to the maximum controllable setpoint. Changing the speed setpoint is done by pushing the arrow buttons to the right of the speed and speed setpoint.

Pushing the TEST 5009 TRIP button will allow the speed setpoint to be raised to the electrical overspeed setpoint as configured in the 5009 control. Once the speed reaches the electrical overspeed set point the 5009 will trip the turbine.

Pushing the TEST EXTERNAL TRIP button will allow the speed setpoint to be raised to the maximum overspeed setpoint as configured in the 5009 control. The mechanical or external overspeed protection of the turbine should trip during this test. The speed of the turbine can not be increased past the overspeed setpoint limit as configured in the 5009.

If the speed setpoint is not changed within 60 seconds during either of the tests, the control automatically discontinues the overspeed test. If the speed of the turbine is above the electrical overspeed setpoint, the turbine will trip. If it is below the electrical trip setpoint it will ramp down to the maximum controllable setpoint.

Peak Speed is shown that displays the highest speed the turbine has attained since the RESET PEAK SPEED button has been pushed.

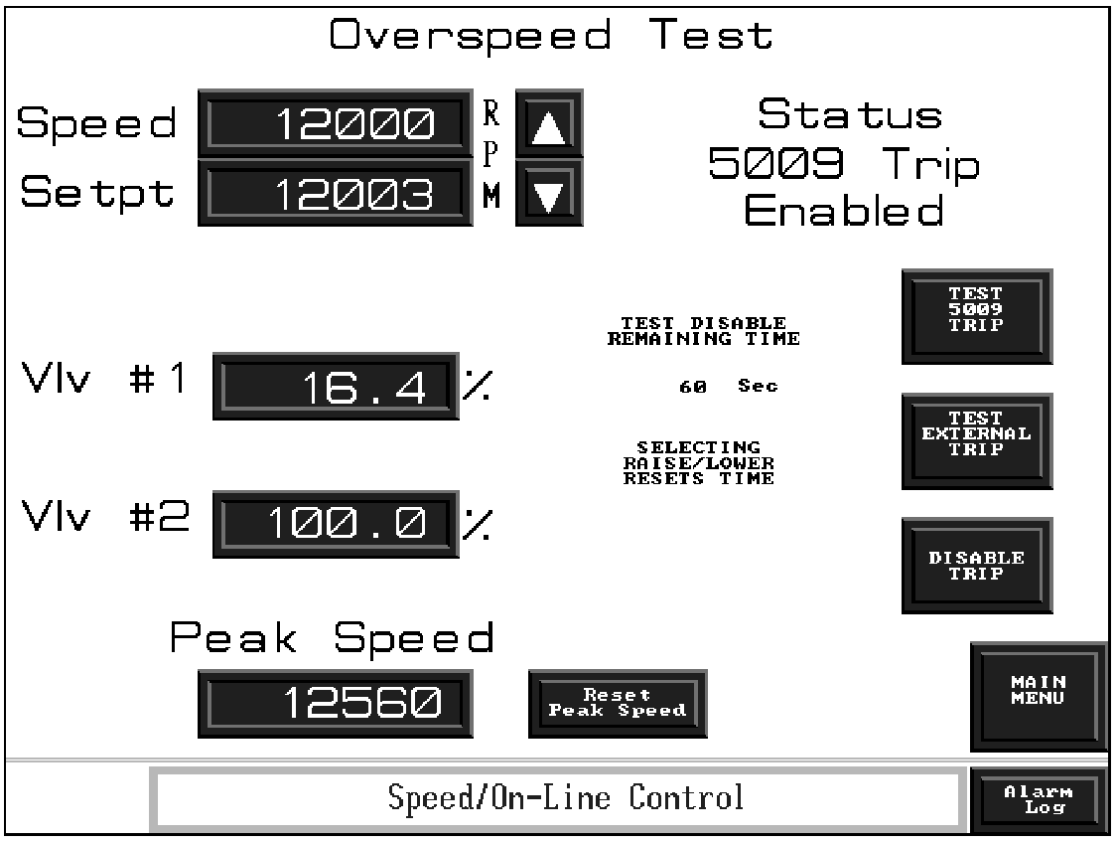


Figure 4-15. Overspeed Test

## Dynamics / Trend

This menu (similar to Main Menu) contains buttons to access PID settings and trend screens for configured PIDs.

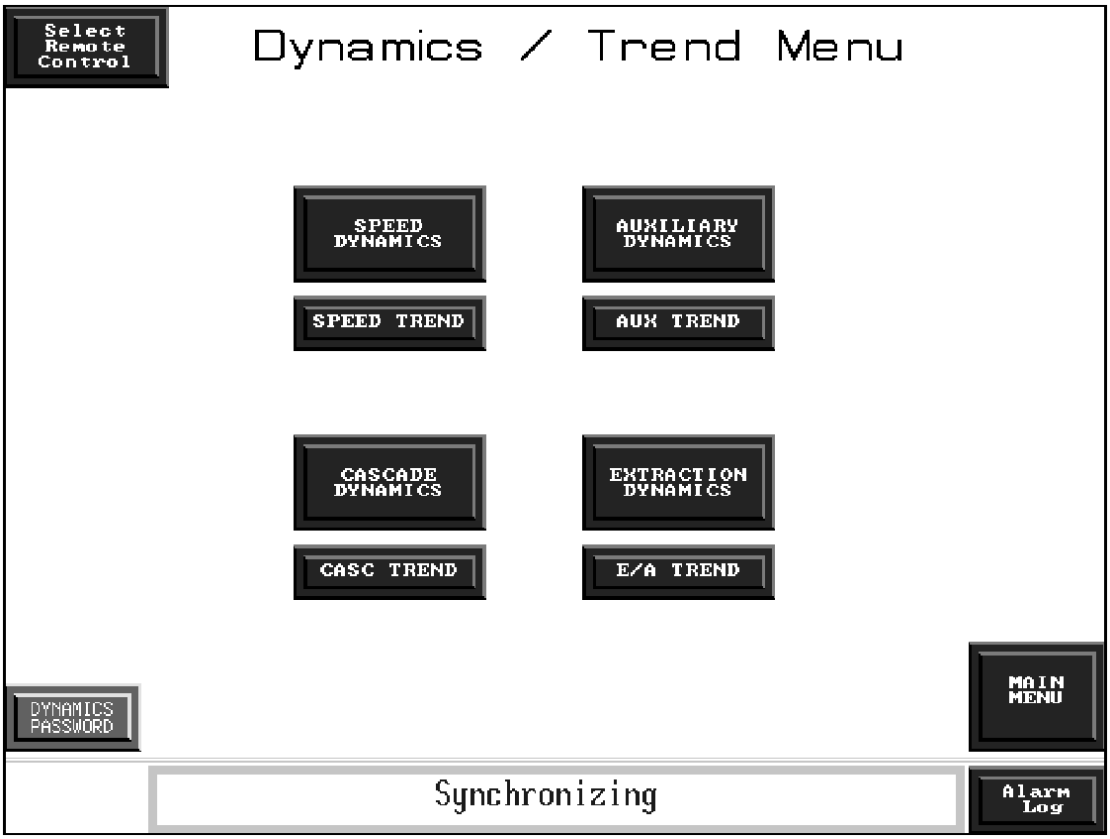


Figure 4-16. Dynamics / Trend Menu

## Dynamics Adjustment

Adjustment to each controller's PID settings may be performed through the OpView. Each dynamic and trend screen may be viewed at all times, although PID adjustments remain hidden until the dynamics password has been entered. Optionally, the dynamics adjustments may be locked out through the PCI. Refer to volume 3 of the 5009 manual series for more information on the PCI.

Each dynamic screen is formatted in the same manner. Each contains adjustments to the Proportional, Integral, and Derivative Ratio settings as well as setpoint, controller enable / disable buttons and a link to the associated Trend screen. Setpoint, control input, valve demand(s) and controller status are also found on the dynamics screen.

When dynamic adjustments have been completed, press the SAVE DYNAMIC CHANGES button to store the PID settings in the 5009 control. Return the dynamics password to the 5009 user level to prevent unauthorized dynamic adjustments.

To learn more on how to dynamically tune a steam turbine, reference Volume 1, of the MicroNet TMR 5009 Control - Dynamic Adjustments.

## Speed Dynamics

The Speed PID has two sets of dynamics; Off-Line and On-Line. The dynamics mode currently in use is displayed on the OpView. When the 5009 changes from Off-Line to On-Line mode the OpView will also change to reflect the current mode. On-Line or Off-Line dynamics can be viewed and adjusted by selecting the desired mode through the OpView - this does not change which mode the 5009 control is currently using, only which set of dynamics is adjusted. If dynamic settings are not producing any change in control action, ensure that the proper set of dynamics is being adjusted.

Refer to Volume 1 of the 5009 manual series for information on tuning as well as On-Line vs. Off-Line.

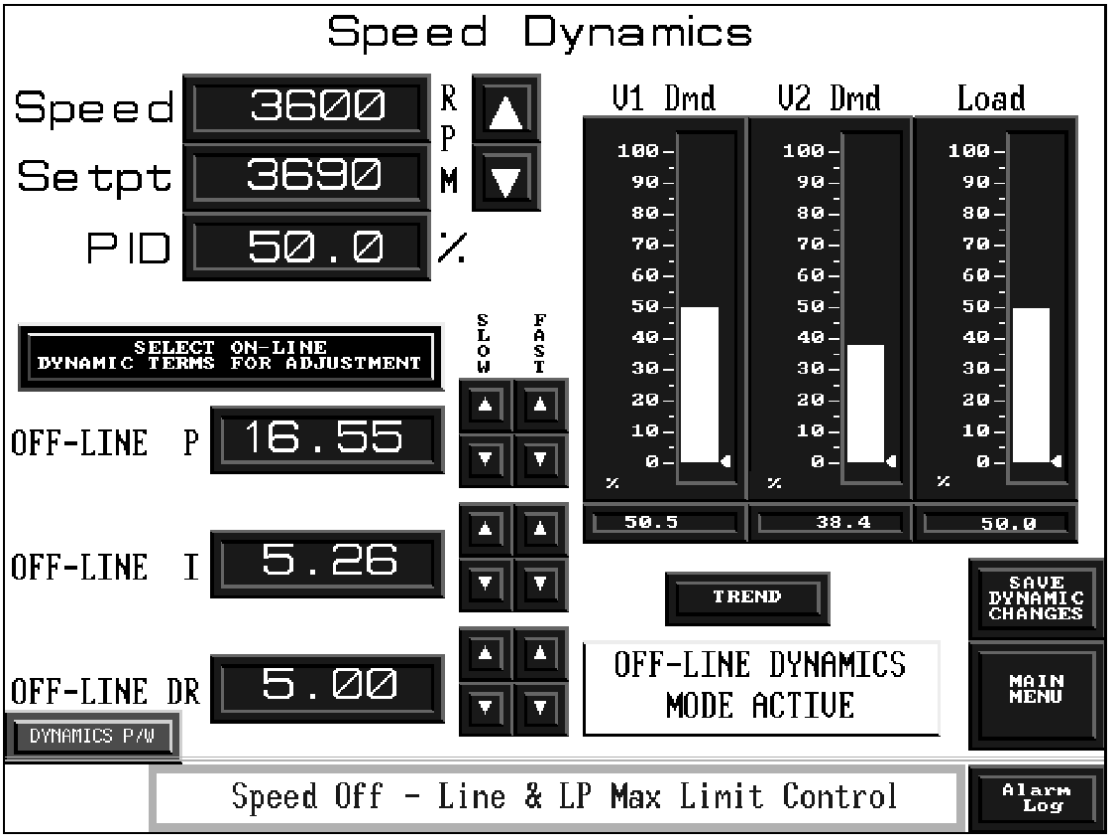


Figure 4-17. Speed Dynamic Tuning Screen

## Trend Screens

Trend screens provide a one minute trend of setpoint, PID output, and control input captured at a one second scan rate. This screen also contains most of the parameters and adjustments on the corresponding dynamics screen. Display buttons, found below the trend graph, are used to show all or one of the available parameters. The color of the text on the display button is also the color of the trend. Data is provided in a percentage format. i.e. If the extraction input ranged from 0 to 1000; 500 would be displayed as 50%. The PID raise / lower buttons utilize the slow rate of adjustment as seen on the Dynamics screen. If configured for a generator, load is also provided on the Speed Trend screen.

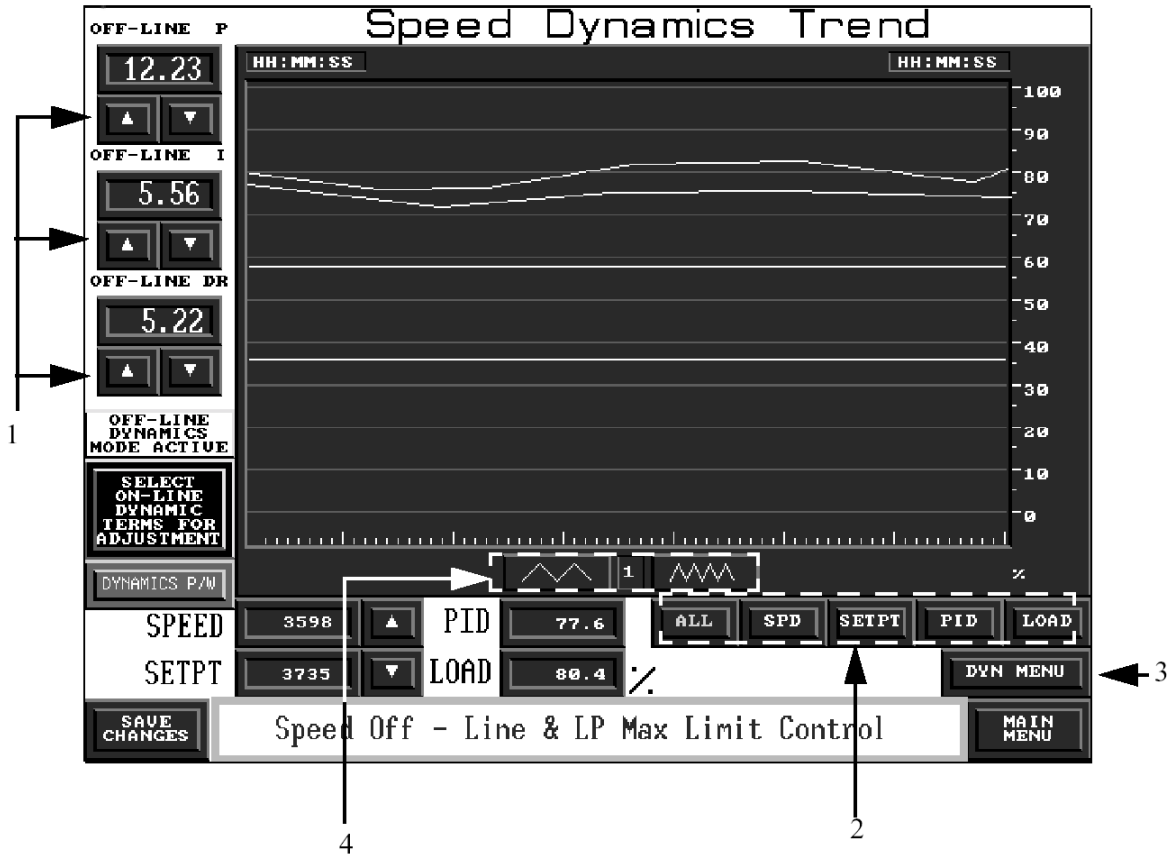


Figure 4-18. Speed Trend Screen

Table 4-8. Trend Functions

| Button / Display | Function | Visibility |
|---|---|---|
| 1. PID raise / lower | Raise or lower the corresponding PID setting | Dynamics adjustment permissible |
| 2. Display buttons | Select which parameter is to be displayed | Always, except Load: when configured for generator |
| 3. DYN MENU | Returns to the Dynamic Menu | Always |
| 4. Time resolution | Increases or decreases the resolution (seconds) of the displayed trend | Always |

## Alarm Log Screen

The Alarm Log screen displays 5009 alarms and trips. Active alarms / trips appear in red with an asterisk next to the description. ALM ACK clears the asterisk and RESET will reset the alarm if it is no longer active, turning the text white. The RESET button operates the same way as the reset contact input. Once an alarm has been acknowledged and reset, it may be removed from the Alarm Log by pressing CLEAR. It will then be stored in the Alarm History. The last 500 alarms and trips are stored in the Alarm Log and Alarm History. The arrow buttons on the right of the Alarm Log and Alarm History screen are used to scroll up and down the list of alarms.

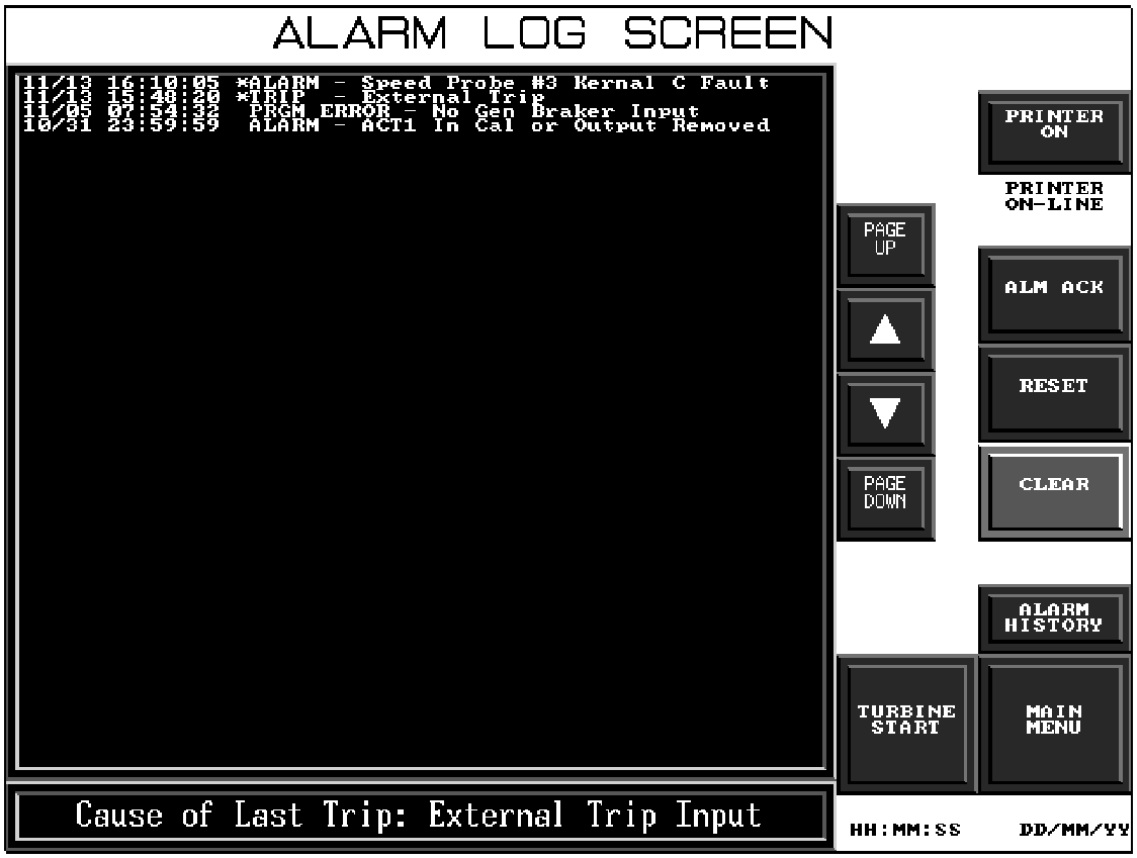


Figure 4-19. Alarm Log Screen

The Alarm Log can be sent to a serial printer via comm 1 on the back of the OpView (Figure 2-2). After connecting the printer, press the PRINTER ON button on the Alarm Log or Alarm History screen to activate the printer. All alarms occurring after this point will be sent to the printer. The alarms already listed on the OpView event Log will not be sent.

Port settings:

| | |
|---|---|
| baud rate: | 9600 |
| parity: | none |
| data bits: | 8 |
| stop bit: | 1 |

The Alarm Log is printed as it appears on the screen. The Event Log will print each time an alarm or trip occurs. Acknowledges and reset commands are also sent to the printer.

Table 4-9. Interact Alarm Log

| **INTERACT ALARM LOG<br>Application: 5009** | | | | | |
|---|---|---|---|---|---|
| **TIME** | **DATE** | **DESCRIPTION** | **STATUS** | **VALUE** | **USER** |
| 09:30:54 | 09/23/96 | <<PRINTER ENABLED>> | | | supvar |
| 09:55:06 | 09/23/96 | *Alarm Comm Link #1 Failed | ACTIVE ALARM | ON | |
| 09:56:04 | 09/23/96 | Alarm Comm Link #1 Failed | ACKNOWLEDGE | | supvar |
| 09:58:04 | 09/23/96 | Alarm Comm Link #1 Failed | INACTIVE | OFF | |

Table 4-9 contains an example of an Alarm Log print out. The title and header is printed each time the OpView is initialized in the Run Mode and the printer is turned on.

In the example there is a comm failure. The print out shows the time, date, the type of alarm, and alarm status. When the event is acknowledge, the time of the acknowledgment is printed and the asterisk next to the event is no longer printed. The current user level is also printed. The next line shows when the alarm condition was reset after the comm link error was corrected.

Printer control and status are displayed. If a printer is not connected to the OpView or the printer is malfunctioning the printer control must be in the off state or the OpView will experience reduced performance.

Optionally, a serial printer can be connected to CPU communications port B of the 5009 control. (refer to Volume 3 of the 5009 manual series)

## Alarm History Screen

(accessed from ALARM LOG screen only)

The Alarm History screen is the same as the Alarm Log screen except that alarms cannot be cleared. The last 500 alarm conditions are displayed.

The PRINTER ON button of this screen serves the same function as the button on the Alarm Log screen.

# Appendix.
# Password Information

## General

The OpView requires a password to change between the two different user levels, supvar, tuner/valve calibration, and 5009. The user levels are used to limit the access of unauthorized or untrained personnel from accessing functions. Passwords may be entered through a pop-up key pad that appears when one of the password buttons is pressed. The user level can also be changed from the application manager screen by pressing Change User and inputting the appropriate password. It is recommended to return the password to the 5009 user level during normal operation to prevent unauthorized access to protected screens and adjustments.

## SUPVAR Level Password

The password for your OpView is: **1113**.

Used to access the Application Manager.

## Tuner/Valve Calibration Level Password

The password for this level is: **1111**.

Used to access dynamic adjustments and valve calibration adjustments.

## 5009 Level Password

The password for your OpView is: **5009**.

**We appreciate your comments about the content of our publications.**

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