WOODWARD

5009FT — Main Menu

Speed Control | Turbine Run | PID Control
Steam Map | Extraction Control | Auxiliary Control
Cascade Control | DCPL Control | Generator

Start Curve | Start Sequence Steps | Auxiliary Sequence Steps | Trends
Overspeed Test | Extraction Sequence Steps | Cascade Sequence Steps | SG PID

Analog Inputs Status | Analog Outputs Status
Discrete Inputs Status | Relay Outputs Status
Actuators Status | Actuator Service

MicroNet TMR® 5009FT
Fault-Tolerant Steam Turbine Control

HMI Interface Manual

Volume 4

Contents

Illustrations and Tables

Warnings and Notices

Important Definitions

This is the safety alert symbol 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.

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 number 8269-1012 is suitable for use in ordinary (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 Ordinary (non-hazardous) 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. It is to be used in Ordinary or non-hazardous locations only.**
	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.

⚠️ **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

Introduction

The technical documentation for the 5009FT 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 5009FT control's personal computer based configuration & commissioning tool software program (CCT), information on all CCT features and modes (Configuration, 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 HMI operator control station, if provided with your system.

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

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

The following part numbers are covered in this manual:

8269-1056   Computer-Optional iFix Operator Interface (HMI)

Chapter 2.
Description

The HMI Operator Interface is a touch screen workstation that functions as an enunciator and operator control panel for Woodward's MicroNet TMR® 5009FT digital control. This workstation allows an operator to remotely view operating points, vary control setpoints, and issue run mode commands. The HMI is comprised of an industrialized touch screen hardware package and Proficy iFix running on a Windows XP Embedded operating system. This standard software program allows the HMI to automatically select the correct interface screens based on how the 5009FT control has been configured. No field configuration is necessary. The hardware package selected is the Phoenix Contact ValueLine industrial PC. Even though the computer is fully tested and programmed before it is packaged with the 5009FT, the manual contains basic maintenance information and a user's guide.

The HMI is connected to the 5009FT control via two redundant Ethernet switches mounted in the control panel: ETH1 and ETH2. Once communications between the HMI and the 5009FT control have been established, the HMI will automatically configure its screens to match the configuration of the control. Depending on how the 5009FT control is configured, all 5009FT run mode operations can be monitored and performed through the HMI.

Figure 2-1. 5009FT System

A selection of screens allows operators to monitor, control, and troubleshoot a system. These screens display:
- All controlling parameters
- Starting sequence status
- Turbine related information
- Generator related information
- Compressor 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:
- Valve stroking
- Various turbine functions such as startup, shut down, and speed/process controllers.

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

Chapter 3.
Installation Procedure

Introduction

This touch screen workstation is designed for industrial applications for panel mounting. The front has an IP65 rating. The ambient temperature for operation is 5 to 55 °C (41 to 131 °F) and humidity conditions ranging 5 to 95% relative humidity (non-condensing).

The HMI can be secured with mounting bolts and clamps provided. The recommended cutout dimensions are 329.5 x 424.0 mm (12.972 x 16.693 in.).

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 airflow for the unit. To provide for this, a minimum of two inches must be provided around the sides of the unit to insure proper airflow. When installing the unit, enough room should be left in the back for ease of wiring.

For more information, consult the Phoenix Contact ValueLine Industrial PC User Manual.

TouchPanel Hardware

Technical Data

Ambient temperature (operating)	5 to 55 °C
Ambient temperature (storage/transport)	–40 to +70 °C
Permissible humidity (relative)	5 to 95%
Display, 17-inch (dimensions/weight)	452 x 356.5 x 50 mm / 5.85 kg
Degree of protection	IP65 (front), IP20 (back)
Panel Mounting / LED indicators	Power, HDD, Run, Error

Electrical Data

Power supply	nominal 24 Vdc
Power supply	range 19.2—28.8 Vdc
Current draw, typical	1.0—1.5 A
Current draw, maximum	2.0—5.2 A
Power consumption, typical	36.0 W
Power consumption, maximum	124.8 W
RTC battery, typical life	5 years

> **Note:** Protective earth ground and circuit ground (return) are connected.

Computer Data

Operating system	Windows® 7 Ultimate SP1 (64 bit)
Processor	1.7 GHz Intel Core2™ Duo, 667 FSB, 4 MB L2 Cache
RAM	16 GB
Data memory	2.5 inch SATA solid state drive 32GB
Interfaces	USB 3x Type A, USB 2.0; USB 1x Type A, USB 3.0
Serial	RS-232 (configurable option) DB-9, male
Video (configurable option)	VGA (DB-15, female)
NVRAM size	128 kB
Number of Ethernet ports	Two RJ45 Ethernet ports (10/100/1000 Mbps)

Display - 17 in.
Screen size, diagonal	430 mm (16.93 in.)
Screen size, horizontal x vertical	337.92 x 270.34 mm
Resolution	1280 x 1024
Type	Resistive touch screen with serial/USB interface
Brightness	350 Cd/m²
Number of colors	16.7 million
Contrast ratio	1000:1
View angle, horizontal/vertical (CR=10)	170°/160°
Installation cutout dimensions (width x height)	424.0 x 329.5 mm
Outside bezel dimensions (width x height x depth)	452.0 x 356.5 x 10 mm
Backlight life	minimum 50 000 hours
Interface (configurable option)	USB 1.1/2.0, Type A

Mechanical Tests
Shock test according to IEC 60068-2-27 15 g, 11 ms impulse
Vibration resistance according to IEC 61131-2 Hard Drive: 0.5g

Conformance With EMC Directives
Developed according to IEC 61000-6-2
IEC 61000-4-2 (ESD) Criterion B
IEC 61000-4-3 (radiated-noise immunity) Criterion A
IEC 61000-4-4 (burst) Criterion B
IEC 61000-4-5 (surge) Criterion B
IEC 61000-4-6 (conducted noise immunity) Criterion A
IEC 61000-4-8 (noise immunity against magnetic fields) Criterion A
EN 55022 (noise emission) Class A

Approvals
CE
UL, cUL UL 508
UL, cUL Class I, Division 2, Groups A, B, C, D
UL 1604

For more information, consult the Phoenix Contact ValueLine Industrial PC User Manual.

Communications

The HMI has multiple communication ports. The HMI's "Ethernet 1" communication port is used for 5009FT to HMI communications. The "Ethernet 2" communication port is used for backup communications in case the Eth 1 network fails.

As shipped, the 5009FT system should begin communicating once the appropriate network cable(s) have been connected. The default configuration for the HMI will communicate with either port and either network on MicroNet TMR CPU's in Kernel A or B. The following are the default HMI computer and MicroNet TMR CPU IP addresses that are programmed for iFix communications:

Table 3-1. iFix TCP/IP Address Configuration

Ethernet Ports	HMI Computer	Kernel A CPU	Kernel B CPU
Primary	172.16.100.45	172.16.100.47	172.16.100.48
Subnet	255.255.0.0	255.255.0.0	255.255.0.0
Secondary	192.168.128.27	192.168.128.21	192.168.128.22
Subnet	255.255.255.0	255.255.255.0	255.255.255.0

If the 5009FT port/IP settings have been changed from the defaults, the HMI will not communicate unless the MicroNet TMR IP addresses as well as related iFix settings on the HMI computer have been modified as well.

The HMI communicates via Modbus slave ID/numbers 1 and 2. There are 4 more Modbus slave ports available, which are defaulted to Modbus slave or device numbers 3, 4, 5, and 6. Note that changing some communication protocol settings and device numbers may require a control reboot in order for those communications to resume properly. This can be achieved via AppManager or by going into and then out of the "Full Configuration Menu" on the CCT.

Any 5009FT control serial port configured for Modbus communications can be used to communicate with a user DCS. For successful Modbus communications the respective 5009FT Modbus port's settings must configured to match the DCS's communication port settings. Special care must be taken to ensure there is no conflict of Modbus slave numbers from devices connected to the 5009FT networks.

Printer Setup

If a printer is to be used with the HMI to print out the alarm log, it must be connected to the HMI's port.

Initial Setup

Upon power up, the HMI 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 HMI is not communicating with the 5009FT control, it may take up to 2 minutes before application screens are visible.

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

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

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

Setting the Time and Date
The HMI uses the computers clock for its time and date information for display throughout the HMI screens. The time and date on the HMI can be set via the windows operating system as would typically be set on a Windows computer.

Chapter 4.
Operating Procedures

General Operating Procedures

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

The HMI is an industrial hardened touch screen 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 another. The push buttons will change intensity or color when selected to inform the operator when they have been received by the touch screen of the HMI.

If the 5009FT control is configured to receive commands from the HMI, all control operations can be performed through the HMI. If not, the HMI 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 HMI (such as enable / disable buttons). Visibility largely depends on how the 5009FT is configured. For example, if configured for a single valve turbine, no extraction data or gauges will appear.

Modbus Data Written to the Control—Modbus data sent to the control can be limited via the configuration. Using the CCT, any link's Write capability can be disabled by selections made on the Communications page. See the 5009FT manual Volume 3 for more details.

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.

Note that commands written to the control via Modbus are pulsed signals. The control will respond to the last input received whether from a discrete input, the CTT, the OpView™, or another Modbus source.

Lost Communication
If the HMI is not communicating to the 5009FT, a COMMUNICATION FAULT' 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 HMI and the 5009FT control, the 5009FT will generate an alarm. Turbine control will not be affected. No commands from the HMI will be executed until the communications link is restored.

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

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

Local/Remote

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

If the 5009FT is configured to accept a Local/Remote input from the HMI, 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 5009FT manuals for more information.

Emergency Trip

The 5009FT control is defaulted to not accept an emergency shutdown (ESD) command from the HMI. If the 5009FT is configured to accept an ESD from the HMI, the ESD command button is displayed in the top right corner of all screens. The HMI 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 continue button to verify the emergency trip or the cancel button to cancel (a popup window will appear).
3.   The 5009FT will shut down immediately.

General Screen Functions

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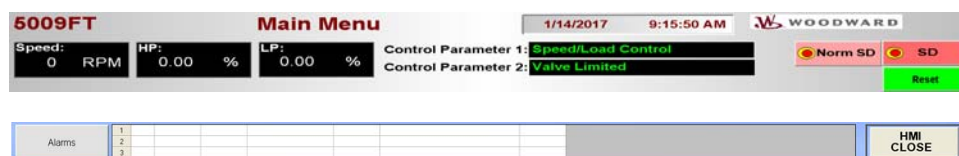

Figure 4-1. General Functions

Table 4-1. General Functions

1	Alarm button for alarm screen display
2	Alarm/Trip Status
3	HMI close (only on the Main Menu screen)
4	SD button for an emergency shutdown
5	Norm SD button for a controlled shutdown
6	Reset button to Reset Acknowledged alarms
7	Time, Speed, HP valve, LP valve, and controlling parameters 1 and 2 are always available

Detailed Operating Procedures

The following section describes HMI buttons and status indications, their function, and when they appear on the HMI (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 5009FT control to perform a function) is dependent on the Modbus being enabled. Refer to volume 1 and volume 3 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 Trend menu.
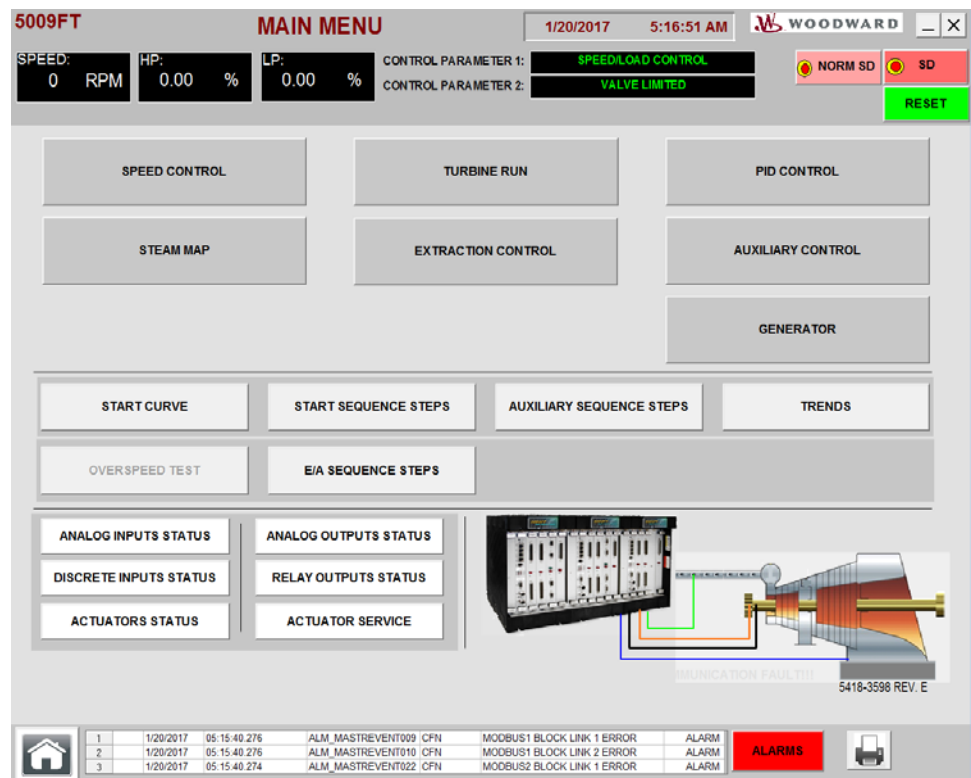

Figure 4-2. Main Menu

Startup Curve Screen
This screen is used to start the turbine and ramp to rated speed or the minimum controlling speed. The Startup screen displayed will be different depending upon the configured values in the 5009FT control. Speed raise/lower buttons as well as a Go To button are available on this screen to control speed.
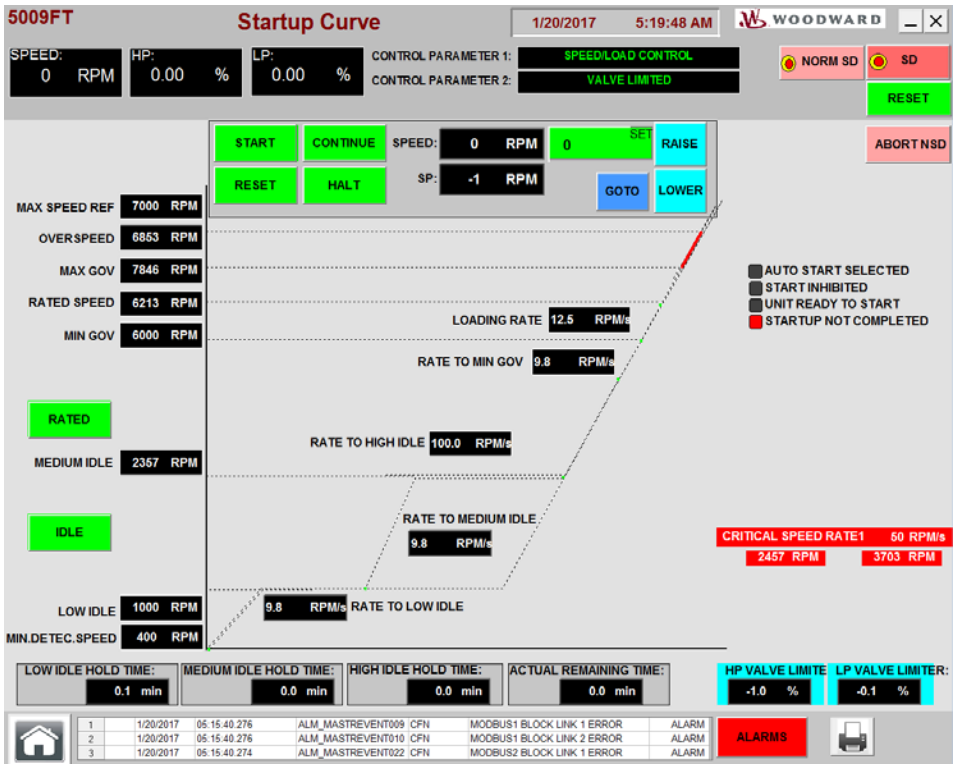
Figure 4-3. Startup Curve Screen

Sequence Graphics

This screen allows the user to immediately see which part of a sequence the control is currently in. This is indicated by the green light as shown in Figure 4-4.
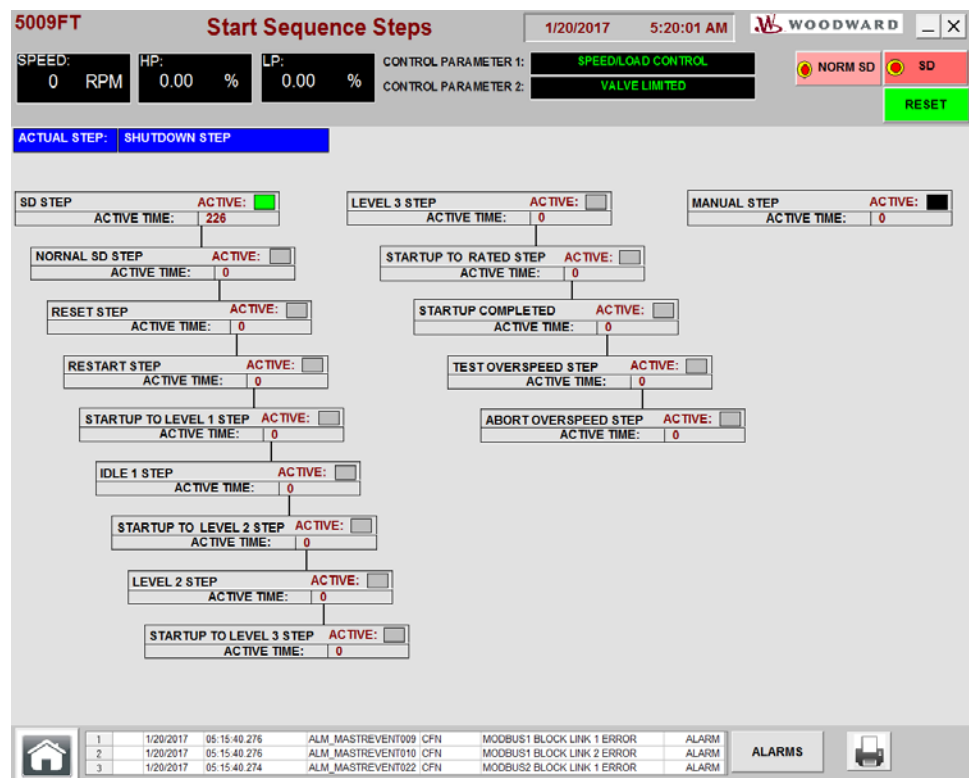
Figure 4-4. Start Sequence Screen

In addition to sequence step status and the typical header functions, the elapsed time for any sequence step can be view in the bottom right corner of each sequence.

Turbine Run Screen

A graphic representation is displayed according to turbine type and application as configured in the 5009FT. 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).
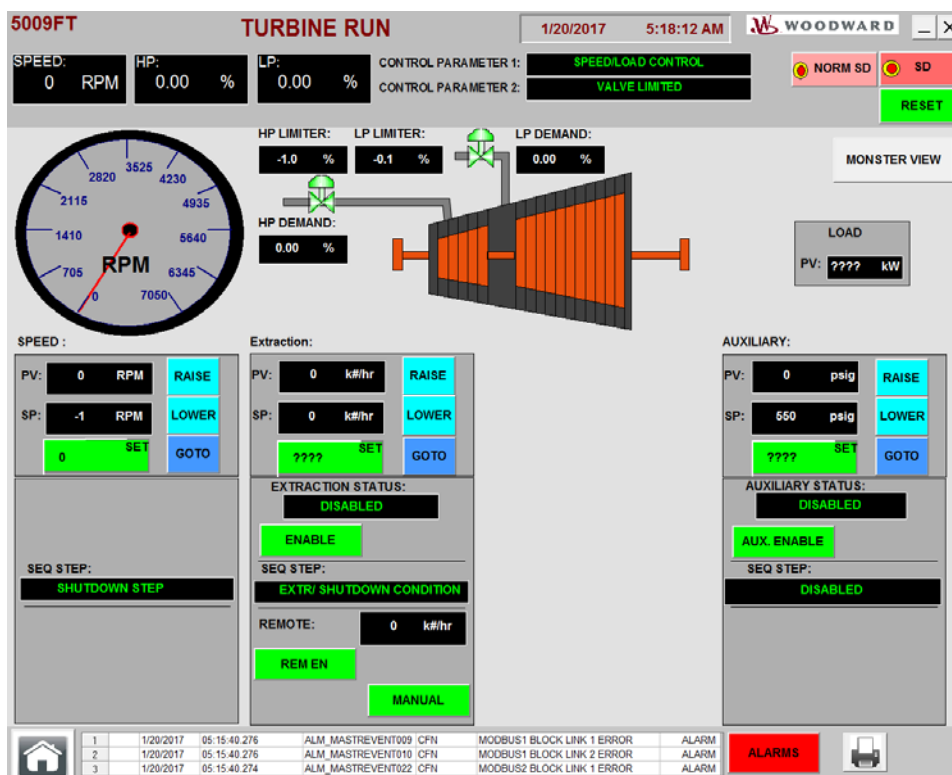
Figure 4-5. Turbine Run (Generator Unit)

Remote Setpoints will display for each feature as configured. Basic information for each controller is displayed on this screen. More detailed information can be found on the page for each individual controller.

Dynamics Adjustment

Adjustment to each controller's PID settings can only be performed through the CCT.

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

Monster View Screen
(accessed from Turbine Run screen only)

The Monster View Screen is a monitor only screen. This screen is provided for large views of the basic control parameters.
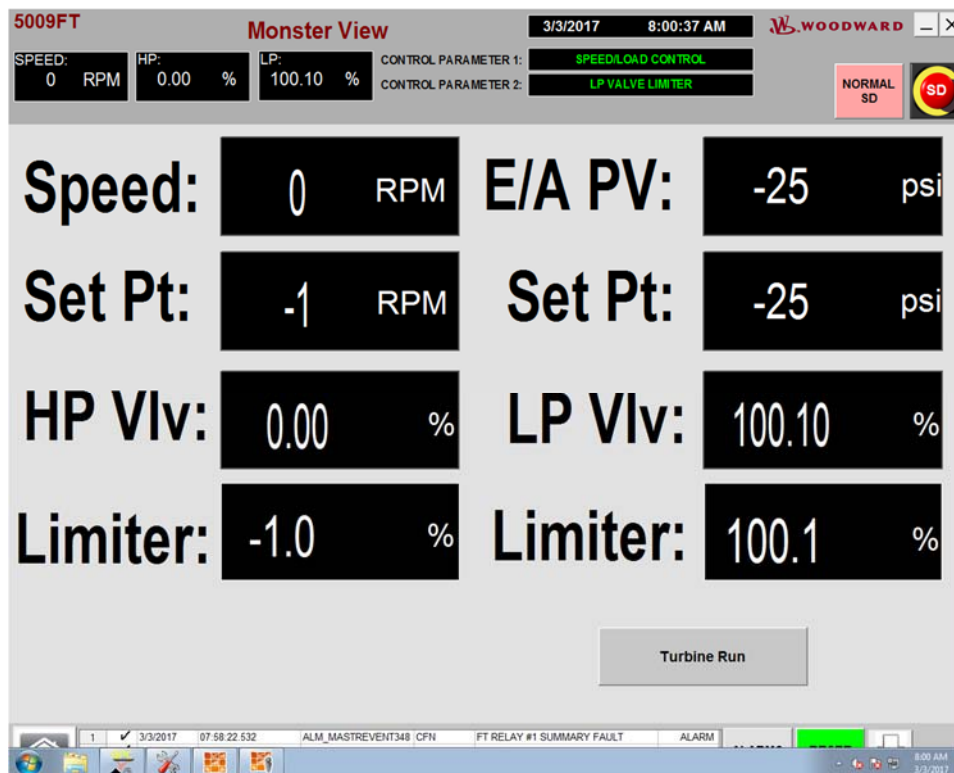

Figure 4-6. Monster View Screen

Analog Input/Output Screen

nalog 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.

5009FT — Analog Inputs Status — 1/20/2017 5:23:58 AM — WOODWARD

SPEED: 0 RPM   HP: 0.00 %   LP: 0.00 %

CONTROL PARAMETER 1: SPEED/LOAD CONTROL
CONTROL PARAMETER 2: VALVE LIMITED

NORM SD   SD   RESET

AI #1:	– Extraction/Admission Input #1	-65 EU	0.00 mA	AI #5:	– Extraction/Admission Input #2	-65 EU	0.00 mA
AI #2:	– Auxiliary Input #1	-188 EU	0.00 mA	AI #6:	– Extraction/Admission Input #3	-65 EU	0.00 mA
AI #3:	– KW/Unit Load Input #1	-4000 EU	0.00 mA	AI #7:	– Auxiliary Input #2	-188 EU	0.00 mA
AI #4:	– Remote Extract/Admiss Setpoint #1	-65 EU	0.00 mA	AI #8:	– Auxiliary Input #3	-188 EU	0.00 mA

AI #9:	--- Not Used ---	-25 EU	0.00 mA	AI #23:	--- Not Used ---	-25 EU	0.00 mA
AI #10:	--- Not Used ---	-25 EU	0.00 mA	AI #24:	--- Not Used ---	-25 EU	0.00 mA
AI #11:	--- Not Used ---	-25 EU	0.00 mA	AI #25:	--- Not Used ---	-25 EU	0.00 mA
AI #12:	--- Not Used ---	-25 EU	0.00 mA	AI #26:	--- Not Used ---	-25 EU	0.00 mA
AI #13:	--- Not Used ---	-25 EU	0.00 mA	AI #27:	--- Not Used ---	-25 EU	0.00 mA
AI #14:	--- Not Used ---	-25 EU	0.00 mA	AI #28:	--- Not Used ---	-25 EU	0.00 mA
AI #15:	--- Not Used ---	-25 EU	0.00 mA	AI #29:	--- Not Used ---	0 EU	0.00 mA
AI #16:	--- Not Used ---	-25 EU	0.00 mA	AI #30:	--- Not Used ---	-25 EU	0.00 mA
AI #17:	--- Not Used ---	-25 EU	0.00 mA	AI #31:	--- Not Used ---	-25 EU	0.00 mA
AI #18:	--- Not Used ---	-25 EU	0.00 mA	AI #32:	--- Not Used ---	-25 EU	0.00 mA
AI #19:	--- Not Used ---	-25 EU	0.00 mA				
AI #20:	--- Not Used ---	-25 EU	0.00 mA	Speed Sensor #1:	0 RPM	Speed Sensor #3:	0 RPM
AI #21:	--- Not Used ---	-25 EU	0.00 mA	Speed Sensor #2:	0 RPM	Speed Sensor #4:	0 RPM
AI #22:	--- Not Used ---	-25 EU	0.00 mA			Validated Turbine Speed Signal:	0 RPM

1	1/20/2017	05:15:40.276	ALM_MASTREVENT009 CFN	MODBUS1 BLOCK LINK 1 ERROR	ALARM
2	1/20/2017	05:15:40.276	ALM_MASTREVENT010 CFN	MODBUS1 BLOCK LINK 2 ERROR	ALARM
3	1/20/2017	05:15:40.274	ALM_MASTREVENT022 CFN	MODBUS2 BLOCK LINK 1 ERROR	ALARM

ALARMS

5009FT — Analog Outputs Status — 3/3/2017 7:59:51 AM — WOODWARD

SPEED: 0 RPM   HP: 0.00 %   LP: 100.10 %

CONTROL PARAMETER 1: SPEED/LOAD CONTROL
CONTROL PARAMETER 2: LP VALVE LIMITER

NORMAL SD   SD

FUNCTION FOR AO #1:	– ACTUAL SHAFT SPEED	0
FUNCTION FOR AO #2:	– SPEED REFERENCE SETPOINT	-1
FUNCTION FOR AO #3:	– ACT 1 (HP) VALVE DEMAND CONTROL	4
FUNCTION FOR AO #4:	– ACT 2 (LP) VALVE DEMAND CONTROL	20
FUNCTION FOR AO #5:	– --- NOT USED ---	0
FUNCTION FOR AO #6:	– --- NOT USED ---	0
FUNCTION FOR AO #7:	– --- NOT USED ---	0
FUNCTION FOR AO #8:	– --- NOT USED ---	0
FUNCTION FOR AO #9:	– --- NOT USED ---	0
FUNCTION FOR AO #10:	– --- NOT USED ---	0
FUNCTION FOR AO #11:	– --- NOT USED ---	0
FUNCTION FOR AO #12:	– --- NOT USED ---	0

1	✓	3/3/2017	07:58:22.532	ALM_MASTREVENT348 CFN	FT RELAY #1 SUMMARY FAULT	ALARM
2	✓	3/3/2017	07:58:22.532	ALM_MASTREVENT349 CFN	FT RELAY #2 SUMMARY FAULT	ALARM
3	✓	3/3/2017	07:58:22.532	ALM_MASTREVENT441 CFN	REM SPEED SETPOINT SIG DIFF	ALARM

ALARMS   RESET

Figure 4-7. Analog In/Out

Controlled Shutdown

The operator can initiate and abort a controlled shutdown from any screen. The shutdown can be monitored from the startup curves screen.

Speed Control Screen

Setpoints can be adjusted and from this screen. This screen is used to control and monitor speed and the HP and LP limiters. Load may also appear on this page depending on configuration.

Entering a Setpoint

- Press the set button. A keypad will pop-up.
- Enter the desired setting.
- Press ENTER. The setpoint will be entered, sent to the control, and the keypad will disappear.
- Press the "Go To" button and the control begin to ramp to the setting at the 'entered rate' (defaulted to the 'slow rate').

This process can be aborted by simply pressing a raise or lower arrow for the appropriate setpoint. 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 5009FT will not allow the entered speed value within a critical band.
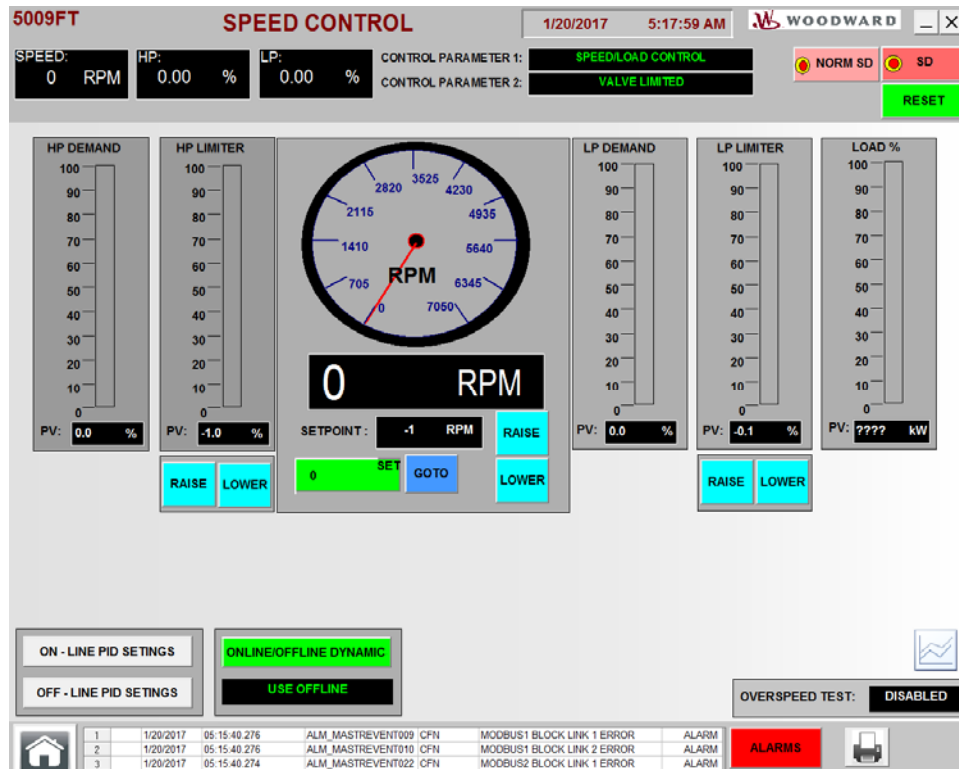
Figure 4-8. Speed Control

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 HMI. When the 5009FT changes from Off-Line to On-Line mode the HMI will also change to reflect the current mode. On-Line or Off-Line dynamics can be viewed by selecting the desired mode through the HMI - this does not change which mode the 5009FT control is currently using, only which set of dynamics is viewed. All dynamics are adjusted via the CCT only.

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

Contact Input Screen

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

Figure 4-9. Contact Input

Actuator Service Screen

In order for the actuator valves to be stroked, several permissives must be met. The 5009FT control must be in a shutdown mode and the speed of the turbine must be 0 RPM. The stroking ENABLE/DISABLE button(s) remain hidden until the permissives are met. Refer to Volumes 1 and 3 for more information regarding valve stroke and calibration procedures. To stroke an actuator, click/touch the appropriate position demand value.
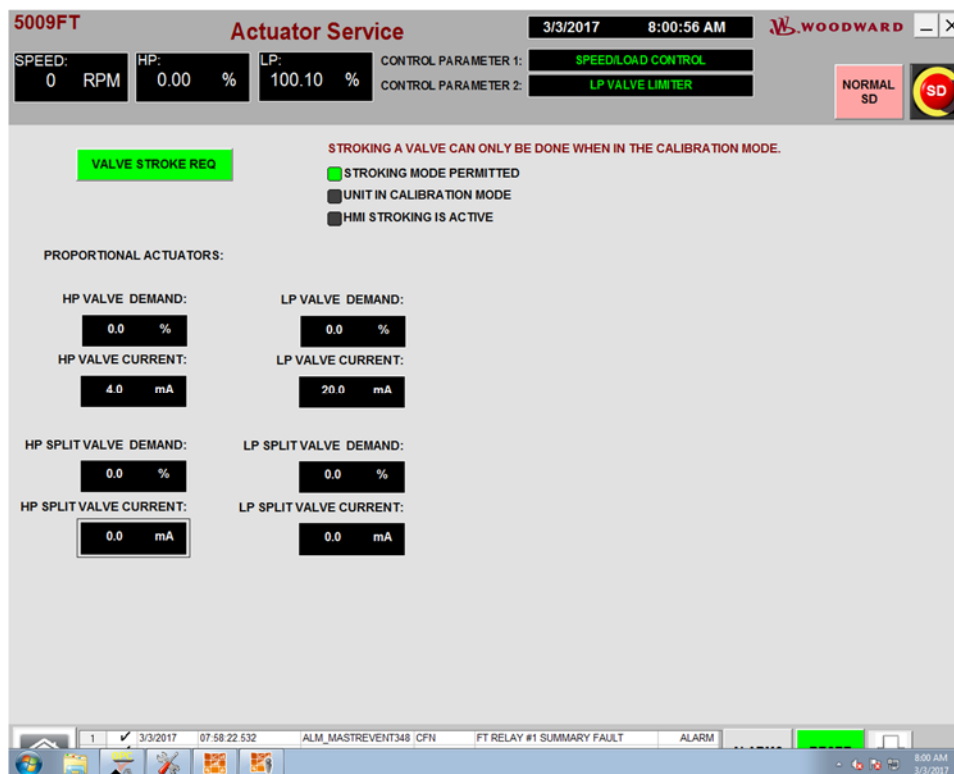
Figure 4-10. Actuator Service

Actuator Status Screen

The actuator status screen is available to let the operator know which channels are configured and used. It can also be used to monitor valve demands to those valves that are configured.
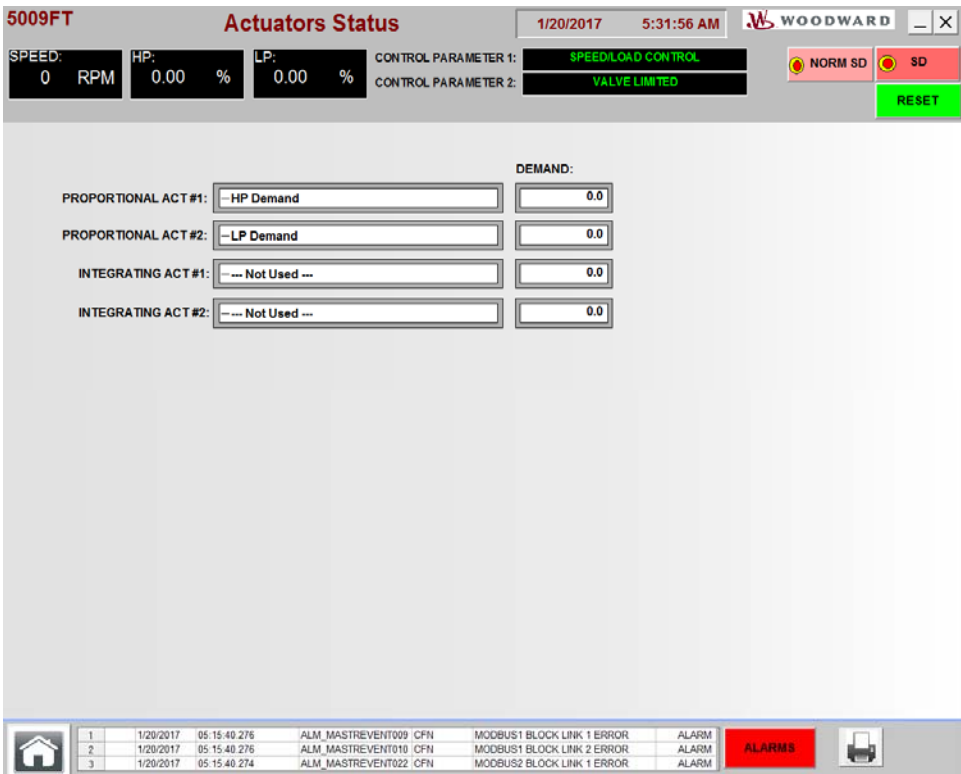
Figure 4-11. Actuator Status

PID Control Screen

The PID Control screen shows all of the configured 5009FT PID outputs and setpoints in a bar graph form. Setpoints can be adjusted and the enabled/disabled statuses of control functions can be monitored. 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 PID gauge displays the PID's output.
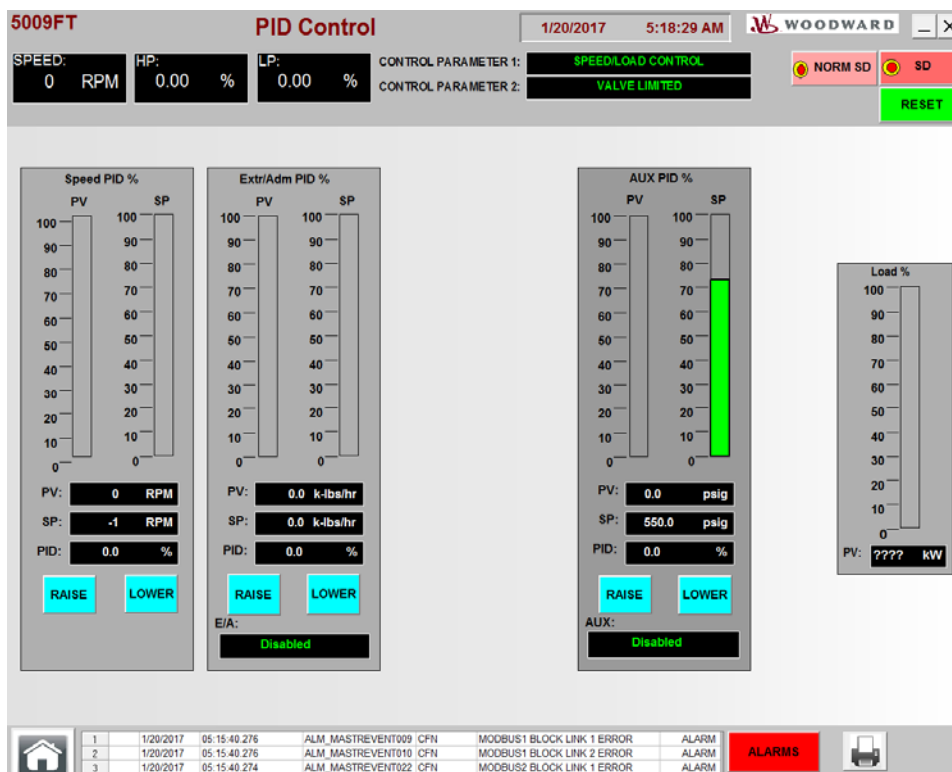
Figure 4-12. PID Control

Relay Output Status Screen

Relay configuration and status is displayed. The 5009FT 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.
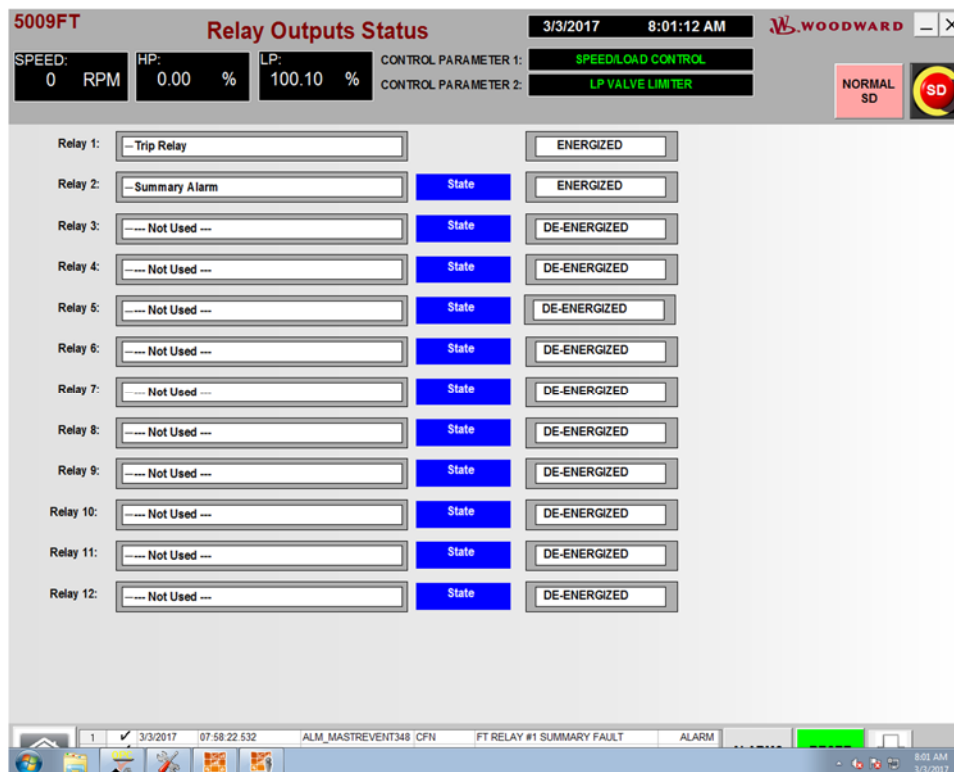
Figure 4-13. Relay Outputs

Steam Map Screen
The Steam Map screen displays the steam map configured in the control. It also allows for some basic control functions related to the flow of steam and the turbine's operating point on the map.
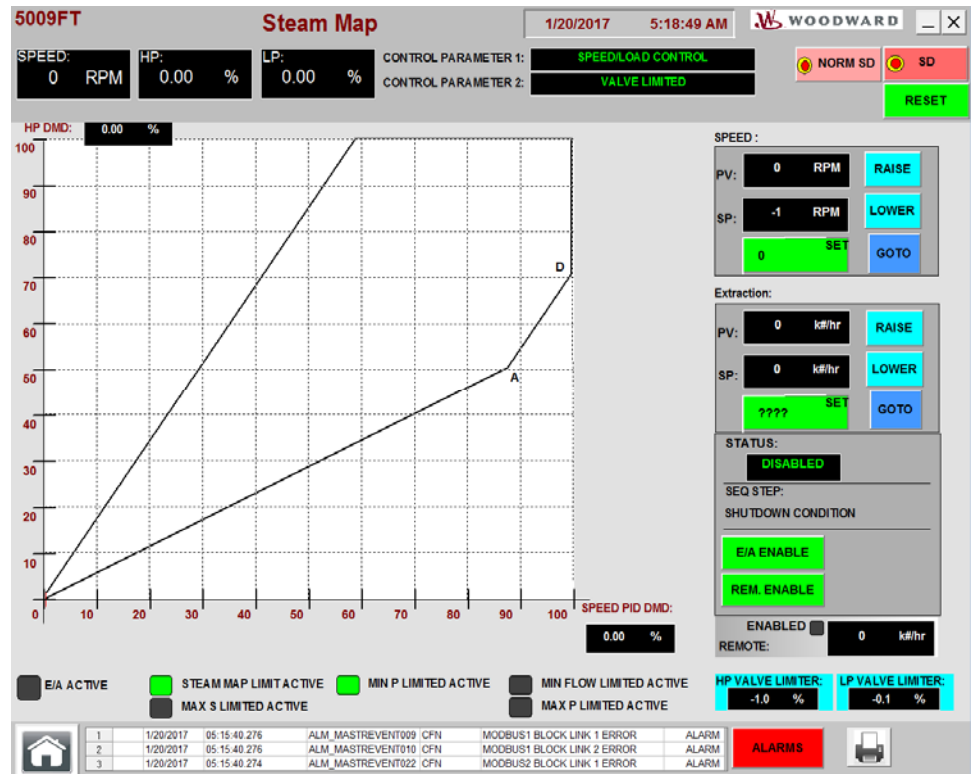
Figure 4-14. Steam Map Screen

Extraction, Admission, EXTR/ADM Control Screen

This screen contains functions used when enabling extraction, admission, or extr/adm.
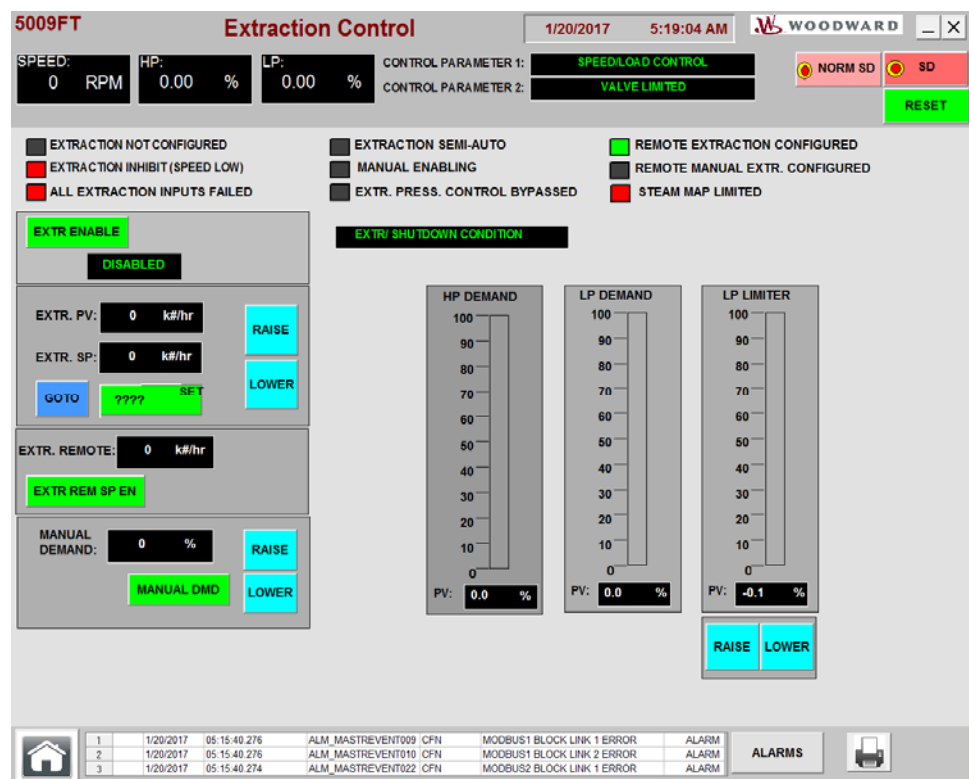
Figure 4-15. Extraction/Admission Control Screen

Auxiliary Control Screen

This screen contains functions used when enabling the Auxiliary Controller. Units displayed and the affect this controller has on the turbine operation will vary depending on how the 5009FT is configured. See the 5009FT manual Volume 1 for more information.
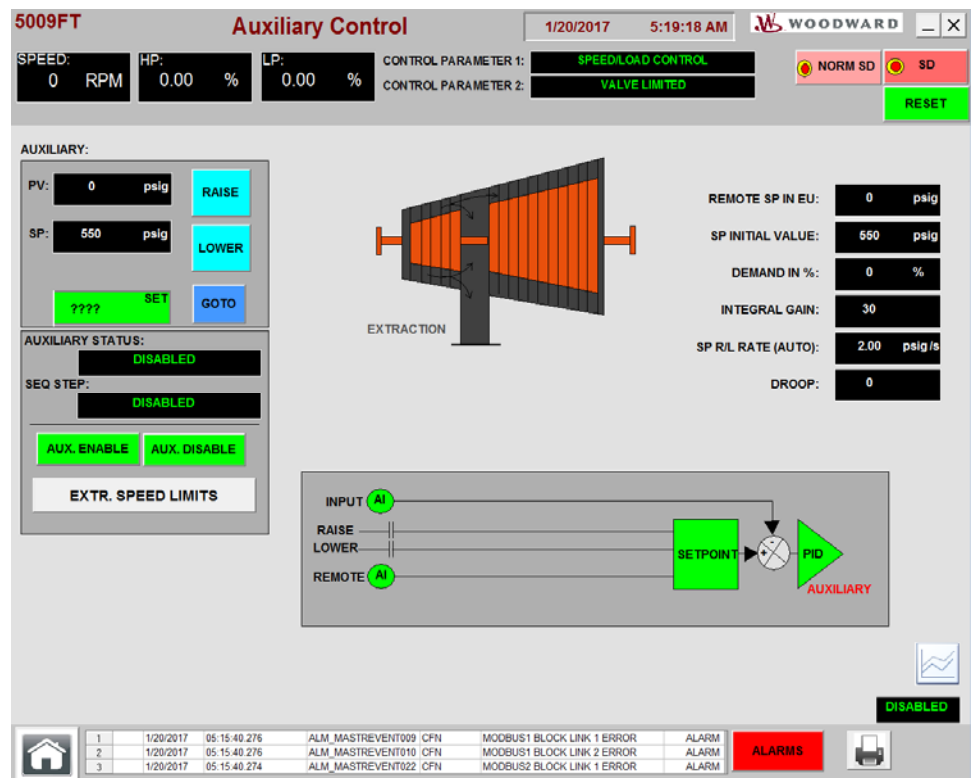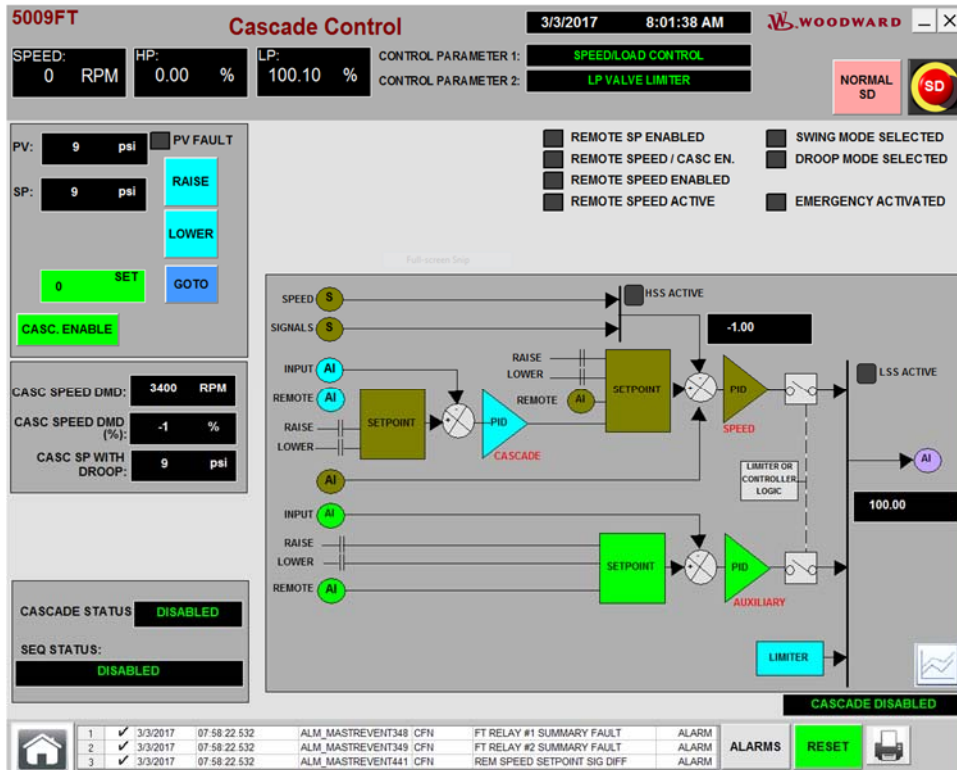

Figure 4-16. Auxiliary Control Screen

Cascade Control Screen

This screen contains functions used when enabling the Cascade Controller. Units displayed and the affect this controller has on the turbine operation will vary depending on how the 5009FT is configured. See the 5009FT manual Volume 1 for more information.
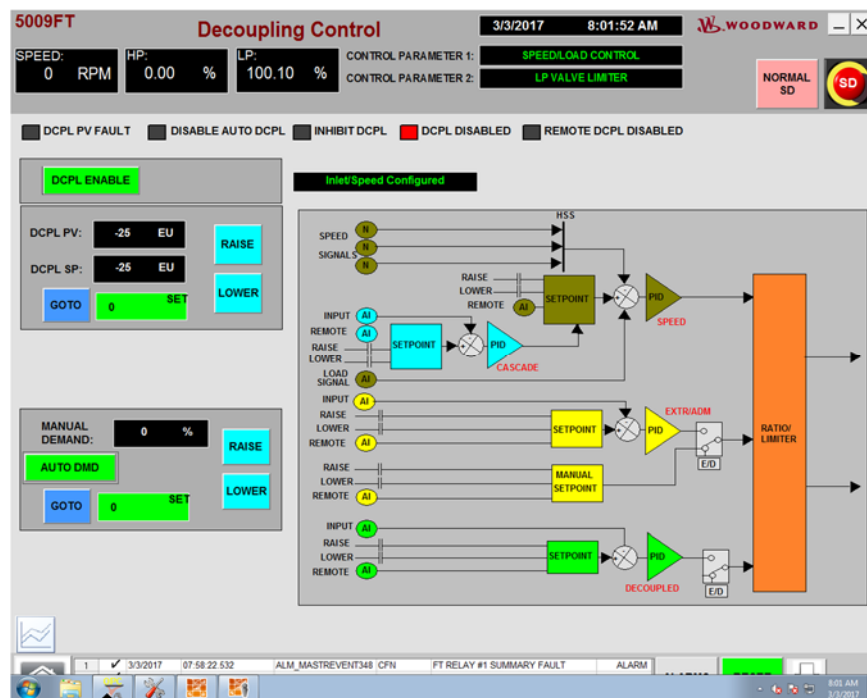

Figure 4-17. Cascade Control Screen

Decoupling Control Screen

This screen contains functions used when enabling the Decoupling Controller. Units displayed and the affect this controller has on the turbine operation will vary depending on how the 5009FT is configured. See the 5009FT manual Volume 1 for more information.

Figure 4-18. DCPL Control Screen

Generator Screen

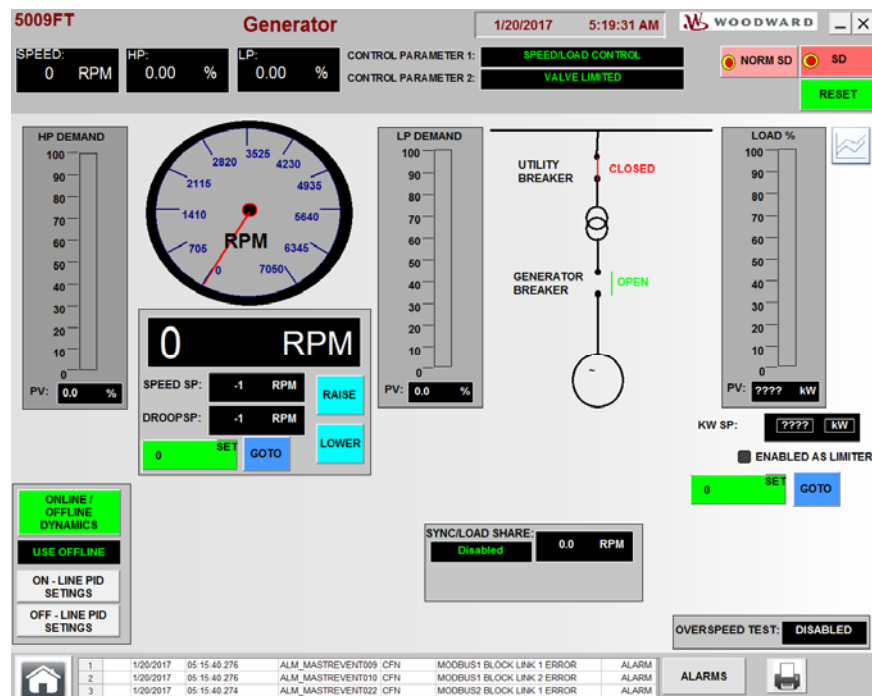This screen contains functions used in a Generator application.

Figure 4-19. Generator Screen

Overspeed Test Screen

Testing of the mechanical and electrical overspeed devices can be monitored from this screen. To perform an overspeed test, refer to the 5009FT manual Volume 3.
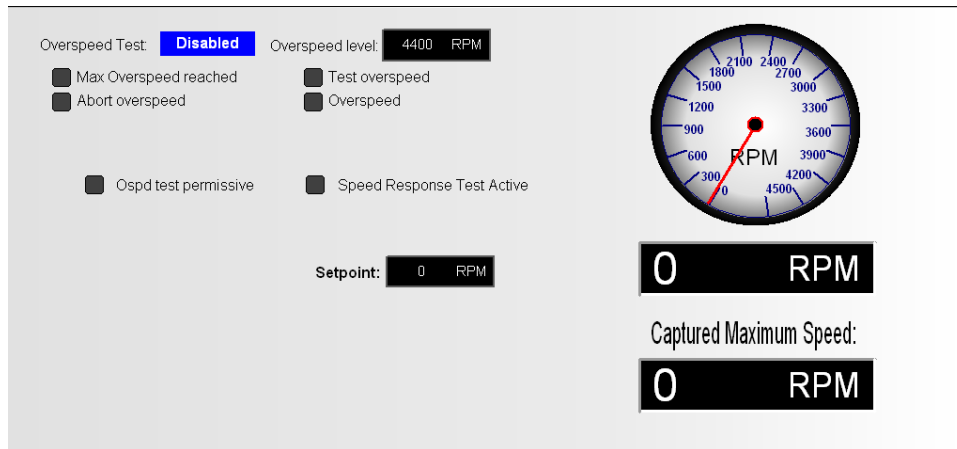

Figure 4-20. Overspeed Test

Main Trends Screen

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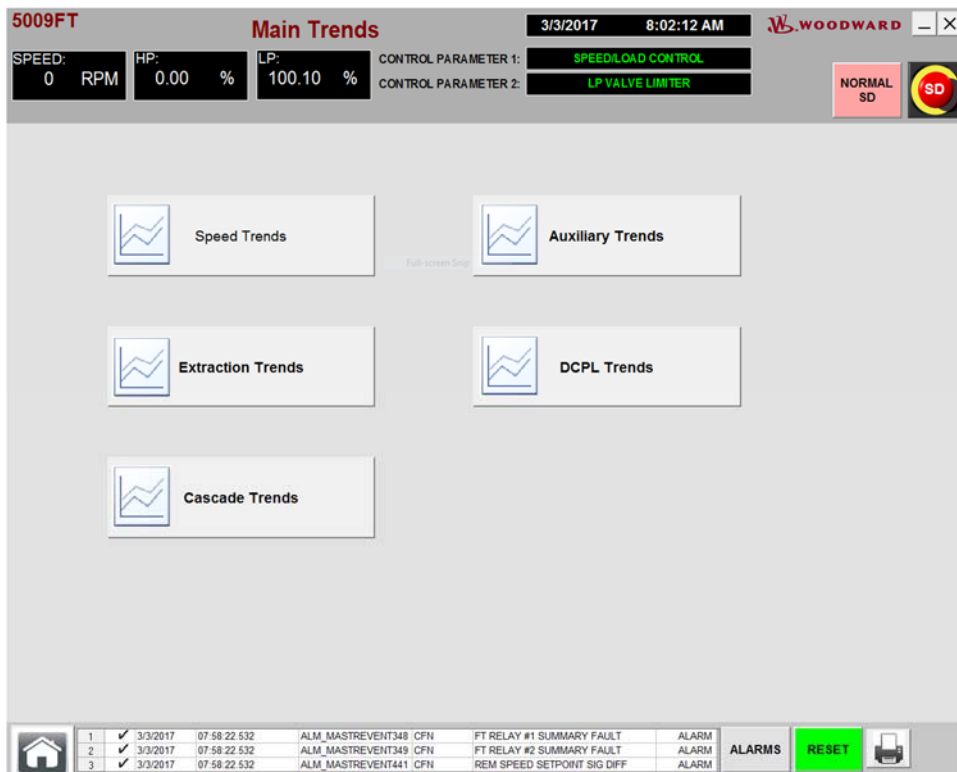

Figure 4-21. Trend Menu

Trend Screens

Trend screens provide trend of setpoint, PID output, and control input captured at a one second scan rate. This screen also contains several 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.

Figure 4-22. Extraction Trend Screen

Alarm Screen

The Alarm Log screen displays 5009FT 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.
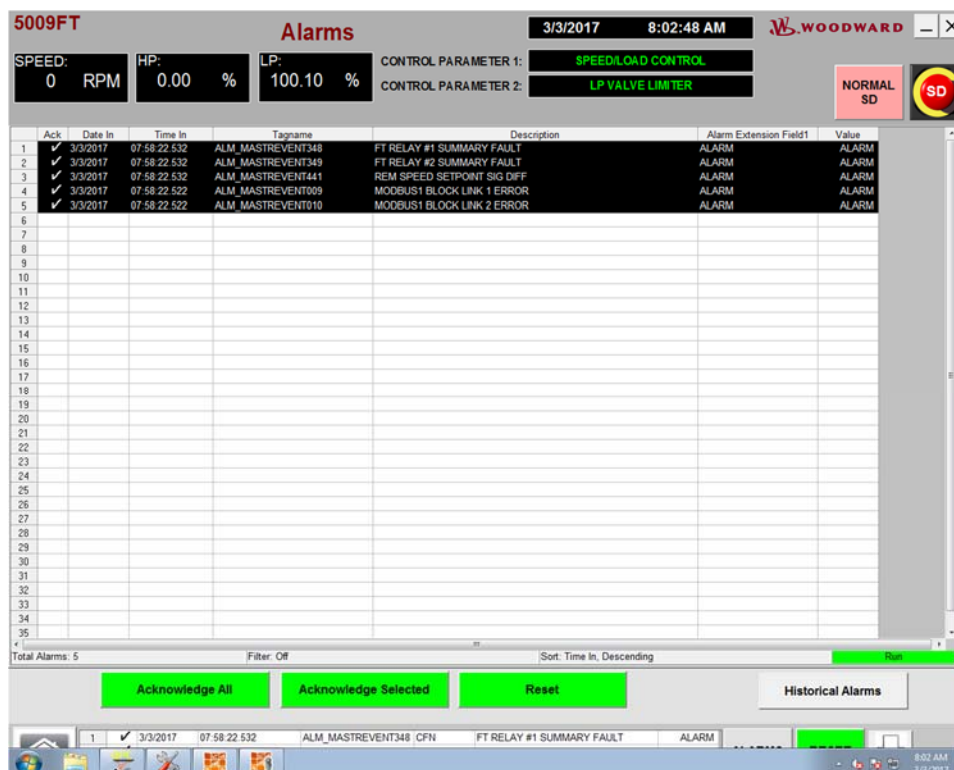

Figure 4-23a. Alarm Screen

The Alarm Log can be sent to a printer connected to the HMI. After connecting the printer, press the PRINTER button on a screen to print a screen capture of the content on that screen.

Historical Alarm Screen
(accessed from ALARM 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 button on this screen serves the same function as the button on the Alarm Log screen. A screen shot will be sent to the printer configured on the HMI.
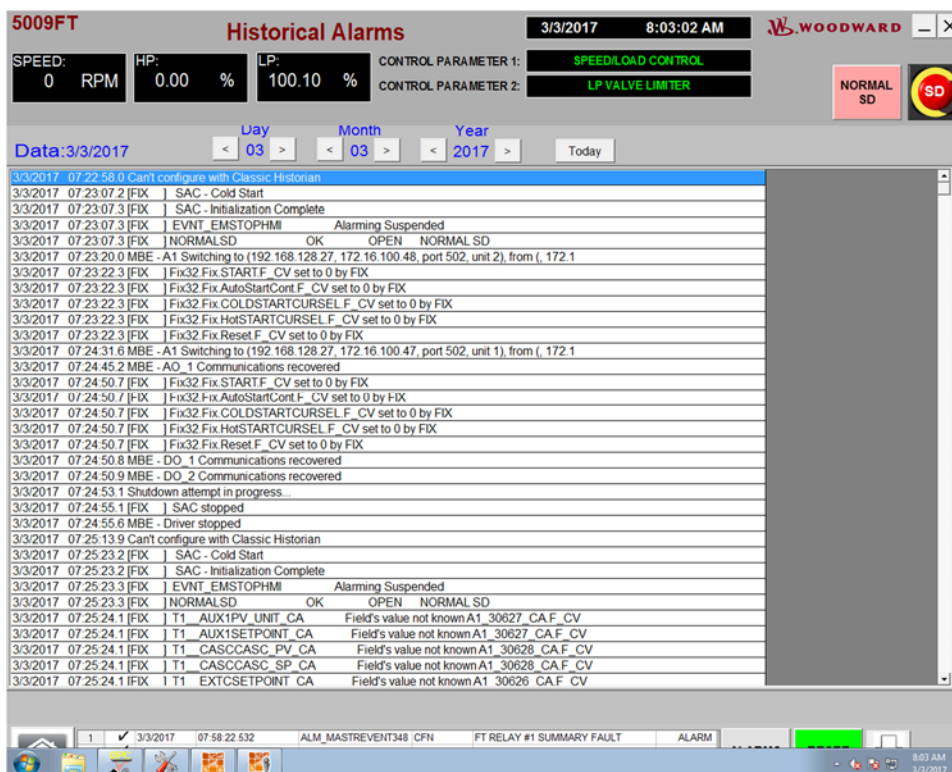

Figure 4-23b. Alarm Screen

Revision History

Changes in Revision B—
- Updated part number of HMI covered in this manual.
- Updated Computer Data for Valueline PPC 3000.
- New Figures in Chapter 4 for iFix 5.8.

We appreciate your comments about the content of our publications.

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