WOODWARD

Product Manual 26433
(Revision NEW)
Original Instructions

GTC250A Gas Turbine Control for Generator or Compressor Applications

8262-1031

Installation and Operation Manual

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:** **www.woodward.com/publications** **The latest version of most publications is available on the *publications page*. If your publication is not there, please contact your customer service representative to get the latest copy.**

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 Out-of-date translations are marked with ⚠.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.

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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.

Chapter 1. General Information

Introduction

This manual describes the GTC250A Digital Control System designed to control two-shaft gas turbines for compressor or generator applications. The manual should be used along with the standard Atlas-II™ hardware manual (26415), and therefore the scope of this document is only to describe details of the GTC250A application software functionality and assist the customer in configuration and start-up of the control. Refer to manual 26415 for information on hardware specifications, mounting information, wiring details, and adding distributed I/O to the system.

Scope of Supply

Item #	Description
8262-1031	GTC250A—Atlas-II (Fuel Control and pre-programmed Profibus Distributed I/O
1796-1043	CD—System Documentation & Software Tools

Optional Add-ons

Item #	Description
8923-1025	Distributed I/O Kit (optional)
1784-505	Moore Industries AD590 Ambient Temperature Signal Converter
8900-067	Ambient Air Temperature Sensor (AD590)
5441-699	Relay Interface (12) FTM
5417-747	Relay FTM Interface Cable
8200-224	Servo Position Controller (SPC)

General Description

The Woodward GTC250A Atlas-II Digital Control System is a configurable control system for gas turbines that produces a fuel demand output to control speed, load, pressure, and temperature. In addition to this, the control allows packager or user programming by use of an auxiliary programming tool. For a given GTC model, the maximum I/O available is fixed and has been pre-programmed into the unit. If additional I/O is required, the customer should inquire about other models of the GTC family.

Hardware

The GTC250A Atlas-II Digital Control is designed to be bulkhead mounted in a control panel. The complete unit contains an A5200 CPU module with actuators, 3 Analog Combo modules, Profibus interface module for distributed I/O and a Power Supply board. In addition, the system can include an optional relay Field Termination Module (FTM) and/or optional kits that include Distributed I/O modules and cables. These components are designed for DIN rail mounting in the control cabinet.

The CPU module controls the system. The I/O modules interface the CPU module to the outside world, permitting it to sense digital and analog inputs and to issue analog and discrete outputs.

Optional relays are available for the system to isolate the system's discrete output circuits from the field wiring.

Power Requirements
The Atlas-II Digital Control System requires an 18-32 Vdc input supply voltage.

Physical Description
For further details on the physical hardware, refer to the Atlas-II product manual 26415.

A5200 CPU Module

The A5200CPU runs under a VxWorks® ***** real time operating system and follows the instructions of the application program, which controls all of the input and output circuits of the GTC250A Atlas-II Control.

*—VxWorks is a trademark of Wind River Systems, Inc.

The CPU module has the following Communications Ports:

Ethernet 100BT
4-10/100 Base-TX Ethernet ports used for Modbus® ***** communication and service tools.

*—Modbus is a trademark of Schneider Automation Inc.

Serial COM 1
This port is a dedicated operating system debug port and should not be used.

Serial COM 2
The COM 2 Serial Port is configured for use as a Modbus interface on this control. If used, a serial isolation adapter must be used.

I/O Modules

Every I/O module has a FAULT LED that is controlled by the CPU. During every initialization of the system, the CPU turns these LEDs on. The CPU then individually tests each I/O module. If an I/O module fails any test, the FAULT LED remains on. The FAULT LED remaining on after the diagnostics have run may mean that the module has failed a test, or it may mean that the module is not correctly declared in the GAP application.

For further details on the specific hardware modules installed in this system refer to the Atlas-II product manual 26415.

The I/O signals for GTC systems are divided into two groups, the Atlas-II I/O and the Distributed I/O.

Atlas-II I/O

Inputs
This control can receive inputs from the following devices:
8 Magnetic pickups
18 Temperature sensors (K-type Thermocouples)
15 Analog Input Sensors (4 to 20 mA dc signals)
12 RTD Inputs
24 Discrete Input Contacts

Outputs
An Atlas-II Digital Control System uses analog and discrete output modules to provide the following outputs:
2 actuator driver channels (0 to 20 mA dc or 0 to 200 mA dc maximum range)
12 Discrete Relay Outputs
10 Analog Current Outputs (4 to 20 mA dc)

Serial Communications
The Atlas-II SmartCore module contains 2 serial communications ports:
2 RS-232/RS-485/RS-422 ports with terminal connections

Profibus Distributed I/O (8262-1031 version only)

The GTC250A allows the customer to incorporate additional programming functionality using an application programming tool called Ladder Logic. This unit also has Distributed IO pre-programmed into the system. This is done via a Profibus communication network that links into the GTC through a port (PROFIBUS) on the Profibus Interface board. The software programming required to bring this I/O into the application is pre-programmed into the GTC250A application. There is a file (named applicom.ply) that must be placed on the Atlas-II in the same folder as the GAP application that allows the DIO to be routed to the system.

FOR Allen-Bradley Flex IO—
160 Discrete Inputs
128 Discrete Output drivers
16 RTD Inputs
48 T/C Inputs
40 Analog Inputs (4-20 mA dc)
8 Analog Outputs (4-20 mA dc)

Software Application Program

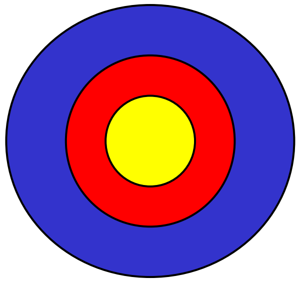
The application program is designed by using the Woodward GAP™ Graphical Application Program. The GAP program, which runs on a standard PC (personal computer), builds and compiles the application program file. This application code is then processed through a coder/compiler, which generates the application program code. This executable code is then loaded into flash memory on the CPU module circuit board. The GTC250A application is designed as a fuel control for a two-shaft gas turbine and is intended to provide proper fuel demand control from the initial ‘Fuel On’ signal to ‘Fuel Off’. The GTC250A control, as delivered from Woodward, is not designed to provide any turbine start permissive or sequencing logic, off-turbine package sub-system control, or plant process requirements.

One of the special & unique features of GAP is the ability to combine multiple source GAP programs into one compiled/executable program. This allows for separate engineering control of specific areas of programming logic. The GTC family uses a programming architecture that is best represented in the following illustration.

Third-Ring (blue) – Ladder Logic

Second-Ring (red) - GAP

CORE (yellow) - GAP



The CORE file GAP program contains the main control loop functions for the control of the turbine fuel-metering valve. The next chapter shows a functional block view of this logic and explains its functions in more detail. This file is designed and engineering controlled by Woodward and is not intended to be changed by the customer.

The Second-Ring file GAP program contains all of the control system I/O blocks of the system, interfaces to the CORE and all communications software for the system. This file is initially designed and supplied by Woodward, but in some cases can be modified by the customer for package ancillary devices, sub-systems, interface to other distributed I/O and communications to customer devices.

The GTC250A control includes a built-in programming tool named Ladder Logic. This allows packagers or users to construct a custom program “Third-Ring” (if desired) to control such things as turbine sequencing logic or control of ancillary turbine equipment. This program can utilize the additional I/O pre-programmed into the GTC250A. The program is created by a separate software programming tool and is loaded into the control during runtime. It has access to all GAP variables, but can only write into pre-defined memory locations and control a limited amount of the total system I/O.

Chapter 2.
Description of Operation

Introduction

This chapter describes the operation and features included in the GTC250A system for control of a gas turbine driving a generator or a compressor.

Scope

The control has been divided into major functions for this description. Many of these functions have sub-functions, and all of these may not be utilized in your specific unit. The major functions of this Atlas-II™ Digital Control System include:

- Ambient Temperature Sensing
- Speed Sensing
- Turbine Inlet Temperature Sensing
- Compressor Discharge Pressure (CDP) Sensing
- Exhaust Gas Temperature (EGT) Sensing
- Analog and Digital Outputs
- Speed Reference Logic
- Start Ramp and Start Control Logic
- Speed Control of Gas Generator Shaft (GG)
- Speed/Load Control of Power Turbine Shaft (PT)
- CDP Limiting Control
- EGT Limiting Control
- Megawatt Limiting Control
- Acceleration and Deceleration Control
- Fuel Transfer Logic
- NO_X Valve Demand
- Power Augmentation Valve Demand
- Flameout Detection (both UV detectors and EGT temp sensing)

Functional Block Diagram

The following diagram shows a general outline of the functionality of the GTC250A control.

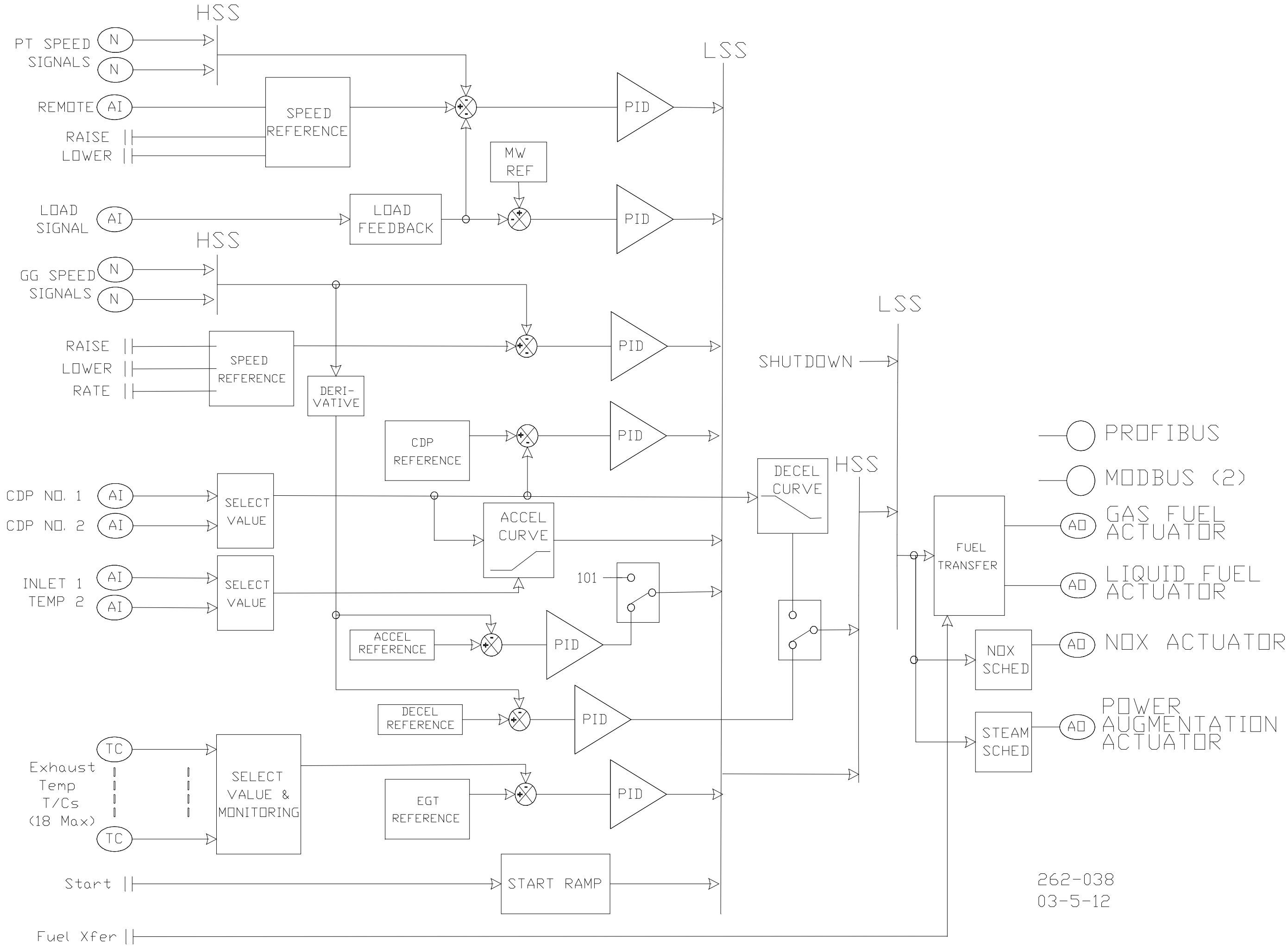


Figure 2-1. GTC250A Functional Block Diagram

Control Loops

Start Ramp/Start Control

The control contains options for Start mode, including an open loop start ramp, a closed loop GG acceleration schedule, and an EGT-temperature-controlled start. This control mode accelerates the turbine from initial 'Lite-off' to a point where the GG control PID can take control of the fuel valve demand.

Gas Generator Control (GG) PID

The intent of this controller is to keep the turbine GG speed equal to the GG speed reference. This control loop will typically accelerate the turbine up to the rated PT speed. The GG control PID (proportional-integral-derivative) function block compares the GG actual speed signal with the GG speed reference and calculates an appropriate output response. The GG control PID has three inputs:

- Actual speed input from the GG scalar
- GG speed reference input
- Feedback input from the LSS

Power Turbine Control (PT) PID

The intent of this controller is to maintain desired speed of the PT shaft. Under normal operating conditions, the unit will be loaded while in this mode and maintain speed control from zero load to maximum load. The PT control PID compares the PT actual speed signal with the PT speed reference and calculates an appropriate output response. The PT control PID has three inputs:

- Actual speed input from the PT scalar
- PT speed reference input
- Feedback input from the LSS

ACCEL Control (Curve Schedule & PID)

The accel schedule determines the maximum amount of fuel allowed, during acceleration. This demand is driven by either a configurable curve (based on CDP) or by a PID control on the GG speed derivative. The CDP versus Fuel Demand accel limit curve is a required configuration by the user. It will determine the maximum amount of fuel allowed for the current CDP. The speed derivative accel PID is an option that can also be used. The maximum amount of fuel allowed is determined by a speed vs. speed derivative curve. Both of these control parameters feed into the LSS bus. If the value is the lowest on the LSS, then its schedule controls the LSS. The PID option can be selected during the configuration of the unit.

Temperature Limiting Control (EGT) PID

The EGT PID block compares the actual EGT signal with the reference EGT signal and generates an appropriate output response signal. The EGT control PID is typically used as a limiter on the high end of the load curve of the turbine. It is also used in the GTC as an option on startup to limit the fuel flow until closed loop speed control can be reached (typically at GG idle). It will limit the fuel demand to the turbine once the EGT temperature reaches the EGT reference setpoint. The EGT Control PID has three inputs:

- Calculated average temperature from all validated EGT T/C inputs
- EGT temperature reference setpoint
- Feedback from the LSS

Megawatt Limiting Control (MW_LIM) PID

The MW PID block compares the actual MW signal (or calculated MW load based on turbine CDP) with the reference MW signal and generates an appropriate output response signal. The MW control PID is typically used as a limiter on the high end of the load curve of the turbine. It will limit the fuel demand to the turbine once the MW output reaches the MW reference setpoint. The MW Control PID has three inputs:

- Actual or calculated MW load input
- MW limiter reference setpoint
- Feedback from the LSS

Pressure Limiting Control (CDP) PID

The CDP PID block compares the actual CDP signal with the reference CDP signal and generates an appropriate output response signal. The CDP control PID is typically used as a limiter on the high end of the load curve of the turbine. It will limit the fuel demand to the turbine once the CDP pressure reaches the CDP reference setpoint. The CDP Control PID has three inputs:

- Validated CDP from all valid CDP inputs:
- CDP reference setpoint
- Feedback from the LSS

Compressor Stall Detection Logic

The control includes the option of using Compressor Stall Detection algorithms. The control monitors the CDP signals at a very high-speed data rate and then calculates a derivative of this signal. When this calculation exceeds the OEM defined limits of this turbine parameter, a control shutdown is initiated.

LSS Bus

The low signal select (LSS) bus selects the lowest of the GG PID, PT PID, EGT PID, CDP PID, MW Limiter, Start Ramp, or the accel schedule signals, and passes it to the HSS bus. Whichever signal is calling for the lowest fuel is the one used for LSS bus output.

DECEL Control (Curve Schedule or PID)

The decel schedule determines the minimum amount of fuel allowed during deceleration. This demand is determined by a curve that is based on CDP as the forcing function or by a PID control on the GG speed derivative signal. It uses one of these signals to determine the minimum amount of fuel allowed. It then outputs this value to the HSS. If the value is the highest on the HSS, the decel schedule controls the HSS.

HSS Bus

The HSS bus receives the output of the LSS bus and the decel schedule as input. Whichever of these inputs is higher will be the signal sent to the output of the HSS bus. This output is responsible for setting the turbine fuel valve position to maintain the requested turbine parameter.

LSS Bus (LSS_2)

A second low signal select (LSS) bus exists downstream of the HSS. This is where the Shutdown command is invoked to chop fuel flow to the turbine.

Fuel Demand

This block is the true 0–100% fuel demand being commanded from the fuel control.

Actuator Driver

The actuator driver converts the 0-to-100% software control signal to a proportional actuator drive current signal. This can be configured for a 4–20 mA or 0–200 mA drive signal. An input from the shutdown input can override the control signal and cause the actuator to go to minimum-fuel position or shutdown. The shutdown circuit also has short and open coil fault detection. The actuator translates the signal from the electronic control into mechanical force to position the fuel valve. There are separate actuator drive outputs for gas and liquid fuel.

Fuel Transfer Logic

The control has the capability to run on gas or liquid fuel and the ability to make on-line fuel transfers between the two fuels. It is important to note that the packager/user will need to gather the necessary fuel property and valve flow schedule information to correctly configure the unit to make smooth on-line fuel transfers.

NO_X Valve Demand

The control has the capability to control the turbine emissions through the modulation of a NO_X control valve. This logic provides a 4–20 mA output that is designed to be the demand signal to a driver for positioning of a water or steam injection valve. The logic has configuration choices for the forcing function input to a tunable curve schedule blocks. There are separate schedule curves for gas and liquid fuel as well as ‘ratio multipliers’ and raise and lower ramps to adjust the NO_X flow to the desired demand.

Power Augmentation Valve Demand

The control has the capability to provide the demand signal for a steam injection valve. Some installed turbine designs incorporate an optional power augmentation system. This logic provides a 4–20 mA output that is designed to be the demand signal to a driver for positioning of a steam injection valve for this purpose. There are options for steam flow schedules and a raise & lower ramp to adjust the demand to the desired levels.

Chapter 3.
Installation

Introduction

A detailed list of the Atlas-II™ I/O signal layout including channel allocation, wiring terminations, descriptions, and range information is found in Appendix A. This chapter describes details of the signals that the GTC250A is programmed to handle. The control wiring diagrams in Appendix A also identify which signals are required and which are optional.

Fuel Control Input/Output Signals

Speed Sensing

The function of speed sensing is to monitor turbine speed. The sub-functions are:

- Speed Sensors
- Speed Derivative
- Sensor Fault Detection
- Speed Switches

Speed Sensors

There are four speed sensors in this system, two for GG and two for PT. The digital speed sensor I/O board receives input from the speed sensors on the turbine and converts this speed signal to a usable form for the control. The two speed signals for each shaft are high-signal selected with only the one indicating the higher speed being sent to the control PIDs.

Speed Derivative

The speed sensor input blocks also generate a derivative of the speed, which gives the control a high frequency calculation of the rate of change in speed over time. This signal is high signal selected, and this value is used to control acceleration and deceleration of the turbine.

Sensor Fault Detection

Sensor fault detection is done in the application software. On detection of a sensor fault, a signal is generated for activation of associated indicators and alarms. Failure of both signals from the same shaft will cause a shutdown. An alarm also exists for annunciating a speed difference between redundant sensors.

Speed Switches

In the software there are three speed switches for GG and three speed switches for PT. These speed switches are configurable for any speed and are used to drive relay outputs. These outputs can be used by other systems. There is also an overspeed switch for GG and one for PT. Each of these switches can be configured to activate at any speed. Each switch also initiates a potential shutdown or alarm when activated.

Speed Reference

The speed reference produces the desired speed-setting signal and sends it to the speed controller. The sub-functions are:

- Speed Setting
- GG Ambient Bias
- Remote Speed Setting

Speed Setting
The GG and PT speed settings are raised or lowered by closing the associated contact. The rate at which the reference changes can also be selected. Each speed reference has both an upper and a lower limit position. The speed setting at each of these positions is a tunable value. Each speed reference also includes relay options to indicate when that speed reference is at the upper and lower limits.

GG Ambient Bias
There is an option to bias the GG speed or the GG reference input from an ambient temperature bias block. If the ambient temperature input fails, a fixed value (which is configurable) bias signal is used.

Remote Speed Setting
The PT speed setting can be controlled by a remote signal. The ENABLE contact enables remote speed setting. When enabled, the speed setting can be changed by varying a remote 4-to-20 mA signal. At this time all PT associated switch contacts (RAISE, LOWER, FAST, and INSTANT) will be disabled.

Ambient Temperature Sensor

The control is designed to receive an ambient temperature signal via a single 4–20 mA input, a thermocouple input, or via a single or redundant RTD input.

It is very common for this ambient temperature to be sensed by an AD590. There is an optional kit item that can be included with the GTC products to convert this signal. The AD590 microamp signal is converted to a milliamp signal through the Moore Industries device. This device has been programmed with a microamp to milliamp/temperature conversion chart that converts the value into a 4–20 mA signal.

The ambient temperature sensor signal is converted to a digital signal in the Atlas-II Digital Control System and can be configured to bias any of the following turbine parameters: GG Speed, GG reference, and/or the EGT reference. If the ambient temperature input signal fails, a fixed-value signal (tunable) is used as the bias signal.

Exhaust Gas Temperature (EGT)

The EGT section of this control includes the following sub-sections:

- EGT Sensing
- Temperature Reference
- Temperature Switch Output Relay Signals

EGT Sensing
Two methods of sensing EGT are available, one 4–20 mA summary EGT input or multiple thermocouples. When the summary method is selected, a single 4–20 mA input senses the EGT. The system feeds the temperature information from this signal to the three temperature switches, the overtemp switch, and the EGT control PID. When the multiple-thermocouple method is used, the EGT is sensed by a number of type K thermocouples (configurable from 1 to 18). Cold Junction compensation is done on the Atlas-II I/O module, but there is an option to bring in a CJ sensor from a remote location, if the appropriate T/C wiring is not run all the way to the Atlas-II. The temp spread monitor block calculates the average reading of the thermocouples. It excludes any that are outside of the allowed spread or those T/C that have failed. The temp spread monitor block and the subtract block calculate the difference between the highest and lowest readings of the thermocouples that are included in the average. The average is sent to the three temperature switches, the overtemp switch, and the EGT control PID. Configurable alarms and shutdowns are available for each T/C, number of failed T/Cs, and excessive spread.

Temperature Reference
The EGT Reference is set by a tunable variable and can be configured to use an ambient temperature bias. There is an option to use the EGT control for starting the unit. The control has additional temperature setpoints that are used for this option.

Temperature Switches
In the software there are two temperature switches for the EGT. These temp switches are configurable for any temperature setpoint and are used to drive relay outputs. These outputs can be used by other systems.

Flameout Detection Logic (UV)

The Flameout section of this control includes the following sub-sections:
- UV Detector (discrete inputs) Sensing
- EGT Temperature Monitoring
- GG Speed Monitoring

Ultra-Violet Flame Sensor Detectors
If UV detectors are used, the control will monitor these signals to confirm that ignition exists in the combustor. Both single and redundant sensors are supported. Flame is recognized by the control by a True signal on the discrete contacts.

EGT Temperature Monitoring
The control uses EGT temperature logic to monitor for a 'Lite-off' detection in the combustor. This setpoint for this software switch is set at 400 °F (204 °C). If during any valid turbine running sequence the EGT temperature drops below this level, the control will consider this a lost flame condition and initiate a shutdown. The control can be configured to use either one or both of these options.

GG Speed Monitoring
This method monitors the GG shaft for speed to be greater than a programmed setpoint. Once this speed is reached, the control monitors for the speed to drop 200 rpm below this speed to determine that the unit has flamed out.

Compressor Discharge Pressure (CDP)

The CDP section of this control includes the following sub-sections:
- CDP Sensing
- CDP Derivative Calculation

CDP Sensing
The compressor discharge pressure (CDP) is sensed by a 4-to-20 mA pressure transducer. There are two 4-to-20 mA pressure signals available. The selection of the value that is used is configurable and can be an average, mean, HSS, or LSS. This value is then used by the control for pressure control and fuel schedules.

CDP Derivative Calculation
The CDP sensor input blocks also generate a derivative of this signal, which gives the control a high frequency calculation of the rate of change of compressor discharge pressure over time. This signal is high signal selected and this value is used in certain turbine operation protection algorithms.

Megawatt Sensor (MW)

The MW section of this control includes the following sub-section:
- MW Sensing

MW Sensing
The megawatt load (MW) is sensed by a 4-to-20 mA load transducer. There is a 4-to-20 mA MW load sensor input signal available for applications driving generators. This value is then used by the control for load control/droop feedback when running the unit against a utility grid.

Discrete Inputs

Twenty-four discrete inputs are available as direct inputs into the Atlas-II I/O. These 'high-speed' input signals are used to direct the actions and functions of the fuel control. The following 20 are fixed and the other four are configurable. The * on the active state means that this state can be altered in configuration. In the programmable version of the GTC250A, each of these inputs can be configured to be used as shown or reallocated for use in a Ladder Logic program.

	Active State
1. Shutdown (Fuel Off)	* TRUE = No external Shutdowns
2. Start/Run	* TRUE = Start / Fuel ON
3. System Reset (ALM & SD)	TRUE = Reset Alarm/Shutdown
4. System Acknowledge (ALM & SD)	TRUE = Acknowledge Alarm/Shutdown
5. GG Reference Lower	TRUE = Lower GG Speed Setpoint
6. GG Reference Raise	TRUE = Raises GG Speed Setpoint
7. GG Reference Select Fast Rate	TRUE = GG Speed Setpoint Rate = Fast
8. GG Reference Select Instant Rate	TRUE = GG Speed Setpoint Rate = Instant
9. PT Reference Lower	TRUE = Lower PT Speed Setpoint
10. PT Reference Raise	TRUE = Raise PT Speed Setpoint
11. PT Reference Fast Rate	TRUE = PT Speed Setpoint Rate = Fast
12. GG Speed and EGT Temp Signals Failed Override	TRUE = Override these sensor failures
13. PT Speed Signal Failed Override	TRUE = Override PT sensor failures
14. Fuel Selection/Transfer	TRUE = Liquid Fuel (False = Gas Fuel)
15. Enable Remote PT Reference Setpoint	TRUE = Actively follow remote setpoint
16. Enable NOX Valve Control	TRUE = Turn on NOX valve control
17. Isoch/Droop Select	* TRUE = Go to Isoch (GenBrkr Open)
18. Enable Power Augmentation Valve Control	TRUE = Turn on Power Aug. valve control
19. Flame Detector A	TRUE = Flame Detected
20. Flame Detector B	TRUE = Flame Detected

Actuator Driver Outputs

This system includes two actuator drivers, one for the gaseous-fuel actuator and one for the liquid-fuel actuator. Each of the actuator drivers receives a fuel demand signal and sends a proportional drive current signal to its actuator. Each actuator, in turn, controls the flow of one type of fuel. The outputs are configurable as 4–20 mA or 0–200 mA. These outputs are proportional drivers only—if integrating drivers are required, inquire about the Woodward Servo Position Controller (SPC).

Analog Outputs

The system includes ten analog outputs. These readout signals are 4–20 mA signals for driving readouts or sending to other plant system controls. Each of these signals is configurable to be driven via the auxiliary program or by the fuel control. Each of these analog outputs can be configured to be driven by one of the functions shown below. These are setup via a tunable 'menu' on the GAP Configuration sheets that is most conveniently done in Monitor GAP mode.

- PT Actual Speed Readout
- PT Reference Speed Readout
- Fuel Valve Demand Readout (Total)
- Gas Fuel Valve Demand Readout
- Liquid Fuel Valve Demand Readout
- Exhaust Gas Temperature Readout
- GG Reference Speed Readout
- GG Actual Speed Readout
- Compressor Discharge Pressure Readout
- MW Load Readout
- NO_X Valve Demand
- Power Augmentation Valve Demand
- Output from Modbus AW
- Output from Ladder Logic
- Customer Analog Output

Relay Driver Outputs

Twelve relay driver outputs are available from the Atlas-II I/O. These signals are used to indicate the function or status of the control or turbine. The first three outputs for SHUTDOWN, ALARM and HEALTH relays are fixed outputs. The SHUTDOWN and HEALTH signals (1 & 3) are normally energized to reflect a healthy GTC250A with no shutdowns present. The ALARM signal (2) along with all of the others is normally de-energized, and the control energizes these outputs when the condition shown is reached. The other nine signal outputs are configurable to be driven via the auxiliary program or by the fuel control. The default status for each one is to be driven by the fuel control and those functions are shown below.

- SHUTDOWN Summary
- ALARM Summary
- Summary Horn (Alm or SD) Output
- Unit in ISOCH
- Unit in Droop
- PT Reference at Low Limit
- GG Speed Switch 1
- GG Speed Switch 2
- GG Speed Switch 3
- PT Speed Switch 1
- PT Speed Switch 2
- PT Speed Switch 3
- EGT Temperature Switch 1
- EGT Temperature Switch 2
- EGT Temperature Switch 3
- GG Speed in Control
- PT Speed in Control
- EGT Temp in Control
- Start Ramp in Control
- MW Load in Control
- Running on 100% Gas Fuel
- Running on 100% Liquid Fuel
- NO_X Valve Control Active
- Output from Modbus BW
- Output from Ladder Logic
- Customer Defined

Software Interface Tools Setup

Apply Power to the GTC250A

At power-up, the GTC250A runs through its boot-up routine and performs a set of initial diagnostics to verify CPU, memory, I/O initialization, and bus health. This boot-up routine takes approximately a minute to execute. During this time, the control's green run and red status LEDs on the CPU and I/O modules should be on. When boot-up is complete, the application program code begins running, the control outputs will be enabled, and system control will begin—the control's red status LEDs will turn off and should remain off as long as the control is running.

Install Control Assistant Software

Both Woodward's AppManager and Control Assistant configuration and service tool may be downloaded at no cost from the Woodward website (**www.woodward.com/ic/software**). As an alternative, an Install version of these software tools are included on the System documentation CD that came with the control.

Connect PC to GTC250A

The connection of a computer is only required for calibration and setup of the GTC250A. The computer and service interface software program are not required or necessary for normal operation of the control. You will need to connect a standard Ethernet cable between the Ethernet port # 1 of the Atlas-II A5200 CPU module on the GTC250A and a user PC per the control wiring diagram (Appendix A - 9971-1270). For information on the cable or communication port settings, see the troubleshooting section of this manual.

AppManager (2.7 or higher)

Application Manager is a tool that allows users to do the following:

1. Change the IP address of the control
2. Transfer application or datalog files to or from the control
3. Start or Stop the GAP application that the control is running
4. Install Operating System Service Packs

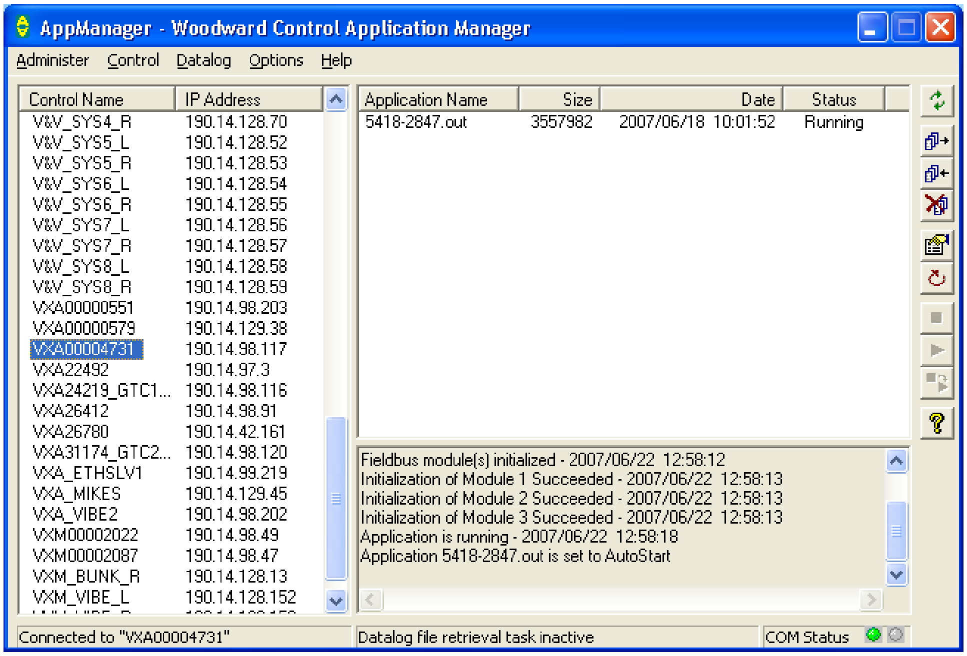


Figure 3-1. AppManager Tool

Initiating Ethernet Communications with the Control

Each GTC250A ships from Woodward with a default IP address of **172.16.100.20.** This means that the user must initially connect directly to the control with a PC that has had its IP changed to an address that is on this same first three octets within the subnet mask (for example 172.16.100.21). Once the connecting PC is configured like this, the user will see the control on the left side of the AppManager window.

Changing the IP address of the Control

It is usually desirable to change the fixed IP to an address available on the user's plant network, thus placing the control on the plant LAN. This is done via the AppManager program (available from www.woodward.com). The user can change the control IP to any available IP on the plants local network. The GTC250A can also be set up to receive an IP automatically from a DNS or DHCP.

IMPORTANT	**This is done from AppManager via the "Change Network Settings" under the Control pull down menu in the menu bar**

Control Assistant (3.4 or higher)

Control Assistant is the primary service interface tool needed to configure the control, manage tunable values, trend values within the control, and view ‘datalog’ files (which are high speed data files that the control creates upon chosen events). The GTC250A is programmed to interface with this tool via an Ethernet connection from port 1 of the control to a user PC via the Woodward ServLink to OPC Server (SOS) communication utility. SOS is included in the Control Assistant installation and will launch automatically when needed.

WinPanel (Tool within Control Assistant)

WinPanel is a typical Windows application that provides a powerful and intuitive interface. The menu structures are familiar to Windows users. Variable navigation is provided through the Explorer window similar to the Explorer in Windows.

The WinPanel tool within Control Assistant permits you to talk to the GTC250A via the Ethernet port on the CPU. You can use WinPanel to monitor values, read fault messages, or issue instructions to the GTC250A System. The WinPanel tool runs on a laptop or desktop PC and utilizes standard Windows dialog boxes and Explorer windows to allow the user to create ‘Inspector’ files of any fields available in the application software. This tool will allow you to access the service or configuration screens through an automatically created ‘inspector’ file.

Software setup for the GTC250A begins with the Software Configuration & Service Tunables Worksheet. When the worksheet is completed, the values are then entered into the GTC250A with the WinPanel tool. This tool can also be used to upload (from the control to a file on the user PC) the tunable settings from the control. This file then can be downloaded (from the user PC to the control) into another control of the same part number and revision number. Keep this tunable file archived, as it will simplify configuration of other spare units and aid technical support in commissioning troubleshooting.

An “inspector” provides a window for real-time monitoring and editing of all control Configuration and Service Menu parameters and values. Custom “inspectors” can easily be created and saved. Each window can display up to 28 lines of monitoring and tuning parameters without scrolling. The number with scrolling is unlimited. Two windows can be open simultaneously to display up to 56 parameters without scrolling. Tunable values can be adjusted at the inspector window.

Initial GTC250A Communications:

Before communications can begin between the WinPanel program and a control, a service interface definition file must be created. Once this network definition file is created and saved, it never has to be recreated, unless a new program is loaded into the control.

To create a service interface definition file:

1. Open the Control Assistant program and click on the WinPanel icon 
2. The following prompt will open – enter the password 1112 and select OK

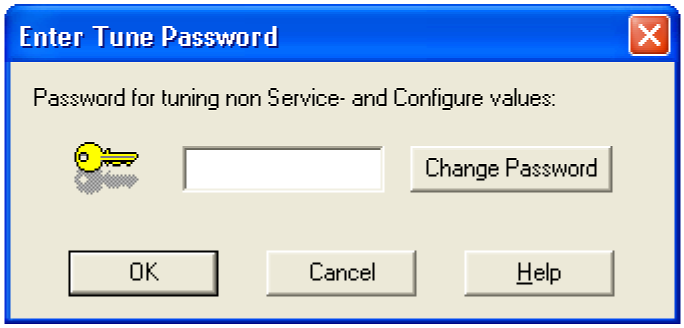


Figure 3-2. Initial WinPanel screen

At this point the tool will prompt you for the type of OPC connection you desire

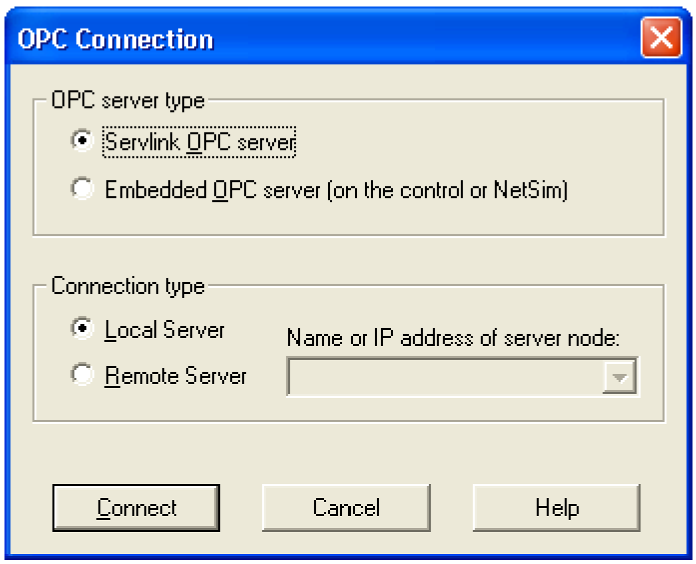


Figure 3-3. OPC Connection screen

1. Select ServLink OPC server and Local Server and select Connect.

At this point the SOS utility will launch. Initially it will not know where to connect to the control, so from the dialog box below select Session / New

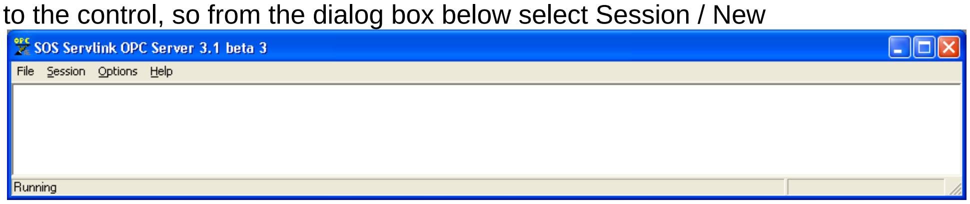


Figure 3-4. Initial SOS screen

and the following dialog box will open.

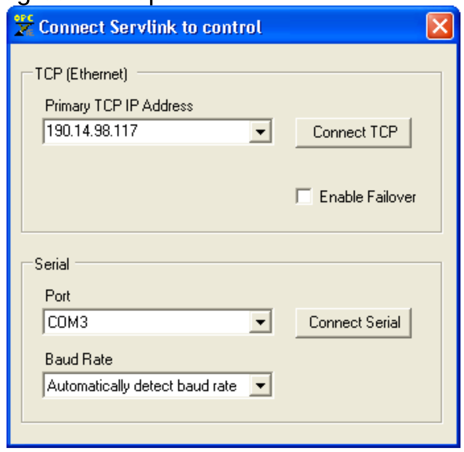


Figure 3-5. Ethernet Link IP address

Enter the correct TCP IP address of your control and click on Connect TCP and the OPC Server program will establish control communications, begin reading all control setting registers, and create a lookup table for these registers to expedite future control communications. Upon reading register location information from the control, the following Windows pop-up box will appear. (This step can take up to a minute to complete.)

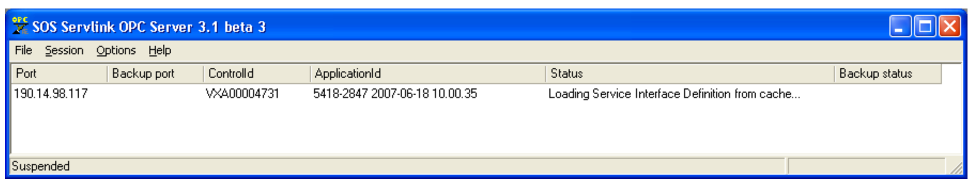


Figure 3-6. Reading Control Information

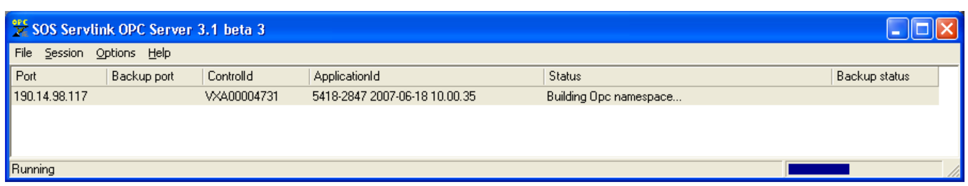


Figure 3-7. Building Control Information

Once all control program registers have been read, the text “Dflt Control ID” will appear within the ServLink program window and the network definition file can be saved for future retrieval by the WinPanel program. If the network definition file is not saved it will have to be re-created before computer-to-control communications can be established again. Save this network definition file and minimize the ServLink program window.

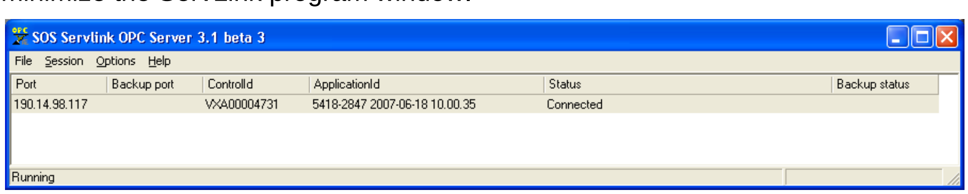


Figure 3-8. Connection to Control Established

Start WinPanel Software

At this point, the WinPanel software program will open its interface environment that looks like this:

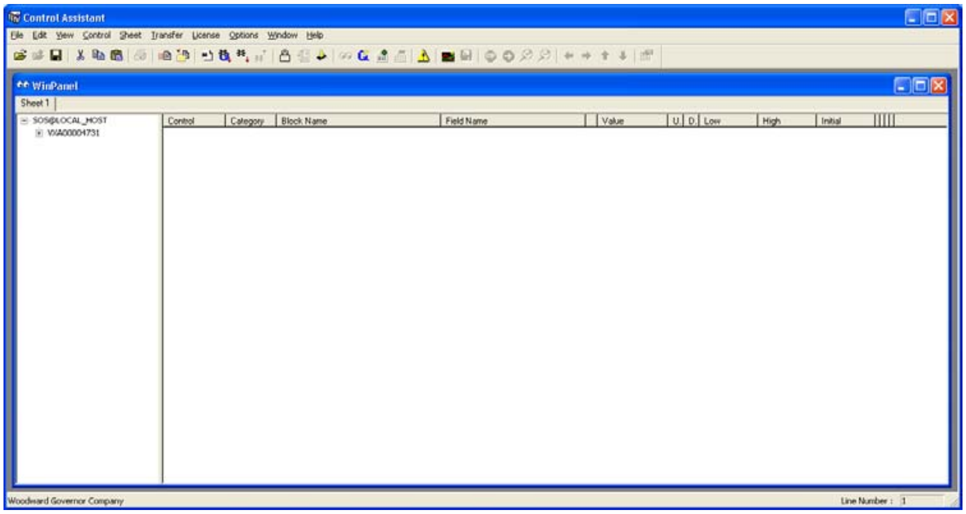


Figure 3-9. WinPanel Menu and Explorer

The WinPanel Menu bar, Explorer and Inspector will appear as shown above. Click on the  icon (Quick Inspector) on the tool bar. Multiple sheets will automatically be created from each Service and Configure Header programmed into the control. Optionally, other inspectors can be created to allow viewing of more than one sheet at a time.

Once communications with the control is established, WinPanel performs these primary functions:

Monitoring and Tuning of Control Variables—WinPanel presents variables in a tabular format. The user chooses the variables to view. Multiple pages of variables can be created, each with useful parameters for various troubleshooting or tuning procedures. The user can toggle between pages depending on the task being performed.

Control Configuration and Set Point Management—WinPanel can upload or download all tunable variables from the control system. This feature allows a user (e.g., fleet owner, distributor, packager) to upload (and save) all tunable parameters from one control and download the same settings to other controls for similar turbine configurations.

 WinPanel allows for automatic generation of inspector sheets. Click on the Q icon (Quick Inspector) on the tool bar. A sheet will automatically be created from each Service and Configure Header programmed into the control. Multiple inspectors can be created to allow for viewing more than one sheet at a time.

 To enter the I/O Lock mode and enable a configure value to be entered, click on the I/O Lock icon on the Tool Bar. Because the values set in Configure are critical to turbine operation, it is not safe to operate the prime mover while these parameters are being configured. In the Configure mode, the control outputs will be set to their off state and the microprocessor will stop executing the application code. The control will have to be reset to continue operation.

The Reset icon allows the microprocessor to store the configure parameters, to return the outputs to their active state, and to resume executing the application software.

When the tuning or setting of parameters is complete, the values must be saved in the control's non-volatile memory. Go to the Tool Bar and click the PROM icon for Save Values. The values will be saved in non-volatile memory and will be unaffected by loss of power to the control.

To save the configuration to a file in the external computer for backup or download later into another control, select the Save Application Settings icon. All the tunable values presently set in the control will be saved to a file and can be loaded into this control to reprogram it to the saved values or into another control at a later time.

If an application configuration has been previously saved to a *.TC file, the saved set of parameters can be loaded into the control as a group by selecting the Load Application Settings icon.

Configure Menu Descriptions

The GTC250A has multiple Configure and Service menus to simplify and protect control settings and their adjustments. All menus appear as pages (or sheets), are arranged alphabetically, and can be located by using the inspector's arrow buttons located above the pages to scroll to the desired menu.

The program's Configure menu items are protected when the control is in operation and cannot be changed. Before configuration values can be changed, the control must be in its I/O Lock mode. Service menus are not protected and can be modified at any time.

To enter the I/O Lock mode and enable configure changes, click on the  I/O Lock icon on the Tool Bar. Because the values set in Configure are critical to turbine operation, it is not safe to operate the prime mover while these parameters are being configured. In the I/O Lock mode the control outputs will be set to their off state and the microprocessor will stop executing the application code.

Once the configuration changes have been completed, save the values to the control, exit the WWI program, and then Power Cycle the GTC control. This will allow the unit to re-initialize the configured parameters and resume executing the application software.

Chapter 4. Configuration and Service Setup Procedures

Introduction

This chapter contains information on control configurations, setting adjustments, and the use of Woodward's WinPanel software tool. Because of the variety of installations, system and component tolerances, the GTC250A must be tuned and configured for each system to obtain optimum performance.

⚠WARNING

An improperly calibrated control could cause an overspeed or other damage to the prime mover. To prevent possible serious injury from an over speeding prime mover, read this entire procedure before starting the prime mover.

The worksheet in the Appendices of this manual should be used to select the values used in the tunable blocks of the GAP™ program for the GTC250A application. On the lines provided, enter the values used for your control. Once the worksheet is completed, connect the control with the WWII tool as described in the previous section. Click on the Q in the tool bar to execute a routine that will automatically generate an inspector file for all of the configuration and service fields. Using the worksheet, tune each field to the value you require for your application. Use a separate worksheet for each control when more than one control is used at each site. Note that as a user gets more familiar with the system, you can modify/customize your own inspector files to best fit your needs.

This should be done at initial installation to establish the correct turbine package configuration details for correct operation of the fuel control. The turbine must be shut down (in a non-running state) during control set-up to tune or adjust any of the parameters on the Configuration sheets. This is not required to adjust or tune any parameters in the Service sheets.

IMPORTANT

Users that plan to do GAP programming of there own in the Second-Ring (Master) GAP may find that using monitor GAP (with the control or in simulation) is a more convenient way to configure the control. To do this, utilize the CONFIGURE I/O sheets in the GAP and change the default tunables to the desired value for your system.

Tunable Upload/Download Function

The TUNABLE UPLOAD & DOWNLOAD functionality is used for downloading or uploading tunables into or out of the control. The tunables may be downloaded from the control to a PC anytime, however the turbine must be shutdown while using the TUNABLE UPLOAD FUNCTION mode.

NOTICE	**Entering into I/O Lock mode while the turbine is running will cause an automatic shutdown of the turbine with resulting process stoppage. Do not enter the I/O Lock to upload tunables into the control while the turbine is running.**

From WW, go to the Explorer Window and 'right-mouse' click on the control (top level). A pull-down menu will appear and the App Settings selection will allow you to Save to File or Load from File.

- SAVE = Download the tunables in the control to a file on the user PC
- LOAD = Upload tunable settings from a user PC into the control

Loading tunables into the control will cause the unit to Lock the I/O and shutdown the turbine.

A complete list of tunables can be found in Appendix B.

IMPORTANT	**It is highly recommended that the user keep a current tunable list file available at site. This will make the configuration and setup of a spare unit very simple.**

Start Modes

This control contains options for start control, which is the initial control mode for the fuel. These options are intended to provide a consistent acceleration of the turbine, from turbine 'lite-off' up to closed loop GG speed control. Once the fuel control has reached GG control, the start mode demand signal is ramped out of the way (to 100%). The default option is to have the unit transition from Start Ramp to GG Derivative Control (Accel schedule) up to GG Speed control. This allows for the most aggressive ramp-up times of the turbine. For less aggressive ramp-ups, the start ramp rate can be reduced, or the EGT Temp controlled start ramp option can be enabled.

Once the Start Ramp Enabled discrete input contact is closed (TRUE), the fuel control will initiate a start. This contact is NOT a latched input, meaning that it must be held TRUE to activate fuel (hold closed versus momentary). If this signal is lost or drops out, the fuel control chops fuel demand to the MIN Fuel Demand position. To achieve successful turbine 'lite-off', the unit must have been set up for either a Mechanical Lite-off or an Electrical Lite-off.

IMPORTANT	**For information on setting correct Fuel Flow for lite-off, see the Troubleshooting section.**

Mechanical Lite-off = Minimum Valve position mechanically set to yield correct lite-off fuel flow. If this is used configure the MIN_FUEL position to Zero (0.0).

Electrical Lite-off = Minimum Valve position is set in software (MIN_FUEL) to yield correct valve demand position to yield lite-off fuel flow. If this is used then mechanically the valve should have the min stop set to zero degrees.

Start Ramp Control Start

The initial increase of fuel valve position is accomplished by a ramp of the Start Ramp from the initial MIN_FUEL position to a point at which a speed loop takes over control of the fuel valve demand. The ramp will increase at the default rate, which is configurable. The start ramp provides a user-defined increase in fuel valve demand and a corresponding acceleration of the turbine until another input of the LSS takes control. If the rate of increase of the ramp becomes too high, the GG Derivative control will take over control of fuel demand.

GG Derivative Control Start

This is the default start mode programmed for accelerating the turbine from lite-off to speed control. This mode provides a PID control to raise the GG speed at a defined acceleration rate of the GG speed signal. The default rate for this is 50 rpm/s. This control loop steadily increases fuel demand until a point at which a speed loop takes over control. The advantage of this mode is that it is closed loop around a parameter, while the start ramp mode simply opens the fuel valve with no feedback on what is happening. The start ramp default rate (tunable) should be set to be high enough to just stay ahead (greater than) the demand from this PID. The CDP versus Fuel Flow curve limits the Accel PID from over-demanding fuel if the turbine does not accelerate.

EGT Temp Ramp Control Start

After the initial increase of fuel valve position is accomplished by the start ramp, the EGT PID can be used to bring the unit up to a point at which a speed loop takes over control of the fuel valve demand (usually GG Speed control). The temp ramp contains two user defined setpoints and a ramp rate (in °F/s). The temp ramp starts at the Lower temp setpoint until ‘Lite-off’ is detected. The ramp then ramps up to the High temp setpoint at the user defined rate. This option is useful if a unit is experiencing overtemps during start-ups or the user desires to avoid high temps at sub-idle conditions. If the rate of increase of the ramp becomes too high, the GG Derivative control takes over control of fuel demand.

Alarm Sequence

When the fuel control detects an alarm condition, it activates a summary alarm relay output and sends information about the specific cause of the alarm out through the Modbus block. The customer can also go into Service mode and view a numeric alarm value that corresponds to the numbered alarms found in the Appendices of this manual. A reset will clear the alarm if the condition that initiated it no longer exists.

Shutdown Sequence

When a shutdown occurs, either a fuel control initiated event or the discrete contact shutdown input, all of the actuator signals go to zero and the turbine shuts down. The fuel control will activate a summary shutdown relay output and also send information as to the specific cause of the shutdown out through the Modbus block. The customer can also go into Service mode and view a numeric shutdown value that corresponds to the numbered shutdowns found in the Appendices of this manual. A reset will only clear the shutdown if the condition that initiated it no longer exists AND the GG speed has dropped below the user defined speed setpoint.

Setup of the CDP/Fuel Limiter Curve

The GTC250A requires that the user configure a fuel limiter curve based on the compressor discharge pressure of the turbine. The CDP/Fuel Schedule biases on CDP (as the X value) as scaled by the user. The output of the curves block (Y value) limits the LSS bus in scale of 0-100% (that is, if output is 50 for a given input, then fuel flow will not be able to increase above 50%). There are separate curves for gas and liquid fuel—if the turbine is a single fuel, unit then the unused fuel curve should have all Y values set to 100%.

To calculate the correct X and Y values for this curve, one of the following methods should be used.

- Turbine OEMs typically define a curve of Compressor Discharge Pressure vs. Fuel (in BTU/hr) in the control or installation manuals for the turbine. The user should get the heating value of the fuel used at their installation site and translate this curve into a CDP vs. Fuel Flow curve. The user should then plot their fuel valve flow output (in pph) versus demanded position (%) and create an appropriate CDP vs Fuel Valve demand curve. Further information of the creation of this curve can be found in the Troubleshooting section.
- The user could record data from their unit while it is currently running and generate a CDP vs Fuel Valve demand curve. The Appendices of this manual contain a sheet to assist in this effort.

NO_X Water Injection Setup

The control has the capability to control the turbine emissions through the modulation of a NO_x control valve. This logic provides a 4–20 mA output that is designed to be the demand signal to a driver for positioning of a water injection valve. The algorithm for calculating the water demand signal is basically a ratio of fuel to water. A tunable curve schedule block that outputs the fuel flow (in pph) based on fuel valve demand position must be set up first. The output of this block yields the calculated fuel flow, and is used to determine the correct water flow demand. The output side (Y-values) of this curve block is all tunable values to be configured by the user. There are separate schedule curves for gas and liquid fuel. There are also 'ratio multipliers' and raise and lower inputs to the ramp to adjust the NO_x demand from the base ratio schedule.

NO_X Steam Injection Setup

The control has the capability to control the turbine emissions through the modulation of a NO_x control valve. This logic provides a 4–20 mA output that is designed to be the demand signal to a driver for positioning of a steam injection valve. The logic for calculating the steam demand is driven by the mathematical product of a base steam curve (driven by the fuel flow curve), a gain multiplier for each point on this base curve, and an overall gain multiplier. This value is then low-signal selected (LSS) with a curve driven by a CDP input. The CDP curve is usually used as the upper limiter of steam demand, but can be used as the main schedule driver if desired. This value is used as the demand input into a deadband control block, and a NO_x steam flow signal is used as the active feedback signal to the deadband controller. This block then drives a ramp block that ultimately positions the valve demand output. There are also raise and lower inputs to the ramp to adjust the NO_x demand from the base ratio schedule.

The schedule curves for calculating the gas and liquid fuel flow as a function of fuel valve position are the same curves as the ones set up for the NO_x water setup.

Power Augmentation Steam Injection Setup

The control has the capability to provide the demand signal for a power augmentation steam injection valve. Some installed turbine designs incorporate an optional system that boosts the overall power output of the gas generator system. This logic provides a 4–20 mA output that is designed to be the demand signal to a driver for positioning of a steam injection valve for this purpose. There are options for steam flow schedules and a raise and lower ramp to adjust the demand to the desired levels. This value is used as the demand input into a deadband control block, and a steam flow signal is used as the active feedback signal to the deadband controller. This block then drives a ramp block that ultimately positions the steam valve demand output.

Chapter 5. Troubleshooting

Dynamic Response Problems

PID Controller Tuning

The majority of problems associated with the control of the turbine can be attributed to poor tuning of the PID control loops. These problems include overspeeding, overtemping, and flaming out as well as many others. For example, if the turbine control is hunting, the loop that is currently controlling the fuel valve is most likely incorrectly tuned and could cause sufficient overshoot to overspeed or overtemp the turbine. Some general tuning guidelines are outlined below.

WARNING

Tuning of PID loops should only be performed by qualified personnel that have a good understanding how the control should be performing. Improper tuning can result in overspeed or overtemp conditions, which could cause damage to the turbine or possible injury or death to personnel.

The quality of regulation obtained from an automatic control system depends upon the adjustments that are made to the various controller modes. Best results are obtained when the adjustment (tuning) is done systematically. Prior training and experience in controller tuning are desirable for effective application of this procedure.

This procedure will lead to controller settings, which, after a load change, will provide:

- Process control without sustained cycling
- Process recovery in a minimum time

Controller settings derived for given operating conditions are valid over a narrow range of load change. The settings made for one operating set of conditions may result in excessive cycling or highly damped response at some other operating condition. This procedure should be applied under the most difficult operating conditions to assure conservative settings over the normal operating range.

There are several methods of controller tuning in use. The following procedure presents one which will be easy to use, and at the same time minimize process upset. This method is one of systematic trial and error.

The method given is based upon the 1/4-ratio decay cycle. The peak of each cycle is 1/4 of the preceding one. The objective is to produce a trace as shown in Figure 5-1.

It is good practice to keep the average of the set point changes near the normal set point of the process to avoid excessive departure from normal operating level.

After each set point change, allow sufficient time to observe the effect of the last adjustment. It is wise to wait until approximately 90% of the change has been completed.

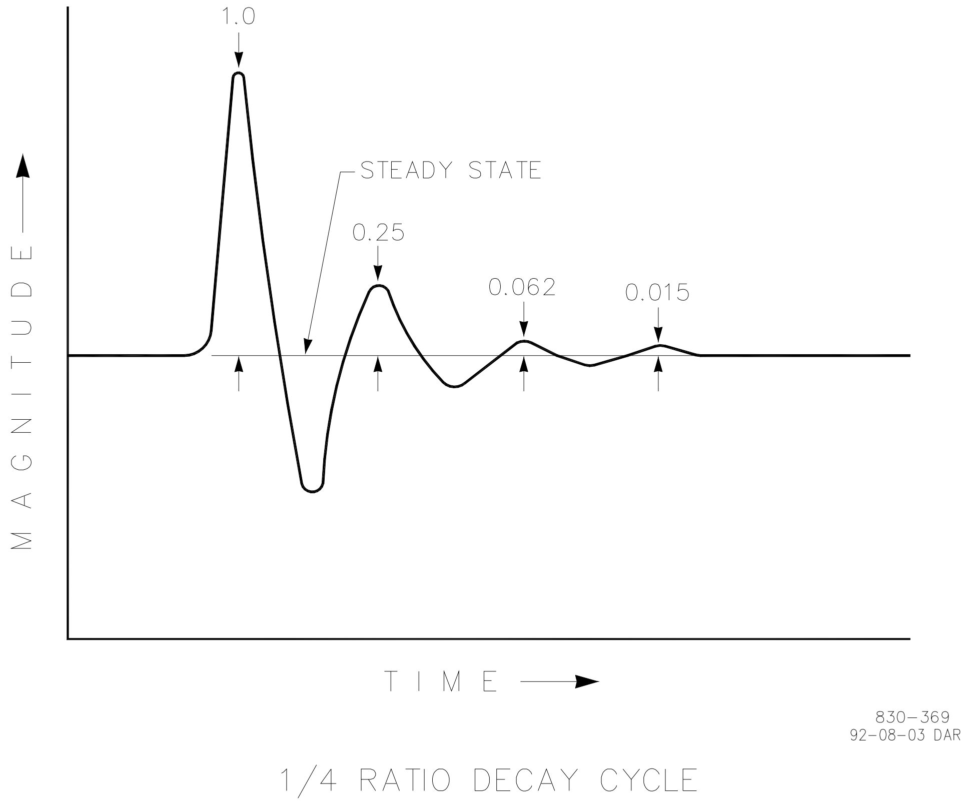


Figure 5-1. Ratio Decay Cycle

Controller Field Tuning Procedure

1. Have the process steady state on manual control at the normal set point. It is important that, for the duration of the controller tuning operation, no load changes take place. The occurrence of a load change may cause a misinterpretation of the recorder trace. Turn the integral adjustment to the position of low reset response, that is, place the reset adjustment at 0.02 repeats per minute (or 50 minutes per repeat). Adjust the Proportional Gain to a fairly low setting. (The actual value of the Proportional Gain will depend on the type of process variable being controlled.) Leave it this way until you are sure that the process has reached steady state.

2. Turn the Integral adjustment to minimum Reset effect; this will reduce or eliminate the Integral function. Check to see that Derivative adjustment is set for minimum Derivative, or in Woodward controllers at 100.

3. Switch to automatic control. Make a small change* in the set point and observe the response of the process to the Proportional Gain setting. If little or no cycling takes place, increase the Proportional Gain to 150% of its previous value and make another small change to the set point. After each set point change, increase the Proportional Gain to twice its previous value until an "Optimum Proportional" response curve (see below) is obtained. If a change in Proportional produces a "Proportional Too High" curve (see below), lower the Proportional Gain to its previous setting. The "Proportional Too Low" curve illustrates the condition in which the proportional is too low.

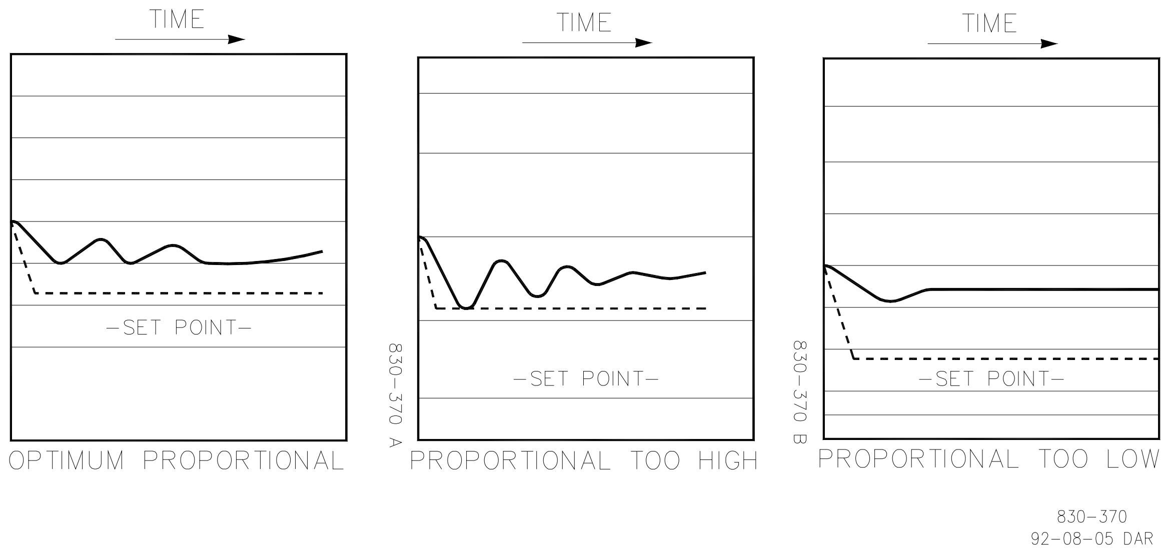


Figure 5-2. Proportional Gain Settings

*Set point changes can be made either up or down scale. The second change should return the set point to its original setting. Repeat this pattern through the tuning procedure.

4. With the Proportional Gain at the setting previously obtained in step 3, make a change in set point and observe the recovery cycle. If there is no excessive cycling, increase the Integral to 0.04 repeats per minute (or 25 minutes per repeat). Make another set point change and observe results. After each set point change, make a change in the Integral adjustment to increase the Integral by 50% of the previous Integral effect. Continue in this manner until an acceptable response curve is obtained.

Accel/Decel Curves Setup

The GTC250A requires the user to configure an acceleration limiting curve and a deceleration limiting curve. The forcing function of this curve is the CDP signal. The output is a fuel valve position demand that equals the maximum fuel flow allowed for a given CDP. The information below will assist the user in programming these parameters in the service category. There are separate schedules for both gas and liquid fuels. For each curve, a maximum of five pairs (x,y) of data points can be defined. Any unused curve points should be at the end of the schedule and tuned out of the way (max CDP, 100).

CDP Accel Schedule (Service–CDP to Fuel Limit Curve)—The curve-defined acceleration rate limiter based on CDP scaled in same units as above. Outputs are scaled from 0 to 100% of valve travel. Since gas flow is not proportional to actuator current or valve angle, the Accel Schedule breakpoints should be calculated based on fuel flow and then fuel flow converted to actuator current using valve test data.

Note on completing Accel and Decel Schedules: Gas flow in pph or BTU/hr vs. actuator current data is required. Also required are the turbine manufacturer’s acceleration and deceleration specifications.

1. Plot a piece-wise linear approximation to the required accel and decel schedules with four slopes maximum for accel and decel. This plot determines the breakpoints in the schedules entered into the Atlas-II Digital Control System. Note that line slopes established by the schedule points do not change to zero at endpoints. If actuator current is to be held constant for varying CDP then a zero slope line segment must be created in the schedule.

2. Rescale the dependent variable (gas mass flow or heat consumption) to match the units used in the gas flow data.

3. Now plot the valve test data with the dependent variable scaled as above vs. actuator current. For greatest accuracy, a non-linear curve fit of the data should be used, however a piece-wise linear plot is generally acceptable.

4. Using the Y axis (gas flow) values of the endpoints and breakpoints from the plot of step 1, determine the corresponding actuator current values, which produce those flows in the plot of step 3.

5. Find the X axis (CDP) values of the endpoints and breakpoints from the plot of step 1.

6. Rescale the actuator current values of step 4 on a scale of 0 to 100 corresponding to min. to max. stops on the valve. If desired, plot this normalized actuator current as a function of CDP. This is the schedule to be entered in the Atlas-II Digital Control System.

   For example, see the linearized sample manufacturers specification, Figure 5-3, and the valve test data example Table 5-1.

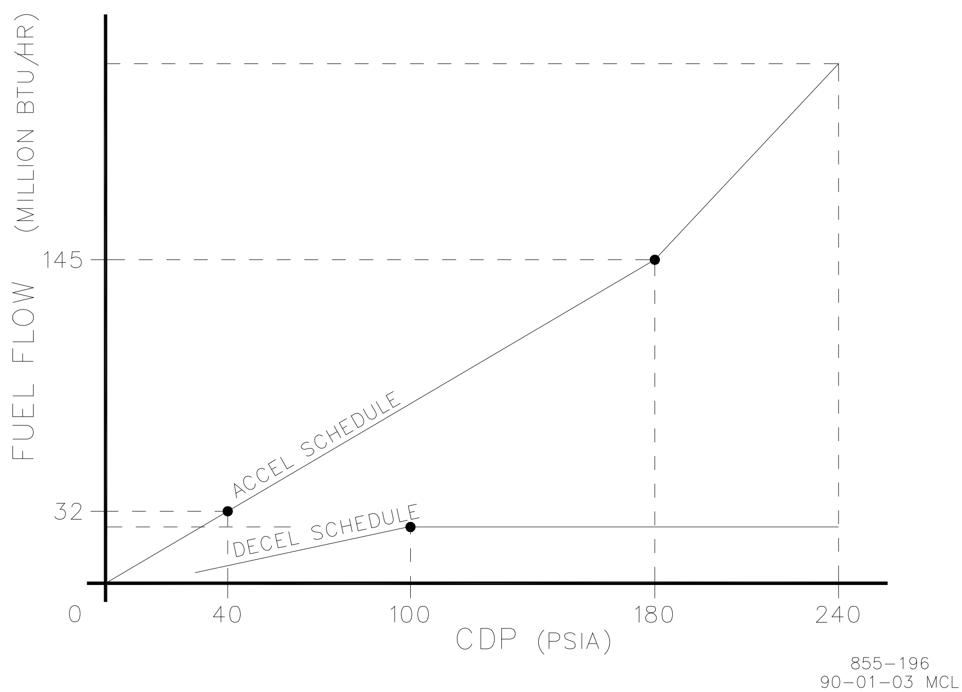


Figure 5-3. Linearized Flow Schedule

Valve Angle (deg)	Actuator Current (mA)	Gas Flow (pph)
9.0	32.8	435
9.8	35.0	515
16.5	54.7	1580
22.6	72.1	3060
28.0	86.3	4689
34.9	107.2	7059
41.8	127.7	9378
51.5	155.1	12488

Table 5-1. Valve Test Data

Given the gas lower heating value of 20 000 BTU/lbm, flow in million BTU/h can be rescaled for pph as in the valve test data. The accel schedule breakpoint is at 7250 pph (145 million BTU/h) fuel flow and 180 psia CDP. From the valve test data, this point corresponds to 108.9 mA of actuator current. For this example, a linear interpolation between valve test data points was used to find the actuator current (step 3 above). However, better accuracy would result using a non-linear curve fit. Two more points are required to establish the two-slope accel schedule. The first is (40 psia,1600 pph) which corresponds to 54.9 mA. The second endpoint is (240 psia, 10500 pph) which corresponds to an actuator current of 137.6 mA. Now rescale actuator current for 0 to 100 for min. to max. travel of the valve. From the valve data, min. travel is at 35.0 mA and max travel is at 155.1 mA. This gives:

CDP (psia)	Act. Current (mA)	Act. Signal (0 to 100)
40	54.9	16.6
180	108.9	61.5
240	137.6	85.4

Where CDP is the Accel Schedule input value to be entered and ACT. SIGNAL is the output value to be entered. The same procedure is followed for the Decel Schedule.

DN/DT Accel Schedule is biased by GG speed derivative. When DN/DT PID control is used, the acceleration (or deceleration) schedule values must be in terms of GG speed (for inputs) and GG derivative (for outputs).

Poor Valve Response

What can often appear as a tuning problem is poor valve response. This can be due to a sticky actuator or inconsistent hydraulic pressure to the actuator. Changing hydraulic oil properties can also have an adverse affect to the control of the turbine.

The hydraulic supply to the actuator must be a consistent pressure over the entire operating range of the turbine.

The Atlas-II Digital Control System does have logic built in to account for a sticky valve/actuator assembly. If you are having problems with the control of the turbine and the loops have been tuned and hydraulics verified, contact Woodward for service.

Common SIO Port Configurations

The following is a guideline for configuring a serial port interface from the control to a communication device. Items highlighted are required.

	Control Assistant (Mimic/WinPanel)	Control Assistant (Tunables/Datalogs)	Modbus RTU	Eventlatch	ServLink and Watch Window
BAUD	10 (38400)	10 (38400)	10 (38400)	10 (38400)	10 (38400)
BITS	2 (8 data)	2 (8 data)	2 (RTU-8 bits)	2 (8 data)	2 (RTU-8 bits)
STOP	1 (1 stop)	1 (1 stop)	1 (1 stop)	1 (1 stop)	1 (1 stop)
PARITY	1 (none)	1 (none)	1 (none)	1 (none)	1 (none)
MODE	2 (char)	1 (line)	1 (line)	1 (line)	1 (line)
FLOW	1 (off)	1 (off)	1 (off)	2 (xon-xoff)	1 (off)
ECHO	1 (off)	1 (off)	1 (off)	1 (off)	1 (off)
ENDLINE	3 (crlf)	3 (crlf)	3 (crlf)	3 (crlf)	1 (lf)
IGNCR	2 (on)	2 (on)	1 (off)	1 (off)	1 (off)

Serial Null Modem Cable Reference

The following defines a standard null modem cable which can be purchase an any electronics store. This cable is useful for interfacing a Woodward control to a PC running either Control Assistant, ServLink, or Watch Window.

Pinout Diagram for a 9 pin to 9 pin null modem cable:
(1-4, 2-3, 3-2, 4-6, 5-5, 6-4, 7-8, 8-7)

```
RD2    ----------\      /----------   2RD    (pin 2 is tied to pin 3)
TD3    ----------/      \----------   3TD    (pin 3 is tied to pin 2)
DTR4   --------|\       /|--------    4DTR   (pin 4 is tied to pin 1, then to 6
DCD1   --------| \      / |--------   1DCD   on both sides)
DSR6   ----------/      \----------   6DSR   (both are tied to pin 6)
SG5    ----------------------         5SG
RTS7   ----------\      /----------   7RTS   (pin 7 is tied to pin 8)
CTS8   ----------/      \----------   8CTS   (pin 8 is tied to pin 7)
RI9    -----|           |-----        9RI    (pins 9 and 9 are terminated)
```

Pin Definitions

CTS	Clear To Send. The CTS line is asserted by the PC (as DCE device) when it is ready to receive data.
DCD	Data Carrier Detect. The DCD line is asserted when the data link is established.
DCE	Data Communications Equipment. Refers to the modem in a computer to modem setup.
DSR	Data Set Ready. The DSR line is asserted by the DCE when it is ready to communicate with the DTE.
DTE	Data Terminal Equipment. Refers to the computer in a computer to modem setup.
DTR	Data Terminal Ready. The DTR line is asserted by the DTE when it is ready to communicate with the DCE.
FG	Field Ground. A protective line used to ground the DCE.
RD	Receive Data. The RD line is used by the DCE to send data to the DTE.
RI	Ring Indicator. The RI line is asserted by the DCE when a ring is detected.
RTS	Request To Send. The RTS line is asserted by the DTE when it wants to transmit data to the DCE.
SG	Signal Ground. The common return (and voltage baseline) for the various signal lines.
TD	Transmit Data. The TD line is used by the DTE to send data to the DCE.

Chapter 6.
Service Options

Product Service Options

If you are experiencing problems with the installation, or unsatisfactory performance of a Woodward product, the following options are available:

- Consult the troubleshooting guide in the manual.
- Contact the manufacturer or packager of your system.
- Contact the Woodward Full Service Distributor serving your area.
- Contact Woodward technical assistance (see "How to Contact Woodward" later in this chapter) and discuss your problem. In many cases, your problem can be resolved over the phone. If not, you can select which course of action to pursue based on the available services listed in this chapter.

OEM and Packager Support: Many Woodward controls and control devices are installed into the equipment system and programmed by an Original Equipment Manufacturer (OEM) or Equipment Packager at their factory. In some cases, the programming is password-protected by the OEM or packager, and they are the best source for product service and support. Warranty service for Woodward products shipped with an equipment system should also be handled through the OEM or Packager. Please review your equipment system documentation for details.

Woodward Business Partner Support: Woodward works with and supports a global network of independent business partners whose mission is to serve the users of Woodward controls, as described here:

- A **Full Service Distributor** has the primary responsibility for sales, service, system integration solutions, technical desk support, and aftermarket marketing of standard Woodward products within a specific geographic area and market segment.
- An **Authorized Independent Service Facility (AISF)** provides authorized service that includes repairs, repair parts, and warranty service on Woodward's behalf. Service (not new unit sales) is an AISF's primary mission.
- A **Recognized Engine Retrofitter (RER)** is an independent company that does retrofits and upgrades on reciprocating gas engines and dual-fuel conversions, and can provide the full line of Woodward systems and components for the retrofits and overhauls, emission compliance upgrades, long term service contracts, emergency repairs, etc.
- A **Recognized Turbine Retrofitter (RTR)** is an independent company that does both steam and gas turbine control retrofits and upgrades globally, and can provide the full line of Woodward systems and components for the retrofits and overhauls, long term service contracts, emergency repairs, etc.

You can locate your nearest Woodward distributor, AISF, RER, or RTR on our website at:

www.woodward.com/directory

Woodward Factory Servicing Options

The following factory options for servicing Woodward products are available through your local Full-Service Distributor or the OEM or Packager of the equipment system, based on the standard Woodward Product and Service Warranty (5-01-1205) that is in effect at the time the product is originally shipped from Woodward or a service is performed:

- Replacement/Exchange (24-hour service)
- Flat Rate Repair
- Flat Rate Remanufacture

Replacement/Exchange: Replacement/Exchange is a premium program designed for the user who is in need of immediate service. It allows you to request and receive a like-new replacement unit in minimum time (usually within 24 hours of the request), providing a suitable unit is available at the time of the request, thereby minimizing costly downtime. This is a flat-rate program and includes the full standard Woodward product warranty (Woodward Product and Service Warranty 5-01-1205).

This option allows you to call your Full-Service Distributor in the event of an unexpected outage, or in advance of a scheduled outage, to request a replacement control unit. If the unit is available at the time of the call, it can usually be shipped out within 24 hours. You replace your field control unit with the like-new replacement and return the field unit to the Full-Service Distributor.

Charges for the Replacement/Exchange service are based on a flat rate plus shipping expenses. You are invoiced the flat rate replacement/exchange charge plus a core charge at the time the replacement unit is shipped. If the core (field unit) is returned within 60 days, a credit for the core charge will be issued.

Flat Rate Repair: Flat Rate Repair is available for the majority of standard products in the field. This program offers you repair service for your products with the advantage of knowing in advance what the cost will be. All repair work carries the standard Woodward service warranty (Woodward Product and Service Warranty 5-01-1205) on replaced parts and labor.

Flat Rate Remanufacture: Flat Rate Remanufacture is very similar to the Flat Rate Repair option with the exception that the unit will be returned to you in "like-new" condition and carry with it the full standard Woodward product warranty (Woodward Product and Service Warranty 5-01-1205). This option is applicable to mechanical products only.

Returning Equipment for Repair

If a control (or any part of an electronic control) is to be returned for repair, please contact your Full-Service Distributor in advance to obtain Return Authorization and shipping instructions.

When shipping the item(s), attach a tag with the following information:

- return authorization number;
- name and location where the control is installed;
- name and phone number of contact person;
- complete Woodward part number(s) and serial number(s);
- description of the problem;
- instructions describing the desired type of repair.

Packing a Control

Use the following materials when returning a complete control:

- protective caps on any connectors;
- antistatic protective bags on all electronic modules;
- packing materials that will not damage the surface of the unit;
- at least 100 mm (4 inches) of tightly packed, industry-approved packing material;
- a packing carton with double walls;
- a strong tape around the outside of the carton for increased strength.

NOTICE

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*.

Replacement Parts

When ordering replacement parts for controls, include the following information:

- the part number(s) (XXXX-XXXX) that is on the enclosure nameplate;
- the unit serial number, which is also on the nameplate.

Engineering Services

Woodward offers various Engineering Services for our products. For these services, you can contact us by telephone, by email, or through the Woodward website.

- Technical Support
- Product Training
- Field Service

Technical Support is available from your equipment system supplier, your local Full-Service Distributor, or from many of Woodward's worldwide locations, depending upon the product and application. This service can assist you with technical questions or problem solving during the normal business hours of the Woodward location you contact. Emergency assistance is also available during non-business hours by phoning Woodward and stating the urgency of your problem.

Product Training is available as standard classes at many of our worldwide locations. We also offer customized classes, which can be tailored to your needs and can be held at one of our locations or at your site. This training, conducted by experienced personnel, will assure that you will be able to maintain system reliability and availability.

Field Service engineering on-site support is available, depending on the product and location, from many of our worldwide locations or from one of our Full-Service Distributors. The field engineers are experienced both on Woodward products as well as on much of the non-Woodward equipment with which our products interface.

For information on these services, please contact us via telephone, email us, or use our website: **www.woodward.com**.

How to Contact Woodward

For assistance, call one of the following Woodward facilities to obtain the address and phone number of the facility nearest your location where you will be able to get information and service.

Electrical Power Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
Germany	+49 (0) 21 52 14 51
India	+91 (129) 4097100
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
Poland	+48 12 295 13 00
United States	+1 (970) 482-5811

Engine Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
Germany	+49 (711) 78954-510
India	+91 (129) 4097100
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
The Netherlands	+31 (23) 5661111
United States	+1 (970) 482-5811

Turbine Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
India	+91 (129) 4097100
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
The Netherlands	+31 (23) 5661111
Poland	+48 12 295 13 00
United States	+1 (970) 482-5811

You can also locate your nearest Woodward distributor or service facility on our website at:

www.woodward.com/directory

Technical Assistance

If you need to telephone for technical assistance, you will need to provide the following information. Please write it down here before phoning:

Your Name ____________________

Site Location ____________________

Phone Number ____________________

Fax Number ____________________

Engine/Turbine Model Number ____________________

Manufacturer ____________________

Number of Cylinders (if applicable) ____________________

Type of Fuel (gas, gaseous, steam, etc) ____________________

Rating ____________________

Application ____________________

Control/Governor #1

Woodward Part Number & Rev. Letter ____________________

Control Description or Governor Type ____________________

Serial Number ____________________

Control/Governor #2

Woodward Part Number & Rev. Letter ____________________

Control Description or Governor Type ____________________

Serial Number ____________________

Control/Governor #3

Woodward Part Number & Rev. Letter ____________________

Control Description or Governor Type ____________________

Serial Number ____________________

If you have an electronic or programmable control, please have the adjustment setting positions or the menu settings written down and with you at the time of the call.

Appendix A.
System Input/Output Signal Layout

Control Wiring Diagram, 15 sheets (9971-1270)

IMPORTANT

1) When using Allen Bradley Flex I/O, each terminal base (8 per head) must be present to preserve the pre-programmed slave addresses of the nodes. The I/O module does not have to be installed (only the terminal base).

REVISION HISTORY

REV	DESCRIPTION		DATE	APPROVED
NEW	E/C 1101385	DPENNI	JUN-2007	SOCEAN

Control Wiring Diagram

GTC250A
(ATLAS II BASED)

8262-1031 - FUEL CONTROL (FC) ONLY W/PROFIBUS DISTRIBUTED IO

MATERIALS:

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES.

THIRD ANGLE PROJECTION

APPROVED	SOCEAN	DATE JUN-2007
CHECKED	DPENNI	DATE JUN-2007
DRAWN	DPENNI	DATE JUN-2007

WOODWARD Industrial Controls — FT. COLLINS COLORADO USA

TITLE: DIAGRAM - CONTROL WIRING GTC250A w/DIO

SIZE	CAGE CODE	DWG NO	REV
D	31361	9971-1270	NEW

SCALE NTS — SHEET 1 OF 15

AUTOCAD

SHEET NUMBER	DESIGNATION	DESCRIPTION	Applies to GTC P/N
SHEET 1	COVER	COVER SHEET	All
SHEET 2	INDEX	SHEET INDEX SHEET	All
SHEET 3	CHASSIS LAYOUT	ATLAS-II CHASSIS	All
SHEET 4	PS BOARD	POWER & DISCRETE OUTPUTS	All
SHEET 5	A02 A5200CPU1	DISCRETE INPUTS	All
SHEET 6	A02 A5200CPU2	ANALOG INPUTS & SPEED INPUTS	All
SHEET 7	A02 A5200CPU3	ANALOG OUTPUTS AND ACTUATOR OUTPUTS	All
SHEET 8	A02 A5200CPU4	COMMUNICATION PORTS	All
SHEET 9	A03 ANALOGCOMBO1	ANALOG INPUTS 1-11	All
SHEET 10	A03 ANALOGCOMBO2	ANALOG OUTPUTS & SPEED SIGNAL INPUTS	All
SHEET 11	A04 ANALOGCOMBO1	ANALOG INPUTS 1-11	All
SHEET 12	A04 ANALOGCOMBO2	ANALOG OUTPUTS & SPEED SIGNAL INPUTS	All
SHEET 13	A05 ANALOGCOMBO1	ANALOG INPUTS 1-11	All
SHEET 14	A05 ANALOGCOMBO2	ANALOG OUTPUTS & SPEED SIGNAL INPUTS	All
SHEET 15	Profibus MODULE	PROFIBUS ALLEN-BRADLEY I/O (FLEX 1794- series)	8262-1031

NOTES:

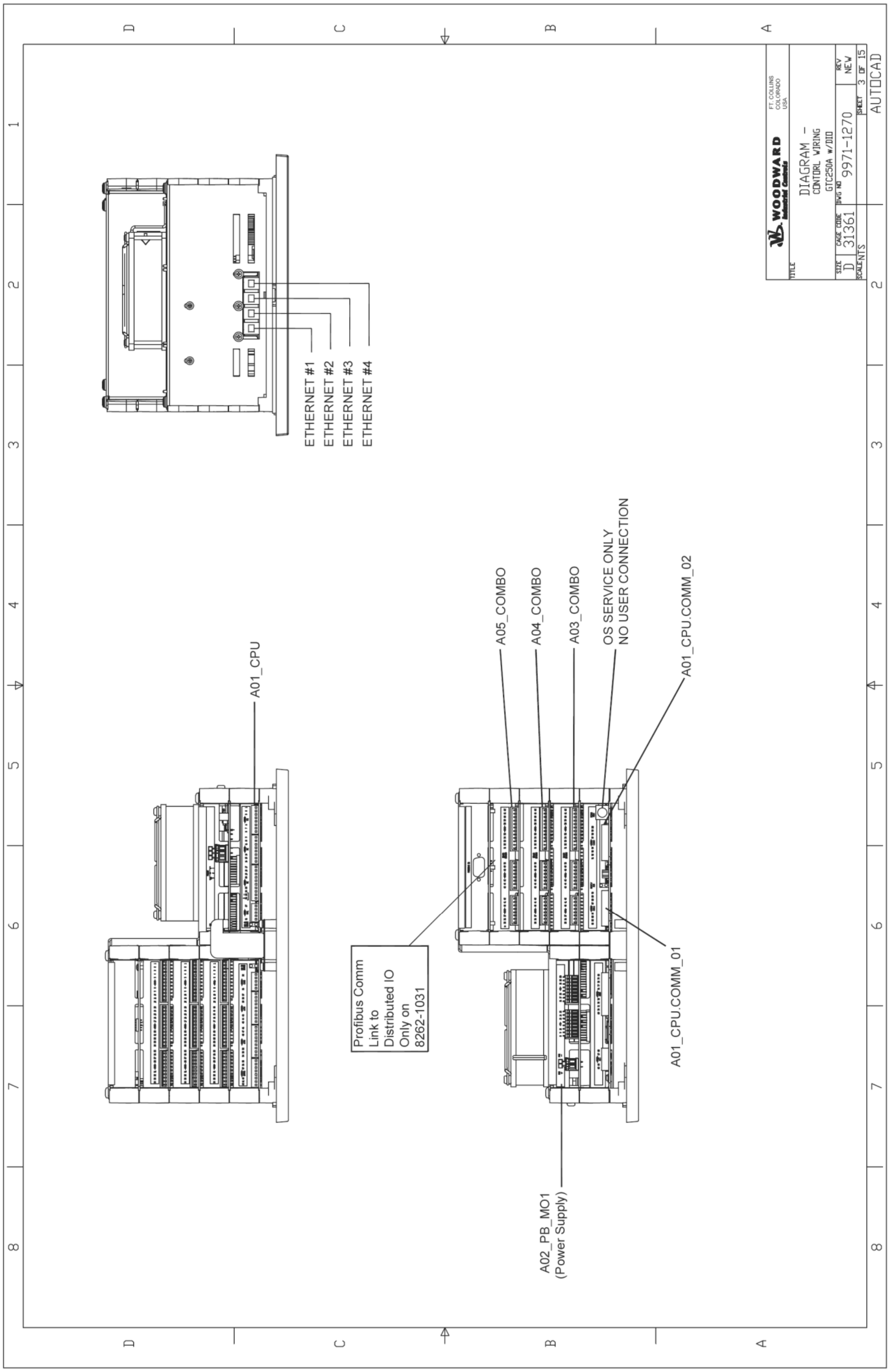
1) Descriptions in * **BOLD** are fixed I/O points that are required by the GTC250A.
2) All other I/O points are configurable to be used as shown or reprogrammed via customer programming.
3) Each of the 3 Analog Combo boards is configured in the following manner:
   - Channels 1-6 Thermocouple Input
   - Channels 7-11 Analog 4-20 mA Input
   - Channels 12-15 RTD Input (100 or 200 Ohm only)

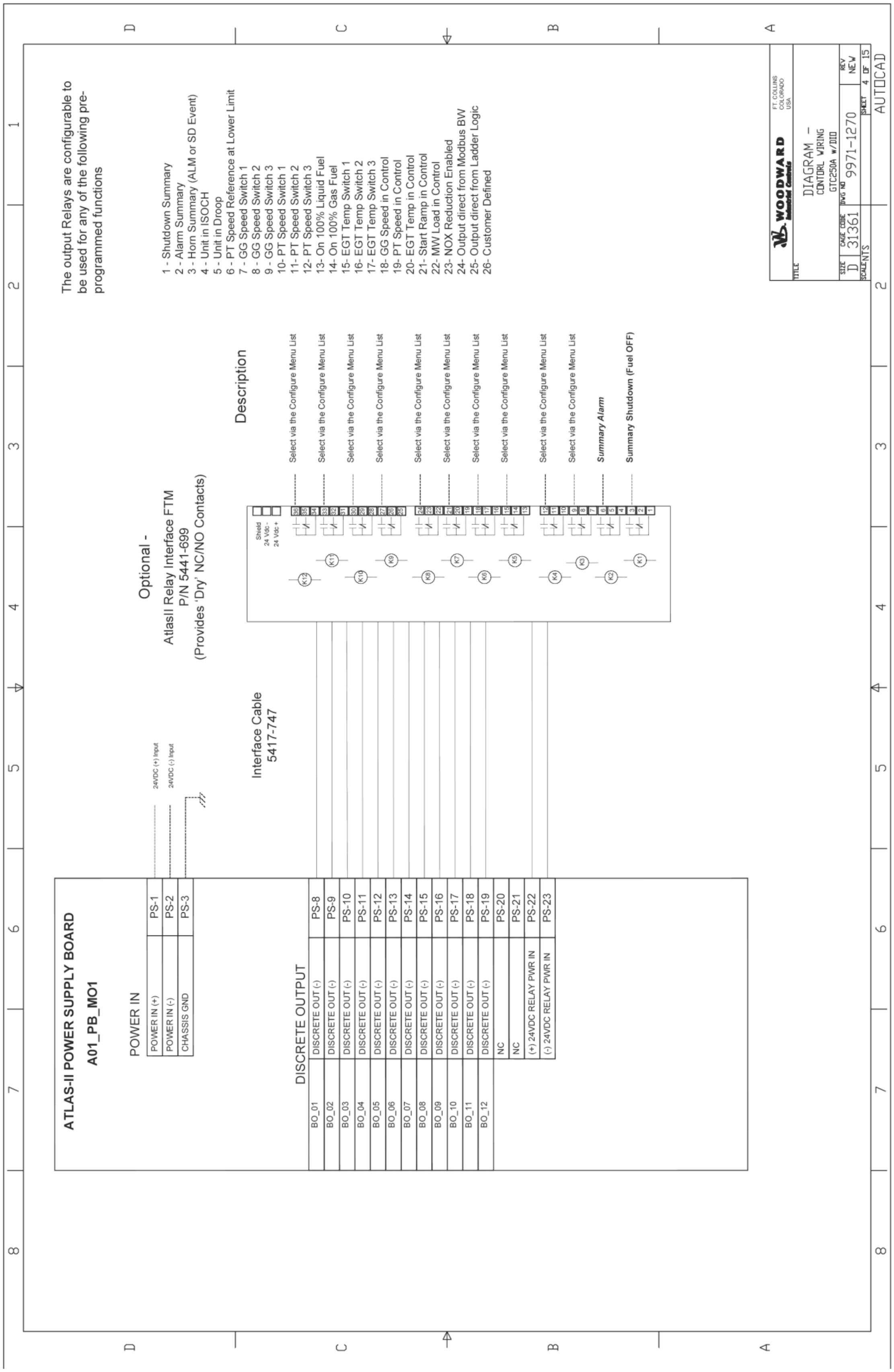
WOODWARD Industrial Controls — FT. COLLINS COLORADO USA

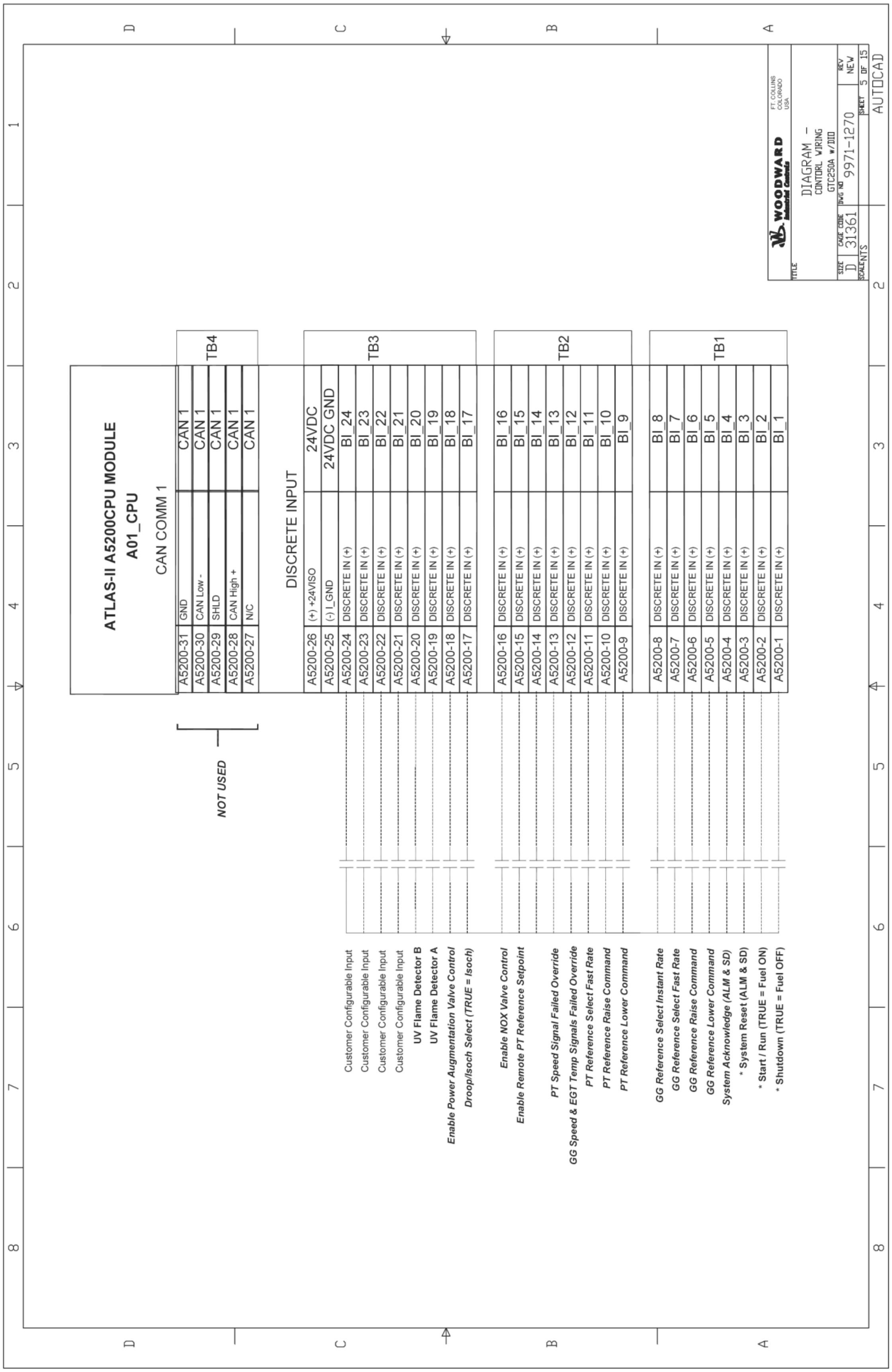
TITLE: DIAGRAM – CONTORL WIRING GTC250A w/DID

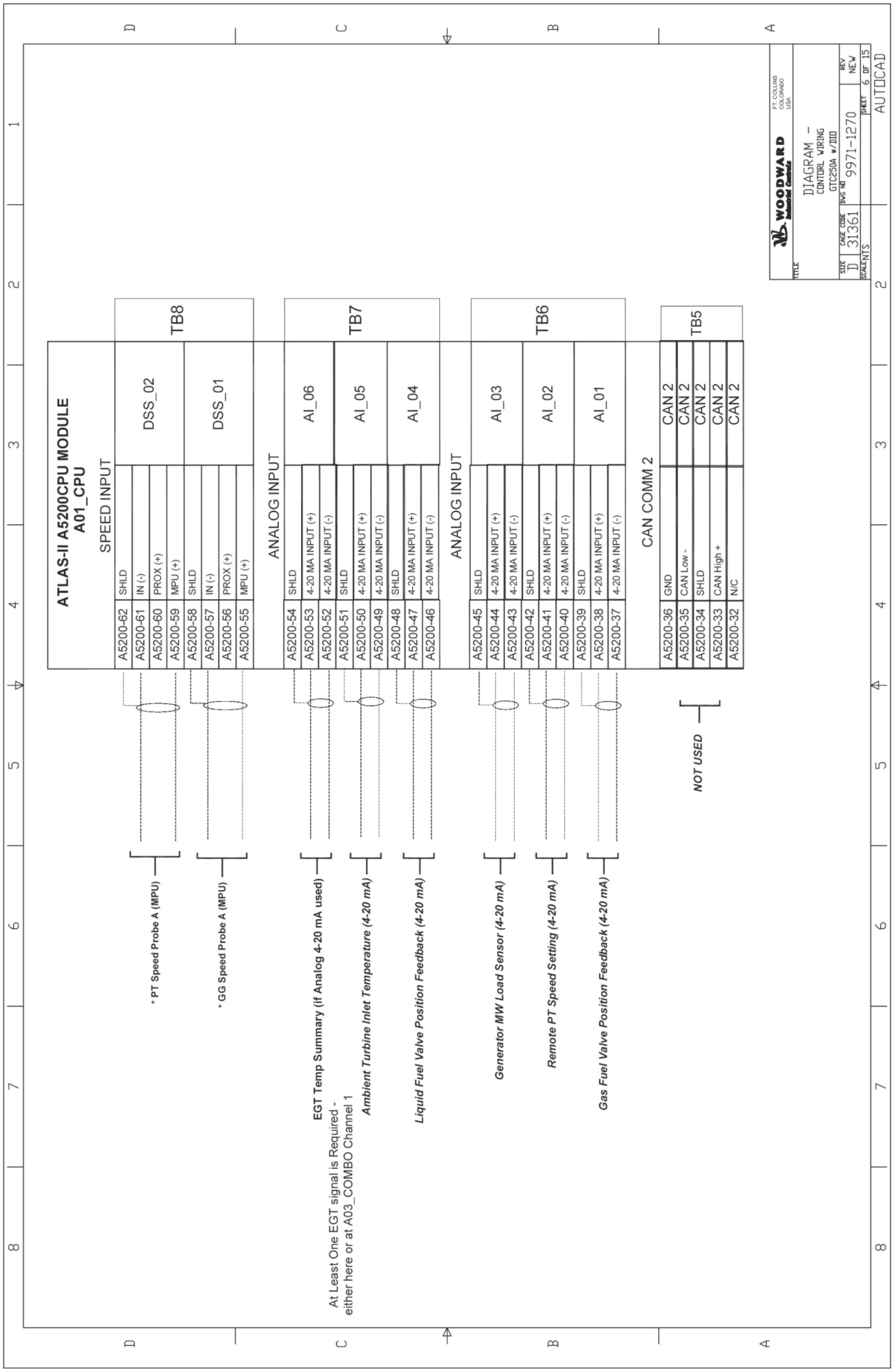
SIZE	CAGE CODE	DWG NO	REV
D	31361	9971-1270	NEW

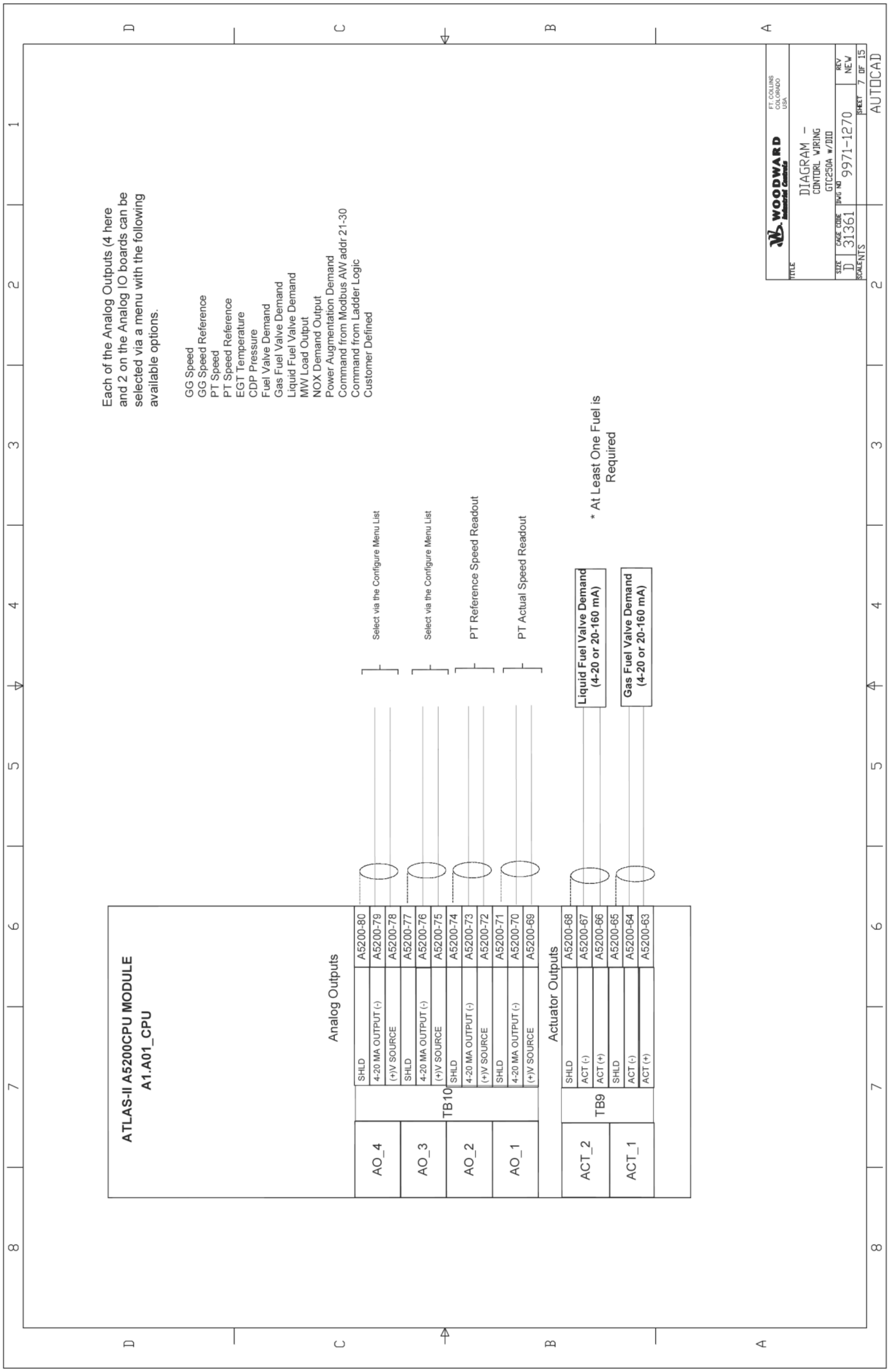
SCALE NTS — SHEET 2 OF 15 — AUTOCAD

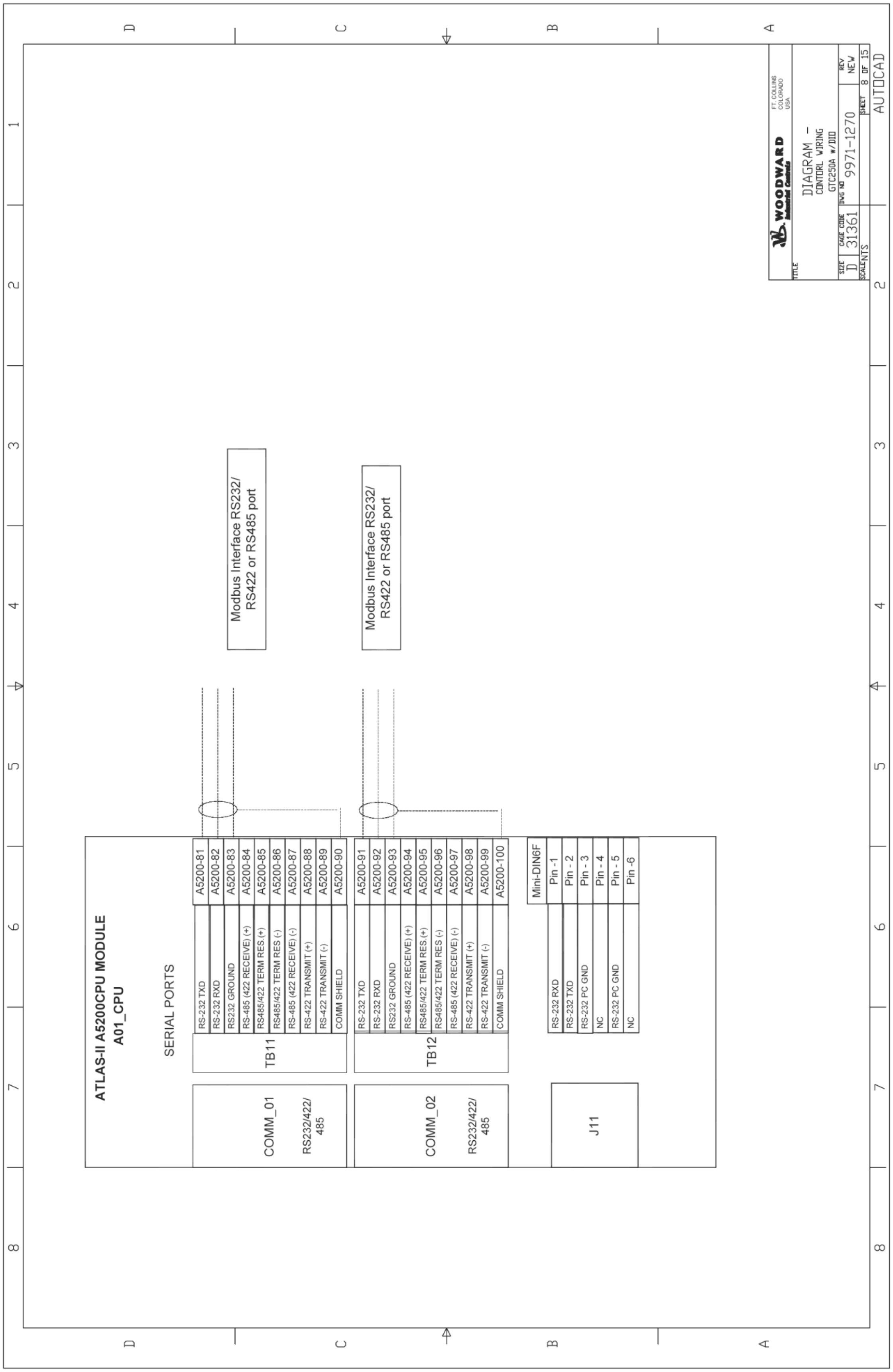

ETHERNET #1
ETHERNET #2
ETHERNET #3
ETHERNET #4
A01_CPU
A05_COMBO
A04_COMBO
A03_COMBO
OS SERVICE ONLY
NO USER CONNECTION
A01_CPU.COMM_02
Profibus Comm Link to Distributed IO Only on 8262-1031
A01_CPU.COMM_01
A02_PB_MO1 (Power Supply)
WOODWARD
FT. COLLINS COLORADO USA
DIAGRAM - CONTROL WIRING GTC250A w/DIO
SIZE D
CAGE CODE 31361
DWG NO 9971-1270
REV NEW
SCALE NTS
SHEET 3 OF 15
AUTOCAD

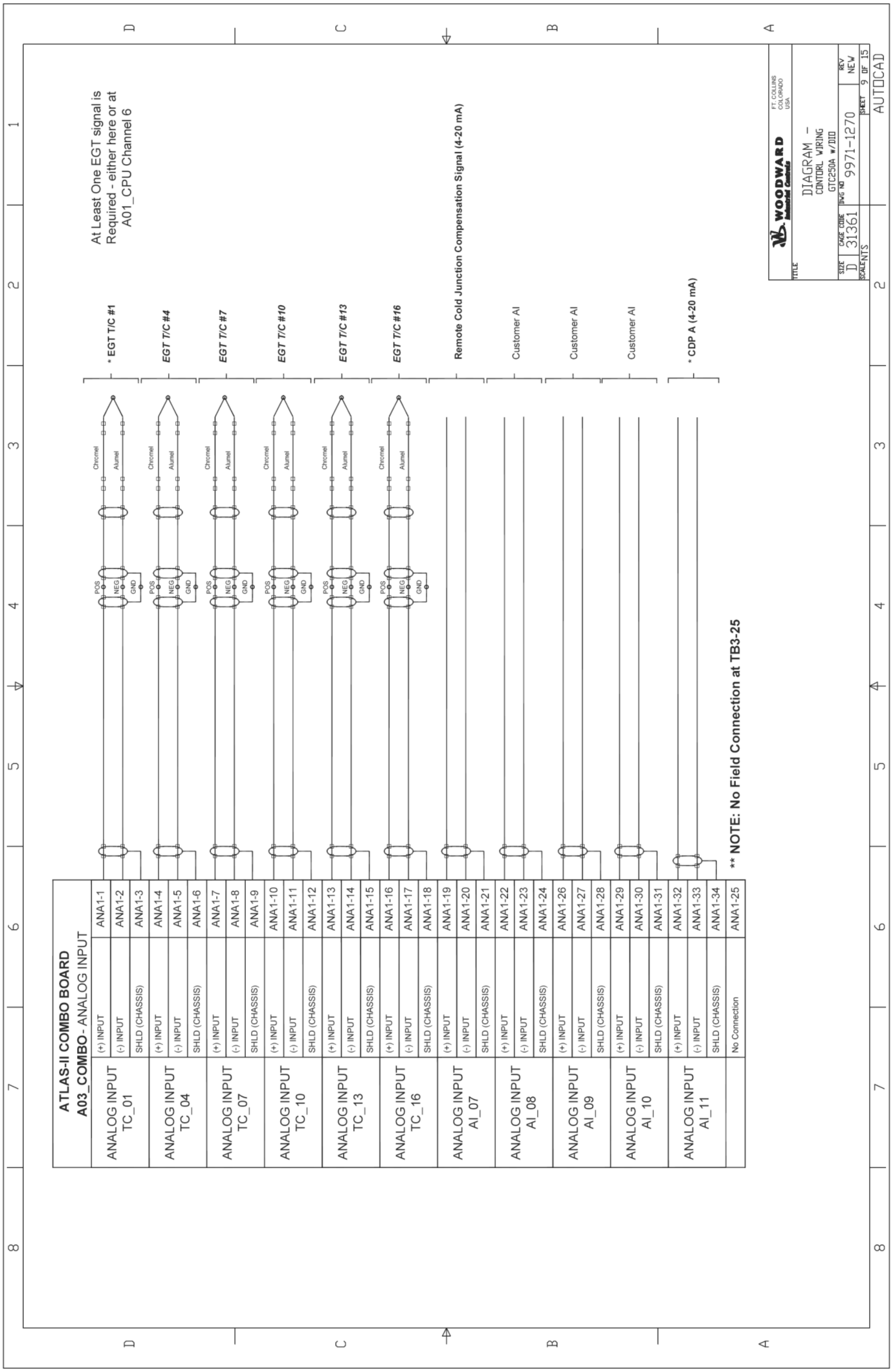

The output Relays are configurable to be used for any of the following pre-programmed functions
1 - Shutdown Summary
2 - Alarm Summary
3 - Horn Summary (ALM or SD Event)
4 - Unit in ISOCH
5 - Unit in Droop
6 - PT Speed Reference at Lower Limit
7 - GG Speed Switch 1
8 - GG Speed Switch 2
9 - GG Speed Switch 3
10- PT Speed Switch 1
11- PT Speed Switch 2
12- PT Speed Switch 3
13- On 100% Liquid Fuel
14- On 100% Gas Fuel
15- EGT Temp Switch 1
16- EGT Temp Switch 2
17- EGT Temp Switch 3
18- GG Speed in Control
19- PT Speed in Control
20- EGT Temp in Control
21- Start Ramp in Control
22- MW Load in Control
23- NOX Reduction Enabled
24- Output direct from Modbus BW
25- Output direct from Ladder Logic
26- Customer Defined
Description
Select via the Configure Menu List
Summary Alarm
Summary Shutdown (Fuel OFF)
Optional -
AtlasII Relay Interface FTM
P/N 5441-699
(Provides 'Dry' NC/NO Contacts)
Shield
24 Vdc -
24 Vdc +
Interface Cable
5417-747
24VDC (+) Input
24VDC (-) Input
ATLAS-II POWER SUPPLY BOARD
A01_PB_MO1
POWER IN
POWER IN (+) PS-1
POWER IN (-) PS-2
CHASSIS GND PS-3
DISCRETE OUTPUT
BO_01 DISCRETE OUT (-) PS-8
BO_02 DISCRETE OUT (-) PS-9
BO_03 DISCRETE OUT (-) PS-10
BO_04 DISCRETE OUT (-) PS-11
BO_05 DISCRETE OUT (-) PS-12
BO_06 DISCRETE OUT (-) PS-13
BO_07 DISCRETE OUT (-) PS-14
BO_08 DISCRETE OUT (-) PS-15
BO_09 DISCRETE OUT (-) PS-16
BO_10 DISCRETE OUT (-) PS-17
BO_11 DISCRETE OUT (-) PS-18
BO_12 DISCRETE OUT (-) PS-19
NC PS-20
NC PS-21
(+) 24VDC RELAY PWR IN PS-22
(-) 24VDC RELAY PWR IN PS-23
WOODWARD
FT. COLLINS COLORADO USA
DIAGRAM - CONTROL WIRING GTC250A w/DIO
SIZE D
CAGE CODE 31361
DWG NO 9971-1270
REV NEW
SCALE NTS
SHEET 4 OF 15
AUTOCAD

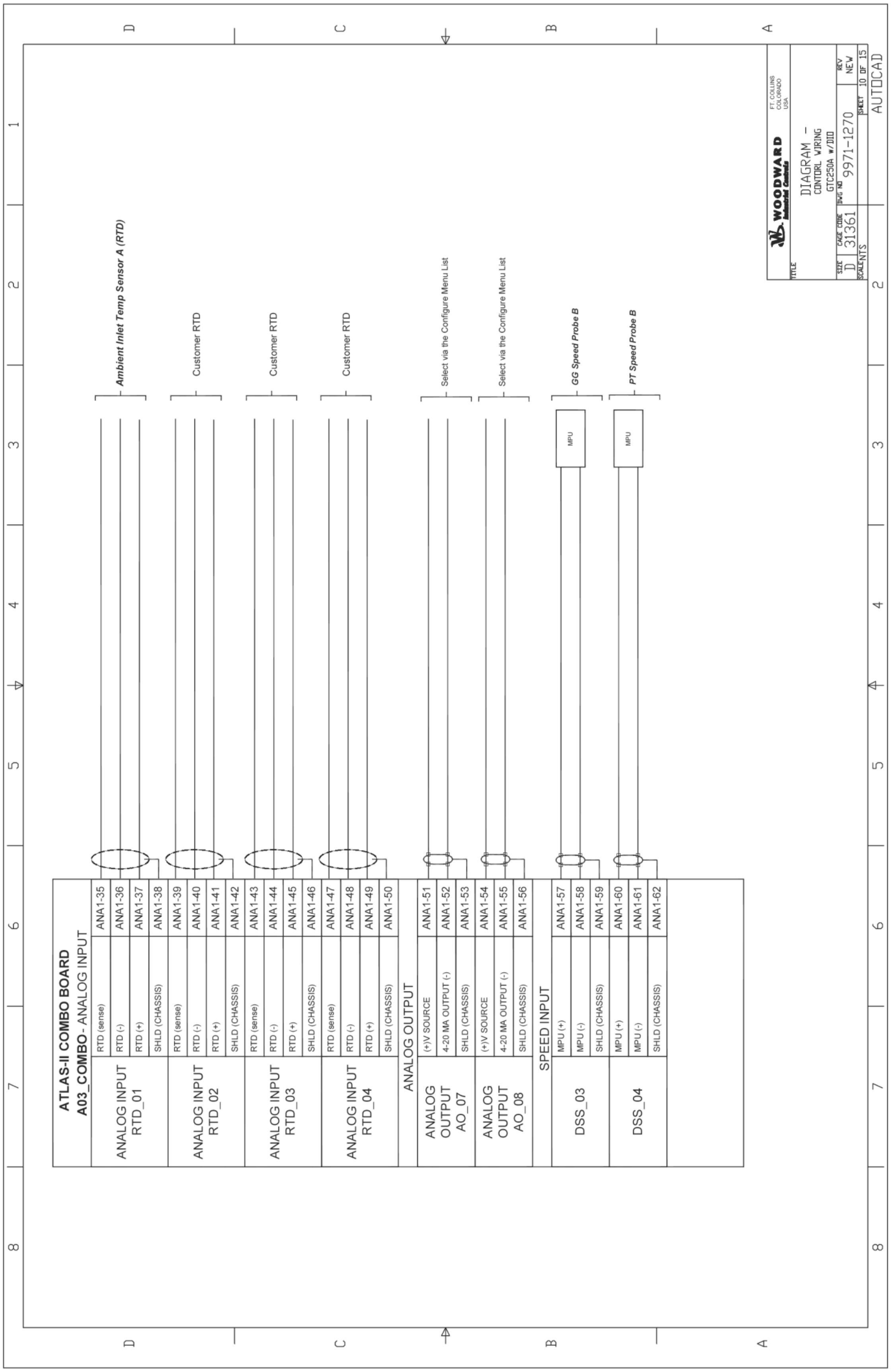

ATLAS-II A5200CPU MODULE
A01_CPU
CAN COMM 1
A5200-31 GND CAN 1
A5200-30 CAN Low - CAN 1
A5200-29 SHLD CAN 1
A5200-28 CAN High + CAN 1
A5200-27 N/C CAN 1
TB4
NOT USED
DISCRETE INPUT
A5200-26 (+) +24VISO 24VDC
A5200-25 (-) I_GND 24VDC GND
A5200-24 DISCRETE IN (+) BI_24 Customer Configurable Input
A5200-23 DISCRETE IN (+) BI_23 Customer Configurable Input
A5200-22 DISCRETE IN (+) BI_22 Customer Configurable Input
A5200-21 DISCRETE IN (+) BI_21 Customer Configurable Input
A5200-20 DISCRETE IN (+) BI_20 UV Flame Detector B
A5200-19 DISCRETE IN (+) BI_19 UV Flame Detector A
A5200-18 DISCRETE IN (+) BI_18 Enable Power Augmentation Valve Control
A5200-17 DISCRETE IN (+) BI_17 Droop/Isoch Select (TRUE = Isoch)
TB3
A5200-16 DISCRETE IN (+) BI_16 Enable NOX Valve Control
A5200-15 DISCRETE IN (+) BI_15 Enable Remote PT Reference Setpoint
A5200-14 DISCRETE IN (+) BI_14
A5200-13 DISCRETE IN (+) BI_13 PT Speed Signal Failed Override
A5200-12 DISCRETE IN (+) BI_12 GG Speed & EGT Temp Signals Failed Override
A5200-11 DISCRETE IN (+) BI_11 PT Reference Select Fast Rate
A5200-10 DISCRETE IN (+) BI_10 PT Reference Raise Command
A5200-9 DISCRETE IN (+) BI_9 PT Reference Lower Command
TB2
A5200-8 DISCRETE IN (+) BI_8 GG Reference Select Instant Rate
A5200-7 DISCRETE IN (+) BI_7 GG Reference Select Fast Rate
A5200-6 DISCRETE IN (+) BI_6 GG Reference Raise Command
A5200-5 DISCRETE IN (+) BI_5 GG Reference Lower Command
A5200-4 DISCRETE IN (+) BI_4 System Acknowledge (ALM & SD)
A5200-3 DISCRETE IN (+) BI_3 * System Reset (ALM & SD)
A5200-2 DISCRETE IN (+) BI_2 * Start / Run (TRUE = Fuel ON)
A5200-1 DISCRETE IN (+) BI_1 * Shutdown (TRUE = Fuel OFF)
TB1
WOODWARD Industrial Controls
FT. COLLINS COLORADO USA
TITLE
DIAGRAM -
CONTROL WIRING
GTC250A w/DIO
SIZE D
CAGE CODE 31361
DWG NO 9971-1270
REV NEW
SCALE NTS
SHEET 5 OF 15
AUTOCAD

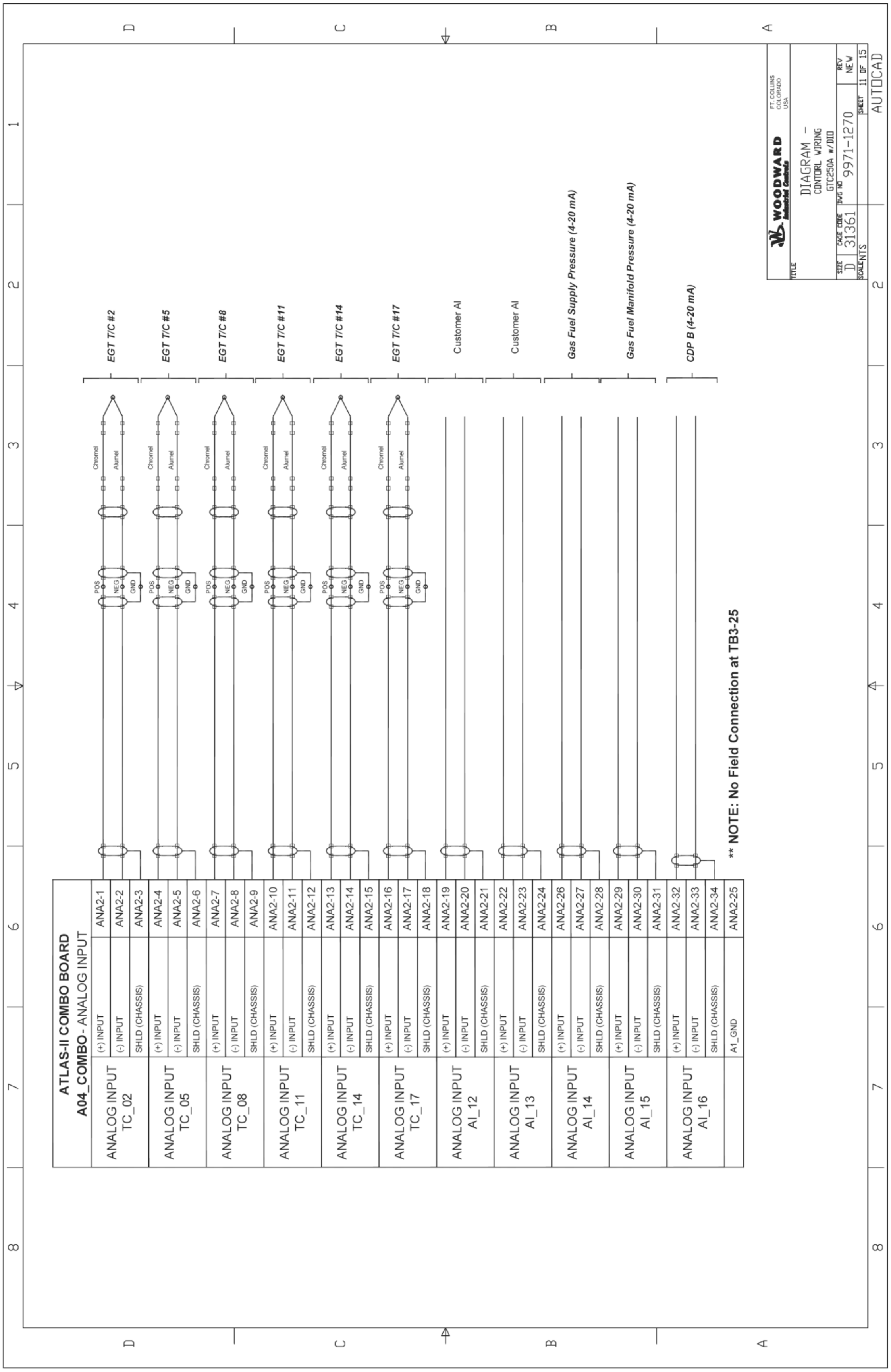

ATLAS-II A5200CPU MODULE
A01_CPU
SPEED INPUT
DSS_02
DSS_01
TB8
A5200-62 SHLD
A5200-61 IN (-)
A5200-60 PROX (+)
A5200-59 MPU (+)
A5200-58 SHLD
A5200-57 IN (-)
A5200-56 PROX (+)
A5200-55 MPU (+)
ANALOG INPUT
AI_06
AI_05
AI_04
TB7
A5200-54 SHLD
A5200-53 4-20 MA INPUT (+)
A5200-52 4-20 MA INPUT (-)
A5200-51 SHLD
A5200-50 4-20 MA INPUT (+)
A5200-49 4-20 MA INPUT (-)
A5200-48 SHLD
A5200-47 4-20 MA INPUT (+)
A5200-46 4-20 MA INPUT (-)
ANALOG INPUT
AI_03
AI_02
AI_01
TB6
A5200-45 SHLD
A5200-44 4-20 MA INPUT (+)
A5200-43 4-20 MA INPUT (-)
A5200-42 SHLD
A5200-41 4-20 MA INPUT (+)
A5200-40 4-20 MA INPUT (-)
A5200-39 SHLD
A5200-38 4-20 MA INPUT (+)
A5200-37 4-20 MA INPUT (-)
CAN COMM 2
TB5
A5200-36 GND CAN 2
A5200-35 CAN Low - CAN 2
A5200-34 SHLD CAN 2
A5200-33 CAN High + CAN 2
A5200-32 N/C CAN 2
NOT USED
* PT Speed Probe A (MPU)
* GG Speed Probe A (MPU)
EGT Temp Summary (if Analog 4-20 mA used)
At Least One EGT signal is Required -
either here or at A03_COMBO Channel 1
Ambient Turbine Inlet Temperature (4-20 mA)
Liquid Fuel Valve Position Feedback (4-20 mA)
Generator MW Load Sensor (4-20 mA)
Remote PT Speed Setting (4-20 mA)
Gas Fuel Valve Position Feedback (4-20 mA)
WOODWARD
FT. COLLINS COLORADO USA
TITLE
DIAGRAM -
CONTROL WIRING
GTC250A w/DIO
SIZE D
CAGE CODE 31361
DWG NO 9971-1270
REV NEW
SCALE NTS
SHEET 6 OF 15
AUTOCAD

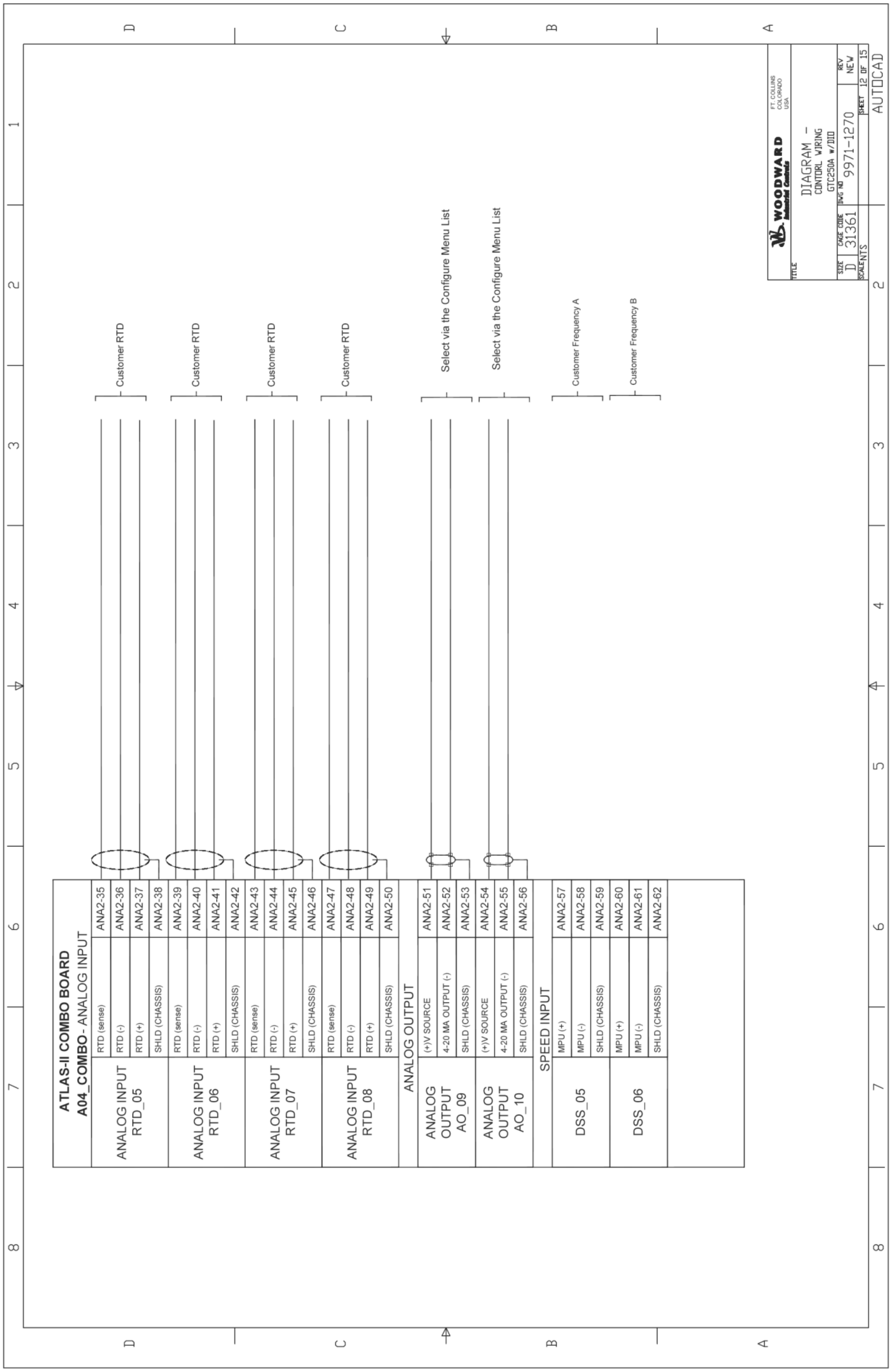

Each of the Analog Outputs (4 here and 2 on the Analog IO boards can be selected via a menu with the following available options.
GG Speed
GG Speed Reference
PT Speed
PT Speed Reference
EGT Temperature
CDP Pressure
Fuel Valve Demand
Gas Fuel Valve Demand
Liquid Fuel Valve Demand
MW Load Output
NOX Demand Output
Power Augmentation Demand
Command from Modbus AW addr 21-30
Command from Ladder Logic
Customer Defined
Select via the Configure Menu List
Select via the Configure Menu List
PT Reference Speed Readout
PT Actual Speed Readout
Liquid Fuel Valve Demand (4-20 or 20-160 mA)
Gas Fuel Valve Demand (4-20 or 20-160 mA)
* At Least One Fuel is Required
ATLAS-II A5200CPU MODULE
A1.A01_CPU
Analog Outputs
Actuator Outputs
TB10
TB9
AO_4
AO_3
AO_2
AO_1
ACT_2
ACT_1
SHLD A5200-80
4-20 MA OUTPUT (-) A5200-79
(+)V SOURCE A5200-78
SHLD A5200-77
4-20 MA OUTPUT (-) A5200-76
(+)V SOURCE A5200-75
SHLD A5200-74
4-20 MA OUTPUT (-) A5200-73
(+)V SOURCE A5200-72
SHLD A5200-71
4-20 MA OUTPUT (-) A5200-70
(+)V SOURCE A5200-69
SHLD A5200-68
ACT (-) A5200-67
ACT (+) A5200-66
SHLD A5200-65
ACT (-) A5200-64
ACT (+) A5200-63
WOODWARD
FT. COLLINS COLORADO USA
DIAGRAM - CONTORL WIRING GTC250A w/DIO
SIZE D
CAGE CODE 31361
DWG NO 9971-1270
REV NEW
SCALE NTS
SHEET 7 OF 15
AUTOCAD

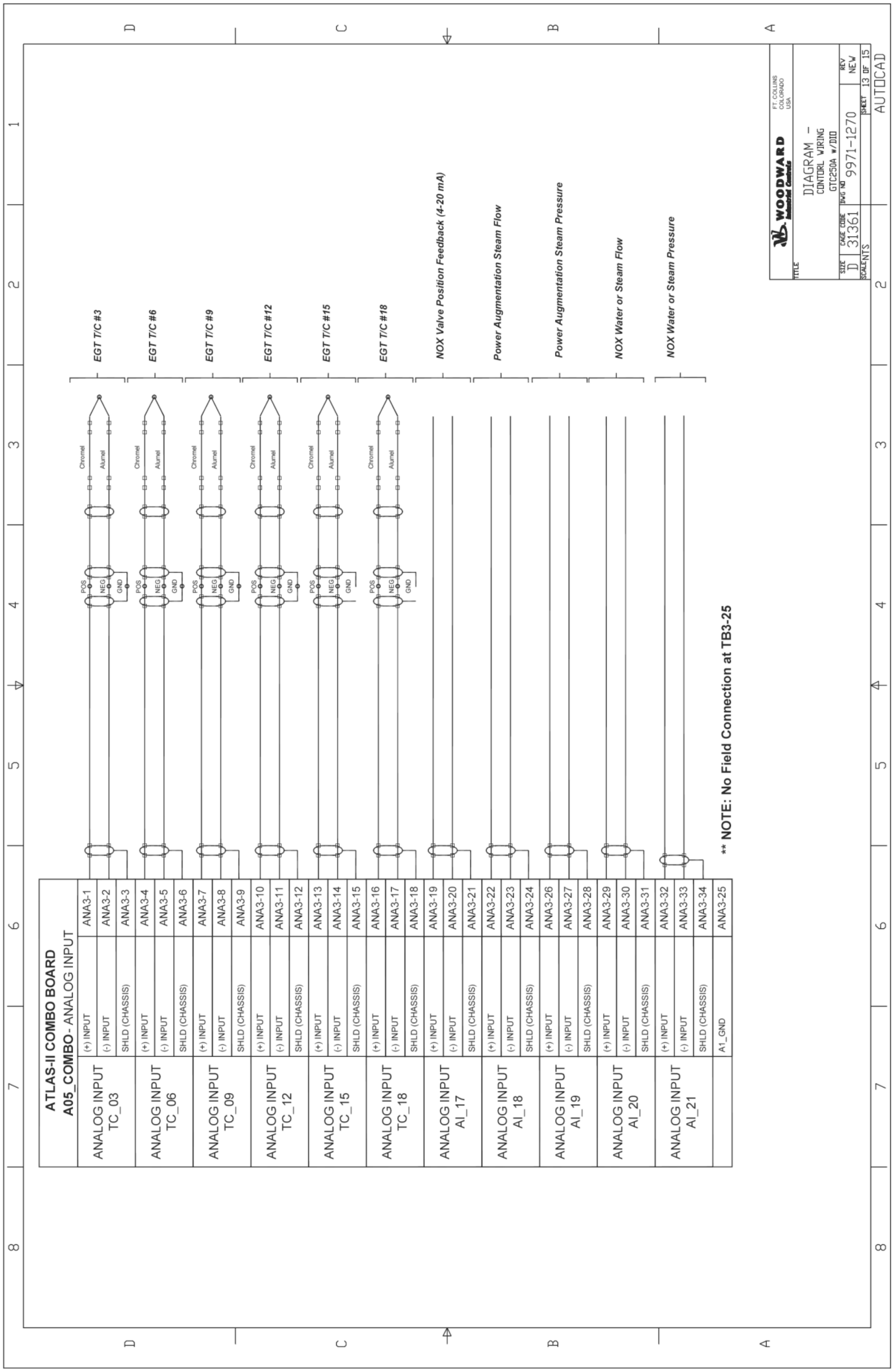

ATLAS-II A5200CPU MODULE
A01_CPU
SERIAL PORTS
TB11
A5200-81 RS-232 TXD
A5200-82 RS-232 RXD
A5200-83 RS232 GROUND
A5200-84 RS-485 (422 RECEIVE) (+)
A5200-85 RS485/422 TERM RES (+)
A5200-86 RS485/422 TERM RES (-)
A5200-87 RS-485 (422 RECEIVE) (-)
A5200-88 RS-422 TRANSMIT (+)
A5200-89 RS-422 TRANSMIT (-)
A5200-90 COMM SHIELD
TB12
A5200-91 RS-232 TXD
A5200-92 RS-232 RXD
A5200-93 RS232 GROUND
A5200-94 RS-485 (422 RECEIVE) (+)
A5200-95 RS485/422 TERM RES (+)
A5200-96 RS485/422 TERM RES (-)
A5200-97 RS-485 (422 RECEIVE) (-)
A5200-98 RS-422 TRANSMIT (+)
A5200-99 RS-422 TRANSMIT (-)
A5200-100 COMM SHIELD
Mini-DIN6F
Pin -1 RS-232 RXD
Pin - 2 RS-232 TXD
Pin - 3 RS-232 PC GND
Pin - 4 NC
Pin - 5 RS-232 PC GND
Pin -6 NC
COMM_01 RS232/422/485
COMM_02 RS232/422/485
J11
Modbus Interface RS232/ RS422 or RS485 port
Modbus Interface RS232/ RS422 or RS485 port
WOODWARD Industrial Controls
FT. COLLINS COLORADO USA
TITLE DIAGRAM - CONTROL WIRING GTC250A w/DIO
SIZE D
CAGE CODE 31361
DWG NO 9971-1270
REV NEW
SCALE NTS
SHEET 8 OF 15
AUTOCAD

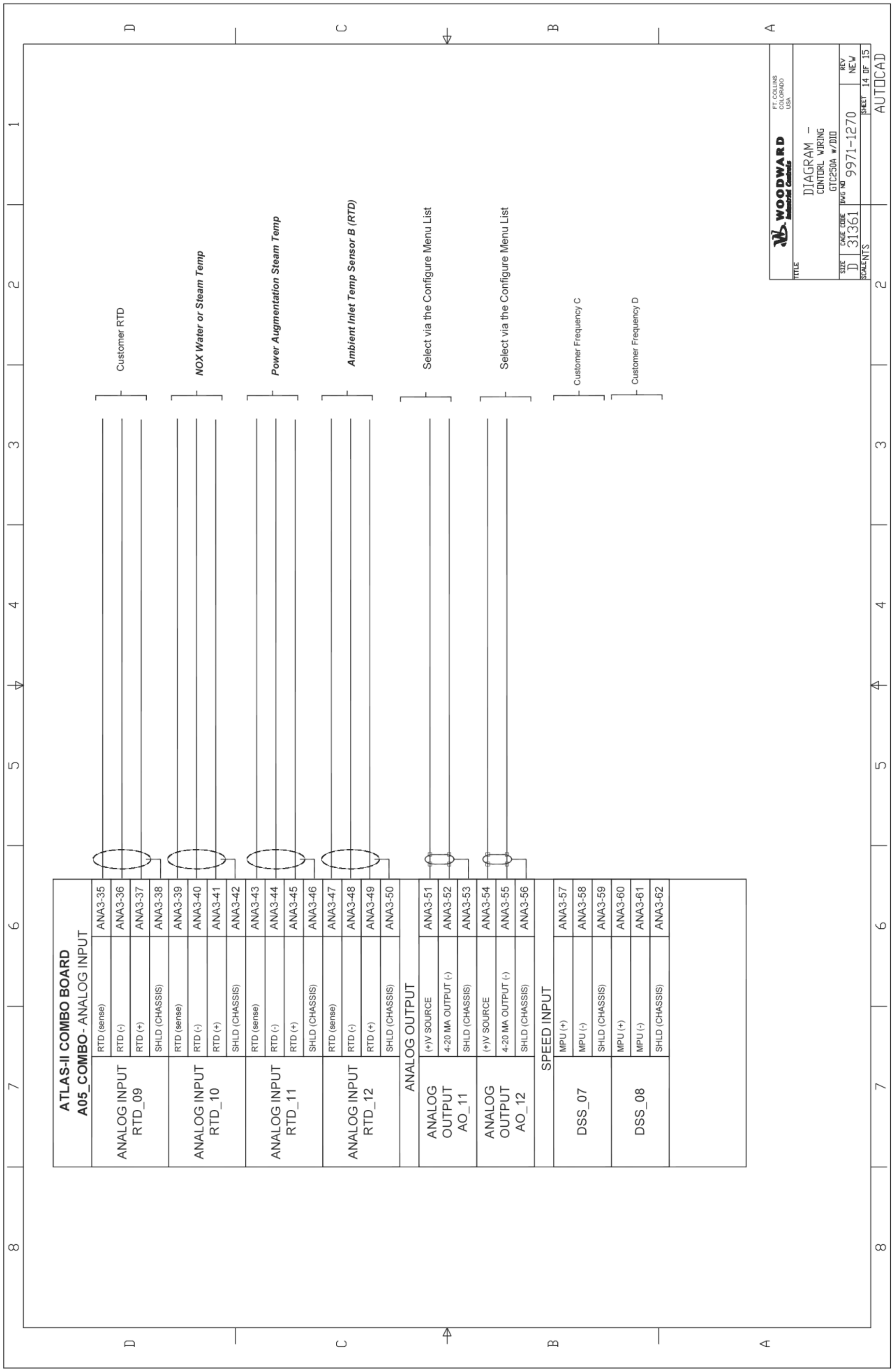

At Least One EGT signal is Required - either here or at A01_CPU Channel 6
* EGT T/C #1
EGT T/C #4
EGT T/C #7
EGT T/C #10
EGT T/C #13
EGT T/C #16
Remote Cold Junction Compensation Signal (4-20 mA)
Customer AI
Customer AI
Customer AI
* CDP A (4-20 mA)
Chromel
Alumel
POS
NEG
GND
** NOTE: No Field Connection at TB3-25
ATLAS-II COMBO BOARD
A03_COMBO- ANALOG INPUT
ANALOG INPUT TC_01
ANALOG INPUT TC_04
ANALOG INPUT TC_07
ANALOG INPUT TC_10
ANALOG INPUT TC_13
ANALOG INPUT TC_16
ANALOG INPUT AI_07
ANALOG INPUT AI_08
ANALOG INPUT AI_09
ANALOG INPUT AI_10
ANALOG INPUT AI_11
(+) INPUT
(-) INPUT
SHLD (CHASSIS)
No Connection
ANA1-1 … ANA1-34
ANA1-25
DIAGRAM - CONTORL WIRING GTC250A w/DIO
9971-1270
31361
AUTOCAD


ATLAS-II COMBO BOARD
A03_COMBO - ANALOG INPUT
ANALOG INPUT RTD_01
ANALOG INPUT RTD_02
ANALOG INPUT RTD_03
ANALOG INPUT RTD_04
RTD (sense)
RTD (-)
RTD (+)
SHLD (CHASSIS)
ANA1-35
ANA1-36
ANA1-37
ANA1-38
ANA1-39
ANA1-40
ANA1-41
ANA1-42
ANA1-43
ANA1-44
ANA1-45
ANA1-46
ANA1-47
ANA1-48
ANA1-49
ANA1-50
Ambient Inlet Temp Sensor A (RTD)
Customer RTD
Customer RTD
Customer RTD
ANALOG OUTPUT
ANALOG OUTPUT AO_07
ANALOG OUTPUT AO_08
(+)V SOURCE
4-20 MA OUTPUT (-)
SHLD (CHASSIS)
ANA1-51
ANA1-52
ANA1-53
ANA1-54
ANA1-55
ANA1-56
Select via the Configure Menu List
Select via the Configure Menu List
SPEED INPUT
DSS_03
DSS_04
MPU (+)
MPU (-)
SHLD (CHASSIS)
ANA1-57
ANA1-58
ANA1-59
ANA1-60
ANA1-61
ANA1-62
MPU
MPU
GG Speed Probe B
PT Speed Probe B
WOODWARD
FT. COLLINS COLORADO USA
TITLE
DIAGRAM - CONTROL WIRING GTC250A w/DIO
SIZE D
CAGE CODE 31361
DWG NO 9971-1270
REV NEW
SCALE NTS
SHEET 10 OF 15
AUTOCAD


ATLAS-II COMBO BOARD
A04_COMBO- ANALOG INPUT
ANALOG INPUT TC_02
ANALOG INPUT TC_05
ANALOG INPUT TC_08
ANALOG INPUT TC_11
ANALOG INPUT TC_14
ANALOG INPUT TC_17
ANALOG INPUT AI_12
ANALOG INPUT AI_13
ANALOG INPUT AI_14
ANALOG INPUT AI_15
ANALOG INPUT AI_16
(+) INPUT
(-) INPUT
SHLD (CHASSIS)
A1_GND
ANA2-1
ANA2-2
ANA2-3
ANA2-4
ANA2-5
ANA2-6
ANA2-7
ANA2-8
ANA2-9
ANA2-10
ANA2-11
ANA2-12
ANA2-13
ANA2-14
ANA2-15
ANA2-16
ANA2-17
ANA2-18
ANA2-19
ANA2-20
ANA2-21
ANA2-22
ANA2-23
ANA2-24
ANA2-25
ANA2-26
ANA2-27
ANA2-28
ANA2-29
ANA2-30
ANA2-31
ANA2-32
ANA2-33
ANA2-34
POS
NEG
GND
Chromel
Alumel
EGT T/C #2
EGT T/C #5
EGT T/C #8
EGT T/C #11
EGT T/C #14
EGT T/C #17
Customer AI
Customer AI
Gas Fuel Supply Pressure (4-20 mA)
Gas Fuel Manifold Pressure (4-20 mA)
CDP B (4-20 mA)
** NOTE: No Field Connection at TB3-25
WOODWARD
FT. COLLINS COLORADO USA
DIAGRAM - CONTROL WIRING GTC250A w/DID
SIZE D
CAGE CODE 31361
DWG NO 9971-1270
REV NEW
SCALE NTS
SHEET 11 OF 15
AUTOCAD


ATLAS-II COMBO BOARD
A04_COMBO - ANALOG INPUT
ANALOG INPUT RTD_05
ANALOG INPUT RTD_06
ANALOG INPUT RTD_07
ANALOG INPUT RTD_08
ANALOG OUTPUT
ANALOG OUTPUT AO_09
ANALOG OUTPUT AO_10
SPEED INPUT
DSS_05
DSS_06
RTD (sense)
RTD (-)
RTD (+)
SHLD (CHASSIS)
(+)V SOURCE
4-20 MA OUTPUT (-)
MPU (+)
MPU (-)
ANA2-35
ANA2-36
ANA2-37
ANA2-38
ANA2-39
ANA2-40
ANA2-41
ANA2-42
ANA2-43
ANA2-44
ANA2-45
ANA2-46
ANA2-47
ANA2-48
ANA2-49
ANA2-50
ANA2-51
ANA2-52
ANA2-53
ANA2-54
ANA2-55
ANA2-56
ANA2-57
ANA2-58
ANA2-59
ANA2-60
ANA2-61
ANA2-62
Customer RTD
Select via the Configure Menu List
Customer Frequency A
Customer Frequency B
WOODWARD
FT. COLLINS COLORADO USA
TITLE
DIAGRAM - CONTROL WIRING GTC250A w/DID
SIZE D
CAGE CODE 31361
DWG NO 9971-1270
REV NEW
SCALE NTS
SHEET 12 OF 15
AUTOCAD


ATLAS-II COMBO BOARD
A05_COMBO - ANALOG INPUT
ANALOG INPUT TC_03
ANALOG INPUT TC_06
ANALOG INPUT TC_09
ANALOG INPUT TC_12
ANALOG INPUT TC_15
ANALOG INPUT TC_18
ANALOG INPUT AI_17
ANALOG INPUT AI_18
ANALOG INPUT AI_19
ANALOG INPUT AI_20
ANALOG INPUT AI_21
(+) INPUT
(-) INPUT
SHLD (CHASSIS)
A1_GND
ANA3-1
ANA3-2
ANA3-3
ANA3-4
ANA3-5
ANA3-6
ANA3-7
ANA3-8
ANA3-9
ANA3-10
ANA3-11
ANA3-12
ANA3-13
ANA3-14
ANA3-15
ANA3-16
ANA3-17
ANA3-18
ANA3-19
ANA3-20
ANA3-21
ANA3-22
ANA3-23
ANA3-24
ANA3-26
ANA3-27
ANA3-28
ANA3-29
ANA3-30
ANA3-31
ANA3-32
ANA3-33
ANA3-34
ANA3-25
** NOTE: No Field Connection at TB3-25
POS
NEG
GND
Chromel
Alumel
EGT T/C #3
EGT T/C #6
EGT T/C #9
EGT T/C #12
EGT T/C #15
EGT T/C #18
NOX Valve Position Feedback (4-20 mA)
Power Augmentation Steam Flow
Power Augmentation Steam Pressure
NOX Water or Steam Flow
NOX Water or Steam Pressure
WOODWARD
FT. COLLINS COLORADO USA
TITLE
DIAGRAM -
CONTROL WIRING
GTC250A w/DIO
SIZE D
CAGE CODE 31361
DWG NO 9971-1270
REV NEW
SCALE NTS
SHEET 13 OF 15
AUTOCAD

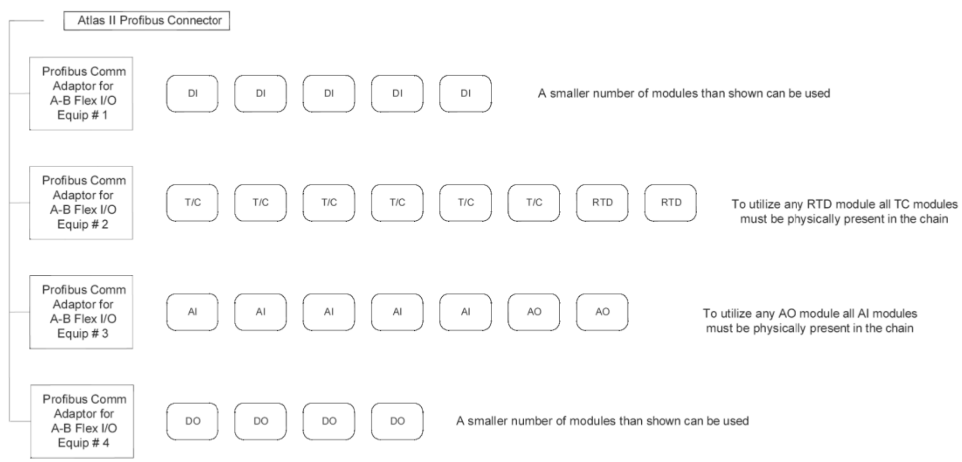

ATLAS-II COMBO BOARD
A05_COMBO - ANALOG INPUT
ANALOG INPUT RTD_09
ANALOG INPUT RTD_10
ANALOG INPUT RTD_11
ANALOG INPUT RTD_12
ANALOG OUTPUT
ANALOG OUTPUT AO_11
ANALOG OUTPUT AO_12
SPEED INPUT
DSS_07
DSS_08
RTD (sense)
RTD (-)
RTD (+)
SHLD (CHASSIS)
(+)V SOURCE
4-20 MA OUTPUT (-)
MPU (+)
MPU (-)
ANA3-35
ANA3-36
ANA3-37
ANA3-38
ANA3-39
ANA3-40
ANA3-41
ANA3-42
ANA3-43
ANA3-44
ANA3-45
ANA3-46
ANA3-47
ANA3-48
ANA3-49
ANA3-50
ANA3-51
ANA3-52
ANA3-53
ANA3-54
ANA3-55
ANA3-56
ANA3-57
ANA3-58
ANA3-59
ANA3-60
ANA3-61
ANA3-62
Customer RTD
NOX Water or Steam Temp
Power Augmentation Steam Temp
Ambient Inlet Temp Sensor B (RTD)
Select via the Configure Menu List
Select via the Configure Menu List
Customer Frequency C
Customer Frequency D
WOODWARD
FT. COLLINS COLORADO USA
DIAGRAM - CONTROL WIRING GTC250A w/DIO
SIZE D
CAGE CODE 31361
DWG NO 9971-1270
REV NEW
SCALE NTS
SHEET 14 OF 15
AUTOCAD

ALLEN-BRADLEY FLEX IO 1794- SERIES
DISTRIBUTED IO MODULES
SEE WOODWARD MANUAL 85586V2 FOR CONFIGURATION INFORMATION AND CONSULT THE A-B SPECIFICATIONS FOR INFORMATION ON CHANNEL WIRING FOR MODULES BY PART NUMBER.

THE AB FLEX IO SYSTEM CONSISTS OF 3 SECTIONS:
1- TERMINAL BASES - WHICH CLIP TOGETHER AND CONNECT TO ALL FIELD TERMINATIONS
2- COMMUNICATION HEADS - HANDLES ALL COMMUNICATION PROTOCOL WITH THE CONTROL
3- IO MODULES - WHICH SLIDE INTO THE TERMINAL BASES & INTERFACE TO THE FIELD DEVICES
EACH COMM ADAPTOR (4) CAN INTERFACE TO 8 MODULES AND IS CONNECTED VIA A TRUNK LINE TO THE ATLAS II PROFIBUS PORT - USING PROFIBUS CABLING (SEE ATLAS MANUAL)

GTC250A HAS BEEN PRE-PROGRAMMED TO SUPPORT INTERFACING TO THE FOLLOWING PART NUMBERS.

DESCRIPTION	AB P/N	WG P/N	QTY	TOTAL CHAN
PROFIBUS FLEX I/O COMM	3170-PDP	1752-367	4	
TERMINAL BASE	1794-TB3S	1752-365	15	
TERMINAL BASE	1794-TB32S	-	9	
DISCRETE INPUT (32 CH)	1794-IB32	-	5	160
DISCRETE OUTPUT (32 CH)	1794-OB32P	-	4	128
RTD INPUT (8 CH)	1794-IR8	1752-575	2	16
T/C INPUT (8 CH)	1794-IT8	1752-577	6	48
ANALOG INPUT CURRENT (8 CH)	1794-IE8/B	1752-571	5	40
ANALOG OUTPUT CURRENT (4 CH)	1794-OE4/B	1752-572	2	8



WOODWARD Industrial Controls — FT. COLLINS COLORADO USA

TITLE: DIAGRAM - CONTORL WIRING GTC250A w/DIO

SIZE	CAGE CODE	DWG NO	REV
D	31361	9971-1270	NEW

SCALE NTS — SHEET 15 OF 15

AUTOCAD

Appendix B. Modbus List for 8262-1031

The following is the Modbus List generated from the Application software. This information is sent out from the control on serial port COM2 and on Ethernet Port 5003 on the CPU module.

```
WOODWARD GOVERNOR COMPANY
INDUSTRIAL CONTROLS DIVISION
FORT COLLINS, COLORADO, U.S.A.

Woodward MODBUS Slave Address Information
File created on 06/22/07
FileName:     5418-2847.gap
Project:      90493
P/N:    5418-2847
Rev:
GTC250 MASTER SECOND RING GAP FILE
FUEL CONTROL (NO SEQUENCING)
W/ PROFIBUS DISTRIBUTED I/O
GAP 2.18A / CODER 4.04

------------------------------------------------------------
MODBUS_S Block Name : COMM.MOD_VAL

Boolean Writes (RPTbw)
```

Boolean Writes (RPTbw)		
Addr	Input	Description
0:0001		SHUTDOWN
0:0002		START
0:0003		RESET
0:0004		ACKNOWLEDGE
0:0005		GG SPEED LOWER
0:0006		GG SPEED RAISE
0:0007		GG FAST RATE SELECT
0:0008		GG INSTANT RATE SELECT
0:0009		PT SPEED LOWER
0:0010		PT SPEED RAISE
0:0011		PT FAST RATE SELECT
0:0012		GG AND EGT OVERRIDE
0:0013		PT SPEED SIGNAL OVERRIDE
0:0014		FUEL TRANSFER (TRUE = LIQ)
0:0015		ENABLE REMOTE SPEED SETPOINT
0:0016		NOX ENABLE / PERMISSIVE
0:0017		ISOCH/DROOP SELECT
0:0018		ENABLE PWR AUG SYSTEM
0:0019		FLAME DETECTOR A
0:0020		FLAME DETECTOR B
0:0021		Custom Config 21
0:0022		Custom Config 22
0:0023		Custom Config 23
0:0024		Custom Config 24
0:0025		Enable Output Forcing Mode
0:0026		Force-Energize Output #01 Relay
0:0027		Force-Energize Output #02 Relay
0:0028		Force-Energize Output #03 Relay
0:0029		Force-Energize Output #04 Relay
0:0030		Force-Energize Output #05 Relay
0:0031		Force-Energize Output #06 Relay
0:0032		Force-Energize Output #07 Relay
0:0033		Force-Energize Output #08 Relay
0:0034		Force-Energize Output #09 Relay

0:0035		Force-Energize Output #10 Relay
0:0036		Force-Energize Output #11 Relay
0:0037		Force-Energize Output #12 Relay
0:0038		
0:0039		
0:0040		ENABLE CALIBRATE MODE
0:0041		EXIT CALIBRATE MODE
0:0042		
0:0043		
0:0044		
0:0045		
0:0046		
0:0047		
0:0048		
0:0049		
0:0050		NOX LOWER
0:0051		NOX RAISE
0:0052		NOX ESD
0:0053		NOX VALVE STROKE ENABLE
0:0054		POWER AUGMENTATION PERMISSIVE
0:0055		POWER AUGMENTATION SHUTDOWN
0:0056		POWER AUGMENTATION LOWER
0:0057		POWER AUGMENTATION RAISE
0:0058		POWER AUGMENTATION VLV STROKE ENABLE
0:0059		NOX WATER PRESSURE PERMISSIVE
0:0060		FUEL TRANSFER HOLD
0:0061		SELECT PEAK MODE
0:0062		Spare
0:0063		Modbus Drive Output #02 Relay
0:0064		Modbus Drive Output #03 Relay
0:0065		Modbus Drive Output #04 Relay
0:0066		Modbus Drive Output #05 Relay
0:0067		Modbus Drive Output #06 Relay
0:0068		Modbus Drive Output #07 Relay
0:0069		Modbus Drive Output #08 Relay
0:0070		Modbus Drive Output #09 Relay
0:0071		Modbus Drive Output #10 Relay
0:0072		Modbus Drive Output #11 Relay
0:0073		Modbus Drive Output #12 Relay
0:0074		Spare
0:0075		Spare
0:0076		
0:0077		
0:0078		
0:0079		
0:0080		
0:0081		
0:0082		
0:0083		
0:0084		
0:0085		
0:0086		
0:0087		
0:0088		
0:0089		
0:0090		
0:0091		
0:0092		
0:0093		
0:0094		
0:0095		
0:0096		
0:0097		
0:0098		
0:0099		
0:0100		
0:0101		
0:0102		
0:0103		
0:0104		

0:0105		
0:0106		
0:0107		
0:0108		
0:0109		
0:0110		
0:0111		
0:0112		
0:0113		
0:0114		
0:0115		
0:0116		
0:0117		
0:0118		
0:0119		
0:0120		
0:0121		
0:0122		
0:0123		
0:0124		
0:0125		
Boolean Reads (RPTbr)		
Addr	Input	Description
1:0001	A02_TC.BI_01.BI_ATL	SHUTDOWN (CHOP FUEL)
1:0002	A02_TC.BI_02.BI_ATL	START/RUN
1:0003	A02_TC.BI_03.BI_ATL	SYSTEM ACKNOWLEDGE (ALM & SD)
1:0004	A02_TC.BI_04.BI_ATL	SYSTEM RESET (ALM & SD)
1:0005	A02_TC.BI_05.BI_ATL	GG REFERENCE LOWER
1:0006	A02_TC.BI_06.BI_ATL	GG REFERENCE RAISE
1:0007	A02_TC.BI_07.BI_ATL	GG REFERENCE SELECT FAST RATE
1:0008	A02_TC.BI_08.BI_ATL	GG REFERENCE SELECT INSTANT RATE
1:0009	A02_TC.BI_09.BI_ATL	PT REFERENCE LOWER
1:0010	A02_TC.BI_10.BI_ATL	PT REFERENCE RAISE
1:0011	A02_TC.BI_11.BI_ATL	PT REFERENCE SELECT FAST RATE
1:0012	A02_TC.BI_12.BI_ATL	GG SPD & EGT TEMP SIGNALS FAILED OVERR
1:0013	A02_TC.BI_13.BI_ATL	PT SPEED SIGNAL FAILED OVERRIDE
1:0014	A02_TC.BI_14.BI_ATL	FUEL SELECTION / TRANSFER
1:0015	A02_TC.BI_15.BI_ATL	ENABLE REMOTE PT REF SETPOINT
1:0016	A02_TC.BI_16.BI_ATL	ENABLE NOX CONTROL
1:0017	A02_TC.BI_17.BI_ATL	ISOC/DROOP (1=ISOC)
1:0018	A02_TC.BI_18.BI_ATL	POWER AUGMENTATION ENABLE
1:0019	A02_TC.BI_19.BI_ATL	Customer Configurable DI
1:0020	A02_TC.BI_20.BI_ATL	Customer Configurable DI
1:0021	A02_TC.BI_21.BI_ATL	Customer Configurable DI
1:0022	A02_TC.BI_22.BI_ATL	Customer Configurable DI
1:0023	A02_TC.BI_23.BI_ATL	Customer Configurable DI
1:0024	A02_TC.BI_24.BI_ATL	Customer Configurable DI
1:0025	FALSE	
1:0026	A02_PB_MO1.BO_01.DISPLAY	
1:0027	A02_PB_MO1.BO_02.DISPLAY	
1:0028	A02_PB_MO1.BO_03.DISPLAY	
1:0029	A02_PB_MO1.BO_04.DISPLAY	
1:0030	A02_PB_MO1.BO_05.DISPLAY	
1:0031	A02_PB_MO1.BO_06.DISPLAY	
1:0032	A02_PB_MO1.BO_07.DISPLAY	
1:0033	A02_PB_MO1.BO_08.DISPLAY	
1:0034	A02_PB_MO1.BO_09.DISPLAY	
1:0035	A02_PB_MO1.BO_10.DISPLAY	
1:0036	A02_PB_MO1.BO_11.DISPLAY	
1:0037	A02_PB_MO1.BO_12.DISPLAY	
1:0038		
1:0039		
1:0040		
1:0041		
1:0042		
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1:0044		
1:0045		
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1:0049		** SHUTDOWNS START AT ADDRESS 50 **
1:0050	SD_SUM.SHUTDOWN.B_NAME	CORE SUMMARY SHUTDOWN
1:0051	CORE.SD.SD_CORE1	EXTERNAL SHUTDOWN
1:0052	CORE.SD.SD_CORE2	GAS DRIVER FAULT
1:0053	CORE.SD.SD_CORE3	LIQUID DRIVER FAULT
1:0054	CORE.SD.SD_CORE4	THREE ADJACENT EGT FAULT
1:0055	CORE.SD.SD_CORE5	ANALOG EGT SENSOR FAULT
1:0056	CORE.SD.SD_CORE6	EGT EXCESSIVE SPREAD
1:0057	CORE.SD.SD_CORE7	SINGLE EGT TC FAULT
1:0058	CORE.SD.SD_CORE8	EXCESSIVE NUMBER OF BAD EGT SENSORS
1:0059	CORE.SD.SD_CORE9	ALL GG SPEED SENSORS FAILED
1:0060	CORE.SD.SD_CORE10	GG OVERSPEED
1:0061	CORE.SD.SD_CORE11	PT OVERSPEED
1:0062	CORE.SD.SD_CORE12	ALL PT SPEED SENSORS FAILED
1:0063	CORE.SD.SD_CORE13	EGT OVERTEMP SD
1:0064	CORE.SD.SD_CORE14	ALL CDP SENSORS FAILED
1:0065	CORE.SD.SD_CORE15	CDP STALL DETECTED SD
1:0066	CORE.SD.SD_CORE16	TURBINE FLAMEOUT DETECTED SD
1:0067	CORE.SD.SD_CORE17	CONTROL IS NOT CONFIGURED SD
1:0068	CORE.SD.SD_CORE18	CDP HIGH PRESSURE SD
1:0069	CORE.SD.SD_CORE19	CORE SHUTDOWN SPARE
1:0070	CORE.SD.SD_CORE20	CORE SHUTDOWN SPARE
1:0071	CORE.SD.SD_CORE21	Spare
1:0072	CORE.SD.SD_CORE22	
1:0073	CORE.SD.SD_CORE23	
1:0074	CORE.SD.SD_CORE24	
1:0075	CORE.SD.SD_CORE25	
1:0076	CORE.SD.SD_CORE26	
1:0077	CORE.SD.SD_CORE27	
1:0078	CORE.SD.SD_CORE28	
1:0079	CORE.SD.SD_CORE29	
1:0080	CORE.SD.SD_CORE30	
1:0081		
1:0082		
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1:0098		
1:0099		** ALARMS START AT ADDRESS 100 **
1:0100	CORE.ALARM.ALM_CORE	CORE SUMMARY ALARM
1:0101	CORE.ALARM.ALM_CORE1	EGT 01 DIFFERENCE ALARM
1:0102	CORE.ALARM.ALM_CORE2	EGT 02 DIFFERENCE ALARM
1:0103	CORE.ALARM.ALM_CORE3	EGT 03 DIFFERENCE ALARM
1:0104	CORE.ALARM.ALM_CORE4	EGT 04 DIFFERENCE ALARM
1:0105	CORE.ALARM.ALM_CORE5	EGT 05 DIFFERENCE ALARM
1:0106	CORE.ALARM.ALM_CORE6	EGT 06 DIFFERENCE ALARM
1:0107	CORE.ALARM.ALM_CORE7	EGT 07 DIFFERENCE ALARM
1:0108	CORE.ALARM.ALM_CORE8	EGT 08 DIFFERENCE ALARM
1:0109	CORE.ALARM.ALM_CORE9	EGT 09 DIFFERENCE ALARM
1:0110	CORE.ALARM.ALM_CORE10	EGT 10 DIFFERENCE ALARM
1:0111	CORE.ALARM.ALM_CORE11	EGT 11 DIFFERENCE ALARM
1:0112	CORE.ALARM.ALM_CORE12	EGT 12 DIFFERENCE ALARM
1:0113	CORE.ALARM.ALM_CORE13	EGT 13 DIFFERENCE ALARM

1:0114	CORE.ALARM.ALM_CORE14	EGT 14 DIFFERENCE ALARM
1:0115	CORE.ALARM.ALM_CORE15	EGT 15 DIFFERENCE ALARM
1:0116	CORE.ALARM.ALM_CORE16	EGT 16 DIFFERENCE ALARM
1:0117	CORE.ALARM.ALM_CORE17	EGT 17 DIFFERENCE ALARM
1:0118	CORE.ALARM.ALM_CORE18	EGT 18 DIFFERENCE ALARM
1:0119	CORE.ALARM.ALM_CORE19	EGT EXCESSIVE SPREAD ALARM
1:0120	CORE.ALARM.ALM_CORE20	EGT OVERTEMPERATURE ALARM
1:0121	CORE.ALARM.ALM_CORE21	EXCESSIVE NUMBER OF BAD EGT SENSORS
1:0122	CORE.ALARM.ALM_CORE22	EGT UNDER TEMPERATURE ALARM
1:0123	CORE.ALARM.ALM_CORE23	EGT 01 FAULT
1:0124	CORE.ALARM.ALM_CORE24	EGT 02 FAULT
1:0125	CORE.ALARM.ALM_CORE25	EGT 03 FAULT
1:0126	CORE.ALARM.ALM_CORE26	EGT 04 FAULT
1:0127	CORE.ALARM.ALM_CORE27	EGT 05 FAULT
1:0128	CORE.ALARM.ALM_CORE28	EGT 06 FAULT
1:0129	CORE.ALARM.ALM_CORE29	EGT 07 FAULT
1:0130	CORE.ALARM.ALM_CORE30	EGT 08 FAULT
1:0131	CORE.ALARM.ALM_CORE31	EGT 09 FAULT
1:0132	CORE.ALARM.ALM_CORE32	EGT 10 FAULT
1:0133	CORE.ALARM.ALM_CORE33	EGT 11 FAULT
1:0134	CORE.ALARM.ALM_CORE34	EGT 12 FAULT
1:0135	CORE.ALARM.ALM_CORE35	EGT 13 FAULT
1:0136	CORE.ALARM.ALM_CORE36	EGT 14 FAULT
1:0137	CORE.ALARM.ALM_CORE37	EGT 15 FAULT
1:0138	CORE.ALARM.ALM_CORE38	EGT 16 FAULT
1:0139	CORE.ALARM.ALM_CORE39	EGT 17 FAULT
1:0140	CORE.ALARM.ALM_CORE40	EGT 18 FAULT
1:0141	CORE.ALARM.ALM_CORE41	GG SPEED SENSOR 01 FAULT
1:0142	CORE.ALARM.ALM_CORE42	GG SPEED SENSOR 02 FAULT
1:0143	CORE.ALARM.ALM_CORE43	NOX STEAM FLOW SENSOR FAULT
1:0144	CORE.ALARM.ALM_CORE44	NOX STEAM PRESSURE SENSOR FAULT
1:0145	CORE.ALARM.ALM_CORE45	NOX STEAM TEMP SENSOR FAULT
1:0146	CORE.ALARM.ALM_CORE46	PT SPEED SENSOR 01 FAULT
1:0147	CORE.ALARM.ALM_CORE47	PT SPEED SENSOR 02 FAULT
1:0148	CORE.ALARM.ALM_CORE48	PWR AUG STEAM FLOW SENSOR FAULT
1:0149	CORE.ALARM.ALM_CORE49	PWR AUG STEAM PRESSURE SENSOR FAULT
1:0150	CORE.ALARM.ALM_CORE50	PWR AUG STEAM TEMP SENSOR FAULT
1:0151	CORE.ALARM.ALM_CORE51	REMOTE SPD SETPOINT SIGNAL FAILED
1:0152	CORE.ALARM.ALM_CORE52	CDP SENSOR A FAULT
1:0153	CORE.ALARM.ALM_CORE53	CDP SENSOR B FAULT
1:0154	CORE.ALARM.ALM_CORE54	GG OVERSPEED ALARM
1:0155	CORE.ALARM.ALM_CORE55	PT OVERSPEED ALARM
1:0156	CORE.ALARM.ALM_CORE56	AMBIENT SENSOR A FAULT
1:0157	CORE.ALARM.ALM_CORE57	AMBIENT SENSOR B FAULT
1:0158	CORE.ALARM.ALM_CORE58	BOTH AMBIENT SENSORS FAILED
1:0159	CORE.ALARM.ALM_CORE59	GAS FUEL DRIVER FAULT (RUNNING LIQ)
1:0160	CORE.ALARM.ALM_CORE60	LIQUID FUEL DRIVER FAULT (RUNNING GAS)
1:0161	CORE.ALARM.ALM_CORE61	ATLAS TEMP ALARM (CHECK FAN)
1:0162	CORE.ALARM.ALM_CORE62	ATLAS POWER SUPPLY ALARM
1:0163	CORE.ALARM.ALM_CORE63	MEGAWATT SENSOR FAULT
1:0164	CORE.ALARM.ALM_CORE64	
1:0165	CORE.ALARM.ALM_CORE65	
1:0166	CORE.ALARM.ALM_CORE66	
1:0167	CORE.ALARM.ALM_CORE67	
1:0168	CORE.ALARM.ALM_CORE68	
1:0169	CORE.ALARM.ALM_CORE69	
1:0170	CORE.ALARM.ALM_CORE70	
1:0171	CORE.ALARM.ALM_CORE71	
1:0172	CORE.ALARM.ALM_CORE72	
1:0173	CORE.ALARM.ALM_CORE73	
1:0174	CORE.ALARM.ALM_CORE74	
1:0175	CORE.ALARM.ALM_CORE75	
1:0176	FALSE	
1:0177	FALSE	
1:0178	FALSE	
1:0179	FALSE	
1:0180	FALSE	
1:0181	FALSE	
1:0182	FALSE	
1:0183	FALSE	

1:0184	FALSE	
1:0185	FALSE	
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1:0191	FALSE	
1:0192	FALSE	
1:0193	FALSE	
1:0194	FALSE	
1:0195	FALSE	
1:0196	FALSE	
1:0197	FALSE	
1:0198	FALSE	
1:0199		
1:0200	*FALSE	Additional LL inputs if needed
1:0201	*FALSE	
1:0202	*FALSE	
1:0203	*FALSE	
1:0204	*FALSE	
1:0205	*FALSE	
1:0206	*FALSE	
1:0207	*FALSE	
1:0208	*FALSE	
1:0209	*FALSE	
1:0210	*FALSE	
1:0211	*FALSE	
1:0212	*FALSE	
1:0213	*FALSE	
1:0214	*FALSE	
1:0215	*FALSE	
1:0216	*FALSE	
1:0217	*FALSE	
1:0218	*FALSE	
1:0219	*FALSE	
1:0220	*FALSE	
1:0221	*FALSE	
1:0222	*FALSE	
1:0223	*FALSE	
1:0224	*FALSE	
1:0225	*FALSE	
1:0226	*FALSE	
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1:0228	*FALSE	
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1:0230	*FALSE	
1:0231	*FALSE	
1:0232	*FALSE	
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1:0240	*FALSE	
1:0241	*FALSE	
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1:0244	*FALSE	
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1:0249	*FALSE	
1:0250	*FALSE	
1:0251	*FALSE	
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1:0253	*FALSE	

1:0254	*FALSE	
1:0255	*FALSE	
1:0256	*FALSE	
1:0257	*FALSE	
1:0258	*FALSE	
1:0259	*FALSE	
1:0260	*FALSE	
1:0261	*FALSE	
1:0262	*FALSE	
1:0263	*FALSE	
1:0264	*FALSE	
1:0265	*FALSE	
1:0266	*FALSE	
1:0267	*FALSE	
1:0268	*FALSE	
1:0269	*FALSE	
1:0270	*FALSE	
1:0271	*FALSE	
1:0272	*FALSE	
1:0273	*FALSE	
1:0274	*FALSE	
1:0275	*FALSE	
1:0276	*FALSE	
1:0277	*FALSE	
1:0278	*FALSE	
1:0279	*FALSE	
1:0280	*FALSE	
1:0281	*FALSE	
1:0282	*FALSE	
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1:0289	*FALSE	
1:0290	*FALSE	
1:0291	*FALSE	
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1:0293	*FALSE	
1:0294	*FALSE	
1:0295	*FALSE	
1:0296	*FALSE	
1:0297	*FALSE	
1:0298	*FALSE	
1:0299	*FALSE	
1:0300		** CORE Status Indicators at 300 ****
1:0301	CORE.DIGITAL.CNTRL_1	GG Speed Control
1:0302	CORE.DIGITAL.CNTRL_2	PT Speed Control
1:0303	CORE.DIGITAL.CNTRL_3	EGT Temp Control
1:0304	CORE.DIGITAL.CNTRL_4	Accel Control
1:0305	CORE.DIGITAL.CNTRL_5	Start Mode Control
1:0306	CORE.DIGITAL.CNTRL_6	CDP Control
1:0307	CORE.DIGITAL.CNTRL_7	MW Limit Control
1:0308	CORE.DIGITAL.CNTRL_8	Max CDP vs Fuel Curve Limit
1:0309	CORE.DIGITAL.CNTRL_9	Decel Control
1:0310	CORE.DIGITAL.CNTRL_10	Unit Shutdown
1:0311	CORE.DIGITAL.GAS_100	Running Gas Fuel 100%
1:0312	CORE.DIGITAL.LIQ_100	Running Liquid Fuel 100%
1:0313	CNFG_BI_01.SD_FUEL.OR	External SD to Fuel Control CORE
1:0314	CNFG_BI_02.START_RUN.OR	Start/Run to Fuel Control CORE
1:0315	CNFG_BI_03.RESET.OR	Reset to Fuel Control CORE
1:0316	CNFG_BI_04.ACKN.OR	Acknowledge to Fuel Control CORE
1:0317	CNFG_BI_05.GG_LOWER.OR	GG Ref Lower to Fuel Control CORE
1:0318	CNFG_BI_06.GG_RAISE.OR	GG Ref Raise to Fuel Control CORE
1:0319	CNFG_BI_07.GG_FSTRATE.OR	GG Ref Fast Rate to Fuel Control CORE
1:0320	CNFG_BI_08.GG_INSTRTE.OR	GG Instant Rate to Fuel Control CORE
1:0321	CNFG_BI_09.PT_LOWER.OR	PT Ref Lower to Fuel Control CORE
1:0322	CNFG_BI_10.PT_RAISE.OR	PT Ref Raise to Fuel Control CORE
1:0323	CNFG_BI_11.PT_FSTRATE.OR	PT Ref Fast Rate to Fuel Control CORE

1:0324	CNFG_BI_12.GG_EGT_OVR.OR	GG/EGT Failed Signal Override to CORE
1:0325	CNFG_BI_13.PT_OVRD.OR	PT Failed Override to Fuel Control CORE
1:0326	CNFG_BI_14.FUEL_XFER.OR	Fuel Select to Fuel Control CORE
1:0327	CNFG_BI_15.ENBL_RMT.OR	Enable Remote PT setpoint to CORE
1:0328	CNFG_BI_16.NOX_ENA.OR	NOX Enable to Fuel Control CORE
1:0329	CNFG_BI_17.ISOCH.OR	Go to Isoch to Fuel Control CORE
1:0330	CNFG_BI_18.PWRAUG_ENA.OR	PWR AUG Steam Enable to CORE
1:0331	CNFG_BI_19.FLAME_DET1.OR	Flame Detect #1 to Fuel Control CORE
1:0332	CNFG_BI_20.FLAME_DET2.OR	Flame Detect #2 to Fuel Control CORE
1:0333		BI 21 not used
1:0334		BI 22 not used
1:0335		BI 23 not used
1:0336		BI 24 not used
1:0337	IFACE_CORE.NOX_L.B_NAME	NOX Lower Cmd to Fuel Control CORE
1:0338	IFACE_CORE.NOX_R.B_NAME	NOX Raise Cmd to Fuel Control CORE
1:0339	IFACE_CORE.NOXSHUTDN.B_NAME	NOX Shutdown Cmd to Fuel Control CORE
1:0340	IFACE_CORE.NOXSTRKEN.B_NAME	NOX Valve Stroke Enabled to CORE
1:0341	IFACE_CORE.PWRAUGESD.B_NAME	PWR AUG Shutdown Cmd to CORE
1:0342	IFACE_CORE.PWRAUG_L.B_NAME	PWRAUG Lower Cmd to Fuel Control CORE
1:0343	IFACE_CORE.PWRAUG_R.B_NAME	PWRAUG Raise Cmd to Fuel Control CORE
1:0344	IFACE_CORE.PWRAUGSTRK.B_NAME	PWRAUG Valve Stroke Enabled to CORE
1:0345	IFACE_CORE.WTRPRS_PRM.B_NAME	NOX Water Pressure Permissive to CORE
1:0346	CALMODE.CALPERM.B_NAME	Permissives Met for Calibration Mode
1:0347	CALMODE.CALMODE.B_NAME	Unit in Calibration Mode
1:0348	CALMODE.FORCE.AND	Output Forcing Enabled
1:0349	SEQ.GL_X_HOLD.OR	Hold Fuel Transfer to Fuel Control COR
1:0350	MP.MP_WATCH.B_NAME	Ladder Logic is Running
1:0351		
1:0352		
1:0353		
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1:0356		
1:0357		
1:0358		
1:0359		
1:0360		
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1:0398		
1:0399	MP.EGT_VIA_MP.B_NAME	
1:0400	MP.MP_WATCH.B_NAME	*** LL & Distributed I/O Signals ***
1:0401	ALM_SUM.ALM_MP.SEL_1	
1:0402	ALM_SUM.ALM_MP.SEL_2	
1:0403	ALM_SUM.ALM_MP.SEL_3	
1:0404	ALM_SUM.ALM_MP.SEL_4	
1:0405	ALM_SUM.ALM_MP.SEL_5	
1:0406	ALM_SUM.ALM_MP.SEL_6	
1:0407	ALM_SUM.ALM_MP.SEL_7	
1:0408	ALM_SUM.ALM_MP.SEL_8	
1:0409	ALM_SUM.ALM_MP.SEL_9	
1:0410	ALM_SUM.ALM_MP.SEL_10	
1:0411	ALM_SUM.ALM_MP.SEL_11	
1:0412	ALM_SUM.ALM_MP.SEL_12	
1:0413	ALM_SUM.ALM_MP.SEL_13	
1:0414	ALM_SUM.ALM_MP.SEL_14	
1:0415	ALM_SUM.ALM_MP.SEL_15	
1:0416	ALM_SUM.ALM_MP.SEL_16	
1:0417	ALM_SUM.ALM_MP.SEL_17	
1:0418	ALM_SUM.ALM_MP.SEL_18	
1:0419	ALM_SUM.ALM_MP.SEL_19	
1:0420	ALM_SUM.ALM_MP.SEL_20	
1:0421	ALM_SUM.ALM_MP.SEL_21	
1:0422	ALM_SUM.ALM_MP.SEL_22	
1:0423	ALM_SUM.ALM_MP.SEL_23	
1:0424	ALM_SUM.ALM_MP.SEL_24	
1:0425	ALM_SUM.ALM_MP.SEL_25	
1:0426	ALM_SUM.ALM_MP.SEL_26	
1:0427	ALM_SUM.ALM_MP.SEL_27	
1:0428	ALM_SUM.ALM_MP.SEL_28	
1:0429	ALM_SUM.ALM_MP.SEL_29	
1:0430	ALM_SUM.ALM_MP.SEL_30	
1:0431	ALM_SUM.ALM_MP.SEL_31	
1:0432	ALM_SUM.ALM_MP.SEL_32	
1:0433	ALM_SUM.ALM_MP.SEL_33	
1:0434	ALM_SUM.ALM_MP.SEL_34	
1:0435	ALM_SUM.ALM_MP.SEL_35	
1:0436	ALM_SUM.ALM_MP.SEL_36	
1:0437	ALM_SUM.ALM_MP.SEL_37	
1:0438	ALM_SUM.ALM_MP.SEL_38	
1:0439	ALM_SUM.ALM_MP.SEL_39	
1:0440	ALM_SUM.ALM_MP.SEL_40	
1:0441	ALM_SUM.ALM_MP.SEL_41	
1:0442	ALM_SUM.ALM_MP.SEL_42	
1:0443	ALM_SUM.ALM_MP.SEL_43	
1:0444	ALM_SUM.ALM_MP.SEL_44	
1:0445	ALM_SUM.ALM_MP.SEL_45	
1:0446	ALM_SUM.ALM_MP.SEL_46	
1:0447	ALM_SUM.ALM_MP.SEL_47	
1:0448	ALM_SUM.ALM_MP.SEL_48	
1:0449	ALM_SUM.ALM_MP.SEL_49	
1:0450	ALM_SUM.ALM_MP.SEL_50	
1:0451	ALM_SUM.ALM_MP.SEL_51	
1:0452	ALM_SUM.ALM_MP.SEL_52	
1:0453	ALM_SUM.ALM_MP.SEL_53	
1:0454	ALM_SUM.ALM_MP.SEL_54	
1:0455	ALM_SUM.ALM_MP.SEL_55	
1:0456	ALM_SUM.ALM_MP.SEL_56	
1:0457	ALM_SUM.ALM_MP.SEL_57	
1:0458	ALM_SUM.ALM_MP.SEL_58	
1:0459	ALM_SUM.ALM_MP.SEL_59	
1:0460	ALM_SUM.ALM_MP.SEL_60	
1:0461	ALM_SUM.ALM_MP.SEL_61	
1:0462	ALM_SUM.ALM_MP.SEL_62	
1:0463	ALM_SUM.ALM_MP.SEL_63	

1:0464	ALM_SUM.ALM_MP.SEL_64	
1:0465	ALM_SUM.ALM_MP.SEL_65	
1:0466	ALM_SUM.ALM_MP.SEL_66	
1:0467	ALM_SUM.ALM_MP.SEL_67	
1:0468	ALM_SUM.ALM_MP.SEL_68	
1:0469	ALM_SUM.ALM_MP.SEL_69	
1:0470	ALM_SUM.ALM_MP.SEL_70	
1:0471	ALM_SUM.ALM_MP.SEL_71	
1:0472	ALM_SUM.ALM_MP.SEL_72	
1:0473	ALM_SUM.ALM_MP.SEL_73	
1:0474	ALM_SUM.ALM_MP.SEL_74	
1:0475	ALM_SUM.ALM_MP.SEL_75	
1:0476	ALM_SUM.ALM_MP.SEL_76	
1:0477	ALM_SUM.ALM_MP.SEL_77	
1:0478	ALM_SUM.ALM_MP.SEL_78	
1:0479	ALM_SUM.ALM_MP.SEL_79	
1:0480	ALM_SUM.ALM_MP.SEL_80	
1:0481	ALM_SUM.ALM_MP.SEL_81	
1:0482	ALM_SUM.ALM_MP.SEL_82	
1:0483	ALM_SUM.ALM_MP.SEL_83	
1:0484	ALM_SUM.ALM_MP.SEL_84	
1:0485	ALM_SUM.ALM_MP.SEL_85	
1:0486	ALM_SUM.ALM_MP.SEL_86	
1:0487	ALM_SUM.ALM_MP.SEL_87	
1:0488	ALM_SUM.ALM_MP.SEL_88	
1:0489	ALM_SUM.ALM_MP.SEL_89	
1:0490	ALM_SUM.ALM_MP.SEL_90	
1:0491	ALM_SUM.ALM_MP.SEL_91	
1:0492	ALM_SUM.ALM_MP.SEL_92	
1:0493	ALM_SUM.ALM_MP.SEL_93	
1:0494	ALM_SUM.ALM_MP.SEL_94	
1:0495	ALM_SUM.ALM_MP.SEL_95	
1:0496	ALM_SUM.ALM_MP.SEL_96	
1:0497	ALM_SUM.ALM_MP.SEL_97	
1:0498	ALM_SUM.ALM_MP.SEL_98	
1:0499	ALM_SUM.ALM_MP.SEL_99	
1:0500	ALM_SUM.ALM_MP.SEL_100	
1:0501	ALM_SUM.ALM_MP.SEL_101	
1:0502	ALM_SUM.ALM_MP.SEL_102	
1:0503	ALM_SUM.ALM_MP.SEL_103	
1:0504	ALM_SUM.ALM_MP.SEL_104	
1:0505	ALM_SUM.ALM_MP.SEL_105	
1:0506	ALM_SUM.ALM_MP.SEL_106	
1:0507	ALM_SUM.ALM_MP.SEL_107	
1:0508	ALM_SUM.ALM_MP.SEL_108	
1:0509	ALM_SUM.ALM_MP.SEL_109	
1:0510	ALM_SUM.ALM_MP.SEL_110	
1:0511	ALM_SUM.ALM_MP.SEL_111	
1:0512	ALM_SUM.ALM_MP.SEL_112	
1:0513	ALM_SUM.ALM_MP.SEL_113	
1:0514	ALM_SUM.ALM_MP.SEL_114	
1:0515	ALM_SUM.ALM_MP.SEL_115	
1:0516	ALM_SUM.ALM_MP.SEL_116	
1:0517	ALM_SUM.ALM_MP.SEL_117	
1:0518	ALM_SUM.ALM_MP.SEL_118	
1:0519	ALM_SUM.ALM_MP.SEL_119	
1:0520	ALM_SUM.ALM_MP.SEL_120	
1:0521	ALM_SUM.ALM_MP.SEL_121	
1:0522	ALM_SUM.ALM_MP.SEL_122	
1:0523	ALM_SUM.ALM_MP.SEL_123	
1:0524	ALM_SUM.ALM_MP.SEL_124	
1:0525	ALM_SUM.ALM_MP.SEL_125	
1:0526	ALM_SUM.ALM_MP.SEL_126	
1:0527	ALM_SUM.ALM_MP.SEL_127	
1:0528	ALM_SUM.ALM_MP.SEL_128	
1:0529	ALM_SUM.ALM_MP.SEL_129	
1:0530	ALM_SUM.ALM_MP.SEL_130	
1:0531	ALM_SUM.ALM_MP.SEL_131	
1:0532	ALM_SUM.ALM_MP.SEL_132	
1:0533	ALM_SUM.ALM_MP.SEL_133	

1:0534	ALM_SUM.ALM_MP.SEL_134	
1:0535	ALM_SUM.ALM_MP.SEL_135	
1:0536	ALM_SUM.ALM_MP.SEL_136	
1:0537	ALM_SUM.ALM_MP.SEL_137	
1:0538	ALM_SUM.ALM_MP.SEL_138	
1:0539	ALM_SUM.ALM_MP.SEL_139	
1:0540	ALM_SUM.ALM_MP.SEL_140	
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1:0542	ALM_SUM.ALM_MP.SEL_142	
1:0543	ALM_SUM.ALM_MP.SEL_143	
1:0544	ALM_SUM.ALM_MP.SEL_144	
1:0545	ALM_SUM.ALM_MP.SEL_145	
1:0546	ALM_SUM.ALM_MP.SEL_146	
1:0547	ALM_SUM.ALM_MP.SEL_147	
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1:0554	ALM_SUM.ALM_MP.SEL_154	
1:0555	ALM_SUM.ALM_MP.SEL_155	
1:0556	ALM_SUM.ALM_MP.SEL_156	
1:0557	ALM_SUM.ALM_MP.SEL_157	
1:0558	ALM_SUM.ALM_MP.SEL_158	
1:0559	ALM_SUM.ALM_MP.SEL_159	
1:0560	ALM_SUM.ALM_MP.SEL_160	
1:0561	ALM_SUM.ALM_MP.SEL_161	
1:0562	ALM_SUM.ALM_MP.SEL_162	
1:0563	ALM_SUM.ALM_MP.SEL_163	
1:0564	ALM_SUM.ALM_MP.SEL_164	
1:0565	ALM_SUM.ALM_MP.SEL_165	
1:0566	ALM_SUM.ALM_MP.SEL_166	
1:0567	ALM_SUM.ALM_MP.SEL_167	
1:0568	ALM_SUM.ALM_MP.SEL_168	
1:0569	ALM_SUM.ALM_MP.SEL_169	
1:0570	ALM_SUM.ALM_MP.SEL_170	
1:0571	ALM_SUM.ALM_MP.SEL_171	
1:0572	ALM_SUM.ALM_MP.SEL_172	
1:0573	ALM_SUM.ALM_MP.SEL_173	
1:0574	ALM_SUM.ALM_MP.SEL_174	
1:0575	ALM_SUM.ALM_MP.SEL_175	
1:0576	ALM_SUM.ALM_MP.SEL_176	
1:0577	ALM_SUM.ALM_MP.SEL_177	
1:0578	ALM_SUM.ALM_MP.SEL_178	
1:0579	ALM_SUM.ALM_MP.SEL_179	
1:0580	ALM_SUM.ALM_MP.SEL_180	
1:0581	ALM_SUM.ALM_MP.SEL_181	
1:0582	ALM_SUM.ALM_MP.SEL_182	
1:0583	ALM_SUM.ALM_MP.SEL_183	
1:0584	ALM_SUM.ALM_MP.SEL_184	
1:0585	ALM_SUM.ALM_MP.SEL_185	
1:0586	ALM_SUM.ALM_MP.SEL_186	
1:0587	ALM_SUM.ALM_MP.SEL_187	
1:0588	ALM_SUM.ALM_MP.SEL_188	
1:0589	ALM_SUM.ALM_MP.SEL_189	
1:0590	ALM_SUM.ALM_MP.SEL_190	
1:0591	ALM_SUM.ALM_MP.SEL_191	
1:0592	ALM_SUM.ALM_MP.SEL_192	
1:0593	ALM_SUM.ALM_MP.SEL_193	
1:0594	ALM_SUM.ALM_MP.SEL_194	
1:0595	ALM_SUM.ALM_MP.SEL_195	
1:0596	ALM_SUM.ALM_MP.SEL_196	
1:0597	ALM_SUM.ALM_MP.SEL_197	
1:0598	ALM_SUM.ALM_MP.SEL_198	
1:0599	ALM_SUM.ALM_MP.SEL_199	
1:0600	ALM_SUM.ALM_MP.SEL_200	
1:0601	SD_SUM.SD_MP.SEL_1	
1:0602	SD_SUM.SD_MP.SEL_2	
1:0603	SD_SUM.SD_MP.SEL_3	

1:0604	SD_SUM.SD_MP.SEL_4	
1:0605	SD_SUM.SD_MP.SEL_5	
1:0606	SD_SUM.SD_MP.SEL_6	
1:0607	SD_SUM.SD_MP.SEL_7	
1:0608	SD_SUM.SD_MP.SEL_8	
1:0609	SD_SUM.SD_MP.SEL_9	
1:0610	SD_SUM.SD_MP.SEL_10	
1:0611	SD_SUM.SD_MP.SEL_11	
1:0612	SD_SUM.SD_MP.SEL_12	
1:0613	SD_SUM.SD_MP.SEL_13	
1:0614	SD_SUM.SD_MP.SEL_14	
1:0615	SD_SUM.SD_MP.SEL_15	
1:0616	SD_SUM.SD_MP.SEL_16	
1:0617	SD_SUM.SD_MP.SEL_17	
1:0618	SD_SUM.SD_MP.SEL_18	
1:0619	SD_SUM.SD_MP.SEL_19	
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1:0625	SD_SUM.SD_MP.SEL_25	
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1:0630	SD_SUM.SD_MP.SEL_30	
1:0631	SD_SUM.SD_MP.SEL_31	
1:0632	SD_SUM.SD_MP.SEL_32	
1:0633	SD_SUM.SD_MP.SEL_33	
1:0634	SD_SUM.SD_MP.SEL_34	
1:0635	SD_SUM.SD_MP.SEL_35	
1:0636	SD_SUM.SD_MP.SEL_36	
1:0637	SD_SUM.SD_MP.SEL_37	
1:0638	SD_SUM.SD_MP.SEL_38	
1:0639	SD_SUM.SD_MP.SEL_39	
1:0640	SD_SUM.SD_MP.SEL_40	
1:0641	SD_SUM.SD_MP.SEL_41	
1:0642	SD_SUM.SD_MP.SEL_42	
1:0643	SD_SUM.SD_MP.SEL_43	
1:0644	SD_SUM.SD_MP.SEL_44	
1:0645	SD_SUM.SD_MP.SEL_45	
1:0646	SD_SUM.SD_MP.SEL_46	
1:0647	SD_SUM.SD_MP.SEL_47	
1:0648	SD_SUM.SD_MP.SEL_48	
1:0649	SD_SUM.SD_MP.SEL_49	
1:0650	SD_SUM.SD_MP.SEL_50	
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1:0850	*FALSE	
Analog Reads (RPTar)		
Addr	Input	Description
3:0001	CORE.ANALOG.ACCEL_OUT	ACCEL CONTROL
3:0002	CORE.ANALOG.DECEL_OUT	DECEL CONTROL
3:0003	CORE.ANALOG.START_CTRL	START RAMP CONTROL
3:0004	DISPLAY.CDPHSS.A_SW	CDP HIGH SIGNAL SELECT
3:0005	CORE.ANALOG.GAS_DMD	GAS VALVE DEMAND
3:0006	CORE.ANALOG.LIQ_DMD	LIQUID VALVE DEMAND
3:0007	CORE.ANALOG.VLV_DMND	VALVE DEMAND
3:0008	DISPLAY.EGT_AVG.A_SW	EGT AVERAGE
3:0009	CORE.ANALOG.EGT_PID	EGT CONTROL
3:0010	DISPLAY.EGT_SPRD.A_SW	EGT SPREAD
3:0011	CORE.ANALOG.CDPCURVLIM	CDP vs FUEL MAX LIMIT
3:0012	CORE.ANALOG.CDP_PID	CDP TOPPING CONTROL
3:0013	CORE.ANALOG.GG_HSS	GG SPEED HIGH SIGNAL SELECT
3:0014	CORE.ANALOG.GG_PID	GG SPEED CONTROL
3:0015	CORE.ANALOG.GG_REF	GG SPEED REFERENCE
3:0016	CORE.ANALOG.MW_LIM	MAX MW CONTROL LIMIT
3:0017	CORE.ANALOG.NOXSTMBIAS	NOX STEAM BIAS
3:0018	CORE.ANALOG.NOXSTMDMD	NOX STEAM DEMAND
3:0019	CORE.ANALOG.STMFLOWDMD	NOX STEAM REFERENCE
3:0020	CORE.ANALOG.WATERBIAS	NOX WATER BIAS
3:0021	CORE.ANALOG.WTRDMD	NOX WATER DEMAND
3:0022	CORE.ANALOG.PT_HSS	PT SPEED HIGH SIGNAL SELECT
3:0023	CORE.ANALOG.PT_PID	PT SPEED CONTROL
3:0024	CORE.ANALOG.PTREF	PT SPEED REFERENCE
3:0025	CORE.ANALOG.PWRAUGDMD	POWER AUGMENTATION STEAM DEMAND
3:0026	CORE.ANALOG.PWRAUGREFL	POWER AUGMENTATION STEAM REFERENCE
3:0027	CORE.ANALOG.PWRAUGFLOW	POWER AUGMENTATION STEAM FLOW

3:0028	ALM_SUM.FIRST_OUT.A_MUX_N_1	First Alarm to set Latch (#)
3:0029	SD_SUM.FIRST_OUT.A_MUX_N_1	First Shutdown to set Latch (#)
3:0030	DISPLAY.EGT_REF.A_SW	EGT REFERENCE
3:0031	CORE.ANALOG.LSS_BUS	Fuel Demand LSS Bus 1
3:0032	CORE.ANALOG.HSS	Fuel Demand HSS Bus
3:0033	CORE.ANALOG.LSS_2	Fuel Demand LSS Bus 2
3:0034	DISPLAY.AMBTEMPANY.A_SW	Ambient Inlet Temp (Any type)
3:0035	CORE.ANALOG.MW_CDP	Turbine MW Load (Snsr or Calc)
3:0036	CORE.ANALOG.DERIV_GG	Derivative of GG Speed
3:0037	CORE.ANALOG.DRY_STM_SW	GG Accel Reference Setpoint
3:0038	CORE.ANALOG.DECELSCHED	GG Decel Reference Setpoint
3:0039	CORE.ANALOG.FUEL_DCURV	Fuel Decel Limit Curve (vs CDP)
3:0040	CORE.ANALOG.STRT_ATTMT	Turbine Start Attempts
3:0041	CORE.ANALOG.FIRE_STRTS	Turbine Number of Fired Starts
3:0042	CORE.ANALOG.TRUNHRS	Turbine Run Hours (accumulated)
3:0043	CORE.ANALOG.SD_NUM	Turbine CORE Shutdowns (accumulated)
3:0044		
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3:0100		*** Atlas H/W Analog Signals ***
3:0101	A02_TC.DSS_01.TSS_ATL	GG SPEED PROBE A
3:0102	A02_TC.DSS_02.TSS_ATL	PT SPEED PROBE A
3:0103	A02_TC.AI_01.AI_ATL	GAS FUEL VLV POSITION FDBK
3:0104	A02_TC.AI_02.AI_ATL	REMOTE PT SPEED REF SETTING
3:0105	A02_TC.AI_03.AI_ATL	GENERATOR MW LOAD SENSOR
3:0106	A02_TC.AI_04.AI_ATL	LIQUID FUEL VLV POSITION FDBK
3:0107	DISPLAY.AI05.A_SW	AMBIENT TURB INLET TEMP (4-20mA)
3:0108	DISPLAY.AI06.A_SW	EGT TEMP SUMMARY (if 4-20mA used)
3:0109	A02_TC.AO_01.DISPLAY	PT ACTUAL SPEED READOUT
3:0110	A02_TC.AO_02.DISPLAY	PT REFERENCE SPEED READOUT
3:0111	A02_TC.AO_03.DISPLAY	FUEL VALVE DEMAND READOUT
3:0112	A02_TC.AO_04.DISPLAY	EXHAUST GAS TEMP READOUT
3:0113	A02_TC.AO_05.DISPLAY	CDP READOUT
3:0114	A02_TC.AO_06.DISPLAY	CUSTOMER AO
3:0115	A02_TC.ACT_01.ACT_ATL	GAS FUEL VALVE DEMAND
3:0116	A02_TC.ACT_02.ACT_ATL	LIQUID FUEL VALVE DEMAND
3:0117	A03_COMBO.DSS_03.TSS_ATL	GG SPEED PROBE B
3:0118	A03_COMBO.DSS_04.TSS_ATL	PT SPEED PROBE B
3:0119	DISPLAY.TC01.A_SW	EGT T/C #1
3:0120	DISPLAY.TC04.A_SW	EGT T/C #4
3:0121	DISPLAY.TC07.A_SW	EGT T/C #7
3:0122	DISPLAY.TC10.A_SW	EGT T/C #10
3:0123	DISPLAY.TC13.A_SW	EGT T/C #13
3:0124	DISPLAY.TC16.A_SW	EGT T/C #16
3:0125	DISPLAY.REM_CJ.A_SW	REMOTE COLD JUNCT COMP (4-20mA)
3:0126	A03_COMBO.AI_08.AI_420_ATL	CUSTOMER AI
3:0127	A03_COMBO.AI_09.AI_420_ATL	CUSTOMER AI
3:0128	A03_COMBO.AI_10.AI_420_ATL	CUSTOMER AI
3:0129	DISPLAY.CDPA.A_SW	CDP SENSOR A (4-20 mA)
3:0130	DISPLAY.RTD01.A_SW	AMBIENT TURB INLET TEMP A (RTD)
3:0131	DISPLAY.RTD02.A_SW	CUSTOMER CONFIGURABLE RTD
3:0132	DISPLAY.RTD03.A_SW	CUSTOMER CONFIGURABLE RTD
3:0133	DISPLAY.RTD04.A_SW	CUSTOMER CONFIGURABLE RTD
3:0134	DISPLAY.CJ01.A_SW	T/C COLD JUNCTION SENSOR
3:0135	A03_COMBO.AO_07.DISPLAY	GG REFERENCE READOUT
3:0136	A03_COMBO.AO_08.DISPLAY	GG ACTUAL SPEED READOUT
3:0137	A04_COMBO.DSS_05.TSS_ATL	CUSTOMER FREQUENCY A
3:0138	A04_COMBO.DSS_06.TSS_ATL	CUSTOMER FREQUENCY B
3:0139	DISPLAY.TC02.A_SW	EGT T/C #2
3:0140	DISPLAY.TC05.A_SW	EGT T/C #5
3:0141	DISPLAY.TC08.A_SW	EGT T/C #8
3:0142	DISPLAY.TC11.A_SW	EGT T/C #11
3:0143	DISPLAY.TC14.A_SW	EGT T/C #14
3:0144	DISPLAY.TC17.A_SW	EGT T/C #17
3:0145	A04_COMBO.AI_12.AI_420_ATL	CUSTOMER AI
3:0146	A04_COMBO.AI_13.AI_420_ATL	CUSTOMER AI
3:0147	A04_COMBO.AI_14.AI_420_ATL	GAS FUEL SUPPLY PRESSURE
3:0148	A04_COMBO.AI_15.AI_420_ATL	GAS FUEL MANIFOLD PRESSURE
3:0149	DISPLAY.CDPB.A_SW	CDP SENSOR B (4-20 mA)
3:0150	DISPLAY.RTD05.A_SW	CUSTOMER CONFIGURABLE RTD
3:0151	DISPLAY.RTD06.A_SW	CUSTOMER CONFIGURABLE RTD
3:0152	DISPLAY.RTD07.A_SW	CUSTOMER CONFIGURABLE RTD
3:0153	DISPLAY.RTD08.A_SW	CUSTOMER CONFIGURABLE RTD
3:0154	DISPLAY.CJ02.A_SW	T/C COLD JUNCTION SENSOR
3:0155	A04_COMBO.AO_09.DISPLAY	NOX VALVE DEMAND
3:0156	A04_COMBO.AO_10.DISPLAY	NOX VALVE READOUT
3:0157	A05_COMBO.DSS_07.TSS_ATL	CUSTOMER FREQUENCY C
3:0158	A05_COMBO.DSS_08.TSS_ATL	CUSTOMER FREQUENCY D
3:0159	DISPLAY.TC03.A_SW	EGT T/C #3
3:0160	DISPLAY.TC06.A_SW	EGT T/C #6
3:0161	DISPLAY.TC09.A_SW	EGT T/C #9
3:0162	DISPLAY.TC12.A_SW	EGT T/C #12
3:0163	DISPLAY.TC15.A_SW	EGT T/C #15
3:0164	DISPLAY.TC18.A_SW	EGT T/C #18
3:0165	A05_COMBO.AI_17.AI_420_ATL	NOX VALVE POSITION FDBK
3:0166	A05_COMBO.AI_18.AI_420_ATL	POWER AUGMENTATION STEAM FLOW
3:0167	A05_COMBO.AI_19.AI_420_ATL	POWER AUGMENTATION STEAM PRESSR

3:0168	A05_COMBO.AI_20.AI_420_ATL	NOX WATER OR STEAM FLOW
3:0169	A05_COMBO.AI_21.AI_420_ATL	NOX WATER OR STEAM PRESSURE
3:0170	DISPLAY.RTD09.A_SW	CUSTOMER CONFIGURABLE RTD
3:0171	DISPLAY.RTD10.A_SW	NOX WATER OR STEAM TEMP
3:0172	DISPLAY.RTD11.A_SW	POWER AUGMENTATION STEAM TEMP
3:0173	DISPLAY.RTD12.A_SW	AMBIENT TURB INLET TEMP B (RTD)
3:0174	DISPLAY.CJ03.A_SW	T/C COLD JUNCTION SENSOR
3:0175	A05_COMBO.AO_11.DISPLAY	POWER AUG VALVE DEMAND
3:0176	A05_COMBO.AO_12.DISPLAY	POWER AUG VALVE READOUT
3:0177		
3:0178		
3:0179		
3:0180		
3:0181		
3:0182		
3:0183		
3:0184		
3:0185		
3:0186		
3:0187		
3:0188		
3:0189		
3:0190		
3:0191		
3:0192		
3:0193		
3:0194		
3:0195		
3:0196		
3:0197		
3:0198		
3:0199		
3:0200	*0.0 (-32000.0, 32000.0)	** Distributed I/O & LL Signals **
3:0201	*0.0 (-32000.0, 32000.0)	
3:0202	*0.0 (-32000.0, 32000.0)	
3:0203	*0.0 (-32000.0, 32000.0)	
3:0204	*0.0 (-32000.0, 32000.0)	
3:0205	*0.0 (-32000.0, 32000.0)	
3:0206	*0.0 (-32000.0, 32000.0)	
3:0207	*0.0 (-32000.0, 32000.0)	
3:0208	*0.0 (-32000.0, 32000.0)	
3:0209	*0.0 (-32000.0, 32000.0)	
3:0210	*0.0 (-32000.0, 32000.0)	
3:0211	*0.0 (-32000.0, 32000.0)	
3:0212	*0.0 (-32000.0, 32000.0)	
3:0213	*0.0 (-32000.0, 32000.0)	
3:0214	*0.0 (-32000.0, 32000.0)	
3:0215	*0.0 (-32000.0, 32000.0)	
3:0216	*0.0 (-32000.0, 32000.0)	
3:0217	*0.0 (-32000.0, 32000.0)	
3:0218	*0.0 (-32000.0, 32000.0)	
3:0219	*0.0 (-32000.0, 32000.0)	
3:0220	*0.0 (-32000.0, 32000.0)	
3:0221	*0.0 (-32000.0, 32000.0)	
3:0222	*0.0 (-32000.0, 32000.0)	
3:0223	*0.0 (-32000.0, 32000.0)	
3:0224	*0.0 (-32000.0, 32000.0)	
3:0225	*0.0 (-32000.0, 32000.0)	
3:0226	*0.0 (-32000.0, 32000.0)	
3:0227	*0.0 (-32000.0, 32000.0)	
3:0228	*0.0 (-32000.0, 32000.0)	
3:0229	*0.0 (-32000.0, 32000.0)	
3:0230	*0.0 (-32000.0, 32000.0)	
3:0231	*0.0 (-32000.0, 32000.0)	
3:0232	*0.0 (-32000.0, 32000.0)	
3:0233	*0.0 (-32000.0, 32000.0)	
3:0234	*0.0 (-32000.0, 32000.0)	
3:0235	*0.0 (-32000.0, 32000.0)	
3:0236	*0.0 (-32000.0, 32000.0)	
3:0237	*0.0 (-32000.0, 32000.0)	

3:0238	*0.0 (-32000.0, 32000.0)	
3:0239	*0.0 (-32000.0, 32000.0)	
3:0240	*0.0 (-32000.0, 32000.0)	
3:0241	*0.0 (-32000.0, 32000.0)	
3:0242	*0.0 (-32000.0, 32000.0)	
3:0243	*0.0 (-32000.0, 32000.0)	
3:0244	*0.0 (-32000.0, 32000.0)	
3:0245	*0.0 (-32000.0, 32000.0)	
3:0246	*0.0 (-32000.0, 32000.0)	
3:0247	*0.0 (-32000.0, 32000.0)	
3:0248	*0.0 (-32000.0, 32000.0)	
3:0249	*0.0 (-32000.0, 32000.0)	
3:0250	*0.0 (-32000.0, 32000.0)	
3:0251	*0.0 (-32000.0, 32000.0)	
3:0252	*0.0 (-32000.0, 32000.0)	
3:0253	*0.0 (-32000.0, 32000.0)	
3:0254	*0.0 (-32000.0, 32000.0)	
3:0255	*0.0 (-32000.0, 32000.0)	
3:0256	*0.0 (-32000.0, 32000.0)	
3:0257	*0.0 (-32000.0, 32000.0)	
3:0258	*0.0 (-32000.0, 32000.0)	
3:0259	*0.0 (-32000.0, 32000.0)	
3:0260	*0.0 (-32000.0, 32000.0)	
3:0261	*0.0 (-32000.0, 32000.0)	
3:0262	*0.0 (-32000.0, 32000.0)	
3:0263	*0.0 (-32000.0, 32000.0)	
3:0264	*0.0 (-32000.0, 32000.0)	
3:0265	*0.0 (-32000.0, 32000.0)	
3:0266	*0.0 (-32000.0, 32000.0)	
3:0267	*0.0 (-32000.0, 32000.0)	
3:0268	*0.0 (-32000.0, 32000.0)	
3:0269	*0.0 (-32000.0, 32000.0)	
3:0270	*0.0 (-32000.0, 32000.0)	
3:0271	*0.0 (-32000.0, 32000.0)	
3:0272	*0.0 (-32000.0, 32000.0)	
3:0273	*0.0 (-32000.0, 32000.0)	
3:0274	*0.0 (-32000.0, 32000.0)	
3:0275	*0.0 (-32000.0, 32000.0)	
3:0276	*0.0 (-32000.0, 32000.0)	
3:0277	*0.0 (-32000.0, 32000.0)	
3:0278	*0.0 (-32000.0, 32000.0)	
3:0279	*0.0 (-32000.0, 32000.0)	
3:0280	*0.0 (-32000.0, 32000.0)	
3:0281	*0.0 (-32000.0, 32000.0)	
3:0282	*0.0 (-32000.0, 32000.0)	
3:0283	*0.0 (-32000.0, 32000.0)	
3:0284	*0.0 (-32000.0, 32000.0)	
3:0285	*0.0 (-32000.0, 32000.0)	
3:0286	*0.0 (-32000.0, 32000.0)	
3:0287	*0.0 (-32000.0, 32000.0)	
3:0288	*0.0 (-32000.0, 32000.0)	
3:0289	*0.0 (-32000.0, 32000.0)	
3:0290	*0.0 (-32000.0, 32000.0)	
3:0291	*0.0 (-32000.0, 32000.0)	
3:0292	*0.0 (-32000.0, 32000.0)	
3:0293	*0.0 (-32000.0, 32000.0)	
3:0294	*0.0 (-32000.0, 32000.0)	
3:0295	*0.0 (-32000.0, 32000.0)	
3:0296	*0.0 (-32000.0, 32000.0)	
3:0297	*0.0 (-32000.0, 32000.0)	
3:0298	*0.0 (-32000.0, 32000.0)	
3:0299	*0.0 (-32000.0, 32000.0)	
3:0300	*0.0 (-32000.0, 32000.0)	
Analog Writes (RPTaw)		
Addr		Description
4:0001		Analog Out #1 Force

4:0002		Analog Out #2 Force
4:0003		Analog Out #3 Force
4:0004		Analog Out #4 Force
4:0005		Analog Out #5 Force
4:0006		Analog Out #6 Force
4:0007		Analog Out #7 Force
4:0008		Analog Out #8 Force
4:0009		Analog Out #9 Force
4:0010		Analog Out #10 Force
4:0011		Analog Out #11 Force
4:0012		Analog Out #12 Force
4:0013		Actuator Out #1 Force
4:0014		Actuator Out #2 Force
4:0015		Fuel Valve Manual Stroke
4:0016		
4:0017		
4:0018		
4:0019		
4:0020		*** Multi-Prog Commands ***
4:0021		
4:0022		
4:0023		
4:0024		
4:0025		
4:0026		
4:0027		
4:0028		
4:0029		
4:0030		

Appendix C. Alarm List

When an alarm occurs, relay driver output turns on. The RESET will turn the alarm off if the alarm condition has been removed.

```
ALM_1 = EGT 01 DIFFERENCE ALARM
ALM_2 = EGT 02 DIFFERENCE ALARM
ALM_3 = EGT 03 DIFFERENCE ALARM
ALM_4 = EGT 04 DIFFERENCE ALARM
ALM_5 = EGT 05 DIFFERENCE ALARM
ALM_6 = EGT 06 DIFFERENCE ALARM
ALM_7 = EGT 07 DIFFERENCE ALARM
ALM_8 = EGT 08 DIFFERENCE ALARM
ALM_9 = EGT 09 DIFFERENCE ALARM
ALM_10 =     EGT 10 DIFFERENCE ALARM
ALM_11 =     EGT 11 DIFFERENCE ALARM
ALM_12 =     EGT 12 DIFFERENCE ALARM
ALM_13 =     EGT 13 DIFFERENCE ALARM
ALM_14 =     EGT 14 DIFFERENCE ALARM
ALM_15 =     EGT 15 DIFFERENCE ALARM
ALM_16 =     EGT 16 DIFFERENCE ALARM
ALM_17 =     EGT 17 DIFFERENCE ALARM
ALM_18 =     EGT 18 DIFFERENCE ALARM
ALM_19 =     EGT EXCESSIVE SPREAD ALARM
ALM_20 =     EGT OVERTEMPERATURE ALARM
ALM_21 =     EXCESSIVE NUMBER OF BAD EGT SENSORS
ALM_22 =     EGT UNDER TEMPERATURE ALARM
ALM_23 =     EGT 01 FAULT
ALM_24 =     EGT 02 FAULT
ALM_25 =     EGT 03 FAULT
ALM_26 =     EGT 04 FAULT
ALM_27 =     EGT 05 FAULT
ALM_28 =     EGT 06 FAULT
ALM_29 =     EGT 07 FAULT
ALM_30 =     EGT 08 FAULT
ALM_31 =     EGT 09 FAULT
ALM_32 =     EGT 10 FAULT
ALM_33 =     EGT 11 FAULT
ALM_34 =     EGT 12 FAULT
ALM_35 =     EGT 13 FAULT
ALM_36 =     EGT 14 FAULT
ALM_37 =     EGT 15 FAULT
ALM_38 =     EGT 16 FAULT
ALM_39 =     EGT 17 FAULT
ALM_40 =     EGT 18 FAULT
ALM_41 =     GG SPEED SENSOR A FAULT
ALM_42 =     GG SPEED SENSOR B FAULT
ALM_43 =     NOX STEAM FLOW SENSOR FAULT
ALM_44 =     NOX STEAM PRESSURE SENSOR FAULT
ALM_45 =     NOX STEAM TEMP SENSOR FAULT
ALM_46 =     PT SPEED SENSOR A FAULT
ALM_47 =     PT SPEED SENSOR B FAULT
ALM_48 =     PWR AUG STEAM FLOW SENSOR FAULT
ALM_49 =     PWR AUG STEAM PRESSURE SENSOR FAULT
ALM_50 =     PWR AUG STEAM TEMP SENSOR FAULT
ALM_51 =     REMOTE REFERENCE SIGNAL FAULT
ALM_52 =     CDP SENSOR A FAULT
ALM_53 =     CDP SENSOR B FAULT
ALM_54 =     GG OVERSPEED ALARM
ALM_55 =     PT OVERSPEED ALARM
ALM_56 =     AMBIENT SENSOR A FAULT
ALM_57 =     AMBIENT SENSOR B FAULT
```

```
ALM_58 =      BOTH AMBIENT SENSORS FAILED
ALM_59 =      GAS FUEL DRIVER FAULT (RUNNING LIQUID)
ALM_60 =      LIQUID FUEL DRIVER FAULT (RUNNING GAS)
ALM_61 =      ATLAS TEMP ALARM (CHECK FAN)
ALM_62 =      ATLAS POWER SUPPLY ALARM
ALM_63 =      MEGAWATT SENSOR FAULT
ALM_64 =      GG SPEED SENSOR DIFFERENCE ALARM
ALM_65 =      PT SPEED SENSOR DIFFERENCE ALARM
ALM_66 =      GG OR PT OVERSPEED TEST ENABLED
ALM_67 =      SPARE
ALM_68 =      SPARE
ALM_69 =      SPARE
ALM_70 =      SPARE
ALM_71 =      SPARE
ALM_72 =      SPARE
ALM_73 =      SPARE
ALM_74 =      SPARE
ALM_75 =      SPARE
```

NOTE
* Dependent on configuration, some Alarms are optional

Appendix D. Shutdown List

```
SD_1 =  EXTERNAL SHUTDOWN
SD_2 =  GAS DRIVER FAULT
SD_3 =  LIQUID DRIVER FAULT
SD_4 =  THREE ADJACENT EGT FAULT
SD_5 =  ANALOG EGT SENSOR FAULT
SD_6 =  EGT EXCESSIVE SPREAD
SD_7 =  SINGLE EGT TC FAULT
SD_8 =  EXCESSIVE NUMBER OF BAD EGT SENSORS
SD_9 =  GG SPEED SENSOR FAULT
SD_10 = GG OVERSPEED
SD_11 = PT OVERSPEED
SD_12 = PT SPEED SENSOR FAULT
SD_13 = EGT OVERTEMP SHUTDOWN
SD_14 = CDP SENSORS FAILED
SD_15 = COMPRESSOR STALL DETECTED
SD_16 = FLAME OUT DETECTED
SD_17 = CONTROL IS NOT CONFIGURED
SD_18 = CDP OVERPRESSURE SD
SD_19 = SPARE
SD_20 = SPARE
SD_21 = SPARE
SD_22 = SPARE
SD_23 = SPARE
SD_24 = SPARE
SD_25 = SPARE
SD_26 = SPARE
SD_27 = SPARE
SD_28 = SPARE
SD_29 = SPARE
SD_30 = SPARE
```

NOTE
* Dependent on configuration, some Shutdowns are optional

Appendix E. Configuration and Service Tunables Worksheet

Control Part Number ____________________

Software Number & Revision Letter ____________________

Control Serial Number ____________________

I/O CONFIGURATION NOTES

MPUs:
GG MPUs: Maximum frequency sensing = 25000 Hz
PT MPUs: Maximum frequency sensing = 25000 Hz

TEMPERATURE INPUT (summary input):
EGT: display in Deg. F, 4-20mA

TEMPERATURE INPUT (Optional):
T/C #1-18: display in Deg. F, "K" type thermocouple only

AMBIENT SENSOR:
AMBIENT TEMP: display in Deg. F, type sensor = AD59O through a converter or RTD

CONFIGURE SHEETS

The following section outlines optional configurations that can be adjusted in this standard control. These should be checked at the site to be sure they are correct for the turbine being controlled. The default value and range are shown for each tunable.

****
** LIST OF CONFIGURE SHEET TAB HEADERS **
****
** CONFIGURE: SYSTEM **
** CONFIGURE: SPEED SENSOR SETTINGS**
** CONFIGURE: EGT TYPE**
** CONFIGURE: EGT SETTINGS**

Configure: C01- SYSTEM

Category	Field Name		Value	Low	High	User Value
Configure	01 Fuel Type- Gas/Liq/Dual	*	3	1	3	
Configure	02 Confirm Fuel Type		Dual Fuel			
Configure	03 Use Gas Valve Feedbk	*	TRUE			
Configure	04 Use Liquid Valve Feedbk	*	FALSE			
Configure	05 Configure NOX Control 1 = None, 2 = Water, 3 = Steam	*	1	1	3	
Configure	06 Confirm NOX Type		NONE			
Configure	07 Use NOX Valve Feedback	*	FALSE			
Configure	08 Interface Options Mod/LL 1 = Modbus Input, 2 = Ladder Logic, 3 = Modbus OR Ladder Logic	*	3	1	3	

Configure	09 Confirm Interface Option		Modbus or Ladder Logic			
Configure	10 Use Pwr Augmentation	*	FALSE			
Configure	11 PT Rated Speed	*	3600	0	100000	
Configure	12 Remote Speed Reference True to use/False to not use	*	FALSE			
Configure	13 GG Speed for SD Reset GG speed with either UV sensors or temperature flameout detection activated	*	2500	100	100000	
Configure	14 Flame Detect Options 1= EGT >400 deg, 2= UV sensors, 3= Use both, 4= Use GG Speed	*	1	1	4	
Configure	15 GG Spd to Enabl FlamOut	*	3200	1000	10000	
Configure	16 Display Temps in Deg C	*	FALSE			
Configure	17 SD BO True=SD	*	TRUE			
Configure	18 ALM Out Summary or Horn False = Output On (True) when any alarm exists (Summary) True = Output On (True) when any new alarm comes in and an Acknowledge input pulse will turn the output off (false)	*	FALSE			
Configure	19 Tune True= CNFGComplete THIS MUST BE TUNED TRUE TO RUN TURBINE	*	FALSE			

Configure: C02- SPEED SENSOR SETTINGS

Category	Field Name		Value	Low	High	User Value
Configure	01 Use Two GG Sensors	*	FALSE			
Configure	02 GG Max Speed Maximum anticipated running speed of GG	*	12000	1000	30000	
Configure	03 GG Gear Ratio	*	1	0.01	100	
Configure	04 GG Number of Gear Tee	*	47	1	1000	
Configure	05 GG Failed High Setpoint Speed setting for sensor failure	*	10400	1000	30000	
Configure	06 GG Failed Low Setpoint Speed setting for sensor failure	*	300	0	30000	
Configure	07 GG Spread Alarm Level Max difference between two speed sensors for alarm: If using one speed sensor, set this to zero	*	1000	0	30000	
Configure	08 GG Hi Speed Alarm Set	*	10100	100	30000	
Configure	09 GG Overspeed SD Setpo	*	10200	100	30000	
Configure	10 Use Two PT Sensors	*	FALSE			
Configure	11 PT Max Speed Maximum anticipated running speed of PT	*	5000	0	30000	
Configure	12 PT Gear Ratio	*	1	0.01	100	
Configure	13 PT Number of Gear Tee	*	83	1	1000	
Configure	14 PT Failed High Setpoint Speed setting for sensor failure	*	4000	0	30000	
Configure	15 PT Failed Low Setpoint Speed setting for sensor failure	*	275	0	30000	

Configure	16 PT Spread Alarm Level Max difference between two speed sensors for alarm: If using one speed sensor, set this to zero	*	1000	0	30000	
Configure	17 PT Hi Speed Alarm Set	*	3960	100	10000	
Configure	18 PT Overspeed SD Setpo	*	4100	100	10000	

Configure: C03- EGT TYPE & Quantity

Category	Field Name		Value	Low	High	User Value
Configure	01 EGT Configuration 1 = Analog 4-20 mA, 2 = Common TC Harness, 3 = Individual TCs	*	3	1	3	
Configure	02 Confirm EGT Signal Type		Individual T/C			
Configure	03 Use EGT TC01	*	TRUE			
Configure	04 Use EGT TC02	*	TRUE			
Configure	05 Use EGT TC03	*	TRUE			
Configure	06 Use EGT TC04	*	TRUE			
Configure	07 Use EGT TC05	*	TRUE			
Configure	08 Use EGT TC06	*	TRUE			
Configure	09 Use EGT TC07	*	TRUE			
Configure	10 Use EGT TC08	*	TRUE			
Configure	11 Use EGT TC09	*	FALSE			
Configure	12 Use EGT TC10	*	FALSE			
Configure	13 Use EGT TC11	*	FALSE			
Configure	14 Use EGT TC12	*	FALSE			
Configure	15 Use EGT TC13	*	FALSE			
Configure	16 Use EGT TC14	*	FALSE			
Configure	17 Use EGT TC15	*	FALSE			
Configure	17 Use EGT TC16	*	FALSE			
Configure	19 Use EGT TC17	*	FALSE			
Configure	20 Use EGT TC18	*	FALSE			

Configure: C04- EGT SETTINGS

Category	Field Name		Value	Low	High	User Value
Configure	01 Number of TC Used	*	8	0	18	
Configure	02 Use adjacent TC Shutdown	*	FALSE			
Configure	03 TC Snsr Failed Lo Setpnt	*	-100	-1000	2500	
Configure	04 TC Snsr Failed Hi Setpt	*	2000	-1000	2500	
Configure	05 Number of TC Failed Alm	*	10	0	18	
Configure	06 Number of TC Failed SD	*	4	0	18	
Configure	07 Individ TC High Differnc	*	200	50	2000	
Configure	08 Individ TC Low Differnc	*	200	50	2000	
Configure	09 Hi/Low TC Spread Alarm	*	122	0	10000	
Configure	10 Hi/Low TC Spread Shutdwn	*	140	0	10000	
Configure	11 Sum EGT Snsr Fail Setpnt	*	100	0	10000	
Configure	12 EGT Overtemp Alm Setpnt	*	1580	0	10000	
Configure	13 EGT Overtemp SD Setpnt	*	1600	0	10000	
Configure	14 EGT Temp Switch 1 Setpnt	*	400	0	10000	
Configure	15 EGT Temp Switch 2 Setpnt	*	1000	0	10000	
Configure	16 EGT Temp Switch 3 Setpnt	*	1500	0	10000	

SERVICE SHEETS

The following section outlines Optional configurations that can be adjusted in this standard control. These should be checked at the site to be sure they are correct for the turbine being controlled. The default value and range are shown for each tunable. In Service mode, these are values that can be adjusted without shutting down the engine, however, caution should always be used when making on-line adjustments.

****
** LIST OF SERVICE SHEET TAB HEADERS **
****

SERVICE: 01 Configur AnalogIns 1-6
SERVICE: 02 Configur AnalogIns 7-12
SERVICE: 03 Configur AnalogIns 13-18
SERVICE: 04 Configur AnalogIns 19-21
SERVICE: 05 Configur RTD 1-6
SERVICE: 06 Configur RTD 7-12
SERVICE: 07 Fuel System Setup
SERVICE: 08 Confirm Turbine Signals
SERVICE: 09 Ambient Temp Curve
SERVICE: 10 Remote Speed Ref Setup
SERVICE: 11 Valve Calibration & Stroking
SERVICE: 12 GG Speed Control Setup
SERVICE: 13 PT Speed Control Setup
SERVICE: 14 CDP to Fuel Limit Curve
SERVICE: 15 Accel Control PID
SERVICE: 16 Accel Ref. (Steam units)
SERVICE: 17 Decel Curve (CDP) Setup
SERVICE: 18 Decel Control Setup
SERVICE: 19 CDP Control Setup
SERVICE: 20 EGT Control Setup
SERVICE: 21 Generator Settings
SERVICE: 22 NOX Water Curve (Liq)
SERVICE: 23 NOX Water Curve (Gas)
SERVICE: 24 NOX Settings
SERVICE: 25 Turbine Parameters
SERVICE: 26 Configur Analog Out 1-6
SERVICE: 27 Configur Analog Out 7-12
SERVICE: 28 Analog OUTS Used by MP?
SERVICE: 29 Relay OUTS Used by MP?

Service: S01 Configur AnalogIns1-6

Category	Field Name		Value	Low	High	User Value
Service	01 Analog 1 Offset =	*	0	-487500	487500	
Service	02 Analog 1 Gain =	*	1	0	2	
Service	03 Analog 1 Value @ 4 mA =	*	0	-20000	20000	
Service	04 Analog 1 Value @ 20 mA =	*	100	-80000	80000	
Service	05 Analog 2 Offset =	*	0	-487500	487500	
Service	06 Analog 2 Gain =	*	1	0	2	
Service	07 Analog 2 Value @ 4 mA =	*	3600	-20000	20000	
Service	08 Analog 2 Value @ 20 mA =	*	3780	-80000	80000	
Service	09 Analog 3 Offset =	*	0	-487500	487500	
Service	10 Analog 3 Gain =	*	1	0	2	
Service	11 Analog 3 Value @ 4 mA =	*	0	-20000	20000	
Service	12 Analog 3 Value @ 20 mA =	*	30	-80000	80000	
Service	13 Analog 4 Offset =	*	0	-487500	487500	

Service	14 Analog 4 Gain =	*	1	0	2	
Service	15 Analog 4 Value @ 4 mA =	*	0	-20000	20000	
Service	16 Analog 4 Value @ 20 mA =	*	100	-80000	80000	
Service	17 Analog 5 Offset =	*	0	-487500	487500	
Service	18 Analog 5 Gain =	*	1	0	2	
Service	19 Analog 5 Value @ 4 mA =	*	-40	-20000	20000	
Service	20 Analog 5 Value @ 20 mA =	*	140	-80000	80000	
Service	21 Analog 6 Offset =	*	0	-487500	487500	
Service	22 Analog 6 Gain =	*	1	0	2	
Service	23 Analog 6 Value @ 4 mA =	*	0	-20000	20000	
Service	24 Analog 6 Value @ 20 mA =	*	2000	-80000	80000	

Service: S02 Configur AnalogIns7-12

Category	Field Name		Value	Low	High	User Value
Service	01 Analog 7 Offset =	*	0	-487500	487500	
Service	02 Analog 7 Gain =	*	1	0	2	
Service	03 Analog 7 Value @ 4 mA =	*	-40	-20000	20000	
Service	04 Analog 7 Value @ 20 mA	*	140	-20000	20000	
Service	05 Analog 8 Offset =	*	0	-487500	487500	
Service	06 Analog 8 Gain =	*	1	0	2	
Service	07 Analog 8 Value @ 4 mA =	*	0	-20000	20000	
Service	08 Analog 8 Val @ 20 mA =	*	100	-20000	20000	
Service	09 Analog 9 Offset =	*	0	-487500	487500	
Service	10 Analog 9 Gain =	*	1	0	2	
Service	11 Analog 9 Value @ 4 mA =	*	0	-20000	20000	
Service	12 Analog 9 Value @ 20 mA	*	100	-20000	20000	
Service	13 Analog 10 Offset =	*	0	-100	100	
Service	14 Analog 10 Gain =	*	1	0	2	
Service	15 Analog 10 Value @4 mA =	*	0	-20000	20000	
Service	16 Analog 10 Value @20 mA	*	100	-20000	20000	
Service	17 Analog 11 Offset =	*	0	-487500	487500	
Service	18 Analog 11 Gain =	*	1	0	2	
Service	19 Analog 11 Value @ 4 mA	*	0	-20000	20000	
Service	20 Analog 11 Value @20 mA	*	500	-20000	20000	
Service	21 Analog 12 Offset =	*	0	-487500	487500	
Service	22 Analog 12 Gain =	*	1	0	2	
Service	23 Analog 12 Value @4 mA =	*	0	-20000	20000	
Service	24 Analog 12 Value @20 mA	*	100	-20000	20000	

Service: S03 Configur AnalogIns13-18

Category	Field Name		Value	Low	High	User Value
Service	01 Analog 13 Offset =	*	0	-487500	487500	
Service	02 Analog 13 Gain =	*	1	0	2	
Service	03 Analog 13 Value @ 4 mA	*	0	-20000	20000	
Service	04 Analog 13 Value @20 mA	*	100	-20000	20000	
Service	05 Analog 14 Offset =	*	0	-487500	487500	
Service	06 Analog 14 Gain =	*	1	0	2	
Service	07 Analog 14 Value @ 4 mA	*	0	-20000	20000	

Service	08 Analog14 Val @20 mA =	*	500	-20000	20000	
Service	09 Analog 15 Offset =	*	0	-487500	487500	
Service	10 Analog 15 Gain =	*	1	0	2	
Service	11 Analog 15 Value @4 mA	*	0	-20000	20000	
Service	12 Analog 15 Val @20 mA =	*	500	-20000	20000	
Service	13 Analog 16 Offset =	*	0	-487500	487500	
Service	14 Analog 16 Gain =	*	1	0	2	
Service	15 Analog 16 Val @4 mA =	*	0	-20000	20000	
Service	16 Analog 16 Val @20 mA =	*	300	-20000	20000	
Service	17 Analog 17 Offset =	*	0	-487500	487500	
Service	18 Analog 17 Gain =	*	1	0	2	
Service	19 Analog 17 Val @4 mA =	*	0	-20000	20000	
Service	20 Analog 17 Val @20 mA =	*	100	-20000	20000	
Service	21 Analog 18 Offset =	*	0	-487500	487500	
Service	22 Analog 18 Gain =	*	1	0	2	
Service	23 Analog 18 Val @4 mA =	*	0	-20000	20000	
Service	24 Analog 18 Val @20 mA =	*	1000	-80000	80000	

Service: S04 Configur AnalogIns19-21

Category	Field Name		Value	Low	High	User Value
Service	01 Analog 19 Offset =	*	0	-487500	487500	
Service	02 Analog 19 Gain =	*	1	0	2	
Service	03 Analog 19 Val @ 4 mA =	*	0	-20000	20000	
Service	04 Analog 19 Val @ 20 mA	*	1000	-80000	80000	
Service	05 Analog 20 Offset =	*	0	-487500	487500	
Service	06 Analog 20 Gain =	*	1	0	2	
Service	07 Analog 20 Val @ 4 mA =	*	0	-20000	20000	
Service	08 Analog 20 Val @ 20 mA	*	1000	-80000	80000	
Service	09 Analog 21 Offset =	*	0	-487500	487500	
Service	10 Analog 21 Gain =	*	1	0	2	
Service	11 Analog 21 Val @ 4 mA =	*	0	-20000	20000	
Service	12 Analog 21 Val @ 20 mA	*	1000	-80000	80000	

Service: S05 Configure RTD 1-6

Category	Field Name		Value	Low	High	User Value
Service	01 Config RTD 1 Offset	*	0	-487500	487500	
Service	02 Config RTD 1 Gain	*	1	0	2	
Service	03 Config RTD 1 Low Fault	*	-40	-20000	20000	
Service	04 Config RTD 1 High Fault	*	1000	-20000	20000	
Service	05 Config RTD 2 Offset	*	0	-487500	487500	
Service	06 Config RTD 2 Gain	*	1	0	2	
Service	07 Config RTD 2 Low Fault	*	0	-20000	20000	
Service	08 Config RTD 2 High Fault	*	1000	-20000	20000	
Service	09 Config RTD 3 Offset	*	0	-487500	487500	
Service	10 Config RTD 3 Gain	*	1	0	2	
Service	11 Config RTD 3 Low Fault	*	0	-20000	20000	
Service	12 Config RTD 3 High Fault	*	1000	-20000	20000	
Service	13 Config RTD 4 Offset	*	0	-487500	487500	

Service	14 Config RTD 4 Gain	*	1	0	2	
Service	15 Config RTD 4 Low Fault	*	0	-20000	20000	
Service	16 Config RTD 4 High Fault	*	1000	-20000	20000	
Service	17 Config RTD 5 Offset	*	0	-487500	487500	
Service	18 Config RTD 5 Gain	*	1	0	2	
Service	19 Config RTD 5 Low Fault	*	0	-20000	20000	
Service	20 Config RTD 5 High Fault	*	1000	-20000	20000	
Service	21 Config RTD 6 Offset	*	0	-487500	487500	
Service	22 Config RTD 6 Gain	*	1	0	2	
Service	23 Config RTD 6 Low Fault	*	0	-20000	20000	
Service	24 Config RTD 6 High Fault	*	1000	-20000	20000	

Service: S06 Configure RTD 7-12

Category	Field Name		Value	Low	High	User Value
Service	01 Config RTD 7 Offset	*	0	-487500	487500	
Service	02 Config RTD 7 Gain	*	1	0	2	
Service	03 Config RTD 7 Low Fault	*	0	-20000	20000	
Service	04 Config RTD 7 High Fault	*	1000	-20000	20000	
Service	05 Config RTD 8 Offset	*	0	-487500	487500	
Service	06 Config RTD 8 Gain	*	1	0	2	
Service	07 Config RTD 8 Low Fault	*	0	-20000	20000	
Service	08 Config RTD 8 High Fault	*	1000	-20000	20000	
Service	09 Config RTD 9 Offset	*	0	-487500	487500	
Service	10 Config RTD 9 Gain	*	1	0	2	
Service	11 Config RTD 9 Low Fault	*	0	-20000	20000	
Service	12 Config RTD 9 High Fault	*	1000	-20000	20000	
Service	13 Config RTD 10 Offset	*	0	-487500	487500	
Service	14 Config RTD 10 Gain	*	1	0	2	
Service	15 Config RTD 10 Low Fault	*	0	-20000	20000	
Service	16 Config RTD 10 High Fault	*	1000	-20000	20000	
Service	17 Config RTD 11 Offset	*	0	-487500	487500	
Service	18 Config RTD 11 Gain	*	1	0	2	
Service	19 Config RTD 11 Low Fault	*	0	-20000	20000	
Service	20 Config RTD 11 High Fault	*	1000	-20000	20000	
Service	21 Config RTD 12 Offset	*	0	-1000	1000	
Service	22 Config RTD 12 Gain	*	1	0	2	
Service	23 Config RTD 12 Low Fault	*	-40	-20000	20000	
Service	24 Config RTD 12 High Fault	*	1000	-20000	20000	

Service: S07 Fuel System Setup

Category	Field Name		Value	Low	High	User Value
Service	01 Confirm Fuel Type(s)		Dual Fuel			
Service	02 Fuel Transfer Rate	*	0.01667	0.00833	333	
Service	03 Use Electric Liteoff? Start ramp minimum fuel limit in % of valve travel (set below). This sets an "electrical" light off fuel flow. If the fuel valve mechanical minimum stop is set for light-off	*	TRUE			

	flow then set this value to FALSE and the Gas/Liq values to zero.					
Service	04 Start Ramp Rate	*	0.3	0.1	100	
Service	05 Start Ramp Gas Min Fuel	*	3	0	100	
Service	06 Start Ramp Liq Min Fuel	*	3	0	100	

Service: S08 Confirm Turbine Signals

Category	Field Name		Value	Low	High	User Value
Service	01 CDP A (AI#11) Max Valu		500			
Service	02 Use Redundant CDP Snsr	*	FALSE			
Service	03 CDP B (AI#16) Max Valu		300			
Service	04 Ambient Snsr Type	*	4	1	4	
Service	05 Confirm Amb Sensor Typ		Analog 4-20mA			
Service	06 Use Redundant RTD's?	*	FALSE			
Service	07 Ambient Sensor Default	*	80	0	200	
Service	08 MW (AI#03) Max Value=		30			
Service	09 PT Rem Ref (AI#02) Max		3780			
Service	10 EGT Sum (AI#06) Max Va		2000			
Service	11 Use Remote CJ Comp(AI0	*	FALSE			

Service: S09 Ambient Temp Curve

Category	Field Name		Value	Low	High	User Value
Service	01 Amb Bias EGT Curve X1	*	-50	-300	300	
Service	02 Amb Bias EGT Curve Y1	*	1	0	10	
Service	03 Amb Bias EGT Curve X2	*	0	-300	300	
Service	04 Amb Bias EGT Curve Y2	*	1	0	10	
Service	05 Amb Bias EGT Curve X3	*	59	-300	300	
Service	06 Amb Bias EGT Curve Y3	*	1	0	10	
Service	07 Amb Bias EGT Curve X4	*	140	-300	300	
Service	08 Amb Bias EGT Curve Y4	*	1	0	10	

Service: S10 Remote Speed REF Setup

Category	Field Name		Value	Low	High	User Value
Service	01 Remote Ref Low Limit	*	3600	0	10000	
Service	02 Remote Ref High Limit	*	3780	0	50000	
Service	03 Remote Ref Lrg Error Rate	*	4	0	100	
Service	04 Remote Ref Small Window	*	1	0	100	
Service	05 Remote Ref Large Window	*	5	0	100	

Service: S11 Valve Calibrate & Strok

Category	Field Name		Value	Low	High	User Value
Service	01 OK to Enter Cal Mode?		TRUE			
Service	02 Enable Calibration Mod	*	FALSE			
Service	03 Fuel Meter Valve Strok	*	0	0	100	
Service	04 Act1 Type 0-20 / 0-200 0 = 0-20 mA, 1 = 0-200 mA	*	0	0	1	

Service	05 Act1 mA at 0% Dmnd Calibration of GAS fuel act driver current at 0% Demand	*	4	-200	200	
Service	06 Act1 mA at 100% Dmnd Calibration of GAS fuel act driver current at 100% Demand	*	20	-200	200	
Service	07 Act1 Offset	*	0	-200	200	
Service	08 Act1 Gain	*	1	0	2	
Service	09 Act1 Dither This value adjusts the amplitude of the AC component of the actuator signal. Adjust this value in the increasing direction until vibration is noticeable at the terminal shaft of the actuator and decrease the amplitude until the vibration is no longer perceptible.	*	0	0	3	
Service	10 Act2 Type 0-20 / 0-200 0 = 0-20 mA, 1 = 0-200 mA	*	0	0	1	
Service	11 Act2 mA at 0% Dmnd Calibration of LIQ fuel act driver current at 0% Demand	*	4	-200	200	
Service	12 Act2 mA at 100% Dmnd Calibration of LIQ fuel act driver current at 100% Demand	*	20	-200	200	
Service	13 Act2 Offset	*	0	-200	200	
Service	14 Act2 Gain	*	1	0	2	
Service	15 Act2 Dither This value adjusts the amplitude of the AC component of the actuator signal. Adjust this value in the increasing direction until vibration is noticeable at the terminal shaft of the actuator and decrease the amplitude until the vibration is no longer perceptible.	*	0	0	3	
Service	16 NOX Stroke Valve Enabl	*	FALSE			
Service	17 NOX Valve Stroke	*	0	0	100	
Service	18 Pwr Aug Vlv Stroke Ena	*	FALSE			
Service	19 Power Aug Valve Stroke	*	0	0	100	
Service	20 Actuator #1 (Gas) Dema		0			
Service	21 Actuator #1 (Liq) Dema		0			

Service: S12 GG Speed Control Setup

Category	Field Name		Value	Low	High	User Value
Service	01 GG Prop Gain	*	0.08	0.001	100	
Service	02 GG Integral Gain	*	0.26	0.005	50	
Service	03 GG SDR	*	100	0.01	100	
Service	04 GG Ref Low Limit	*	5000	0	10000	
Service	05 GG Ref High Limit Base	*	10100	1000	100000	
Service	06 GG Corrected Ref Limit	*	10100	0	100000	
Service	07 GG Refernce Default Rat	*	20	0	1000	
Service	08 GG Reference Fast Rate	*	50	0	1000	
Service	09 Use GG Auto Override	*	TRUE			
Service	10 GG Speed Switch 1	*	2000	0	100000	

Service	11 GG Speed Switch 2	*	5000	0	100000	
Service	12 GG Speed Switch 3	*	7000	0	100000	
Service	13 GG Overspeed Test Enabl	*	FALSE			
Service	14 GG Ref High Limit Peak	*	10100	1000	100000	
Service	15 Turbine GG Speed		240			
Service	16 GG Speed Reference		5000			
Service	17 GG Speed PID Output Val		100			

Service: S13 PT Speed Control Setup

Category	Field Name		Value	Low	High	User Value
Service	01 PT Prop Gain 1	*	0.5	0	100	
Service	02 PT Integral Gain 1	*	0.8	0	50	
Service	03 PT SDR 1	*	0.2	0.01	100	
Service	04 Use Dual Dynamics	*	TRUE			
Service	05 PT Prop Gain 2	*	0.15	0	100	
Service	06 PT Integral Gain 2	*	0.5	0	50	
Service	07 PT SDR 2	*	0.2	0.01	100	
Service	08 PT Low Limit	*	3500	100	10000	
Service	09 PT High Limit	*	3780	1000	50000	
Service	10 PT Refernce Default Rat	*	2	0	1000	
Service	11 PT Reference Fast Rate	*	4	0	1000	
Service	12 Use PT Auto Override	*	TRUE			
Service	13 Override until GG =	*	6000	0	10000	
Service	14 PT Speed Switch 1	*	1500	0	100000	
Service	15 PT Speed Switch 2	*	3500	0	100000	
Service	16 PT Speed Switch 3	*	3600	0	100000	
Service	17 PT Overspeed Test Enabl	*	FALSE			
Service	18 Turbine PT Speed		175.34			
Service	19 PT Ref Setpoint (Loaded		3500			
Service	20 PT Speed PID Output Val		101			

Service: S14 CDP to Fuel Limit Curve
** If unfamiliar with setting up these schedules – refer to the CDP/Fuel area of the Troubleshooting Section **
CDP/Fuel SCHEDULE biased on CDP (as the X value) as scaled by the user. Output of curves block (Y value) will limit LSS bus in scale of 0-100%, i.e. if output is 50, for a given input, then fuel flow will not be able to increase above 50%. There are separate curves for gas or liquid fuel.
** These Curves are Required for each Fuel used – the Accel PID is optional **
** If a Fuel is not used – place all Y values at 100 % **

Category	Field Name		Value	Low	High	User Value
Service	01 Gas CDP/WF CURVE X1 =	*	2	0	1000	
Service	02 Gas CDP/WF CURVE Y1 =	*	0	0	100	
Service	03 Gas CDP/WF CURVE X2 =	*	10	0	1000	
Service	04 Gas CDP/WF CURVE Y2 =	*	11.46	0	100	
Service	05 Gas CDP/WF CURVE X3 =	*	165	0	1000	
Service	06 Gas CDP/WF CURVE Y3 =	*	64.81	0	100	
Service	07 Gas CDP/WF CURVE X4 =	*	225	0	1000	
Service	08 Gas CDP/WF CURVE Y4 =	*	90	0	100	
Service	09 Gas CDP/WF CURVE X5 =	*	250	0	1000	

Service	10 Gas CDP/WF CURVE Y5 =	*	100	0	100	
Service	11 Liq CDP/WF CURVE X1 =	*	2	0	1000	
Service	12 Liq CDP/WF CURVE Y1 =	*	0	0	100	
Service	13 Liq CDP/WF CURVE X2 =	*	10	0	1000	
Service	14 Liq CDP/WF CURVE Y2 =	*	11.46	0	100	
Service	15 Liq CDP/WF CURVE X3 =	*	165	0	1000	
Service	16 Liq CDP/WF CURVE Y3 =	*	64.81	0	100	
Service	17 Liq CDP/WF CURVE X4 =	*	225	0	1000	
Service	18 Liq CDP/WF CURVE Y4 =	*	90	0	100	
Service	19 Liq CDP/WF CURVE X5 =	*	250	0	1000	
Service	20 Liq CDP/WF CURVE Y5 =	*	100	0	100	
Service	21 CDP/WF Curve Output Va		12.64			

Service: S15 ACCEL Control PID

** If unfamiliar with setting up these schedules – refer to the Accel/Decel area of the Troubleshooting Section **

The reference for the PID setpoint is defined by the curve entered here. The forcing function (X values) input is the corrected GG speed and the output (Y values) is the acceptable acceleration limit of the GG shaft in rpm/sec. This curve is for units without Steam injection

Category	Field Name		Value	Low	High	User Value
Service	01 Use Accel PID?	*	TRUE			
Service	02 Confirm Choice		TRUE			
Service	03 Accel PID Prop Gain	*	0	0.001	1	
Service	04 Accel PID Integral Gain	*	20	0.1	50	
Service	05 Accel Ref Curv X1 =	*	0	0	500	
Service	06 Accel Ref Curv Y1 =	*	75	10	2000	
Service	07 Accel Ref Curv X2 =	*	5900	1000	20000	
Service	08 Accel Ref Curv Y2 =	*	75	10	2000	
Service	09 Accel Ref Curv X3 =	*	6800	1000	20000	
Service	10 Accel Ref Curv Y3 =	*	200	10	2000	
Service	11 Accel Ref Curv X4 =	*	8130	1000	20000	
Service	12 Accel Ref Curv Y4 =	*	1545	100	2000	
Service	13 Accel Ref Curv X5 =	*	9530	1000	20000	
Service	14 Accel Ref Curv Y5 =	*	725	100	2000	
Service	15 Accel Ref Curv X6 =	*	10200	1000	20000	
Service	16 Accel Ref Curv Y6 =	*	725	100	2000	

Service: S16 ACCEL Ref (STM Units)

** If unfamiliar with setting up these schedules – refer to the Accel/Decel area of the Troubleshooting Section **

The reference for the PID setpoint is defined by the curve entered here. The forcing function (X values) input is the corrected GG speed and the output (Y values) is the acceptable acceleration limit of the GG shaft in rpm/sec. This curve is for units that use Steam injection for NOX control or Power Augmentation.

Category	Field Name		Value	Low	High	User Value
Service	01 Accel Ref STMCurv X1 =	*	0	0	500	
Service	02 Accel Ref STMCurv Y1 =	*	75	10	2000	
Service	03 Accel Ref STMCurv X2 =	*	5900	1000	20000	
Service	04 Accel Ref STMCurv Y2 =	*	75	10	2000	

Service	05 Accel Ref STMCurv X3 =	*	6800	1000	20000	
Service	06 Accel Ref STMCurv Y3 =	*	200	10	2000	
Service	07 Accel Ref STMCurv X4 =	*	8130	1000	20000	
Service	08 Accel Ref STMCurv Y4 =	*	1545	100	2000	
Service	09 Accel Ref STMCurv X5 =	*	9530	1000	20000	
Service	10 Accel Ref STMCurv Y5 =	*	330	100	2000	
Service	11 Accel Ref STMCurv X6 =	*	10200	1000	20000	
Service	12 Accel Ref STMCurv Y6 =	*	330	100	2000	

Service: S17 DECEL Curve (CDP) SETUP

DECEL SCHEDULE biased by CDP (as the X value) as scaled by the user. Output of curves block will limit HSS bus in scale of 0-100%, i.e. if output is 50, for a given input, then fuel flow will not be able to decrease below 50%. There are separate curves for gas or liquid fuel.

Category	Field Name		Value	Low	High	User Value
Service	01 Using Decel (CDP) Curv		TRUE			
Service	02 Gas DECEL CURVE X1 =	*	0	0	1000	
Service	03 Gas DECEL CURVE Y1 =	*	0	0	100	
Service	04 Gas DECEL CURVE X2 =	*	35	0	1000	
Service	05 Gas DECEL CURVE Y2 =	*	0	0	100	
Service	06 Gas DECEL CURVE X3 =	*	75	0	1000	
Service	07 Gas DECEL CURVE Y3 =	*	10	0	100	
Service	08 Gas DECEL CURVE X4 =	*	250	0	1000	
Service	09 Gas DECEL CURVE Y4 =	*	20	0	100	
Service	10 Gas DECEL CURVE X5 =	*	300	0	1000	
Service	11 Gas DECEL CURVE Y5 =	*	30	0	100	
Service	12 Liq DECEL CURVE X1 =	*	2	0	1000	
Service	13 Liq DECEL CURVE Y1 =	*	0	0	100	
Service	14 Liq DECEL CURVE X2 =	*	35	0	1000	
Service	15 Liq DECEL CURVE Y2 =	*	0	0	100	
Service	16 Liq DECEL CURVE X3 =	*	75	0	1000	
Service	17 Liq DECEL CURVE Y3 =	*	10	0	100	
Service	18 Liq DECEL CURVE X4 =	*	250	0	1000	
Service	19 Liq DECEL CURVE Y4 =	*	20	0	100	
Service	20 Liq DECEL CURVE X5 =	*	300	0	1000	
Service	21 Liq DECEL CURVE Y5 =	*	30	0	100	

Service: S18 DECEL Control Setup

DECEL SCHEDULE based on the Derivative of the GG speed (as the X value). Output of curves block will be the negative speed rate of change limit that will be the Reference signal for the PID.

Category	Field Name		Value	Low	High	User Value
Service	01 Use Decel PID?	*	FALSE			
Service	02 Confirm Choice		FALSE			
Service	03 Decel PID Prop Gain	*	0.01	0.001	1	
Service	04 Decel PID Integral Gain	*	20	0.1	50	
Service	06 DECEL Ref CURVE Y1 =	*	-100	-5000	5000	
Service	07 DECEL Ref CURVE X2 =	*	7200	1000	15000	
Service	08 DECEL Ref CURVE Y2 =	*	-100	-5000	5000	

Service	09 DECEL Ref CURVE X3 =	*	7763	1000	15000	
Service	10 DECEL Ref CURVE Y3 =	*	-750	-5000	5000	
Service	11 DECEL Ref CURVE X4 =	*	7930	1000	15000	
Service	12 DECEL Ref CURVE Y4 =	*	-2400	-5000	5000	
Service	13 DECEL Ref CURVE X5 =	*	8353	1000	15000	
Service	14 DECEL Ref CURVE Y5 =	*	-4200	-5000	5000	
Service	15 DECEL Ref CURVE X6 =	*	10050	1000	15000	
Service	16 DECEL Ref CURVE Y6 =	*	-4200	-5000	5000	

Service: S19 CDP Control Setup

Category	Field Name		Value	Low	High	User Value
Service	01 CDP Control Setpoint	*	285	0	1000	
Service	02 CDP PID Proportional Gn	*	0.6	0.001	100	
Service	03 CDP PID Integral Gain	*	7.8	0	50	
Service	04 CDP PID SDR term	*	100	0.01	100	
Service	05 Use Corrected CDP Setpt Use Corrected value of CDP as setpoint?	*	FALSE			
Service	06 Turbine CDP Value		13.37			
Service	07 CDP PID Output Value		102			

Service: S20 EGT Control Setup

Category	Field Name		Value	Low	High	User Value
Service	01 EGT Contrl Base Setpoint	*	1575	0	10000	
Service	02 EGT PID Proportional Gn	*	0.3	0.001	100	
Service	03 EGT PID Integral Gain	*	0.8	0	50	
Service	04 EGT PID SDR term	*	100	0.01	100	
Service	05 Use Temp Start Ramp	*	FALSE			
Service	06 Temp Ramp Lo Temp	*	1575	0	10000	
Service	07 Temp Ramp Hi Temp	*	1575	0	10000	
Service	08 Temp Ramp Rise Rate	*	10	0	100	
Service	09 EGT Contrl Peak Setpoint	*	1585	0	10000	
Service	10 Turbine EGT Average Temp		59.98			
Service	11 EGT PID Output Value		102			

Service: S21 Generator Settings

Category	Field Name		Value	Low	High	User Value
Service	01 Confirm MW Range		30			
Service	02 Droop Percent	*	5	0	8	
Service	03 Use CDP Droop if MW Fail	*	TRUE			
Service	04 Use CDP for Load Feedbk	*	FALSE			
Service	05 MW vs CDP curve X1	*	10	0	500	
Service	06 MW vs CDP curve Y1	*	0	0	100	
Service	07 MW vs CDP curve X2	*	50	0	500	
Service	08 MW vs CDP curve Y2	*	0	0	100	
Service	09 MW vs CDP curve X3	*	100	0	500	
Service	10 MW vs CDP curve Y3	*	0	0	100	
Service	11 MW vs CDP curve X4	*	200	0	500	

Service	12 MW vs CDP curve Y4	*	0	0	100	
Service	13 MW vs CDP curve X5	*	300	0	500	
Service	14 MW vs CDP curve Y5	*	0	0	100	
Service	15 Use MW Limiter (=2)	*	1	1	2	
Service	16 MW Setpoint	*	23	1	50	
Service	17 MW PID Prop Gain	*	1.25	0.001	100	
Service	18 MW PID Integral Gain	*	2.2	0	50	

Service: S22 NOX Water Curve (LIQ)

Category	Field Name		Value	Low	High	User Value
Service	01 LIQ VLV DMD (10%) =	*	0	0	25000	
Service	02 LIQ VLV DMD (20%) =	*	0	0	25000	
Service	03 LIQ VLV DMD (30%) =	*	0	0	25000	
Service	04 LIQ VLV DMD (40%) =	*	0	0	25000	
Service	05 LIQ VLV DMD (50%) =	*	0	0	25000	
Service	06 LIQ VLV DMD (60%) =	*	0	0	25000	
Service	07 LIQ VLV DMD (70%) =	*	0	0	25000	
Service	08 LIQ VLV DMD (80%) =	*	0	0	25000	
Service	09 LIQ VLV DMD (90%) =	*	0	0	25000	
Service	10 LIQ VLV DMD (100%) =	*	0	0	25000	
Service	11 LIQ VLV DMD (MAX) =	*	0	0	25000	

Service: S23 NOX Water Curve (GAS)

Category	Field Name		Value	Low	High	User Value
Service	01 GAS VLV DMD (10%) =	*	0	0	25000	
Service	02 GAS VLV DMD (20%) =	*	0	0	25000	
Service	03 GAS VLV DMD (30%) =	*	0	0	25000	
Service	04 GAS VLV DMD (40%) =	*	0	0	25000	
Service	05 GAS VLV DMD (50%) =	*	0	0	25000	
Service	06 GAS VLV DMD (60%) =	*	0	0	25000	
Service	07 GAS VLV DMD (70%) =	*	0	0	25000	
Service	08 GAS VLV DMD (80%) =	*	0	0	25000	
Service	09 GAS VLV DMD (90%) =	*	0	0	25000	
Service	10 GAS VLV DMD (100%) =	*	0	0	25000	
Service	11 GAS VLV DMD (MAX) =	*	0	0	25000	

Service: S24 NOX Settings

Category	Field Name		Value	Low	High	User Value
Service	01 NOX Vlv Flow Rate (pph)	*	100	0.1	30000	
Service	02 Initial pph ratio (Gas)	*	1	0.5	1.5	
Service	03 Initial pph ratio (Liq)	*	1	0.5	1.5	
Service	04 Use DP Flow for NOX Stm	*	FALSE			

Service: S25 Turbine Parameters

Category	Field Name		Value	Low	High	User Value
Service	01 Alarm Latch Status		TRUE			

Service	02 Alarm Condition #		25			
Service	03 Shutdown Latch Status		TRUE			
Service	04 Shutdown Condition #		17			
Service	05 LSS Bus Position %		0.33			
Service	06 HSS Bus Position %		0.33			
Service	07 Fuel Valve Demand %		0			
Service	08 GG Speed (rpm)		240			
Service	09 GG Speed Ref (rpm)		5000			
Service	10 PT Speed (rpm)		175.31			
Service	11 PT Speed Ref (rpm)		3500			
Service	12 EGT Temp (deg F)		60			
Service	13 Amb Inlet Temp (deg F)		66.02			
Service	14 CDP (psia)		13.44			
Service	15 Turbine Load (mw)		-0.01			
Service	16 Disable Modbus Writes	*	FALSE			

Service: S26 Configur AnalogOUT 1-6

Category	Field Name		Value	Low	High	User Value
Service	01 Analog Out 1 Offset	*	0	-1000	1000	
Service	02 Analog Out 1 Gain	*	1	0	2	
Service	03 Analog Out1 Val at 4 mA	*	0	-20000	20000	
Service	04 Analog Out1 Val at 20 m	*	5000	-20000	20000	
Service	05 Analog Out 2 Offset	*	0	-1000	1000	
Service	06 Analog Out 2 Gain	*	1	0	2	
Service	07 Analog Out2 Val at 4 mA	*	0	-20000	20000	
Service	08 Analog Out2 Val at 20 m	*	5000	-20000	20000	
Service	09 Analog Out 3 Offset	*	0	-487500	487500	
Service	10 Analog Out 3 Gain	*	1	0	2	
Service	11 Analog Out3 Val at 4 mA	*	0	-20000	20000	
Service	12 Analog Out3 Val at 20 m	*	100	-20000	20000	
Service	13 Analog Out 4 Offset	*	0	-487500	487500	
Service	14 Analog Out 4 Gain	*	1	0	2	
Service	15 Analog Out4 Val at 4 mA	*	0	-20000	20000	
Service	16 Analog Out4 Val at 20 m	*	2000	-20000	20000	
Service	17 Analog Out 5 Offset	*	0	-487500	487500	
Service	18 Analog Out 5 Gain	*	1	0	2	
Service	19 Analog Out5 Val at 4 mA	*	0	-20000	20000	
Service	20 Analog Out5 Val at 20 m	*	300	-20000	20000	
Service	21 Analog Out 6 Offset	*	0	-1000	1000	
Service	22 Analog Out 6 Gain	*	1	0	2	
Service	23 Analog Out6 Val at 4 mA	*	0	-20000	20000	
Service	24 Analog Out6 Val at 20 m	*	100	-20000	20000	

Service: S27 Configur AnalogOUT 7-12

Category	Field Name		Value	Low	High	User Value
Service	01 Analog Out 7 Offset	*	0	-487500	487500	
Service	02 Analog Out 7 Gain	*	1	0	2	
Service	03 Analog Out7 Val at 4 m	*	0	-20000	20000	

Service	04 Analog Out7 Val at 20	*	11000	-20000	20000	
Service	05 Analog Out 8 Offset	*	0	-487500	487500	
Service	06 Analog Out 8 Gain	*	1	0	2	
Service	07 Analog Out8 Val at 4 m	*	0	-20000	20000	
Service	08 Analog Out8 Val at 20	*	11000	-20000	20000	
Service	09 Analog Out 9 Offset	*	0	-487500	487500	
Service	10 Analog Out 9 Gain	*	1	0	2	
Service	11 Analog Out9 Val at 4 m	*	0	-20000	20000	
Service	12 Analog Out9 Val at 20	*	100	-20000	20000	
Service	13 Analog Out 10 Offset	*	0	-487500	487500	
Service	14 Analog Out 10 Gain	*	1	0	2	
Service	15 Analog Out10 Val at 4	*	0	-20000	20000	
Service	16 Analog Out10 Val at20	*	100	-20000	20000	
Service	17 Analog Out 11 Offset	*	0	-487500	487500	
Service	18 Analog Out 11 Gain	*	1	0	2	
Service	19 Analog Out11 Val at 4	*	0	-20000	20000	
Service	20 Analog Out11 Val at20	*	100	-20000	20000	
Service	21 Analog Out 12 Offset	*	0	-487500	487500	
Service	22 Analog Out 12 Gain	*	1	0	2	
Service	23 Analog Out12 Val at 4	*	0	-20000	20000	
Service	24 Analog Out12 Val at20	*	100	-20000	20000	

Service: S28 Analog OUTS Used by LL?

Category	Field Name		Value	Low	High	User Value
Service	01 Use Analog Out 1?	*	FALSE			
Service	02 Use Analog Out 2?	*	FALSE			
Service	03 Use Analog Out 3?	*	FALSE			
Service	04 Use Analog Out 4?	*	FALSE			
Service	05 Use Analog Out 5?	*	FALSE			
Service	06 Use Analog Out 6?	*	FALSE			
Service	07 Use Analog Out 7?	*	FALSE			
Service	08 Use Analog Out 8?	*	FALSE			
Service	09 Use Analog Out 9?	*	FALSE			
Service	10 Use Analog Out 10?	*	FALSE			
Service	11 Use Analog Out 11?	*	FALSE			
Service	12 Use Analog Out 12?	*	FALSE			

Service: S29 Relay OUTS Used by LL?

Category	Field Name		Value	Low	High	User Value
Service	01 Use Relay Out 3?	*	FALSE			
Service	02 Use Relay Out 4?	*	FALSE			
Service	03 Use Relay Out 5?	*	FALSE			
Service	04 Use Relay Out 6?	*	FALSE			
Service	05 Use Relay Out 7?	*	FALSE			
Service	06 Use Relay Out 8?	*	FALSE			
Service	07 Use Relay Out 9?	*	FALSE			
Service	08 Use Relay Out 10?	*	FALSE			
Service	09 Use Relay Out 11?	*	FALSE			
Service	10 Use Relay Out 12?	*	FALSE			

Appendix F. Pre-Installation Control Information Checklist

Detail an I/O list (interfaces to GTC Fuel Control)

- Analog Inputs & Outputs – (ranges, units, alarm & shutdown points)
- Discrete Inputs – Active hi or lo
- Relay outputs – NO or NC, contact load ratings
- MPU Speed sensor specifications (# of teeth, gear ratio, hi/lo fail spds)
- Fuel Actuator/Valve drivers – mA range (need SPC?), pph flow vs. Valve Pos.
- Communication Links – signal type, protocols
- Termination wiring details (existing & upgrades)

Control Limits

- EGT topping temperature limit
- CDP topping pressure limit
- GG Speed – upper limit (Alm & SD), Ref limits (high & low)
- PT Speed – upper limit (Alm & SD), Ref limits (high & low)

Start-up Information

- Electrical or Mechanical liteoff, valve degrees, start ramp percent
- Fuel Info – Type, supply pressure, LHV, SG
- Manifold pressure at liteoff
- Any EGT Start overtemp limit
- Time from Liteoff to GG Control (typically GG Lower Ref limit)
- Time from GG Idle to PT Rated speed

Running Information

- Gathering the following info will greatly simplify GTC control configuration

Data Point	CDP (psia)	EGT (deg F)	GG Speed (rpm)	Fuel Valve (%)	NOX Valve (%)
@ GG Idle			----		
@ PT Rated					
@ 10% Load					
@ 25% Load					
@ 50% Load					
@ 75% Load					
@ 100% Load					

Appendix G. Interfacing to Distributed IO & Ladder Logic (8262-1031 Unit)

Adding Ladder Logic Programming into the GTC250A

The system documentation CD contains the source code of the Master GAP file (or sometimes called the Second-ring file). Customers intending to incorporate additional programming into the Atlas control will need to utilize this file. The programmer should have a good working knowledge of GAP programming and the use of the GAP editor tool, including a clear understanding of what the meaning of terms template and coder versions. In most cases the GTC250A GAP file will be used as a reference in finding the software 'handles' (both input & output) of the control signals and also the tunable fields that have been programmed as being available to the Ladder Logic programming environment. Input fields that are available for LL control are identified with a boxed LL designation. The programmer can pass any GAP block output field to Ladder Logic for use in programming. The GTC250A does not include the application tool required to write the program that is intended to reside on the GTC250A.

Additional programming help can be found in the GAP help file that will assist the programmer in interfacing the 2 programs together.

Distributed IO Pre-programmed into the GTC250A

For the 8262-1031 Control

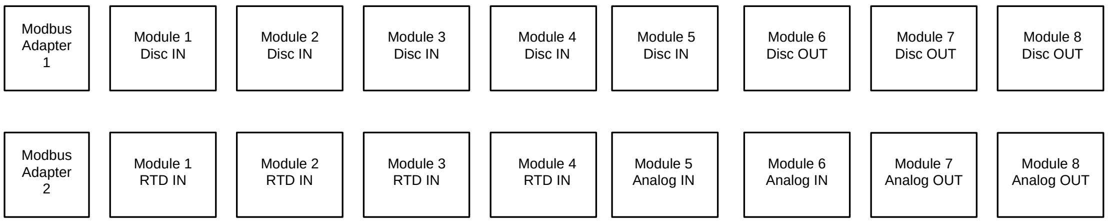
This version of the GTC250A includes a Profibus Distributed IO module in the Atlas-II hardware. This device interfaces with Allen-Bradley Flex IO (1794-series) that should be connected as shown in the control wiring diagram found in Appendix A. This full compliment of DIO was pre-programmed to be "ready-to-use" via the Ladder Logic programming tool and is segregated into a separate GAP file that gets compiled into the executable code through GAP's multi-GAP interfacing feature. The CD also contains an auxiliary file (applicom.ply) that must be loaded onto the control (via AppManager) that allows the Applicom Profibus module to link the IO into the GAP software. It is possible to use a subset of the modules that are pre-programmed, but adding IO modules will require modifying the GAP and then creating a new Applicom interface file to load on the control.

NOTICE	**This process requires additional programming and testing by the user, and careful consideration should be made before undertaking this effort. Many hours of engineering effort can be spent programming and debugging the interfacing of the GAP to a specific type of distributed IO—review the Atlas-II hardware manual for examples of how this is done.**

Allen-Bradley Flex IO

The Allen-Bradley Flex IO design utilizes a Modbus communication head that has 8 IO module blocks programmed after it. In the GTC implementation 2 heads are used designated as Slave 1 and Slave 2. The ProSoft Communication modules need to have the DIP switches configured as slaves 1 & 2 and should be setup for the following serial communications parameters:

- Baud rate = 38400, 8 data bits, 1 Stop Bit, No Parity



Allen-Bradley Flex IO Layout

Description	Category	Block Name	Field Name
ABF - Adapter #1 FAULT (No Link)	ABF_DIDO	ADAPT_FLT	B_NAME
ABF - Adapter #1 Comm Error	ABF_DIDO	ADAPT_ERR	B_NAME
ABF - Adapter 1 Module # 1 FAULT	ABF_DIDO	MOD_FLTS	LIST_1
ABF – Adapter 1 Module # 2 FAULT	ABF_DIDO	MOD_FLTS	LIST_2
ABF – Adapter 1 Module # 3 FAULT	ABF_DIDO	MOD_FLTS	LIST_3
ABF – Adapter 1 Module # 4 FAULT	ABF_DIDO	MOD_FLTS	LIST_4
ABF – Adapter 1 Module # 5 FAULT	ABF_DIDO	MOD_FLTS	LIST_5
ABF – Adapter 1 Module # 6 FAULT	ABF_DIDO	MOD_FLTS	LIST_6
ABF – Adapter 1 Module # 7 FAULT	ABF_DIDO	MOD_FLTS	LIST_7
ABF – Adapter 1 Module # 8 FAULT	ABF_DIDO	MOD_FLTS	LIST_8
ABF – Discrete IN Mod # 1 Chan 0	ABF_DIDO	MOD01_VALS	LIST_1
ABF – Discrete IN Mod # 1 Chan 1	ABF_DIDO	MOD01_VALS	LIST_2
ABF – Discrete IN Mod # 1 Chan 2	ABF_DIDO	MOD01_VALS	LIST_3
ABF – Discrete IN Mod # 1 Chan 3	ABF_DIDO	MOD01_VALS	LIST_4
ABF – Discrete IN Mod # 1 Chan 4	ABF_DIDO	MOD01_VALS	LIST_5
ABF – Discrete IN Mod # 1 Chan 5	ABF_DIDO	MOD01_VALS	LIST_6
ABF – Discrete IN Mod # 1 Chan 6	ABF_DIDO	MOD01_VALS	LIST_7
ABF – Discrete IN Mod # 1 Chan 7	ABF_DIDO	MOD01_VALS	LIST_8
ABF – Discrete IN Mod # 1 Chan 8	ABF_DIDO	MOD01_VALS	LIST_9
ABF – Discrete IN Mod # 1 Chan 9	ABF_DIDO	MOD01_VALS	LIST_10
ABF – Discrete IN Mod # 1 Chan 10	ABF_DIDO	MOD01_VALS	LIST_11
ABF – Discrete IN Mod # 1 Chan 11	ABF_DIDO	MOD01_VALS	LIST_12
ABF – Discrete IN Mod # 1 Chan 12	ABF_DIDO	MOD01_VALS	LIST_13
ABF – Discrete IN Mod # 1 Chan 13	ABF_DIDO	MOD01_VALS	LIST_14
ABF – Discrete IN Mod # 1 Chan 14	ABF_DIDO	MOD01_VALS	LIST_15
ABF – Discrete IN Mod # 1 Chan 15	ABF_DIDO	MOD01_VALS	LIST_16
Discrete Input modules 2-5 are the same as above with following block names		MOD02_VALS MOD03_VALS MOD04_VALS MOD05_VALS	
ABF – Discrete OUT Mod # 6 Chan 0	ABF_DIDO	MOD06_VALS	IN_1
ABF – Discrete OUT Mod # 6 Chan 1	ABF_DIDO	MOD06_VALS	IN_2
ABF – Discrete OUT Mod # 6 Chan 2	ABF_DIDO	MOD06_VALS	IN_3
ABF – Discrete OUT Mod # 6 Chan 3	ABF_DIDO	MOD06_VALS	IN_4
ABF – Discrete OUT Mod # 6 Chan 4	ABF_DIDO	MOD06_VALS	IN_5
ABF – Discrete OUT Mod # 6 Chan 5	ABF_DIDO	MOD06_VALS	IN_6
ABF – Discrete OUT Mod # 6 Chan 6	ABF_DIDO	MOD06_VALS	IN_7
ABF – Discrete OUT Mod # 6 Chan 7	ABF_DIDO	MOD06_VALS	IN_8

ABF – Discrete OUT Mod # 6 Chan 8	ABF_DIDO	MOD06_VALS	IN_9
ABF – Discrete OUT Mod # 6 Chan 9	ABF_DIDO	MOD06_VALS	IN_10
ABF – Discrete OUT Mod # 6 Chan 10	ABF_DIDO	MOD06_VALS	IN_11
ABF – Discrete OUT Mod # 6 Chan 11	ABF_DIDO	MOD06_VALS	IN_12
ABF – Discrete OUT Mod # 6 Chan 12	ABF_DIDO	MOD06_VALS	IN_13
ABF – Discrete OUT Mod # 6 Chan 13	ABF_DIDO	MOD06_VALS	IN_14
ABF – Discrete OUT Mod # 6 Chan 14	ABF_DIDO	MOD06_VALS	IN_15
ABF – Discrete OUT Mod # 6 Chan 15	ABF_DIDO	MOD06_VALS	IN_16
Discrete Output modules 7-8 are the same as above with demand signal going to the following block names		MOD07_VALS MOD08_VALS	
ABF - Adapter # 2 FAULT (No Link)	ABF_ANALOG	ADAPT_FLT	B_NAME
ABF - Adapter # 2 Comm Error	ABF_ANALOG	ADAPT_ERR	B_NAME
ABF - Adapter 2 Module # 1 FAULT	ABF_ANALOG	MOD_FLTS	LIST_1
ABF – Adapter 2 Module # 2 FAULT	ABF_ANALOG	MOD_FLTS	LIST_2
ABF – Adapter 2 Module # 3 FAULT	ABF_ANALOG	MOD_FLTS	LIST_3
ABF – Adapter 2 Module # 4 FAULT	ABF_ANALOG	MOD_FLTS	LIST_4
ABF – Adapter 2 Module # 5 FAULT	ABF_ANALOG	MOD_FLTS	LIST_5
ABF – Adapter 2 Module # 6 FAULT	ABF_ANALOG	MOD_FLTS	LIST_6
ABF – Adapter 2 Module # 7 FAULT	ABF_ANALOG	MOD_FLTS	LIST_7
ABF – Adapter 2 Module # 8 FAULT	ABF_ANALOG	MOD_FLTS	LIST_8
ABF – RTD IN Mod # 1 Chan 0	ABF_RTD	MOD01_VALS	LIST_1
ABF – RTD IN Mod # 1 Chan 1	ABF_RTD	MOD01_VALS	LIST_2
ABF – RTD IN Mod # 1 Chan 2	ABF_RTD	MOD01_VALS	LIST_3
ABF – RTD IN Mod # 1 Chan 3	ABF_RTD	MOD01_VALS	LIST_4
ABF – RTD IN Mod # 1 Chan 4	ABF_RTD	MOD01_VALS	LIST_5
ABF – RTD IN Mod # 1 Chan 5	ABF_RTD	MOD01_VALS	LIST_6
ABF – RTD IN Mod # 1 Chan 6	ABF_RTD	MOD01_VALS	LIST_7
ABF – RTD IN Mod # 1 Chan 7	ABF_RTD	MOD01_VALS	LIST_8
** Value in control is Deg F the range depends on RTD type used – for 100 ohm PT = -328 to 1598 deg F			
RTD Input modules 2-4 are the same as above with following block names		MOD02_VALS MOD03_VALS MOD04_VALS	
ABF – Analog 4-20 IN Mod # 5 Chan 0	ABF_420	MOD05_VALS	LIST_1
ABF – Analog 4-20 IN Mod # 5 Chan 1	ABF_420	MOD05_VALS	LIST_2
ABF – Analog 4-20 IN Mod # 5 Chan 2	ABF_420	MOD05_VALS	LIST_3
ABF – Analog 4-20 IN Mod # 5 Chan 3	ABF_420	MOD05_VALS	LIST_4
ABF – Analog 4-20 IN Mod # 5 Chan 4	ABF_420	MOD05_VALS	LIST_5
ABF – Analog 4-20 IN Mod # 5 Chan 5	ABF_420	MOD05_VALS	LIST_6
ABF – Analog 4-20 IN Mod # 5 Chan 6	ABF_420	MOD05_VALS	LIST_7
ABF – Analog 4-20 IN Mod # 5 Chan 7	ABF_420	MOD05_VALS	LIST_8
** Range on all is 4ma=4, 20ma=20			
Analog 4-20 Input module 6 is the same as above with this block name		MOD06_VALS	
ABF Analog 4-20 Out Mod # 7 Chan 0	ABF_420	MOD07_VALS	IN_1
ABF Analog 4-20 Out Mod # 7 Chan 1	ABF_420	MOD07_VALS	IN_2
ABF Analog 4-20 Out Mod # 7 Chan 2	ABF_420	MOD07_VALS	IN_3
ABF Analog 4-20 Out Mod # 7 Chan 3	ABF_420	MOD07_VALS	IN_4
ABF Analog 4-20 Out Mod # 8 Chan 0	ABF_420	MOD08_VALS	IN_1
ABF Analog 4-20 Out Mod # 8 Chan 1	ABF_420	MOD08_VALS	IN_2
ABF Analog 4-20 Out Mod # 8 Chan 2	ABF_420	MOD08_VALS	IN_3
ABF Analog 4-20 Out Mod # 8 Chan 3	ABF_420	MOD08_VALS	IN_4
** Range on all is 4ma=4, 20ma=20			

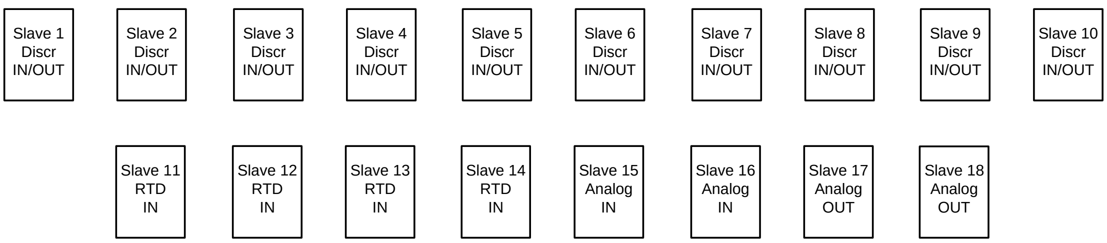
Acromag IO (not used with 8262-1031)

The Acromag IO design utilizes a Modbus communication head that is built into each of the individual IO modules. Therefore each module has a unique slave address number. In the GTC250A implementation 18 modules are pre-programmed and are designated as Slave 1 through Slave 18. The Acromag modules need to be configured individually via a software tool and should be setup for the slave address shown and the following serial communications parameters:

- Baud rate = 38400, 8 data bits, 1 Stop Bit, No Parity
- (** Baud rates can be increased to 115KB if the COM 2 port on the Atlas is also adjusted)

IMPORTANT

If a module is not present in a system, it is important to tune the Slave Timeout value for that module to the minimum value when configuring the control. Failure to do this will create large time delays in the monitoring of the signals on the entire distributed IO network.



Acromag IO Layout

Description	Category	Block Name	Field Name
ACR - Slave # 1 FAULT	ACR_MODS	MOD01_STAT	OUT_16_1
ACR - Slave # 2 FAULT	ACR_MODS	MOD02_STAT	OUT_16_1
ACR - Slave # 3 FAULT	ACR_MODS	MOD03_STAT	OUT_16_1
ACR - Slave # 4 FAULT	ACR_MODS	MOD04_STAT	OUT_16_1
ACR - Slave # 5 FAULT	ACR_MODS	MOD05_STAT	OUT_16_1
ACR - Slave # 6 FAULT	ACR_MODS	MOD06_STAT	OUT_16_1
ACR - Slave # 7 FAULT	ACR_MODS	MOD07_STAT	OUT_16_1
ACR - Slave # 8 FAULT	ACR_MODS	MOD08_STAT	OUT_16_1
ACR - Slave # 9 FAULT	ACR_MODS	MOD09_STAT	OUT_16_1
ACR - Slave # 10 FAULT	ACR_MODS	MOD10_STAT	OUT_16_1
ACR - Slave # 11 FAULT	ACR_MODS	MOD11_STAT	OUT_16_1
ACR - Slave # 12 FAULT	ACR_MODS	MOD12_STAT	OUT_16_1
ACR - Slave # 13 FAULT	ACR_MODS	MOD13_STAT	OUT_16_1
ACR - Slave # 14 FAULT	ACR_MODS	MOD14_STAT	OUT_16_1
ACR - Slave # 15 FAULT	ACR_MODS	MOD15_STAT	OUT_16_1
ACR - Slave # 16 FAULT	ACR_MODS	MOD16_STAT	OUT_16_1
ACR - Slave # 17 FAULT	ACR_MODS	MOD17_STAT	OUT_16_1
ACR - Slave # 18 FAULT	ACR_MODS	MOD18_STAT	OUT_16_1
ACR – Slave # 1 Link Error	ACR_FLTS	MOD_GONE	LIST_1
ACR – Slave # 2 Link Error	ACR_FLTS	MOD_GONE	LIST_2
** and so on until			
ACR – Slave # 18 Link Error	ACR_FLTS	MOD_GONE	LIST_18
ACR – Slave # 1 Exception Error	ACR_FLTS	MOD_ERRS	LIST_1
ACR – Slave # 2 Exception Error	ACR_FLTS	MOD_ERRS	LIST_2
** and so on until			
ACR – Slave # 18 Exception Error	ACR_FLTS	MOD_ERRS	LIST_18

ACR – Discrete Mod # 1 Chan 1 Input	ACR_DIDO	MOD01_VALS	LIST_1
ACR – Discrete Mod # 1 Chan 2 Input	ACR_DIDO	MOD01_VALS	LIST_2
ACR – Discrete Mod # 1 Chan 3 Input	ACR_DIDO	MOD01_VALS	LIST_3
ACR – Discrete Mod # 1 Chan 4 Input	ACR_DIDO	MOD01_VALS	LIST_4
ACR – Discrete Mod # 1 Chan 5 Input	ACR_DIDO	MOD01_VALS	LIST_5
ACR – Discrete Mod # 1 Chan 6 Input	ACR_DIDO	MOD01_VALS	LIST_6
ACR – Discrete Mod # 1 Chan 7 Input	ACR_DIDO	MOD01_VALS	LIST_7
ACR – Discrete Mod # 1 Chan 8 Input	ACR_DIDO	MOD01_VALS	LIST_8
ACR – Discrete Mod # 1 Chan 9 Input	ACR_DIDO	MOD01_VALS	LIST_9
ACR – Discrete Mod # 1 Chan 10 Input	ACR_DIDO	MOD01_VALS	LIST_10
ACR – Discrete Mod # 1 Chan 11 Input	ACR_DIDO	MOD01_VALS	LIST_11
ACR – Discrete Mod # 1 Chan 12 Input	ACR_DIDO	MOD01_VALS	LIST_12
ACR – Discrete Mod # 1 Chan 1 Output	ACR_DIDO	MOD01_VALS	IN_13
ACR – Discrete Mod # 1 Chan 2 Output	ACR_DIDO	MOD01_VALS	IN_14
ACR – Discrete Mod # 1 Chan 3 Output	ACR_DIDO	MOD01_VALS	IN_15
ACR – Discrete Mod # 1 Chan 4 Output	ACR_DIDO	MOD01_VALS	IN_16
ACR – Discrete Mod # 1 Chan 5 Output	ACR_DIDO	MOD01_VALS	IN_17
ACR – Discrete Mod # 1 Chan 6 Output	ACR_DIDO	MOD01_VALS	IN_18
ACR – Discrete Mod # 1 Chan 7 Output	ACR_DIDO	MOD01_VALS	IN_19
ACR – Discrete Mod # 1 Chan 8 Output	ACR_DIDO	MOD01_VALS	IN_20
ACR – Discrete Mod # 1 Chan 9 Output	ACR_DIDO	MOD01_VALS	IN_21
ACR – Discrete Mod # 1 Chan 10 Output	ACR_DIDO	MOD01_VALS	IN_22
ACR – Discrete Mod # 1 Chan 11 Output	ACR_DIDO	MOD01_VALS	IN_23
ACR – Discrete Mod # 1 Chan 12 Output	ACR_DIDO	MOD01_VALS	IN_24
ACR Slaves 2-10 are Discrete In/Out Modules same as above – but with the following block name		MOD02_VALS MOD03_VALS and so on MOD10_VALS	
ACR – RTD Mod # 11 Chan 1 (temp C)	ACR_RTD	MOD01_VALC	LIST_1
ACR – RTD Mod # 11 Chan 2 (temp C)	ACR_RTD	MOD01_VALC	LIST_2
ACR – RTD Mod # 11 Chan 3 (temp C)	ACR_RTD	MOD01_VALC	LIST_3
ACR – RTD Mod # 11 Chan 4 (temp C)	ACR_RTD	MOD01_VALC	LIST_4
ACR – RTD Mod # 11 Chan 1 (temp F)	ACR_RTD	MOD01_VALF	LIST_1
ACR – RTD Mod # 11 Chan 2 (temp F)	ACR_RTD	MOD01_VALF	LIST_2
ACR – RTD Mod # 11 Chan 3 (temp F)	ACR_RTD	MOD01_VALF	LIST_3
ACR – RTD Mod # 11 Chan 4 (temp F)	ACR_RTD	MOD01_VALF	LIST_4
ACR – RTD Mod # 11 Chan 1 Fault Num	ACR_RTD	MOD01_FLTS	LIST_1
ACR – RTD Mod # 11 Chan 2 Fault Num	ACR_RTD	MOD01_FLTS	LIST_2
ACR – RTD Mod # 11 Chan 3 Fault Num	ACR_RTD	MOD01_FLTS	LIST_3
ACR – RTD Mod # 11 Chan 4 Fault Num	ACR_RTD	MOD01_FLTS	LIST_4
** Range is set in module configuration ** Key for RTD Chan fault numbers: 0= In Range 1= Overrange 2= Underrange 4= Low Limit Exceeded 6= High Limit Exceeded 9= OPEN Wire detected			
ACR Slaves 12-14 are RTD Modules same as above but with the following block name		MOD02_xxxx MOD03_xxxx MOD04_xxxx	
ACR – 4-20 mA IN Mod # 15 Chan 1	ACR_420IN	MOD01_VALS	LIST_1
ACR – 4-20 mA IN Mod # 15 Chan 2	ACR_420IN	MOD01_VALS	LIST_2
ACR – 4-20 mA IN Mod # 15 Chan 3	ACR_420IN	MOD01_VALS	LIST_3
ACR – 4-20 mA IN Mod # 15 Chan 4	ACR_420IN	MOD01_VALS	LIST_4
** Range on all is 4ma=0, 20ma=20000			
ACR – 4-20 mA IN Mod # 15 Chan 1 Fault Num	ACR_420IN	MOD01_FLTS	LIST_1

ACR – 4-20 mA IN Mod # 15 Chan 2 Fault Num	ACR_420IN	MOD01_FLTS	LIST_2
ACR – 4-20 mA IN Mod # 15 Chan 3 Fault Num	ACR_420IN	MOD01_FLTS	LIST_3
ACR – 4-20 mA IN Mod # 15 Chan 4 Fault Num	ACR_420IN	MOD01_FLTS	LIST_4
** Key for 4-20 mA Chan fault numbers: 0= In Range 1= Overrange 2= Underrange 4= Low Limit Exceeded 6= High Limit Exceeded			
ACR Slave 16 is a 4-20 mA input module same as above with following block name		MOD02_xxxx	
ACR – 4-20 mA IN Mod # 17 Chan 1	ACR_420OUT	MOD01_VALS	IN_1
ACR – 4-20 mA IN Mod # 17 Chan 2	ACR_420OUT	MOD01_VALS	IN_2
ACR – 4-20 mA IN Mod # 17 Chan 3	ACR_420OUT	MOD01_VALS	IN_3
ACR – 4-20 mA IN Mod # 17 Chan 4	ACR_420OUT	MOD01_VALS	IN_4
** Range on all is 0=4ma, 20000=20ma			
ACR – 4-20 mA IN Mod # 18 Chan 1	ACR_420OUT	MOD02_VALS	IN_1
ACR – 4-20 mA IN Mod # 18 Chan 2	ACR_420OUT	MOD02_VALS	IN_2
ACR – 4-20 mA IN Mod # 18 Chan 3	ACR_420OUT	MOD02_VALS	IN_3
ACR – 4-20 mA IN Mod # 18 Chan 4	ACR_420OUT	MOD02_VALS	IN_4

We appreciate your comments about the content of our publications.

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