

AtlasPC™

Turbine and Engine Control Platform



DESCRIPTION

The AtlasPC™ control is an industrial platform that offers robust, low cost control for a wide variety of turbine, engine, and compressor applications. Most importantly, this control is designed to be a true “network based platform” that interfaces seamlessly with a wide variety of modern communication and field bus architectures. The platform couples state of the art PC technology with a proven real time operating system to provide reliable and deterministic performance that is required for recursion-rate sensitive applications. Dedicated inputs and outputs (I/O) are available onboard for key control signals while distributed I/O can be used for other less critical parameters.

The modular hardware configuration lends itself to bulkhead mounting. Environmental specifications allow the AtlasPC control to move out of the control room and closer to the prime mover. In many cases, it can be mounted on the prime mover skid. Typically, the AtlasPC control is mounted in an enclosure rated for the site-specific environmental conditions.

A variety of computational and I/O modules are available to meet the specific needs of the application. Internally, the configuration of the printed circuit board stacks eliminates the need for a motherboard; reducing overall cost. Wiring terminations are provided on the top and bottom edges of the printed circuit boards by means of quick disconnect plug and socket connectors. Control power is supplied from an external 24 Vdc source.

In addition to its primary purpose of basic fuel control for engine and turbine prime movers, the AtlasPC platform can be programmed to provide added control functionality. Unit start sequencing, protective monitoring or other site-specific control requirements are easily accomplished by adding additional onboard I/O or utilizing remote distributed I/O. The AtlasPC platform supports several field architectures normally used for remote distributed I/O – Profibus, DeviceNet, and Ethernet.

Communications with the AtlasPC control are available to program and service the control as well as to interface with other systems (Plant DCS, HMI, etc). Application code is generated by use of Woodward’s Graphical Application Program (GAP) or Woodward’s Ladder Logic programming environment. A service interface allows the user to view and tune system variables. Several tools are available to provide this interface (See Engineering and Service Access). Communication protocols such as TCP/IP, OPC, Modbus®* and other current designs are included so that the user can correctly interface the control to existing or new plant level systems.

APPLICATIONS

The AtlasPC programmable control can be applied to a variety of engine and turbine applications. Since the hardware is flexible in terms of the number of onboard I/O modules as well as distributed I/O capability, the control can be scaled from minimal application requirements to very large applications.

Typical prime mover types include:

- Industrial Gas Turbines
- Aero-derivative Gas Turbines
- Compressor Control and Protection
- Gas and Diesel Engines
- Steam Turbines
- Hydro Turbines

Prime mover applications generally fall into one of two categories – generator drives or mechanical drives. For generator drive applications, the AtlasPC control has an optional PowerSense module that receives PT and CT signals from the generator and supplies speed and voltage bias signals to external controls. This module allows the application to be programmed to provide KW control, synchronizing, load sharing, KW droop and other useful power management functions. For mechanical drive applications, additional I/O modules can be added that enable the platform to provide process control functions as well as compressor/pump control and protection (including electric drive).

- True “Network Based” platform
- Industrial Pentium Processor
- VxWorks® Real Time Operating System
- Distributed I/O Capability
 - Profibus
 - DeviceNet
 - Ethernet
- Multiple Communications Protocols
 - Modbus®
 - Ethernet TCP/IP
 - Ethernet UDP
 - OPC (Ethernet)
 - DDE (Dynamic Data Exchange)
 - EGD (Ethernet)
- Low cost alternative to a general purpose PLC
- Scalable from core fuel control to total package control
- CE Compliant; Hazardous Locations

*—Modbus is a trademark of Modicon, Inc.

AtlasPC CONFIGURATIONS

The AtlasPC control system supports two bus technologies and two "stacks" of modules, the PC/104 stack and the Power Bus stack. The modules utilize connectors that build the bus structure, as they are stacked together. (See AtlasPC stack configuration graphic.)

Each bus structure supports different types of modules. The PC/104 stack uses the PC industry PC/104 standard and supports most I/O modules, the Pentium processor, and the communications modules. The Power Bus stack supports the power supply and limited I/O modules. Modular construction allows considerable flexibility in meeting market requirements. Module options are listed at the end of this document.

Every system contains the "SmartCore" module that bridges the power bus and the PC/104 bus. It contains I/O required by many prime mover control applications.

The PowerSense board is a specialized I/O module for Generator Control including Synchronizing, Load Management, and Load Control. PowerSense extends across both bus stacks.

"Atlas I/O" personality modules are placed on the PC/104 bus stack to tailor the AtlasPC control to the particular needs of certain market segments. Up to three Atlas I/O modules may be used (two if PowerSense is present).

The Pentium CPU Module always sits on top of the Atlas I/O modules on the PC/104 stack. One or two small communications modules can stack on top of the Pentium module.

The "Power Bus" distributes power to the control. The power supply provides regulated power for the AtlasPC control and contains the relay driver outputs.

PROGRAMMING AND SIMULATION

The AtlasPC control makes use of the same powerful and proven tools used by all of Woodward's PC control systems. Engineers create powerful and flexible programs through the IEC 1131-3 programming environment:

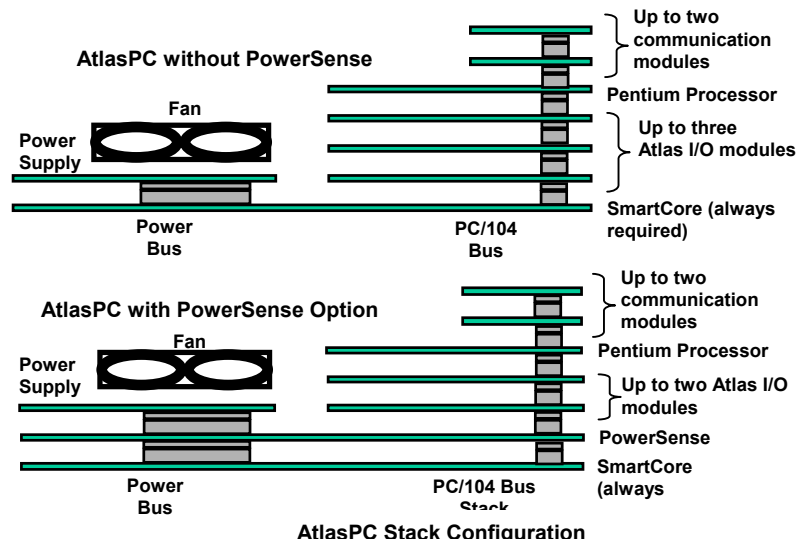
- Function Block Diagrams—through Graphical Application Program (GAP™)
- Sequential Function Charts—through Graphical Application Program (GAP)
- Structured Text
- Ladder Logic (On-line Programmable)

GAP™ (Graphical Application Program) software is Woodward's pictures-to-code programming tool. GAP software accesses libraries of control objects to quickly and efficiently implement complex (or simple) control strategies. The GAP environment lets application engineers concentrate on system level control rather than software coding details.

NetSim™ software is the virtual simulation environment for testing AtlasPC code without hardware in the loop. NetSim software links prime mover and package models (created in standard modeling packages—MatLab/Simulink, MatrixX, ACSL) to the GAP environment. With NetSim software, the control code can be completely tested in the office before field commissioning begins. The performance of NetSim software is optimized to provide simulation results that correlate very tightly to actual field results.

The AtlasPC control's programming and simulation tools are optimized for controlling turbines and engines, and their driven loads. Rather than providing a generic environment that is adaptable to any industrial automation requirement, GAP and NetSim software are specific. The libraries of supported functions have been proven over many years and countless applications. GAP and NetSim can be downloaded from the Internet at www.woodward.com/ic. The software is activated by purchasing a license from your Woodward distributor or Woodward Order Entry.

Woodward's worldwide organization has unequaled turbine and engine control expertise. To support its OEM and Packager customers, Woodward can supply software tools, or entire solutions, or a variety of options in-between.



High Performance On-board I/O

AtlasPC on-board I/O is optimized for prime mover control

- High Speed and deterministic update times
- High CMRR and control-specific filtering result in high degree of noise immunity
- 15 bit resolution differential inputs, allowing very precise control
- I/O is accurate across temperature range
- I/O is isolated in groups to prevent ground loops and other induced noise issues

REAL TIME OPERATING SYSTEM (RTOS)

The AtlasPC control system utilizes a popular and field-proven real time operating system (RTOS). The RTOS uses VxWorks®* real time software that has been used in several critical applications for a number of years.

The Rate Group structure of the GAP development environment, integrated with the RTOS, enforces fast, deterministic, and completely repeatable dynamic behavior. Thorough and extensive FFT testing has proven the control system response is exactly as expected at all times, regardless of what is happening elsewhere in the system. The response is also identical to previous proprietary Woodward RTOS architectures. PLCs often make use of a less rigid looping structure that can introduce dynamic instability as code is added or removed.

The GAP/VxWorks RTOS system ensures the highest reliability. All required drivers have been extensively tested for robustness and inability to adversely affect system reliability or real-time control. To ensure integrity, no unapproved drivers can be added.

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

CONTROL AND PLANT LEVEL COMMUNICATIONS

The AtlasPC platform supports multiple protocols and physical mediums for communications to DCS systems, PLCs, HMIs, and SCADA systems.

Protocols Supported:

- Modbus (RTU and ASCII) over serial or Ethernet
- Ethernet TCP/IP
- Ethernet UDP
- OPC (Ethernet)—OLE for Process Control
- DDE Dynamic Data Exchange (serial)
- EGD (Ethernet)

FIELD BUS INTERFACE

Field bus technologies provide the ultimate flexibility in control I/O and distributed intelligence. The AtlasPC platform embraces this trend while still providing on-board I/O for those signals that are not commercially or technically ready for field bus distribution.

Field bus standards supported:

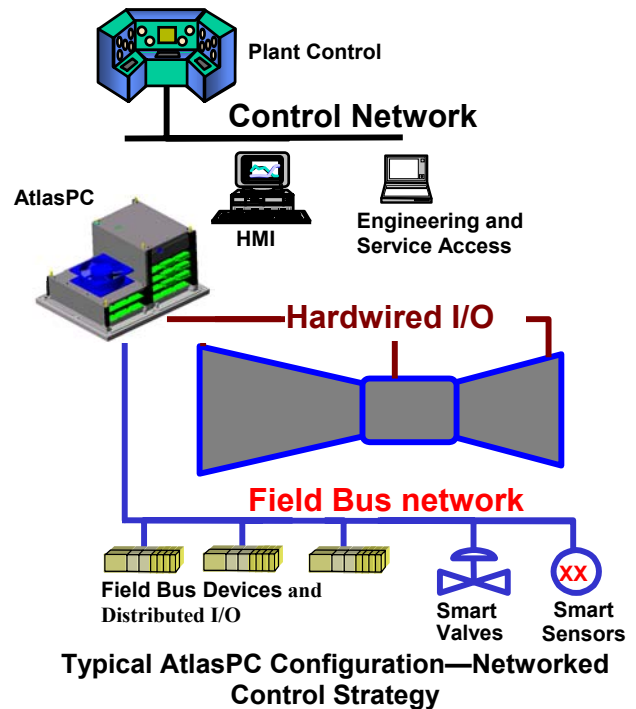
- Profibus DP (12MBaud)—optional communications module
- Ethernet TCP/IP Modbus—standard on Pentium CPU
- Dual Ethernet – optional communications module
- DeviceNet – optional communications module

Many field bus standards currently compete for market share in engine and turbine control. The AtlasPC platform can adapt to changing requirements.

ENGINEERING AND SERVICE ACCESS

Woodward offers a complete suite of software products for service interface. From simple monitoring of any system variable to high resolution plotting of control variables, service tools are available to simplify troubleshooting.

- Watch Window—Ethernet or Serial connection to Windows-based control variable viewing (see product spec 03202)
- Control Assistant—Ethernet connection to Windows-based viewing of high-speed data log captures and other useful utilities (see product spec 03201)
- Application Manager and Other Engineering Interface Tools—Ethernet access to the AtlasPC control for program loading, network configuration and support, and system diagnostics (refer to manual)
- Remote Access—Powerful and seamless remote connectivity is inherent in the operating system of the AtlasPC system. Remote viewing, access and diagnostics are as close as a network or a modem.
- Human Machine Interface (HMI)—Standard commercial HMI programs interface through Ethernet or serial to provide operator access.



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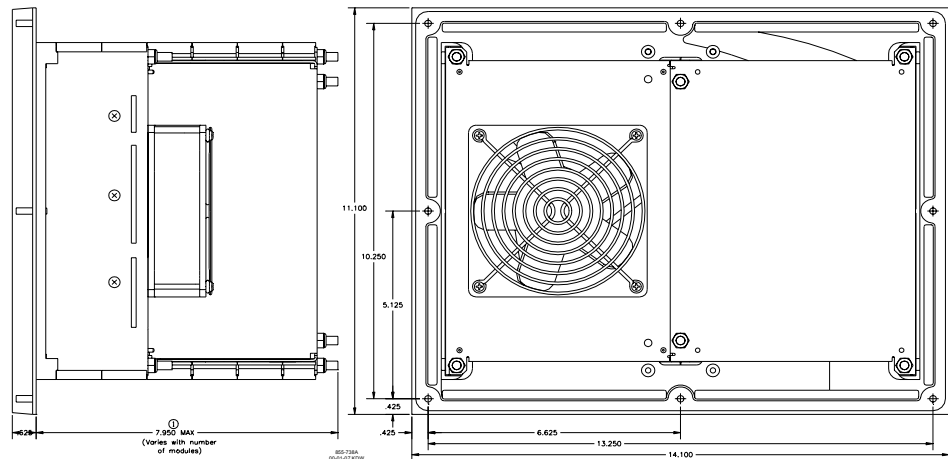
www.woodward.com

AtlasPC Control System Modules

- **Pentium CPU Module**
 - 266 MHz Pentium, 64MB RAM
 - On-board solid state hard drive
 - Hard Real Time VxWorks operating system
 - Ethernet (communications, distributed I/O)
 - 10/100 Base T auto sensing and auto switching
 - 2 Non-isolated Serial Ports (Service Interface and Remote Access Services)
- **Analog Input/Output Module**
 - 2 MPU speed pickups
 - 4 RTD (100 or 200 ohm, 3 wire) /4–20 mA inputs (software selectable)
 - 11 Thermocouple (E, J, K, N, R, S, T) / 4–20 mA inputs (software selectable)
 - 2 4–20 mA analog outputs
 - On-board cold junction sensor
- **Primary Power Supply**
 - 18–32 Vdc
 - 12 Relay Drivers
- **Profibus Communications Module**
 - 12 MBaud Profibus DP Master/Slave
- **DeviceNet Communications Module**
 - 500 Kbaud DeviceNet Master/Slave
- **Dual Ethernet Communications Module**
 - 10/100 Mbaud Ethernet Auto Selecting
- **SmartCore Module**
 - 3 Isolated Serial Ports
 - 1 RS232
 - 2 configurable RS232, RS422, or RS485
 - 2 MPU/Proximity
 - 24 Discrete Inputs
 - 6 Analog Inputs (4–20 mA, 0–5 V)
 - 6 Analog Outputs (4–20 mA)
 - 2 Actuator Outputs (4–20 mA, 20–200 mA)
- **PowerSense Module**
 - 70/120/240 Vac PT sensing
 - 2 three-phase voltage inputs
 - 2 three-phase current inputs
 - 0–5 A CT sensing
 - Speed Bias (PWM, 4–20 mA, 0–5 V, ±3 V)
 - Voltage Bias (4–20 mA, ±1 V, ±3 V, ±9 V)
 - LON Channel – communicate to other Woodward Power Management Controls
 - Revenue grade accuracy (ANSI C12.1)
 - Power calculated per IEEE 1459
 - Harmonic metering to 13th harmonic for both voltage and current

Environmental Specifications

- **Skid Mount Packaging**
 - CE compliant—Low Voltage Directive, EMC Directive, ATEX Directive
 - European Class I, Zone 2, Group IIC when installed in an IP-54 minimum rated enclosure per DEMKO certification
 - UL Class I, Div 2, Groups A, B, C, D
 - Operating temperature: –20 to +70 °C (+60 °C w/ Profibus, DeviceNet or Dual Ethernet)
 - Storage temperature: –40 to +85 °C
 - Vibration: Lloyds Test Specification No. 1, 2002, Vibration Test 1 (5–13.2 Hz, ±1 mm; 13.2–100 Hz, ±0.7 g)
 - Shock: US MIL-STD-810C, 516.2-2 (30 g, 11 ms, 1/2 sine)



– Marine Type Approvals: ABS, DNV, LRS

AtlasPC Control Outline Drawing (Do not use for construction)

For more information contact:

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