Atlas-II™
Turbine and Engine Control Platform

APPLICATIONS

The Atlas-II™ control is an industrial platform that offers robust, low-cost control for a wide variety of turbine, engine, and compressor applications. This control is designed to integrate into the modern plant architecture through the use of Ethernet and fieldbus communication protocols. Four Ethernet ports and add-on fieldbus communication modules allow for the network flexibility and redundancy necessary for today's communication architectures. With a proven real-time operating system and dedicated inputs and outputs, the Atlas-II provides reliable and deterministic performance for key prime mover control functionality. Less critical control functionality can be added into the Atlas-II through the use of free-time programming structures and distributed I/O.

The Atlas-II programmable control is designed specifically for prime mover control applications such as:

- Gas Turbines
- Compressor Control and Protection
- Gas and Diesel Engines
- Steam Turbines
- Hydro Turbines

Atlas-II features and performance are designed for the rigorous requirements of prime mover control. CPU capability, software recursion rates, software algorithms, I/O conditioning and filtering, and numerous other features combine with long-term support and Woodward service to ensure a smooth start-up and long support life. These features create the ideal product when performance matters:

- Rigorous load rejection performance
- Incipient Surge Detection
- Long-term naval programs

In addition to its primary purpose of basic fuel control for prime movers, the Atlas-II platform can be designed to provide added control functionality. Adding additional onboard I/O or utilizing remote distributed I/O easily achieves unit sequencing, protective monitoring, or other site-specific control requirements.

DESCRIPTION

The Atlas-II control is available in several configurations to meet the specific I/O needs of the prime mover. The modular hardware configuration of the Atlas-II lends itself to bulkhead mounting.

Hardware modules can support a variety of analog and digital signals including thermocouples, RTDs, 4–20 mA signals, and others. Control power for the Atlas-II is supplied from an external 24 Vdc source.

Environmental specifications allow the Atlas-II 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 Atlas-II control is mounted in an enclosure rated for the site-specific environmental conditions.

The Atlas-II platform supports Profibus and Ethernet field architectures for remote distributed I/O.

Application code is generated by use of Woodward's Graphical Application Program (GAP™) or Woodward's Ladder Logic programming environment. Powerful service tools interface to the Atlas-II to provide real-time monitoring and troubleshooting of the control.

- Total system control
- Powerful CPU for demanding applications
- Real-time multi-tasking VxWorks® operating system
- Deterministic update rates as fast as 5 ms
- Improved control system availability and reliability
- SNTP compliant for time synchronization
- Four Ethernet ports
- Distributed I/O Capability
- Profibus
- Ethernet
- Low cost alternative to a general purpose PLC
- CE and UL compliant, marine type approved

ATLAS-II CONFIGURATIONS

The Atlas-II control system supports two bus technologies and two "stacks" of modules: the Personality Module stack and the Power Bus stack. The modules utilize connectors that build the bus structure as they are stacked together (See Atlas-II stack configuration graphic). For higher complexity configurations, a fan is required for module cooling.

Each bus structure supports different types of modules. The Personality Module stack supports most I/O modules and the communications modules. A maximum of five modules can be added to the Personality Module stack. The Power Bus stack supports the power supply and PowerSense module. Modular construction allows considerable flexibility in meeting market requirements. Module options are listed at the end of this document.

Every system contains the A5200 SmartCore module that bridges the power bus and the personality module bus. It contains I/O required by many prime mover control applications.

For power generation applications, the Atlas-II 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.

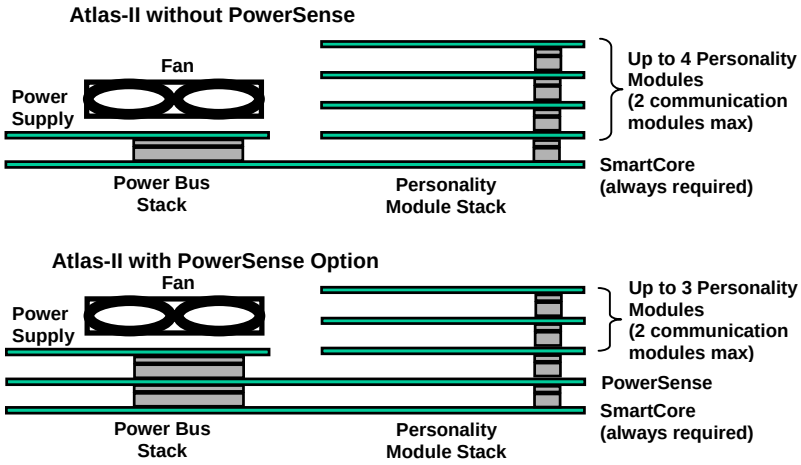
Atlas I/O personality modules are placed on the Personality Module stack to tailor the Atlas-II control to the particular needs of certain market segments. Up to three Atlas I/O modules may be used (two if PowerSense is present).

Up to two communication modules can be placed on the Personality Module stack to allow for redundant or multiple communication paths to distributed I/O through the Profibus communication protocol.

High Performance On-board I/O

Atlas-II 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



Atlas-II Stack Configuration

ATLAS-II CPU, OPERATING SYSTEM, AND SOFTWARE

The Atlas-II utilizes the robust and powerful 400 MHz Motorola* MPC5200 microprocessor to form the A5200 SmartCore module. Extended temperature operation, suitability to real time operation, and long support life all combine to make the MPC5200 the right choice for the Atlas-II.

Atlas-II applications are created with Woodward's Graphical Application Programmer tool. GAP is a high-level functional programming tool providing Function Block Diagrams, Sequential Functional Charts, Ladder Logic, and lower level programming support. GAP's powerful features ensure that control engineers can concentrate on control logic rather than programming details. A third-party Human Machine Interface (HMI) is often provided for operator interface. See product specification 03216 for additional details about GAP.

GAP application programs may be tested in Woodward's NetSim™ simulation environment against a process model to ensure proper field operation. This powerful simulation tool reduces system-commissioning time and enables convenient field upgrades in the future.

The Atlas-II utilizes a VxWorks® * operating system combined with the proven rate group structure of Woodward's GAP environment to provide a highly reliable, real-time operating system. GAP's unique rate group structure ensures that control functions will execute deterministically at rate groups defined by the application engineer. Critical control loops can be processed in 5 milliseconds, while less critical code may be assigned to slower rate groups. Control system dynamic performance is deterministic and predictable in all situations and is not affected by program loading or by changes made to the application code, thus simplifying commissioning and field changes and ensuring reliable field operation.

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

The Atlas-II supports many of the communication protocols used in modern prime mover and plant automation controllers shown in the figure below including:

- Modbus® ** (RTU and ASCII) over serial or Ethernet
- Ethernet TCP/IP
- Ethernet UDP/IP
- CANopen
- OPC DA 3.0 and AE 1.0
- Ethernet Global Data (EGD)

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

The Atlas-II control system incorporates an SNTP version-4-compliant timeserver that enables the control to be synchronized to within 1 millisecond of any other external time source. Time stamping of sequence of events can be accomplished to within 5 ms resolution.

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

Fieldbus standards supported:

- Profibus DP (12 MBaud)—optional communications module available singly or redundantly
- Ethernet TCP/IP Modbus—standard on Atlas-II CPU

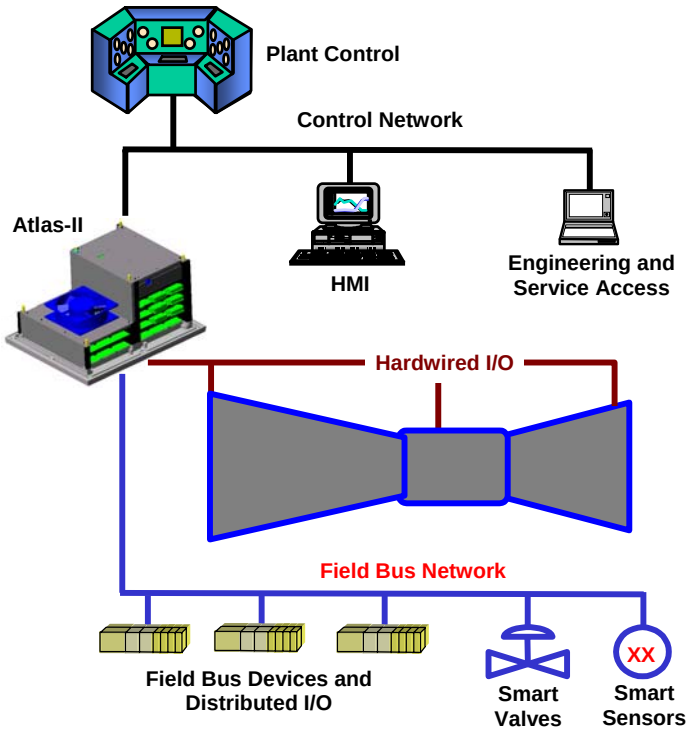
Many fieldbus standards currently compete for market share in engine and turbine control. The Atlas-II

platform can adapt to changing requirements (see Typical Atlas-II Configuration – Networked Control Strategy graphic below).

Woodward's powerful software service tools provide service personnel with extensive monitoring and troubleshooting for the Atlas-II. The service tools provide operational and analytical information such as graphical display of operating data, data logging (at rate group resolution), trending, event logging, X-Y plotting, and other features. For additional information on Woodward software service tools, see product specifications 03201 and 03306 describing Control Assistant and Monitor GAP.

The Atlas-II 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/software**. Purchasing a license from your Woodward distributor or Woodward Order Entry activates the software.

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.



Typical Atlas-II Configuration—Networked Control Strategy

Regulatory Compliance

North American:

UL: UL Listed for Class I, Division 2, Groups A, B, C, & D, T3C at 70 °C surrounding air temperature. For use in Canada and the United states. (UL File E156028)

European Compliance for CE Marking:

EMC Directive:	2004/108/EC
Low Voltage Directive:	2006/95/EC
ATEX Directive:	94/9/EC (Zone 2, Cat. 3, Group II G, Ex nA IIC T3 X)

Marine Compliance

ABS:	ABS Rules 2006 SVR 4-2-1/7.3, 7.5.1, 7.9.3/174-9-7/Table 9
DNV:	Standard No. 2.4, 2006: Temp. Class B, Hum. Class B, Vib. Class C, and EMC Class A
LRS:	Test Specification No. 1, 2002: ENV1, ENV2, and ENV3

Environmental Specifications

Skid Mount Packaging

- Operating temperature: –20 to +70 °C (+60 °C w/ Profibus)
- 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

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Distributors & Service
Woodward has an international network of distributors and service facilities. For your nearest representative, call the Fort Collins plant or see the Worldwide Directory on our website.

www.woodward.com

Atlas-II Control System Modules

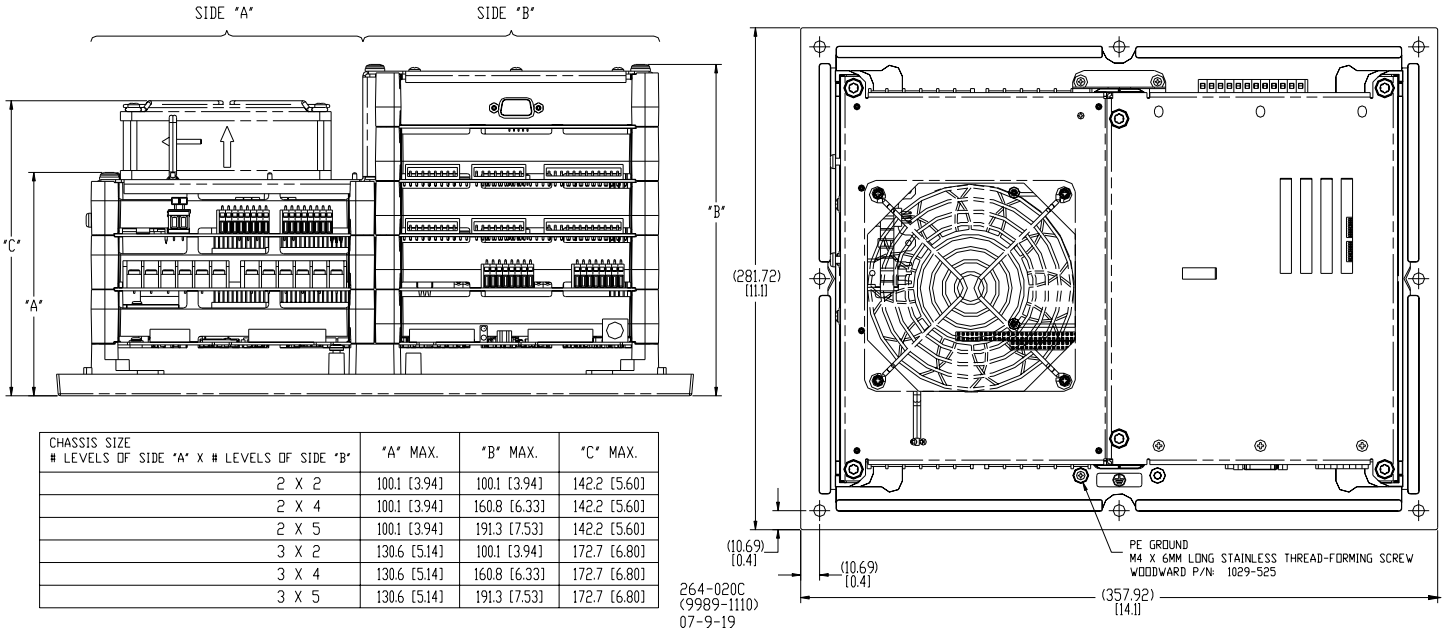
A5200 SmartCore Module
- Powerful Freescale MPC5200 CPU
- 2 configurable RS-232, RS-422, or RS-485
- 4 Ethernet communication ports
- 2 CANopen communication ports
- 2 MPU/Proximity
- 24 Discrete Inputs
- 6 Analog Inputs (4–20 mA, 0–5 V)
- 4 Analog Outputs (4–20 mA)
- 2 Actuator Outputs (4–20 mA, 20–200 mA)

Primary Power Supply
- 18–32 Vdc
- 12 Relay Drivers

Profibus Communications Module
- 12 MBaud Profibus DP Master/Slave

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

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



CHASSIS SIZE # LEVELS OF SIDE "A" X # LEVELS OF SIDE "B"	"A" MAX.	"B" MAX.	"C" MAX.
2 X 2	100.1 [3.94]	100.1 [3.94]	142.2 [5.60]
2 X 4	100.1 [3.94]	160.8 [6.33]	142.2 [5.60]
2 X 5	100.1 [3.94]	191.3 [7.53]	142.2 [5.60]
3 X 2	130.6 [5.14]	100.1 [3.94]	172.7 [6.80]
3 X 4	130.6 [5.14]	160.8 [6.33]	172.7 [6.80]
3 X 5	130.6 [5.14]	191.3 [7.53]	172.7 [6.80]

Atlas-II Outline Drawing

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