In-Pulse™ II

Fuel Injection Control

Applications

The In-Pulse™ II fuel injection control manages and controls electronically fuel injected (EFI) reciprocating engines (gas, diesel, or dual fuel) used in power generation, marine propulsion, locomotive and industrial engine, and process markets.

The In-Pulse II manages the core fuel system and injection events for many EFI fuel systems, including electronic unit injectors and pumps (EUI/EUP), common rail systems (C-R), SOGAV™ Solenoid Operated Gas Admission Valves, micro pilot injection systems, and electronic rail valves (ERV).

The In-Pulse II can mount directly on the engine, withstanding the high temperature and vibration environment. The In-Pulse II can also be mounted inside nearby control cabinets if required.

The In-Pulse II, with the addition of an 18-channel driver board, uses the same packaging, digital core, software tools, communication ports, I/O, and features of the 733 Digital Control (see product specification 03304). Therefore, where common engine types utilize different fuel systems, seamless interchangeability of the core fuel control can be easily accomplished without redesigning the complete engine management system.

If required, the In-Pulse II can be used as the main control unit within an engine management system. The control is designed for network connectivity to other Woodward or customer-selected devices, such as remote I/O modules, actuators, ignition controls, air/exhaust and fuel flow control valves, and power management controls. It may be programmed to perform all engine functions such as speed, air and fuel control, monitoring, alarms, engine protection, and sequencing.

The In-Pulse II improves engine management or plant control system reliability by offering many redundant options, including redundant networks, redundant speed and position sensors, redundant power supply inputs, and a second In-Pulse II wired as a hot stand-by for critical applications or where marine classification requires it.

Because of the many philosophies with respect to sensing speed and crank position, the control incorporates multiple sensing algorithms that include missing tooth and pin detection on the crank or cam for sensing speed and crank position. If sensor failure protection is required, redundant sensors can be employed.

- On-engine mounting
- Controls up to 18 outputs
- Processor technology and I/O is based on the 733 digital control
- Multiple sensor detection options
- Redundant speed sensor options
- Up to 7 injection events per cylinder
- Programmable current profiles for each injection event
- Woodward GAP™ programming environment
- Redundant single propulsion marine configurations

Programming

The In-Pulse II is programmed using Woodward's proven GAP™ Graphical Application Programmer. GAP is a dedicated, high-level, block-oriented programming language specifically designed for simple and quick implementation of difficult engine control strategies. GAP functions are easily modified and expanded, allowing fast creation of new applications.

Adjustments

Adjustments can be made quickly and easily through the Woodward Watch Window or Control View PC configuration interfaces. Both adjustment methods are menu-driven. The control saves all set points to non-volatile memory upon command. More information is on our website (www.woodward.com).

Communications

The In-Pulse II provides two isolated serial interfaces—one RS-232 and the other RS-485. Both ports feature an industry-standard Modbus® * protocol (ASCII or

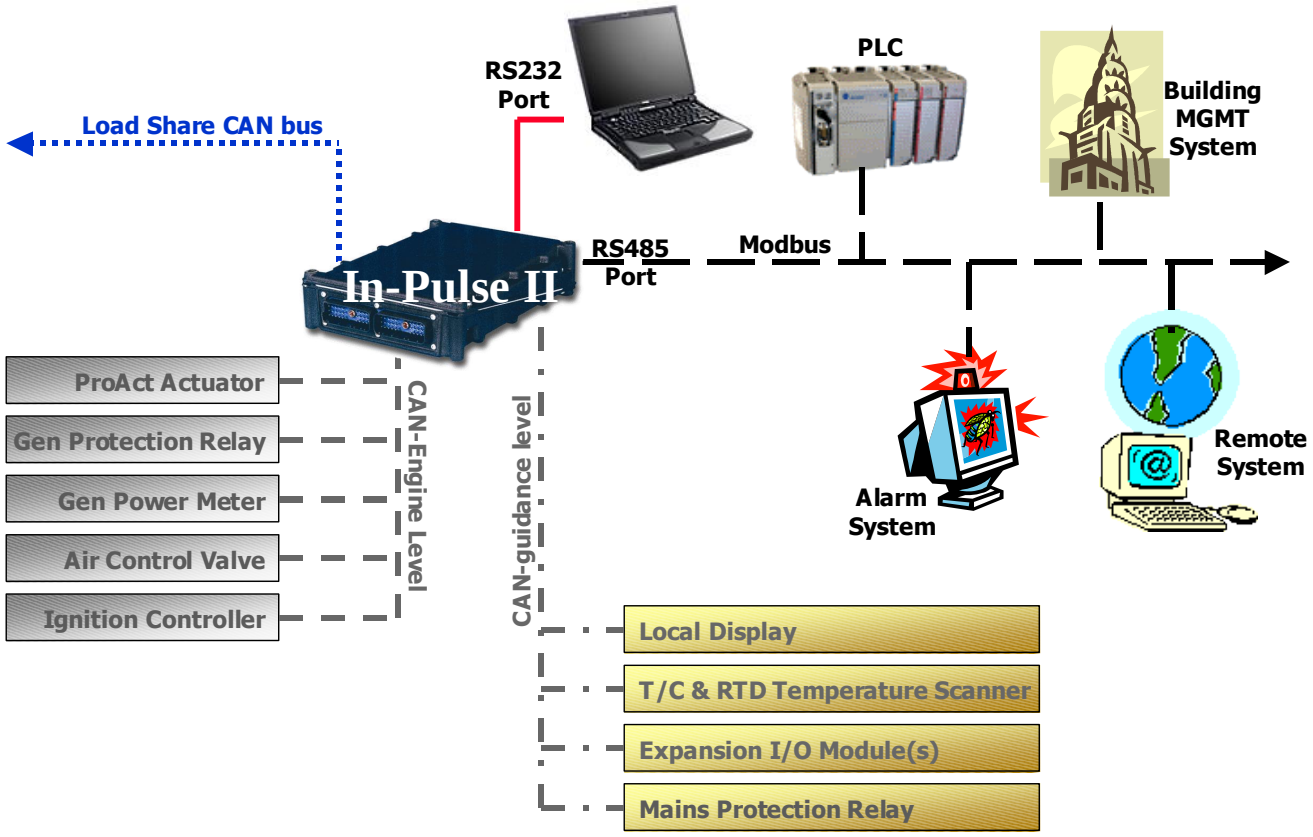
RTU) that can interface to a Modbus master or slave device such as a Human/Machine Interface (HMI). These ports also support Woodward ServLink protocol for a Watch Window or Control View PC interface. Baud rates are tunable to meet specific user requirements.

The In-Pulse II also provides three CAN ports, one of which is isolated if requested. All ports feature J1939 and CANOpen protocols. These ports can be used for distributed control with other devices such as actuators, valves, other In-Pulse II controls and 733's (to load share for example), and to communicate with other on-engine devices such as I/O modules and displays. The isolated port is well suited for communication to off-engine components like PLCs, ship and building systems.

* Modbus is a trademark of Schneider Automation Inc.

Self-Diagnostics

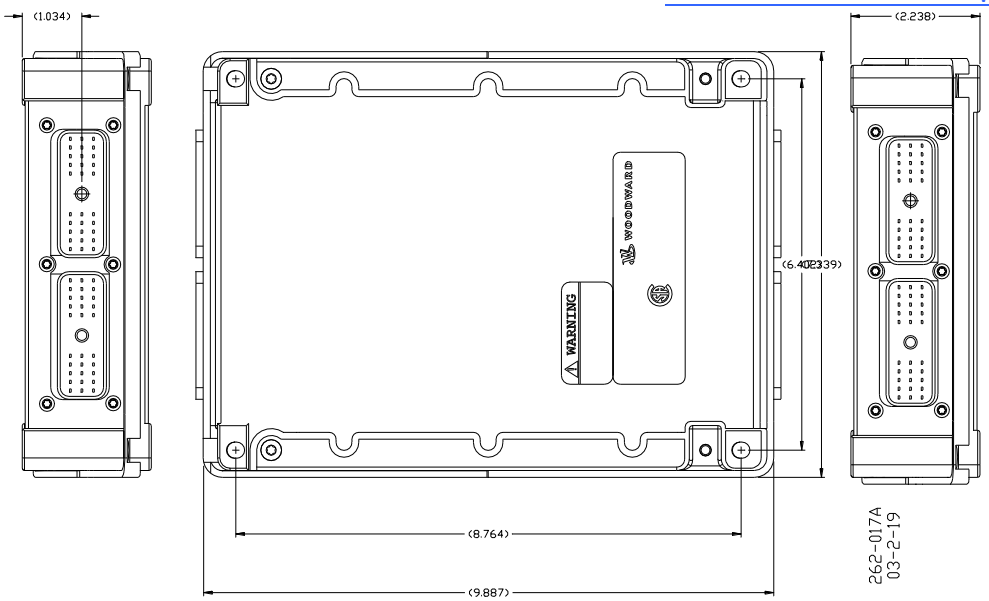
The In-Pulse™ II has integrated diagnostics to determine the control and IO integrity. Memories, processor, IO, and baseline power supply monitoring are included in the diagnostic tests.



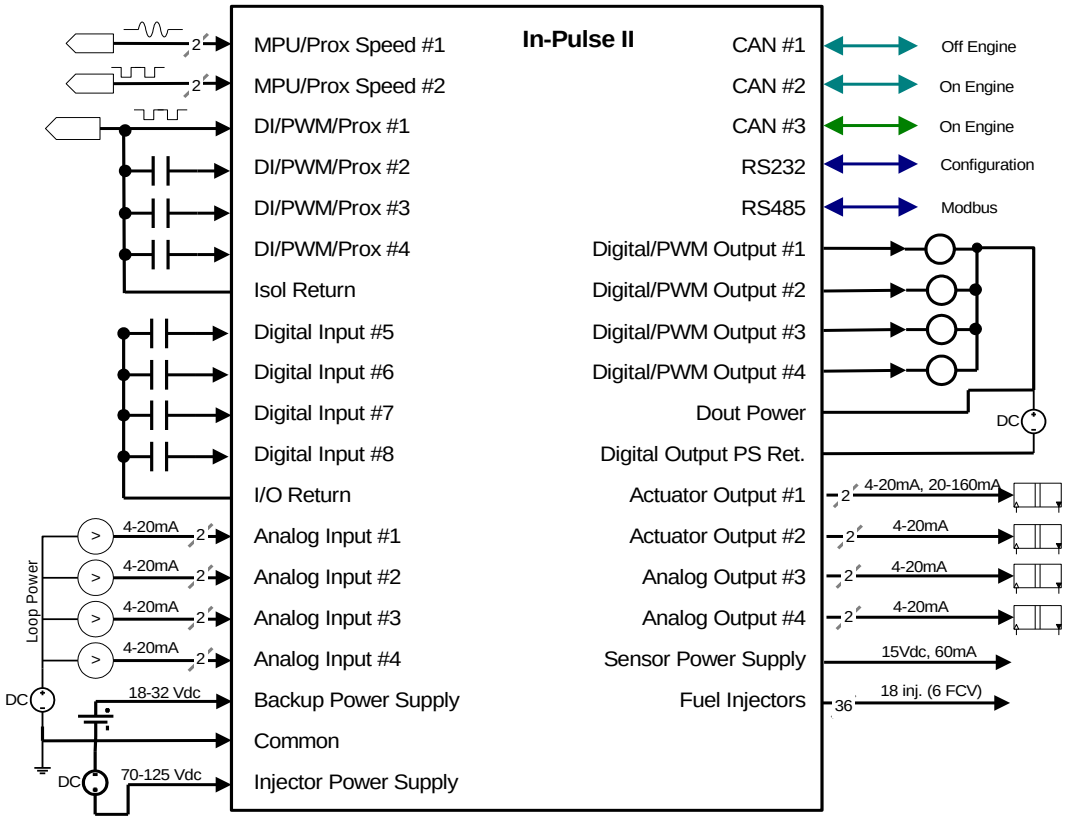
Typical In-Pulse II System Diagram

Specifications

Input Power	
Voltage	70–125 Vdc (110 Vdc nominal)
Power Consumption	Application-specific
Speed Signal Inputs (2)	
Speed Input Voltage	Magnetic Pickup: 1.4–70.0 V peak-to-peak Proximity Probe: 5–28 Vdc
Speed Input Frequency	10 Hz to 25 kHz
Proximity Input Duty Cycle	10–90% to 10 kHz, 20–80% to 20 kHz
Magnetic Pickup Diagnostics	Open wire detection
Discrete Inputs (8)	
Type	4 isolated inputs can be configured for PWM, digital, or proximity probes 4 non-isolated inputs are dedicated discrete inputs
Discrete Input Impedance	Sinking with internal pull-up 15 kΩ
Proximity Probe Frequency/Duty Cycle	10 Hz – 7 kHz / 10–90% to 3 kHz, 20–80% to 7 kHz
PWM Frequency/Duty Cycle	100 Hz – 1 kHz / 10–90% duty cycle
Analog Inputs (4)	
Type	4–20 mA, transducers externally powered
Input Impedance	200 Ω
Resolution	12 bits
Accuracy	0.5% of full scale
Current Outputs, 4–20 mA (3)	
Type	4–20 mA
Accuracy	0.5% of full scale
Resolution	14 bits
Diagnostics	Current readback provided
Current Outputs, 4-20/20-160 mA (1)	
Type	4–20 mA or 20–160 mA
Accuracy	0.8% of full scale (4–20 mA) or 1.1% of full scale (20–160 mA)
Resolution	14 bits
Diagnostics	Current readback provided
Discrete/PWM Outputs (4)	
Type	Isolated outputs sinking to dedicated return Each output can be configured as either a discrete or PWM output
Max Output Current	500 mA (Boolean) or 150 mA (PWM)
PWM Frequency Range	50–1000 Hz (configurable)
Proximity Probe Power Output (1)	
Voltage Level	15 Vdc, isolated
Current Limit	60 mA
Injector Outputs (18)	
Voltage Level	70–125 Vdc (as applied at input terminals)
Current Limit	20 A pull-in (configurable)
Type	May also be configured as 6 PWM FCV drivers (3 A limit)
	Environment
Max Operating Temperature	On-engine mounting with application-defined temperature limits
Storage Temperature	–40 to +120 °C (–40 to +248 °F)
Humidity	95% at +60 °C (+140 °F)
Mechanical Vibration	US MIL-STD 202F, Method 214A, TC(B)
Mechanical Shock	US MIL-STD 810C, Method 516.2, Procedure I
Enclosure Protection	IP-66



In-Pulse™ II Outline Drawing



In-Pulse II Control Block Diagram

WOODWARD

PO Box 1519, Fort Collins CO 80522-1519, USA
1041 Woodward Way, Fort Collins CO 80524, USA
Phone +1 (970) 482-5811
Email and Website—www.woodward.com

Woodward has company-owned plants, subsidiaries, and branches, as well as authorized distributors and other authorized service and sales facilities throughout the world. Complete address / phone / fax / email information for all locations is available on our website.

For more information contact: