WOODWARD

In-Pulse™
Electronic Fuel Injection Control

Installation and Operation Manual

Contents

Illustrations and Tables

Electrostatic Discharge Awareness

All electronic equipment is static-sensitive, some components more than others. To protect these components from static damage, you must take special precautions to minimize or eliminate electrostatic discharges.

Follow these precautions when working with or near the control.

1. Before doing maintenance on the electronic control, discharge the static electricity on your body to ground by touching and holding a grounded metal object (pipes, cabinets, equipment, etc.).

2. 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.

3. Keep plastic, vinyl, and Styrofoam materials (such as plastic or Styrofoam cups, cup holders, cigarette packages, cellophane wrappers, vinyl books or folders, plastic bottles, and plastic ash trays) away from the control, the modules, and the work area as much as possible.

4. 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.

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.*

Chapter 1.
General Information

Introduction

The primary purpose of the In-Pulse™ Electronic Fuel Injection Control is to control the timing and duration of up to 20 cylinder injection events.

The speed and angular position of the engine are determined by the following sensor inputs:
- Top Dead Center (TDC)
- Phase (only used in 4-cycle engines)
- Engine Speed (angular position)

These signals are used to determine the timing and duration periods.

The In-Pulse software uses the Applications Block Language Software (ABLS) to create applications using the Graphical Applications Programmer (GAP).

Tunable parameters can be changed via the service port by using a hand-held terminal.

Accessories

The Hand-held Tester (part number 9905-292) is used to configure the In-Pulse control. It plugs into the RS-422 port (J5).

Please contact Woodward for the In-Pulse control's requirements for speed, TDC, and phase signals.

A list of the range of valves that can be driven by the In-Pulse is available from Woodward.
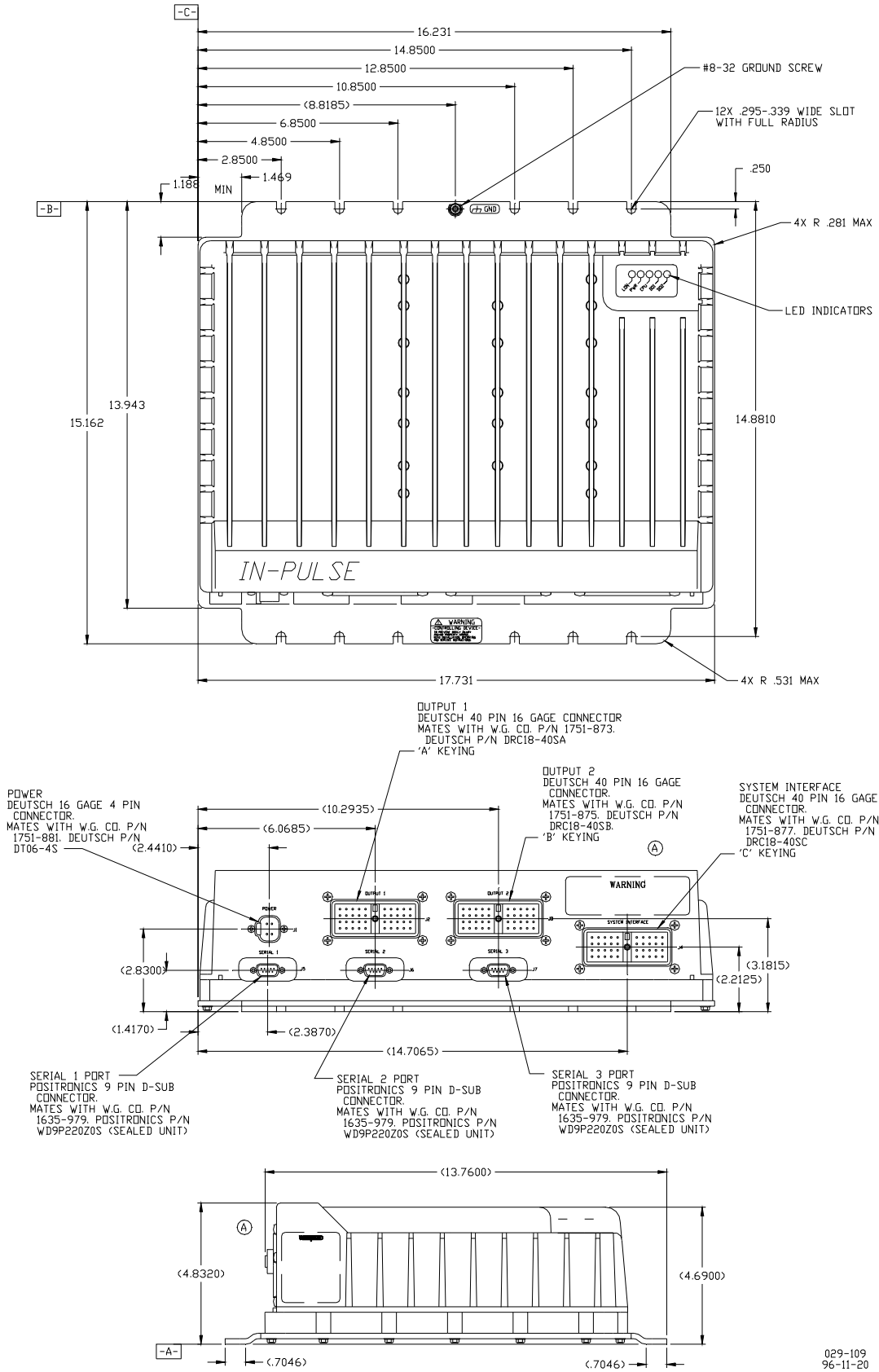
Figure 1-1. In-Pulse Control Outline Drawing
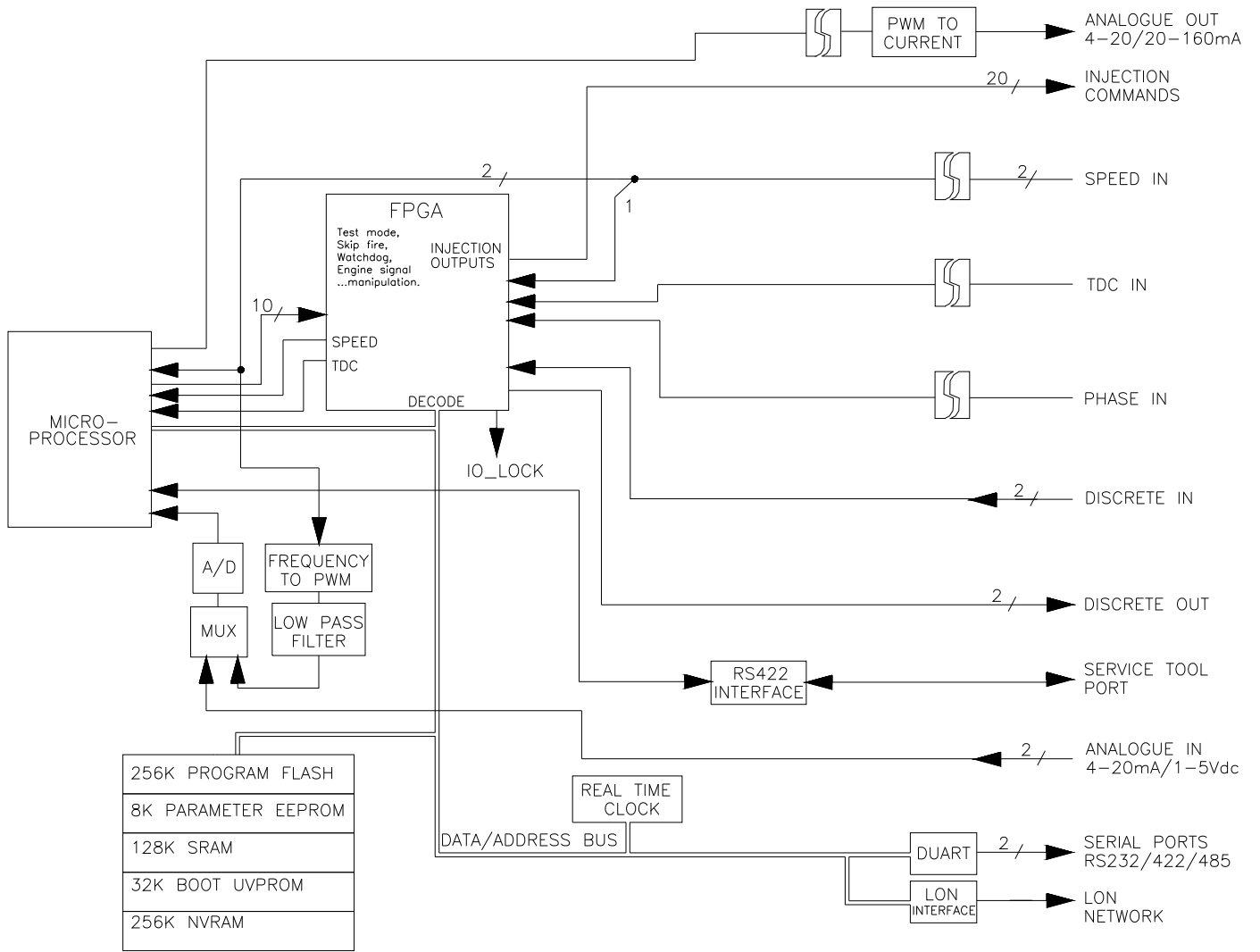
Figure 1-2. In-Pulse CPU Functional Block Diagram
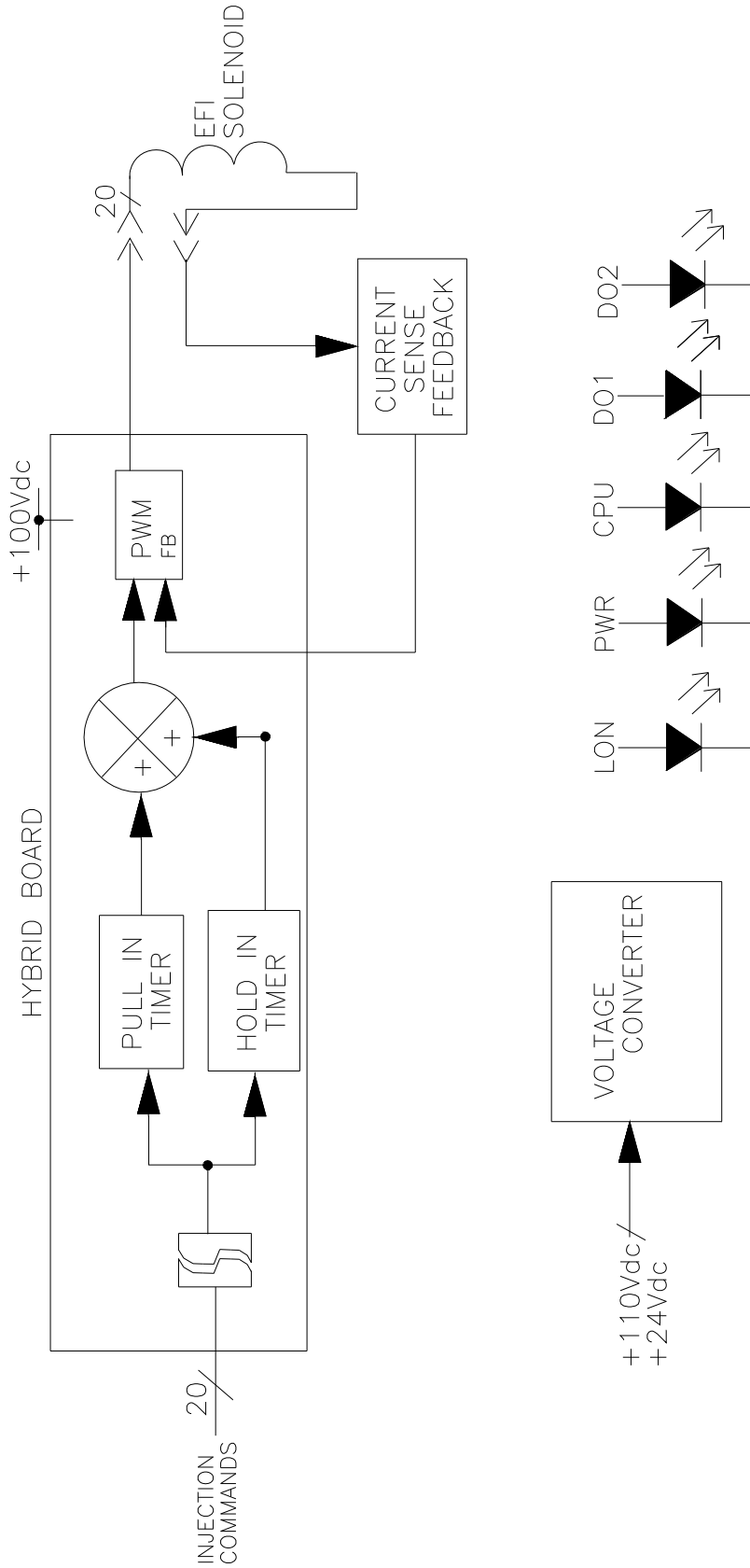
Figure 1-3. In-Pulse Driver Functional Block Diagram
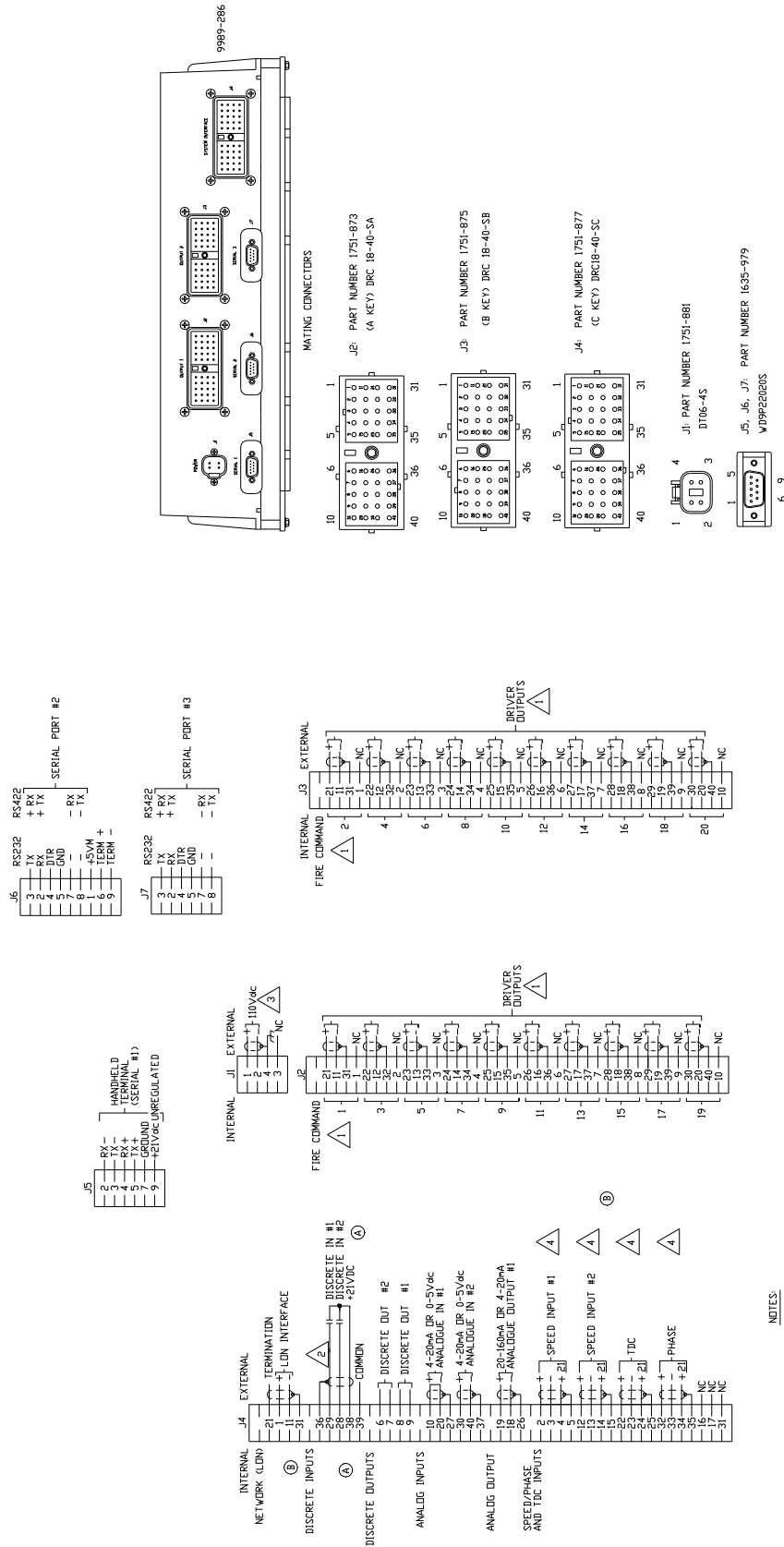
Figure 1-4. In-Pulse Plant Wiring Diagram

Chapter 2.
Installation

Scope

This chapter contains general installation instructions for the In-Pulse™ control. Power requirements, temperature limits, and location considerations are included to help you determine the best location for the control. Additional information includes unpacking instructions, electrical connections, and the installation checkout procedure.

Unpacking

Before handling the In-Pulse control, read page ii, *Electrostatic Discharge Awareness.* Be careful when unpacking the control. Check the control for signs of damage such as bent panels, scratches, and loose or broken parts. If any damage is found, immediately notify the shipper.

Power Requirements

High Voltage Version

The high voltage version of the In-Pulse control requires a voltage source of between 90 and 140 Vdc (110 Vdc nominal). The voltage source must be capable of providing 7 A for 2 ms without dropping below 90 Vdc. The control unit will consume a maximum of 300 W.

Low Voltage Version

The low voltage version of the In-Pulse control requires a voltage source of between 18 and 32 Vdc (24 Vdc nominal). The voltage source must be capable of providing 14 A for 2 ms without dropping below 18 Vdc. The control unit will consume a maximum of 300 W. [There are a limited number of In-Pulse controls available in the low voltage version. Contact Woodward for more information.]

Mounting the In-Pulse Control

The In-Pulse control is designed to operate within a temperature range of –40 to +70 °C (–40 to +158 °F). The control can be stored within a temperature range of –40 to +85 °C (–40 to +185 °F). A reduced life-span of the Real Time Clock can be expected if the In-Pulse control is operated continuously at temperatures above +55 °C (131 °F). The maximum relative humidity permitted for the control is 95%, non-condensing, at –40 to +70 °C (–40 to +158 °F).

Mount the In-Pulse control in a location with space for wiring access. Do not expose the control to sources of radiant heat such as exhaust manifolds or turbochargers. The mounting location of the control should provide protection from high-voltage or high-current devices, or devices which produce electromagnetic interference.

Installation

See Figure 1-1 to determine the dimensions of the In-Pulse control. Secure the control using the mounting slots provided.

Wiring Instructions

See Figure 1-4. This figure shows the external wiring connections and shielding requirements for the In-Pulse control. Carefully follow the instructions below when making the external wire connections to the control.

NOTICE	**The Driver outputs are labeled as Fire commands and are sequentially numbered from 1 through 20. Take great care to make sure that the correct firing order for the engine is obtained by wiring each fire command to the correct cylinder solenoid valve. The fire command 1 should be connected to the reference (No. 1) cylinder.**

Connectors for the power and driver cables require 1.0 mm² (16 AWG) wire. Power and driver cables may have a maximum length of 30 m (98 ft). Wire connections are site specific. See the control wiring diagram for your system.

Electromagnetic interference (EMI) is the undesirable interaction of electronic circuits with each other and sometimes with themselves. Woodward has established procedures to prevent most EMI that can affect engine control circuits. Following these procedures is a slight extra expense in planning and installing electronic governing systems, but it is inexpensive insurance over the life of the electronic control system. Follow all of the shielding instructions below to ensure maximum efficiency and dependability of the electronic governing system.

Software Downloading Instructions

1. Connect the download cable (Woodward part number 5416-870) from the PC to In-Pulse control connector J5. Application HEX file to be downloaded is needed.

2. Run the program XFER.exe (Woodward part number 9924-150) provided with the In-Pulse tool kit. Follow the instructions given from the program.

3. The XFER.exe program needs to be run from DOS or a DOS shell under Windows 3.1, 3.11, or 95.

IMPORTANT	**This program will not run under Windows NT.**

4. To combine the ABLS application, refer to the README.txt file included with the tool kit for the In-Pulse.

Shielded Wiring

All shielded cable must be twisted conductor pairs. Do not attempt to tin (solder) the braided shield. All signal lines should be shielded to prevent picking up stray signals from adjacent equipment. Connect the shields to the correct pin on the connectors. Wire exposed beyond the shield should be as short as possible, not exceeding 50 mm (2 inches). The other end of the shields must be left open and insulated from any other conductor. DO NOT run shielded signal wires along with other wires carrying large currents. See Woodward application note 50532, *Interference Control in Electronic Governing Systems*, for more information.

Where shielded cable is required, cut the cable to the desired length and prepare the cable as instructed below.

1. Strip outer insulation from BOTH ENDS, exposing the braided or spiral wrapped shield. DO NOT CUT THE SHIELD.

2. Using a sharp, pointed tool, carefully spread the strands of the shield.

3. Pull the inner conductor(s) out of the shield. If the shield is the braided type, twist it to prevent fraying.

4. Remove 6 mm (1/4 inch) of insulation from the inner conductors.

Chapter 3.
Description of Operation

Introduction to the In-Pulse™ Control

The primary purpose of the In-Pulse™ control is to control the timing and duration of the fueling event of up to 20 cylinders.

The angular position of the engine is determined from the speed, TDC (top dead center), and phase signals. In four-cycle applications, only the TDC pulse immediately following the phase pulse is passed on as a timing reference mark to the CPU. The CPU sets up the hardware for two- or four-cycle operation based on the application requirements set up in the ABLS EFIC Block. The phase pulse is not used in two-cycle engine applications.

Every time the ABLS EFIC Block runs, the SOI (Start of Injection) and EOI (End of Injection) points are calculated for every cylinder. The SOI and EOI can be varied in increments of 128th of a degree. The CPU has ten output lines used to generate 20 injection events. A CPU output line will contain two injection events every engine cycle. Because of this limitation, the duration of injection event must be less than half of an engine cycle. The software has limit checking to ensure that an injection event does not overlap the complementary injection event on a common CPU output line. When an injection pulse finishes, it sets up the SOI and EOI for its complementary cylinder. When the SOI occurs, the most recently calculated EOI value is loaded. The injection pulses are then de-multiplexed and passed on the driver board. The driver board then converts these logic level signals to high current and high voltage signals capable of driving the EFI solenoids.

The digital I/O and the analog I/O can be used for the functions set by the ABLS application. A LON interface is required to further expand the In-Pulse control's I/O capability.

In-Pulse CPU Functional Block Diagram Description

See Figure 1-2 for the In-Pulse CPU Functional Block Diagram. The CPU executes the ABLS board software program to provide the various functions required of the control. The main outputs of this block diagram are injection commands to the drivers. The In-Pulse control can accommodate up to 20 drivers. The In-Pulse Driver Functional Block Diagram is shown in Figure 1-3, which displays the blocks necessary for one solenoid valve. See the In-Pulse Driver Function Block Diagram Description below for more information on its operation.

LED Indications

The In-Pulse control has five LEDs to give the user a status indication of the unit. They consist of the following:

Name	Description
LON	Illuminates to indicate activity on the Local Operator Network (LON).
PWR	Illuminates when +5 Vdc power is applied to the CPU board.
CPU	Illuminates when the CPU is running. Turns off when the CPU halts. Remains turned off until the CPU restarts.
DO1	Illuminates to indicate that Discrete Output DO1 is high.
DO2	Illuminates to indicate that Discrete Output DO2 is high.

CPU

The Central Processor Unit (CPU) executes your applications program. The applications program is stored in the flash memory.

FPGA

The Field Programmable Gate Array (FPGA) performs the following functions:
- De-multiplexes the driver signals from the CPU.
- Manipulates the SPEED, TDC, and PHASE signals.
- Skip Fire Calculations.
- Watchdog Timer that monitors the condition of the program. If it detects a fault, it will halt the CPU and issue an I/O_LOCK out which will force all the outputs into a non-active state.
- Test Mode Operation simulates an engine speed of 37.5 rpm 60 teeth to allow the solenoids to be tested with the ENGINE SHUTDOWN.
- Decode Function. This Function decodes set-up commands for the FPGA and also decodes for the memory mapped I/O.

In-Pulse Driver Functional Block Diagram Description

See Figure 1-3. Each Driver Functions Block receives the fuel injection commands for its cylinder from the FPGA. The width of the command determines the time that the electronic fuel injection solenoid is energized. The driver develops the necessary power to energize the electronic fuel injection (EFI) solenoid and keep the solenoid energized for the time called for by the fuel injection command.

Description of Blocks

See Figure 1-3. The Pull-In and Hold-In timers receive the fuel injection commands from the FPGA. The timers are activated at the beginning of these commands. The duration of the Pull-In timer varies from 1 to 4 ms depending on the type of solenoid that your system requires. The Hold-In timer limits the maximum duration for the solenoid. This limit is set at 450 ms and should never be exceeded under normal running conditions. It is intended to be a maximum limit to protect the driver from overcurrent conditions. This limit is too long to protect the engine from excessive durations.

Since the amount of current required to energize the EFI solenoid is greater than that required to hold in the solenoid, current sense feedback is applied to instruct the pulse width modulation (PWM) driver to reduce the pulse width to keep the solenoid current at hold-in value for the time required. Reducing the current limits the amount of heat generated and extends the life of the solenoid, and at the same time speeds up the response of the valve in the off direction.

If the current outputs need to be monitored, a dc current probe must be used. Otherwise, a distorted voltage measurement will be obtained due to the PWM method of driving the valves.

Communications Ports

LON

The In-Pulse control uses the Local Operator Network (LON) to communicate with other devices that are connected to the network. The transmission media is:
- Twisted pair; 1.25 Mbs Manchester coded
- Message types:
        Single variable message
        Woodward proprietary structured message

Isolated Serial Port

One isolated serial port (J6) can be used to communicate application-specific information to external devices. Characteristics are:
- RS-232/RS-422; 100 to 38 400 Baud; 7–8 Data Bits; None–Even Parity and 0–2 Stop bits
- Modbus$^®$ * master/slave; ASCII
- General purpose ASCII out with XON/XOFF
- Woodward ServLink
                        *—Modbus is a registered trademark of Schneider Automation Inc.

Non-isolated Serial Port

One non-isolated serial port (J7) can be used to communicate application-specific information to external devices. Characteristics are:
- RS-232/RS-422; 100 to 38 400 Baud; 7–8 Data Bits; None–Even Parity and 0–2 Stop bits
- Modbus master /slave; RTU/ASCII
- General purpose ASCII out with XON/XOFF
- Woodward ServLink

HHT or Service Tool Port

A serial port is provided for the Hand Held Tester or Service Tool. Characteristics are:
- RS-422 1200 Baud; 8 Data Bits; No Parity Bit; One Stop Bit

Inputs

Speed, Phase, and TDC Sensors

Two MPU inputs can detect the speed of your engine or turbocharger. Input #1 must be used to detect the speed of the engine which is using the EFI functions.

- Analog Speed Detection:
        50 to 2100 rpm
        380 to 17 500 Hz

- Digital Speed Detection:
        1 to 2100 rpm
        7.5 to 17 500 Hz.

- Sensor Options:
    Magnetic Pickup (MPU)
    The wiring of the MPU needs to ensure that the polarity is correct. The positive pin of the MPU must be connected to the positive pin of the In-Pulse input. The phase and TDC signal should look like Figure 4-1.


```
                                                    029-137
                                                    98-09-22 skw
```
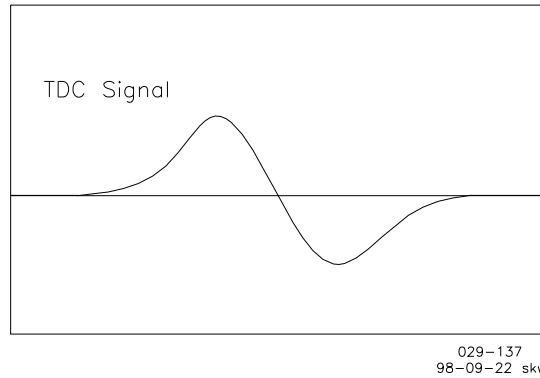
Figure 4-1. Phase and TDC Signal

The polarity of the MPU signals is important due to the way that the MPU input circuitry inside the In-Pulse control functions. The rising and falling edges are used to "arm and trip" the signal going to the CPU. The rising edge arms the event and the falling edge trips the event out of a comparator. The polarity is most important for phase and TDC signals because they only occur once or twice per engine cycle.

MPU Amplitude: 1 to 50 Vrms
MPU Input Impedance: 10 kΩ ±15%

IMPORTANT	When a magnet is being used to increase the amplitude of an MPU signal, the magnet should be mounted so that it attracts the sensor end of the MPU. The magnet should be installed into the flywheel or camshaft so that the north pole end of the magnet comes in contact with the MPU.

Proximity Inputs
This type of input is typically used by proximity probes or optical encoders. Typical optical encoders used generate a speed and TDC pulse. The encoder is mounted to the camshaft.

IMPORTANT	The maximum speed along with other parameters will affect the temperature rating of the In-Pulse control. For more information, please contact Woodward.

Non-isolated Analog Inputs

Two non-isolated analog inputs are available for use as control, feedback, or monitoring functions. Transducers will need to be powered from an external source. The analog inputs are rated at:
- 4 to 20 mA @ 250 Ω (factory setting)
- 1 to 5 Vdc @ 10 kΩ

Discretes

Two discrete inputs are available for use as start/stop sequencing, operator controls, or other site logic. The discrete inputs are rated at (dependent on hardware configuration):

- 21 Vdc nominal @ 3 mA (factory setting)
- 75 Vdc nominal @ 3 mA
- 110 Vdc nominal @ 3 mA

Outputs

Valve Solenoid Energizing Signals

Up to twenty valve solenoid energizing signal outputs are available.

Analog Output

One analog output is available for use as a control or monitoring function:

- 4 to 20 mA maximum load of 600 Ω
- 20 to 160 mA maximum load of 50 Ω (factory setting)

Discrete Outputs

Two discrete outputs are available for use as start/stop sequencing, indication, or other site logic:

- 0.6 A @ 115 Vac breaking
- 4 A @ 28 Vdc breaking

Use of Hand Held Terminal

The Hand Held Terminal can communicate with the In-Pulse control through a serial port to service and maintain the control.

Alarms

Alarms are application-dependent. Refer to your system manual for a list of alarms.

Shutdowns

Shutdowns are application-dependent. Refer to your system manual for a list of shutdowns.

Troubleshooting

Troubleshooting is application-dependent. Refer to your system manual troubleshooting guide.

If the current outputs need to be monitored, a dc current probe must be used. Otherwise, a distorted voltage measurement will be obtained due to the PWM method of driving the valves.

Chapter 4.
Specifications

Woodward Part Number(s):   8402-xxx

Power Supply

Power Rating (high voltage):	90–140 Vdc (110 Vdc nominal)
Power Consumption (high voltage):	300 W maximum. The voltage source must be capable of providing 7 A for 2 ms without dropping below 90 Vdc.
Power Rating (low voltage):	18–32 Vdc (24 Vdc nominal)
Power Consumption (low voltage):	300 W maximum. The voltage source must be capable of providing 14 A for 2 ms without dropping below 18 Vdc.

Analog Input Channels

Number of Channels:	2
Input Signal Range:	4–20 mA @ 250 Ω or 1–5 Vdc @ 10 kΩ

Analog Output Channel

Number of Channels:	1
Rating:	4–20 mA @ 600 Ω max. or 20–160 mA @ 50 Ω max.

Serial Communications Ports

Number of Ports:	2
Can be Configured to:	RS-232 or RS-422

Other Communications Ports

Number of Ports:	1
Type:	LON Network

Discrete Inputs

Number of Inputs:	2
Ratings:	21 Vdc nominal @ 3 mA
	75 Vdc nominal @ 3 mA
	110 Vdc nominal @ 3 mA

Discrete Outputs

Number of Outputs:	2
Ratings:	0.6 A @ 115 Vac breaking
	4 A @ 28 Vdc breaking

Temperature Ranges

Ambient Operating Temperature:	–40 to +70 °C (–40 to +149 °F)
Storage Temperature:	–40 to +85 °C (–40 to +185 °F)

EMI/RFI Specification: EN50081-2, EN50082-2

Chapter 5.
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.

A current list of Woodward Business Partners is available at **www.woodward.com/support/directory.cfm**.

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/support**.

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	**Engine Systems**	**Turbine Systems**
Facility---------------Phone Number	**Facility---------------Phone Number**	**Facility---------------Phone Number**
Brazil ------------ +55 (19) 3708 4800	Brazil ------------ +55 (19) 3708 4800	Brazil ------------ +55 (19) 3708 4800
China ---------- +86 (512) 6762 6727	China ---------- +86 (512) 6762 6727	China ---------- +86 (512) 6762 6727
Germany:	Germany:	India --------------+91 (129) 4097100
Kempen----+49 (0) 21 52 14 51	Stuttgart----- +49 (711) 78954-0	Japan-------------- +81 (43) 213-2191
Stuttgart----- +49 (711) 78954-0	India --------------+91 (129) 4097100	Korea ------------- +82 (51) 636-7080
India --------------+91 (129) 4097100	Japan-------------- +81 (43) 213-2191	Poland---------------+48 12 295 13 00
Japan-------------- +81 (43) 213-2191	Korea ------------- +82 (51) 636-7080	The Netherlands- +31 (23) 5661111
Korea ------------- +82 (51) 636-7080	The Netherlands- +31 (23) 5661111	United States ---- +1 (970) 482-5811
Poland---------------+48 12 295 13 00	United States ---- +1 (970) 482-5811	
United States ---- +1 (970) 482-5811		

You can also contact the Woodward Customer Service Department or consult our worldwide directory (**www.woodward.com/support/directory.cfm**) for the name of your nearest Woodward distributor or service facility.

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.

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication 02983C.

B02983:C