

721 Digital Control

**8280-133, 8280-134, 9906-118, 9906-119
Hardware Only**

Hardware Manual

IMPORTANT



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.

DEFINITIONS

- **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

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.



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.



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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.

NOTICE

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.

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*.

Woodward reserves the right to update any portion of this publication at any time. Information provided by Woodward is believed to be correct and reliable. However, no responsibility is assumed by Woodward unless otherwise expressly undertaken.

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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

This manual describes the Woodward 721 Digital Control hardware, 8280-133 (low voltage), 8280-134 (high voltage), 9906-118 (low voltage, marine type approval), and 9906-119 (high voltage, marine type approval).

Application

The 721 Digital Control can be programmed to suit applications requiring two magnetic pickups (MPUs) or proximity switches (such as for torsional filtering) as the hardware includes two speed inputs. It also includes four analog inputs, three analog outputs, eight discrete inputs and three discrete outputs, all of which can be programmed to satisfy the application. The control can be used in load sharing systems as it contains circuitry and connections to deal with this.

The 721 control (Figure 1-1) consists of a single printed circuit board in a sheet-metal chassis. Connections are via three terminal strips and a 9-pin subminiature D connector.

Control Options

The 721 control requires the following power supply input voltages, with 18 watts as the nominal power consumption at rated voltage:

- 18–32 Vdc (24 Vdc nominal)
- 88–132 Vac 45–65 Hz (120 Vac nominal)
- 90–150 Vdc (125 Vdc nominal)

Discrete input voltages provide on/off command signals to the electronic control. Each discrete input requires 10 mA at its 24 Vdc nominal voltage rating (for 24 volt switching logic).

Other control options are:

- proximity switch input for speed signal frequencies below 100 Hz
- tandem actuator outputs

The control may be used with either proximity switches or magnetic pickups. The minimum frequency for steady state speed control is 7.5 Hz. For more information see Control Specifications (inside back cover).

721 Digital Speed Control Accessories

Hand Held Programmer (Figure 1-2), part number 9905-292, is used for adjusting the 721 control. It plugs into the serial port of the control.

SPM-A Synchronizer, for synchronizing the generator phase to that of the power bus. The synchronizer generates a close generator breaker signal to parallel the generator with the power bus.

Power Output Sensor, for load sharing or droop operation in mechanical load applications.

Real Power Sensor, for load sharing or droop-parallel generator applications.

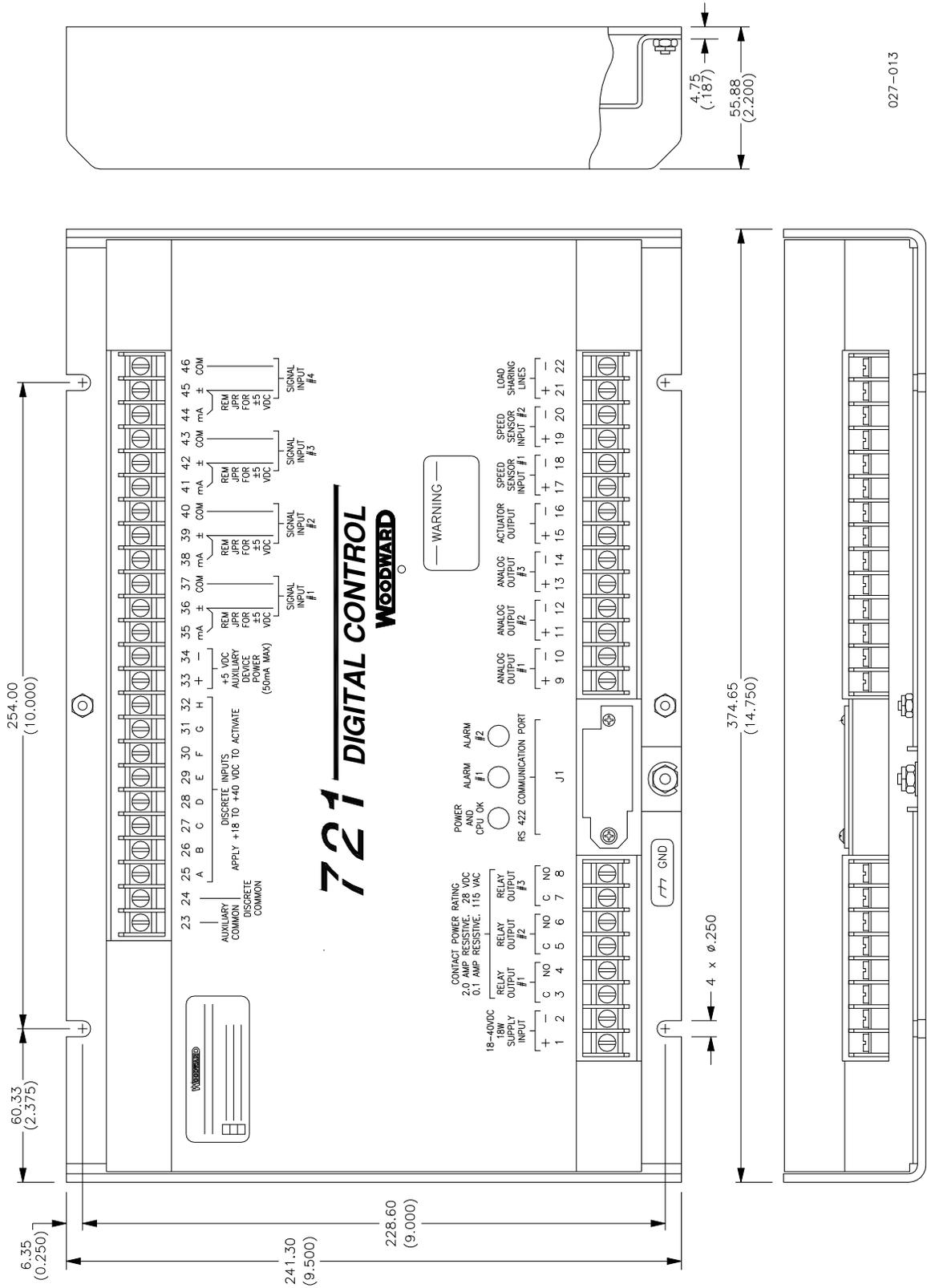
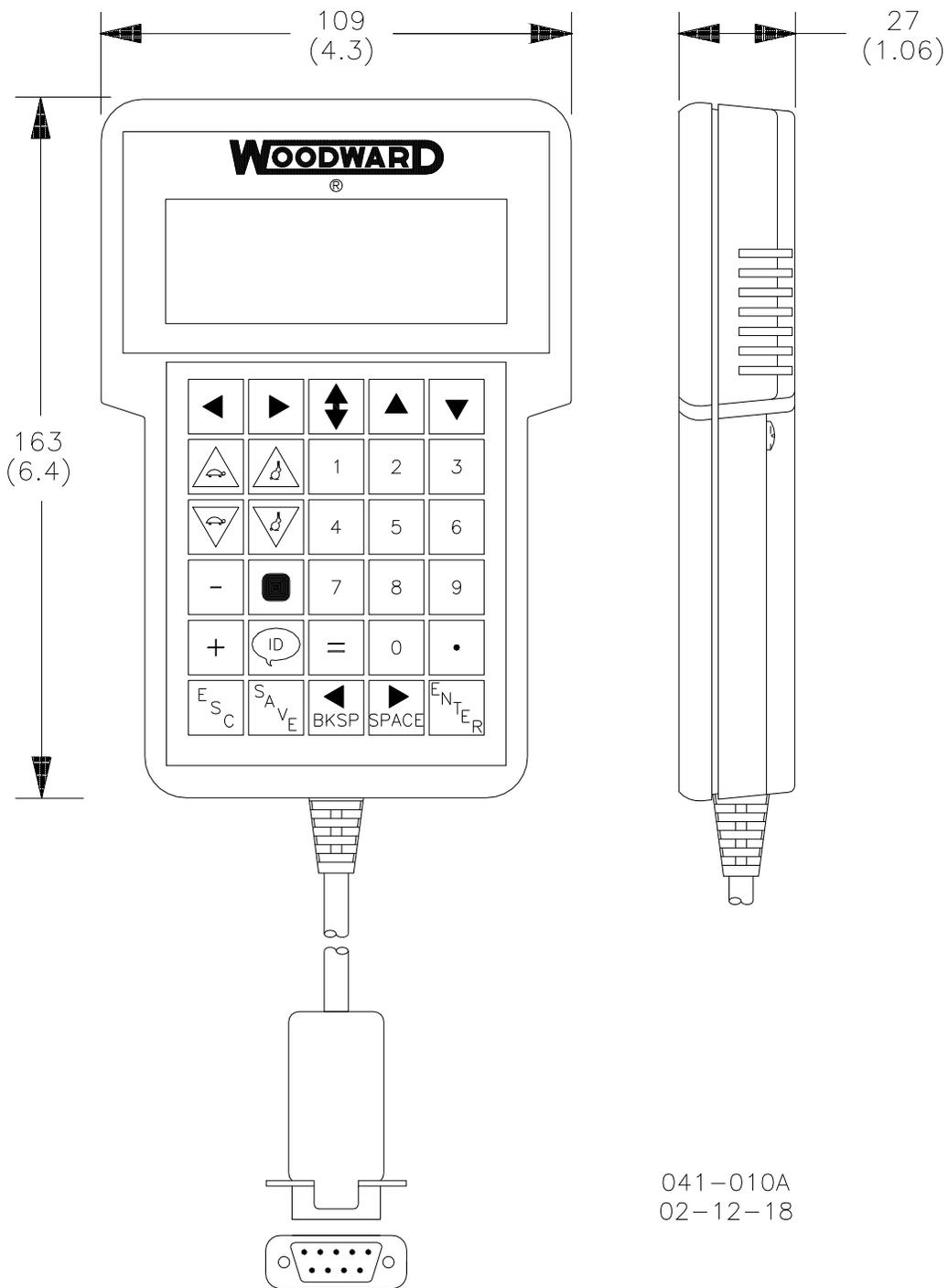


Figure 1-1. 721 Digital Speed Control

027-013



041-010A
02-12-18

Figure 1-2. Hand Held Programmer

Chapter 2. Installation

Scope

This chapter contains general installation instructions for the 721 control. Power requirements, environmental precautions, and location considerations are included to help you determine the best location for the control. Additional information includes unpacking instructions, electrical connections, and installation checkout procedures.

Unpacking

Before handling the control, read page ii, Electrostatic Discharge Awareness. Be careful when unpacking the electronic 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

The high-voltage versions of the 721 Digital Speed Control require a voltage source of 88 to 132 Vac 45 to 65 Hz or 90 to 150 Vdc. The low-voltage versions require a voltage source of 18 to 32 Vdc.

NOTICE

To prevent damage to the control, do not exceed the input voltage range.

IMPORTANT

If a battery is used for operating power, an alternator or other battery-charging device is necessary to maintain a stable supply voltage.

NOTICE

To prevent damage to the control, make sure that the alternator or other battery-charging device is turned off or disconnected before disconnecting the battery from the control.

Location Considerations

Consider these requirements when selecting the mounting location:

- adequate ventilation for cooling
- space for servicing and repair
- protection from direct exposure to water or to a condensation-prone environment
- protection from high-voltage or high-current devices, or devices which produce electromagnetic interference
- avoidance of vibration
- selection of a location that will provide an operating temperature range of -40 to $+70$ °C (-40 to $+158$ °F)

The control must NOT be mounted on the engine.

Internal Jumpers

The 721 control has nine, two-position internal jumpers (JPR1 through JPR18) located on the top of the printed circuit board. If it is necessary to change any jumper to match your control requirements, and this suits the nature of the software, be sure to read page ii, Electrostatic Discharge Awareness.

With the power off, remove the control cover. With your fingers or a small pair of tweezers, carefully remove the appropriate jumper and replace it securely over the proper two connectors (see Figure 3-1).

The jumper connections are listed:

JPR1	analog output #1	0–1 mA
JPR2	analog output #1	0–20 mA
JPR3	analog output #2	0–1 mA
JPR4	analog output #2	0–20 mA
JPR5	analog output #3	0–1 mA
JPR6	analog output #3	0–20 mA
JPR8 & JPR9	actuator output	0–200 mA, single
JPR8 & JPR10	actuator output	0–20 mA, single
JPR7 & JPR9	actuator output	0–160 mA, tandem
JPR11 & JPR15	speed sensor #1	proximity switch
JPR12 & JPR16	speed sensor #1	magnetic pickup
JPR13 & JPR17	speed sensor #2	proximity switch
JPR14 & JPR18	speed sensor #2	magnetic pickup

Electrical Connections

External wiring connections and shielding requirements for each installation are shown in Chapter 5 of the software manual appropriate to the application.

Shielded Wiring

All shielded cable must be twisted conductor pairs. Do not attempt to tin the braided shield. All signal lines should be shielded to prevent picking up stray signals from adjacent equipment. Connect the shields to the nearest chassis ground. 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, *EMI Control for Electronic Governing Systems*, for more information.

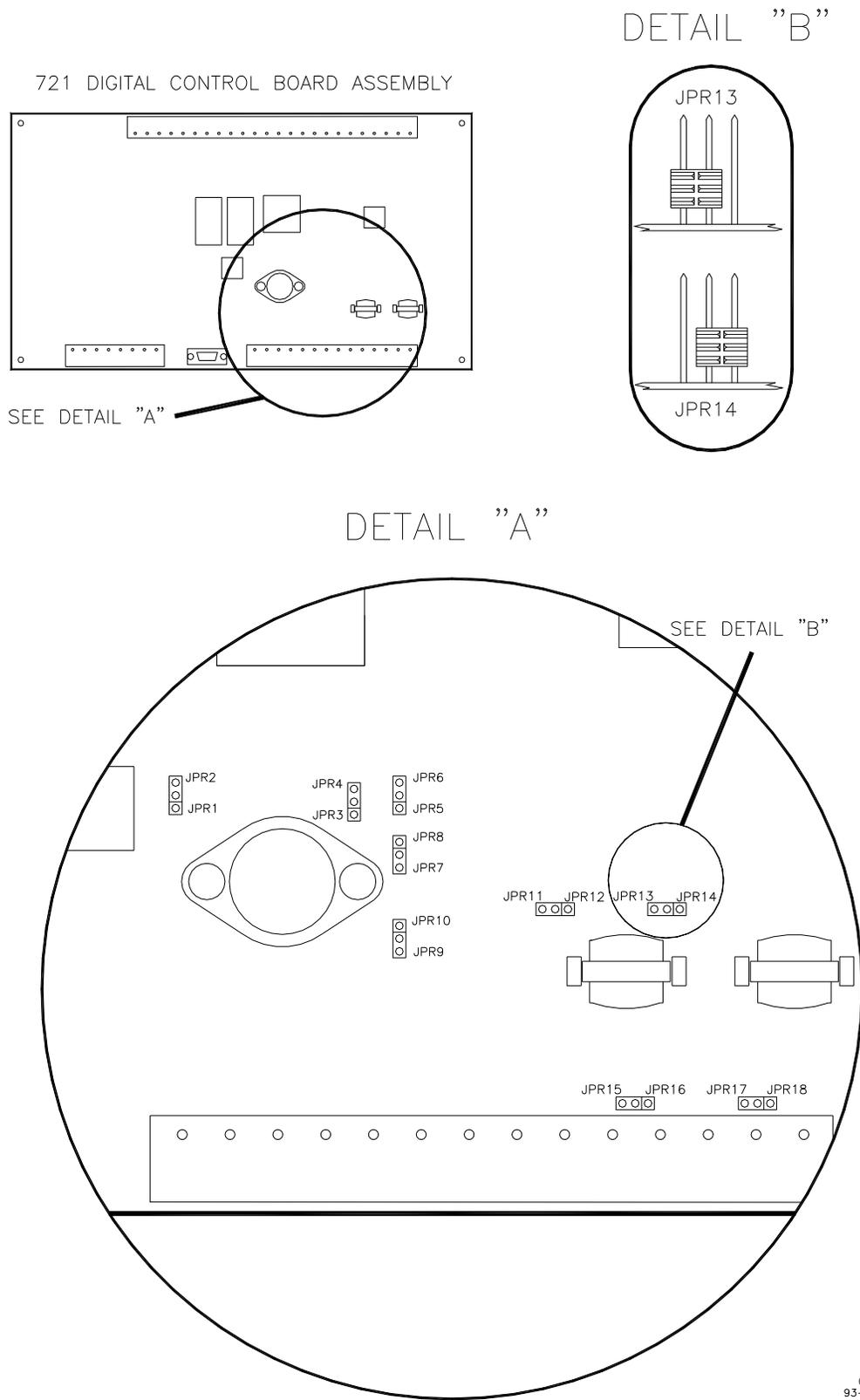


Figure 3-1. 721 Control Internal Jumpers

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 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.

Installations with severe electromagnetic interference (EMI) may require additional shielding precautions. Contact Woodward for more information.

Power Supply (Terminals 1/2)

Power supply output must be low impedance (for example, directly from batteries). DO NOT power the control from high-voltage sources with resistors and zener diodes in series with the control power input. The 721 control contains a switching power supply which requires a current surge to start properly.

NOTICE

To prevent damage to the control, do not power a low-voltage control from high-voltage sources, and do not power any control from high-voltage sources with resistors and zener diodes in series with the power input.

Run the power leads directly from the power source to the control. DO NOT POWER OTHER DEVICES WITH LEADS COMMON TO THE CONTROL. Avoid long wire lengths. Connect the positive (line) to terminal 1 and negative (common) to terminal 2. If the power source is a battery, be sure the system includes an alternator or other battery-charging device.

If possible, do NOT turn off control power as part of a normal shutdown procedure. Leave the control powered except for service of the system and extended periods of disuse.

NOTICE

Do NOT apply power to the control at this time. Applying power may damage the control.

NOTICE

To prevent damage to the engine, apply power to the 721 control at least ten seconds prior to starting the engine. The control must have time to do its power up diagnostics and become operational. Do not start the engine unless the green POWER AND CPU OK indicator on the 721 control cover comes on, because test failure turns off the output of the control.

Analog Outputs (#1, #2, & #3)

Use shielded twisted-pair wires to connect to terminals 9(+) & 10(-), 11(+) & 12(-) and 13(+) & 14(-). For an electrically isolated input device such as a 4 to 20 mA input analog meter, the shield should be grounded at the control end of the cable. For input to other devices, use the recommendation of the device manufacturer.

NOTICE

To prevent possible damage to the control or poor control performance resulting from ground loop problems, we recommend using current-loop isolators if the 721 control's analog inputs and outputs must both be used with non-isolated devices. A number of manufacturers offer 20 mA loop isolators. Consult Woodward for further information.

Actuator Output (Terminals 15/16)

The actuator wires connect to terminals 15(+) and 16(-). Use shielded wires with the shield connected to chassis at the control.

Speed Signal Inputs (Terminals 17/18 & 19/20)

Connect a magnetic pick-up (MPU) or proximity switch to terminals 17 and 18. You may need to connect a second MPU/proximity switch to terminals 19 and 20 (see relevant application manual). Use shielded wire for all speed sensor connections. Connect the shield to the chassis. Make sure the shield has continuity the entire distance to the speed sensor, and make sure the shield is insulated from all other conducting surfaces.

WARNING

The number of gear teeth is used by the control to convert pulses from the speed sensing device to engine rpm. To prevent possible serious injury from an overspeeding engine, make sure the control is properly programmed to convert the gear-tooth count into engine rpm. Improper conversion could cause engine overspeed.

Aux Voltage Input (Load Sharing Lines; Terminals 21/22)

Connect the output of a Woodward Load Sensor, or another 721 control's load sharing lines, to terminals 21(+) and 22(-). Use a shielded twisted-pair cable. Wire the remainder of the load sensor in accordance with the wiring diagram for the sensor used.

Discrete Inputs (Terminals 25–32)

Discrete inputs are the switch input commands to the 721 control. In low voltage systems, or other systems where nominal 24 Vdc is available, the discrete inputs should be powered by this external voltage.

If you are using the control-supplied aux voltage, which is recommended only for high voltage systems where 24 Vdc is not available, jumper terminal 23 to terminal 24. This connects the control's common to the discrete input common. Terminal 15 then supplies power (approximately +21 Vdc) to the discrete inputs. Since the aux voltage is not isolated from other control circuits, use only isolated contacts (dry or signal voltage rated) for the discrete circuits. **DO NOT POWER ANY OTHER DEVICES WITH THE AUX VOLTAGE SOURCE.**

If you are supplying the discrete input voltage (24 Vdc), connect the voltage source negative (-) to terminal 24. Then run the voltage source positive (+) to the appropriate switch or relay contact and then to the corresponding discrete input.

Analog Inputs (#1, #2, #3, & #4)

Use shielded twisted-pair cable to connect to terminals 36(+) & 37(-), 39(+) & 40(-), 42(+) & 43(-) and 45(+) & 46(-). Ensure that a jumper is installed between relevant terminals (35 & 36 - #1, 38 & 39 - #2, 41 & 42 - #3, 44 & 45 - #4) for the mA input. These inputs are not isolated from the other control inputs and outputs (except the power supply input and the discrete inputs). If any other analog input or output is used in a common ground system, an isolator must be installed. A number of manufacturers offer 20 mA loop isolators. Consult Woodward for further information.

Installation Checkout Procedure

With the installation complete, do the following checkout procedure before beginning set point entry or initial start-up adjustments.

1. Visual inspection
 - A. Check the linkage between the actuator and fuel metering device for looseness or binding. Refer to the appropriate actuator manual, and Manual 25070, *Electronic Governor Installation Guide*, for additional information on linkage.

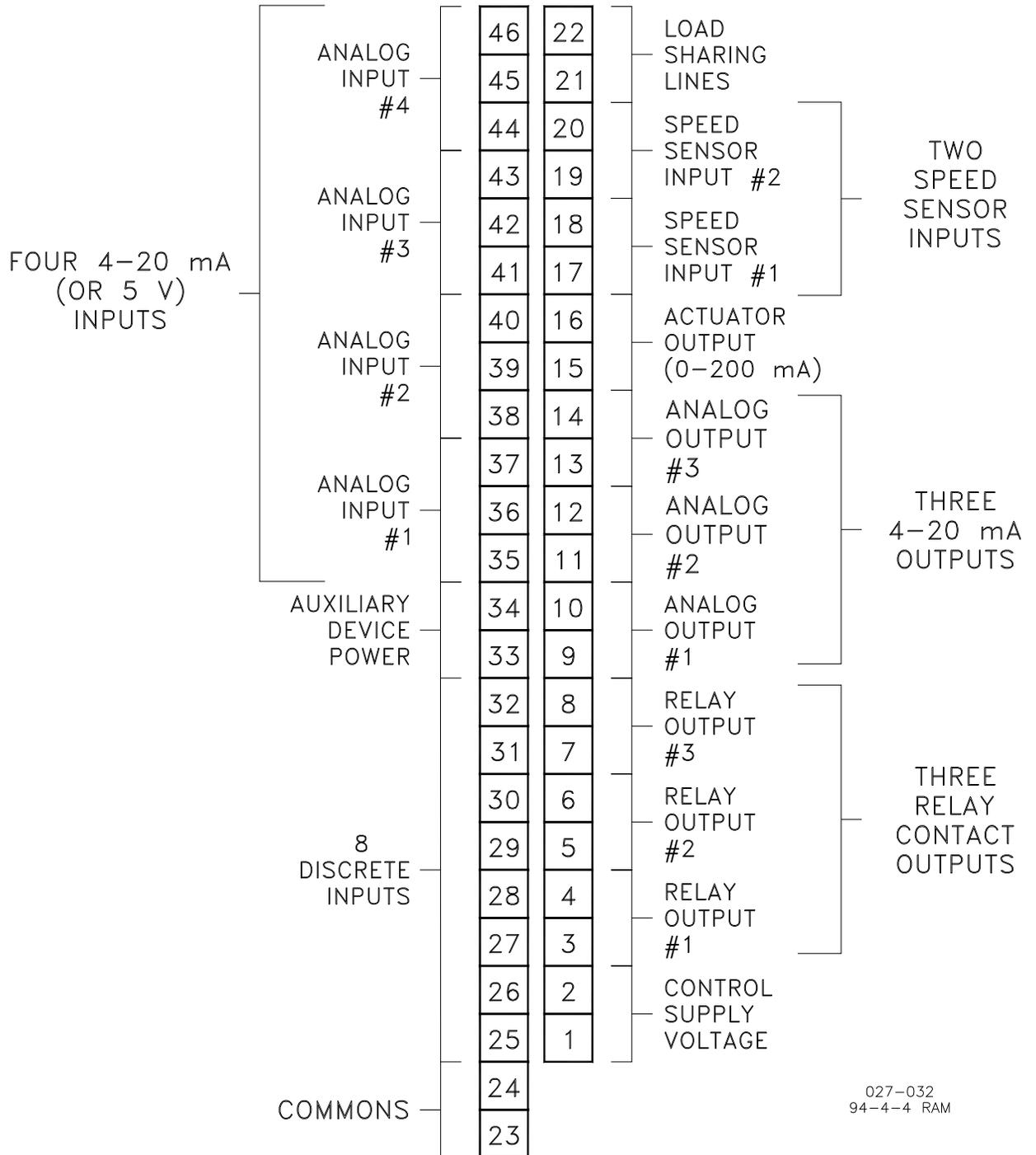


To prevent possible serious injury from an overspeeding engine, the actuator lever or stroke should be near but not at the minimum position when the fuel valve or fuel rack is at the minimum fuel delivery position.

- B. Check for correct wiring in accordance with the plant wiring diagram, (see relevant Application Manual).
- C. Check for broken terminals and loose terminal screws.
- D. Check the speed sensor(s) for visible damage. If the sensor is a magnetic pickup, check the clearance between the gear and the sensor, and adjust if necessary. Clearance should be between 0.25 and 1.25 mm (0.010 and 0.050 inch) at the closest point. Make sure the gear runout does not exceed the pickup gap.

2. Check for grounds

Check for grounds by measuring the resistance from all control terminals to chassis. All terminals except terminals 2 and 24 should measure infinite resistance (the resistance of terminals 2 and 24 depends on whether a floating or grounded power source is used). If a resistance less than infinite is obtained, remove the connections from each terminal one at a time until the resistance is infinite. Check the line that was removed last to locate the fault.



027-032
94-4-4 RAM

Figure 3-2. 721 I/O

Chapter 3.

Entering Control Set Points

Introduction

Due to the variety of installations, plus system and component tolerances, the 721 control must be tuned to each system for optimum performance.

This chapter contains information on how to enter control set points through the control's menu system using the Hand Held Programmer.



WARNING

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

Hand Held Programmer and Menus

The Hand Held Programmer is a hand-held computer terminal that gets its power from the 721 control. The terminal connects to the RS-422 communication serial port on the control (terminal J1). To connect the terminal, slightly loosen the right-hand screw in the cover over J1 and rotate the cover clockwise to expose the 9-pin connector. Then firmly seat the connector on the terminal into J1.

The programmer does a power-up self-test whenever it is plugged into the control. When the self-test is complete, the screen will display two lines of information. This is information relating to the application. Pressing the 'ID' key will change the display to show the part number of the software and version letter.

The programmer screen is a four-line, backlighted LCD display. The display permits you to look at two separate functions or menu items at the same time. Use the "Up/Down Arrow" key to toggle between the two displayed items. The BKSP and SPACE keys will scroll through the display to show the remainder of a prompt if it is longer than the display screen's 18 characters.

The 721 has two sets of menus; the Service menus and the Configure menus. The Service menus allow easy access and tuning while the engine is running. The Configure menus may only be entered if the I/O is shutdown, and hence the engine stopped.

Configure Menus

To access the Configure menus, the engine must be shutdown. Press the . key. The display will show, 'To select configure, press enter'. Press the ENTER key and the display will show, 'To shutdown I/O, press enter'. Press the ENTER key and this will allow you into the Configure menus. Note: If the engine is running during this process, it will be shutdown due to shutting down the I/O of the control. To move between the menus use the ◀ and ▶ keys. To move through the set points within a menu, use the ▲ and ▼ keys. Once within a menu, to return to the menu header, press the ESC key.

To leave the Configure menus press the ESC key. The set points will be automatically saved when leaving Configure.

Service Menus

To access the Service menus press the ▼ key. To move between menus, and to move through set points within menus follow the instructions as for the Configure menus. Also to return to the menu header, or to leave Service, follow the Configure instructions.

Adjusting Set Points

To adjust a set point, use the “Turtle Up” or the “Rabbit Up” keys to increase the value, and the “Turtle Down” or “Rabbit Down” keys to decrease the value. The “Rabbit Up” and “Rabbit Down” keys will make the rate of change faster than the “Turtle Up” and “Turtle Down” keys. This is useful during initial setup where a value may need to be changed significantly. Where necessary, to select TRUE, use either the “Turtle Up” or the “Rabbit Up” keys, and to select FALSE, use the “Turtle Down” or “Rabbit Down” keys.

To obtain an exact value, press the = key. Key in the required figure and press ENTER.

IMPORTANT

This may only be done if the figure is within 10% of the existing value.

To save set points at any time, use the SAVE key. This will transfer all new set point values into the EEPROM memory. The EEPROM retains all set points when power is removed from the control.

NOTICE

To prevent possible damage to the engine resulting from improper control settings, make sure you save the set points before removing power from the control. Failure to save the set points before removing power from the control causes them to revert to the previously saved settings.

Hand Held Programmer Keys

The programmer keys do the following functions (see Figure 4-1):

- | | |
|-----------------|---|
| ◀ (left arrow) | Moves backward through Configure or Service, one menu at a time. |
| ▶ (right arrow) | Advances through Configure or Service, one menu at a time. |
| (up/down arrow) | Toggles between the two displayed items. |
| ▲ (up arrow) | Moves backward through each menu, one step at a time. |
| ▼ (down arrow) | Advances through each menu, one step at a time.
Selects Service from Main Screen. |
| (turtle up) | Increases the displayed set point value slowly. |
| (turtle down) | Decreases the displayed set point value slowly. |
| (rabbit up) | Increases the displayed set point value quickly (about 10 times faster than the turtle keys). |
| (rabbit down) | Decreases the displayed set point value quickly (about 10 times faster than the turtle keys). |

- (minus)	Increases set point values by one step at a time.
+ (plus)	Decreases set point values by one step at a time.
(solid square)	Not used.
ID	Displays the 721 control part number and software revision level.
ESC	To return to menu header or to main screen.
SAVE	Saves entered values (set points).
BKSP	Scrolls left through line of display.
SPACE	Scrolls right through line of display.
ENTER	Used when entering exact values and accessing Configure.
= (equals)	For entering exact values (within 10%).
· (decimal)	To select Configure.

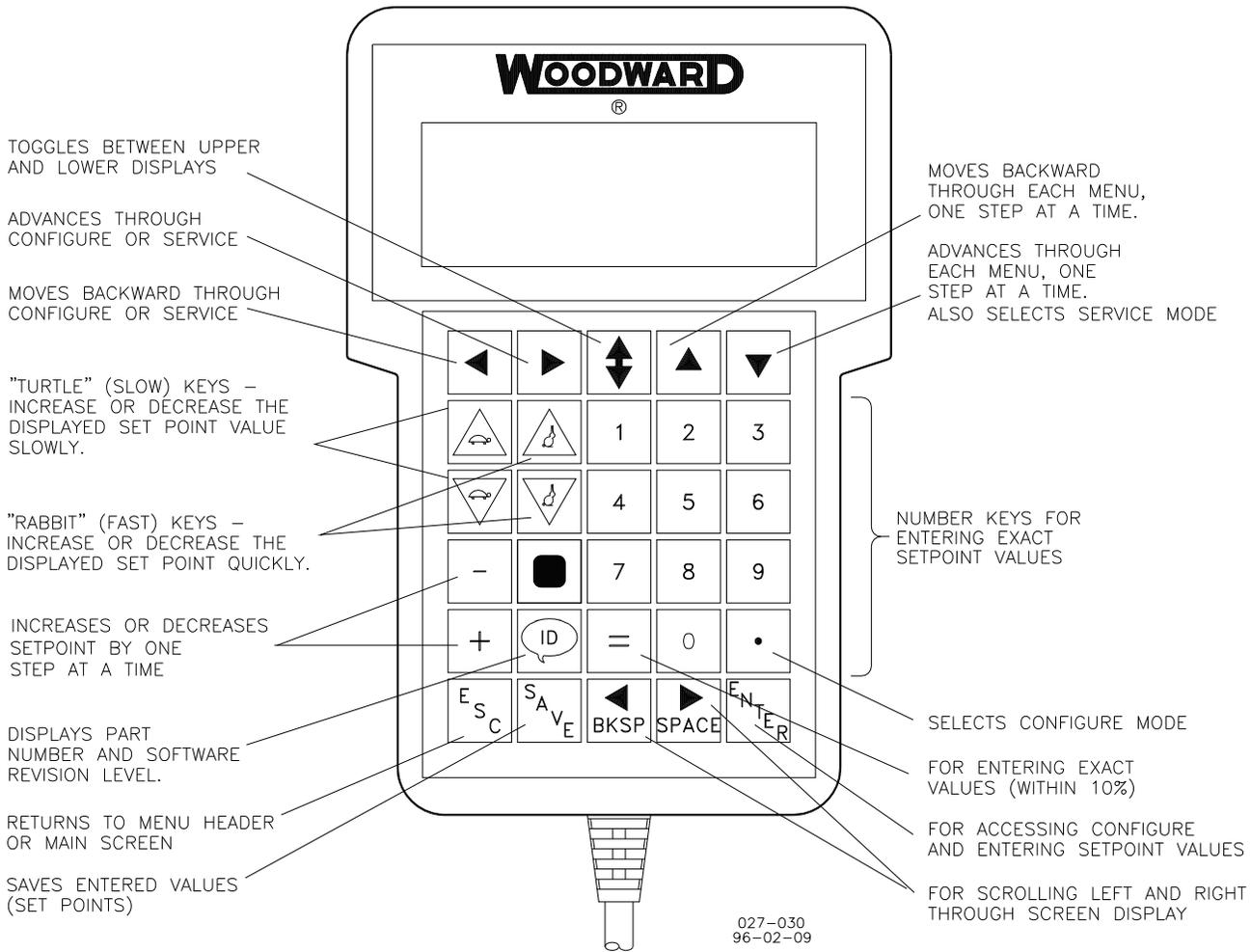


Figure 4-1. Hand Held Programmer Functions

Chapter 4.

Function Block Diagram

This chapter provides a description of the how to use a function block diagram, which can be found in the relevant application manual.

The function block diagram is a form of flow chart which has been designed specifically for the application and is a representation of the software and it's interface to the control hardware. It uses special symbols, some of which are unique to Woodward; each symbol is identified and described in the first sheet of the function block diagram. The function block diagram is drawn as a design aid to act as an interface between the Woodward application engineer and the customer in defining the control function. The third sheet of the diagram is a complete overview of the control software.

The function block diagram is divided into separate categories, each representing a different function of the software. Common categories used are:

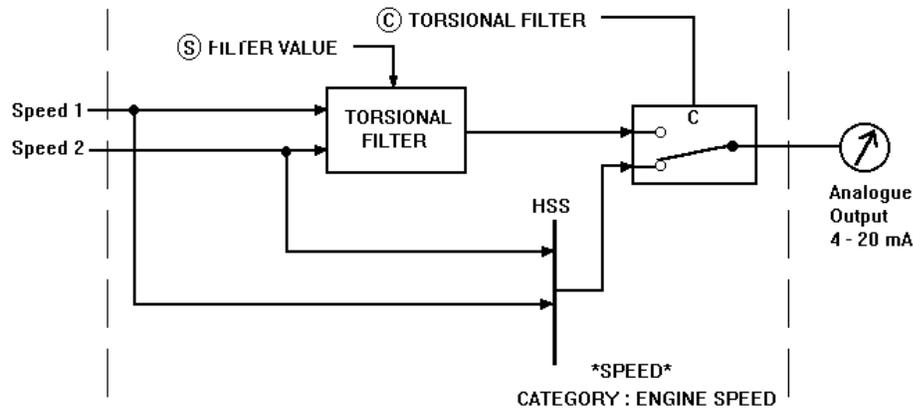
ENGINE SPEED
SPEED REFERENCE
DROOP
KW LOAD
ACTUATOR DRIVER
SHUTDOWN

The adjustable parameters of the control can be identified in the function block diagram by an S or a C within a circle, along with text explaining what the tunable is. Those denoted by an S can be found in the Service menus, and those denoted by a C will be found in the Configure menus (see Chapter 4). The name of the category is found at the bottom of the page. Above this is written the name of the Service or Configure menu under which any tunables in that category can be found.

The diagram is made up of a combination of different blocks connected together. Signal values into a block are depicted by an arrow, and logical inputs without an arrow. Tie points are used to show blocks from different categories linked together. Each tie point is repeated at the top of the page with the page numbers of the categories to which it is connected. This allows quick location of connections between categories.

Two vertical dashed lines on each page show the software/hardware interface, the area in between the lines, detailing the application software. To the left of the left line are the control inputs, whilst to the right of the right line, are the control outputs.

The second page gives a list of the I/O functions dedicated to the application and a list of functions causing shutdown.



Example:

The speed inputs are shown to the left of the left dashed line, which represents the hardware inputs. To the right of the right dashed line is an output to the hardware, which in turn, is an output to the customer.

To enable the torsional filter:

- Select Configure mode
- Scroll left or right through each menu until the "SPEED" menu is located
- Scroll down through menu. All Configure values found in the SPEED category will be located in this menu, including the 'TORSIONAL FILTER' set point

To adjust the filter value:

- Select Service mode
- Scroll left or right through each menu until the "SPEED" menu is located
- Scroll down through menu. All Service values found in the SPEED category will be located in this menu, including the 'FILTER VALUE' set point

Chapter 5.

Product Support and Service Options

Product Support Options

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

1. Consult the troubleshooting guide in the manual.
2. Contact the **OE Manufacturer or Packager** of your system.
3. Contact the **Woodward Business Partner** serving your area.
4. Contact Woodward technical assistance via email (EngineHelpDesk@Woodward.com) with detailed information on the product, application, and symptoms. Your email will be forwarded to an appropriate expert on the product and application to respond by telephone or return email.
5. If the issue cannot be resolved, you can select a further course of action to pursue based on the available services listed in this chapter.

OEM or 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 current list of Woodward Business Partners is available at www.woodward.com/directory.

Product Service Options

Depending on the type of product, the following options for servicing Woodward products may be available through your local Full-Service Distributor or the OEM or Packager of the equipment system.

- 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 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.

Flat Rate Repair: Flat Rate Repair is available for many of the standard mechanical products and some of the electronic 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.

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. 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 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's Full-Service Distributors offer various Engineering Services for our products. For these services, you can contact the Distributor by telephone or by email.

- 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.

Product Training is available as standard classes at many Distributor locations. Customized classes are also available, which can be tailored to your needs and held at one of our Distributor 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 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 one of the Full-Service Distributors listed at www.woodward.com/directory.

Contacting Woodward's Support Organization

For the name of your nearest Woodward Full-Service Distributor or service facility, please consult our worldwide directory published at www.woodward.com/directory.

You can also contact the Woodward Customer Service Department at one of the following Woodward facilities to obtain the address and phone number of the nearest facility at which you can obtain information and service.

Products Used In Electrical Power Systems	Products Used In Engine Systems	Products Used In Industrial Turbomachinery Systems
<u>Facility</u> ----- <u>Phone Number</u>	<u>Facility</u> ----- <u>Phone Number</u>	<u>Facility</u> ----- <u>Phone Number</u>
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-----+49 (711) 78954-510	India -----+91 (129) 4097100
Kempen----+49 (0) 21 52 14 51	India -----+91 (129) 4097100	Japan-----+81 (43) 213-2191
Stuttgart--+49 (711) 78954-510	Japan-----+81 (43) 213-2191	Korea-----+82 (51) 636-7080
India -----+91 (129) 4097100	Korea-----+82 (51) 636-7080	The Netherlands- +31 (23) 5661111
Japan-----+81 (43) 213-2191	The Netherlands- +31 (23) 5661111	Poland-----+48 12 295 13 00
Korea-----+82 (51) 636-7080	United States----+1 (970) 482-5811	United States----+1 (970) 482-5811
Poland-----+48 12 295 13 00		
United States----+1 (970) 482-5811		

For the most current product support and contact information, please visit our website directory at www.woodward.com/directory.

Technical Assistance

If you need to contact technical assistance, you will need to provide the following information. Please write it down here before contacting the Engine OEM, the Packager, a Woodward Business Partner, or the Woodward factory:

General

Your Name _____

Site Location _____

Phone Number _____

Fax Number _____

Prime Mover Information

Manufacturer _____

Engine Model Number _____

Number of Cylinders _____

Type of Fuel (gas, gaseous, diesel,
dual-fuel, etc.) _____

Power Output Rating _____

Application (power generation, marine,
etc.) _____

Control/Governor Information

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 _____

Symptoms

Description _____

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.

721 Control Specifications

Woodward Part Numbers:	
8280-133	721 hardware platform/ low-voltage power supply
8280-134	721 hardware platform/ high-voltage power supply
9906-118	721 hardware platform, marine type approval/ low-voltage power supply
9906-119	721 hardware platform, marine type approval/ high-voltage power supply
9905-292	Hand Held Programmer
Power Supply Rating	18–32 Vdc (24 Vdc nominal) 88–132 Vac 50/60 Hz (120 Vac nominal) 90–150 Vdc (125 Vdc nominal)
Power Consumption	18 W nominal
Steady State Speed Band	magnetic pickup: 400–15 000 Hz (8–2100 rpm) proximity switch: 7.5–1000 Hz (8–2100 rpm)
Discrete Inputs (8)	10 mA at 24 Vdc
Analog Inputs (4)	4-20 mA or 1-5 Vdc
Analog Outputs (3)	4-20 mA or 0-1 mA to meter or computer
Actuator Output	20–160 mA or 4–20 mA
Programmer Serial Port	RS-422, 9-pin D connector, 1200 baud, full duplex
Ambient Operating Temperature	–40 to +70 °C (–40 to +158 °F)
Storage Temperature	–55 to +105 °C (–67 to +221 °F)
Humidity	95% at 38 °C
EMI/RFI Susceptibility	US MIL-STD 461C (Parts 5 & 9)
Humidity	US MIL-STD 810D, Method 507.2, Procedure III
Mechanical Vibration	24–2000 Hz swept sine, 2.5 Gs constant acceleration, resonant dwells—1 million cycles, total time—6 hours/axis
Mechanical Shock	US MIL-STD 810C, Method 516.2, Procedure I (basic design test), Procedure II (transit drop test, packaged), Procedure V (bench handling)
Salt Spray	ASTM B 117-73

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication **02714A**.



PO Box 1519, Fort Collins CO 80522-1519, USA
1000 East Drake Road, Fort Collins CO 80525, USA
Phone +1 (970) 482-5811 • Fax +1 (970) 498-3058

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.