WOODWARD

Application Note 51322
(Revision NEW)

Original Instructions

Upgrading DRFDs to SPCs

General Precautions

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.

Revisions

This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, check manual *26311* , *Revision Status & Distribution Restrictions of Woodward Technical Publications*, on the *publications page* of the Woodward website:

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Proper Use

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.

Translated Publications

If the cover of this publication states "Translation of the Original Instructions" please note:

The original source of this publication may have been updated since this translation was made. Be sure to check manual *26311* , *Revision Status & Distribution Restrictions of Woodward Technical Publications*, to verify whether this translation is up to date. Out-of-date translations are marked with ⚠. Always compare with the original for technical specifications and for proper and safe installation and operation procedures.

Revisions—Changes in this publication since the last revision are indicated by a black line alongside the text.

Warnings and Notices

Important Definitions

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.

- **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

Overspeed / Overtemperature / Overpressure

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.

⚠WARNING

Personal Protective Equipment

The products described in this publication may present risks that could lead to personal injury, loss of life, or property damage. Always wear the appropriate personal protective equipment (PPE) for the job at hand. Equipment that should be considered includes but is not limited to:

- **Eye Protection**
- **Hearing Protection**
- **Hard Hat**
- **Gloves**
- **Safety Boots**
- **Respirator**

Always read the proper Material Safety Data Sheet (MSDS) for any working fluid(s) and comply with recommended safety equipment.

⚠WARNING

Start-up

Be prepared to make an emergency shutdown when starting the engine, turbine, or other type of prime mover, to protect against runaway or overspeed with possible personal injury, loss of life, or property damage.

⚠WARNING

Automotive Applications

On- and off-highway Mobile Applications: Unless Woodward's control functions as the supervisory control, customer should install a system totally independent of the prime mover control system that monitors for supervisory control of engine (and takes appropriate action if supervisory control is lost) to protect against loss of engine control with possible personal injury, loss of life, or property damage.

NOTICE

Battery Charging Device

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.

Electrostatic Discharge Awareness

NOTICE

Electrostatic Precautions

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:

- **Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).**
- **Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.**
- **Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.**

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*.

Follow these precautions when working with or near the control.

1. 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.
2. 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.

Upgrading DRFDs to SPCs

Actions

The Woodward Servo Position Controller (SPC) was designed to accurately position turbine servo valves, and can be used to replace Woodward's older Digital Remote Final Drivers (DRFD) line of products. Although the SPC can be used to replace DRFD units, it was not designed as a drop-in replacement for the DRFD. Because of the differences between these two products, Woodward recommends that engineers consider the following product differences when developing their new SPC replacement application design:

- Environmental Rating Differences
- Input Power Source Differences
- Feedback Transducer Power Differences
- Maximum Actuator Output Drive Current Differences
- GE Oil-Gear Servo Interface Differences
- Shutdown Status Indication Relay Output Differences
- Forward or Reverse-Acting Action Considerations
- Turbine Controller Dynamic Setting Re-adjustment Considerations

Environmental Rating Differences / Recommendations

The DRFD is designed for NEMA 4 or IP54 rated environments, and the SPC is designed for NEMA 12 or IP20 environments, thus designed accordingly to meet application requirements.

The DRFD may have redundant power supplies built in (typically 120 Vac and 132 Vdc). However, the SPC has a single 24 Vdc input (the SPC isn't sold with redundant power supplies). If redundant power supplies are needed, you will need to install two external power supplies, and run them through a diode block to the SPC.

Input Power Source Differences / Recommendations:

The DRFD accepts 90–140 Vdc or 88–132 Vac, while the SPC only accepts 18–32 Vdc

Many DRFDs accept redundant power sources, while the SPC only accepts a single input power source.

If it is desired to continue to use redundant power sources into the SPC, to provide the same level of availability as the DRFD configuration had, Woodward recommends that external power supplies be added using a high-signal-selection diode design. Refer to Figure 2 in this document for an example wiring diagram.

If redundant power supplies are used and power supply health indication is required, Woodward recommends that external power supply indication relays or logic be added. Refer to Figure 2 in this document for an example wiring diagram.

Feedback Transducer Power Differences

Depending on the specific DRFD part number used, the DRFD can output an AC LVDT/RVDT excitation source, or a 24 Vdc output source or ±15 Vdc power source to power feedback transducers or signal conditioners. The SPC outputs an AC LVDT/RVDT excitation source, but does not have 24 Vdc or ±15 Vdc power output sources.

If a 24 Vdc power source is required by the system feedback device, Woodward recommends that the same 24 Vdc input power source used to power the SPC be used to power the system feedback device.

If a ±15 Vdc power source is required by the system feedback device or signal conditioner, Woodward recommends that an external power supply be provided to power the system feedback device.

IMPORTANT

The SPC outputs 18 Vdc (120 mA max) when configured for DC voltage feedback devices. The 18 Vdc output is provided to power devices requiring 0 to 10 Vdc power at 120 mA (max), but Woodward highly recommends that an external power supply be used for all 24 Vdc devices.

Maximum Actuator Output Drive Current Differences

The DRFD is designed to output a maximum drive current of ±400 mA; however, the SPC is designed to output only ±250 mA. If a maximum drive current of ±400 mA is required, Woodward recommends that the SPC not be utilized.

GE Oil-Gear Servo Interface Differences

The GE Oil-Gear Servo is quite different from other types of pilot-valve servos, in that it also has a feedback signal from the pilot valve. DRFD part number 8238-005 was designed to accept both pilot-valve-position and servo-valve-position feedback as was required by many types of GE Oil-Gear Servos. Although the SPC does accept two feedback signals, it does not manage these two feedback signals like DRFD 8239-005. Although several companies have used two SPCs with one cascaded into the other SPC as is displayed in Figure 2-3 of Woodward manual 26236, Woodward has no official recommendation for DRFD 8239-005 replacements.

Shutdown Status Indication Relay Output Differences

The DRFD's Shutdown Status Indication Relay has "Normally Open" and "Normally Closed" contacts rated for 120 Vac voltages; however, the SPC's Shutdown Status Indication Relay has only a "Normally Open" contact, and is only rated for 18–32 Vdc voltages.

Forward or Reverse-Acting Action Considerations

A DRFD functions in a forward- or reverse-acting manner, dependent upon the specific part number, and dependent upon the type of feedback (0–100% = 10–0 Vdc feedback signal). The SPC is software-configurable to function in a forward- or reverse-acting manner, but this setting will determine the SPC's output direction, not its feedback direction, like the DRFD. Ultimately the SPC can be configured to function and fail in the correct direction, however depending on the application, it may be required to configure it for forward action instead of reverse action like the DRFD.

Turbine Controller Dynamic Setting Re-adjustment Considerations

Because the response of the turbine valve control loop has a direct influence on the turbine speed control loop, after the SPC has been successfully installed and dynamically tuned, Woodward recommends that the turbine speed control loop's dynamic settings be tested and, if necessary, re-adjusted. In some cases, these system dynamic response differences are the result of the faster performance of the SPC as compared to the DRFD's previous dynamic response.

Publications

These are available via **www.woodward.com/publications**:

03254 SPC product specification
26115 SPC technical manual (8200-220/-221)
26236 SPC technical manual (8200-224/-225/-226) [includes a DRFD-to-SPC cross-reference table in Appendix A]

Service bulletins are available via e-Business with a password or on the Woodward ActiveNet (intranet):

01222 TI DSP Recall—SPC
01259 SPC Input Demand Current Range Modification
01261 SPC/TM25 Compatibility
01263 SPC Application Software Revision
01352 SPC Service Tool

Figure 1. Photo of Example Conversion

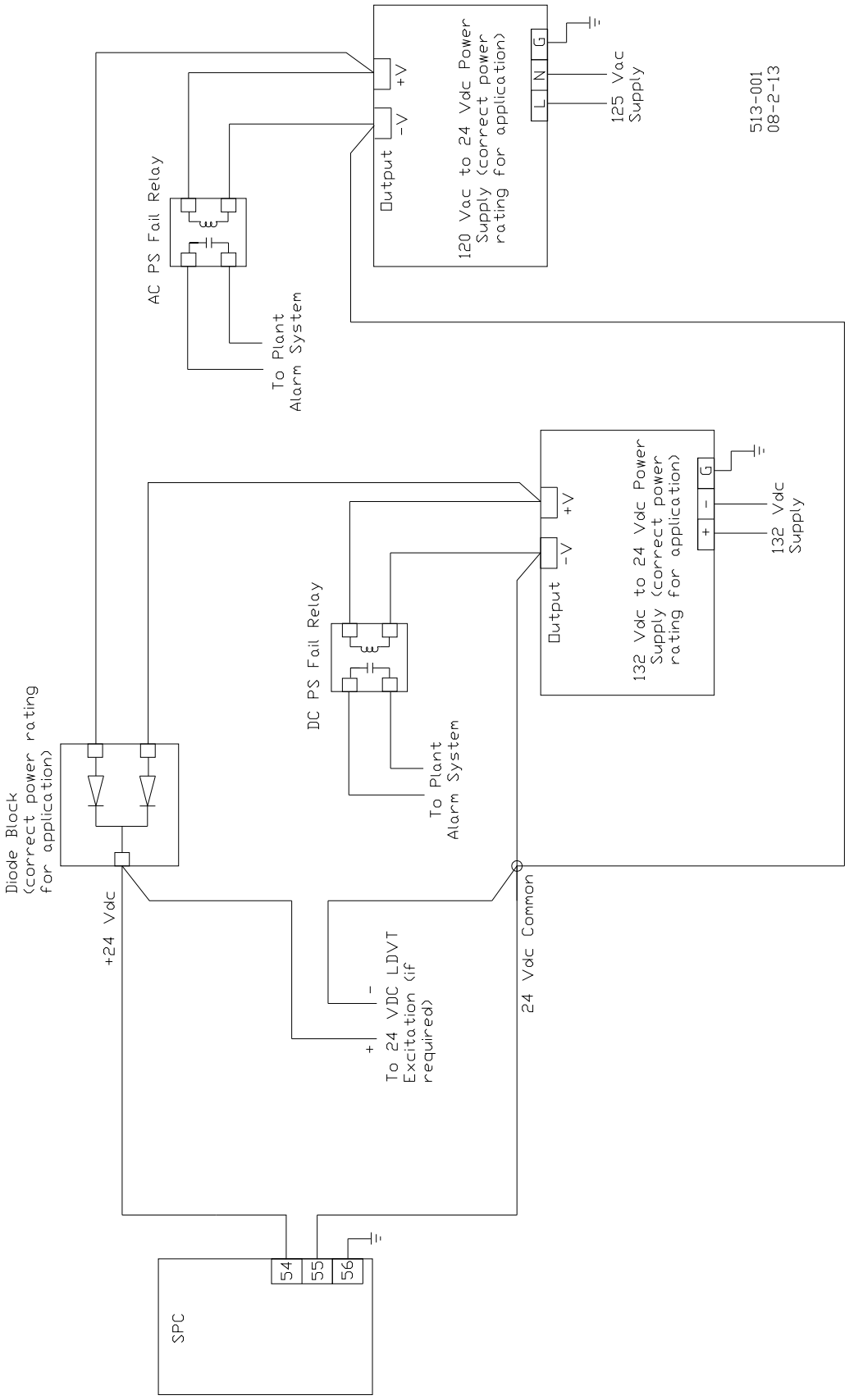

Figure 2. Example Conversion Wiring Changes

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication 51322.

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