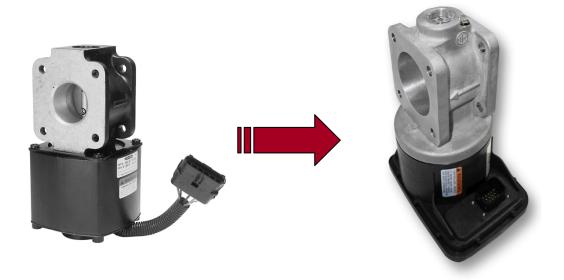


Application Note 51305 (Revision B) Original Instructions



Conversion from Flo-Tech™ to F-Series



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.



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

Translated Publications

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 Out-of-date translations are marked with .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.

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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.

MARNING

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.

MARNING

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.



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.



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.

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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.

- 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.

TPS

Acronyms/Abbreviations

AUX Auxiliary CAN Control area network Counterclockwise CCW **CRC** Cyclic redundancy check CW Clockwise **EEPROM** Electrically erasable programmable read-only memory **EMC** Electromagnetic compatibility Graphic user interface GUI Inputs/outputs I/O Integrated throttle body ITB F-SERIES **ACTUATOR** Woodward modular bi-directional actuator with integral position feedback control and driver F-Series throttle **FST FSTP** F-Series throttle Plus Light emitting diode LED MWP Maximum working pressure Original equipment manufacturer OEM PC Personal computer PWM Pulse-width modulated RS-232 A communications standard SID Service interface definition SPI A/D Serial peripheral interface analog/digital

Throttle position sensor

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Chapter 1. General Information

MARNING

EXPLOSION HAZARD—Do not remove covers or connect/disconnect electrical connectors unless power has been switched off or the area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 2.

Do not clean equipment unless power has been switched off or the area is known to be non-hazardous.



RISQUE D'EXPLOSION—Ne pas enlever les couvercles, ni raccorder / débrancher les prises électriques, sans vous en assurez auparavant que le système a bien été mis hors tension; ou que vous vous situez bien dans une zone non explosive.

La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, Division 2.

Ne pas nettoyer l'équipement sans vous en assurez auparavant que le système a bien été mis hors tension; ou que vous vous situez bien dans une zone non explosive.

Purpose and Scope

This application note is meant to give guidance in the event that a Flo-Tech™ valve in a given application is converted to an F-Series valve. It is *not* meant to be an exhaustive resource for wiring and installation; detailed F-Series installation information is available in the F-Series product manual (Manual 26355).

How to Use This Application Note

The following summarizes how to convert a Flo-Tech application to an F-Series application.

- Unpack and inspect the hardware.
- See Chapter 2 for wiring conversion adaptors available from Woodward.
- Use the service tool to configure and set up the control following the procedures and recommendations in Chapter 3.
- See Chapter 4 for how to contact Woodward for more information.

Chapter 2. Electrical Conversion

Overview

The same command and feedback signals currently available on the most commonly used Flo-Tech™ valves are also available on an F-Series. To simplify the wiring process in a retrofit application, Woodward has designed several cables to adapt the wiring of the popular versions of the Flo-Tech control to the F-Series control. Each adaptor cable is 14 inches (35.5 cm) in length, uses the correct connectors for the intended application, and installs easily by mating to the engine harness originally designed for a Flo-Tech and plugging directly into the F-Series. An example of one of these adaptor cables is pictured in Figure 2-1

Selection of the proper cable can be accomplished using Table 2-1.

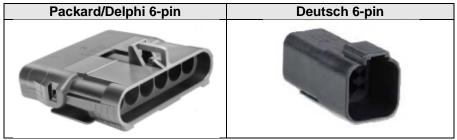
More detailed wiring information regarding the F-Series can be found in Chapter 3 of Woodward manual 26355, F-Series Actuator & Integrated Throttle Body.

For the purpose of the Flo-Tech and F-Series connector configurations in Table 2-1, use the illustrations in Figure 2-2 to match the Flo-Tech and F-Series controls that are being interchanged.



Figure 2-1. Example of a Flo-Tech to F-Series Adaptor Cable

Flo-Tech Connectors



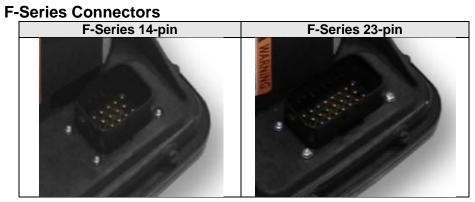


Figure 2-2. Flo-Tech and F-Series Connector Configurations

Flo-Tech	Flo-Tech	F-Series	Woodward	High-Side	Knockdown
Command	Connector Style	Pin Count	Adaptor #	Resistor	Resistor
PWM	Packard 6-pin	14-pin	5450-1146		
PWM	Deutsch 6-pin	14-pin	5450-1186		
PWM	Deutsch 6-pin	23-pin	5450-1187		
0–5 Vdc	Packard 6-pin	23-pin	5450-1188		
4–20 mA	Packard 6-pin	23-pin	5450-1189		
PWM	Packard 6-pin	23-pin	5450-1190		
PWM	Packard 6-pin	14-pin	5450-1290	X	
PWM	Deutsch 6-pin	14-pin	5450-1291	Х	
0–200 mA	Packard 6-pin	23-pin	5450-1232		Х
0–200 mA	Deutsch 6-pin	23-pin	5450-1351		Х

Table 2-1. Flo-Tech to F-Series Wiring Adaptors

Chapter 3. Configuration of F-Series

Overview

Because this application note is intended only for setting up an F-Series control to behave similarly to a Flo-Tech™, the configuration settings will be limited in scope for this purpose.

For more complete information on using the F-Series service tool for configuration of the F-Series ITB, please refer to chapter 6 of Woodward manual 26355, *F-Series Actuator and Integrated Throttle Body*. For best use of the table below, refer specifically to the content in the F-Series manual pertaining to customizing the position demand curve.

Configure the F-Series ITB to Function Similar to a Flo-Tech Throttle

Given small changes in throttle and throttle plate geometry, the F-Series ITB flow curve has small differences when compared to the Flo-Tech flow curve. To correct this, the Position Demand Curve can be configured to make the F-Series ITB flow curve similar to the Flo-Tech throttle. This is needed if flow at a given position is critical in your Flo-Tech application. For most closed loop controls, this configuration to match the flow curves is not needed.

Setting the "Position Demand In %" and "Position Demand Out %" values to those shown in Table 3-1 will make the F-Series ITB flow curve match the Flo-Tech throttle.

	48 mm ITB		60 mm		68 mm	
Brkpt	Position Demand In %	Position Demand Out %	Position Demand In %	Position Demand Out %	Position Demand In %	Position Demand Out %
1	0.0	1.7	0.0	1.2	0.0	0.5
2	7.0	3.0	7.0	2.0	10.0	3.5
3	12.0	7.0	12.0	3.7	18.0	14.0
4	60.0	58.0	87.1	88.0	70.0	72.0
5	100.0	100.0	100.0	99.0	100.0	100.0

Table 3-1. Configure F-Series ITB to function similar to a Flo-Tech Throttle



When the optional non-linear position demand curve is configured, the throttle position sensor (TPS) is corrected to account for the effect of the curve, so that the TPS should still normally match the position demand input. Be sure the TPS output (if used) is applied correctly for this configuration.

Chapter 4. Customer Support

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

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China+	86 (512) 6762 6727
Germany+	49 (711) 78954-510
India	+91 (129) 4097100
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
The Netherlands	- +31 (23) 5661111
United States	+1 (970) 482-5811

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Korea+82 (51) 636-7080
The Netherlands - +31 (23) 5661111
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.

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication 51305B.





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