

36528



DYN3-60030
APECS[®] Electronic Speed Switch

User Manual

Manual 36528



WARNING

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.

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.



CAUTION

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.

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.

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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.



CAUTION

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 two-setpoint speed switch normally obtains its input signal from a magnetic pickup, positioned in proximity to gear teeth on a rotating shaft. The pickup generates an AC signal voltage whose frequency is directly proportional to the rate at which the gear teeth pass by the pole piece. The speed switch converts the input signal voltage into a DC signal that is compared to the preset levels (setpoints) and actuates the relays when the input signal frequency exceeds the preset values.

Features include:

- Overspeed protection signal
- Underspeed protection signal
- Crank termination signal
- Generator field flashing signal
- Ignition signal
- Sequencing signal
- 1 mA output for tachometer

Relay Logic Table for Speed Switches

SWITCH	POWER TO UNIT AND INPUT SIGNAL FREQUENCY BELOW TRIP POINT	POWER TO UNIT AND IN- PUT SIGNAL FREQUENCY ABOVE TRIP POINT
Relay 1 Contacts	De-energized 8 to 9 closed 8 to 7 open	Energized (non-latching) 8 to 9 open 8 to 7 closed
Relay 2 Contacts	De-energized 12 to 11 open 12 to 13 closed	Energized (latched)* 12 to 11 closed 12 to 13 open

(*) Relay 2 can be made non-latching by applying a continuous negative to the RESET terminal.

Tachometer Readout

A tachometer requiring 1 mA for full-scale deflection may be connected across terminals 6 and 2 (-B) as shown in Figure 2 Wiring Diagram. A calibration potentiometer is provided (adjacent to terminal 6).

Relay Adjustment Range

There are two speed trip setpoint adjustments, Trip 1 and Trip 2, located on top of the unit. Turning the 20-turn potentiometer adjustment clockwise increases the RPM setting.

The electronic speed switch will operate over an adjustment range of 800 to 6840 Hz. The sensitivity of the adjustment potentiometer is approximately 300 Hz per turn.

Relay 1 is factory set at 1200 Hz.

Relay 2 is factory set at 2774 Hz.

Chapter 2.

Speed Switch Specifications

Electrical

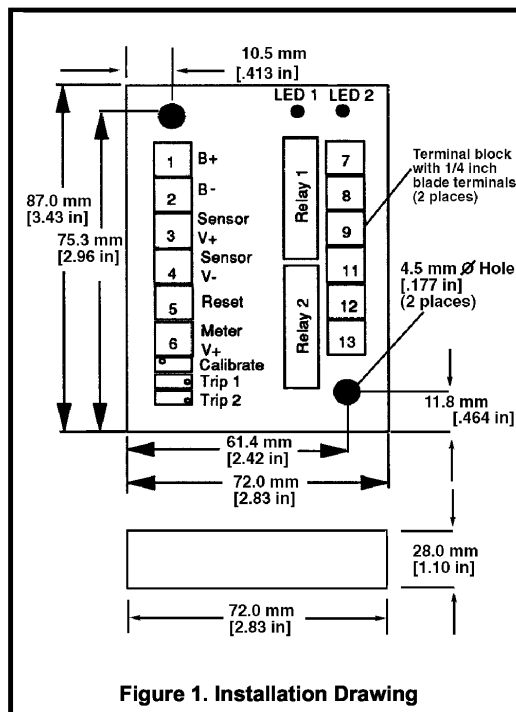
Operating Voltages:	9 Vdc minimum to 30 Vdc maximum
Maximum Controlled Output Current:	7 A
Maximum Surge Current:	14 A for ten seconds
Connections:	Terminal strip with 13 terminals
Input Signal from the Magnetic Pickup:	2.0 VAC RMS minimum during cranking

Mechanical

Ambient Operating Temperature:	+5°F to +158°F (-15°C to +70°C)
Housing:	Humidity and salt spray resistant. Encapsulated for water protection.
Vibration:	5 G's from 20 Hz to 500 Hz
Shock:	4 foot drop test

Mounting Instructions

Two mounting holes are provided on the case as shown in Figure 1. Although the unit can withstand normal vibration levels and temperature excursions encountered, it is good practice to mount the unit in a location where these effects are minimized. The unit should be attached to the mounting plate with 4mm screws.



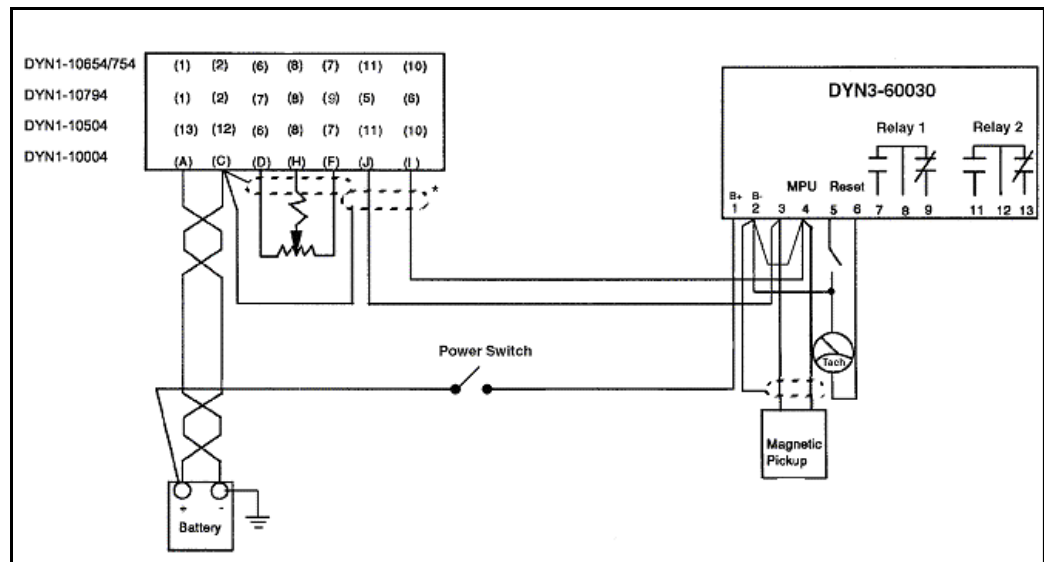
Chapter 3.

Wiring Instructions

The typical wiring diagram shows the wiring required to properly connect the unit to the APECS governor. All the wiring for the tach and input power terminals should be either 18 or 20 AWG wire. The wiring to the relay contacts should be 16 AWG wire if the current requirement is less than 5 amperes, 14 AWG if the current through the contacts is between 5 and 10 amperes, and 12 AWG if the current is between 11 to 16 amperes. The current load and wiring to the relay should be checked thoroughly.

As shown in Figure 2, a two-conductor shielded cable must be used for mounting the speed sensor (MPU) to the unit. The shield should only be connected as shown. It is good practice to isolate the power wiring from the relay contacts and associated relays from the input signal wiring.

The input signal is normally from a magnetic pickup (MPU) mounted on the fly-wheel housing which senses the ring gear speed.



(*) Shielded cable

Figure 2—Typical Wiring Diagram When Using a DYN1-10004, DYN1-10504, DYN1-10794, DYN1-10654 or DYN1-10754 Series Controller

Chapter 4. Operation & Calibration

Operating Procedure

Once the system is wired, the speed switch functions in the following manner.

No power applied to unit. Relay 1 and Relay 2 are de-energized; therefore, contacts are in position as shown on top of unit and as shown in Figure 2.

Power is applied to unit when POWER SWITCH is turned on and no input signal to speed switch. Relay 1 and Relay 2 remain de-energized; therefore, contacts remain in same position as those shown on top of unit.

When the engine is cranked and the engine starts, Relay 1 energizes at its crank-dropout setting that is normally adjusted midway between the cranking RPM and idle RPM of the engine.

When an overspeed condition occurs, Relay 2 energizes and latches up and will remain latched up until the POWER SWITCH is turned off for at least 1 second or power is removed from the unit. The relay will also unlatch if B- is applied to terminal 5. The engine overspeed setpoint is normally adjusted to trip at 10 to 20% above the engine operating speed.

Calibration Procedure

Equipment Required: Signal generator
 Frequency counter
 Ohmmeter

Step 1 Determine the desired trip points for your unit when using a magnetic pickup (MPU).

$$\text{Trip Point in Hz} = \frac{\text{No. of Gear Teeth} \times \text{Engine RPM Trip Point}}{60}$$

Step 2 Connect the signal generator and counter to terminals 3 and 4 with terminal 4 being the ground terminal. Set the signal generator frequency 100 Hz below the trip point you are trying to calibrate/set or check. Then adjust the out signal from the signal generator to 1 volt RMS or greater.

Step 3 If you are calibrating the unit, turn the desired trip point potentiometer adjustment 10 or 15 turns clockwise. (Omit this step if you are only checking the calibration points of the unit.

Relay 1 Trip Point Calibration Or Checking Procedure

Step 1 With no power applied to unit, connect an ohmmeter to terminals 8 and 9 (no other wires attached). The ohmmeter should indicate zero resistance (short circuit). This is the normally closed contact on Relay 1.

Step 2 Apply correct DC power to terminals 1 and 2 of speed switch. The ohmmeter connected to terminals 8 to 9 should still indicate zero resistance, because you should be below the setpoint for Relay 1 and it should not change states when power is applied to the unit.

NOTE: If you are only checking the unit's calibration points, omit Steps 3 and 4 and go to Step 5.

Step 3 Adjust the signal generator frequency to the desired set/trip point as specified or calculated in Step 1 of Calibration Procedure.

Step 4 Slowly adjust Relay 1 setpoint potentiometer counterclockwise until the ohmmeter indicates an open circuit. This is now the set/trip point for Relay 1.

Step 5 Decrease the signal generator frequency and observe the ohmmeter connected to terminals 8 to 9. This indicates zero resistance.

Step 6 Slowly increase the signal generator frequency until the ohmmeter connected to terminals 8 to 9 indicates an open circuit. Note the frequency and verify that it is correct for your set/trip point requirements. If set/trip point of Relay 1 is correct then it is properly calibrated. If set/trip point is incorrect, return to Steps 2, 3, and 4 and calibrate unit.

Relay 2 Trip Point Calibration Or Checking Procedure

Step 1 With no power applied to unit, connect an ohmmeter to terminals 12 and 13 (no other wires attached). The ohmmeter should indicate zero resistance (short circuit). This is the normally closed contact on Relay 2.

Step 2 Apply correct DC power to terminals 1 and 2 of speed switch.

NOTE: If you are only checking the unit's calibration points, omit Steps 3 and 4 and go to Step 5.

Step 3 Adjust the signal generator frequency to the desired Relay 2 set/trip point as specified or calculated in Step 1 of Calibration Procedure.

Step 4 Slowly turn the Relay 2 potentiometer adjustment counterclockwise until the ohmmeter indicates an open circuit. This gives you the correct setpoint for Relay 2. Remember that Relay 2 latches, unless reset is jumpered (terminals 2 to 5).

Step 5 Decrease the signal generator frequency and observe the ohmmeter connected to 12 to 13. This indicates zero resistance.

Step 6 Slowly increase the signal generator frequency until the ohmmeter connected to terminals 12 to 13 indicates an open circuit. Note the frequency and verify that it is correct for your Relay 2 set/trip point requirements. If set/trip point of Relay 2 is correct then it is properly calibrated. If set/trip point is incorrect, return to Steps 2, 3, and 4 and calibrate the unit.

Chapter 5. Troubleshooting

The unit is potted and, therefore, non-repairable. However, the following check-points can help determine if there is an internal fault.

Unit Does Not Function

- Check battery voltage on terminals 1 and 2. Voltage must be within the range of 10 to 32 Vdc.
- Check input signal from MPU on terminals 3 and 4 with an AC voltmeter. Signal must be greater than 1.0 volts RMS.
- Check wiring to speed switch.

Tripping At Wrong RPM

- Check for proper trip point settings.
- See calibration chapter.

Relay Does Not Function

- Check wiring to relays.
- Check relay contacts for proper operation.

Chapter 6. Service Options

Product Service Options

The following factory options are available for servicing Woodward equipment, based on the standard Woodward Product and Service Warranty (5-01-1205) that is in effect at the time the product is purchased from Woodward or the service is performed:

- Replacement/Exchange (24-hour service)
- Flat Rate Repair
- Flat Rate Remanufacture

If you are experiencing problems with installation or unsatisfactory performance of an installed system, the following options are available:

- Consult the troubleshooting guide in the manual.
- Contact Woodward technical assistance (see “How to Contact Woodward” later in this chapter) and discuss your problem. In most cases, your problem can be resolved over the phone. If not, you can select which course of action you wish to pursue based on the available services listed in this section.

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 also a flat rate structured program and includes the full standard Woodward product warranty (Woodward Product and Service Warranty 5-01-1205).

This option allows you to call 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 Woodward facility as explained below (see “Returning Equipment for Repair” later in this chapter).

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 to Woodward within 60 days, Woodward will issue a credit for the core charge. [The core charge is the average difference between the flat rate replacement/exchange charge and the current list price of a new unit.]

Return Shipment Authorization Label. To ensure prompt receipt of the core, and avoid additional charges, the package must be properly marked. A return authorization label is included with every Replacement/Exchange unit that leaves Woodward. The core should be repackaged and the return authorization label affixed to the outside of the package. Without the authorization label, receipt of the returned core could be delayed and cause additional charges to be applied.

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 to Woodward for repair, please contact Woodward in advance to obtain a Return Authorization Number. When shipping the item(s), attach a tag with the following information:

- 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.



CAUTION

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*.

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 4 inches (100 mm) 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.

Return Authorization Number

When returning equipment to Woodward, please telephone and ask for the Customer Service Department [1 (800) 523-2831 in North America or +1 (970) 482-5811]. They will help expedite the processing of your order through our distributors or local service facility. To expedite the repair process, contact Woodward in advance to obtain a Return Authorization Number, and arrange for issue of a purchase order for the item(s) to be repaired. No work can be started until a purchase order is received.



NOTE

We highly recommend that you make arrangement in advance for return shipments. Contact a Woodward customer service representative at 1 (800) 523-2831 in North America or +1 (970) 482-5811 for instructions and for a Return Authorization Number.

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.

How to Contact Woodward

In North America use the following address when shipping or corresponding:

Woodward Governor Company
PO Box 1519
1000 East Drake Rd
Fort Collins CO 80522-1519, USA

Telephone—+1 (970) 482-5811 (24 hours a day)
Toll-free Phone (in North America)—1 (800) 523-2831
Fax—+1 (970) 498-3058

For assistance outside North America, call one of the following international 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.

<u>Facility</u>	<u>Phone Number</u>
Brazil	+55 (19) 3708 4800
India	+91 (129) 230 7111
Japan	+81 (476) 93-4661
The Netherlands	+31 (23) 5661111

You can also contact the Woodward Customer Service Department or consult our worldwide directory on Woodward's website (**www.woodward.com**) for the name of your nearest Woodward distributor or service facility. [For worldwide directory information, go to **www.woodward.com/ic/locations**.]

Engineering Services

Woodward Industrial Controls Engineering Services offers the following after-sales support for Woodward products. For these services, you can contact us by telephone, by email, or through the Woodward website.

- Technical Support
- Product Training
- Field Service

Contact information:

Telephone—+1 (970) 482-5811

Toll-free Phone (in North America)—1 (800) 523-2831

Email—icinfo@woodward.com

Website—www.woodward.com/ic

Technical Support is available through our many worldwide locations or our authorized distributors, depending upon the product. This service can assist you with technical questions or problem solving during normal business hours. Emergency assistance is also available during non-business hours by phoning our toll-free number and stating the urgency of your problem. For technical support, please contact us via telephone, email us, or use our website and reference **Customer Services** and then **Technical Support**.

Product Training is available at many of our worldwide locations (standard classes). 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. For information concerning training, please contact us via telephone, email us, or use our website and reference **Customer Services** and then **Product Training**.

Field Service engineering on-site support is available, depending on the product and location, from one of our many worldwide locations or from one of our authorized 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 field service engineering assistance, please contact us via telephone, email us, or use our website and reference **Customer Services** and then **Technical Support**.

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:

General

Your Name _____
Site Location _____
Phone Number _____
Fax Number _____

Prime Mover Information

Engine/Turbine Model Number _____
Manufacturer _____
Number of Cylinders (if applicable) _____
Type of Fuel (gas, gaseous, steam, etc) _____
Rating _____
Application _____

Control/Governor Information

Please list all Woodward governors, actuators, and electronic controls in your system:

Woodward Part Number and Revision Letter _____

Control Description or Governor Type _____

Serial Number _____

Woodward Part Number and Revision Letter _____

Control Description or Governor Type _____

Serial Number _____

Woodward Part Number and Revision 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 include the manual number from the front cover of this publication.



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Email and Website—www.woodward.com



FM 57982
BS EN ISO 9001:1994
6 March 2001

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.