



## Installation Instructions



## APECS 3000 Electronic Controller

**Manual 36716**  
(Replaces SE-3896 Rev C)

## WARNING—DANGER OF DEATH OR PERSONAL INJURY



### WARNING—FOLLOW INSTRUCTIONS

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.



### WARNING—OUT-OF-DATE PUBLICATION

This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, be sure to check the Woodward website:

[www.woodward.com/pubs/current.pdf](http://www.woodward.com/pubs/current.pdf)

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[www.woodward.com/publications](http://www.woodward.com/publications)

If your publication is not there, please contact your customer service representative to get the latest copy.



### WARNING—OVERSPEED PROTECTION

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—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.

## CAUTION—POSSIBLE DAMAGE TO EQUIPMENT OR PROPERTY



### CAUTION—BATTERY CHARGING

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.



### CAUTION—ELECTROSTATIC DISCHARGE

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.

## IMPORTANT DEFINITIONS

- A **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
- A **CAUTION** indicates a potentially hazardous situation which, if not avoided, could result in damage to equipment or property.
- A **NOTE** provides other helpful information that does not fall under the warning or caution categories.

Revisions—Text changes are indicated by a black line alongside the text.

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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

### Description

The APECS 3000 series controller is an isochronous engine governor that provides a means of controlling and limiting engine speed by adjusting the fuel control lever with a proportional actuator. The controller is software programmable and has no manual adjustments. The APECS Calibration Tool (ACT) is used for programming (configuring and adjusting) the APECS 3000 controller. The ACT may be downloaded from the software page of the Woodward website ([www.woodward.com](http://www.woodward.com)).

Please refer to the APECS 3000 User's Manual SE-4049 for detailed information. The manual may be downloaded from the publications page of the Woodward website ([www.woodward.com](http://www.woodward.com)).

### Controller Wiring

Mount the unit in a location where the effects of vibration and temperature are within the specified range. Operating temperature: -40°F to +185°F (40°C to +85°C), vibration: 6 G's from 40 to 2000 Hz.

Connect power leads directly to a switched power source (i.e., battery). Use of a 10 amp, slow-blow fuse is recommended in the battery (positive) wire.

Use of convoluted tubing, conduit or other wire shielding is recommended to minimize the likelihood of mechanical damage to the actuator wires.



#### WARNING

An overspeed shutdown device, independent of the APECS system, should be provided to prevent loss of engine control that may cause personal injury or equipment damage.

CONTROLLER WIRING TABLE

	MODEL 3100	MODEL 3200	MODEL 3300	MODEL 3400
<b>BATTERY</b>	Red + Black –	Red + Black –	Red + Black –	Red + Black –
<b>ACTUATOR</b>	White + White/Black –	White + White/Black –	White + White/Black –	White + White/Black –
<b>SPEED SIGNAL INPUT</b>	MAGNETIC PICKUP Blue + Green –	IGNITION INPUT Blue Coil A Green Coil B * Tan Coil C *	MAGNETO Blue + Green –	HALL EFFECT Blue: Signal Black: Ground Red: Sensor power
<b>SPEED SELECT 1</b>	Violet	Violet	Violet	Violet
<b>SPEED SELECT 2</b>	Gray	Gray	Gray	Gray
<b>ACT CONNECTOR</b>	Yellow Tx Orange Rx	Yellow Tx Orange Rx	Yellow Tx Orange Rx	Yellow Tx Orange Rx

(\*) Optional

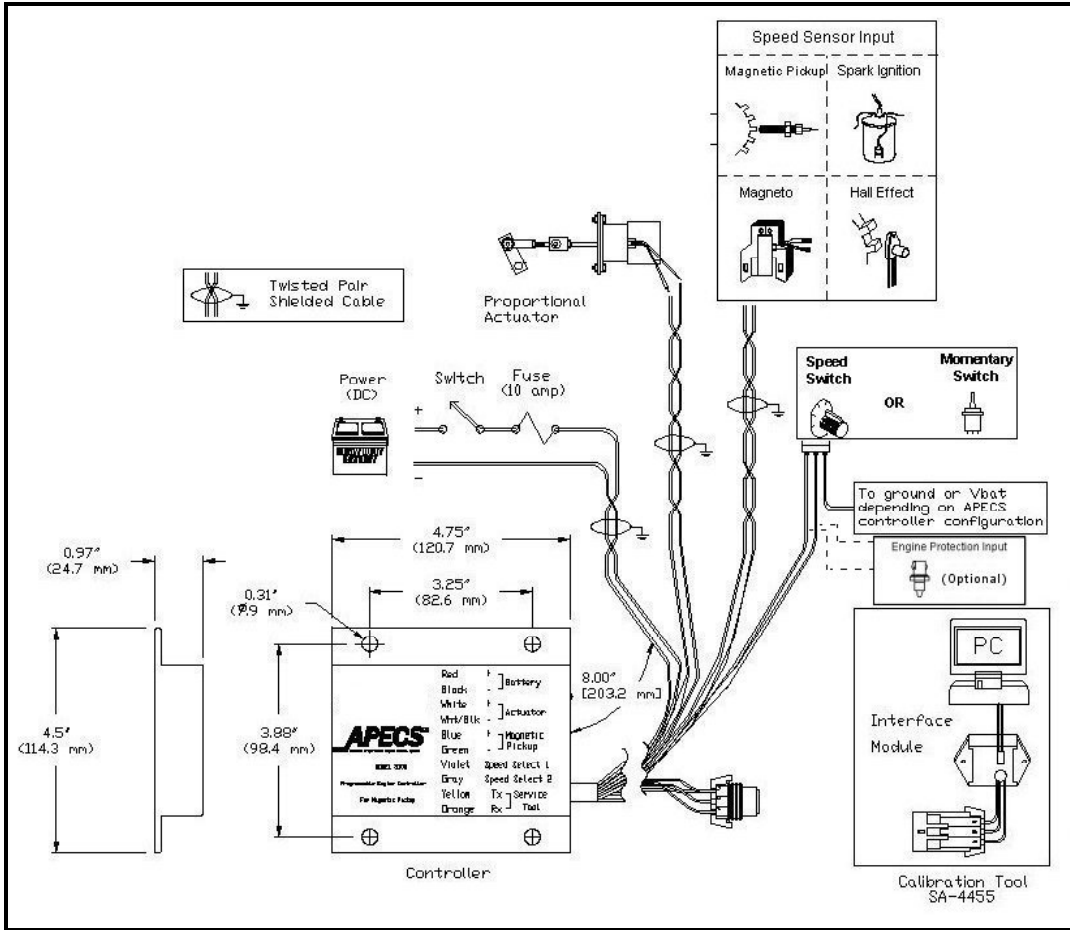


Figure 1. Controller Wiring

### Actuator Wiring

All system wiring should be twisted pair and shielded (preferably foil shielded). Note that the controller has a working range of 9-30 Vdc. However, the actuator must be selected for either 12 or 24 VDC charging system.

ACTUATOR	AWG 14 (2.50 mm <sup>2</sup> )	AWG 16 (1.50 mm <sup>2</sup> )	AWG 18 (1.00 mm <sup>2</sup> )
<b>0175</b>	66 ft (20 m)	33 ft (10 m)	22 ft (6.7 m)
<b>0250</b>	46 ft (14 m)	23 ft (7 m)	15 ft (4.6 m)
<b>0300</b>	46 ft (14 m)	23 ft (7 m)	15 ft (4.6 m)

## Speed Sensor Wiring

There are four different speed-sensing devices that can be used with the APECS 3000 system. The sensing device used depends on the application and the APECS controller unit.

### **Model 3100 / Magnetic Pickup Input (SA-4450 & SA-4451)**

Connect Blue wire to the positive and Green wire to the negative side of sensor.

### **Model 3200 / Spark Ignition Input (SA-4452)**

Intended for either traditional coil and distributor ignition or distributorless ignition systems.

*Traditional coil and distributor: 2-, 3-, 4-, 6-, and 8-cylinder engines:*

Connect any one of the Blue, Green or Tan wires to the negative side of the coil primary and leave the other two wires disconnected.

*Distributorless ignition, 2-cylinder engine:*

Connect any one of the Blue, Green or Tan wires to the negative side of the coil primary and leave the other two wires disconnected.

*Distributorless ignition, 4-cylinder engine:*

Connect any two of the Blue, Green or Tan wires to the negative sides of the two coil primaries and leave the third wire disconnected.

*Distributorless ignition, 6-cylinder engine:*

Connect all three of the Blue, Green and Tan wires to the negative sides of the two coil primaries.

*Distributorless ignition, 8-cylinder engine:*

Connect any two of the Blue, Green or Tan wires to the negative sides of two coil primaries, which are evenly spaced in the firing order. Leave the third wire disconnected.

### **Model 3300 / Magneto Input (SA-4453)**

Connect Blue wire to the primary/engine kill wire and Green wire to the engine block.

### **Model 3400 / Hall Effect Input (SA-4471)**

Connect Blue wire to the sensor output and Green wire to the negative side of the sensor. Connect third sensor lead to battery positive.

## Speed Select Wiring Option

The APECS 3000 features a speed select option for multiple speed settings. Determine the speed mode desired and select the switch hardware best suited for your application. Switch hardware is not provided or sold by Woodward. Please refer to the User's Manual SE-4049 for wiring information.

## Calibration Tool Installation

The APECS Calibration Tool (ACT) is used for programming (configuring and adjusting) and monitoring the APECS controller with your personal computer. The ACT kit contains software CD-ROM, interface module, and RS-232 connecting cable.

### Hardware Requirements

- IBM compatible personal computer equipped with a CD-ROM drive and a serial port with DB-9 connector, capable of 9600 baud communication
- Windows software: 95/98/Me/2000/XP
- 64 MB of available RAM memory and a hard disk with at least 2.0 megabyte of free disk space
- SVGA capable video card and monitor, capable of 256 colors and 800 x 600 display

### Software Requirements

CD-ROM of calibration tool software to run on your personal computer. (Supplied with ACT kit or downloadable from [www.woodward.com](http://www.woodward.com).)

### Hardware Set-Up

To connect your PC to the APECS 3000 unit a standard RS-232 nine-pin cable and a proprietary interface module is required. Both are included in the ACT kit.

**NOTE**

**Make sure power to the PC and the APECS unit is off when making connections. The engine may or may not be running.**

Connect one end of the RS-232 cable to your PC's Com port. Connect the other end of the cable to the interface module.

Now connect the interface module to the APECS 3000 unit via the connector on the harness.



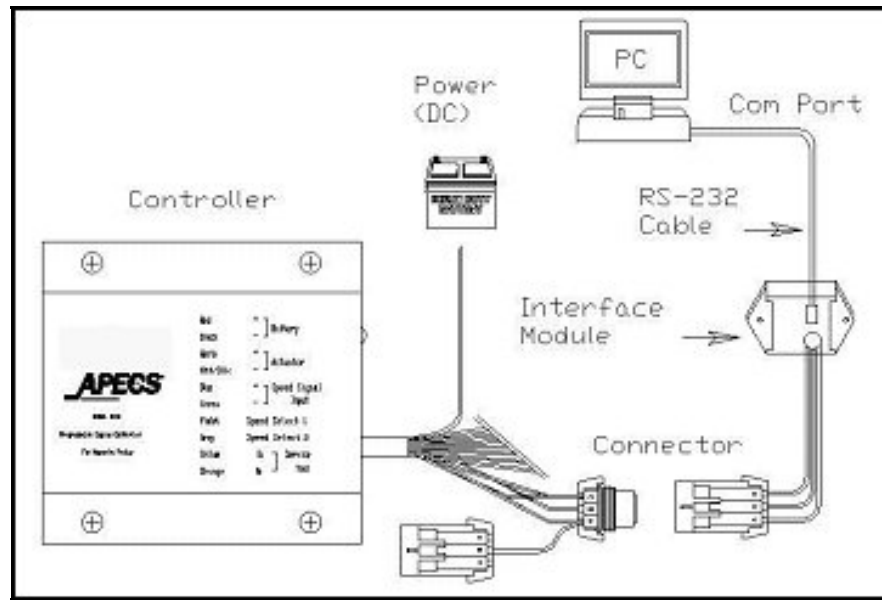


Figure 2. Hardware Setup

### Software Set-Up

ACT software can be automatically installed on your hard drive from the CD-ROM supplied with the kit. To install the software on your hard drive, follow the procedures below.

**Close all other applications to prevent possible conflict with ACT program.**

1. Turn on your computer and insert the ACT disk into the CD-ROM drive. The install program should automatically launch. If it does not, open Windows Explorer, go to the CD-ROM drive and double click on the install or setup program.
2. Follow the prompts from the install program. You may select the default directory or specify your own.
3. When installation is complete, you may access the ACT software from the Start Menu or create your own shortcut.
4. The set-up is now complete and you are ready to run ACT. Please refer to the calibration chapter of the user's manual (SE-4049), which may be accessed through the Help Menu.

**REMEMBER: Power must be supplied to the controller in order to use the ACT software.**

## Fault Codes

The APECS controller identifies certain faults and alerts the user with a flashing LED.

1. *APECS unit not calibrated.* Calibrate the unit.
2. *Excessive engine speed.* Check parameter settings, wiring, case ground, linkage and speed sensor.
3. *Unusually low engine speed.* Check parameter settings, linkage, load, and engine capacity.
4. *Protection input shuts down engine.* Check parameter settings and probable cause for fault.
5. *Factory settings lost.* Download calibration file and recycle power or consult factory.
6. *APECS unit failed.* Check wiring, shielding, and recycle power. Consult factory.

## Chapter 2. 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 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.

## 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) 4097100
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](http://www.woodward.com)) for the name of your nearest Woodward distributor or service facility.

## 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](mailto:icinfo@woodward.com)

Website—[www.woodward.com](http://www.woodward.com)

**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](mailto:icinfo@woodward.com)**

**Please include the manual number from the front cover of this publication.**



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

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