WOODWARD

Application Note 51331
(Revision NEW)
Original Instructions

Replacing the EGS-01 Gas Engine Control with an EGS Full Authority Control System

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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The latest version of most publications is available on the *publications page*. If your publication is not there, please contact your customer service representative to get the latest copy.

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 Out-of-date translations are marked with ⚠.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.

Contents

Illustrations and Tables

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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.

Chapter 1.
General Information

Scope and Purpose

Woodward's EGS-01 control is no longer in production, and has been replaced by an updated EGS Full Authority. The EGS Full Authority replaces EGS-01 in Full-authority, Lambda >1, Mono-control systems.

The purpose of this application note is to provide guidance on retrofitting an EGS-01 installation or design with the EGS Full Authority. It is intended to supplement the EGS Control System Application Manual 26321, which details control installation, operation, calibration, and troubleshooting.

Assumptions

1. Customer has read the entire EGS Control System Application Manual 26321.
2. Customer has understood and complied with all of the warnings highlighted in the Manual 26321.
3. Customer understands that they are strongly encouraged and expected to thoroughly develop and test specific EGS control schemes for their gas engine application under normal and extreme operating conditions.

Introduction

Woodward's EGS Full Authority can be used as a functional replacement for the EGS-01 control. The EGS Full Authority was designed with many new features and functions that are not built into the EGS-01. However, there are a few items that may need special attention to make the EGS-02 function in an EGS-01 system.

Differences Summary

Due to internal control design differences, the customer wiring to the control terminals is different. This application note illustrates the differences in wiring, sensors, communication interfaces, and Service Tool.

Inputs Differences

Inputs	EGS-01	EGS Full Authority
Power supply	Nominal: 10–32 Vdc, minimum 7 Vdc	Nominal: 8–32 Vdc, minimum 6 Vdc; 15 W nominal (not including driven loads)
Speed Sensor	VR or Active Sensor	VR or Active Sensor
ALL ANALOG INPUTS	Two-wire grounded or ungrounded	One wire common return
MAT	PT-100	NTC
MAP	0–20 mA, 0–10 V or 0–5 V	0–5 Vdc
KW	0–20 mA, 0–10 V or 0–5 V	0–5 Vdc
CH4%	0–20 mA, 0–10 V or 0–5 V	0–5 Vdc
Load Reference	0–20 mA, 0–10 V or 0–5 V	0–5 Vdc
Speed Bias	0–20 mA, 0–10 V or 0–5 V	0–5 Vdc
Throttle Position Sensor	0–20 mA, 0–10 V or 0–5 V	0–5 Vdc
Ignition Timing	CAN/FireFly™ only	External timing signal not available
UEGO	0–2.5 V, 0–5 V	Needs Converter box for 0–5 Vdc signal input (NGK UEGO) or Bosch LSU 4.2 sensor directly
Potentiometer	Integrated into the control	External 1 kΩ to 10 kΩ 3-wire pot
Thermocouple	Two (2) J or K type	Cannot use thermocouple
ALL DISCRETE INPUTS	0–6 V = FALSE 4-32 V = TRUE	Close to J1-A24 to activate
Circuit Breaker Aux	Not available	Connect to Gen circuit breaker aux, used for multiple dynamics
Mains Circuit Breaker Aux	Close only when Gen & Mains is closed, used for activation of kW load control	Connect to mains circuit breaker aux, used for multiple dynamics and activation of kW load control
Fuel On	Activates control by opening throttle and TecJet™	Activates control by opening throttle and TecJet
Raise/Lower	Changes internal reference	Changes internal reference
Rated/Idle	Changes internal reference	Changes internal reference
Fault Reset	>10mA resets faults	Standard DI resets faults

Outputs Differences

Outputs	EGS-01	EGS Full Authority
Throttle Command	PWM - Push-Pull, 0–24 Vdc, 1000 Hz	PWM - Push-Pull, 0–24 Vdc, Frequency variable
Wastegate Output	PWM - Push-Pull, 0–24 Vdc, 1000 Hz	PWM - Push-Pull, 0–24 Vdc, Frequency variable
TecJet Power	6 A steady state, 10 A peak for 1 sec	None
TecJet Keyswitch	10 mA max, activates the TecJet when the engine is rolling	Use one of the speed switch outputs and an interposing relay
Fault Outputs	Form C, dry contacts	Low side relay drivers
Major Alarm	De-energizes on Engine Shutdown Condition	De-energizes on Engine Shutdown Condition
Minor Alarm	De-energizes on Control Warning Condition	De-energizes on Control Warning Condition
CPU OK	De-energizes on Control Watchdog Condition	De-energizes on Control Watchdog Condition
Speed Switches	None	Individually configurable for speed limit activation
AUX Power	5 Vdc, 70 mA for sensor power	5 Vdc, 300 mA for sensor power
LED Indications	Power, Fuel On, Alarm, Shutdown	None

Communications Differences

Communications	EGS-01	EGS Full Authority
Engine Control Network	Custom CAN to TecJet(s) and FireFly only	J1939 CAN to TecJet(s), FireFly, IC-920, easYgen™ 3200,
Plant Communications	Modbus® * Slave, RS-232 DB-9M	J1939 CAN, CANopen on rev B
Service Serial Port	RS-232 DB-9M, EGS DOS Tool custom protocol	RS-485 on main connectors, ServLink for Toolkit

*—Modbus is a trademark of Schneider Automation Inc.

Functionality Differences

Functionality	EGS-01	EGS Full Authority
Speed Control	Option	Included
Mono AFR System	Option	Included
Stereo AFR System	Option	Not currently scheduled to include
Single TecJet AFR System	Option	Included
Dual TecJet AFR System	Option	Included
Dual Fuel AFR System – Fuel Blending	Not included	Option

Detailed Comparison

Analog Inputs

The EGS-01 has software configurable two-wire grounded or ungrounded analog inputs. The EGS Full Authority has fixed one-wire analog inputs with J1-B24 (XDRG_B) as common return. See Figure 1-14.

Speed Sensor
Both the EGS-01 and the EGS Full Authority are capable of using Magnetic Pick-up (Variable Reluctance sensor) or Active Pick-Up (ferrous or magnetic target Hall-effect pickup).

MAP Sensor
The standard Manifold Absolute Pressure sensor used for the EGS-01 is compatible with the EGS Full Authority. However, the EGS Full Authority is capable of using a sensor that provides 0–5 Vdc; a 5 Vdc Auxiliary supply is available to power the sensor.

MAT Sensor
The standard Manifold Air Temperature sensor used for the EGS-01 is not compatible with the EGS Full Authority. The EGS-01 uses a Pt100 RTD type sensor. The EGS Full Authority MAT input consists of an internal 2.21 kΩ pull-up resistor to 5.0 Vdc and is best suited for a Negative Temperature Coefficient (NTC) Thermistor probe. The input voltage can be calculated from the resistance curve of the sensor and defined in an 8-point calibration curve in the EGS Full Authority. The EGS Full Authority firmware revision B and later will also support a PWM MAT Sensor.

kW, CH4%, Load Reference, Speed Bias, Throttle Position Sensor Inputs
The EGS-01 can accept these sensors via 0–20 mAdc/0–10 Vdc or 0–5 Vdc software selectable inputs. The EGS Full Authority can accept these inputs as 0–5 Vdc.

UEGO Sensor
The standard NGK UEGO sensor with converter used for the EGS-01 is compatible with the EGS Full Authority. The EGS Full Authority is also capable of using the Bosch LSU 4.2 UEGO sensor directly without using a converter box.

Potentiometer AFR Trim
The EGS-01 has an on-board AFR trim pot. The EGS Full Authority does not have an on-board pot, but can support a 1 kΩ -10 kΩ AFR trim pot externally.

Ignition Timing Input
The EGS-01 can accept an external ignition-timing indicator only from Plant Communication CAN/FireFly only. The EGS Full Authority can accept an external ignition-timing indicator from J1939 CAN/IC-92x.

Discrete Inputs

All EGS-01 Discrete Inputs are common to 24 Vdc return and close to 24 Vdc positive to activate. All EGS Full Authority Discrete Inputs are activated by closing a switch to J1-B24 (XDRG_B). See Figure 1-15.

Circuit Breaker Auxiliary Contact
EGS-01 does not support the use of a generator CB AUX input. EGS Full Authority CB AUX is closed when the generator circuit breaker is closed and is used for multiple speed control dynamics such as offline/online.

Mains Circuit Breaker Auxiliary Contact
EGS-01 CB AUX input should only be closed when both Generator and Mains breaker is closed; this is used for activation of kW load control mode. For the EGS Full Authority connect this to the Mains tie breaker AUX contact and is used for multiple speed control dynamics and in conjunction with the Gen CB AUX contact can activate the kW load Control mode.

Fuel On Contact
Both the EGS-01 and EGS Full Authority use this contact input to allow the throttle and TecJet to open.

Raise/Lower and Rated/Idle Contacts
Both the EGS-01 and EGS Full Authority use these contact inputs to externally modify the internal Speed and or Load Reference.

Reset Contact
The EGS-01 and EGS Full Authority both use this contact to Reset internal Faults. However, the EGS-01 triggers this condition when the input current to this terminal rises above 10 mA. The EGS Full Authority activation of this function is the same as the other Discrete Inputs; close this terminal to J1-B24 (XDRG_B).

Discrete Outputs

The EGS-01 contains Form C dry contact relays. The EGS-02 utilizes low-side relay drivers with one side of the coil connected to the power supply positive. An external relay must be used. See Figure 1-16.

System Devices

The EGS-01 is the main controller that is the integral part of the EGS system. The EGS Full Authority is compatible with most Woodward/Deltec system devices supported by the EGS-01. In most cases the EGS Full Authority will require system device updates to the firmware or reconfiguration of the tunable settings.

TecJet™
- The EGS Full Authority is not compatible with the old Deltec design TecJet 20, 40, and 50.
- The EGS Full Authority is compatible with all TecJet 52 (actuated by F-Series).
- The EGS Full Authority is compatible with TecJet 50+, TecJet 50+ Precision Flow, and TecJet 110 firmware 5418-1232 E or greater.

IMPORTANT **The TecJet 5418-1232 B through E can be updated to rev F by running revision 1.7.0.5 or greater of the TecJet Service Tool.**

EGS-01 is capable of powering the TecJet 50 (old Deltec design) through terminals 1(+) & 2(–) (TecJet 1) and terminals 41(+) & 42(–) (TecJet 2). EGS Full Authority cannot power any TecJets; the valves must be powered externally per the respective manual using fuses and power cutoff strategies.

EGS-01 manages the TecJet keyswitch input through terminal 9 for TecJet 1 and terminal 49 for TecJet 2. EGS Full Authority can be configured to activate the TecJet Keyswitch input by using a Speed Switch output. These outputs are low-side drivers, and the TecJet needs its input pulled-up to the power supply voltage. Thus, a relay is needed to pull the TecJet Keyswitch voltage up (see Figures 1-2 & 1-3).

The TecJet CAN connection for the EGS Full Authority is the same as the EGS-01; an external network termination resistor is required.

FireFly™
The EGS-01 communicates to the FireFly via CAN. EGS-01 sends the load signal and gathers ignition timing information through the proprietary CAN link.

The EGS Full Authority communicates to the FireFly via CAN J1939 proprietary messages. EGS Full Authority sends the load signal and gathers knock information through the J1939 CAN link.

- The EGS Full Authority is compatible with FireFly Voltage Load input 1752-015 revision E and later.
- The EGS Full Authority is compatible with FireFly Current Load input 1752-227 revision D and later.
- The EGS Full Authority is compatible with FireFly Current Load input 1752-1033 revision NEW and later.

The FireFly Service Tool will allow firmware update to allow EGS Full Authority compatibility. Consult the Woodward factory for a copy of the correct firmware file.

The FireFly physical CAN connection for the EGS Full Authority is the same as the EGS-01; an external network termination resistor is required on the EGS side.

External

Ignition Timing Signal
The EGS-01 is not compatible with CAN communication to any ignition product. The EGS-01 can receive external Ignition timing information from the FireFly for Gas Quality Closed-Loop Total Efficiency mapping.

The EGS Full Authority cannot take an analog signal from an external Ignition timing device. The EGS Full Authority communicates with an IC-92x to receive its timing signal and diagnostics information as well as sending timing advance and global energy values.

- The EGS Full Authority is compatible with IC-920 Industrial 20 cylinder 8408-0725.
- The EGS Full Authority is compatible with IC-920 Industrial 24 cylinder 8408-0726.
- The EGS Full Authority is compatible with IC-922 Industrial 20 cylinder 8408-0727.

Wiring

The EGS-01 makes use of differential inputs for analog signals; this method increases immunity to Common Mode noise and reduces the likelihood of signal-to-signal interference. The EGS Full Authority uses single-ended analog inputs with a common return; take care to avoid increased noise problems and ground loops. In some cases, ground-loop isolators and/or ac filters (capacitors) may be required. This makes shielding and grounding absolutely critical; wire-run locations and routing may be difficult to fix if problems arise. The design for the EGS Full Authority was optimized for on-engine mounting with short wire runs; it is likely that the control specifications for electromagnetic susceptibility, immunity, and transmission will be degraded if any wire lengths exceed 30 meters or power supply lines exceed 10 meters.

Consider these requirements when selecting the mounting location:

- Protection from high-voltage or high-current devices, or devices which produce electromagnetic interference in excess of levels defined in EN61000-6-2 (Immunity).
- The control should be electrically grounded to the engine. If the control is mounted inside an enclosure, it should be a metallic enclosure and attached to the engine such that the engine and enclosure have the same ground potential.
- Wiring to and from the control should be routed within 50 mm (2 inches) of engine-ground-potential structural components such as a skid girder or other large grounding bar to minimize subjecting the control to electromagnetic interference.

Location

The EGS-01 is panel-mounted.

The EGS Full Authority is preferably engine mounted (skid mounted recommended < 1.5 m from the engine for full electromagnetic compatibility).

Consider these requirements when selecting the mounting location:

- Adequate ventilation for cooling. Select a location on the engine that will provide an operating temperature range of –40 to +85 °C (–40 to +185 °F). A position low on the engine is more likely to be in this temperature range.
- Space for servicing and repair.
- Protection from direct exposure to water or to a condensation-prone environment.

Termination

The EGS-01 utilizes Phoenix® terminations.

The EGS Full Authority utilizes sealed TYCO® connectors; it is recommended that these connections be wired to a local terminal strip for ease of troubleshooting.

Service Tool

The EGS-01 Service Tool is a DOS-based program and communicates via RS-232 through a DB-9M connector. The EGS-01 Service Tool is a fixed text-based tool and is not compatible with Windows® 2000, Windows NT®, Windows XP, or Windows Vista®.

The EGS Full Authority Service Tool utilizes Woodward Toolkit and communicates via RS-485 through a RS-232 or USB converter. Toolkit is a flexible & powerful user adaptable graphical interface tool and is compatible with Windows Vista, Windows XP, and Windows 2000. Toolkit uses Microsoft.NET version 2 or greater (supplied on every CD-ROM that also has Toolkit).

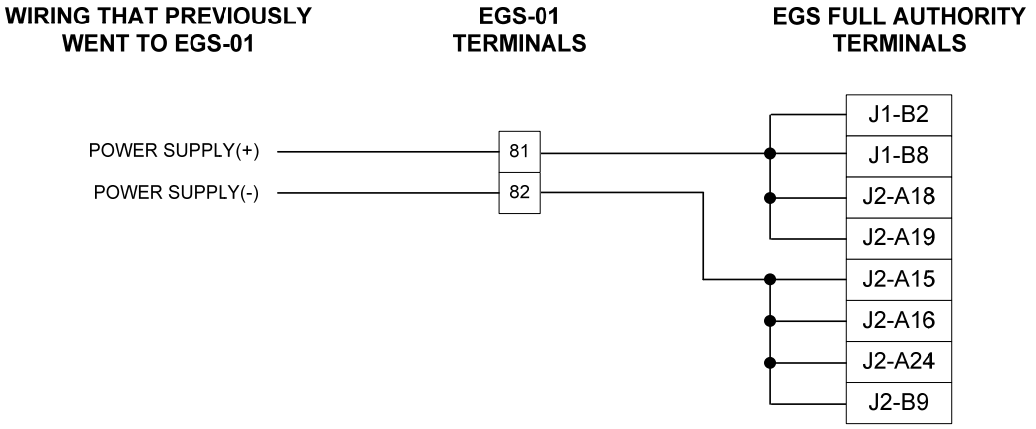

Figure 1-1. Power Supply Wiring

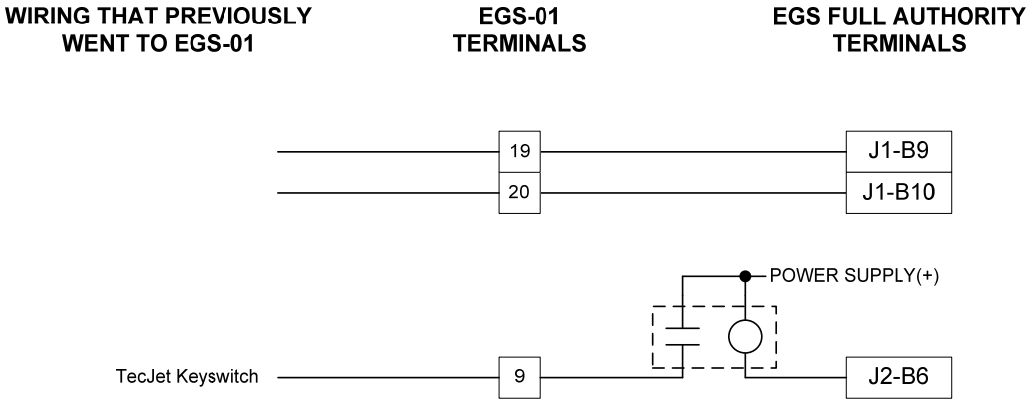

Figure 1-2. TecJet 50+ Wiring

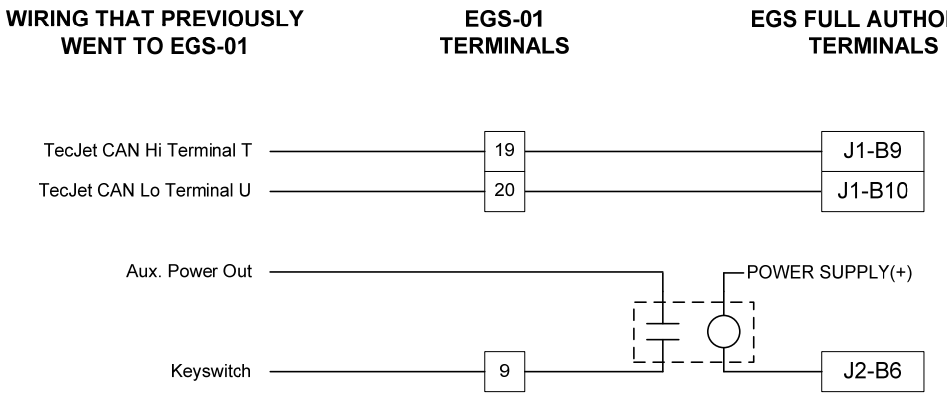

Figure 1-3. TecJet 52 Wiring

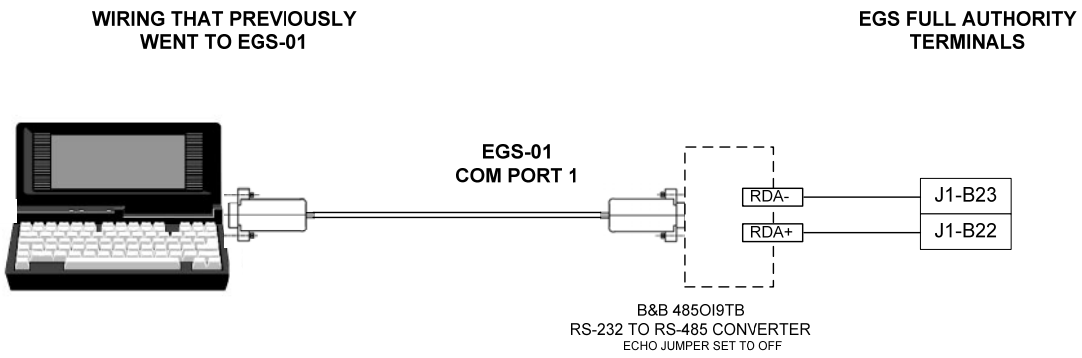

Figure 1-4. Com Port Wiring RS-232 to RS-485 Converter

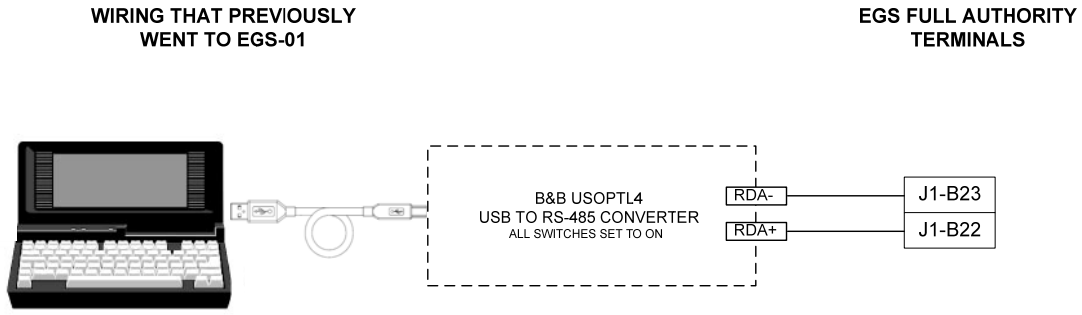

Figure 1-5. Com Port Wiring USB to RS-485 Converter

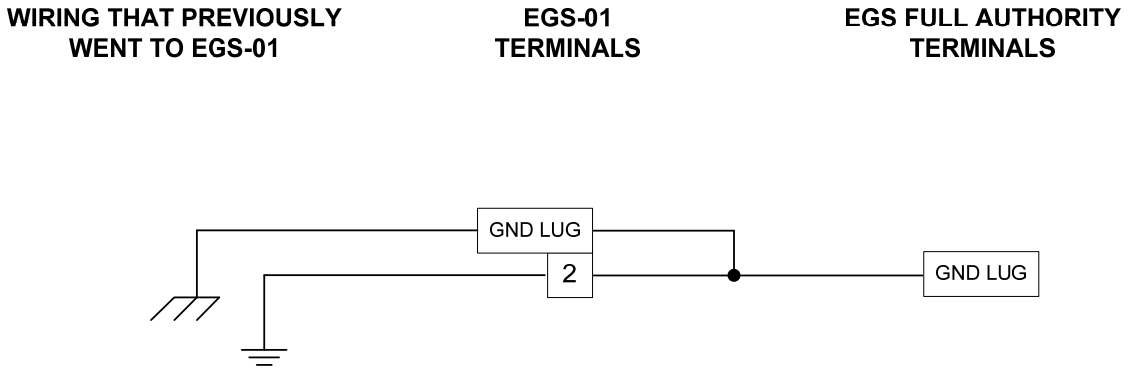

Figure 1-6. Grounding

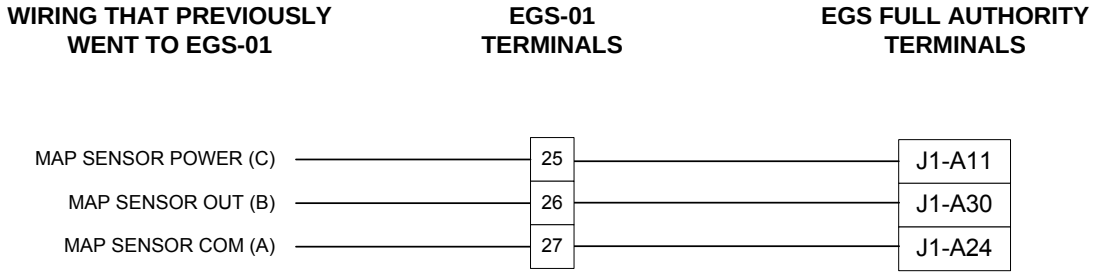

Figure 1-7. MAP Sensor 1 Wiring

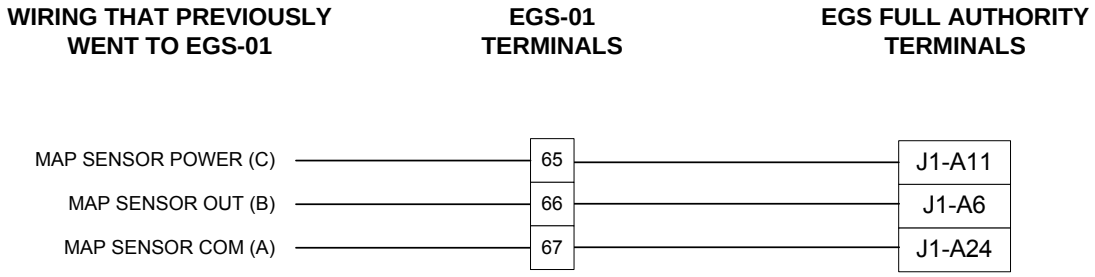

Figure 1-8. MAP Sensor 2 Wiring

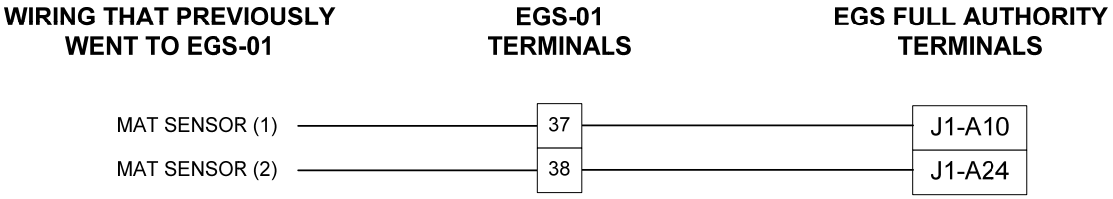

Figure 1-9. MAT Sensor Wiring

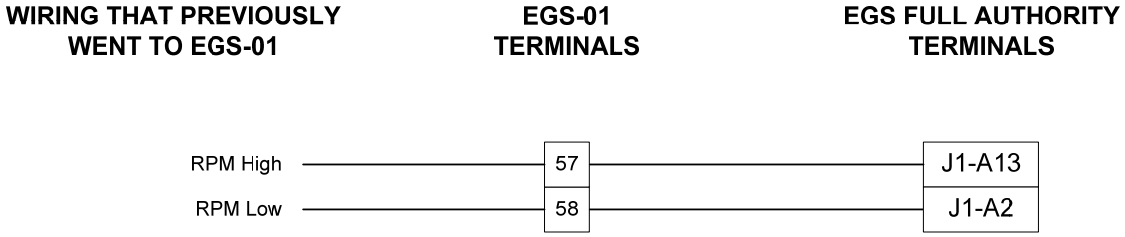

Figure 1-10. Speed Sensor Wiring

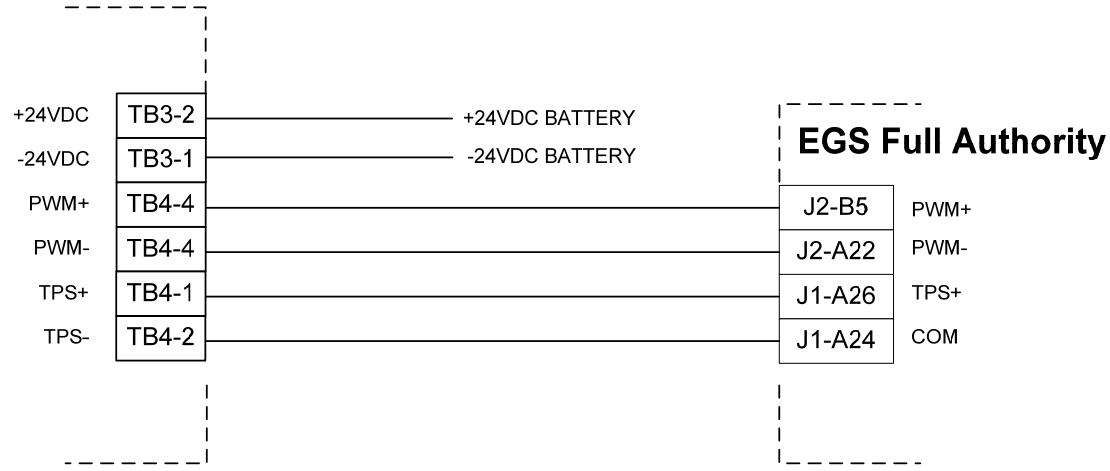

Figure 1-11. ProAct™ Gen I PWM Wiring

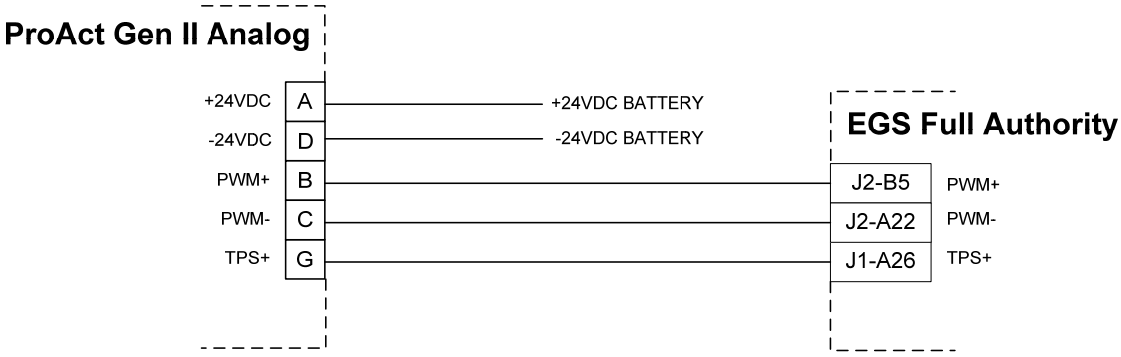

Figure 1-12. ProAct Gen II PWM Wiring

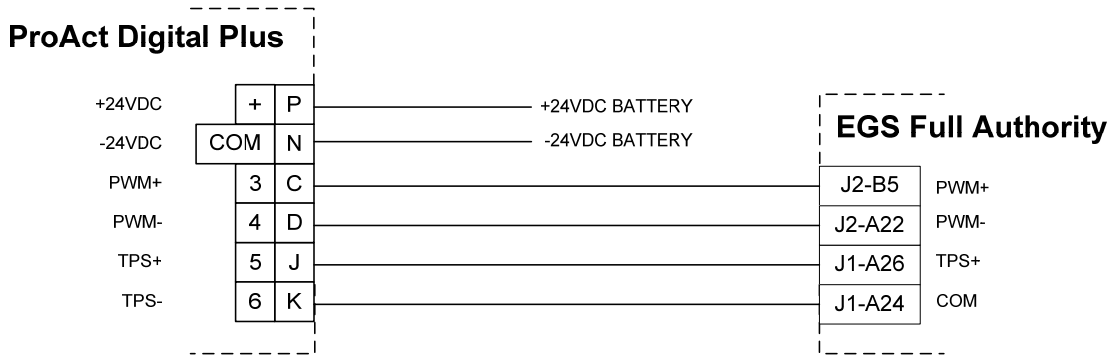

Figure 1-13. ProAct Digital Plus PWM Wiring

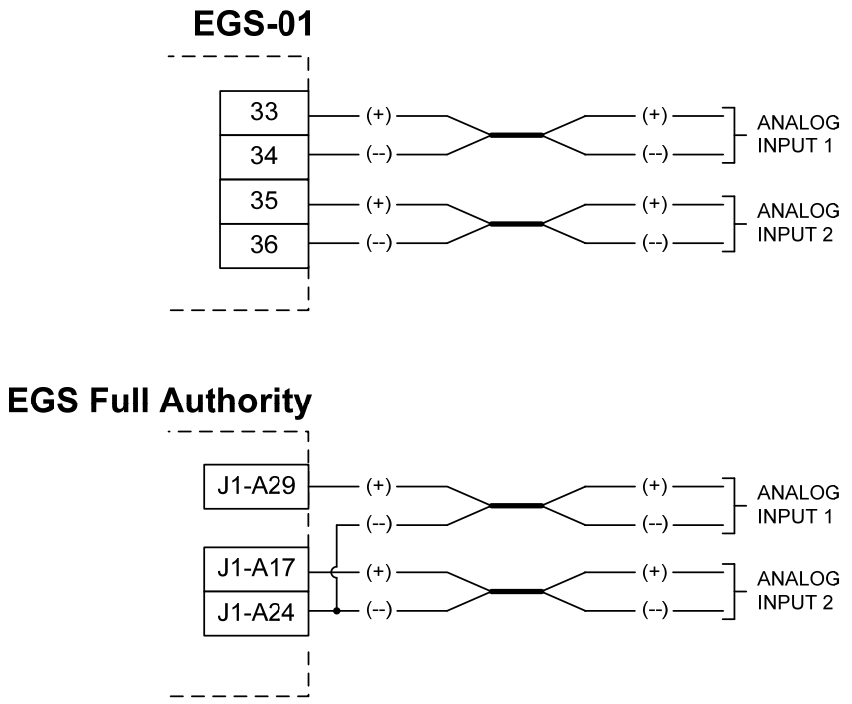

Figure 1-14. Generic Analog Input Wiring

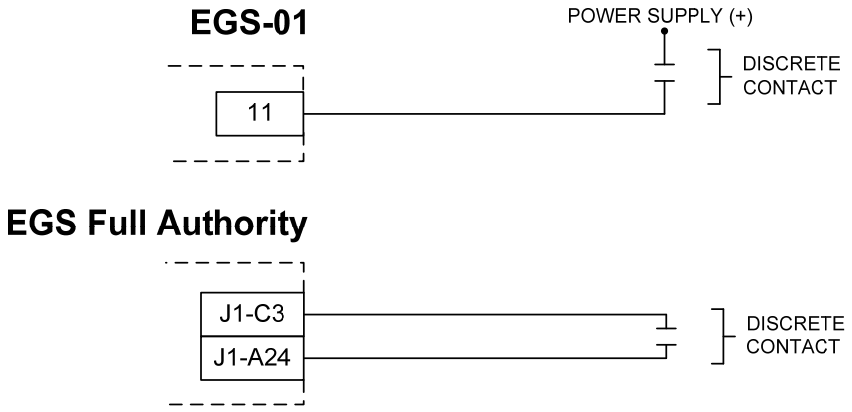

Figure 1-15. Generic Discrete Input Wiring

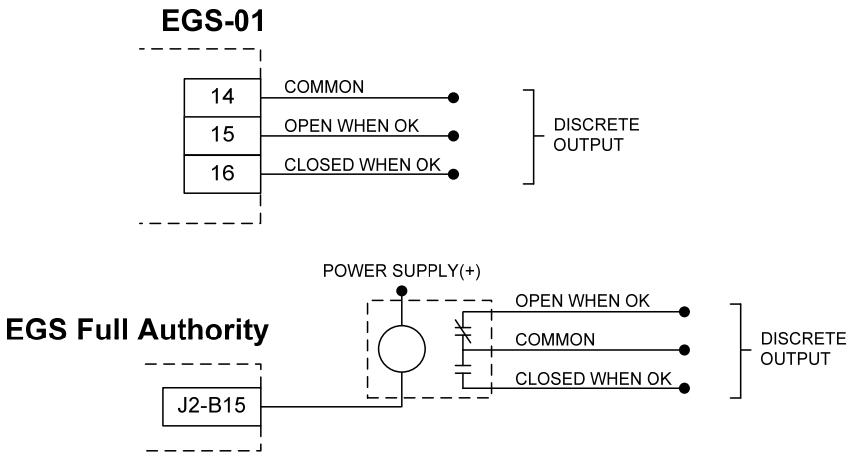

Figure 1-16. Generic Discrete Output Wiring

Chapter 2.
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

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
Germany:	
Kempen	+49 (0) 21 52 14 51
Stuttgart	+49 (711) 78954-510
India	+91 (129) 4097100
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
Poland	+48 12 295 13 00
United States	+1 (970) 482-5811

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

Products Used In Industrial Turbomachinery Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
India	+91 (129) 4097100
Japan	+81 (43) 213-2191
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 51331.

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.

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