WOODWARD

Application Note 50500
(Revision D)

Original Instructions

Simplified Unloading Scheme for Electronic Controls

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 Out-of-date translations are marked with ⚠.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

Warnings and Notices

Important Definitions

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

- **DANGER**—Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING**—Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION**—Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
- **NOTICE**—Indicates a hazard that could result in property damage only (including damage to the control).
- **IMPORTANT**—Designates an operating tip or maintenance suggestion.

⚠WARNING

Overspeed / Overtemperature / Overpressure

The engine, turbine, or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

⚠WARNING

Personal Protective Equipment

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

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

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

⚠WARNING

Start-up

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

⚠WARNING

Automotive Applications

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

NOTICE

Battery Charging Device

To prevent damage to a control system that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.

Electrostatic Discharge Awareness

NOTICE

Electrostatic Precautions

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

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

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual *82715*, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

Follow these precautions when working with or near the control.

1. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as much as synthetics.
2. Do not remove the printed circuit board (PCB) from the control cabinet unless absolutely necessary. If you must remove the PCB from the control cabinet, follow these precautions:
   - Do not touch any part of the PCB except the edges.
   - Do not touch the electrical conductors, the connectors, or the components with conductive devices or with your hands.
   - When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. Immediately after removing the old PCB from the control cabinet, place it in the antistatic protective bag.

Simplified Unloading Scheme for Electronic Controls

It is practical to unload an engine from a parallel-lines load-sharing system before opening the circuit breaker. This will protect the circuit breaker from excessive arcing and allow the engines remaining on the system to avoid excessive frequency/voltage swings as the additional load is accepted.

Automated Equipment

Woodward can provide a wide range of generator control equipment to permit controlled loading and unloading procedures on pre-established scales, and the use of this equipment is recommended for optimal generator efficiency, switch life, and frequency/voltage control. A listing of this equipment and related publications is included at the end of this application note.

Inexpensive Unloading System

Multiple engine installations which do not include any of the sophisticated electronic equipment, but which use isochronous load sharing, may avoid damage to contacts and system disruption by switching the engine from isochronous load sharing to droop operation before opening the breaker. Since the remainder of the system will still be in isochronous-load-sharing operation, the engine in droop will shed almost all load in a controlled manner. The engine may then be removed from the system without damage to the circuit breaker and without the jump in speed which may occur if the generator is dropped from the system while the engine is loaded.

The generator could be damaged by reverse current if the breaker is not opened as no-load is approached.

To prevent a possible reverse-current condition, the operator should open the breaker manually as the engine approaches no-load on the kW meter. The engine being unloaded may go out on reverse current if the speed setting is lower than the system speed. The kW meter or real power meter should be carefully monitored as the engine load decreases to prevent possible damage from reverse current.

Different Systems

Different Woodward electronic governor control systems require different means of switching them from isochronous load sharing to droop. The various means are outlined below under the control name.

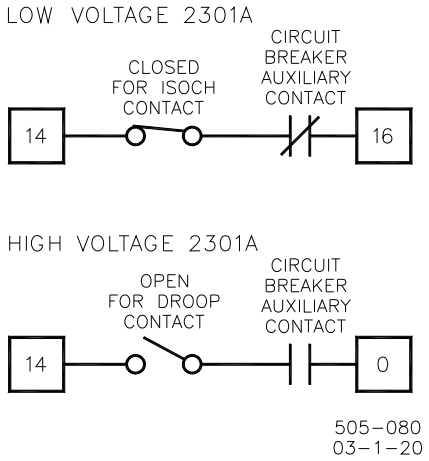

Figure 1. 2301A Droop Switch
(Unit is in droop if either the auxiliary contact or droop contact is open. Low voltage units connect to terminal 16. High voltage units connect to terminal 0.)

2301A

The 2301A control should be wired with a simple switch between the auxiliary-circuit-breaker contacts and terminal 14. The control is in isochronous when the circuit is closed and in droop when the circuit is open. The 2301A is automatically removed from the paralleling lines when it goes into droop operation, preventing a distortion of the system-speed setting.

The rate of unloading will be influenced by the amount of droop set in the 2301A. The droop potentiometer must not be set full counterclockwise. If the engine will not have to run in droop except to unload as outlined in this application note, set the droop pot 3/4 turn clockwise.

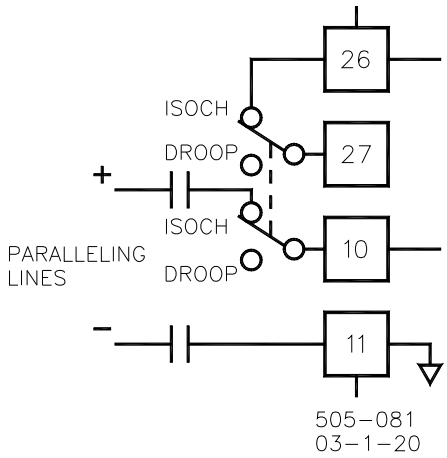

Figure 2. Use a double pole, double thrown switch as shown to put a 2301 control into droop and remove the control from the load- sharing system.

2301

2301 controls do not have automatic switching out of the load-sharing lines and into droop mode. These units can be equipped with a double-pole double-throw switch which will remove the unit from the system paralleling lines by simultaneously opening the circuit from terminal 10 and opening the circuit between terminals 26 and 27, causing the unit to unload the system.

The 2301 control must have droop set into the unit to work as outlined. Set the droop potentiometer 3/4 turn clockwise if a specific amount of droop is not required for other purposes.

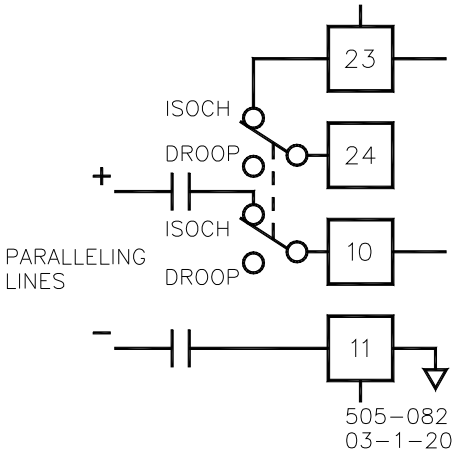

Figure 3. 2500 Wiring to Switch to Droop

2500 and Electric Powered Governor (EPG)

These controls require load sensors to operate in isochronous load sharing systems. The unload procedure requires a switch which will separate the load sharing unit from the parallel lines and place the load sensor in the droop mode.

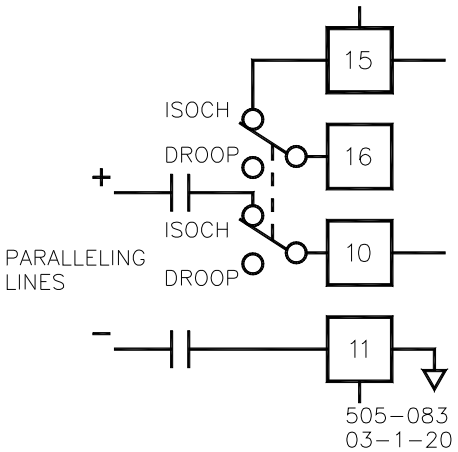

Figure 4. Switch Wiring to Place EPG Into Droop

The droop adjustment is in the load sensor for both the EPG and the 2500 system. For the unload system to work, it is necessary that droop be set into the load sensor. If the only reason to have droop in the system is to unload from the system, set the droop pot on the load sensor to 3/4 turn clockwise. Switch wiring for the removal of the individual control from the paralleling system is shown in Figure 3 for the 2500 control and in Figure 4 for the EPG control. Double-pole, double-throw switches are required in each instance.

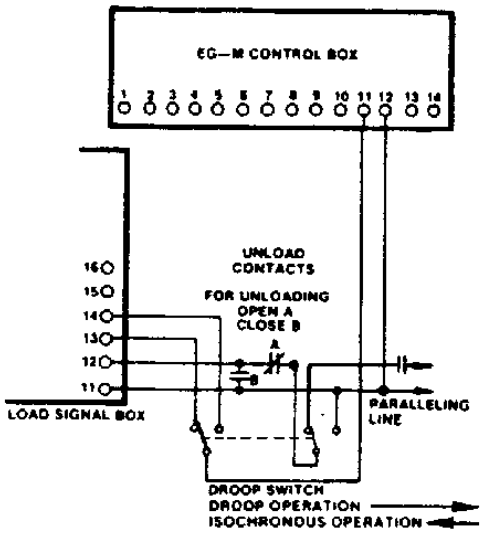

Figure 5. EG-M Isochronous to Droop Wiring

EG-M Controls

A double-pole, double-throw switch is required to unload EG-M controls by switching from parallel lines to droop operation. The switch is located between the load signal box and the control as shown in Figure 5. The droop pot must be set clockwise from the isochronous position for the system to work. If the only use of droop is to unload the engine from the system, set at about 3/4 turn clockwise.

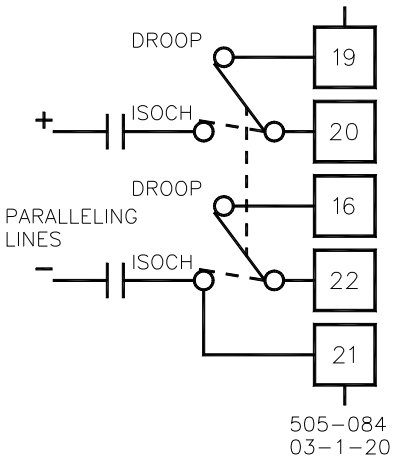

Figure 6. EG-A Isochronous to Droop Wiring

EG-A Controls

A double-pole, double-throw switch from the EG-A terminal strip will allow changing the control mode from isochronous load sharing to droop control and thus unloading the generator. The droop pot on the EG-A must have droop set into it for the unload system to work. If the only use of droop is to unload the generator, the pot should be set at 3/4 turn clockwise. Figure 6 shows the switch wiring required for an EG-A system.

This method of unloading a generator while still paralleled to the isolated system has a number of exceptions, and Woodward recommends that unloading and other generator functions be automated whenever possible.

Automated Equipment

Woodward automated generator control equipment may be selected to exactly suit the needs of a particular generator system, providing loading and unloading control, automated synchronizing, precise frequency control, ramp generators, reference setting, and import/export control. The following publications explain some of the special generator system control elements which Woodward can supply.

Product	Publication
Automatic Power Transfer and Load Control	82380
Automatic Generator Loading Control	82399
Load Pulse Unit	82388
SPM-A Synchronizer	82383

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication 50500D.

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