WOODWARD

Manual 82715
(Revision J, 3/2012)
Original Instructions

Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, & Modules

Reference Manual

General Precautions

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment.

Practice all plant and safety instructions and precautions.

Failure to follow instructions can cause personal injury and/or property damage.

Revisions

This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, check manual *26311* , *Revision Status & Distribution Restrictions of Woodward Technical Publications*, on the *publications page* of the Woodward website:

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Proper Use

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.

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 Out-of-date translations are marked with ⚠.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

Manual 82715

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.

Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules

Introduction

All electronic equipment contains components that can be damaged, or suffer reduced reliability, from improper handling or incorrect wiring. This manual describes methods of handling electronic equipment and techniques for connecting and checking system wiring. These methods and techniques, if used, will substantially reduce handling damage and in-service failures. Although some types of electronic equipment are more easily damaged by mishandling or incorrect wiring than other types, regular use of these methods and techniques will result in fewer damaged components and increased reliability for all types of electronic equipment.

Improper handling (installation, removal, storage, etc.) can cause two types of component failure: immediate failure or eventual failure (decreased reliability). Both of these types of failure, in turn, can be caused by electrostatic discharge, physical damage, or electrical damage.

An electrostatic discharge across a device which is sensitive to static electricity usually punctures an insulating layer, causing the device to fail immediately. However, an electrostatic discharge can also weaken an insulating layer without puncturing it, causing eventual premature failure with no immediate malfunction or sign of damage.

Rough handling or improper protection during installation, removal, shipping, or storage can cause physical damage to a module, a printed circuit board (PCB), or a complete control. Again, the damage may not be apparent immediately, but may cause eventual premature failure.

Incorrect system wiring or improper test procedures can electrically damage a control or can cause temporary incorrect operation without actual damage.

In order to prevent these types of unnecessary damage to a control, module, or PCB, the following instructions must be followed.

Preventing Electrostatic Damage

To effectively reduce damage from electrostatic discharge, all four of the following precautions must be taken:

- Reduce the generation of static electricity
- Safely dissipate any charges that have built up
- Handle equipment correctly
- Use protective devices

The first of these four is the most important because, if no static electricity were generated, the other three precautions would not be necessary. However, since the generation of static electricity is impossible to completely eliminate, all four precautions must be taken to prevent damage from electrostatic discharge.

Reduce Static Generation

- Do not wear clothing that readily generates static electricity (synthetic materials generate large amounts of static electricity). Cotton or cotton blend fabrics, for example, are good because they are not as likely to store electrostatic charges.
- Keep all plastic items away from any area where electronic devices are handled. Any plastic item is a potential static generator. This includes candy-wrappers, foam cups, synthetic carpet, foam cushions, etc.
- Avoid activities that produce static such as wiping feet or putting on smocks, when in the vicinity of static-sensitive devices.
- Maintain as high a humidity as is comfortable and practical.

Dissipate Built-Up Charges

- Always discharge any static charge your body might have built up before touching any electronic module, PCB, or control. To do this, touch and hold a grounded metal object for a minimum of two seconds.
- When connecting a cable to a control, discharge any charge the cable may have. Touch the cable connector to the receptacle before removing the protective cover from the receptacle. Then, remove the protective cover from the receptacle and connect the cable.

Handle Equipment Correctly

- Do not touch components, solder runs, or connectors on a PCB. Hold PCBs only by the edge and modules only by the handle (if provided) or by the front panel.
- When disconnecting a module from a cardcage-type control during testing or service, do not remove the module completely from the control. Pull it out only about 10–15 mm (about 1/2 inch) to disconnect it.

Protective Devices

- Controls are sent from the factory with protective covers on cable receptacles. Leave the cover on any receptacle that has no cable connected to it. Always install covers on all receptacles when a control is in storage.
- Install a Conductive PCB Shunt Bar on any PCB or module that is not installed in a control. Install PCB Shunt Bars on all modules as soon as the module is removed from the control and keep the shunt bars on the modules during storage or shipment.
- When a module or PCB is removed from a control, insert it into an Antistatic Protective Bag.

Preventing Physical Damage

- Do not force a module when installing it into a control. If a module does not go into a control easily, check that the module is in the correct slot (each type of module is keyed to fit only into the correct slot), and that it is not upside down. Be sure that the module is being inserted straight, and that there are no bent pins or obstructions. Insert the module all the way in by hand before tightening the locking screws.

- Do not force a cable connector into its receptacle. Use only your hands, not pliers or other tools. If a connector doesn't easily go into its receptacle, check for bent pins or obstructions.

Preventing Electrical Damage

Installation

- When installing a control, double-check to be sure that all system wiring is correct. Do not connect the control until all wiring is correct.

- Do not use the control to check the system wiring; make sure that the wiring is correct before connecting it to the control.

- Do not make any connections with the power on. Doing so may damage the control and/or cause injury to personnel.

Testing and Servicing

- Do not make connections with power on.

- Double-check all test equipment connections before applying power.

- Use battery-operated test equipment whenever possible.

- Make sure that all test equipment is isolated from ground.

- Do not remove or install modules or PCBs with power on.

Shipping

- Unless otherwise stated in a product manual, preparing a device for shipment should be as follows:
- When a module or PCB is shipped separately, use a conductive PCB Shunt Bar on it (if applicable) and put it into an Antistatic Protective Bag.
- Pack each module that is not installed in a control individually, each with a Conductive PCB Shunt Bar (if applicable) and each in its own Antistatic Protective Bag.
- Use a non-abrasive material to protect all surfaces of the unit.
- Pack a complete control, a module, or a PCB so that it has at least 100 mm (four inches) of tightly packed, industry approved shock-absorbing material on all sides.
- Pack a complete control in a double-walled carton made of minimum 1500 N (340 pound) test material.
- Pack each module to be shipped in its own heavy cardboard box. Do not ship modules or PCBs in padded envelopes.

Storage

- Leave all controls, modules, and PCBs that are to be stored, in their shipping boxes, with all protective devices in place, including Antistatic Protective Bags.
- Store electronic equipment in a cool, dry place.
- Long-term stored units may require operational power prior to installation and setup. Apply power to controls as described in the manual or unit wiring diagram. Modules either can be installed in an operating control, or in a special powered storage rack available from Woodward. This will ensure that the stored unit is functional.

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

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