

UG Governor Limit Switches

Operation 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

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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.



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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.

UG Governor Limit Switches

Description

Woodward makes limit switches available as auxiliary equipment for UG-8D and UG-40D governors.

Two-switch and three-switch limit switches are available for both the UG-8D and the UG-40D.

Limit switches can:

- Shut off the electric motor after reaching the speed setting limit. Normally, the speed setting limits are the minimum and maximum speed limits. When used to shut off the electric motor, limit switches also protect the synchronizer (speed-setting) motor should the operator run the speed adjustment to its limit.
- Energize lights, alarms, or other indicators when the speed setting reaches the speed limit. Usually, these are minimum, maximum, and auxiliary speed limits.



WARNING

If the governor, for any reason, loses its ability to control the prime mover, limit switch protection is also lost.

Woodward provides the internal wiring from the limit switches to the speed-setting motor and/or connector. However, external wiring from the connector to auxiliary devices is not provided. Wiring information is referenced in the product specification for each UG governor.

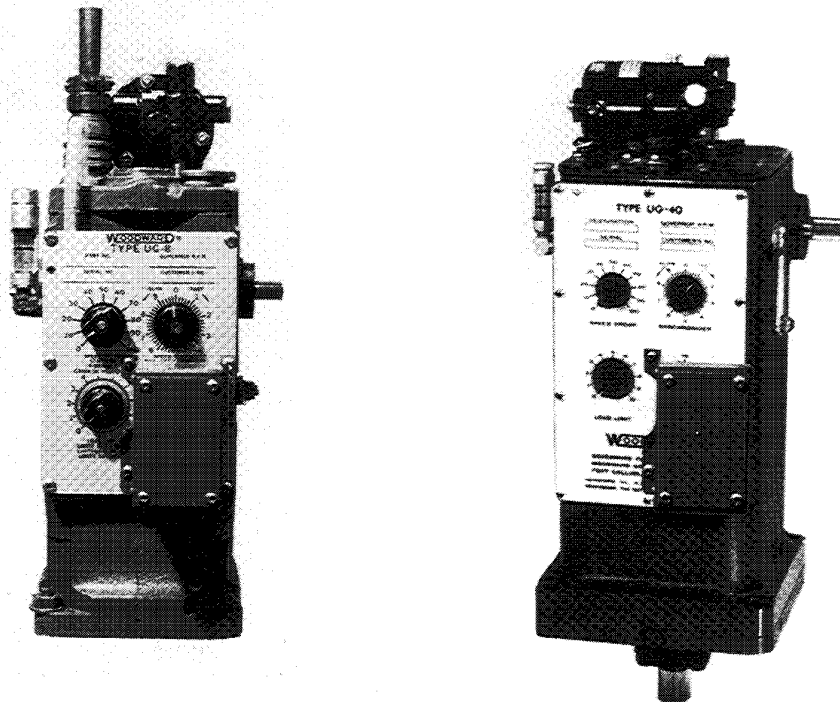


Figure 1. UG-8D and UG-40D Governors with Limit Switches

Related Publications

Document Number	Document Title
Manual 03040	UG-5.7/8/10 Dial Governor
Product Spec 03029	UG-5.7/8/10 Governor
Manual 03039	UG-40 Dial and Lever Governors
Product Spec 03030	UG-40 Governor

Operation

Once the switch points have been calibrated, limit switches operate as follows.

As voltage is applied to the motor, the motor shaft rotates the synchronizer indication gear. The limit cams are also rotated by this motion.

The speed-setting motor turns the synchronizer indication gear and limit cams clockwise to increase speed. When maximum speed is reached, the limit cam actuates the maximum limit switch. Once the switch is actuated, the motor turns off, and the indication side of the switch turns on.

To decrease speed, the speed-setting motor turns the synchronizer indication gear and limit cams counterclockwise. When minimum speed setting is reached, the limit cam actuates the minimum limit switch. Once the switch is actuated, the motor turns off, and the indication side of the switch turns on.

Additionally, you can set an auxiliary limit switch to operate between the minimum and maximum speed limits. A long range cam is available to remain actuated over an extended portion of the speed range.

Calibration

Perform the following procedure only when calibration or recalibration is necessary.

Before calibrating, determine the proper switch points for your application.



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.

1. Properly install the governor on a governor test stand or the engine.
2. Remove the limit switch cover from the governor dial plate (see Figure 2).
3. To set the minimum speed switch point:
 - A. Turn the speed-setting knob to the specified minimum setting.
 - B. Loosen the cam set screw (as shown in Figure 2) using a standard Allen wrench. Move the minimum limit cam until it just activates the switch. Tighten the cam set screw.
 - C. To test the cam's position, use the synchronizing motor to increase the speed setting so that the cam is not on the actuator. Then, slowly decrease the speed setting until the switch activates.

- D. If the cam contacts the actuator at the minimum speed $\text{rpm} \pm 10 \text{ rpm}$, the switch point is set correctly. However, if the cam does not contact the actuator within the 10 rpm tolerance, repeat steps 3B and 3C until the calibration is successful.

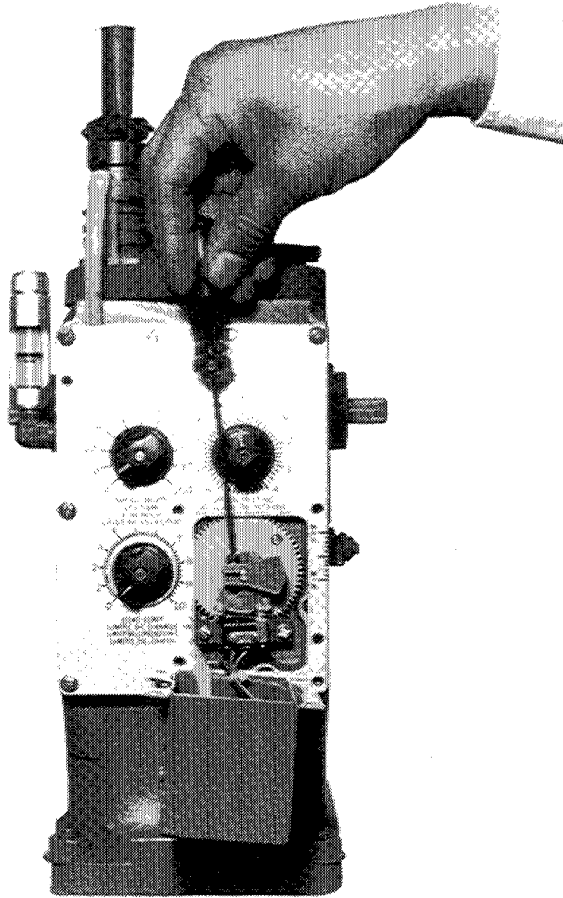


Figure 2. Adjusting the Cam Set Screw

4. To set the maximum speed switch point, repeat step 3, turning the speed-setting knob to maximum speed and adjusting the maximum limit cam.
5. To set the auxiliary speed switch point, repeat step 3, turning the speed-setting knob to the specified auxiliary speed and adjusting the auxiliary limit cam.
6. Return the speed-setting knob to the usual speed. Don't leave the speed setting at a high speed.
7. Replace the limit switch cover.

Troubleshooting

Trouble	Cause	Correction
The limit switch does not open or close when the cam contacts the actuator.	The rollers of the actuator are bent or damaged.	Correct or replace the damaged actuator.
	The wiring is incorrect.	Check the wiring, and correct any problems.
	The micro-switch is damaged.	Replace the micro-switch.
The switch point changes, but the speed setting remains the same.	The cam set screw and/or limit switch set screw is loose.	Check and tighten both these screws.
The governor speed range is correct, but the level is incorrect.	The synchronizer indication gear pin(s) are not positioned correctly.	Index the teeth of the synchronizer indication gear, as appropriate.
The limit switch is activated, but when the cam contacts the actuator it deactivates.	The limit switch wiring is backwards.	Correctly rewire the limit switch.

Replacement Parts

When ordering replacement parts, include the following information:

- The governor serial number and part number shown on the nameplate
- This manual number—03043
- The part's reference number(s) and part name(s), as shown below

IMPORTANT

UG limit switch models look similar and have similar parts. However, the specifications for these parts vary from model to model.

Parts List for Figure 3

Ref. No.	Part Name.....	Quantity
03043-1	Dial Panel.....	1
03043-2	Synchronizer Indication Gear.....	1
03043-3	Cam Switch.....	2
03043-4	Screw - #5-40 x .500 Soc Hd Cap....	2
03043-5	Washer - #5 Splitlock SS.....	2
03043-6	Actuator - JS5 Microswitch.....	2
03043-7	Screw - 6-32 x .875 Slotted Fil Hd...2	
03043-8	Washer - #6 Splitlock SS.....	2
03043-9	Block.....	1
03043-10	Screw - #2-56 x .750 Ph Pan Hd SS2	
03043-11	Washer - Spring Lock No. 2 .086 ID 2	
03043-12	Spring Clip.....	1
03043-13 and -14	.....	Not used

Ref. No.	Part Name.....	Quantity
03043-15	Screw - 6-32 x .250 Ph Pan Hd.....	2
03043-16	Washer - #6 Int Shakeproof.....	2
03043-17	Limit Switch Cover.....	1
03043-18	Screw - 5-40 x .250 Ph Pan Hd.....	4
03043-19	Washer - #5 Int Shakeproof.....	4
03043-20	Plate Cover.....	1
03043-21	Six-Pole Terminal Block (old style) .	1
03043-22	Nut - 5-40 Elastic Hex.....	2
03043-23	Switch - SPDT Microswitch.....	2
03043-24	Block - Switch Spacer.....	2
03043-25	Pin.....	1
03043-26 through -30	.....	Not used

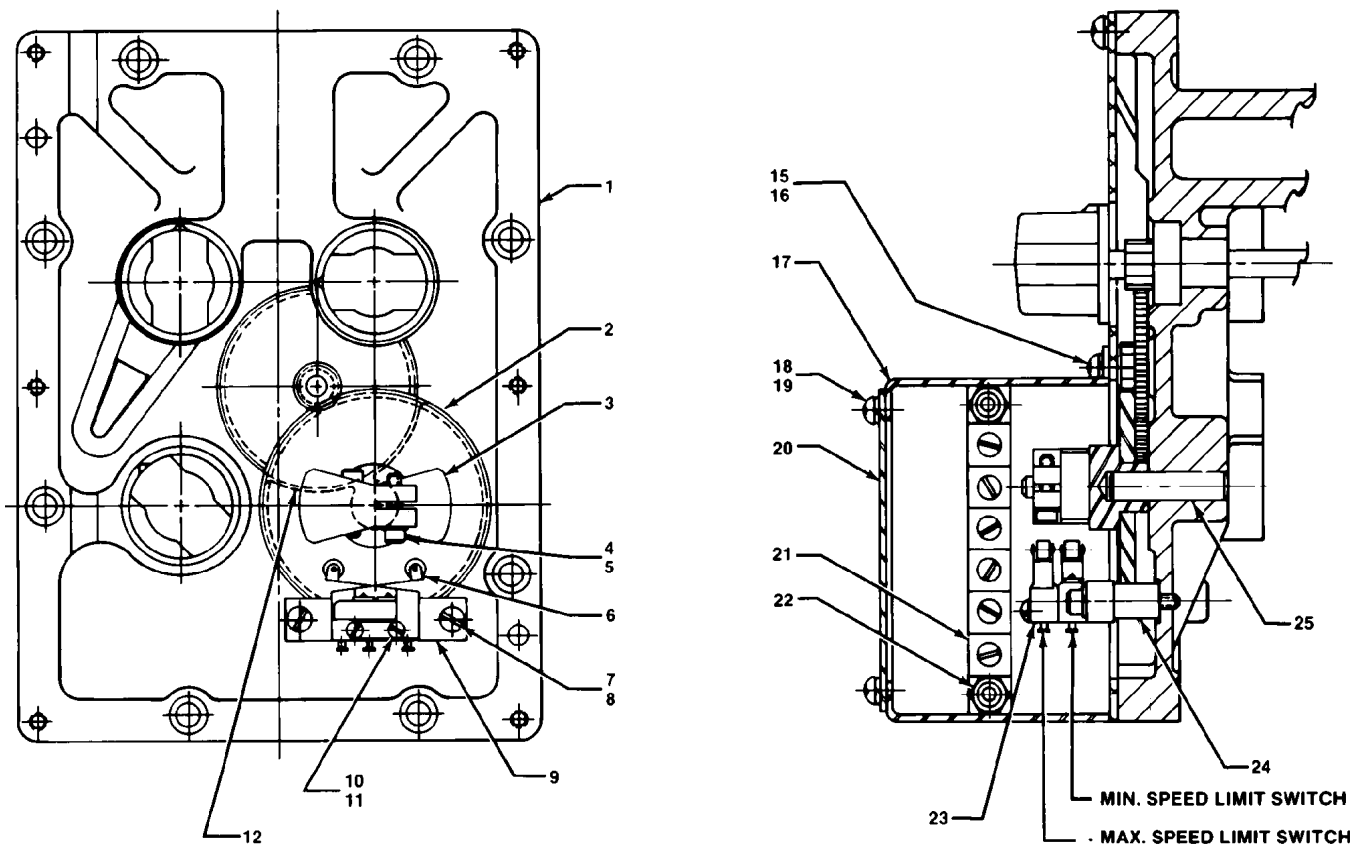


Figure 3. UG-8D Two-Switch Limit Switch

Parts List For Figure 4

Ref. No.	Part Name	Quantity
03043-31	Dial Panel	1
03043-32	Synchronizer Indication Gear.....	1
03043-33	Cam Switch.....	3
03043-34	Screw - #5-40 x .500 Soc Hd Cap.....	3
03043-35	Washer - #5 Splitlock SS	3
03043-36	Actuator - JS5 Microswitch.....	3
03043-37	Screw - 6-32 x .875 Slotted Fil Hd.....	2
03043-38	Washer - #6 Splitlock SS	2
03043-39	Block.....	1
03043-40	Screw - #2-6 x 1.000 Ph Pan Hd SS.....	2
03043-41	Washer - Spring Lock No. 2 .086 ID	2
03043-42	Spring Clip	1
03043-43 and -44.....	Not used	
03043-45	Screw - 6-32 x .250 Ph Pan Hd.....	2
03043-46	Washer - #6 Int Shakeproof	2
03043-47	Limit Switch Cover	1
03043-48	Screw - 5-40 x .250 Ph Pan Hd.....	4
03043-49	Washer - #5 Int Shakeproof	4
03043-50	Plate Cover	1
03043-51	Six-Pole Terminal Block (old style)	1
03043-52	Nut - 5-40 Elastic Hex	2
03043-53	Switch - SPDT Microswitch.....	3
03043-54	Pin.....	1
03043-55	Block - Switch Spacer.....	2
03043-56 through -60	Not used	

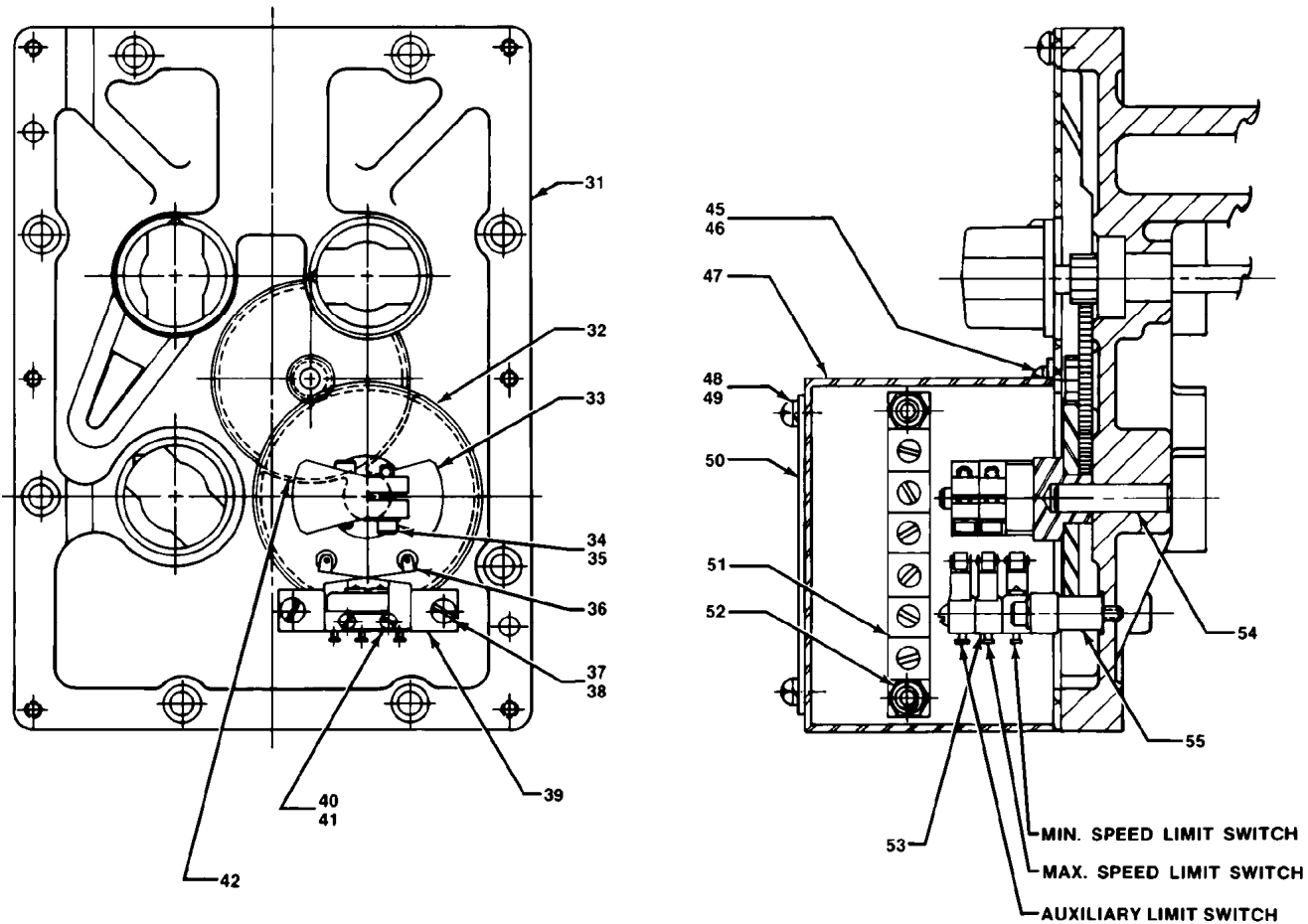


Figure 4. UG-8D Three-Switch Limit Switch

Parts List For Figure 5

Ref. No.	Part Name	Quantity
03043-61	Dial Panel.....	1
03043-62	Synchronizer Indication Gear.....	1
03043-63	Cam Switch.....	3
03043-64	Screw - #5-40 x .500 Soc Hd Cap.....	3
03043-65	Washer - #5 Splitlock SS.....	3
03043-66	Actuator - JS5 Microswitch.....	3
03043-67	Screw - 6-32 x 1.125 Ph Pan Hd SS.....	2
03043-68	Washer - #6 Splitlock SS.....	2
03043-69	Limit Switch Plate.....	1
03043-70	Screw - #2 56 x 1.000 Ph Pan Hd SS.....	2
03043-71	Washer - Spring Lock No. 2 .086 ID.....	2
03043-72	Spring Clip.....	1
03043-73 and -74	.....	Not used
03043-75	Screw - 6-32 x .250 Ph Pan Hd.....	2
03043-76	Washer - #6 Int Shakeproof.....	2
03043-77	Solenoid Washer.....	2
03043-78	Bushing.....	1
03043-79	Limit Switch Cover.....	1
03043-80	Screw - 5-40 x .250 Ph Pan Hd.....	4
03043-81	Washer - #5 Int Shakeproof.....	4
03043-82	Plate Cover.....	1
03043-83	Switch - SPDT Microswitch.....	3
03043-84	Pin.....	1
03043-85	Block - Switch Spacer.....	2
03043-86	Block.....	1
03043-87 through -90	.....	Not used

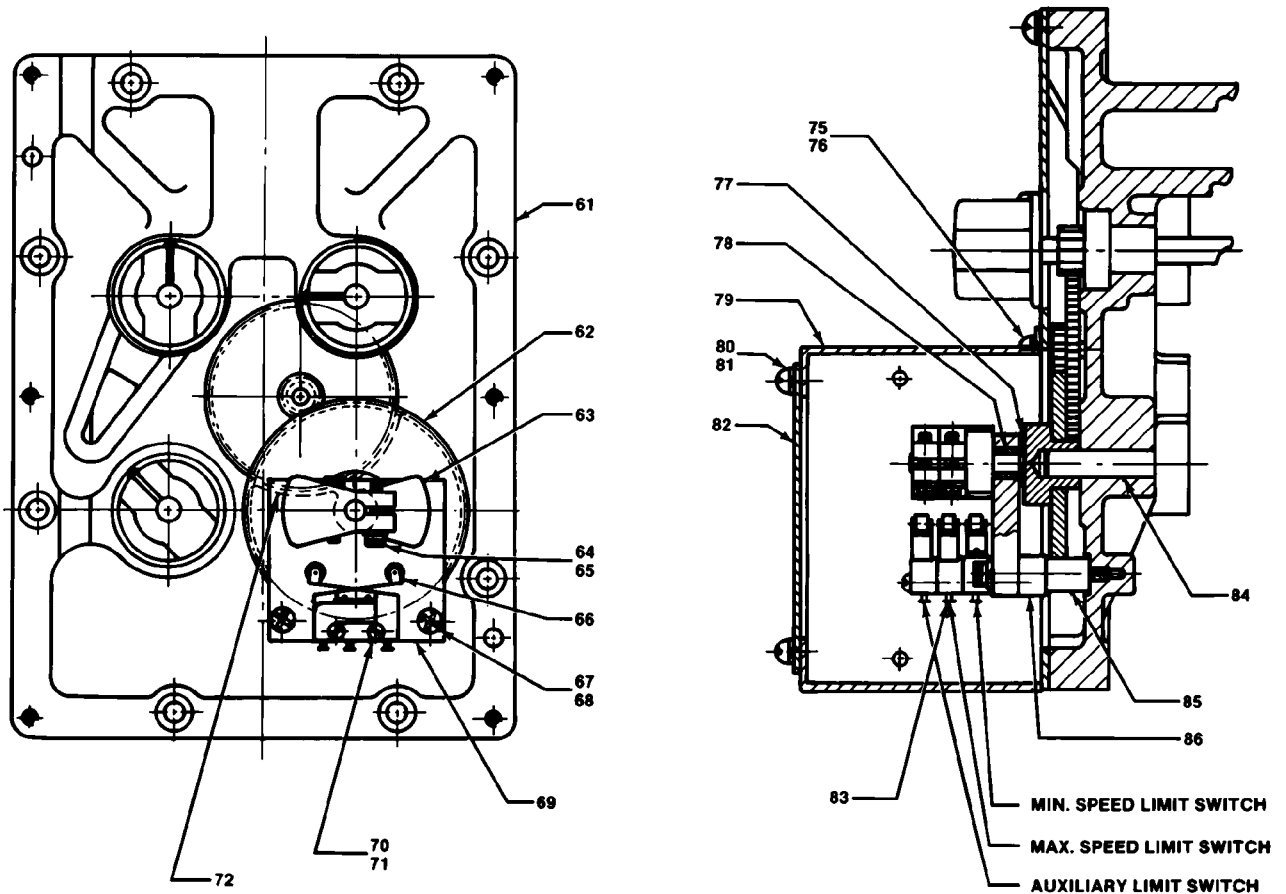


Figure 5. UG-8D Vibration-Resistant Three-Switch Limit Switch

Parts List For Figure 6

IMPORTANT

This model for the UG-40D is available with two or three switches. Order the quantity that's appropriate for your model. (This list is for two switches.)

Ref. No.	Part Name	Quantity
03043-91	Pin.....	1
03043-92	Block.....	2
03043-93	Panel.....	1
03043-94	Cam Switch.....	2
03043-95	Actuator – JS5 Microswitch.....	2
03043-96	Washer - Spring Lock No. 2 .086 ID	2
03043-97	Screw – 2-56 x .750 Pan Hd	2
03043-98	Limit Switch Cover	1
03043-99	Switch - SPDT Microswitch	2
03043-100	Bracket.....	1
03043-101 through -105	.....	Not used
03043-106	Washer - Spring Lock #5 .125 ID	2
03043-107	Screw - #5-40 x .500 Soc Hd Cap.....	2
03043-108	Screw – 6-32 x .875 Slotted Fil Hd.....	2
03043-109	Washer - #6 Splitlock	2
03043-110	Synchronizer Indication Gear.....	1
03043-111 through -114	.....	Not used

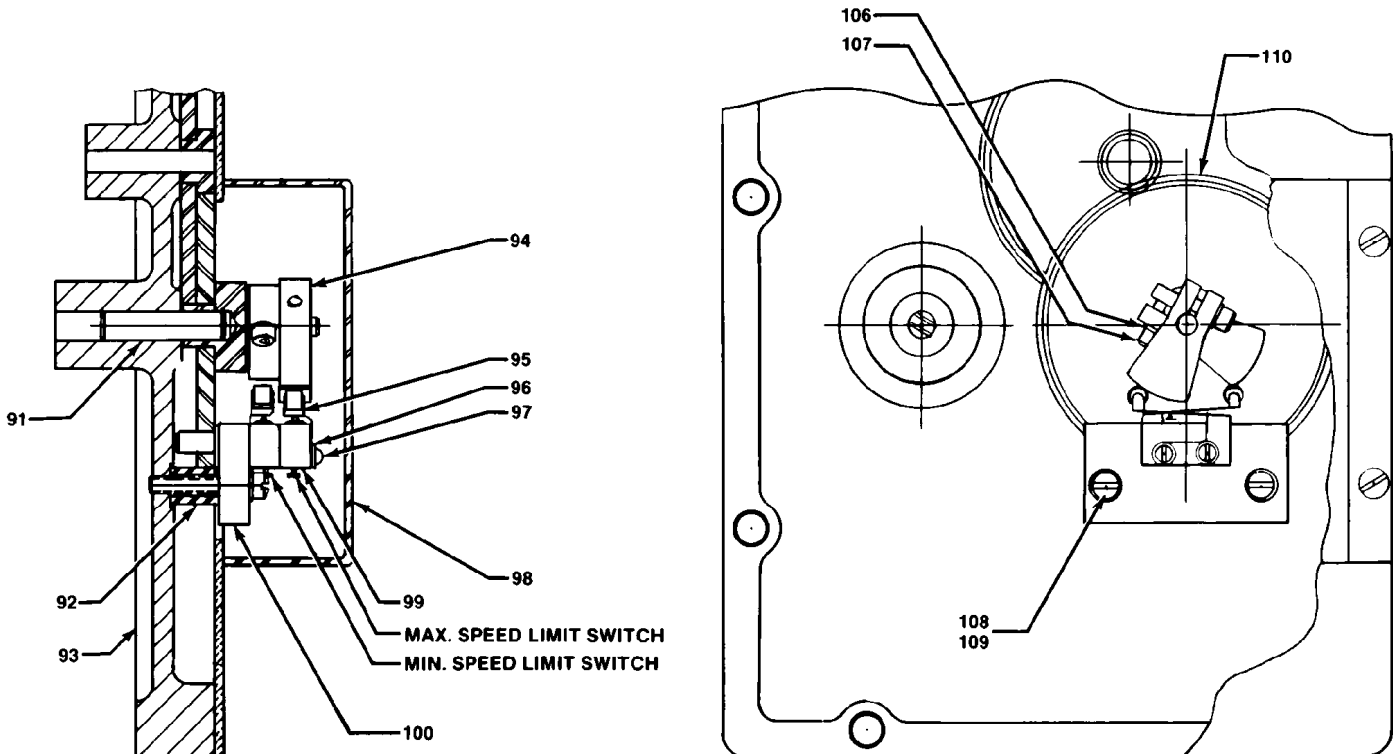


Figure 6. UG-40D Limit Switch

Parts List For Figure 7

IMPORTANT

This vibration-resistant model for the UG-40D is available with two or three switches. Order the quantity that's appropriate for your model.
(This list is for two switches.)

Ref. No.	Part Name	Quantity
03043-115	Pin	1
03043-116	Block	2
03043-117	Panel	1
03043-118	Screw - #8-32 x .625 Set	2
03043-119	Stud	2
03043-120	Screw - #8-32 .500 Socket Hd	2
03043-121	Washer - #8 Helical Spring Lock	3
03043-122	Plate	1
03043-123	Bearing - UG-8 Ballhead Needle	1
03043-124	Washer - .360 OD	2
03043-125	Stud	1
03043-126	Limit Switch Cover	1
03043-127	Washer - #5 Splitlock SS	2
03043-128	Screw - #5-40 x .500 Soc Hd Cap	2
03043-129	Screw - #8-32 x .500 Soc Hd Set	1
03043-130 through -134	.....	Not Used
03043-135	Synchronizer Indication Gear	1
03043-136	Cam Switch	2
03043-137	Actuator - JS5 Microswitch	2
03043-138	Switch - SPDT Microswitch	2
03043-139	Screw-6-32 x .250 Ph Pan Hd SS	4
03043-140	Washer - #6 Splitlock SS	4
03043-141	Bracket	1
03043-142	Washer - Spring Lock No. 2 .086 ID	2
03043-143	Screw - #2-56 x 1.000 Ph Pan Hd SS ...	2
03043-144	Washer - #6 Splitlock SS	2
03043-145	Screw - 6-32 x .875 Slotted Fil Hd	2
03043-146 through -150	Not Used

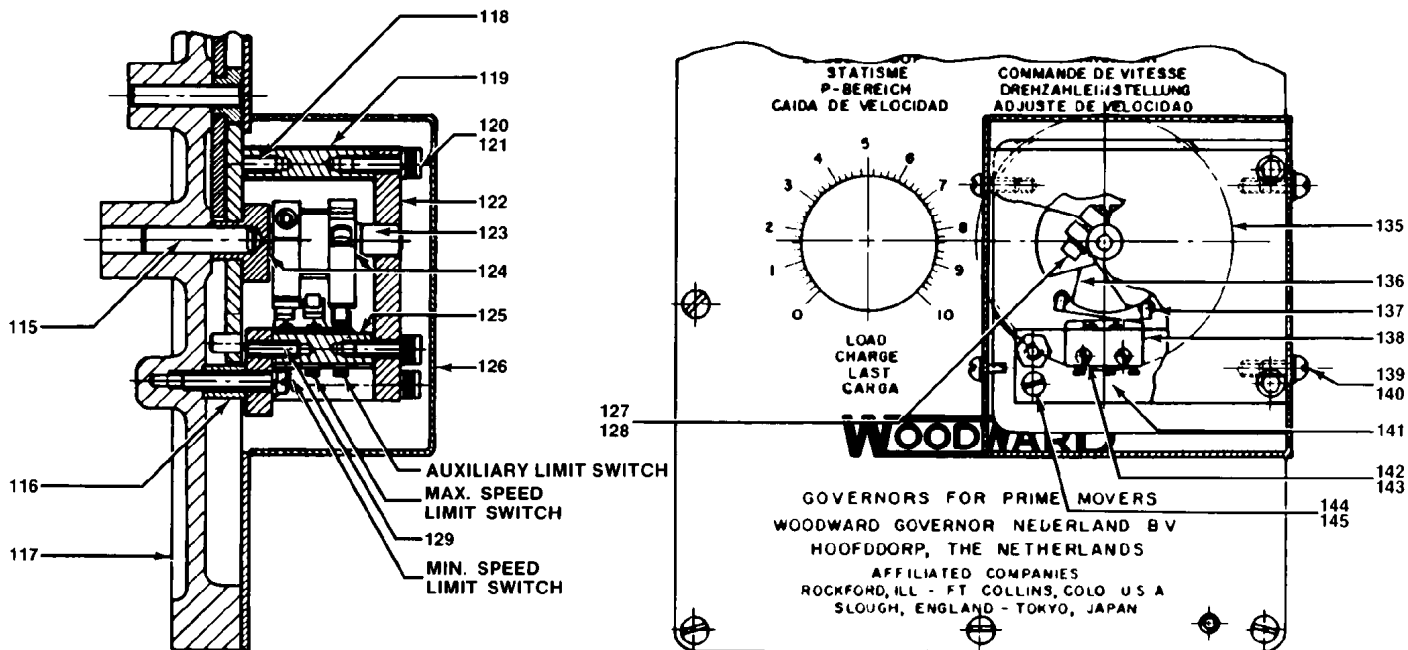


Figure 7. UG-40D Vibration-Resistant Limit Switch

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Please reference publication 03043.



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