WOODWARD

Product Manual 36686
(Revision D)
Original Instructions

PGA Governor
Pneumatic Load Balance System

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

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 Out-of-date translations are marked with ⚠.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

Contents

Illustrations and Tables

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.

Chapter 1.
General Information

General

Where two or more engines are driving a common load, such as a propeller shaft of a ship, it is desirable to control the engines in unison and have the loads on all engines proportionally shared, especially if the speed and load varies over a wide range. This requirement could be met by supplying a common speed setting signal to all governors from a master speed controller if the speed setting, the speed droop and the governor to engine rack relationship were identical. To achieve and maintain this identical relationship with mechanical-hydraulic governors, however, is difficult in practice. The load balance system has been devised to operate in conjunction with the master speed controller to accomplish the desired results.

PGA Governors

The PG (Pressure-compensated Governor) series of governors consists of many types. The pneumatic load balance system is designed to operate with the PGA (Pressure Compensated Governor Air [pneumatic] speed setting) type which is distinguishable by a long column. The governor must have a power piston tail rod to accommodate the load balance equipment and other auxiliary devices. The principal reference is manual 36604 for the basic PGA components, including the base, power case, differential power servo and long column.

Master Speed Controller

The master speed controller is provided by others. It transmits an adjustable pneumatic pressure signal to all bellows speed setting mechanisms on governors operating in unison. This common speed setting signal is adjustable from a minimum to a maximum value corresponding from idle to full speed of the governor.

Load Balance System

The load balance system is based on a position comparison principle. The servo or fuel output position of a selected governor, designated the master, is compared with that of other governors, designated slaves. The servo positions are converted into proportional air pressure signals. A differential air receiver for each slave governor does the comparing. Any difference in the signal of the master governor and that of the slave governor results in an error signal. The error signal is used to bias the speed setting of the slave governor and is in a direction to increase or decrease the slave governor servo position to match that of the master governor. In so doing, the error in servo positions approaches zero as the error signal approaches zero.

Chapter 2.
Principles of Operation

Load Sharing Operation

Figures 2-2, 2-3, and 2-4 show the schematic diagram of the load sharing system. A pneumatic transmitter mounted on each governor produces an air pressure proportional to its servo position. A differential diaphragm assembly, or receiver, on each governor is connected through linkage to the speed setting system. The master governor transmitter feeds its signal to the lower side of all slave governor receivers. The top side of each slave governor receiver receives its own transmitter signal. Differential forces in the receiver will raise or lower the speed setting of the slave governor. If the master governor carries more, or less, load than the slave, the differential force will increase, or decrease, the speed setting of the slave until it carries about the same load as the master.

The master governor receiver must have both sides of its diaphragm either bled to atmosphere or impressed with its own transmitter pressure, as shown in Figure 2-1. Therefore, if No. 1 Engine is always the chosen master governor, its receiver can be omitted.

On loss of the slave signal but retention of the master signal, the speed setting of the slave governor will increase. A yield spring between the receiver and the speed sensing system prevents the speed setting from reaching a dangerous value. However, depending on the engine, it may approach or pass the overspeed trip point.

As long as the load balance system is in operation, all participating governors can operate either isochronously or with speed droop. Operation with speed droop is recommended to maintain a degree of load division in the event the load balance system is taken out of service. Refer to manual 36621 for droop load sharing operation.

Tolerances

The yield spring between the receiver and the speed sensing system permits a maximum speed setting increase of approximately 90 rpm at 1000 rpm nominal speed and 150 rpm at 450 rpm nominal. In many existing applications, experience has shown that load balancing is within 3% full load range of the master governor for the slave governors.

Selection of Master, Slave, and Isolate Modes on Systems that do not have Transfer Valve Blocks

All recent applications of the load balance system use a transfer valve block which simplifies and facilitates the remote control of the mode selection of the governors. However, before the development of the transfer valve, it was necessary to design a control scheme for switching modes external to the governors.

Suggested control schemes for a master controller system with load balancing are shown in Figures 2-1a, b, c, and d. These diagrams illustrate remote control systems using solenoid-operated valves for 2, 3, 4 and 5 engine operations, respectively. Each governor has an individual controller. A master controller is provided for controlling all units in unison. Each engine controller is linked to its engine governor through the solenoid-operated valves (SV1, SV2, etc.) shown directly above each governor in these diagrams. These valves are remotely actuated when the engine or gear-box clutch is engaged to transfer control to the master speed controller. Thus, engine can be tested individually and, on engagement of its clutch, can have a common speed setting signal. The diagram legends give the correct combinations of solenoid-operated valves to be actuated, shown directly below the engine, for the choice of the master governor.

Whatever system may be installed, the manufacturer's instructions should be followed. The master speed controller signal, the solenoid-operated valves and the air piping should be checked out for proper installation, function, air leaks, etc., before proceeding to the setting up procedure for the load balance system. It is recommended that all piping between governors be kept as short as possible and that the maximum size be 0.25 inch (6.4 mm) O.D. Use only instrument grade air in the supply lines.

Transfer Valve Operation

The transfer valve is essentially a remotely operated pneumatic switch for conveniently switching the load balance receiver and transmitter air signals and air supply for each governor. In other words, the transfer valve enables easy selection of master, slave, and isolate modes for any particular governors.

The valve consists of an upper and a lower block with a diaphragm between them. Applying 60 to 150 psi () air to one of the three mode selection holes in the lower block, flattens the diaphragm against the upper block. This action prevents the flow of air between the small holes in the upper block. There are eight chambers in the lower block. By pressurizing different combinations of these chambers the different mode selections can be accomplished. The combination for a particular load selection is clearly shown on the schematics on Figures 2-2, 2-3, and 2-4. More recent transfer valves use a preformed dimpled diaphragm and a special adapter plate to increase performance and reliability.

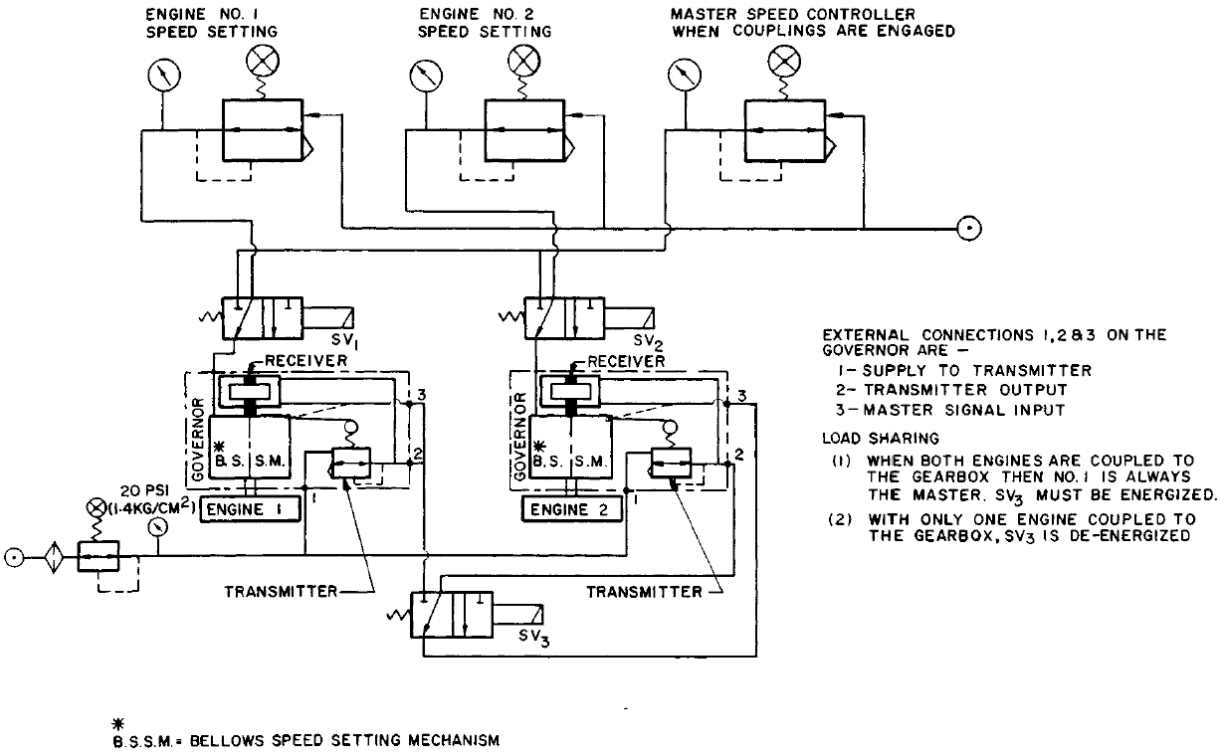

Figure 2-1a. Piping Arrangement, 2 Engines

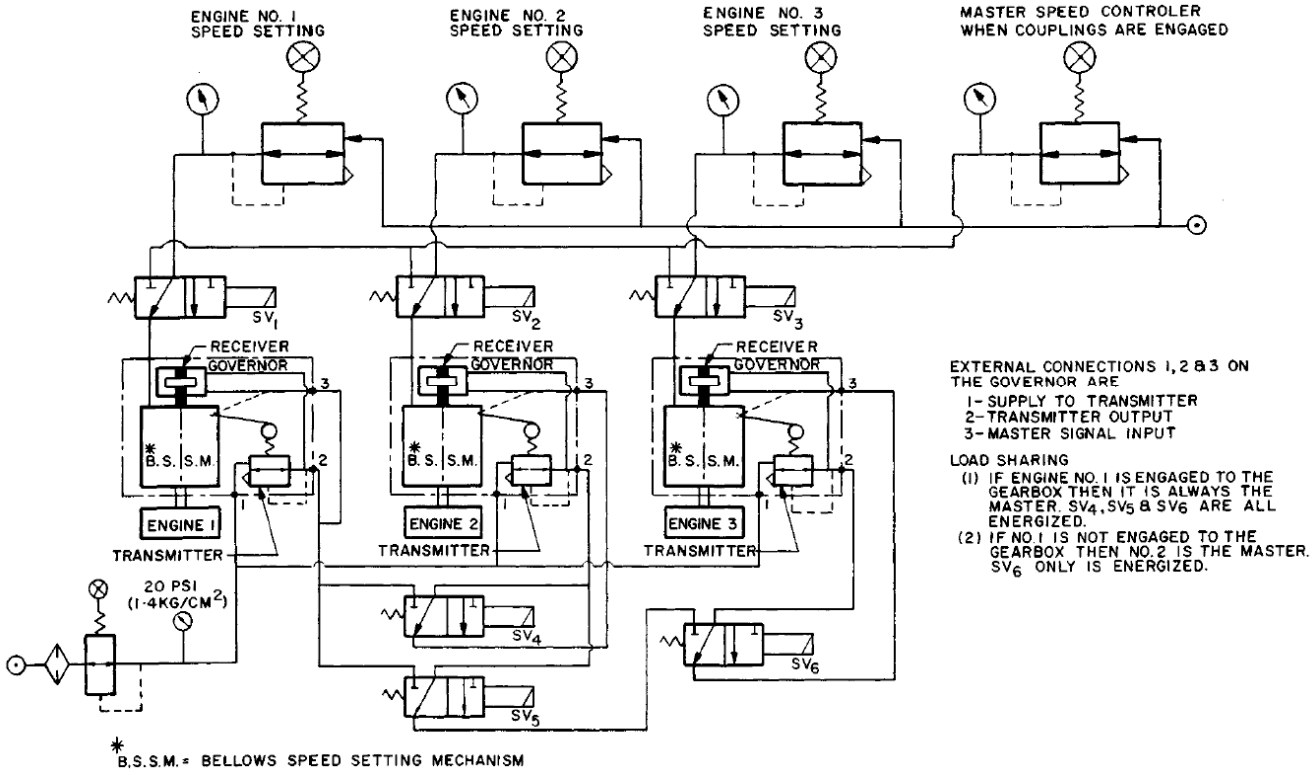

Figure 2-1b. Piping Arrangement, 3 Engines

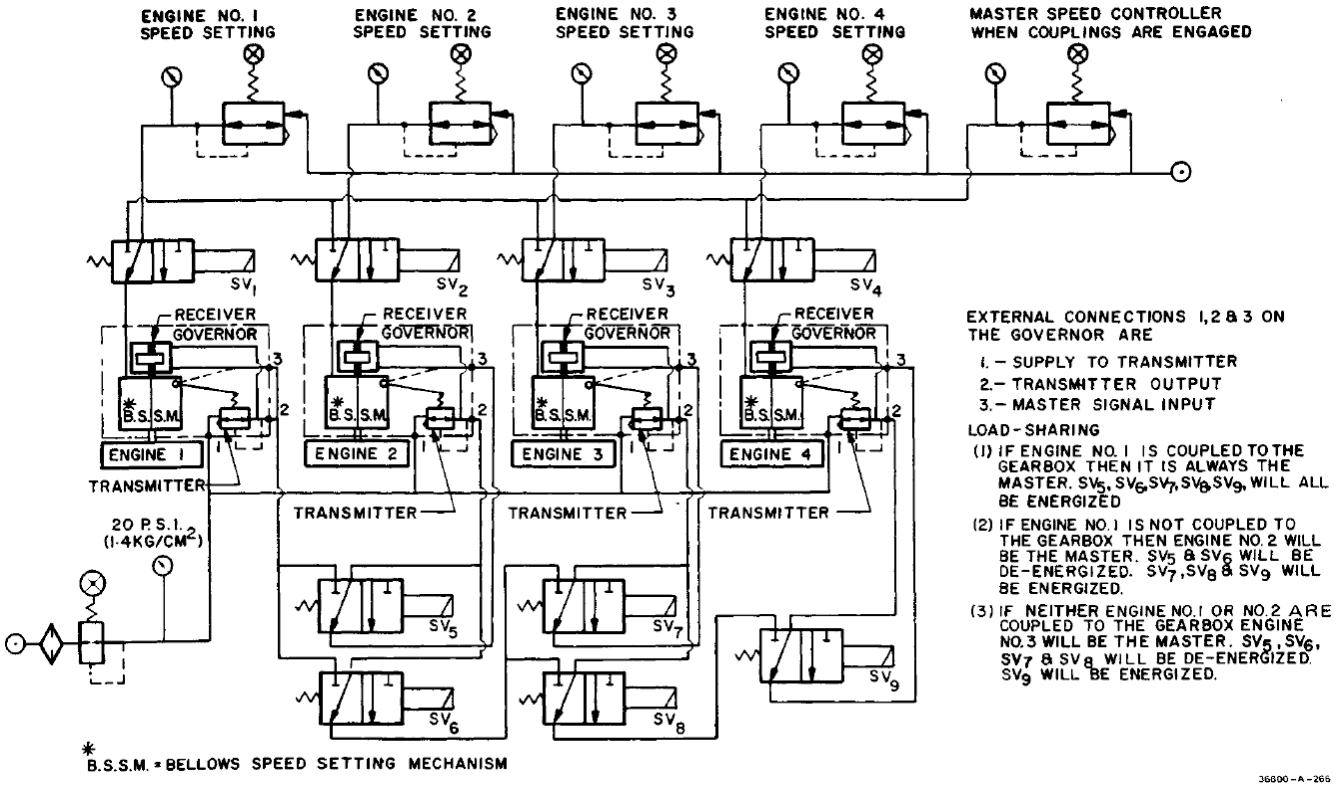

Figure 2-1c. Piping Arrangement, 4 Engines

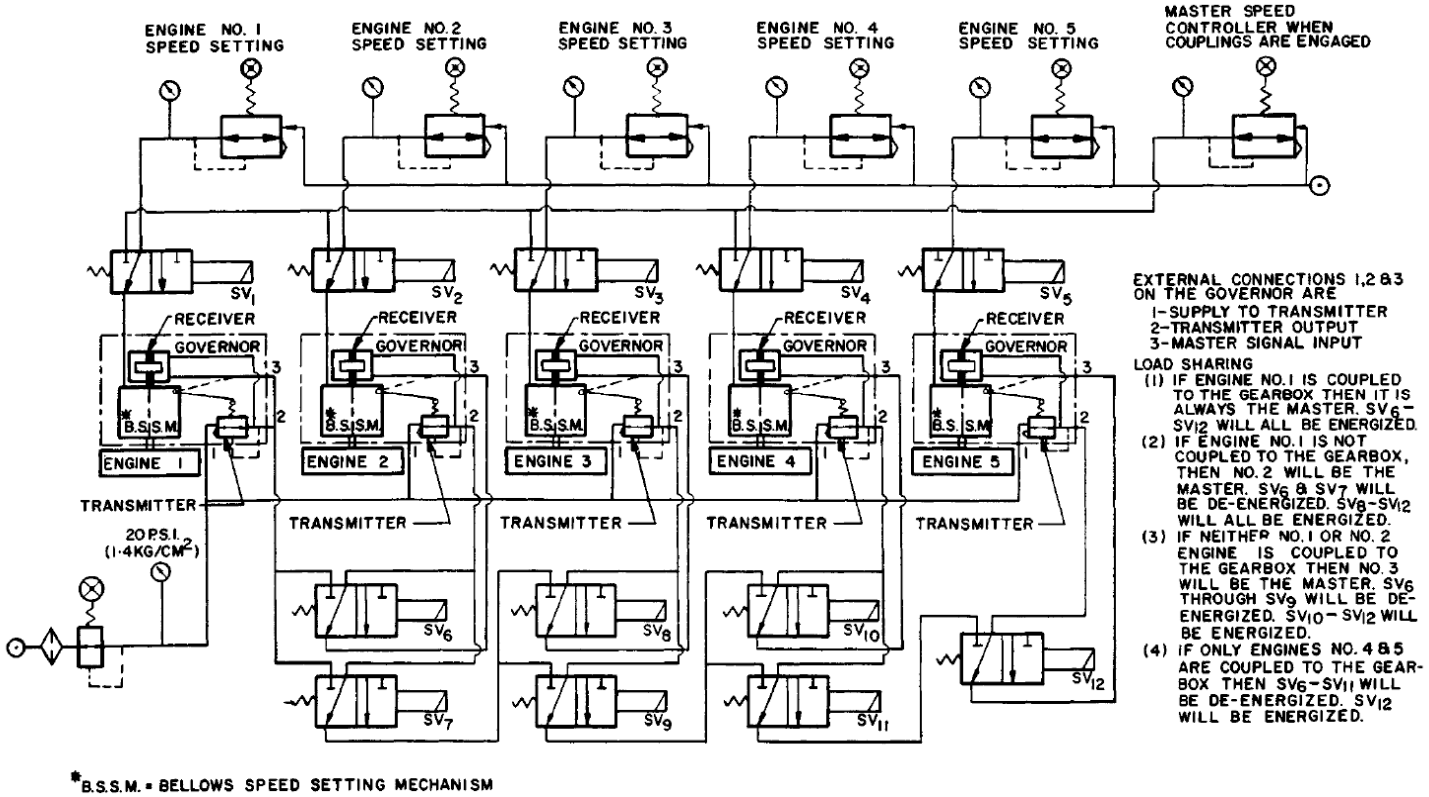

Figure 2-1d. Piping Arrangement, 5 Engines

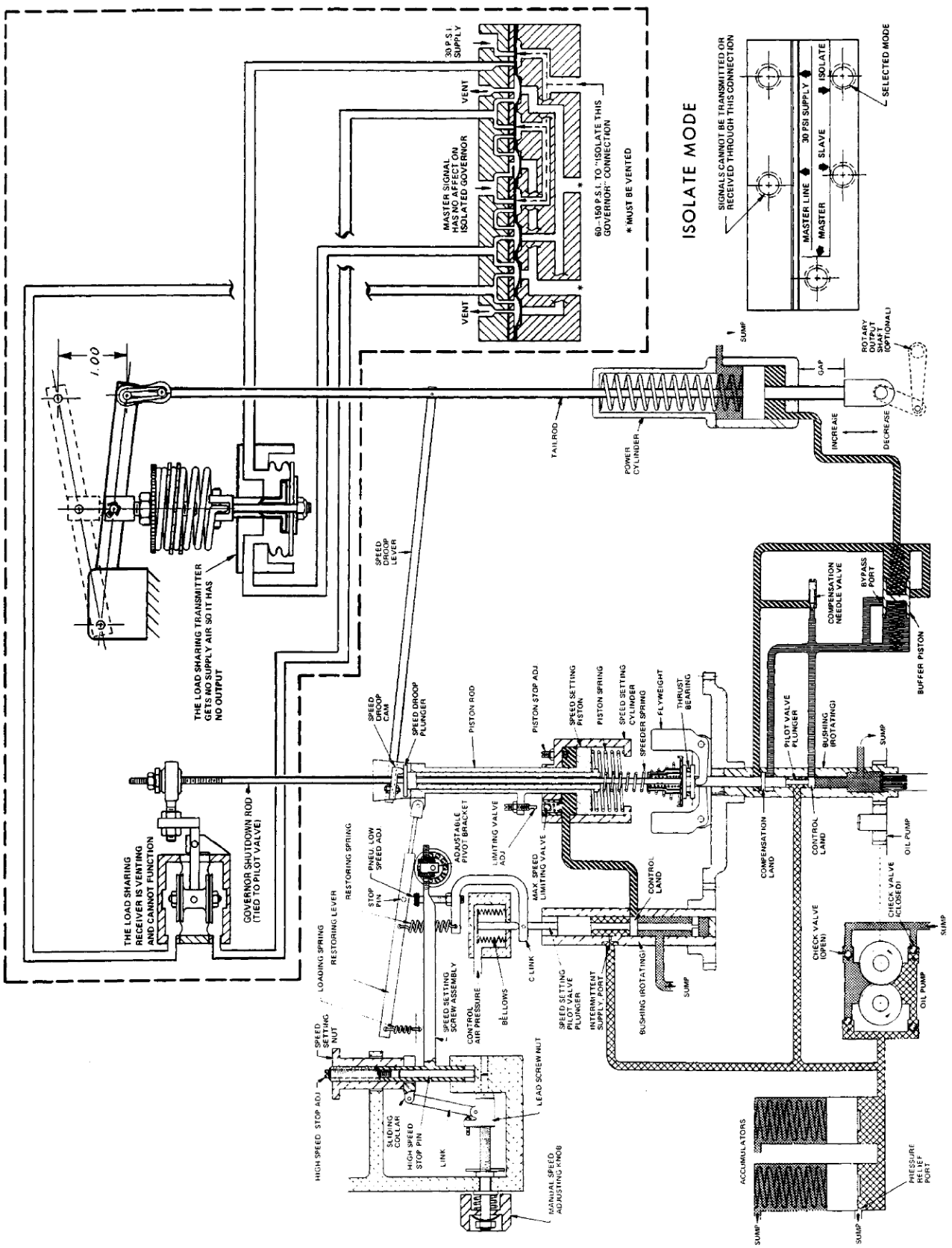

Figure 2-2. Schematic Diagram of System in Isolate Mode

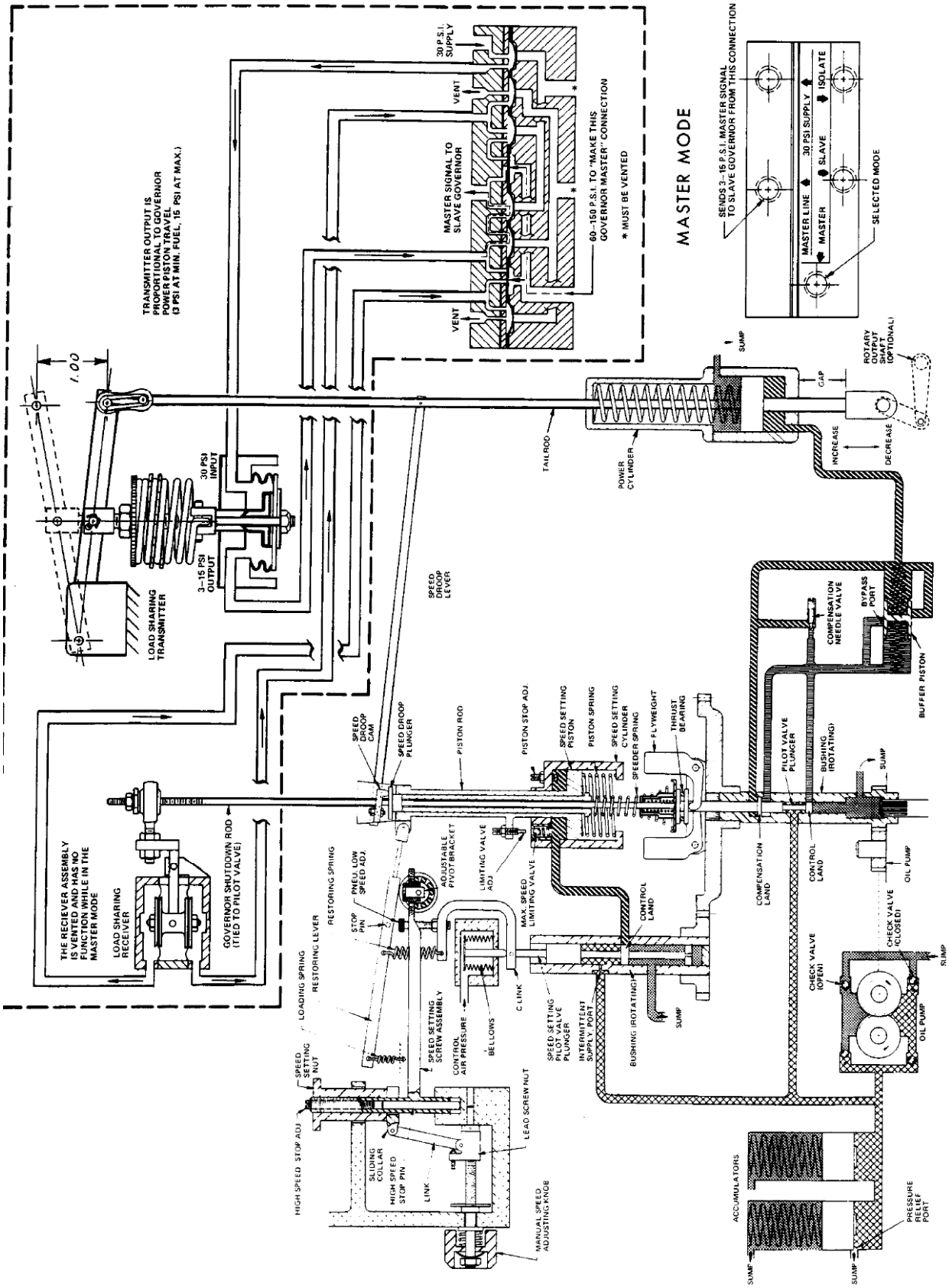

Figure 2-3. Schematic Diagram of System in Master Mode

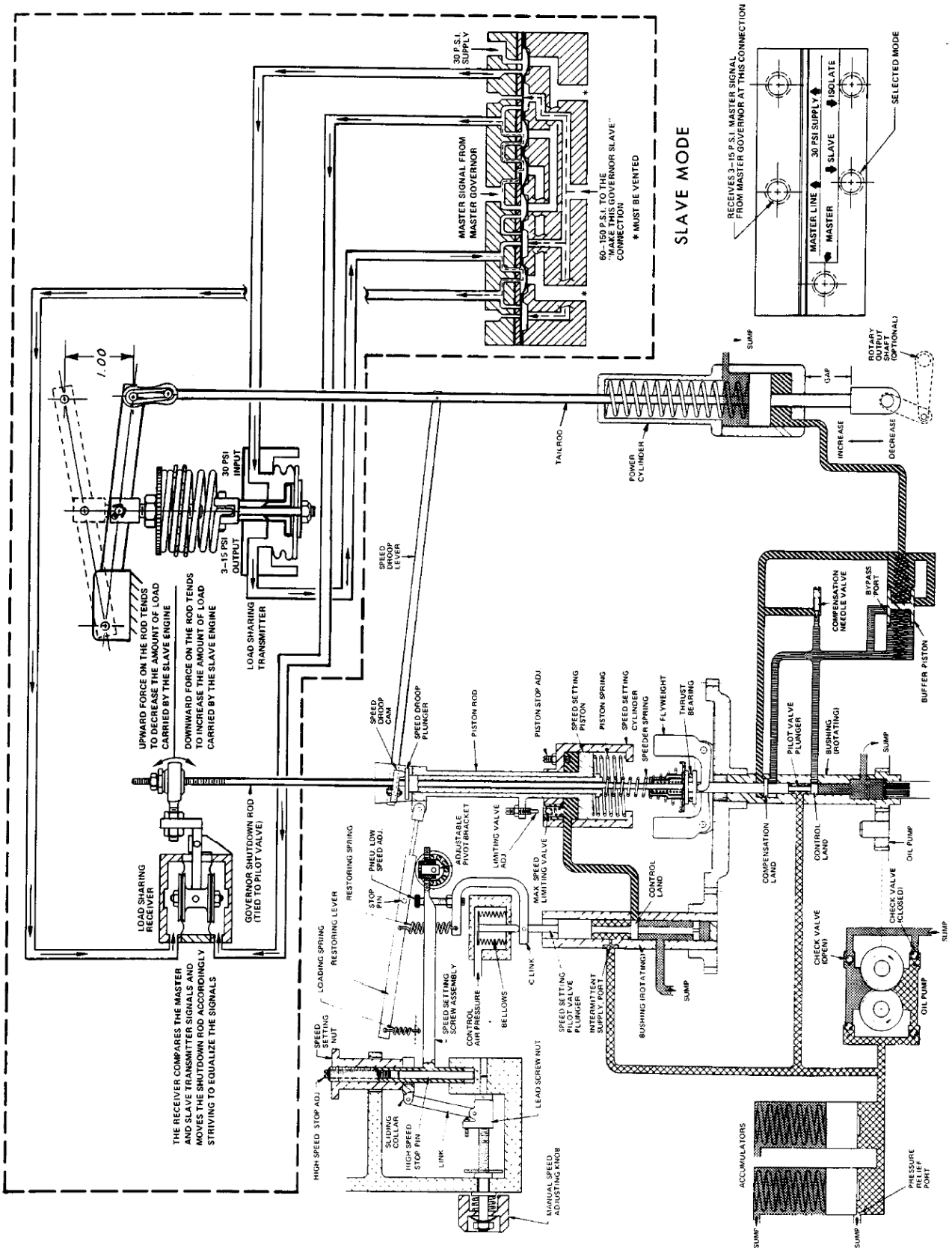

Figure 2-4. Schematic Diagram of System in Slave Mode

Chapter 3.
Maintenance and Adjustments

Adjustment and Checkout Procedure, PGA Pneumatic Load Balance System with Transfer Valve

(Refer to Figures 2-2, 2-3, 2-4, and 2-5)

With engines shut down, check the linkage between the governors and the engine fuel racks and insure they are the same for all engines.

If the fuel rack linkages are not the same on all engines, adjust the linkage, if adjustable, so that each engine uses an equal amount of governor servo travel from minimum to maximum fuel. Check to see that the linkage comes against the rack stops at maximum fuel before the entire governor stroke is used.

For Example:
When using a governor that has a servo indicator scale, zero on the scale should correspond to zero fuel at the fuel pumps. When moving the fuel racks toward maximum fuel, all engines must have the same governor servo to fuel pump relationship at any given point. When coming against the rack stops, most, but not all, of the governor servo travel should be used.

If the linkage is not adjustable, each individual pump can sometimes be adjusted to equalize the fuel pump to governor relationship. Make every effort to equalize the linkages because proper linkage adjustment is very important for good load division since the load balance system compares only governor servo positions.

Check the load sharing transmitter outputs.

1. Apply 60 to 150 psi (414 to 1034 kPa) to the “Make This Governor Master” on the Transfer Valve block.

2. Apply 30 psi (207 kPa) to the “Supply” connection on the Transfer Valve block.

3. Vent all other connections on the Transfer Valve block.

4. Install a precision gauge (0 to 30 psi/0 to 200 kPa) in the “Master Line” connection on the Transfer Valve block. Use the same gauge to check each governor.

5. Transmitter output is proportional to servo travel. For minimum servo travel output is 3 psi (21 kPa) and for maximum servo travel it is 15 psi (103 kPa). Verify the pressure range with Woodward or your authorized dealer/distributor, as some units in the field have different pressure ranges.

6. When the governor servo is at its minimum stroke, the transmitter output should be 3 psi (21 kPa). When the governor servo is at its maximum stroke, the transmitter output should be 15 psi (103 kPa).

It may be necessary to disconnect the fuel rack linkage from the governor in order to move the servo through its full 1.000 inch (25.40 mm) stroke. In some cases it is easier to leave the servo at minimum position, disconnect the transmitter lever and lift it 1.000 inch (25.40 mm) to simulate the maximum servo position. A tool, as shown in Figure 3-1, can be made to facilitate this method of checking the outputs.

If the transmitter output pressures are not correct, check for possible leaks around the tubing connections, on the transmitter and on the transfer valve block.

If no leaks are found, refer to Figure 3-1 and adjust the transmitter as follows:

1. Turn the 1/4” self locking nut located on the bottom of the transmitter clockwise until it is tight, then back it off 1/2 to 1 turn.

NOTICE **Overtightening this nut may damage the valve seats in the transmitter.**

2. Make sure the governor servo is at the end of its stroke in the minimum fuel position.

3. Loosen the 7/16” lock nut on the transmitter spring assembly and adjust the pressure level to 3.0 ±0.1 psi (20.7 ±0.7 kPa) by turning the entire spring assembly counterclockwise to increase pressure (as viewed from the top) or clockwise to decrease pressure. Retighten the lock nut and recheck the pressure.

NOTICE **Take care when turning the entire spring assembly that the spring rate adjustment is not disturbed.**

Move the transmitter lever 1.000 inch (25.40 mm) from minimum servo position to maximum servo position. The transmitter output should be 15.0 ±0.1 psi (103.0 ±0.7 kPa). If not adjust the transmitter spring rate by:

1. Loosen the pressure level adjusting lock nut and the spring rate adjusting lock nut.

2. Wind the transmitter spring coils on or off the rate adjuster nut.

IMPORTANT **The less active coils the greater the rate and the wider the pressure range.**

3. After adjusting the spring rate, it is necessary to repeat steps 2 and 3 of the transmitter adjustment above. It may also be necessary to repeat the spring rate adjustment until the correct pressure outputs are achieved. All governors must have the correct transmitter output for good load division.

NOTICE **Tighten all locking devices before accepting final pressure readings.**

To check for possible leaks in the master line piping between governors, reconnect the master line piping and install the precision gage in the lower diaphragm pressure tap on the slave governors receiver. If the air pressures are the same as above steps then this line is void of leaks.

Start the engines and apply 60 to 150 psi (414 to 1034 kPa) to the isolate hole in the transfer valve block and check the speed settings of all the governors using a reliable tachometer. If possible use the same tachometer on all engines to get an accurate comparison. Also use a precision gauge in the speed setting air line to check if each governor is receiving the correct speed setting air signal. The speed of each engine must be as close as possible for the best load balancing.

If the speeds are incorrect, disconnect the uniball from the load sharing receiver and let it hang on the shutdown rod. Recheck the speeds. If they are still incorrect, refer to the appropriate PGA or PG-PL manual for the correct procedure for resetting the governor speeds to the correct specifications.

Run the engine at any given speed and note the rpm.

Reconnect the uniball to the receiver. Be careful to center the shutdown rod in the clearance hole in the speed setting servo piston.

NOTICE **The shutdown rod must not touch the I.D. of the speed setting servo piston.**

If the engine rpm changes after reconnecting the uniball, adjust the threaded uniball bushing up or down on the shutdown rod until the speed returns to the original rpm.

Check this setting by:

1. Applying 60 to 150 psi (414 to 1034 kPa) to the “Make This Governor Slave” on the transfer block.

2. Attach a line between the top and bottom of the load sharing receiver using the pipe tapped holes that are normally plugged.

3. Remove the master line fitting from the transfer block and plug the hole.

4. Disconnect the transmitter lever and move it up to increase the pressure output from the transmitter.

IMPORTANT **This action applies an equal pressure to both sides of the receiver and tends to center the uniball. When the pressure is increased, the rpm of the engine should not change.**

5. If the speed changes, adjust the uniball accordingly until no rpm change is noted when moving the transmitter lever up and down.

IMPORTANT **Be sure there are no leaks around the receiver or transfer valve.**

6. When the uniball is set, remove the jumper line from the receiver and reinstall the pipe plugs.

7. Reconnect the transmitter lever to the tailrod.

8. Reconnect the master line to transfer valve block.

Run the engines and check for equal load division.

1. Check the servo position on each governor. If the positions are identical, then any difference in load division is due to improperly adjusted fuel rack linkages. Remember, the load balance device only compares governor servo positions.

2. If the servo positions are not the same, check for possible leaks at all the master signal connections. Also check to see if the correct mode selection has been made at each governor. Only one governor is master, all others are slaves.

3. Check that the mode selection is correct, and the fuel linkage and that there are no leaks. If proper load division is still not achieved, recheck the governor calibration. However, if the error in load division is small, make slight adjustments to the transmitters to correct this error while running.

This type of adjustment may be necessary where a precision gauge is not available and the transmitters cannot be easily set to the tolerances specified. Take extreme care and have a full understanding of the system before attempting to adjust the transmitters in this manner.

Adjustment and Checkout Procedure, PGA Pneumatic Load Balance Systems without a Transfer Valve

Calibrating a system without a transfer valve is essentially the same as listed in the previous steps. However, the hookup is slightly different.

1. Supply 30 psi (207 kPa) to the No. 1 connection on the connector block.

2. Attach a line between the No. 2 and No. 3 connections which includes a precision gauge. This connects both receiver diaphragm chambers and the transmitter together.

3. Check the transmitter output as previously discussed. Correct any leaks in the receiver assembly before checking the output pressure.

4. Leaks are more prevalent in the system without a transfer valve since the mode selection is more complex. Therefore, it is important to check every component which carries the master signal between the governors.

5. All other checks and adjustments are the same as previously mentioned.

Trouble	Probable Cause	Correction
Sudden total loss of load balance.	Improper mode selection.	Check other parts of control system.
	Bad leak or restriction in master piping.	Repair leaks if any. Blow through line to check for possible restriction.
	Blown receiver diaphragm in slave governor.	Replace diaphragm.
	Master receiver not venting properly.	Disassemble and check transfer valve for dirt or oil accumulation. Clean and reassemble.
	Loss of transmitter signal on either master or slave.	Check 30 psi (207 kPa) supply to transmitters.
Engines not sharing load equally but governor servo scales are equal.	Improperly adjusted fuel rack linkage.	Readjust linkage to be the same on all engines.
Engines not sharing load equally and governor servo scales also indicate an imbalance.	Leak in the master line.	Check all fittings or connections which the master signal passes through.
	Improper calibration of the load sharing transmitter on either slave or master governors.	Recheck calibration. Slight adjustments may be necessary to the transmitters or fuel rack linkage to achieve perfect load division.
Load balance system does not work under any circumstances.	No spare parts, or problems cannot be resolved.	Isolate or disconnect the load balance system and run the engine on droop load sharing. See manual 36606 for explanation of this type of operation.

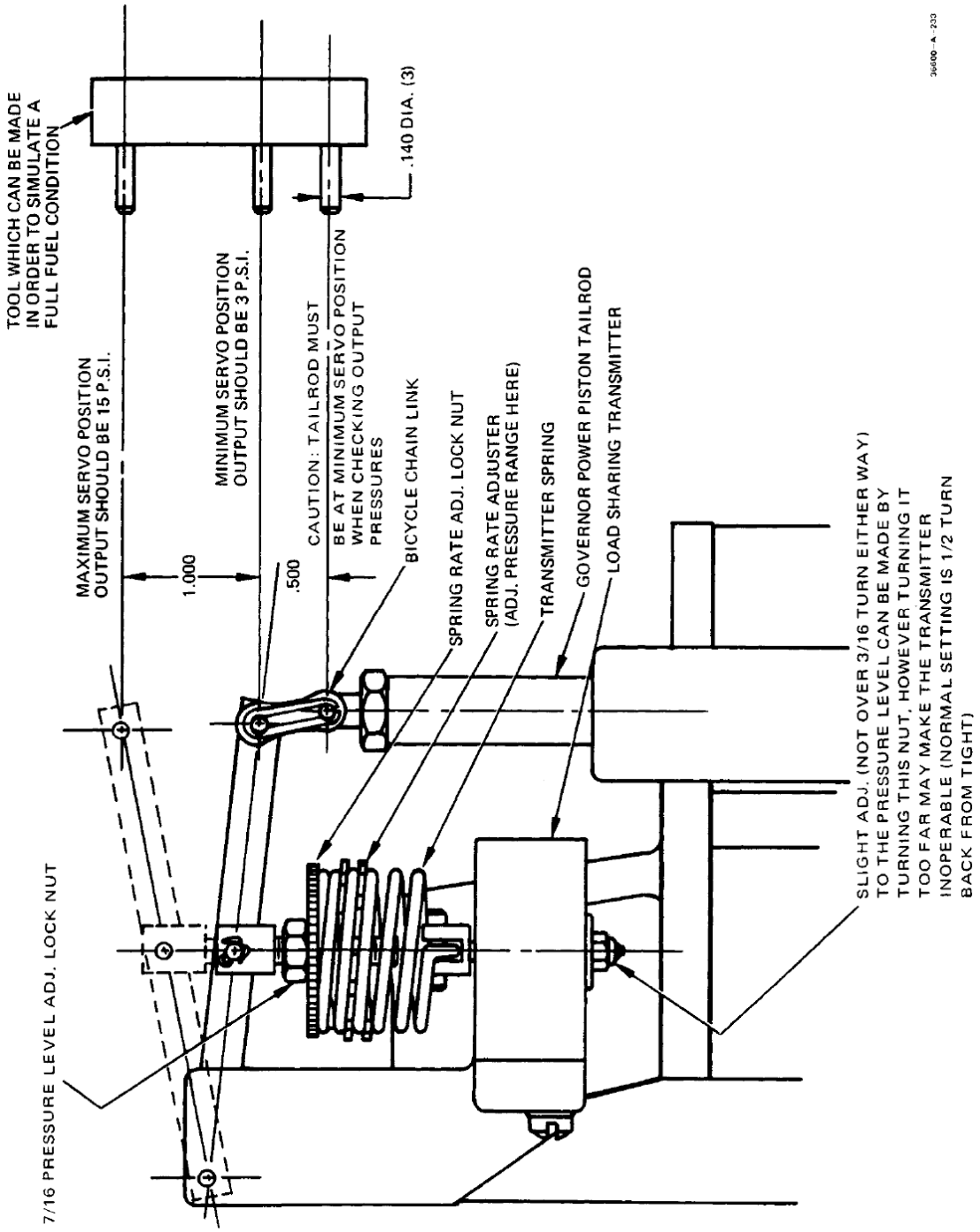

Figure 3-1. Load Sharing Transmitter Pressure Adjustment

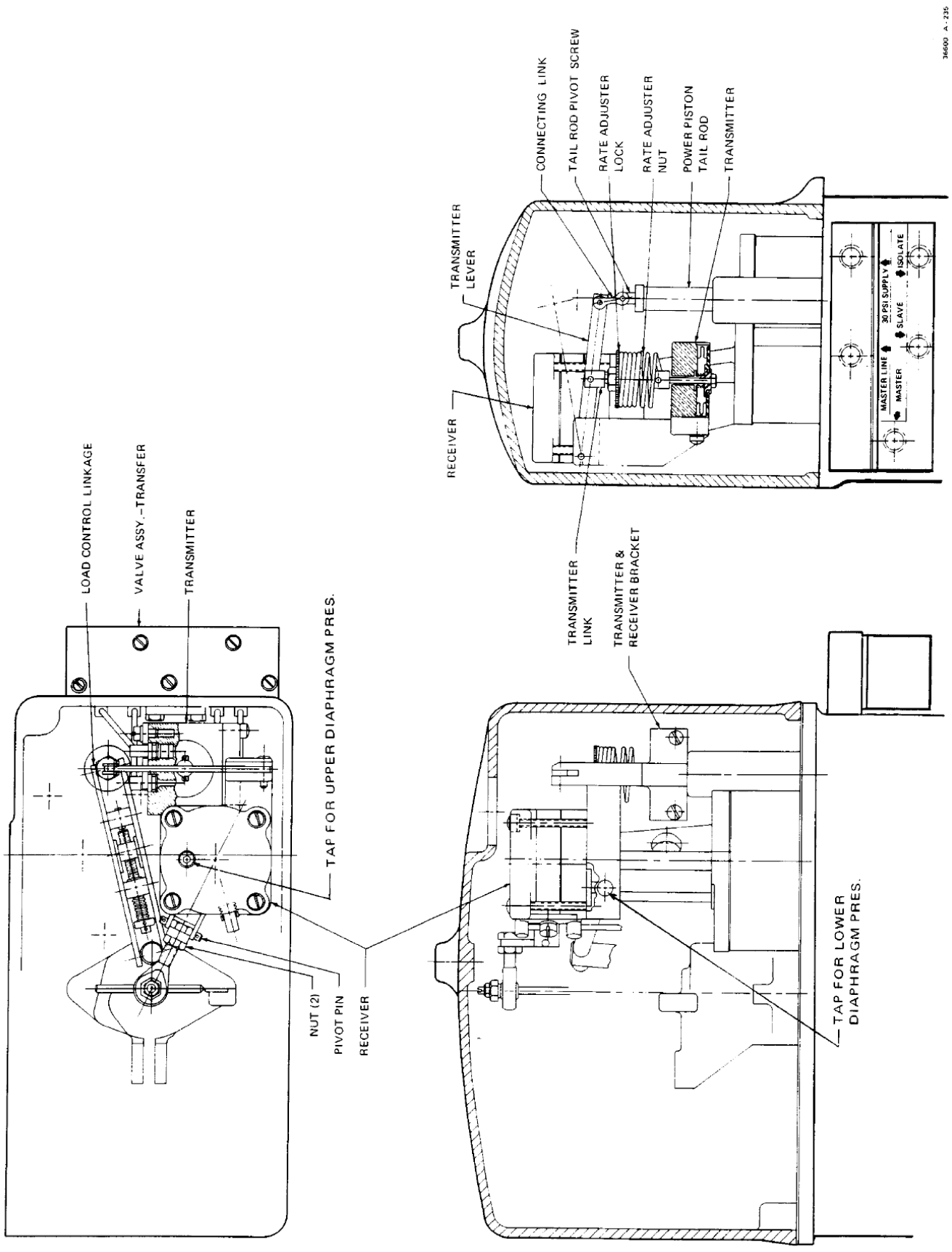

Figure 3-2. Load Balance System with Transfer Valve

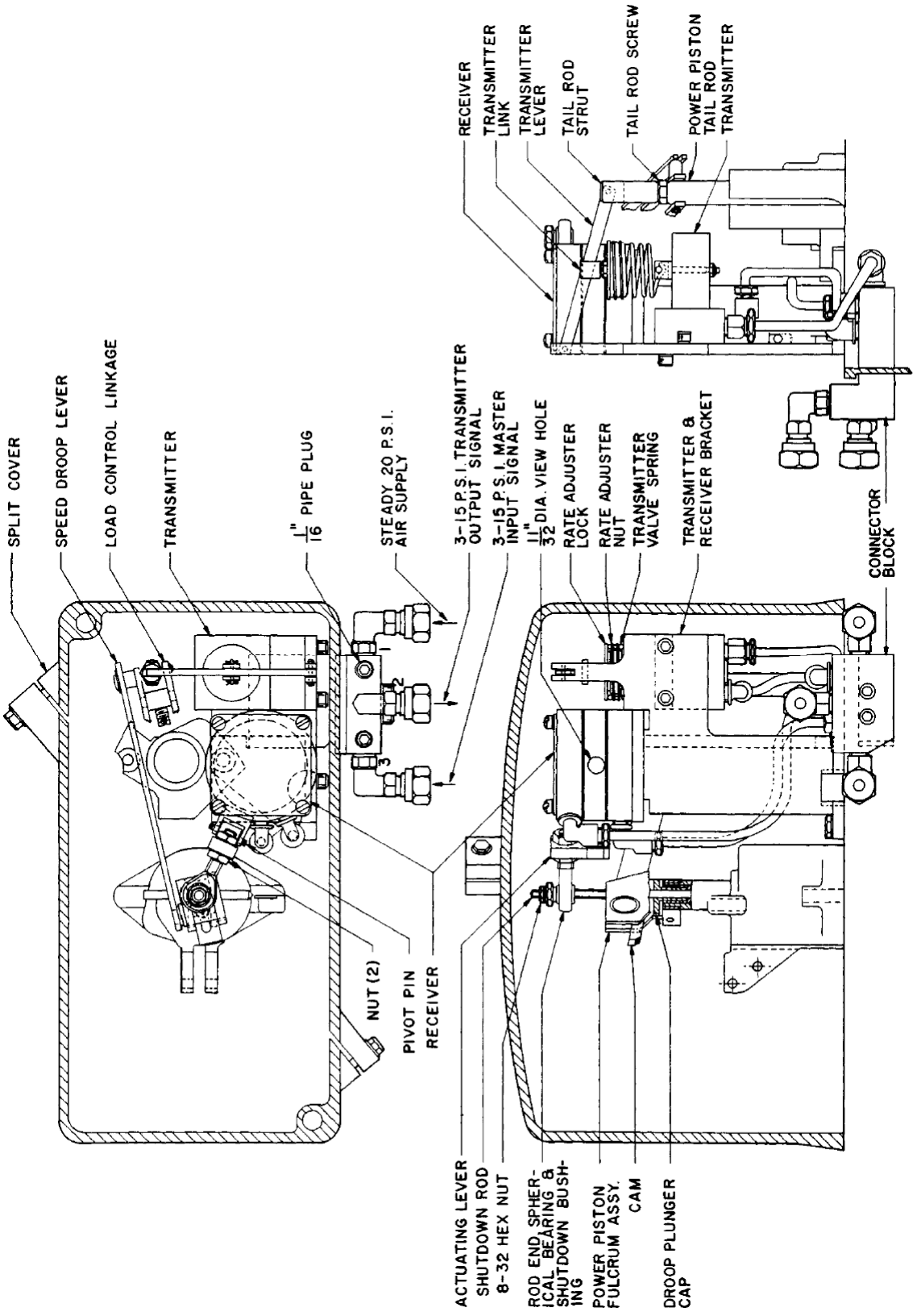

Figure 3-3. Load Balance System without Transfer Valve

Chapter 4.
Replacement Parts

When ordering replacement parts, it is essential to include the following information:

- Governor serial number and part number shown on nameplate
- Manual number (this is manual 36686)
- Parts reference number in parts list and description of part or part name

The illustrated parts breakdown lists all the replaceable parts for the load balance system with transfer valve. The numbers assigned are used as reference numbers and are not specific Woodward part numbers. Woodward will determine the exact part number for your particular governor.

Ref. No.	Part Name	Quantity
36686-1	Column case	1
36686-2	Speeder spring power piston assy.	1
36686-3	Droop plunger cap	1
36686-4	Nut	1
36686-5	Speed droop cam	1
36686-6	Power piston	1
36686-7	Droop lever assembly	1
36686-8	Screw	1
36686-9	Lockwasher	1
36686-10	Elastic hex nut, 5-40	1
36686-11	Transmitter valve plunger	1
36686-12	O-ring, 0.364 1.0. x 0.070	1
36686-13	Transmitter valve seat	1
36686-14	Transmitter bellows assembly	1
36686-15	Transmitter stem	1
36686-16	Cotter pin 0.030 x 0.375	4
36686-17	Pin	2
36686-18	Fitting clamp	1
36686-19	O-ring	1
36686-20	Orifice disc	1
36686-21	Filter element	1
36686-22	Lockwasher, #10-0.190 I.D.	1
36686-23	Fil. screw, 10-32 x 0.375	1
36686-24	Transmitter link spring	1
36686-25	Rate adjuster nut assembly	1
36686-26	Rate adjuster lock	1
36686-27	Jam nut, 0.250-12	1
36686-28	Jam nut, 5/16-18	1
36686-29	Tailrod pivot screw	1
36686-30	Connecting link	1
36686-31	Load divider cover	1
36686-32	O-ring	1
36686-33	Transmitter lever	1
36686-34	Transmitter link	1
36686-35	Hex nut, 8-32	1
36686-36	Shutdown bushing	1
36686-37	Screw	1
36686-38	Fil. screw, 10-32 x 0.375	1
36686-39	Lockwasher, 10-0.190 I.D.	1
36686-40	Tube end clamp	1
36686-41	Spherical bearing rod end	1
36686-42	Jam nut, 0.250-28	2
36686-43	Cotter pin, 0.060 x 0.312	1
36686-44	Pin,.156 D x 1.000 inch	1
36686-45	Lockwasher, 10—0.190 I.D.	4
36686-46	Fil. hd. screw, 10-32 x 2.000	4
36686-47	Soc. hd. pipe plug, 0.125	1
36686-48	O-ring	1
36686-49	Elastic stop nut, 10-32	1
36686-50	Washer	1
36686-51	Diaphragm	1
36686-52	Diaphragm	1
36686-53	Diaphragm crosshead	1
36686-54	Headed pin	1
36686-55	Cotter pin 0.060 x 0.312	1
36686-56	Transmitter cylinder	1
36686-57	Diaphragm	1
36686-58	Diaphragm plate	1
36686-59	Washer	1
36686-60	Elastic stop nut, 10-32	1
36686-61	Load divider cover	1
36686-62	O-ring	1
36686-63	Transmitter bracket	1
36686-64	Soc. hd. pipe plug, 0.125	1
36686-65	O-ring, 0.549 I.D. x 0.103	1
36686-66	Lockwasher, 10—0.190 I.D.	2
36686-67	Fil. hd. screw 10-32, 0.750	2
36686-68	Cotter pin 0.060 x 0.312	1
36686-69	Headed pin, 0.124	1
36686-70	Pivot pin link	1
36686-71	Floating lever assembly	1
36686-72	Headed pin	1
36686-73	Cotter pin	1
36686-74	Not used	
36686-75	Not used	
36686-76	Transfer valve body	1
36686-77	Transfer valve gasket	1
36686-78	Valve adapter plate	1
36686-79	Transfer valve diaphragm	1
36686-80	Transfer valve block	1
36686-81	Transfer valve assembly (includes parts 76 to 80)	1
36686-82	Fil. screw, 10032 - 1.000 inch	5
36686-83	Lockwasher,#10 x 0.190 I.D.	5
36686-84	Soc. hd. pipe plug, 1/16 NPTF	3
36686-85	Transfer valve gasket	1
36686-86	O-ring	2
36686-87	Load division tube assembly	1
36686-88	Load division tube assembly	1
36686-89	Load division tube assembly	1
36686-90	Load division tube assembly	1
36686-91	Transfer valve clamp	1
36686-92	Elastic hex thin nut, 0.250-20	2
36686-93	Stud, 0.250-20 x 1.000 inch	2
36686-94	Actuating lever	1
36686-95	Needle bearing	2
36686-96	Speeder spring power cylinder	1
36686-97	Transmitter valve spring	1
36686-98	Power piston tailrod	1
36686-99	Adjustment screw	1
36686-100	Cotter pin	1
36686-101	Spacers	2
36686-102	Pin	1
36686-103	Knurled knob	1
36686-104	Spring	1
36686-105	Movable fulcrum pin	1
36686-106	Pilot valve link	2
36686-107	Eccentric	1
36686-108	Cotter pin	1
36686-109	Adjusting block	1
36686-110	Screw	1

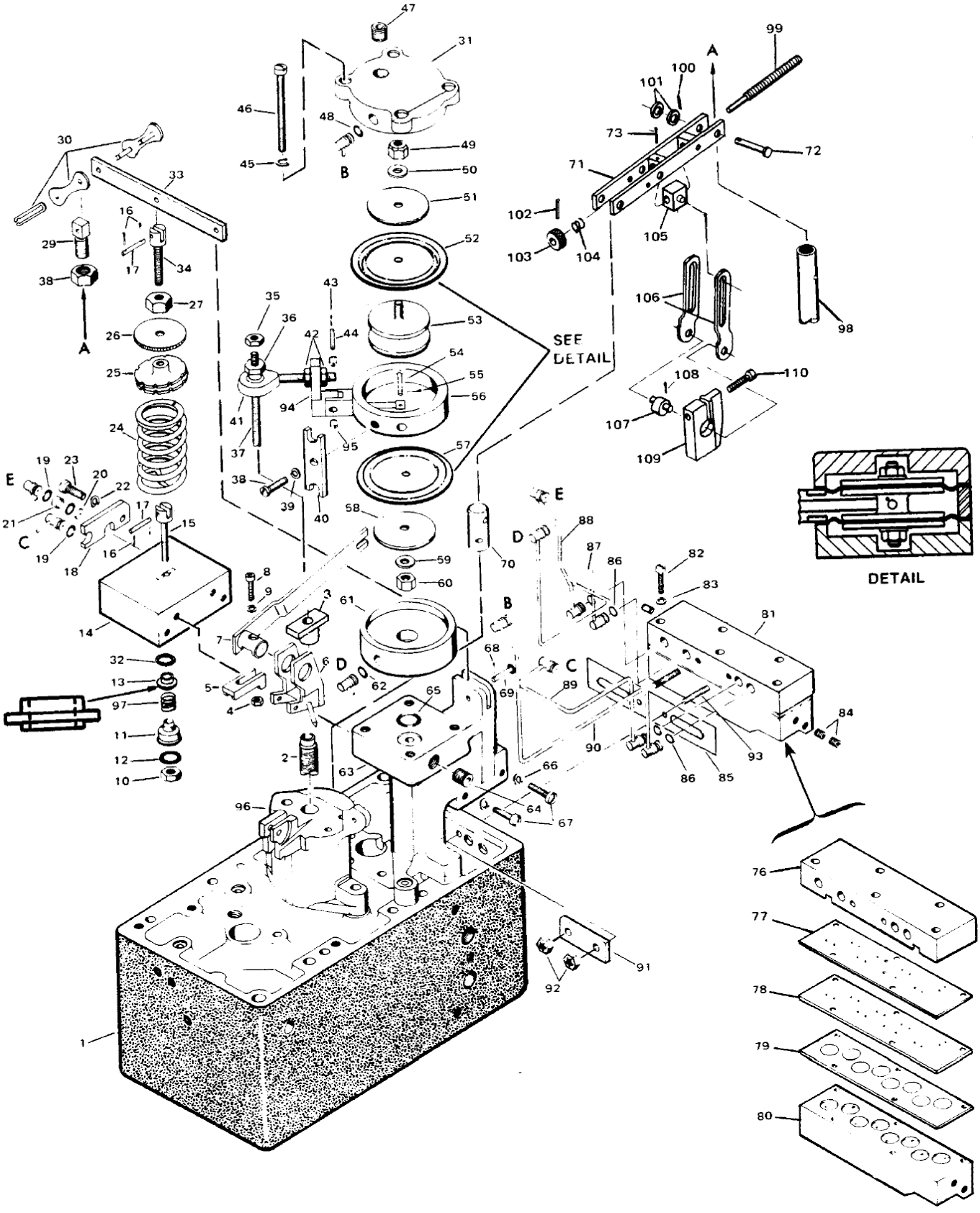

Figure 4-1. Exploded View of the Load Balance System

Chapter 5.
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 36686D.

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**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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