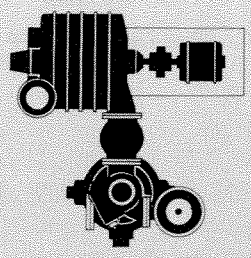
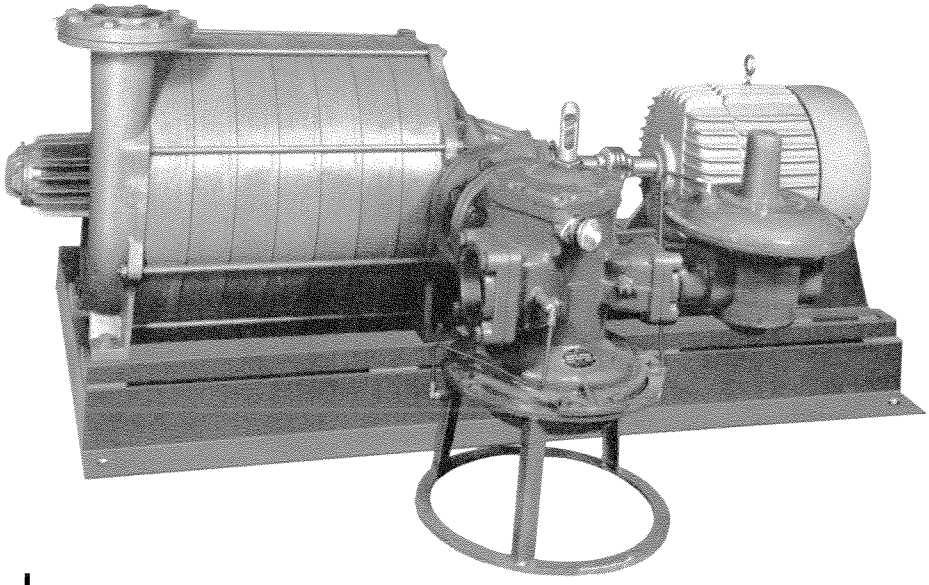
Instructions for INSTALLATION
OPERATION • MAINTENANCE

of the SELAS
COMBUSTION
CONTROLLER

SERIES TD
AND
SERIES TB



CENTRIFUGAL BLOWER TYPE
Series TD (Direct Drive)
Series TB (Belt Drive)



FOR SIZES | 10,000 TO 125,000 CFH
280 TO 3540 m^3/hr

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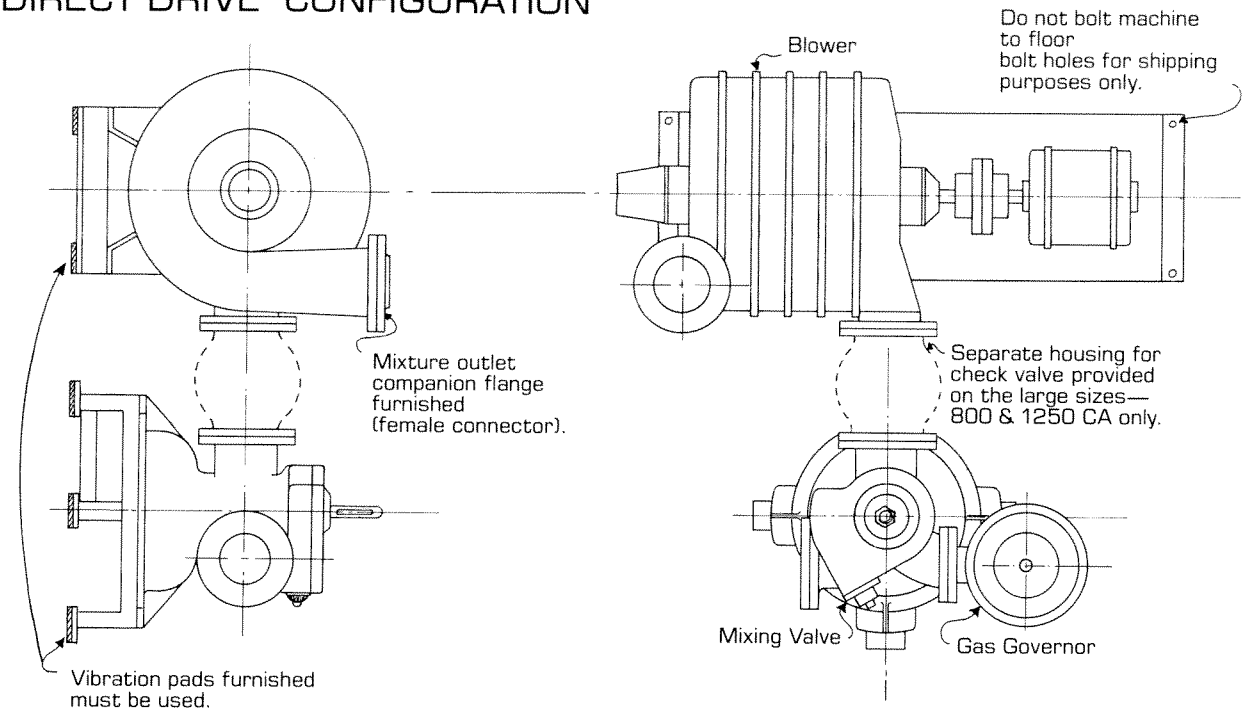
INTRODUCTION

The Selas Combustion Controller is a combustion delivery system wherein fuel gases are mixed with atmospheric air, in exact proportions, and pumped through flame arresters and control valves to industrial burners.

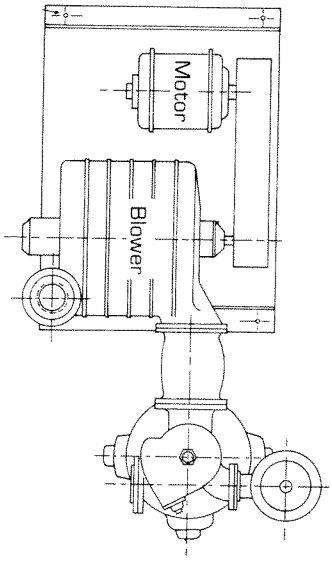
The Mixing Valve automatically adjusts to flow demand thereby providing the same consistent combustible mixture, over a wide range of turndown, to every burner.

FIGURE 1—GENERAL ARRANGEMENT

TD DIRECT DRIVE CONFIGURATION



TB BELT DRIVE CONFIGURATION



Recommended gas pressure at inlet of gas governor should be between 4 to 10 inches wc (1 to 2.5 kPa).

SERIES TD & TB MODEL CAPACITY RATINGS

SELAS MIXING VALVE	BLOWER CAPACITY RATINGS*	
	CFH	m^3/hr
150 CA-V	10,000 to 15,000	280 to 425
300 CA-V	25,000 to 35,000	710 to 990
800 CA-V	40,000 to 80,000	1130 to 2265
1250 CA-V	90,000 to 125,000	2550 to 3540

*Actual capacity may vary from 95 to 110% of specified ratings.

IMPORTANT:

The Selas Combustion Controller is designed for use with combustible gases and should be applied only to its intended function. Proper installation, operation and maintenance are necessary to promote safety. Read carefully and adhere to manufacturer's instructions before installing or using; abide by all codes, government regulations and insurance requirements.

Because uncontrolled combustible mixtures are hazardous, it is extremely important that:

1. Combustion equipment be placed in a well-ventilated area.
2. The care of equipment be assigned to responsible people.
3. Routine maintenance checks be established and followed. (Before performing any maintenance operations involving machine disassembly, be certain that the gas supply valve is closed).

The following instructions cover Selas Corporation of America Series TD & TB Combustion Controllers. Supplemental information such as the piping diagram and wiring schematic are provided only as reference data for typical combustion systems and are not to be construed as necessarily adequate without verification by a competent combustion specialist.

It is prudent to study these instructions before proceeding with installation.

Read and save any other instructions which are provided for specific apparatus.

Record all nameplate data and store the information in a file for future reference should the nameplates become illegible.

INSTALLATION

NOTE—REFER TO THESE DRAWINGS TO ASSIST INSTALLATION:

General Arrangement Figure 1 on Page 2
Wiring Diagram Figure 2 on Page 6
Piping Diagram Figure 3 on Page 6

MACHINE LOCATION

The Selas Combustion Controller should be placed in a well-ventilated area. Do not install in pit or depression where imperceptible gas leaks might accumulate. When possible, select an area in which the combustion air source is likely to be clean and fresh, otherwise remote air intake piping may be required. Protect against condensate freezing if equipment will be exposed to a cold climate. Provide a rigid, level foundation.

HANDLING

Avoid rough handling while unloading and moving the equipment to installation site. Do not remove skids until machine is placed in final postion, ready for installation. Do not use slings around shaft. Do not support from, or hang on, added components. Use care not to damage impulse tubing.

Remove all packing material. Do not remove thread protectors and flange covers until ready to install connecting piping. Do not discard instruction tags until installation is completed.

MACHINE PLACEMENT

Machine must be installed on a rigid, level foundation, buffered with vibration pads. If necessary, add sturdy metal shims and lock them in place. Blower base frame must be seated on vibration mounts at corners; add pads at intermediate spaces on longer spans. If the Mixing Valve is supported separately, add cushioning pads under its support legs. Do not bolt base frame tightly to foundation.

Do not connect motor coupling until turning direction of motor shaft is verified when wiring connections are made.

PIPING

Inside surfaces of all piping must be clean. Connecting pipe must be aligned and supported independently; flexible connections are recommended to avoid strain, reduce vibration and allow for easier assembly.

Use full ported shut-off valves when indicated to eliminate unnecessary restrictions and loss in pipe line pressure. Restrictive valves can prevent regressing flashback flame from reaching the automatic closure mechanism.

Take care to block foreign material from entering any pipe opening. Remove thread protectors and flange covers only when ready to make connections. Seal all joints on gas inlet and mixture outlet piping to guard against gas leakage; avoid excessive use of sealing compound which might squeeze inside pipe channel to cause fouling or plugging. Be sure to use gaskets between flanges.

Recommended inlet pressures to the zero gas governor at Mixing Valve are 4 to 10 inches water column (1 to 2.5 kPa). Locate reducing regulator, if required, at least 10 feet (3 m) upstream of gas governor.

Air filters on combustion air intake inlets are recommended because dirt or industrial contaminants in unfiltered air will hinder machine performance.

Avoid atmospheres which are corrosive to iron, brass or aluminum. If air intake piping must be extended to reach clean, fresh air, use oversize piping with a minimum number of fittings to avoid unnecessary airflow restrictions. Outdoor air filters must be protected from the weather.

PRESSURE TEST

Leak test requirements for piping and components vary with their relative positions in the piping system. In normal use, the air intake piping to the Mixing Valve operates under suction and small leaks are not hazardous; therefore, pressure tightness is not demanded.

A pressure test of 2 psig (14 kPa) is the maximum recommended for the inlet gas piping which supplies raw fuel to the gas governor at the Selas Mixing Valve. Many zero gas governors have a use limit of 2 psig (14 kPa) but the normal operating pressure at this point is less than 10 inches water column (2.5 kPa). If higher test pressures are indicated by local codes or regulations, isolate the gas governor and other vulnerable devices from the higher test pressure. Set or check pressure switches during the pressure test.

The piping between blower discharge and burner shut-off valves (which holds premixed gas and air) should be tested at a pressure not exceeding 10 psig (70 kPa). Higher pressures can blow grease seals in firechecks or rupture a blow-out disc.

The piping between burner shut-off valve and burner can be tested for leaks at the maximum delivery pressure produced by the blower, most commonly 3 psig (21 kPa).

In all cases, apply test pressure slowly to eliminate sudden impulse loads on diaphragm membranes.

ELECTRICAL WIRING

Figure 3 illustrates a typical electrical wiring arrangement and is offered for reference purposes only; include your special conditions as required.

Verify that the available power supply coincides with the electrical characteristics of the equipment at hand. Test to ensure that motor rotation agrees with directions of arrow on blower; change wiring connections at motor, if necessary.

MOTOR COUPLINGS

Do not connect motor couplings until:

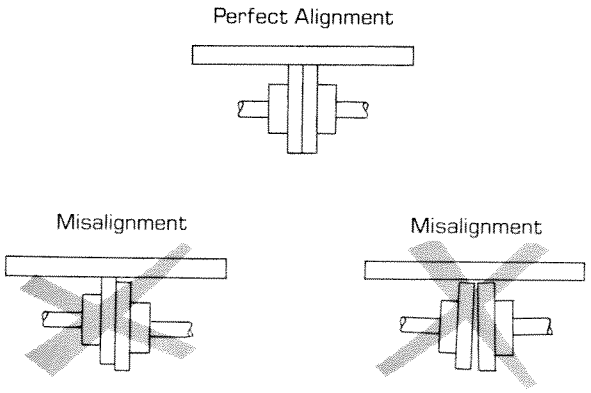
1. Direction of shaft rotation is correct.
2. Motor and blower shafts are aligned.

Shaft alignment specifications depend on which couplings are used. Follow instructions provided by supplier. The more precise the alignment, the longer the life of bearings and couplings. Always allow space between abutted shafts and coupling halves. If instructions are not provided, refer to the following alignment sketches.

Series TD (DIRECT DRIVE)

Check alignment of motor couplings with a dial indicator or a suitable straight edge. Look for parallel offset and angular mismatch at top and side of coupling. Adjust motor as required, using shims to establish correct height.

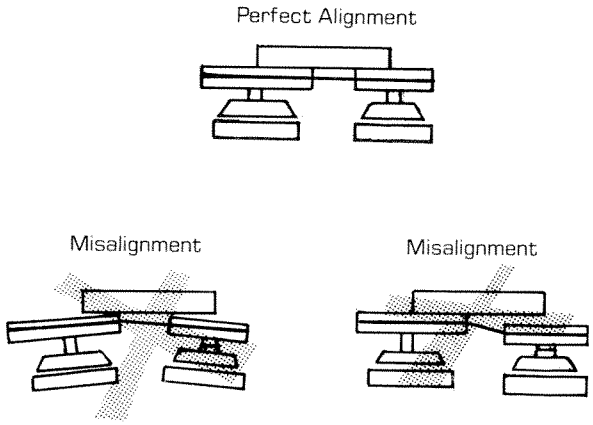
(Series TD Coupling Alignment)



Series TB (BELT DRIVE)

Check alignment of both sheaves with a straight edge or taut string. Look for parallel offset or angular mismatch across sheave diameter. Adjust motor as required until sheaves are aligned squarely. Wipe belts clean, removing oil and grime with clean dry cloth. Adjust belt tension until belt moves approximately ½ inch (12 mm) when applying pressure to belt midway between sheaves. Belts will normally stretch a little when first used; recheck tension after a few days in service. Improper belt tension can decrease blower output and cause premature failure of belts and bearings. (Drawing shows sheaves without safety guards.)

(Series TB Sheave Alignment)



TRIAL RUN (Air Only)

Once Combustion Controller is in place and piping essentially completed, verify that:

1. Combustion Controller base is not bolted to floor.
2. Motor couplings are connected and aligned.
3. Shaft rotation is correct and turns freely by hand.

Close mixture outlet valve to make a test run of the blower on air only. (Centrifugal blowers should not be operated with inlet and outlet connections wide open—this causes the heaviest load. If necessary to test blower before piping connections are made, close off most of inlet with a temporary plate over the inlet flange. Do not run blower more than a few minutes with intake completely closed.) Start the motor. When it attains full speed, open mixture outlet valve; open other restricting valves gradually. Check for vibration and unusual noise. Check that pressure and volume flow are near expected capacity. Complete any leak tests which have not been made.

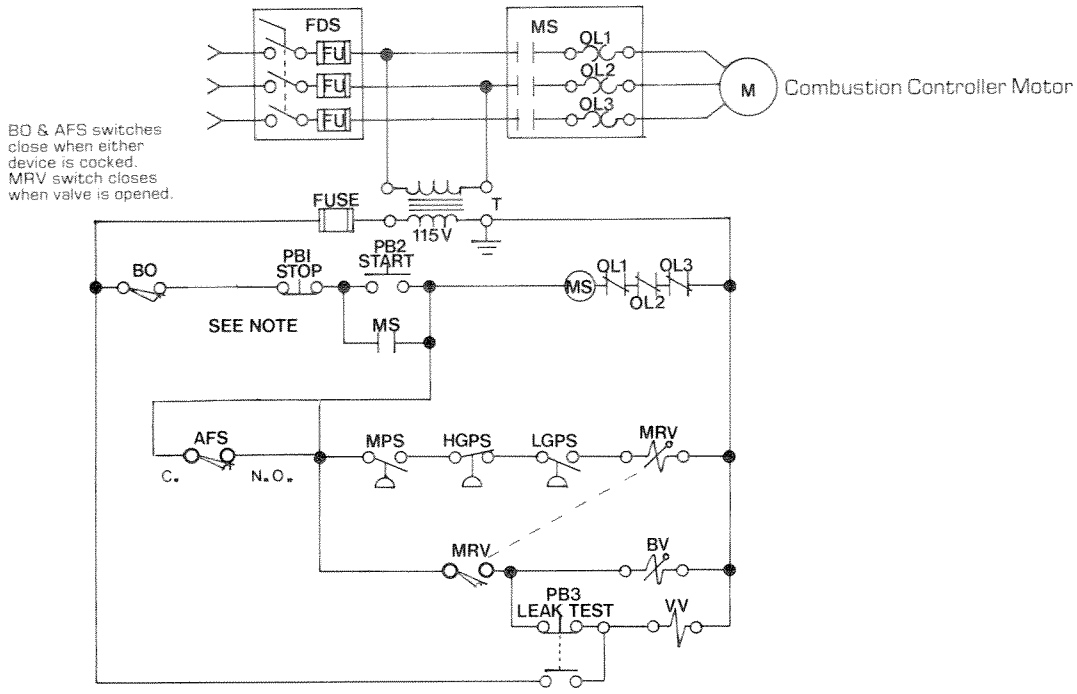
PREPARATION FOR START

Verify that pressure switches in gas supply pipe are properly set. Ensure that gas supply is available to gas governor of Combustion Controller at a pressure between 4 to 10 inches of water column (1 to 2.5 kPa). (Provide a temporary line to bleed air from the gas supply pipe, perhaps at leak test station nearest Combustion Controller, and purge all air to vent or flare in a safe place. Replace pipe cap at bleed point.)

Check that all piping is completed and secure. Close all valves. Make sure that all electrical connections are completed and operable. Turn off all switches.

Set ratio adjustment dial on Mixing Valve to the expected air-gas ratio. Preliminary setting will be an estimate; more precise adjustment can be made after unit is in operation. A nominal setting of the range of port opening scale for typical natural gas operation is 92 on the air scale; for straight propane use a preliminary setting of 95. Leaner fuels like coke oven gas, town gas or manufactured gas are likely to require a range of port openings beginning at approximately 83 on the air scale.

FIGURE 2—WIRING DIAGRAM



LEGEND		DESCRIPTION	LEGEND		DESCRIPTION
AF		AUTOMATIC FIRECHECK	MPS		MIXTURE PRESSURE SWITCH
BV		BLOCKING VALVE	MRV		MANUAL RESET VALVE
FDS		FUSIBLE DISCONNECT SWITCH	MS		MOTOR STARTER
HGPS		HIGH GAS PRESSURE SWITCH	OL		OVERLOAD
LGPS		LOW GAS PRESSURE SWITCH	PB		PUSH BUTTON
LT		LEAK TEST ASSEMBLY	BO		BLOWOUT
M		MOTOR (COMB. CONT.)	VV		VENT VALVE

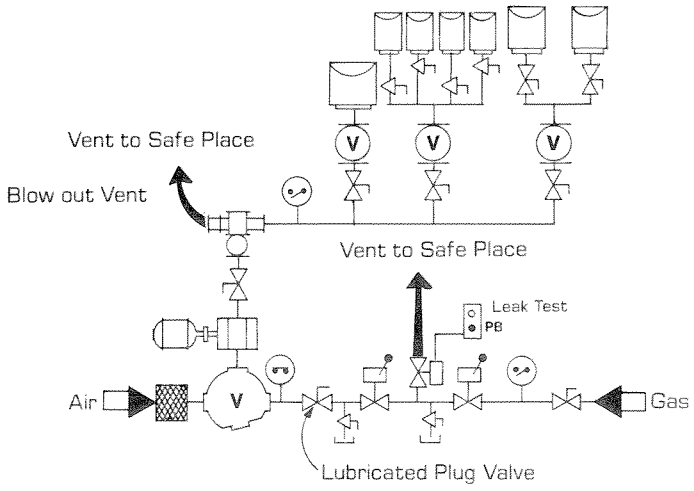


FIGURE 3—PIPING DIAGRAM

WIRING DIAGRAM (Figure 2)

Wiring diagrams of systems including pilot ignition and flame supervision are not shown here. They must be developed by Selas or other competent combustion engineers.

It is the user's responsibility to provide installation and wiring in conformance with all applicable electrical codes, ordinances and regulations.

TYPICAL SCHEMATICS PIPING DIAGRAM (Figure 3)

The piping diagram shows a typical interrelation among firechecks, blowouts and major system components. Specific applications may require variations of the basic system. Consult with Selas engineers for the optimum configuration to meet your requirements.

OSHA or local regulations, underwriter requirements or plant policies may dictate deviations from typical installations.

PIPING

A. The piping from the Combustion Controller to the blowout is generally the same size as the Combustion Controller discharge connection.

B. The piping from the blowout must not exceed the size of the blowout discharge connection. Long or complex piping systems may require special sizing.

C. The piping from the main header to the automatic firechecks should be sized with reference to allowable pipe line losses. Flow velocities of 50 ft./second (15 m/second) are adequate limits for most applications.

D. Insurance company regulations specify that the size of the piping from automatic firechecks to burners must not exceed the firecheck size. Maintain or reduce this size according to allowable pressure losses.

E. Always install a manual shut-off valve ahead of each firecheck.

FIRECHECK

Install firechecks in mixture supply line close to burners.

A. Type AF-A (without micro switch) should be used when backfire at one firecheck must not interrupt operation of remaining burners and no signal or alarm is necessary.

B. Type AFS-A (with micro switch) must be used if alarm or signal is necessary, or if all burners of entire system must be shut down in event of backfire at any section. Micro switch must be wired to close manual reset shut-off valve. This will allow air to purge combustion system piping of combustible mixture before Combustion Controller motor is stopped.

BLOWOUT

Install a Type SBC blowout for the protection of Combustion Controller. It should be located close to the Controller and its micro switch should be wired to close manual reset shut-off valve and stop Controller motor.

Dual blowouts are recommended for systems with flows exceeding 70,000 cfh (1981 m^3/hr).

MANUAL RESET SHUT-OFF

The manual reset shut-off valve shuts off the fuel supply if electrical power is interrupted. The valve is wired to stop the fuel supply if the firecheck, blowout or pressure switches are activated.

PRESSURE SWITCHES

High and low pressure switches monitor the incoming gas supply. Should gas pressure become too high or too low, the switches signal the manual reset shut-off valves to stop the gas supply. Mixture line pressure switch checks that blower output has adequate discharge pressure.

FULL PORT SHUT-OFF

The full port shut-off valves should be full-throated flow valves to avoid unnecessary pressure loss and to eliminate flashback hang-ups at the valve instead of at the firecheck.

VENT VALVE

A normally open solenoid valve which remains closed during normal operation, but opens to vent when manual reset shut-off valve is closed.

LEAK TEST ASSEMBLY

The leak test assembly provides a means for periodic testing of leakage through manual reset and other shut-off valves.

GAS COCK

Gas cocks function as positive gas shut-off valves wherever full port valves are not required.

OPERATION

FIRST START CONSIDERATIONS

The following procedures are separated from routine starting, but they are very important to the first start-up, after system rework or even after prolonged idle time.

Light system burners following procedure given in "Starting the Machine," below.

1. Prove flame safety circuits as applicable.
2. Verify stable burning flames at each burner.
3. Perform "dry-out" or curing of refractories as applicable.
4. Establish high fire limit and set controls for the maximum allowable firing rate; this is determined by process or equipment limits.
5. Provide a low fire limit which assures a minimum flow rate at which the burners have stable flames and operate above their flashback point; this is usually determined by burner operating limits.

STARTING THE MACHINE

The following operating instructions are fundamental to Selas Combustion Controllers. More complex combustion systems which incorporate pilot burners, purge timers, supervisory cocks or other interlocking apparatus obviously will require special instructions provided in other technical literature.

1. Verify that:
   a. Fuel gas supply to machine is shut off.
   b. Mixture outlet valve is fully closed.
   c. All valves at burner position are closed.
   d. Ratio adjustment setting is adequate for light-off.
2. Prepare ignition means, whether lighting torch, spark ignition or burner pilots.
3. Start Combustion Controller motor.
4. Open gas valve.
5. Open mixture outlet valve.
6. Light burners as required.
7. If necessary, readjust air-gas ratio setting to produce desired burning characteristics. After proper ratio is set, hand-tighten ratio adjuster lock screw.

RUNNING THE MACHINE

Once started, the Selas Combustion Controller should not require special attention other than operator awareness of process or system variations. Deviations in quality of fuel gas supply are not unusual and such changes can be accommodated by readjusting air-gas ratio dial, even during operation. Ratio adjustments during operation should be made in small increments, perhaps one scale point at 30 second intervals, but only when unit is operating above 5% of Mixing Valve rating.

Consult the "Maintenance" instructions section for detailed information and procedures to maintain good performance. Troubleshooting clues are also included.

Refer to operating information on supplemental machinery and instrumentation as provided.

STOPPING THE MACHINE

Use the following procedure to stop the Selas Combustion Controller.

1. Close gas supply valve to machine inlet.
2. Allow machine to run long enough to clear gas or mixture from all pipes to burners.
3. Turn off the Combustion Controller motor.
4. Close all valves at burners.
5. Close mixture valve at machine outlet.

MAINTENANCE

CAUTION:
Before performing any maintenance operations involving machine disassembly, be certain that the gas supply valve is closed.

ZERO GAS GOVERNOR

The gas governor, located in the fuel supply line at the inlet to the Selas Mixing Valve, equalizes the incoming fuel supply pressure to match the pressure of the incoming air supply which varies with changes in flow demand.

The upper diaphragm chamber, connected to the air inlet side of the Mixing Valve, senses the system flow requirements. The lower diaphragm chamber responds to governor outlet conditions transmitted through an impulse hole or equalizing tube. With equal pressures in both chambers, the governor achieves zero balance or equilibrium. Changes in system demand create pressure imbalances between the two chambers. When these imbalance conditions occur, the diaphragm adjusts gas flow until the zero balance condition is restored between the chambers. A sensitive spring precisely balances the weight of all internal moving parts within the governor. Figures 9 and 10 show the general construction of the two gas governors used with Selas Mixing Valves.

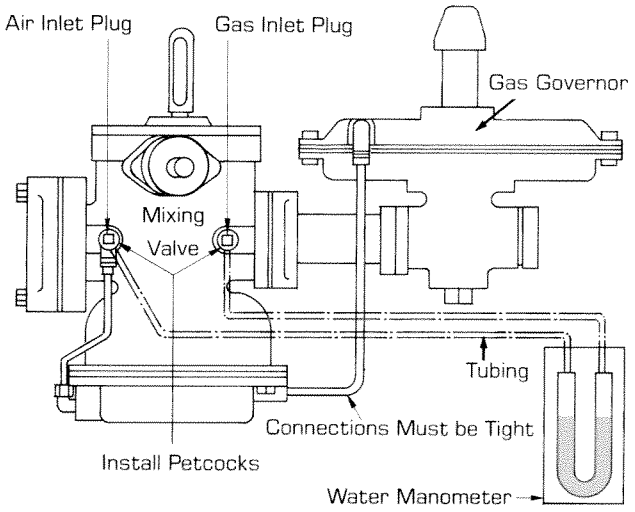
All gas governors are set and sealed when shipped. If adjustment or repair is necessary, the governor should be returned to the factory.

NOTE:
Field repair of the gas governor is not recommended because incorrect assembly could be hazardous. Emergency repairs should be made only by competent repair personnel with thorough knowledge of correct assembly instructions. Assembly instructions can be provided by governor manufacturers or Selas. It is a wise precaution to stock a spare gas governor for emergency replacement.

PRESSURE BALANCE TEST (Figure 4)

Performance of the balanced zero gas governor can be verified by making a pressure balance test. Figure 4 shows the arrangement of equipment required for the test.

FIGURE 4
PRESSURE BALANCE TEST ARRANGEMENT



1. Examine impulse tube to gas governor for soundness and tight connections; leaks will hinder performance. Leak tests with soap solutions are not adequate because this line is normally under suction.
2. During a non-operating period, replace both pipe plugs at test locations near Mixing Valve inlets with petcocks. Connect a water manometer (or low differential pressure gauge) across both petcocks.
3. During the next operating period, open petcocks simultaneously and examine response of gas supply pressure when flow rates change. The differential pressure between the two test points should not exceed 0.2 inch water column (0.05 kPa). Minor deviation might prove tolerable, but larger deviations require replacement of governing regulator.

CAUTION:
Close petcocks or replace plugs at end of test. Never operate Selas Mixing Valve with a test connection open to the atmosphere.

SELAS MIXING VALVE

The Selas Mixing Valve is a three-port, adjustable area valve which accurately mixes any two of a wide variety of gases. "Air" and "Gas" ports in a movable piston are matched to complementary ports in a mating sleeve. An adjustment knob can vary gas proportions for any required mixture ratio. The ratio adjustment will simultaneously restrict one port opening as the other port is increased. Increased flow demand causes the Mixing Valve diaphragm to raise the piston, opening both ports simultaneously for greater flow.

Figures 5A and 5B illustrate Selas 150 & 300 CA and 800 & 1250 CA Mixing Valves, respectively.

CLEANING OF MIXING VALVE (Figures 5A & 5B)

Due to the close tolerance between the bushing and piston, **a regular program of cleaning is required**. This cleaning must be a preventive maintenance function. The frequency is dictated by the severity of each particular application. A monthly cleaning schedule is recommended until a satisfactory program is developed.

To expose the internal parts, remove valve cover (#3). Next, unscrew piston locknut (#23) from diaphragm spindle (#25) and remove piston (#20).

Remove all debris that has accumulated in the valve. Wipe clean all accessible areas, using a cloth saturated with safe solvent. Do not overlook orifice opening in valve body; it must be free of any obstruction.

Remove loose grit and dirt from the piston (#20) and bushing (#10) and carefully inspect surfaces for corrosion and abrasions. Remove stubborn deposits with crocus cloth dipped in solvent. Never use grit or emery because metal removal can alter fit of components. During this cleaning operation, it is important not to mar or deform the sharp metering edges of both piston and bushing ports in any way.

NOTE:
Never coat outside of piston or inside of bushing with oil or grease as this will attract abrasive impurities from the gas or air supply. This will eventually cause sticking or excessive wear. Use dry lubricant and wipe off excess before reassembling.

Remove balancing line tubing and clean by blowing compressed air through the tube. (Make sure that both ends of balancing line are disconnected.)

A drain plug is located in the diaphragm cap (#2). Remove plug to drain accumulated condensation from the Mixing Valve.

Ordinarily, it is not necessary to remove the bushing for cleaning. A grease seal, located between bushing (#10) and body (#1), serves two functions: to ensure free rotation during ratio adjustment, while simultaneously maintaining a preventive barrier against the diversion of the flowing streams from other than metered flow paths. If the bushing does not rotate easily or internal leakage is suspected, disassemble as follows:

Remove ratio adjustment assembly (#11) from adjustment pivot (#13).

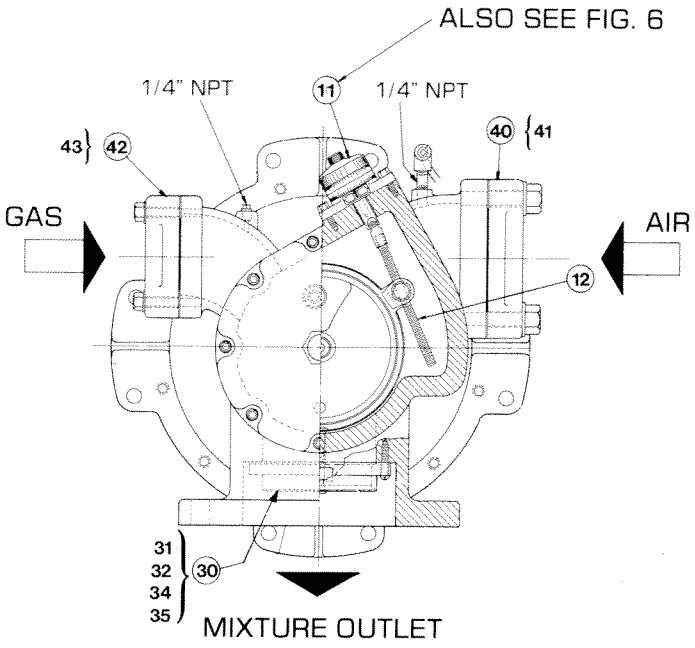
Cont. on Page 12

FIGURE 5A
MIXING VALVE, ARRANGEMENT & PARTS LIST: MODELS 150 CA & 300 CA

(See Figure 5B for larger sizes).

PARTS LIST

1. Mixer body
2. Diaphragm cap (bottom cover)
3. Top cover
4. Top cover gasket
5. Sight glass housing
6. Sight glass tube
7. O-ring
8. Retaining ring
9. Felt pad
10. Mixer bushing
11. Ratio adjustment ass'y. (See Fig. 6)
12. Adjustment spindle
13. Adjustment pivot
14. Retaining ring
20. Mixer piston
21. Piston guide sleeve
22a. Guide sleeve screw
22b. Washer
23. Piston locknut
24. Spindle extension
25. Diaphragm spindle
26. Diaphragm with gaskets
27. Diaphragm plates (2 req'd)
28. Diaphragm washer (2 req'd)
29. Hex nut
30. Check valve ass'y.
31. Body
32. Valve disc & stem ass'y.
34. Spring
35. Lock ring
38. Impulse tubing connector (3 req'd)
39. Nameplate
40. Air inlet flange
41. Air flange gasket
42. Gas inlet flange
43. Gas flange gasket



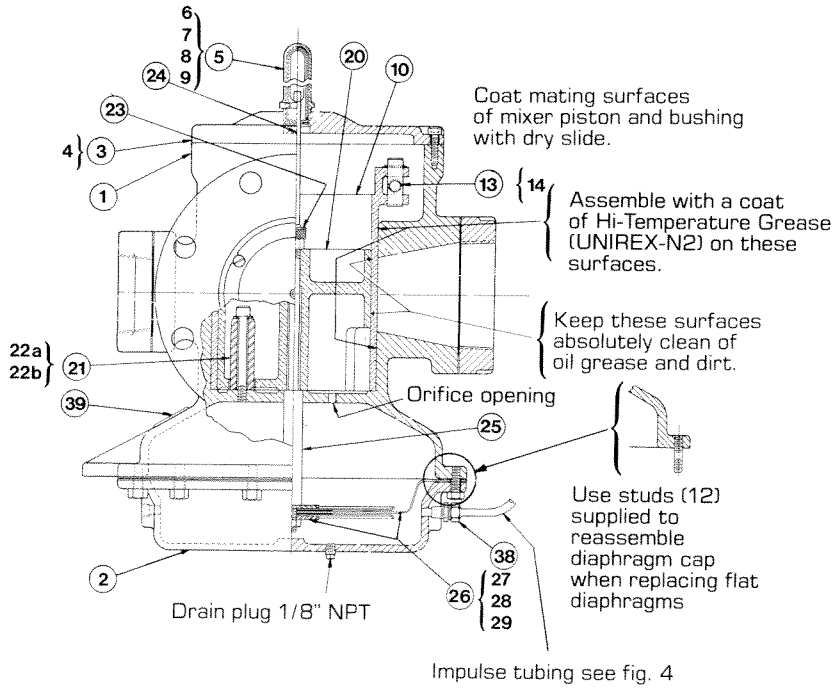
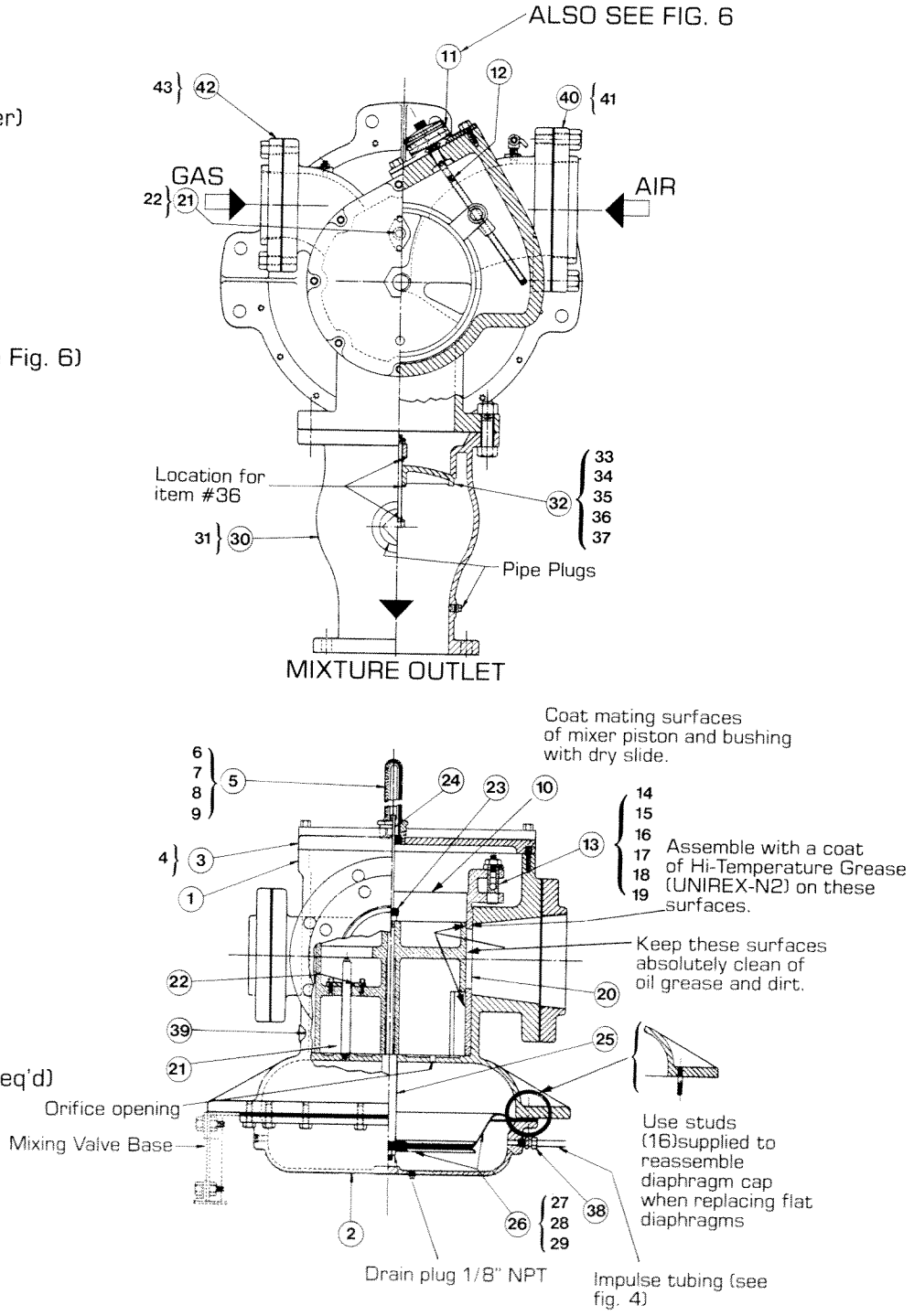


FIGURE 5B
MIXING VALVE, ARRANGEMENT & PARTS LIST: MODELS 800 CA & 1250 CA

(See Figure 5A for smaller sizes).

PARTS LIST

1. Mixer body
2. Diaphragm cap (bottom cover)
3. Top cover
4. Top cover gasket
5. Sight glass housing
6. Sight glass tube
7. O-ring
8. Retaining ring
9. Felt pad
10. Mixer bushing
11. Ratio adjustment ass'y. (See Fig. 6)
12. Adjusting spindle
13. Adjustment pivot
14. Retaining collar
15. Threaded bearing
16. Spring
17. Oval point screw ½-13
18. Jam nut ½-13
19. Cup point screw 10-24
20. Mixer piston
21. Piston guide pin
22. Guide pin positioner
23. Piston locknut
24. Spindle extension
25. Diaphragm spindle
26. Diaphragm with gaskets
27. Diaphragm plates (2 req'd)
28. Diaphragm washer (2 req'd)
29. Hex nut
30. Check valve ass'y.
31. Body casting
32. Valve disc
33. Valve stem (bolt)
34. Spring
35. Slotted hex nut
36. Washer (3 req'd)
37. Cotter pin (2 req'd)
38. Impulse tubing connector (3 req'd)
39. Nameplate
40. Air inlet flange
41. Air flange gasket
42. Gas inlet flange
43. Gas flange gasket



Maint. (cont.)

NOTE:
The threads on the adjustment assembly spindle may be left-hand.

Carefully lift bushing from valve body, using a steady vertical lift in order to prevent binding. Clean thoroughly as previously described for piston cleaning.

Before reassembling bushing in valve body, coat outside of bushing and inside of valve body with UNIREX-N2 grease or equivalent. Replace all parts with care. Do not use force to reassemble parts. (Remove all grease from metering port area.)

To reinstall piston, apply a light coat of molybdenum disulfide base dry film lubricant (Dri-Slide) to the outer surface of piston and the inner surface of the bushing. DO NOT USE OIL OR GREASE ON THESE INTERFACES. Align the piston with guide (#21) being careful not to cock or force the piston while sliding into bushing. Replace piston locknut.

RATIO ADJUSTMENT (Figures 6, 7 & 8)

An indicator dial on the adjustment assembly correlates the relative opening of blender ports. If the ratio assembly was disengaged, it is necessary to reset this dial. Scribe marks are provided on the piston and bushing to show their relative alignment. When these "Gas" port scribe marks are matched, they indicate the position of 100% "Air"/0% "Gas". Note that adjustment knob (#50) is directly connected to adjusting spindle (#12), however the graduated scale (#48) turns at a reduced rate through the gear train shown in Figure 6.

To set the scale correctly, first turn adjustment knob (#50) to indicate 100 on the "Air" scale. With mounting screws removed, turn entire ratio assembly (including its mounting flange) until scribe marks are aligned when the flange is held against the valve body. When assembly is firmly against the valve body, the scribe marks are aligned and the scales read 100% AIR, the ratio scale register is correct. Mount ratio assembly to Mixing Valve body at this position. Turn ratio adjustment knob to desired scale reading. To complete Mixing Valve reassembly, install valve cover.

NOTE:
A locking device is provided on the ratio adjustment assembly. After setting ratio, gently tighten locking screw (#70) with Allen wrench.

MIXING VALVE DIAPHRAGM REPLACEMENT (Figures 5A & 5B)

An elastomeric diaphragm in the lower chamber of Mixing Valve serves to raise or lower the mixer piston, changing both air and gas port openings according to flow demand. The diaphragm requires no maintenance, but must be replaced if embrittled or ruptured.

The diaphragm can be serviced after removal of impulse loading tube and diaphragm cap (#2).

Diaphragms may be molded (preformed) or flat. Flat diaphragms require pleating at bolt circle to allow slack for full vertical travel (or valve stroke). Pleats should be evenly spaced, giving one fold per pleat, but pleats must be avoided at bolt holes. Diaphragm may be stapled to flange gaskets at each pleat to facilitate assembly, however the staples should be outside the bolt circle of the gasket.

Selas Mixing Valves supplied with flat diaphragms are provided with a set of screw studs and a diaphragm installation tag. The studs can be screwed into the tapped holes of the Mixing Valve body for use as guides during diaphragm installation. Install new gaskets when replacing diaphragms, including the smaller gaskets under the diaphragm plates; coat outer (or flange) gasket with good grade grease. Do not remove piston locknut at other end of spindle (in upper chamber) because it holds spindle in a fixed position during diaphragm assembly.

Always check for full stroke before final fastening of bottom diaphragm cap screws. Reconnect impulse tubing and tighten all connections.

CHECK VALVE (Figures 5A & 5B)

A check valve is positioned between the Mixing Valve and blower to protect the Mixing Valve and diaphragm from sudden backpressures; it does not provide positive shutoff.

In normal operation, flow through the system overpowers the light tension of check valve spring and holds it open. Excessive loss in delivery pressure can signal poor check valve operation.

Access to check valves in 150 and 300 CA Mixing Valves is at Mixing Valve outlet flange. The larger 800 and 1250 CA Mixing Valves mount their check valves in an adjoining casting. The check valve spring should be straight and resilient. The disc and stem must be clean and ride freely; clean with safe solvent, if required. Examine stem and disc for wear; replace as necessary.

AIR FILTER

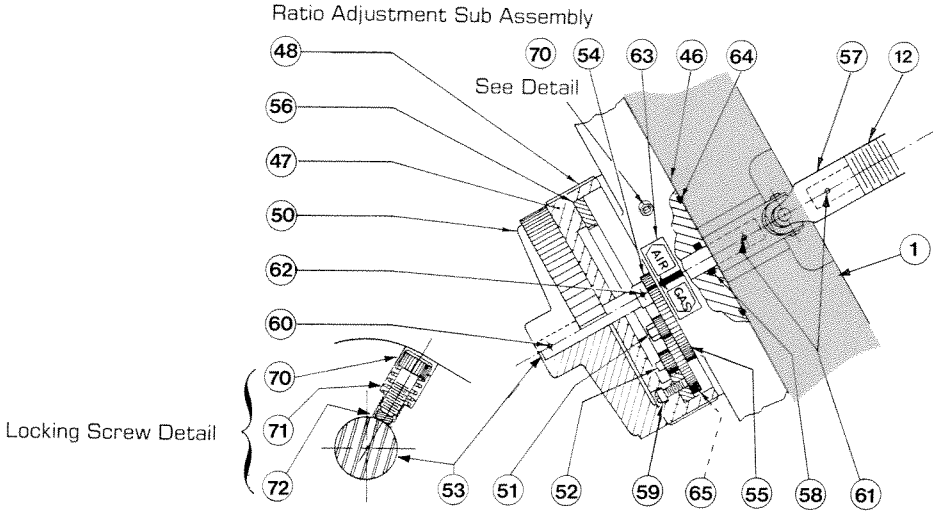
Selas Combustion Controllers should be operated at all times with air filters on air intake piping. This is because air from typical industrial environments generally contains much dirt which would contaminate the Mixing Valve and combustion system piping if allowed to enter the machine. The air filter also stops rags and paper from being drawn into the air intake especially during periods of increased suction which occur at the higher flow rates. It is recommended that a spare air filter element always be kept handy to replace a dirty or damaged air filter. Filter replacement should be made with the Combustion Controller shut down. If the Combustion Controller cannot be stopped, filter replacement can be made during a low fire or idle setting.

The air filter should be cleaned monthly until actual operating conditions determine proper cleaning frequency. Some of the filters can tolerate several cleanings in warm water with mild detergent. Do not use compressed air jets to clean cloth-type filters. Consult the filter supplier for specific cleaning instructions.

NOTE:
DO NOT use oil-wetted filters on Selas Combustion Controllers.

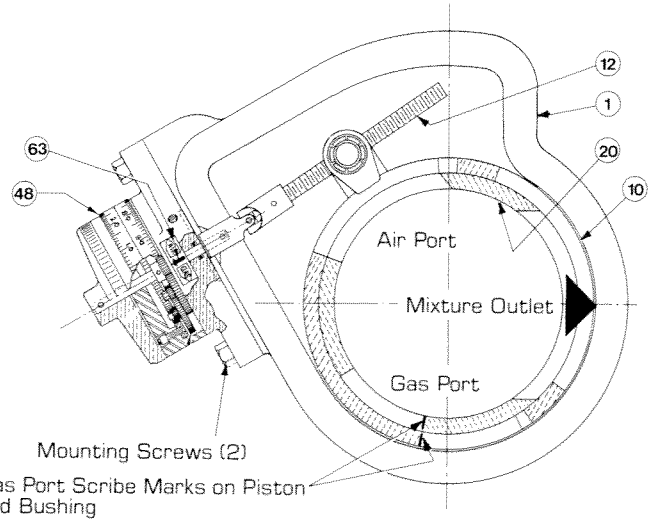
Cont. on Page 14

FIGURE 6
RATIO ADJUSTMENT SUBASSEMBLY



PARTS LIST

1. Mixer body
10. Bushing
12. Adjusting spindle
20. Piston
46. Mounting flange
47. Internal gear mount
48. Range of port opening scale
50. Adjustment knob
51. Gear mounting shaft
52. Gear mounting shaft
53. Adjustment shaft
54. Drive gear
55. Idler gear (2 each for 800 & 1250 CA)
56. Internal gear
57. Universal joint
58. O-ring
59. Fillister head machine screw (3 req'd)
60. Roll pin
61. Roll pin (2 req'd)
62. Roll pin
63. Air-gas pointer
64. O-ring
65. Idler gear (150 & 300 CA only)
70. Locking screw
71. Locking spring
72. Locking plug



ORIENTATION TO ASSURE ACCURATE RATIO SCALE REGISTER: WITH "100" ON AIR SCALE ALIGNED TO AIR-GAS POINTER, SCRIBE MARKS ON TOP OF PISTON AND BUSHING SHOULD MATCH. IF CORRECTION IS NECESSARY, REMOVE MOUNTING SCREWS AND TURN MOUNTING FLANGE AS REQUIRED.

FIGURE 7
RATIO SCALE REGISTER

Maint. (cont.)

MOTOR

Motor types and suppliers may vary. For proper care, refer to instructions of motor manufacturer. Most motors have ratings for safe operation up to 176°F (80°C) in typical environments (ambient temperature plus a 104°F [40°C] temperature rise). Higher temperatures might be caused by overloading, improper wiring or high altitude.

BLOWER

The shaft packing gland adjustment and bearing lubrication are important to the blower's good performance.

NOTE:

The manufacturer of Lamson blowers requires that only Lamson #5 grease be used for bearing lubrication. Under normal operating conditions, bearings should be greased every 2000 hours. Detailed lubrication instructions are provided in Lamson technical bulletins.

Misalignment between blower and motor will cause vibration and noise. Use the following procedures to check for proper blower drive operation.

Series TD (DIRECT DRIVE)

Check coupling alignment regularly; maintain recommended space between blower and motor shaft.

Series TB (BELT DRIVE)

Check sheave alignment and belt tension regularly. When replacing belts in multi-drive units, it is wise to replace all belts simultaneously. Remove tension on belts when blower is expected to be out of service for an extended period.

If blower is idle for extended periods (even before first use) rotate shaft by hand once a month. If idle for over a year, keep in mind that bearings might need replacement.

The discharge pressure of a turbo-type (centrifugal) blower is usually higher when delivering less than full capacity but the pressure is likely to decrease when the blower is operated at more than rated flow capacity.

Blower performance can be affected if changes occur in motor speed or in the specific gravity of the gas-air mixture.

For more detailed information on Lamson blowers, refer to the following bulletins according to appropriate blower frame size:

For Blower Frame 300

See Install & Operate: B-6502; Service: B-6602 (direct & belt drives).

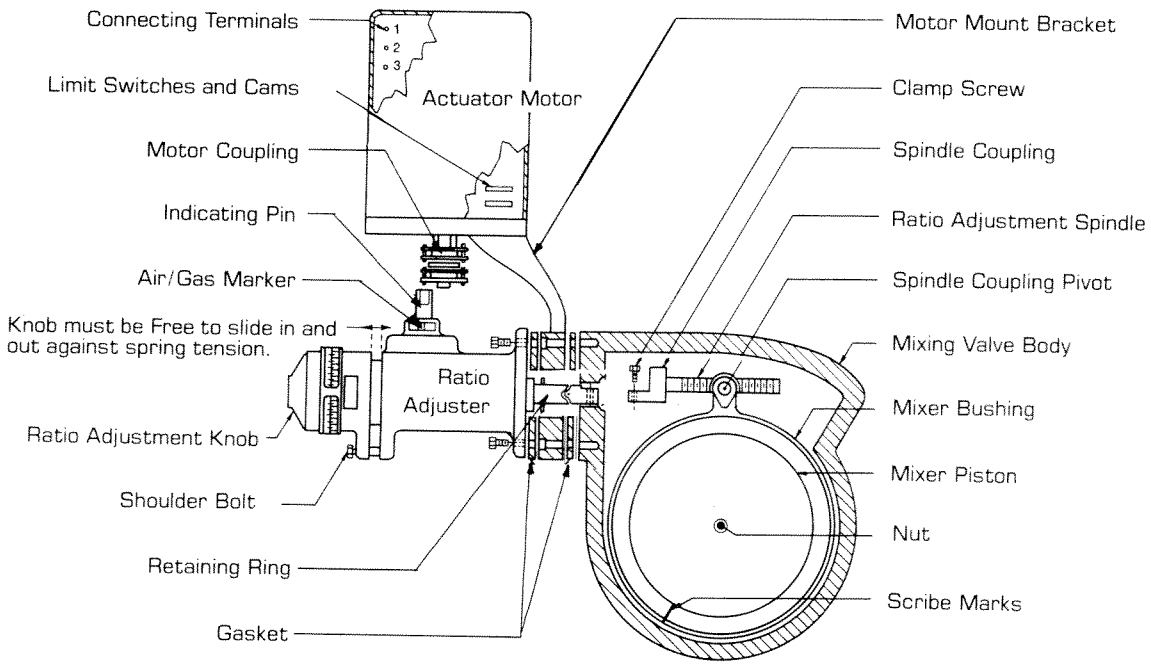
For Blower Frame D

See Install & Operate: B-6501; Service: B-6620 (direct drive), B-6640 (belt drive).

For Blower Frames 500, 600 & 800

See Install & Operate: B-6503; Service: B-6603 (direct & belt drives).

FIGURE 8—AUTOMATIC RATIO ADJUSTER



SEE SELAS INSTRUCTION BULLETIN QARA FOR DETAILED INFORMATION.

FIGURE 9—GAS GOVERNOR

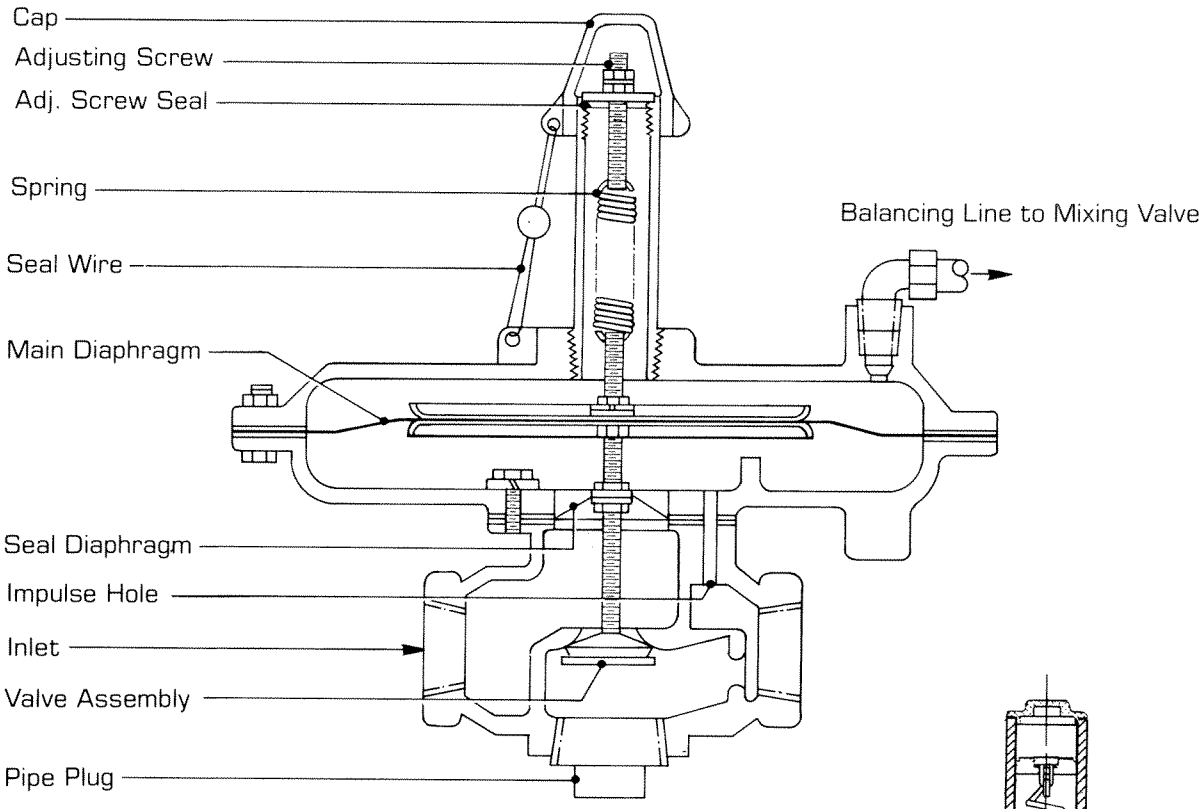
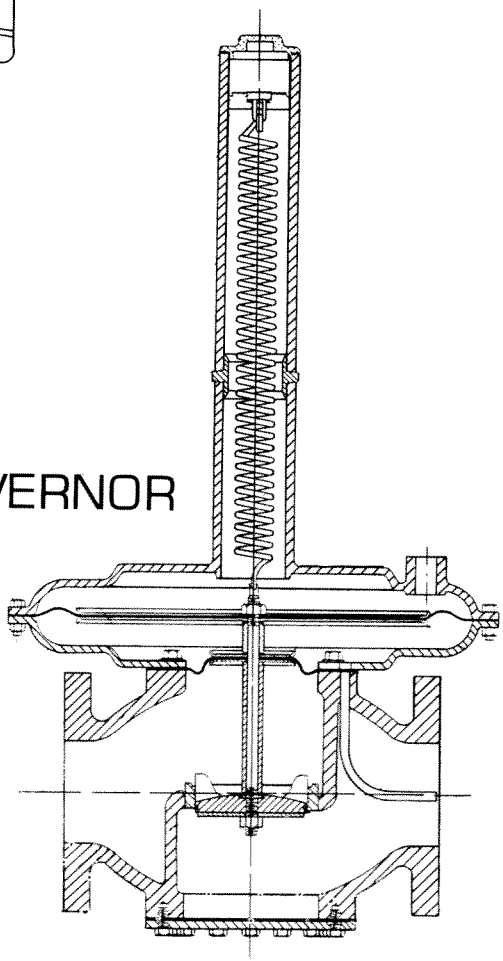


FIGURE 10—ALTERNATE GAS GOVERNOR



OPERATIONAL DIFFICULTIES

TROUBLESHOOTING CLUES

INADEQUATE FLOW OR DELIVERY PRESSURE

1. Check rpm and shaft rotation direction on blower. Most turbo-type blowers run at 3450 rpm, however always make certain that motor and blower nameplates correlate. Also check belt adjustment.
2. Check for obstructions in piping, clogged air filter, inadvertent valve closures, tripped firechecks, stuck check valve or foreign material in pipe line.
3. Check control valve linkage to determine whether adjustments have worked loose.
4. Look for excessive leaks such as loose flanges, broken couplings, blown burner tips or ruptured blow-out discs.
5. Check for damaged or leaking diaphragm in Mixing Valve.

CHANGE IN MIXTURE RATIO

1. Check ratio dial setting—perhaps knob was inadvertently moved.
2. Sticky piston—observe whether flow indicator on top of Mixing Valve rises and falls with changes in flow demand.
3. Broken sight glass. Missing or broken sight glass can allow combustion air to enter Mixing Valve without being metered.
4. Damaged diaphragm in gas governor. Proper operation can be verified by making pressure balance test. See test procedure in "Maintenance" instructions.
5. Impulse line obstruction.
6. Clogged orifice in Mixing Valve. Orifice is located in partition above Mixing Valve diaphragm; remove any obstructions.
7. Change in quality of fuel supply.
8. Loose guide pin or guide pin positioner for Mixing Valve piston.

BLOWER SURGE

Pulses in delivery flow or pressure can occur especially at low flow rates. Occasional surge of short duration might prove tolerable, but it is best to remedy the problem.

1. Determine if low flow limit can be increased beyond surge point without interfering with process.
2. Install bypass loop from blower outlet to blower inlet so that blower flow is increased without changing volume delivery to process (when large volumes need to be bypassed, water cooling may be needed to remove normal compression heat from the recirculated mixture).

BEARING NOISE

High frequency shrieks usually denote a bad bearing. Local vibration should identify whether source is in motor or blower.

ORDERING INSTRUCTIONS

When ordering parts for blower, always specify:

1. Part name or description.
2. Model and frame size of blower.
3. Serial number of blower.

When ordering parts other than for blower, always specify:

1. Quantity.
2. Part name or index number.
3. Figure number and title.
4. Serial number.
5. Catalog and reference number.

selas®
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