



Div. of UniControl Inc.

Series 9400
Master Regulator
(Type CMR)

Instruction Manual 9406.01

INSTRUCTION MANUAL 9406.01
Master Regulator (Type CMR)

Instruction Manual 9406.01

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CLEVELAND MASTER REGULATOR SERIES 9400

(FORMERLY MODELS CMR & CMRM)

INSTRUCTION MANUAL

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IDENTIFICATION

SAFETY WARNINGS

(Safety symbols and terminology per ANSI Z21.)

Failure to comply in full with the following safety requirements can result in equipment damage and personal injury/death.

1. Read the entire manual to become familiar with the use and operation of this device.
2. Only qualified personnel should attempt to install, wire, commission, startup, service or operate this device.
3. This device is not suitable for use in an explosive ambient atmosphere.
4. Before working on this device, be sure that you understand the processes affected by this device completely.
5. Before working on this device, be sure that any process affected by this device is secure and safe for servicing.
6. Take appropriate precautions to avoid electric shock when working with this device near water.
7. Exercise caution while wiring or working on this device. Multiple voltage sources may be present: take appropriate precautions to avoid electric shock.

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1.0 INTRODUCTION

1.1 Description

The Series 9400 Cleveland Master Regulator is a self-contained, fully automatic firing rate controller; combining sensing element, response mechanism and power actuator in one compact unit. It regulates fuel or air supply (or both) in direct proportion to pressure or temperature demand signals.

The Model 941X (CMR) is available for use with Single Point Positioning Systems only. It does not have the capability of being used with a Series 7200 Man/Auto Station because of no feedback signal availability but can have the Man/Auto capability by use of independent Man/Auto and Inc/Dec switches. (See Fig. 3)

The Model 942X (CMRM) includes a re-transmitting potentiometer. It can be used with an Auto/Manual Control Station, Series 7200, and either Single Point or Two Point Positioning Systems. (See Fig. 4 or 5)

1.2 Model Nomenclature

The basic catalog number for the Cleveland Master Regulator is 94. To this model description add suffixes B through HH to build the complete catalog number for your particular instrument.

Selection can be made by choosing the number adjacent to the desired function. When a suffix is not applicable, use a zero (0). If no options are desired (HH), complete the number with a double zero (00).

If the Master Regulator is for water temperature applications, you will need to select range, capillary and desired well or bulb. The immersion bulb is integral to the capillary when shipped. The wells are packed separately.

9 A B C - D E F G - HH

A TYPE

Master Regulator	4
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E APPLICATION:

without Potentiometer	1
with Potentiometer	2

C LOCAL MANUAL OPERATION

N/A	0
Handwheel	1

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D	STROKE:	
	6 inch, 30 seconds	1
	6 inch, 60 seconds	2
	6 inch, 120 seconds	3
E	CONTROL RANGE:	
	0 to 30 psig Steam Pressure	1
	20 to 100 psig Steam Pressure	2
	75 to 300 psig Steam Pressure	3
	300 to 800 psig Steam Pressure	4
	150 to 275 ^o Water Temperature	5
	200 to 375 ^o F Water Temperature	6
	250 to 450 ^o F Water Temperature	7
	Special	9
F	CAPILLARY:	
	(with water temperature models only)	
	Steam Pressure Models	0
	10 feet (std)	1
	20 feet	2
	30 feet	3
	40 feet	4
	50 feet	5
	60 feet	6
	70 feet	7
	Special	9
G	WELLS	
	(with water temperature models only)	
	Steam Pressure Models	0
	Removable copper well	1
	Removable stainless steel well	2
	Non removable direct immersion bulb	3
HH	OPTION:	
	N/A	00

1.3 Theory of Operation

Cleveland Master Regulators are used on single boiler applications where precise control through heavy duty positioning devices is a major criteria. These units can be used on all types of boilers or generators particularly where the valves and dampers to be moved in the combustion process require more thrust with more precise action than is deliverable from smaller actuating devices. Since the sensing, controlling and actuating is all accomplished in one unit the cost of field installation is reduced and the necessity to find mounting locations for more than one device is eliminated.

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The basic operation of the master regulator is the same regardless of whether it is used in a temperature sensing or steam pressure sensing control system. In the temperature sensing unit, a filled capillary and bulb type sensor is used with the capillary fill exerting a pressure on the bellows of the master regulator in proportion to the temperature sensed. On a steam pressure system, that pressure is sensed directly on the bellows assembly.

Movement of the bellows assembly by either of the sensing means causes the balance beam to be offset in proportion to the bellows motion. The spring tension adjustable as the set point function (See 2.5A) acts also on the beam with differences between the bellows motion and the spring tension causing an upset in the sensing switch assembly.

The sensing switch action, through the solid state switching circuitry, causes the slow speed, multi-pole motor to move in one direction or the reverse. The motor turns a drive screw which in turn causes the drive nut and hence the drive tube to move outward from the enclosure or retreat back into the enclosure.

The inward and outward motion is the direct result of the direction of rotation of the motor as directed by the sensing switch assembly. The motion stops when the sensed pressure on the bellows assembly equals the set point spring tension. The action is repeated, as necessary, each time an imbalance occurs and is maintained as long as the imbalance is sustained.

The amount of imbalance necessary to cause the actuator motion can be adjusted within predetermined limits by turning the sensitivity adjustment clockwise to decrease the amount of imbalance necessary for respective motion and counterclockwise to increase that amount. (See 2.5B)

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2.0 SPECIFICATIONS

2.1 Design Criteria

POWER REQUIREMENTS	120 volts, 50/60 Hz
POWER CONSUMPTION	Less than 1.0 amp
PRESSURE RANGES	0-30, 20-100, 75 to 300, or 300 to 800 psig
TEMPERATURE RANGES	150-275, 200-235 or 250-450°F
SWITCHING	Sealed, positive snap-action switches with solid state switching device.
END SWITCHES	Two SPDT, rated 10 amps, at each end of stroke. Provide high and low fire interlocking for pro- gramming.
MOTOR	Sealed, heavy duty, gearhead, 60:1 reduction. Reversible, capacitor-start-run, permanently lubricated, dynamic braking.
STROKE	6"
FULL STROKE TIME/THRUST (seconds)	30/75# 60/150# 120/300#
ADJUSTMENTS	External knobs for controlling set point and firing rate. In- ternal sensitivity and pro- portional band adjustments.
SET POINT	Adjustable to 1% of control range
POTENTIOMETER	4,000 ohms standard (Potentiometer on 9420 Models Only)
FIRING RATE SELECTOR	Standard, for selecting maximum firing rate
WELLS	Separable copper 1/2" NPT P.N. 11868 Separable stainless steel 1/2" NPT P.N. 12177 Direct Immersion Bulb 3/4" NPT P.N. 13282 Weight: 26 lbs. Shipping Weight: 28 lbs.
ENCLOSURE	Fully gasketed, dust tight, heavy gauge construction

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2.2 Recommended Usage

Cleveland Master Regulators are used primarily on single boiler or generator installations or where the necessity to modulate the boiler or generator is independent of any other boiler or generator supplying energy to the system. Having more than one unit of the same system being controlled by master regulators usually leads to the units, so equipped fighting each other for load carrying rights. This will result in load swings and poor operating efficiency. We would recommend employing a plant master type system when trying to control more than one boiler or generator supplying a common system.

As shown in figures 3, 4 and 5 the master regulator can be used by itself to control both the fuel and combustion air through a jackshaft arrangement (Fig. 3 & 4) or by combining a CLA-P linear actuator with the master regulator to provide separate control for both the fuel and combustion air (Fig. 5). The two point positioning systems thus can provide fuel/air ratio capability and improved boiler efficiency.

3.0 INSTALLATION

3.1 Mounting

The Cleveland Master Regulator should be mounted on a flat rigid surface in a location and position convenient for providing straight line thrust through linkage or jackshafting to the units it controls. Ambient or radiant temperatures shall not exceed 125°F. The mounting location should be free from excessive vibration. Mounting dimensions are shown in Figure 1.

3.2 Wiring

Figures 3, 4 & 5 show typical external wiring for Single and Two Point Positioning Regulators. Figure 2 shows internal wiring.

Terminal 1 should be wired externally to the switch or relay contact that is energized when the Regulator is to operate on automatic. This terminal is internally wired to the motor dynamic brake assembly and also to the solid state switching device through a 3/8 amp fuse. The external connection is ultimately made to the 120 volt hot power source.

Terminal 2 is wired to the common or neutral side of the 120 volt power source.

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Terminal 3 is connected to the motor winding that drives the thrust bar to the retracted position. It is powered by Terminal 5 directly through a jumper or indirectly through other switching.

Terminal 4 is connected to the motor winding that drives the thrust bar to the extended position. It is powered by Terminal 6 through the maximum firing rate switch.

Terminal 5 is connected through the solid state switching module to the control sensing switches. It is powered when the control is on automatic and demand is for a decrease in firing rate. Terminal 5 must be connected to Terminal 3 either by a direct jumper or indirectly through external switching such as a low fire start relay, toggle switch, etc.

Terminal 6 is connected to Terminal 4 through the maximum firing rate switch. Terminal 6 must be connected to Terminal 9 through external switching or by direct jumper to power the control when on automatic and demand is for an increase in firing rate.

Terminal 7 and 8 are wired to the normally open contacts of the inward auxiliary limit switch. These contacts are mechanically closed when the thrust bar is fully retracted at low fire position. To prevent the start of the firing unit, except when the Master Regulator is in the low fire position, Terminals 7 and 8 should be externally wired to the low fire start circuit of the ignition programmer or other starting device.

Terminal 9 is connected to the control sensing switches through the solid state switching module.

Terminals 11 and 12 are internally wired to the normally open contacts of the outward auxiliary limit switch. These contacts are mechanically closed when the thrust bar is fully extended (high fire position).

Terminals X, Y and Z are internally connected to the re-transmitting potentiometer of 9420 Models. They are connected externally as shown in Figure 4 and 5.

Note: Diagram and above wiring apply to all units manufactured after 9-1-81. Model number will be followed with a letter A.

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3.3 Sample Connections

Steam Pressure Applications. The sample line is run from the sensing point of the steam boiler to the 1/4" female tapped connection at the bottom of the Master Regulator. The sample line should have a downward pitch of at least 1 inch per running foot. The line should be of sufficient size (minimum 1/2" pipe) to reproduce the sensed pressure accurately at the regulator. On short runs of sample piping, furnish a condensate collection device to prevent direct steam contact with bellows. Install a union connection for ease of installation and removal. As a convenience, a shut off valve should be installed upstream of the union. High pressure limit switches must be included for safety considerations. Fittings, rated for line pressure, must be doped, tight, and free from abnormal strain. Installation must be in accordance with local code requirements. It is recommended that provision be made for a drip leg to allow blowing down the sample line. The final connection between the sample line and the regulator should be made with copper tubing. (See Fig. 6)

Hot Water Applications. The temperature sample line is a specified length of armored capillary tube, with immersion bulb, furnished with the Master Regulator. It is factory connected directly to the bellows and is a sealed system. It should not be cut, crimped or sharply bent. Any excess length must be coiled. Unless the special direct immersion fitting is used, separable wells are required. They are available in copper or stainless steel and may be purchased through Cleveland Controls, Inc. The sensing point should be in the main header. It is recommended that silicone oil or some other non-evaporating liquid be used to fill the space between the bulb and inside wall of the well for better heat transfer and faster response.

3.4 Linkage

The recommended linkage system for connecting the Series 9400 Master Regulator to the fuel valve and fan is shown schematically in Figure 7 (Single Point Positioning System) and Figure 8 (Two Point Positioning System). The adjustable lever arms (P/N 11372) and clevis turnbuckle assemblies (P/N 26908) are available from Cleveland Controls, Inc.

3.4.1 Single Point Positioning System (See Fig. 7)

The single point system consists of a jackshaft (A), three adjustable lever arms (B1, B2, B3), three sets of clevis turnbuckle assemblies (C1 through C6) and three lengths of 1/2" pipe (D1, D2 and D3).

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The system is installed as follows:

1. Install the jackshaft (A) in a location and position convenient for linkage to the units controlled. The Master Regulator should be located for convenient linkage to the jackshaft. NOTE: Make sure the jackshaft is located so that linkage to the Master Regulator and to units controlled is at least 2 feet long. For most effective thrust, make linkage as long as practical, with Regulator and jackshaft positioned so that thrust is as nearly as possible in line with movement of linkage.
2. Attach the three adjustable lever arms (B1, B2, and B3) to the jackshaft in line with 1) the thrust arm of the Regulator, 2) the lever of the fuel valve, and 3) the lever of the fan damper.
3. Attach a clevis turnbuckle assembly (C2, C3 and C5) to each lever arm by inserting the clevis pin through a hole in the arm. It is recommended that the third hole from the end be used to provide later adjustment in either direction. Make sure that bronze bushings provided have been inserted in the holes used. All turnbuckle assemblies should be adjusted so that approximately one inch of threaded rod extends through the pipe fitting adapters.
4. Attach another clevis turnbuckle assembly (C1) to the Regulator thrust bar (which has been positioned to approximately the mid point of its travel) with the clevis pin (E) furnished with this assembly.
5. Link turnbuckles (C1) and (C2) with a 1/2" pipe (D1) that will position the lever arm at right angle to the thrust.
6. Link turnbuckle (C3) to the fuel valve lever (positioned at approximately the mid point of its travel) with the length of a 1/2" pipe (D2) that places both levers at right angles to thrust direction. Another turnbuckle assembly (C4) is used to connect pipe linkage to valve lever.
7. Test the full free movement of the fuel valve linkage as follows: Disconnect clevis at Regulator by removing pin (E). Operate the Regulator electronically through its full range of travel several times while holding clevis (C1) in simulated connected position and moving it to open and close the fuel valve manually.

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Make sure that linkage moves freely without restriction or binding, and that valve moves to the maximum open and closed positions required.

8. Follow the same procedure in linking the third lever arm (B3) to the fan damper lever.
9. When both units have been found to move freely with linkage through the full range of travel, linkage may be reconnected with Regulator and the entire system may be operated electrically.
10. With boilers operating, refinements in adjustments must be made over the full firing range, to provide the correct proportioning of fuel and air for efficient combustion. A variety of adjustments and combination of adjustments are available:
 - A. Each turnbuckle may be shortened or lengthened. Adjustment is from 5 to 8-3/4".
 - B. Clevis connections at lever arms and at levers on fuel valves or fan may be moved to another of the holes provided, to increase or decrease lever travel with relation to thrust. Make sure that the hole selected will not create a "dead center" position at any point.
 - C. Fixed positions of lever arms on jackshaft can be adjusted by loosening clamp and set screw (F) and rotating lever in either direction. Make sure screws are again secured when adjustment is completed.
 - D. If, after making adjustments as described, the full stroke of the Master Regulator thrust bar provides too much movement, travel distance can be shortened by moving the adjustment, switch trip, to a point farther from the guide nut. It is recommended, however, that the full stroke, or as much as possible, be used. Does not apply to 9420 Models.

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3.4.2 Two Point Positioning System (See Fig. 8)

In Two Point Positioning Systems the Master Regulator (Series 9400) positions the fuel valve. The recommended linkage consists of clevis turnbuckle assemblies, and a length of 1/2" pipe. Install as follows:

1. Connect clevises (C1 & C2) to Regulator thrust arm and fuel valve lever.
2. Link these clevises with a length of 1/2" pipe (D1) that will position the valve fully closed with the thrust arm fully retracted, and open the valve as the arm is extended.
3. Similarly connect the CLA-P (Linear Actuator) to the lever of the fan damper utilizing clevises C3 & C4 and their interconnecting 1/2" pipe D2.
4. Test for free movement as in Step 7 above.
5. Make refinements in adjustments with boiler operating as in Step 10 above (reference to lever arms and jackshaft do not apply. Also, disregard Paragraph D, since the 9420 must use full 6" stroke because of potentiometer feedback signal.)

NOTE: Master Regulators must be connected so that fully retracted thrust bar is minimum fuel and/or air, and outward travel increases fuel and/or air. No reverse action is possible on the regulator.

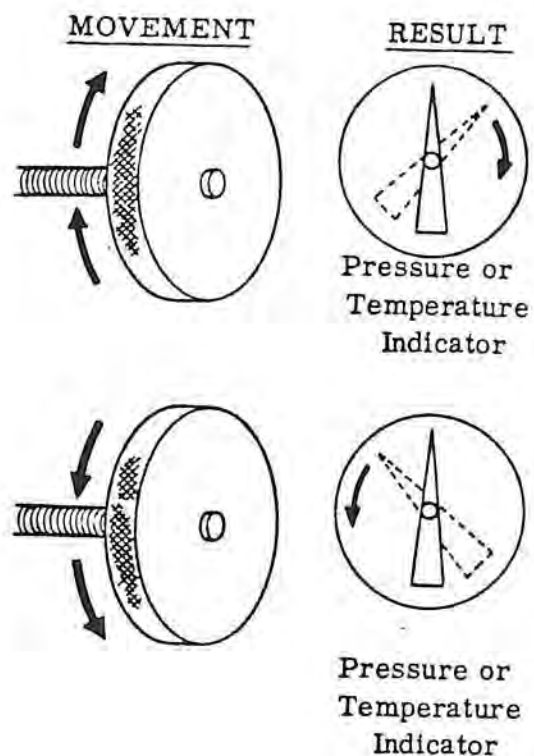
3.5 Adjustments

Reference Figures 9 & 10

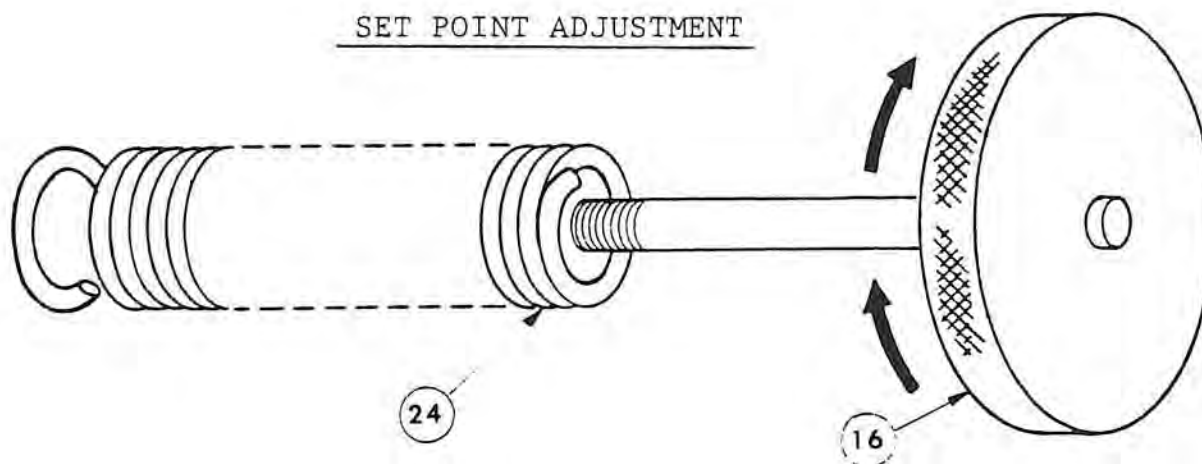
A. Control Set Point

1. The set point adjuster (16) selects pressure or temperature to be maintained. Clockwise rotation raises set point, counter-clockwise lowers it by changing tension on main loading spring (24). Adjustment must be made in small increments, allowing control to settle out after each change. This adjustment can be made only when boiler is firing. Observe indicating gage when adjusting set point.

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2. Control should "settle out" with traveling switch trip approximately midway between limit switches.
3. If control hunts continuously or if control response is not as required after making set point adjustment. (See. B. Sensitivity Adjustments)



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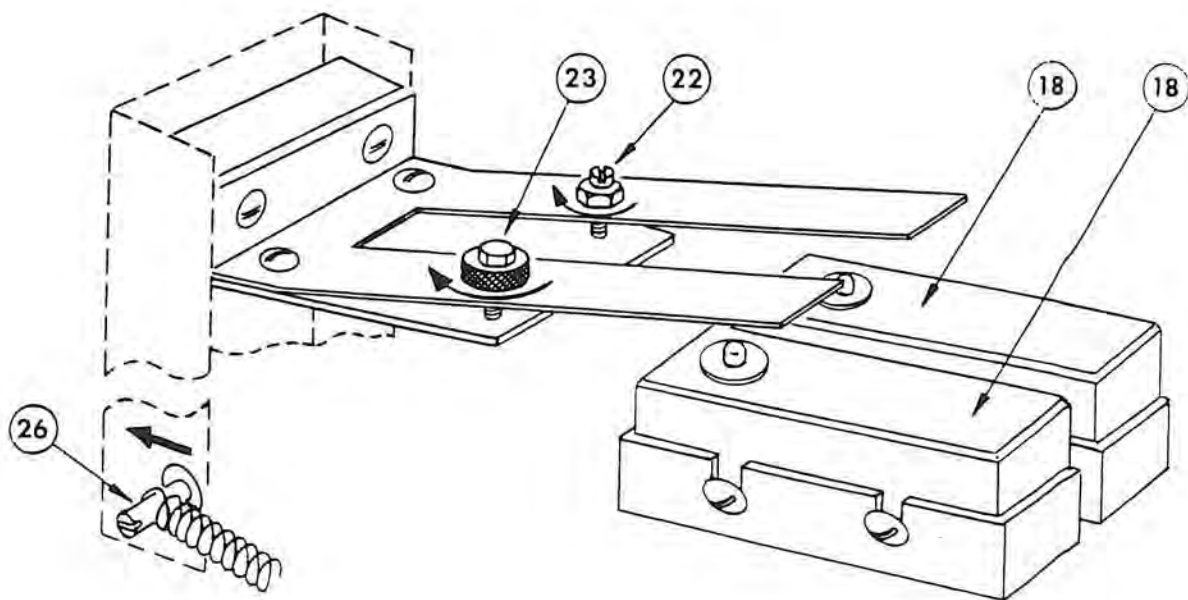
B. Sensitivity Adjustment

The sensing switches (18) have a contacting finger over each button, each with its own adjusting screw. The knurled brass screw (23) over the front switch is the field adjustment for sensitivity and easily accessible for adjustment by hand.

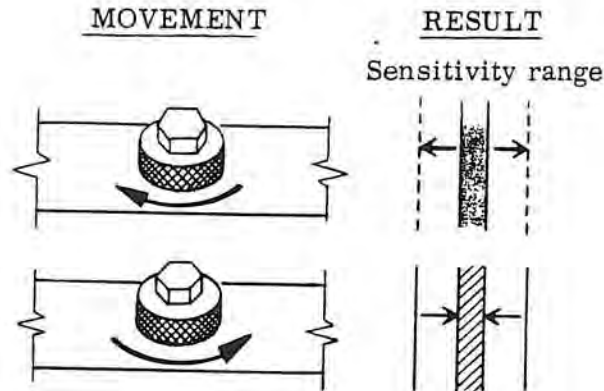
If the control is unstable and "hunts" excessively, this may be corrected by turning the screw clockwise, to decrease the sensitivity. If control tends to lag, this may be corrected by turning the screw counter-clockwise to increase sensitivity. NOTE: A very slight movement makes an effective change.

The screw over the rear switch (22) is factory set and should be field adjusted only by qualified personnel, and only when absolutely necessary. Factory setting is correct for practically every installation -- often it is necessary to change setting of screw (23).

SENSITIVITY ADJUSTMENT



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If, however, sensitivity cannot be adjusted satisfactorily with (23), switches may not be properly balanced. Correction requires a very sensitive adjustment. Follow these instructions exactly and make adjustments in very small increments.

1. Make sure that sensing switches are properly aligned and that contact fingers are not touching bodies of switches.
2. With power on and control on "automatic" turn both adjusting screws (22 and 23) counter-clockwise until contact fingers are away from switch buttons. Traveling switch trip (10) will now move to high fire position.
3. Stabilize spring pin (26) in exact center of hole by rotating set point adjuster or by inserting wedges temporarily on each side of pin or by other convenient means.
4. Turn factory adjusting screw (22) very gradually clockwise until its contacting finger just slightly depresses button of its switch.
5. Turn field adjusting screw (23) very gradually clockwise until a slight movement of the spring pin (26) to the left causes switch trip (10) to start moving.
6. Hold spring pin toward left until switch trip reaches approximately the mid position of its travel.

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7. Follow instructions above for adjusting sensitivity with screw (23), and recheck control set point adjustment.

If your first attempt does not produce desired results, start again with step 1.

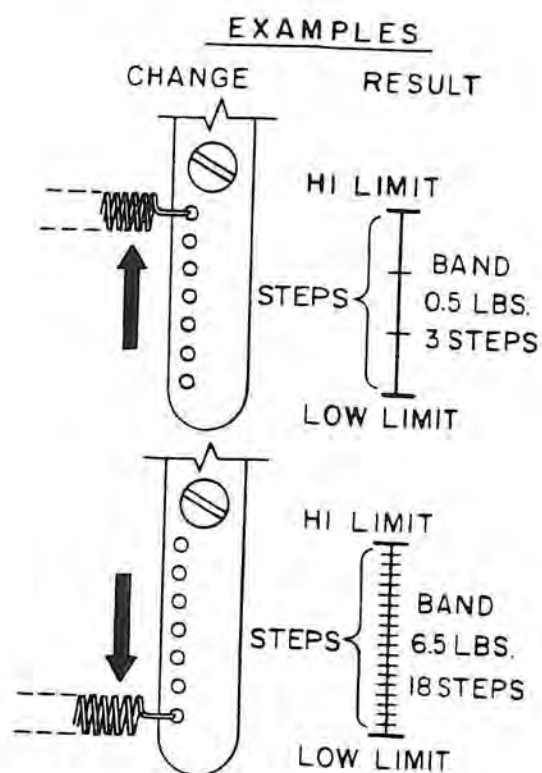
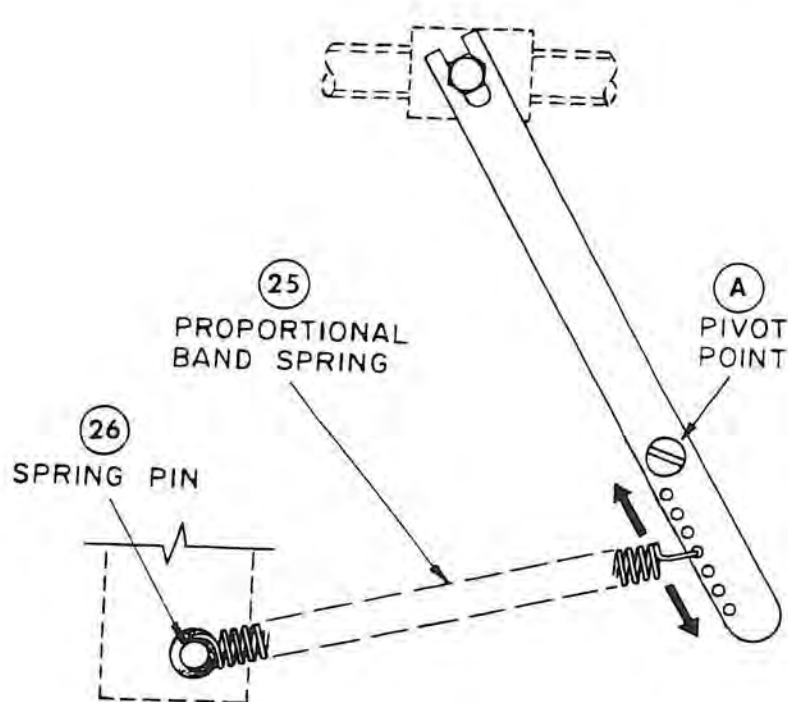
C. Proportional Band Adjustment

This adjustment provides an accurate variation of response of the control, with relation to the response of the boiler, to variations of the load. With this feature, control response can be varied over a wide band to make firing rate corrections directly proportional to load demands.

If boiler recovery tends to lag, greater control response can be obtained by decreasing the proportional band. This is done by relocating the end of the proportional band spring (25) in a hole closer to the pivot of the compensating beam.

If the control causes over-firing, an increase in the proportional band is required. To correct this condition, relocate the spring farther from the pivot (A).

PROPORTIONAL BAND ADJUSTMENT



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Both these adjustments make a uniform correction for a given error over the entire range.

The factory setting of the proportional band spring is correct for most applications. Adjustments can be made to meet specific field conditions.

NOTE: Before making adjustment be sure that spring pin (26) is centered in the hole limiting its movement. (See B Sensitivity Adjustment above).

The factory setting for the proportional band spring is in the middle hole of seven.

D. Maximum Firing Rate Selector

For installations where it is desired to modulate the boiler for sustained periods at reduced firing rates, an external selector knob (20) is provided. Rotation of this knob positions the maximum firing rate switch, permitting the selection of any maximum firing rate from low fire to 100%.

4.0 MAINTENANCE

4.1 Lubrication

The speed reducer gearhead is packed in grease and the motor is lubricated and sealed at the factory. The acme screw has a standard alemite fitting for maintenance lubrication. It and the guide bar beneath the screw are lubricated at the factory with grease. In the field, occasional light lubrication of guide bar is recommended.

Frequency of maintenance lubrication depends on usage and ambient temperature. A regular schedule of inspection is recommended for maintaining maximum operating efficiency and equipment life. Do not overload with grease - excessive lubrication may cause problems.

4.2 Factory Repairs

A defective unit may be returned to the factory for repair service. Factory authorization must be obtained before shipping. Cleveland Controls will not be responsible for any loss, damage, delays or mishandling if proper authorization has not been received.

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Pack the unit securely and include a detailed description of the difficulties encountered. Include Model and Serial Numbers of the unit plus all available original ordering information. All units returned to the factory must be shipped prepaid.

Warrantee service must be done at the factory.

5.0 PARTS LIST

*Refer to Figures 9 and 10

<u>MODEL NO.</u>	<u>REF. NO.</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>
94XX-1XXX-00	6	13377	Drive Screw Assembly
94XX-2XXX-00			(Includes screw, nut & thrust bearing)
94XX-3XXX-00	6	13379	Drive Screw Assembly
			(Includes screw, nut & thrust bearing)
94XX-1XXX-00	1	13386	Motor
94XX-2XXX-00	1	13846	Motor
94XX-3XXX-00			
94XX-X100-00	27	13622	Bellows Assembly
94XX-X200-00	27	12237	Bellows Assembly
94XX-X300-00			
94XX-X400-00	27	12933	Bellows Assembly
A11	5	13391	Capacitor & Brake Assembly
A11	7	12965	Inward Limit Switch Assembly
A11	11	12966	Outward Limit Switch
A11		12336	Bushing (Drive Tube)
A11		11010	Retaining Ring (Bushing)
A11	15	14417	Solid State Switching Device
A11	18	★ 10269	Sensing Switch - REQUIRES SOLDERED WGS
A11	20	15120	Firing Rate Selector Assembly
942X-XXXX-00	28	11928	Potentiometer
A11		16135	Fuse 3/8 Amp
A11		146	Coupling (Motor)
A11	13	10467	Eyebolt
942X-XXXX-00	29	26984	Ladder Chain

For replacement capillary assemblies, supply master regulator model number.

★ **SOLDERING REQUIRED TO INSTALL.**

6.0 TROUBLESHOOTING

<u>CONTROL PROBLEM</u>	<u>PROBABLE CAUSE</u>	<u>CORRECTIVE MEANS</u>
Thrust Bar Will Not Reverse	A. Set point not within control range	A. Readjust set point
	B. Control range incorrect	B. Check for proper range & replace with proper controller.
	C. Firing rate knob set at zero.	C. Reset knob.

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<u>CONTROL PROBLEM</u>	<u>PROBABLE CAUSE</u>	<u>CORRECTIVE MEANS</u>
	D. Incorrect wiring	D. See wiring instructions
	E. Motor failure	E. Check motor, resistors, capacitor, limit switches and wiring
	F. Switch failure	F. Be sure switches are secure
Stalling During Operation	A. Excess load	A. See maximum load rating
	B. Binding linkage	B. Check link connectors
	C. Switch failure	C. Check all switches
No Modulation	A. Incorrect wiring	A. Check wiring instructions
	B. Sample Line failure	B. Blow out sample line & check for closed valves or breaks in line
	C. Sensitivity too wide	C. See adjustment instructions
	D. Proportional band too wide	D. See adjustment instructions
	E. Faulty sensing switches	E. Check against manual operation & replace if necessary
Hunting	A. Sensitivity too fine	A. See adjusting instructions
	B. Faulty sensing switches	B. Check against manual operation & replace if necessary
	C. Extreme sample pulsations	C. Use snubber or other remedy as required
Hi-to-low Operation	A. Sensitivity too wide	A. See adjusting instructions
	B. Proportional band too narrow	B. Widen per instructions
	C. Improper operating range	C. Note control range limitations. Order control or parts for range required

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6.1 Temporary Operating Instructions

1. Without Solid State Switching Device (P/N 14417)

In the event the Cleveland Master Regulator cannot be removed and returned to the factory for repairs and an electrical check indicates that the solid state switching device (part number 14417) has failed, it is possible to remove the device and continue to operate the Master Regulator on an emergency basis.

However, operating the Master Regulator without the device places the Motor's full electrical load on the sensing switch contacts. If this condition is permitted for any extended time, the contacts will burn and the switches will become inoperative.

Removal of part number 14417 is an emergency procedure for a temporary condition. It is recommended that the sensing switches be replaced when a new 14417 is installed.

Cut all wires leading to part number 14417. Strip and jumper wires tan to green, brown to orange and yellow to white. Once part is isolated, loosen two screws and remove device from Regulator. (See fig. #2)

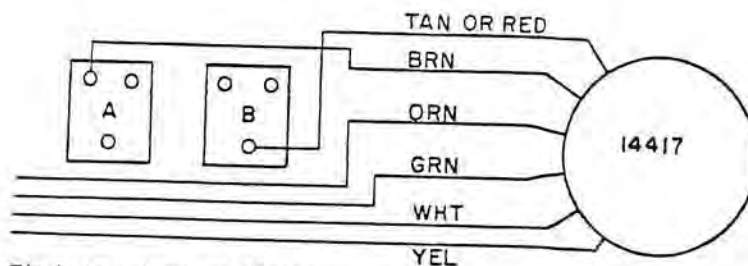


Fig. 1 As wired at factory.

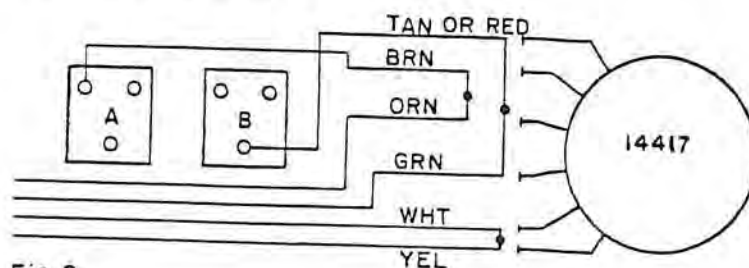


Fig. 2

CLEVELAND MASTER REGULATOR
SERIES 9400
(FORMERLY MODELS CMR & CMRM)

CAUTION

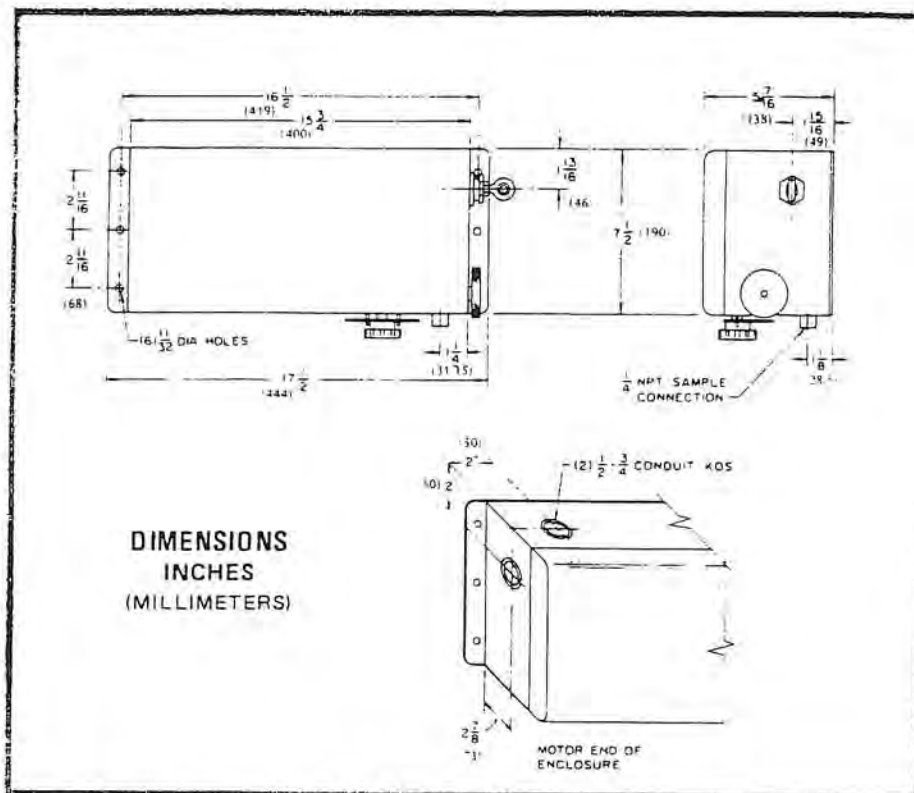
Tan (light brown) wire is often confused with brown wire. To be sure of correct wire trace brown wire to bottom sensing switch (A) and trace tan wire to upper sensing switch (B) before proceeding.

2. Without Firing Rate Selector

If the firing rate selector switch is found to be defective or that item appears to be giving trouble, the switch can be electrically removed from the operation by jumpering terminals 4 and 6 together. Remember that with this jumper in place you will no longer have any firing rate restriction but the control will operate as if the switch were set at 100%.

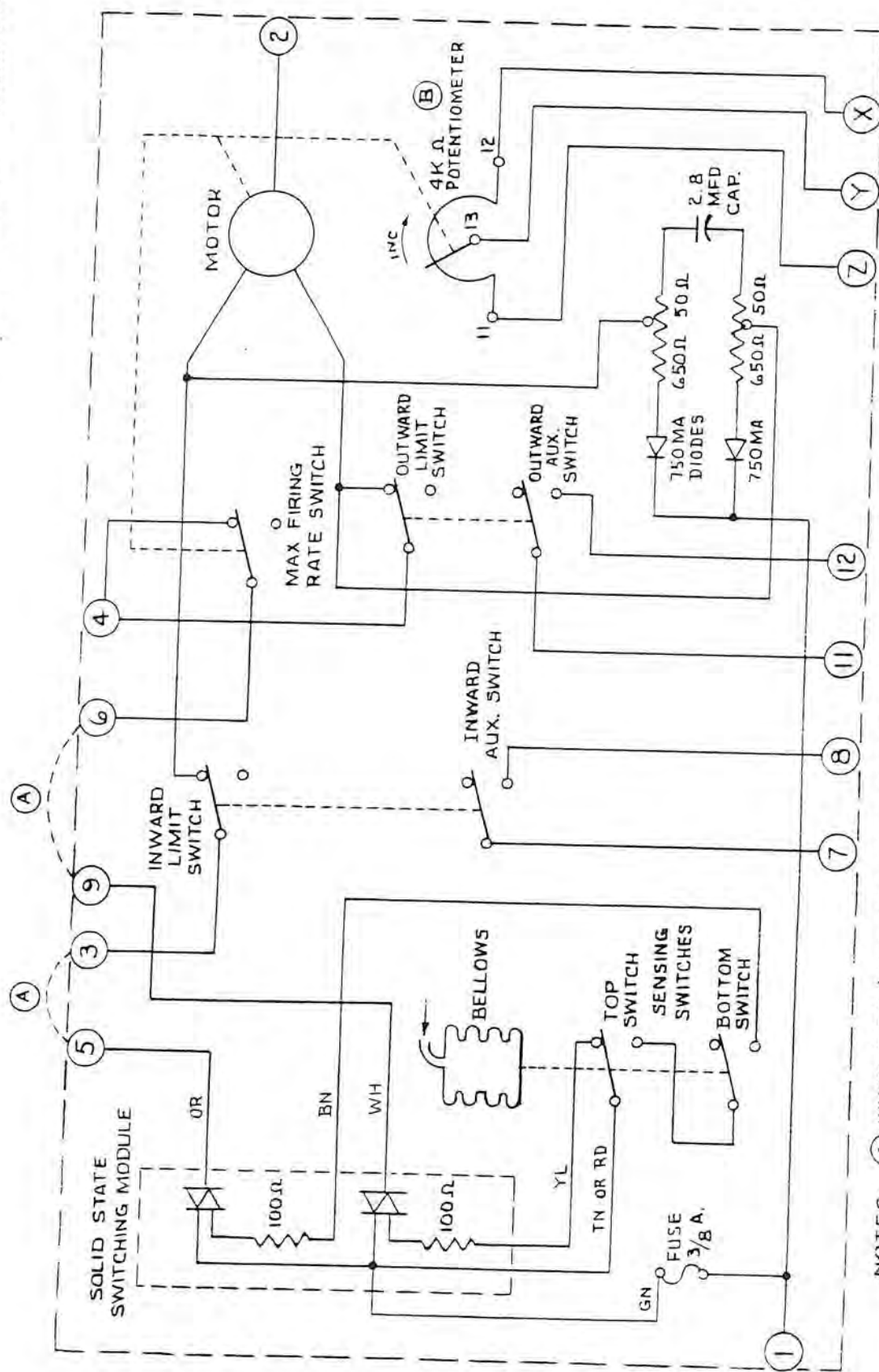
NOTE: Both of the above corrections are temporary corrections and permanent solutions should be instituted as soon as possible

WHEN INFORMATION OR PARTS ARE NEEDED GIVE MODEL AND SERIAL NUMBER.



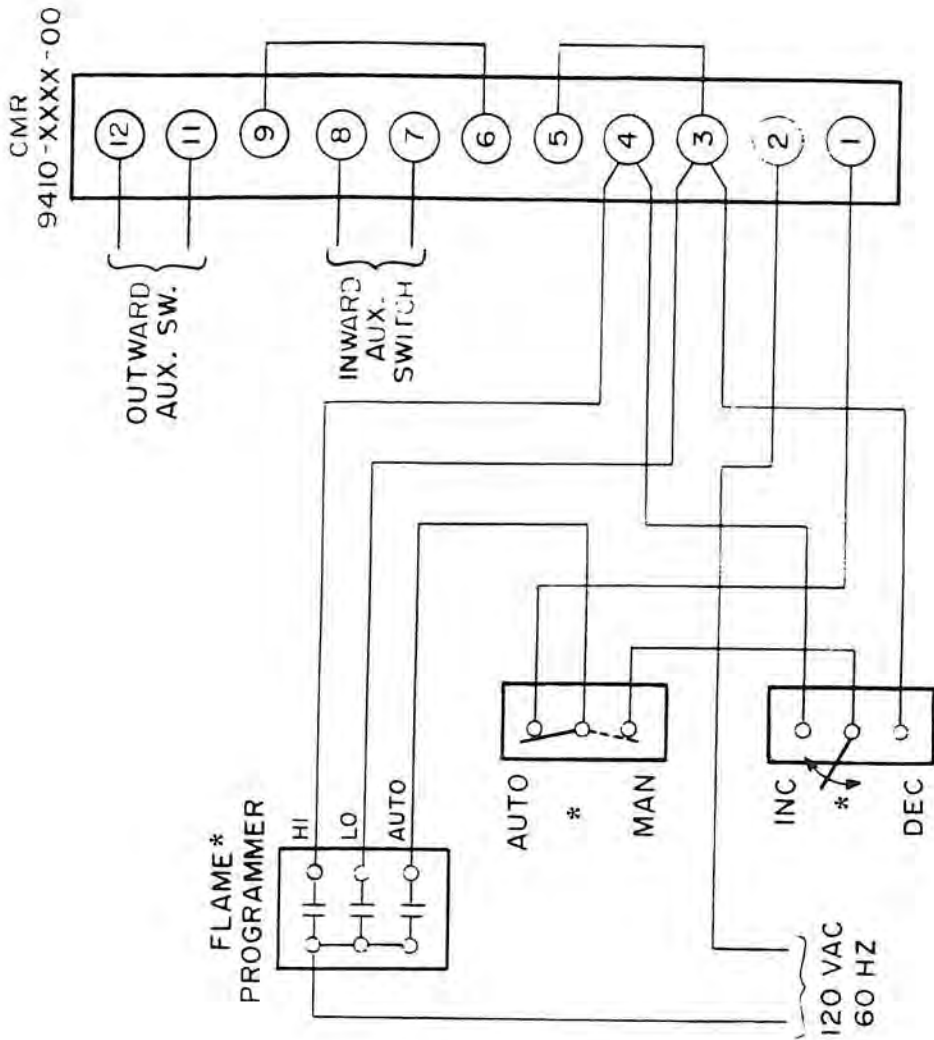
DIMENSIONS

FIGURE 1



- NOTES:
- (A) WHEN AUTO/MAN FUNCTIONS ARE NOT REQUIRED JUMPER TERMINALS 5 TO 3 & 9 TO 6.
 - (B) POTENTIOMETER & ASSOCIATED TERMINALS NOT USED ON 9410 SERIES.

INTERNAL WIRING
FIGURE 2

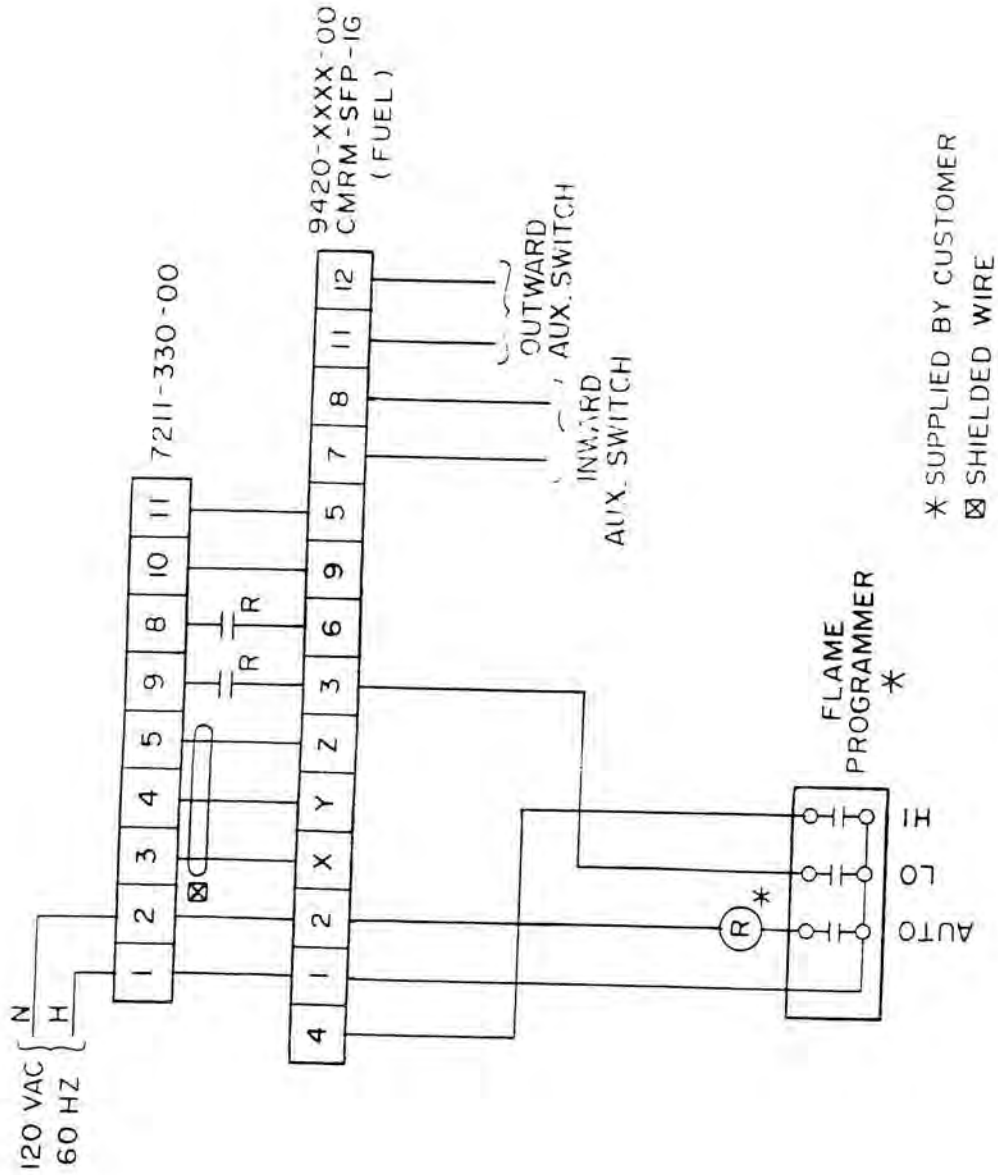


* SUPPLIED BY CUSTOMER

EXTERNAL WIRING - SINGLE POINT POSITIONING

MODEL 9410

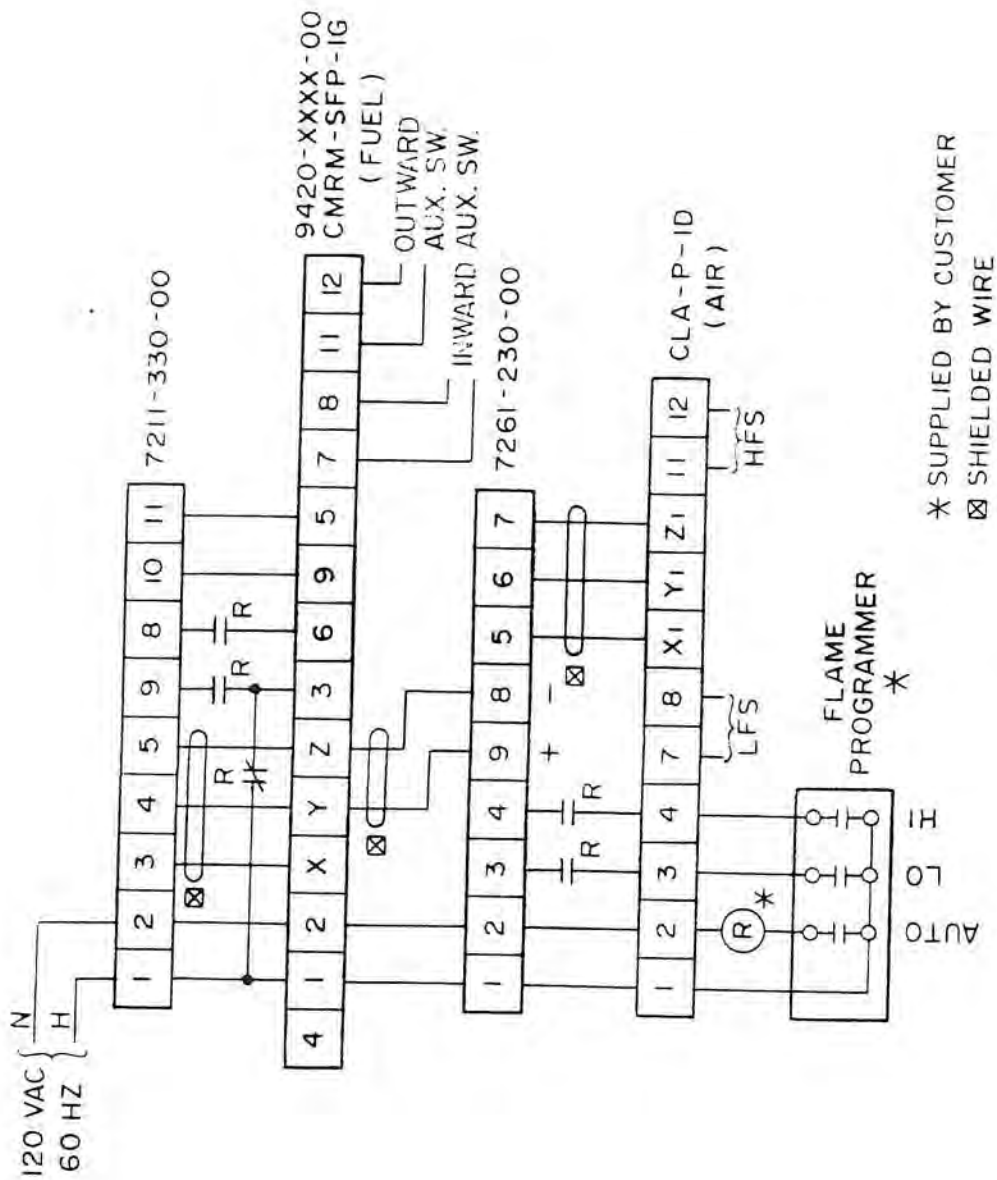
FIGURE 3



EXTERNAL WIRING - SINGLE POINT POSITIONING.

MODEL 9420

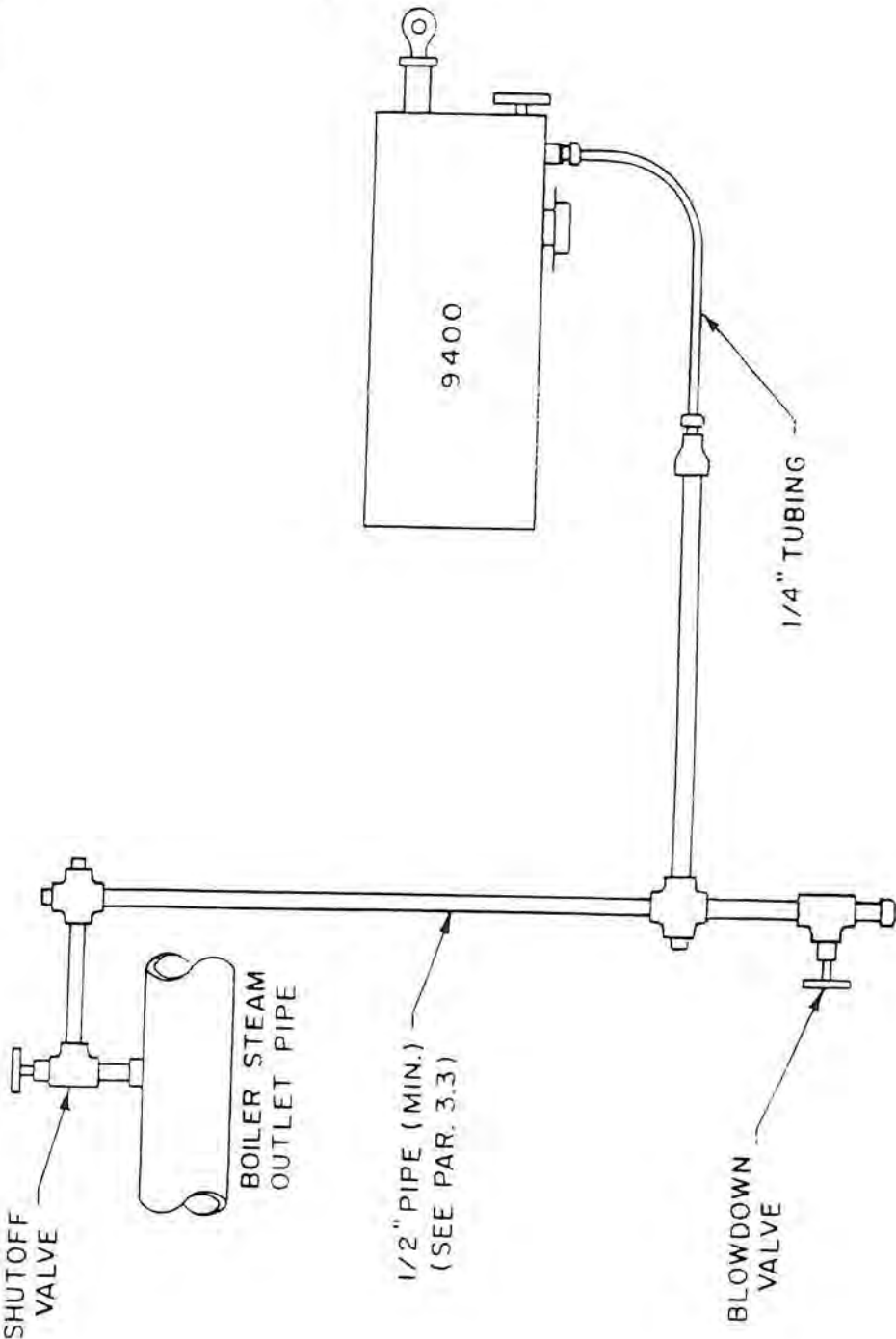
FIGURE 4



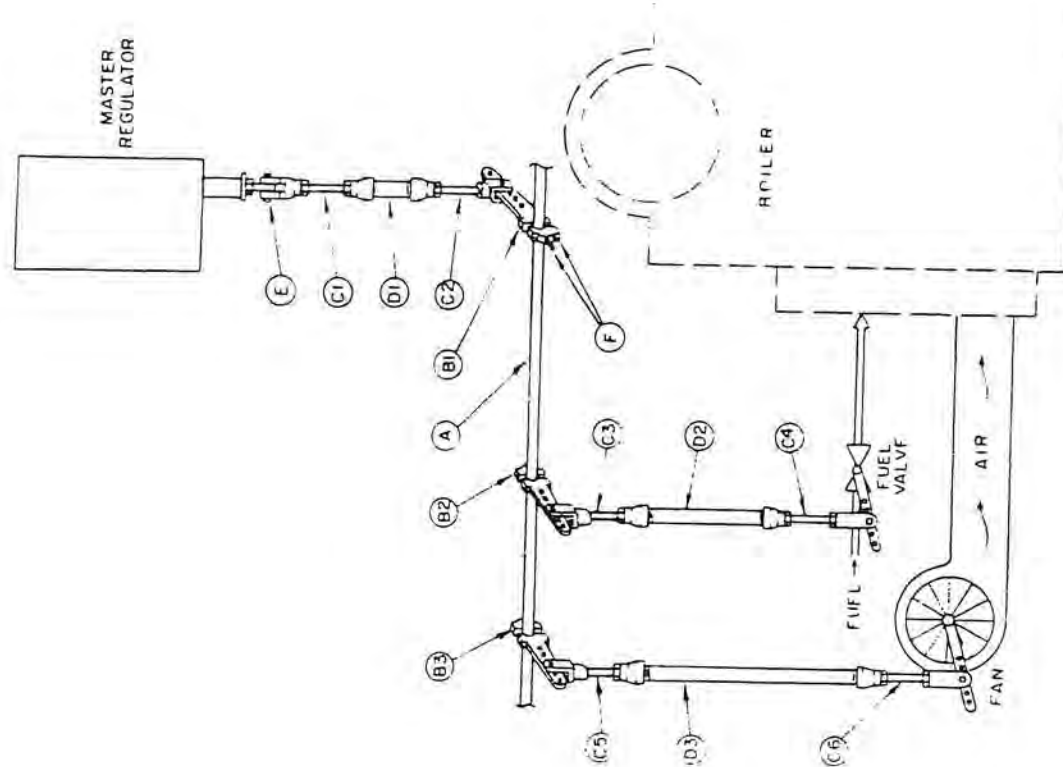
EXTERNAL WIRING - TWO POINT POSITIONING

MODEL 9420

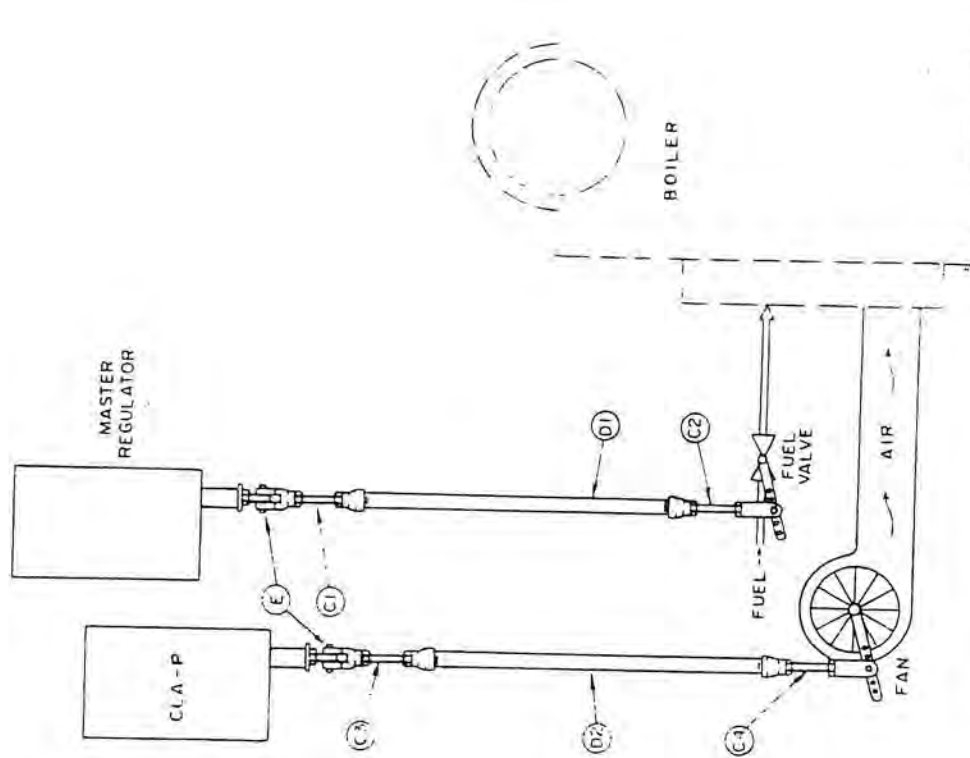
FIGURE 5



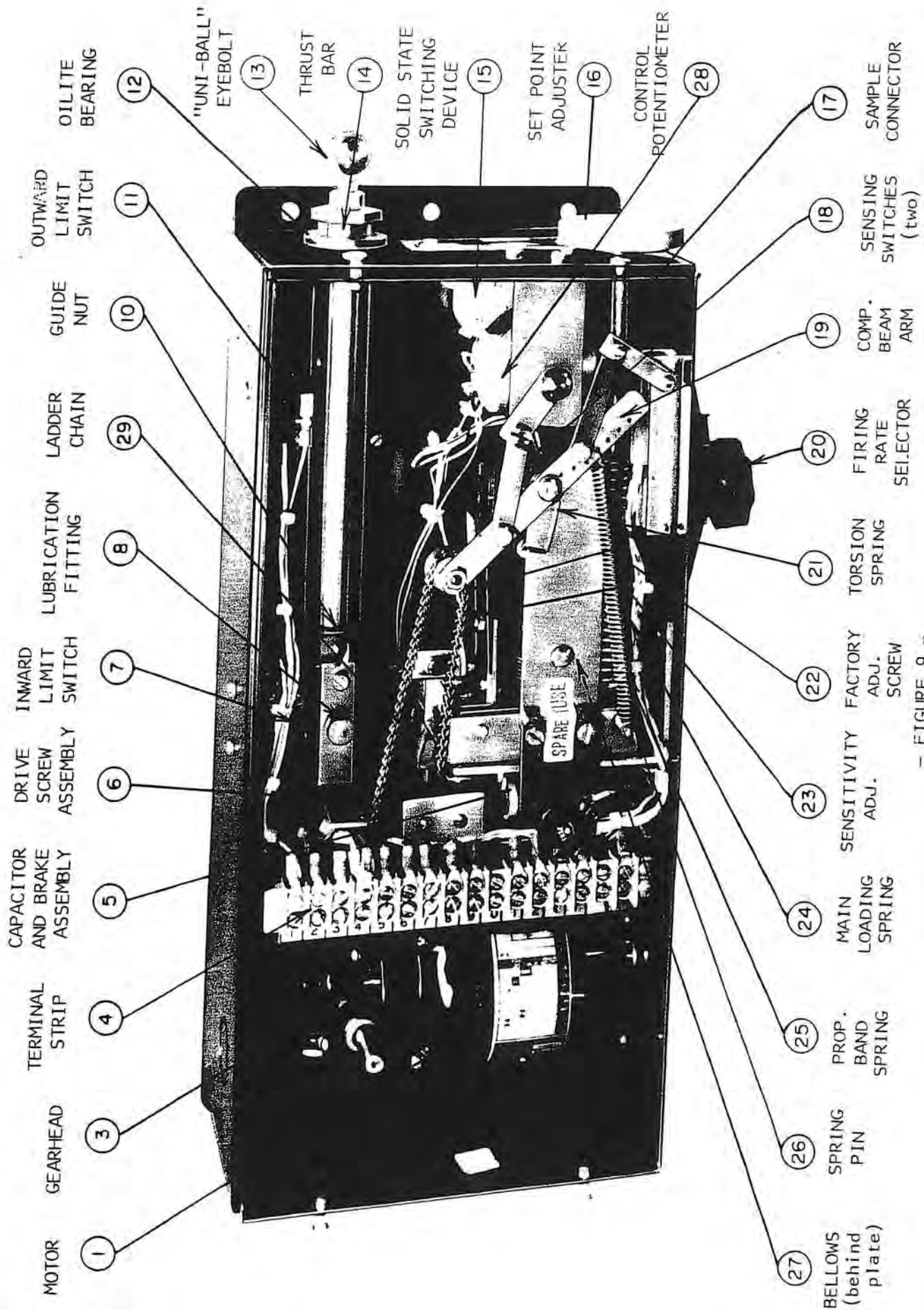
SENSING CONNECTION DIAGRAM (STEAM)
FIGURE 6



SCHEMATIC OF TYPICAL LINKAGE
SINGLE POINT POSITIONING
FIGURE 7

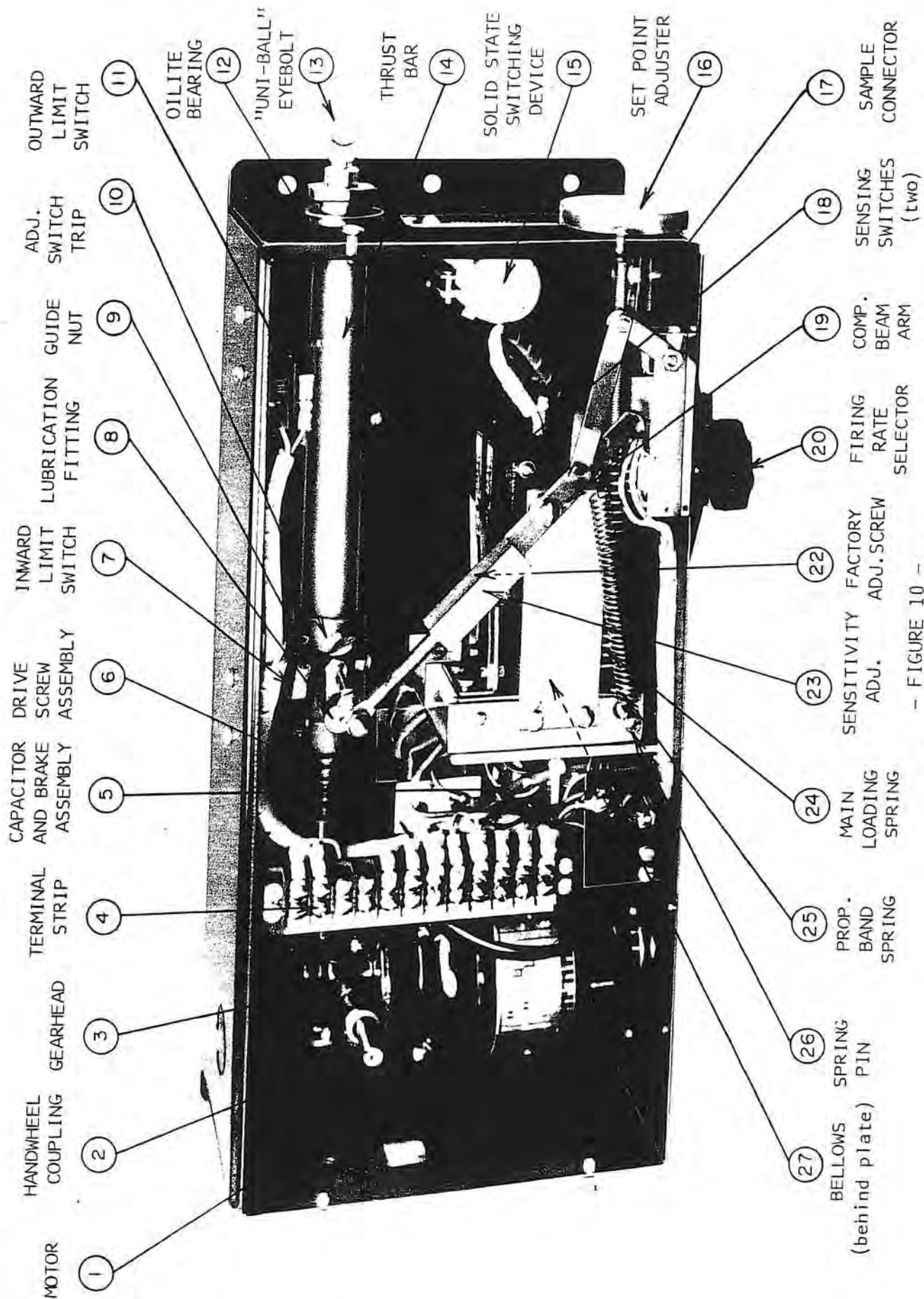


SCHEMATIC OF TYPICAL LINEAR
TWO POINT POSITIONING;
FIGURE 8



- FIGURE 9 -

SERIES 9420



- FIGURE 10 -

S E R I E S 9410

CUSTOMER SERVICE INFORMATION

Contacts

Hays Cleveland Sales Office

1903 South Congress Avenue

Boynton Beach FL 33426

Telephone: 561.734.9400

Fax: 561.734.8060

email: salescombustion@unicontrolinc.com

Hays Cleveland Customer Service Department

1111 Brookpark Road

Cleveland OH 44109

Telephone: 216.398.4414

Fax: 216.398.8556

email: customerservice@unicontrolinc.com

Visit us on the WEB!

<http://www.hayscleveland.com>

Repairs

Damaged or defective units may be returned to the factory for repair. However, factory authorization must be obtained before shipping whether warranty or non-warranty service is required, and all units must be shipped prepaid.

A letter of transmittal that includes the following information should accompany the returned instrument:

1. Location, type of service, and length of time in service of the unit.
 2. Description of the faulty operation of the device and the circumstances of the failure.
-

3. Name and telephone number of the person to contact if there are questions about the unit.
4. Indicate whether warranty or non-warranty service is requested.
5. Attach Purchase Order for all out-of-warranty repairs.
6. Complete shipping instructions for the return of the repaired instrument.
7. Original purchase order number and date of purchase.
8. Return Goods Authorization number provided by the factory when you called.

Clearly label the shipping container:

RETURN FOR REPAIR

Model _____

RG # _____

Ship prepaid to:

HAYS CLEVELAND

1111 Brookpark Road

Cleveland OH 44109-5869

216-398-4414



Please follow this procedure. It expedites handling of the returned item, and avoids unnecessary additional charges for inspection and testing to determine the problem before repairing it.

Service

A **Maintenance and Service Contract** can ensure trouble-free, economical operation of **Hays Cleveland** equipment for many years. One-time on-site service by a factory-trained service engineer can also be provided as needed. Contact Hays Cleveland for information on these service options.

Standard Terms and Conditions of Sale

TERMS OF SALE: 1% discount if paid in ten (10) days, net amount due and payable in thirty (30) days.

AGREEMENT OF SALE: Acceptance by Seller of any order placed for goods whether submitted on Buyer's purchase order form or on seller's Sales Order Acknowledgment form, shall be subject to Seller's Standard Terms and Conditions of Sale and is conditioned upon the Buyer's acceptance of these Standard Terms and Conditions.

TERMS OF CONTRACT: Any terms or conditions of the buyer's order which are inconsistent with these terms and conditions shall not be binding on the Seller and shall not be considered applicable to the sale or shipment of goods or materials. Unless buyer shall notify Seller in writing to the contrary within ten (10) days after the mailing of the Sales Contract by Seller, acceptance of the terms and conditions hereof by Buyer shall be indicated and, in the absence of such notification, the sale and shipment by Seller of the goods and materials covered hereby shall be conclusively deemed to be subject to the terms and conditions hereof.

PRICES: All prices and specifications and applicable discounts are subject to change without notice. Sales contracts which call for delivery in the future will be billed at prices in effect at the time of shipment. Shipping weights shown are approximate and subject to change without notice.

SHIPMENT AND PAYMENTS: All prices contained on the Sales Contract are F.O.B. factory in Cleveland, Ohio. No freight is allowed on any shipments. Shipments and deliveries shall at all times be subject to the approval of Seller's Credit Department, and at any time seller may require payment in advance or satisfactory security or guarantee that invoices will be promptly paid when due. If buyer fails to comply with any terms of payment, seller, in addition to its other rights and remedies, but not in limitation thereof, reserves the right to withhold further deliveries or terminate the Agreement, and any unpaid amount thereon shall become due immediately. Terms of payment shall be as set forth on the Sales Contract.

DELAYS AND DEFAULTS: Delays or defaults in delivery by Seller of the goods and materials covered by the Sales Contract shall be excused so far as the same is caused by fire, strikes, accident, governmental regulation, or any delays unavoidable or beyond reasonable control of Seller. In no event shall Seller be liable for any consequential, special, or contingent damages on account of any default or delay in delivery.

NONCANCELLATION: Orders are not subject to suspension, reduction, or cancellation, except on terms that will indemnify Seller against loss.

SPECIFICATIONS: Seller relies on specifications and other data furnished by the Buyer, an architect, contractor, or consulting engineer in all phases of the work covered by the Sales Contract. Seller shall be responsible to check quantities only. Alterations to or changes in specifications, approval of samples, changes in delivery instructions and all other instructions must be submitted in writing to Seller.

In the event Seller performs design or engineering work at the request of Buyer, an architect, contractor, consulting engineer, or representative in any phase of the work covered by the Sales Contract, Seller shall not be responsible for any damages claimed by Buyer as a result of alleged errors or defects in such design or engineering work.

WARRANTY AND LIMITATION OF LIABILITY: Seller warrants that the goods supplied by it have been manufactured in accordance with its standard manufacturing practices and conform to the contract or catalog description set forth in the order. Seller further warrants that the goods supplied by it are fit for the ordinary purpose or purposes specified in its catalog for which such goods are used when installed in accordance with Seller's recommended installation procedures. Except as stated herein, Seller makes no express warranty with respect to goods supplied by it and Seller makes no warranty that the goods are fit for any particular purpose.

When the use of materials not manufactured by Seller is suggested by Seller's recommended installation procedures or otherwise, Seller makes no express warranty with respect to such materials nor that such materials are merchantable or fit for any particular purpose.

Seller will, at its sole option, credit, repair or replace, any goods supplied by it which its examination shall disclose to its satisfaction are defective in workmanship or material and are returned to it within one year from the date of shipment and any claim not made within this period shall conclusively be deemed waived by Buyer. Credit, repair or replacement will be preconditioned upon examination of the goods by Seller, and, if requested by Seller, return of the goods to Seller at its direction and expense. No goods are to be returned to Seller without its written consent. Seller shall not be liable for any expense incurred by Buyer in order to remedy any defect in its goods. Seller shall not be liable for any consequential, special, or contingent damage or expense, arising directly or indirectly from any defect in its goods or from the use of any defective goods. The remedies set forth herein shall constitute the exclusive remedies available to Buyer and are in lieu of all other remedies.

CLAIMS: Claims for shortage of goods or for mistakes or errors in billing must be presented within forty-five (45) days from the date of shipment of goods and must state the packing slip number and container number applicable to the claim. Any claim not so presented will be conclusively deemed waived.

TAXES: Any federal taxes or other government charges on the sale, shipment, or installation of the goods or equipment covered by the Sales Contract shall be added to the price and paid by Buyer, or, in lieu thereof, the Buyer shall furnish the Seller with tax-exemption certificates acceptable to the taxing authority. The procedure also applies to duty and other similar charges on export sales. Seller is not responsible for sales and/or use tax in any state other than Ohio. The purchase made under this Sales Contract must be exempt or paid directly by Buyer. If Seller is required to pay any such tax, there shall be added to the prices quoted herein all such state and local taxes. Buyer agrees to reimburse and save Seller harmless from all such state and local taxes, including interest and penalties thereon, which may at any time be payable to any state or local government unit with respect to the sale of any goods or materials covered by the Sales Contract.

CORRECTIONS: Typographical or clerical errors contained in the Sales Contract, including prices, are subject to correction by the Seller.

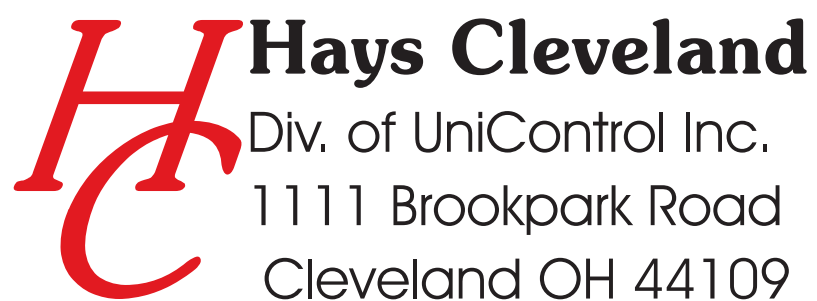
FAIR LABOR STANDARDS: All goods covered by the Sales Contract have been produced in conformity with all applicable provisions of the Fair Labor Standards Act of 1938 as amended.

RENEGOTIATION: Unless advised by Buyer in writing, Seller assumes that Buyer's order and the Sales Contract are not renegotiable under the Renegotiation Act of 1951.

APPLICABLE LAW: All questions arising out of the Sales Contract, which shall be deemed an Ohio contract, shall be governed by the laws of the state of Ohio.

EXCLUSIVE TERMS: The Sales Contract shall constitute the complete contract between the parties, and no one has authority to depart from the terms and conditions set forth therein, nor to make any representations or arrangements other than those printed thereon whether in the execution or in the performance of the Sales Contract, unless the same are written on the face of the Sales Contract or are given in writing with it or in pursuance of it, and are fully approved in writing by an officer or authorized employee of the Seller.

LIMITATION FOR SUITS: Any controversy or claim arising out of or relating to this Sales Contract or the breach thereof, must be commenced within one (1) year after the cause of action accrued.



Hays Cleveland

Div. of UniControl Inc.

1111 Brookpark Road

Cleveland OH 44109