

Sequence Draft Control

Installation and Instruction Manual

MANUFACTURED BY JOHN ZINK COMPANY GORDON-PIATT

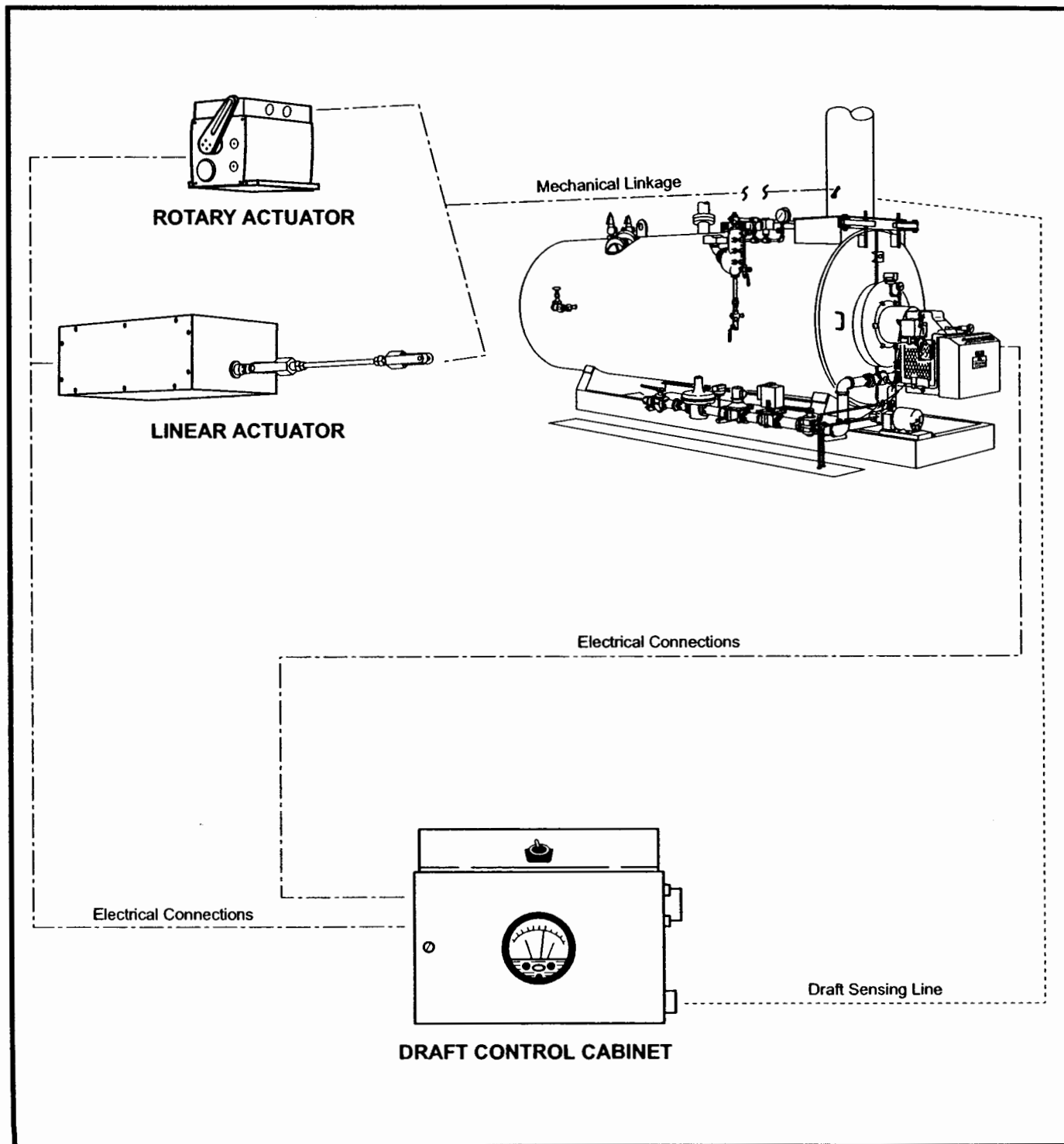


TABLE OF CONTENTS

PART I	- INTRODUCTION	3-4
	1. Description	3
	2. Operation	3-4
	3. Model Designation	4
PART II	- INSTALLATION	5-6
	1. Mounting	5
	2. Linkage	5-6
	3. Draft Sensing Line	6
	4. Wiring	6
PART III	- FIELD ADJUSTMENTS	7-8
	1. General	7
	2. Low Draft/High Breeching Pressure	7
	3. Photohelic	7
	4. Positive Sensing Applications	8
	5. High Negative Firebox Sensing Applications	8
	6. Damper Actuator Switches	8
FIGURE 1	- TYPICAL COMPONENTS	9
FIGURE 2	- FACTORY PIPING CONNECTIONS	10
FIGURE 3	- ADJUSTMENT OF DRAFT SWITCH	11
FIGURE 4	- TYPICAL LOCATIONS FOR DRAFT SENSING CONNECTION	12
FIGURE 5	- CALIBRATION COCK OPERATION	13
FIGURE 6	- LINKAGE ADJUSTMENT	14
FIGURE 7	- SUGGESTED MOUNTING LOCATIONS	15
TYPICAL WIRING ARRANGEMENT FOR GP-SD1H AND GP-SD1C	16
TYPICAL WIRING ARRANGEMENT FOR GP-SD2H AND GP-SD2C	17
NOTES	18-19
PART IV	- SUPPLEMENTARY DATA	20

WARNING!

If you smell gas:

1. Open windows.
2. Don't touch electrical switches.
3. Extinguish any open flame.
4. **EVACUATE** people from building.
5. Immediately call the gas supplier.

The use and storage of gasoline or other flammable liquids and vapors in open containers in the vicinity of this appliance is hazardous.

In accordance with OSHA standard 1910.147, all equipment, machines and processes shall be locked out prior to servicing.

If not installed, vented, operated and maintained in accordance with the manufacturer's instructions, this product could expose you to substances in fuel or from fuel combustion which can cause death or serious illness and which are known to the State of California to cause cancer, birth defects or other reproductive harm.

Improper servicing of this equipment may create a potential hazard to equipment and operators.

SERVICING MUST BE DONE ONLY BY FULLY TRAINED AND QUALIFIED PERSONNEL.

Before disconnecting or opening up a fuel line and before cleaning or replacing parts of any kind.

- Turn **OFF** the manual fuel shutoff valves including pilot gas cock, if applicable. If a multiple fuel burner, shut **OFF** all fuels.
- Turn **OFF** all electrical disconnects to the burner **and any other** equipment or systems electrically interlocked with the burner.

Do **NOT** use TEFLON TAPE or compounds with TEFLON content as an oil or gas pipe sealant. TEFLON can cause valves to fail creating a **SAFETY HAZARD**. Warranties are nullified and liability rests solely with the installer when evidence of TEFLON is found.

PART I INTRODUCTION

1. DESCRIPTION

- John Zink Gordon-Piatt sequence draft control systems control the combustion chamber pressure or breeching pressure at the outlet of the boiler or furnace. These systems use a draft sensing device which controls a damper in the outlet of the vessel being fired. All systems drive the damper motor full open for prepurge. The GP-SD1 system maintains the open damper condition for burner lightoff while the GP-SD2 system moves the damper to a partially open position for lightoff. Both systems automatically control damper position to maintain the proper draft after the burner has started and both return the damper to the closed position after post purge.
- Unless specified and ordered otherwise, the draft control system will be supplied from the factory with piping connections and wiring arranged for negative pressure applications.
- All models include a gauge mounted in the control cabinet to show pressure at the draft control sensing point, and an Automatic-Open damper control switch. The "open" damper switch position permits firing with the damper full open for emergency or maintenance conditions.
- A draft switch and time delay are included to protect against firing with a closed damper.
- Two damper actuator types are available. They are rotary type actuator with a torque rating of 150 in. lbs., and a linear type for dampers in excess of 6 square feet in area or for dampers without anti-friction bearings.

2. OPERATION

TYPICAL OPERATING SEQUENCE FOR: GP-SD1H, GP-SD1C AND GP-SD1P

1. On a boiler call for heat, the stack damper drives toward the open position.
2. When stack damper is proven in the open position, the burner flame safeguard is allowed to start its firing sequence.
3. The overfire draft control is released to automatically control the draft after the main fuel valves are energized.
4. During post-purge, the stack damper is driven to the open position.
5. Upon the completion of post-purge, the stack damper closes.
6. In the event of a flame failure shutdown, the stack damper drives full open and remains open as long as the boiler limit and operating controls continue to call for heat.
7. In the event a low draft condition occurs, the stack damper operates the same as in the flame failure paragraph above.

TYPICAL OPERATING SEQUENCE FOR: GP-SD2H, GP-SD2C AND GP-SD2P

1. On a call for heat, flame safeguard timing starts, burner motor starts, stack damper and burner air louvers drive toward open position.
2. Stack damper and burner air louver proven open for pre-purge.
3. Stack damper closes to the adjustable start position and burner air louver closes for proven low fire start.
4. The overfire draft control is released to automatically control the draft after the flame safeguard is released to automatic operation.
5. During post-purge, the stack damper is driven to the open position.
6. Upon the completion of post-purge, the stack damper closes.
7. In the event a flame failure shutdown, the stack damper drives full open for post-purge. Upon the completion of post-purge, the stack damper closes.
8. In the event a low draft condition occurs, the stack damper operates the same as in the flame failure paragraph above.

3. MODEL DESIGNATION

■ *Basic Model Number is GP - A - B.*

■ To complete the model designation of the draft control system, replace the A and B above with the option number shown in the table below.

<u>DESCRIPTION</u>	<u>OPTION NUMBER</u>
A. Operating mode and draft controller type:	
Open damper position starting (Dwyer Photohelic® draft controller) - - - - -	SD1
Adjustable damper position starting (Dwyer Photohelic® draft controller)- - - -	SD2
B. Damper Actuator Type:	
Honeywell Series 60 rotary actuator - - - - -	H
Preferred Instruments PL-2 linear actuator - - - - -	P
Hays Cleveland Series 9131 linear actuator - - - - -	C

NOTE

Refer to John Zink Gordon-Piatt material list for exact equipment supplied.

NOTE

Photohelic® is a registered trade name of Dwyer Instruments, Inc.
P.O. Box 373, Michigan City IN 46360

PART II INSTALLATION

1. MOUNTING

- Mount the control cabinet in an easily accessible location for ease of adjustment and maintenance.
- Mount the damper actuator in a location that will allow at least 2 feet of linkage to damper arm. See the actuator manufacturer's instructions for additional mounting considerations.

2. LINKAGE

ROTARY ACTUATOR (See Fig. 6)

1. Linkage consists of the following parts: Two adjustable lever arms, linkage rod, swivel connectors.
2. Place damper in fully closed position and electrically operate actuator until it is in fully closed position.
3. Attach lever arm to damper shaft at angle to damper as shown.
4. Insert rod ends into adjusting arm and actuator arm. Maintain the same distance between the damper shaft and adjusting arm rod end and between the actuator shaft and actuator arm rod end. This will achieve the 90 degree stroke for actuator arm and damper adjusting arm.
5. Install the proper length of 1/4" rod between the rod ends.
6. Before operating damper electrically with actuator, disconnect rod end at actuator. Operate actuator electrically through full cycle of travel while holding rod end in simulated connected position and moving it to operate damper manually. Make sure the linkage moves freely, without bending, and that the damper moves to the maximum, open and full closed positions.
7. Re-connect the linkage and damper can now be operated electrically.

LINEAR ACTUATOR (See Fig. 7)

1. Linkage consists of the following parts: Adjustable lever arm, clevis assembly, one extension drive rod assembly, a customer furnished length of 1/2" pipe.
2. Place damper in fully closed position and electrically operate actuator until it is in fully closed position.
3. Attach lever arm to damper shaft at angle to damper as shown.
4. Insert bushing in one of lever arm holes. For full 6" travel use fourth hole from rounded end.
5. Attach one clevis to lever arm with pin through bushing.
6. Attach other clevis to damper actuator with pin through eye in thrust rod.
7. Adjust drive rod until about 1" of threaded rod extends through adapters.
8. Install proper length of 1/2" pipe between adapters to complete linkage.
9. Before operating damper electrically with actuator, disconnect ball joint at actuator. Operate actuator electrically through full cycle of travel while holding ball joint in simulated connected position and moving it to operate damper manually. Make sure the linkage moves freely, without bending, and that the damper moves to the maximum open and full closed positions.
10. Re-connect the linkage and damper can now be operated electrically.

3. DRAFT SENSING LINE

- A common sample line of piping or tubing must be installed for transmitting draft sample to draft controller and draft gauge. Where additional gauges are used to indicate windbox pressure, last pass draft, etc., a separate line should be installed from the source to the instrument.
- Plugged crosses or tees should be used on all pipe turns to allow provision for cleaning lines. All joints should be doped and air tight.
- Where sample line enters boiler it should be 1-1/2" pipe in 2" sleeve. On new installations, boiler specification should call for overfire sample line sleeve of 2" to accommodate 1-1/2" pipe. On existing installations, a 2" sample line sleeve should be installed through the side wall, close to the center of the furnace and well above the fire.
- The opening should be chamfered at inside surface of boiler wall, and sample line should end at chamfer, not extend into the firing chamber (see illustrations).
- The sample line should rise vertically at boiler connection for at least 6 inches.

NOTE

See Fig. 4 for typical sensing line installation.

TABLE I

Linear length of common sample line *	Inside diameter of pipe or tubing **
Less than 40 feet	1/2" - 3/4"
40 to 60 feet	3/4" - 1"
60 to 80 feet	1" - 1-1/4"
Over 80 feet	Not Recommended

* Where pipe is used, add an extra 4 feet for each 90 degree fitting when computing length of line.
** Or use minimum size required to meet local codes.

4. WIRING

- Wire must be 14 AWG minimum with moisture proof insulation suitable for 75 degree C.

PART III

FIELD ADJUSTMENTS

1. GENERAL

- Check all installation wiring, piping, and linkage. Follow burner instruction manual for initial burner start-up.

2. LOW DRAFT/HIGH BREECHING PRESSURE SWITCH

ZERO THE DRAFT SWITCHES:

1. Place the handle of the calibration cock to its horizontal position. (See Fig. 5)
2. Adjust the Dwyer photohelic draft gauge to zero by turning the adjustment screw (located on the bottom front face of photohelic draft gauge) as necessary.

ADJUST THE TRIP POINT SETTING ON THE LOW DRAFT SWITCH:

1. Check to be sure the handle on the calibration cock is in its horizontal position.
2. Attach a two- or three- foot piece of plastic tubing to the unused tap on this calibration cock.
3. Remove the protective metal cover from the low draft switch to expose its load switch and adjustment screw.
4. Temporarily disconnect the two factory wires from the load switch terminals "R" and "B".
(C) (NC)
5. Attach a continuity light or OHM-meter across the "R" and "B" terminals of the exposed load switch.
6. For boilers which normally operate with a positive or slightly negative breeching pressure (-.10" draft), blow gently in the plastic tubing while watching both the photohelic draft gauge and the continuity light on OHM-meter. Observe the draft reading on the photohelic at the point where the switch breaks "R" to "B". The point where the switch transfers to break "R" to "B" should be at about +.10" W.C. for negative breeching boilers or +.20" W.C. above normal positive pressure reading for positive breeching boilers.
7. Adjust the switch to break "R" to "B" at the proper draft reading (if necessary). Turning the adjustment screw clockwise will make the switch trip - point more positive; turning the screw counter-clockwise will make the trip - point more negative. Make small adjustments of 1/4 turn, checking the results after each adjustment. (See Fig. 3)
8. When the switch breaks "R" to "B" at the proper point, remove the plastic tubing and the continuity light or OHM-meter, reconnect the factory wires to load switch terminal "R" and "B" and replace the protective metal cover over the switch and adjustment screw.

3. PHOTOHELIC®

- Adjust the red set-points on each photohelic draft control to maintain the draft or pressure at the appropriate boiler breeching as required and indicated by the burner fire test report(s) in order to meet the proper combustion requirements. The left set point should be set at .10" W.C. below the normal breeching pressure or draft, and the right set-point should be set .10" W.C. above the normal breeching pressure or draft.

4. POSITIVE SENSING APPLICATIONS

- Draft control systems are factory piped and wired for negative draft conditions. For positive pressure applications, the following changes must be made. (See Fig. 2)

LOW DRAFT/HIGH BREECHING PRESSURE SWITCH

- No changes required.

PHOTOHELIC®

- Sensing port connection must change from negative to positive. Remove sensing line at negative pressure port on photohelic and reconnect to positive pressure port on photohelic. If two piece photohelic is used, remove plug from second negative pressure port and install in second positive pressure port.
- Reverse yellow and blue wires on rear of photohelic unit.

5. HIGH NEGATIVE FIREBOX SENSING APPLICATIONS

- Draft control systems are factory piped and wired for negative draft conditions. For applications where high negative firebox pressures are being sensed, the following changes must be made. (See Fig. 2)

LOW DRAFT/HIGH BREECHING PRESSURE SWITCH

- Sensing port connection must change from positive to negative. Remove sensing line at positive pressure port on side of control panel and reconnect to negative pressure port on draft switch. Wiring connections must change. On low draft switch, wire "Y" contact instead of "B" contact to cabinet terminal #13. Switch will make "R" to "Y" on negative draft condition.

PHOTOHELIC®

- No changes required.

6. DAMPER ACTUATOR SWITCHES

ROTARY ACTUATOR

(See Manufacturers Specification sheet for switch adjustment procedures.)

1. GP-SD1H

Adjust outer auxiliary cam so switch lead red makes to blue when damper is fully open.

2. GP-SD2H

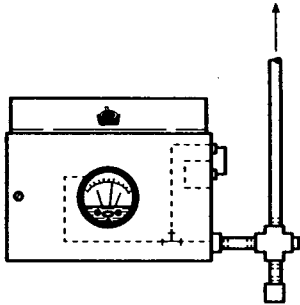
- a. Adjust inner auxiliary cam so that switch lead black/red makes to black/blue when damper is fully open.
- b. For GP-SD2H system only, adjust outer auxiliary cam so switch lead red makes to yellow when damper is in desired position for smooth burner lightoff.

LINEAR ACTUATOR

1. Damper open proving switch is not adjustable. Switch makes terminal #6 and #7 to prove damper open when actuator arm is fully retracted.
2. For GP-SD2C and GP-SD2P systems only, adjust start position proving switch so switch makes terminal #11 to #12 when damper is in desired position for smooth burner lightoff. Switch is adjusted by loosening set screw and sliding switch along metal bar to the desired position. Retighten set screw.

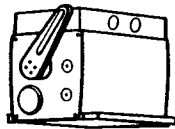
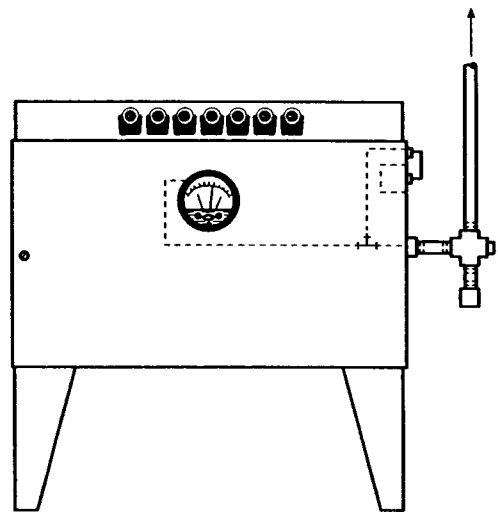
MODELS GP - SD1 and GP - SD2

To Draft Control Sensing Point



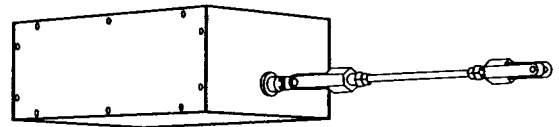
MODELS GP - SD1 and GP - SD2

To Draft Control Sensing Point



-H

ROTARY ACTUATOR

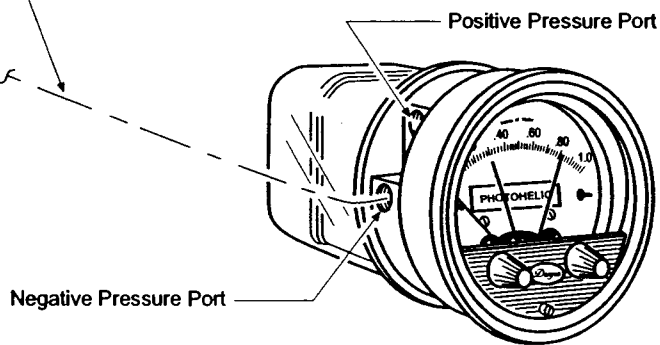


-P

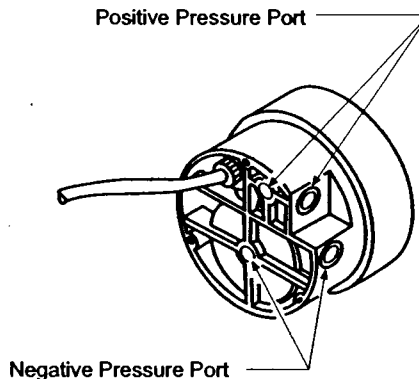
LINEAR ACTUATOR

FIGURE 1 - TYPICAL COMPONENTS

Factory installed negative pressure sensing line to draft control sensing point on side of control cabinet. For positive pressure applications, remove and re-install in positive pressure port of photohelic.



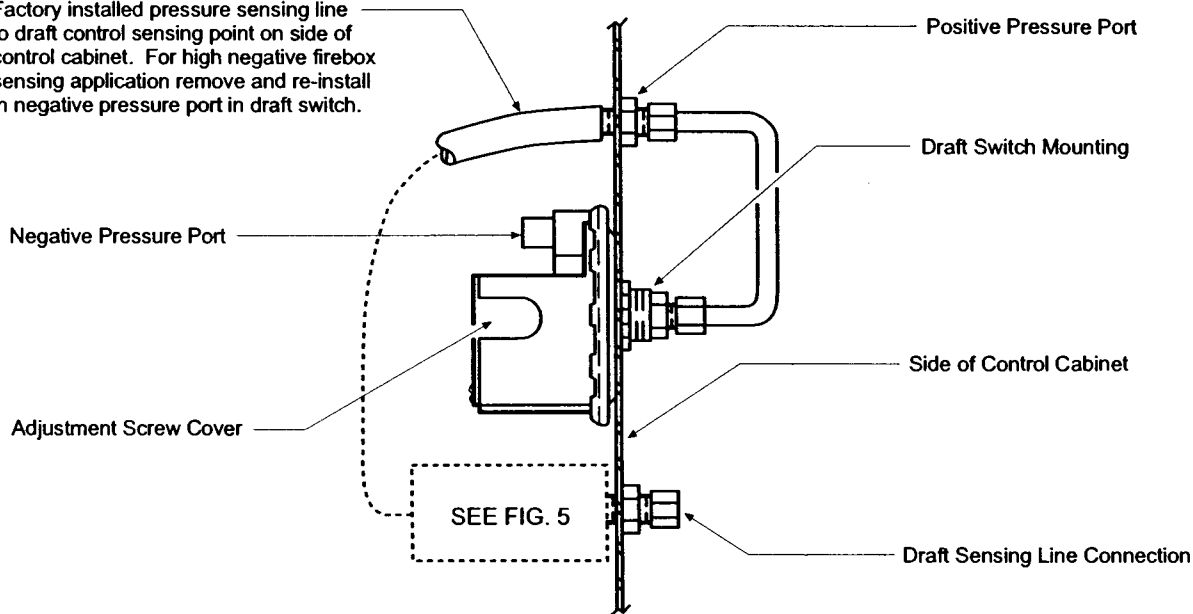
ONE PIECE UNIT
SHOWN FROM FRONT



TWO PIECE UNIT
SHOWN FROM REAR

PHOTOHELIC - MAGNEHELIC SENSING LINE CONNECTION

Factory installed pressure sensing line to draft control sensing point on side of control cabinet. For high negative firebox sensing application remove and re-install in negative pressure port in draft switch.



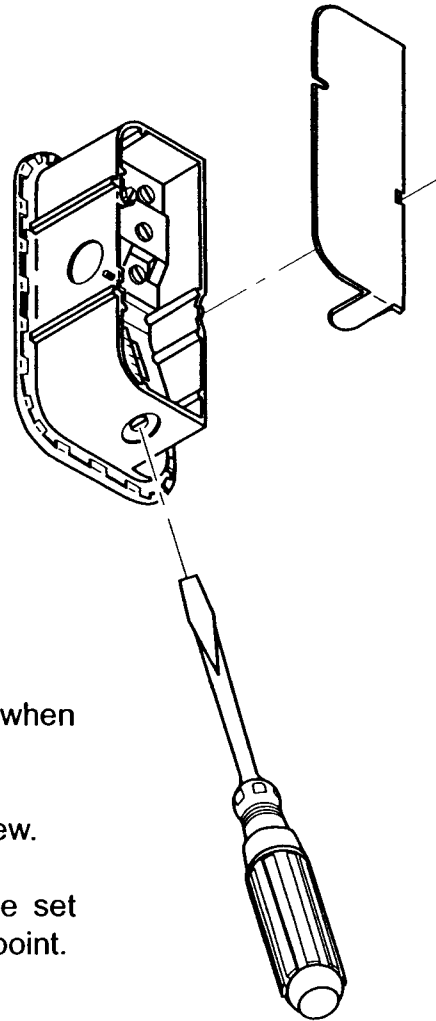
DRAFT SWITCH SENSING LINE CONNECTION

CAUTION

For proper system operation, the unused ports on the photohelic - magnehelic control and the draft switch must remain open to atmosphere. For two - piece photohelic units only, there are two positive pressure ports and two negative pressure ports. The unused port that corresponds to the port used for piping connections must be plugged.

FIGURE 2 - FACTORY PIPING CONNECTIONS

ADJUSTMENT OF DRAFT SWITCH



ADJUSTMENT PROCEDURE:

1. Switches should be set to break (open) when draft is substantially reduced.
2. If applicable, remove cover to adjusting screw.
3. Turn adjusting screw clockwise to increase set point or counter-clockwise to decrease set point.

FIGURE 3 - ADJUSTMENT OF DRAFT SWITCH

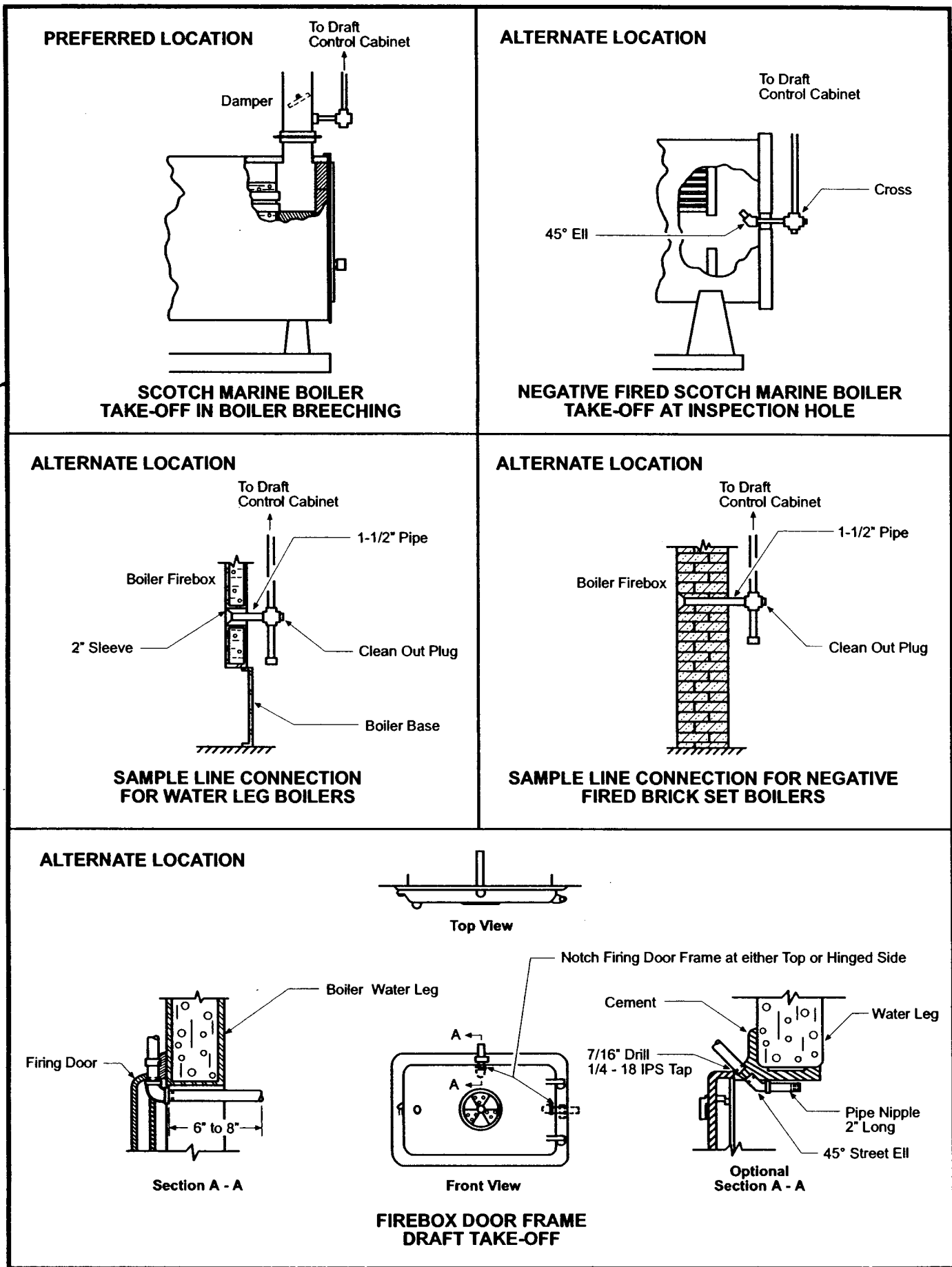
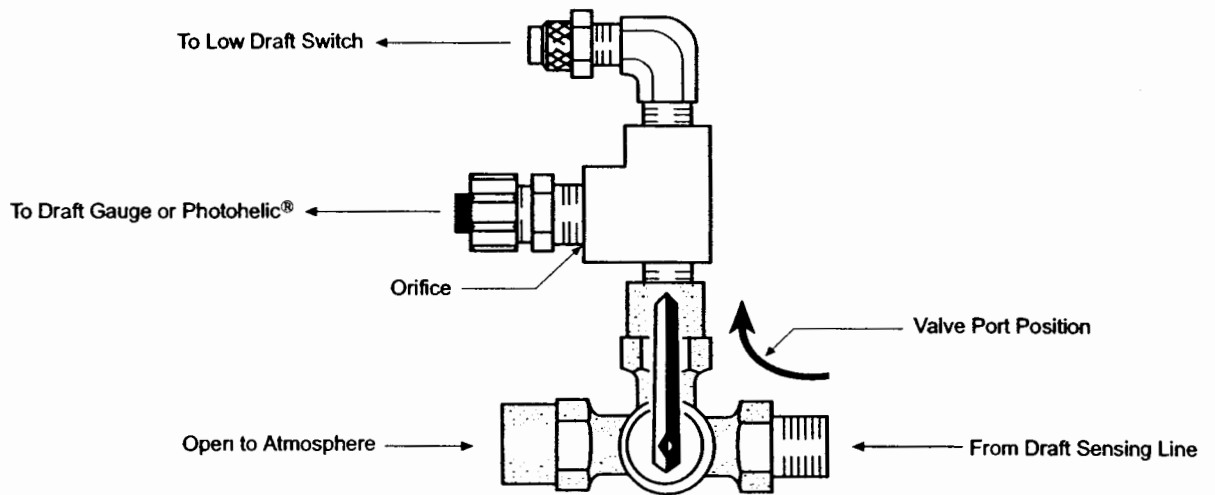
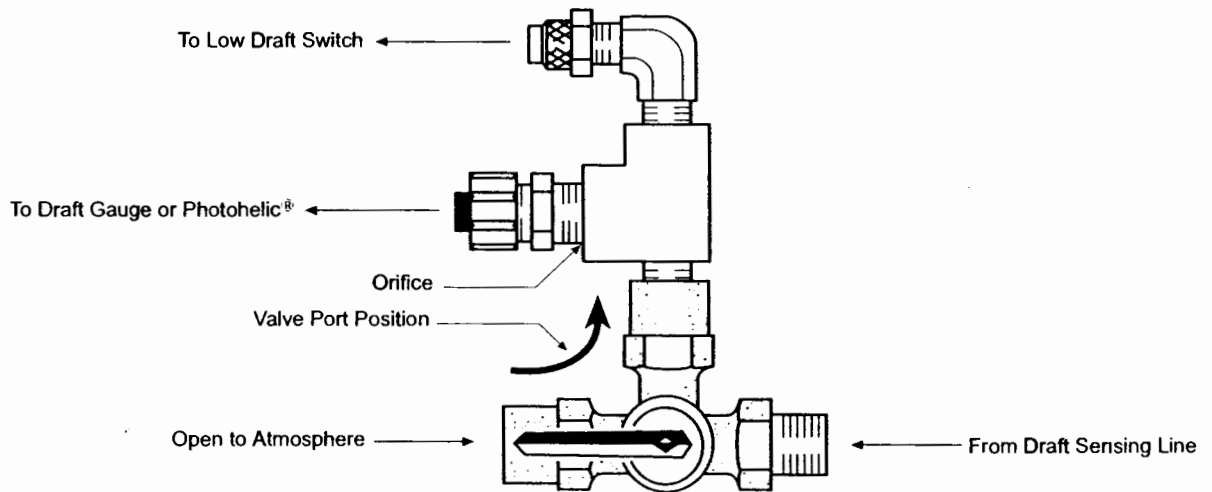


FIGURE 4 - TYPICAL LOCATIONS FOR DRAFT SENSING CONNECTION

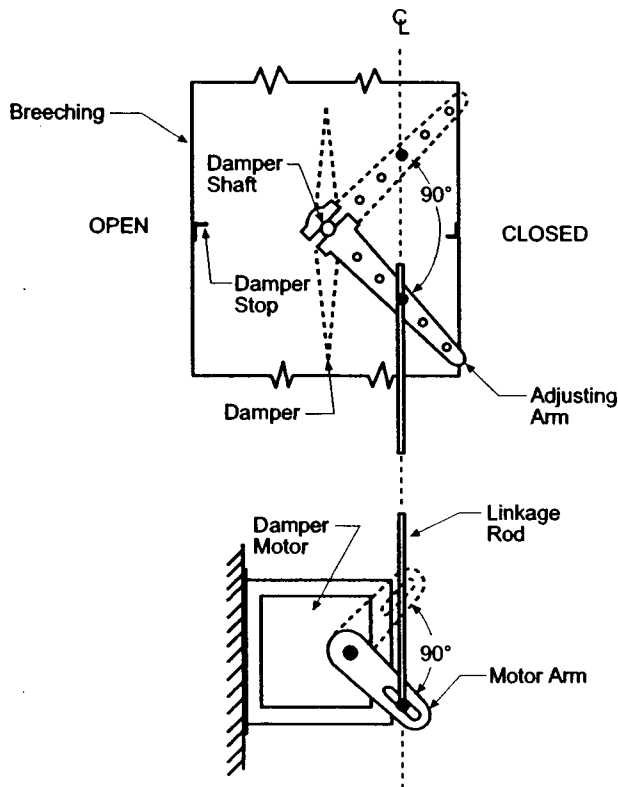


VALVE HANDLE POSITION FOR NORMAL OPERATION

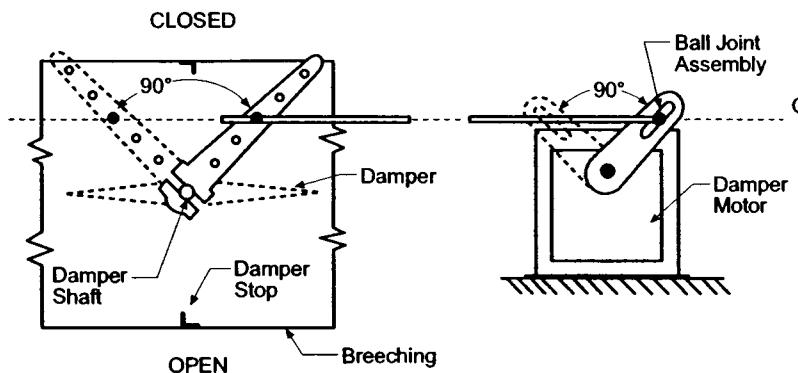


VALVE HANDLE POSITION TO ZERO GAUGE

FIGURE 5 - CALIBRATION COCK OPERATION



90° VERTICAL LINKAGE



90° HORIZONTAL LINKAGE

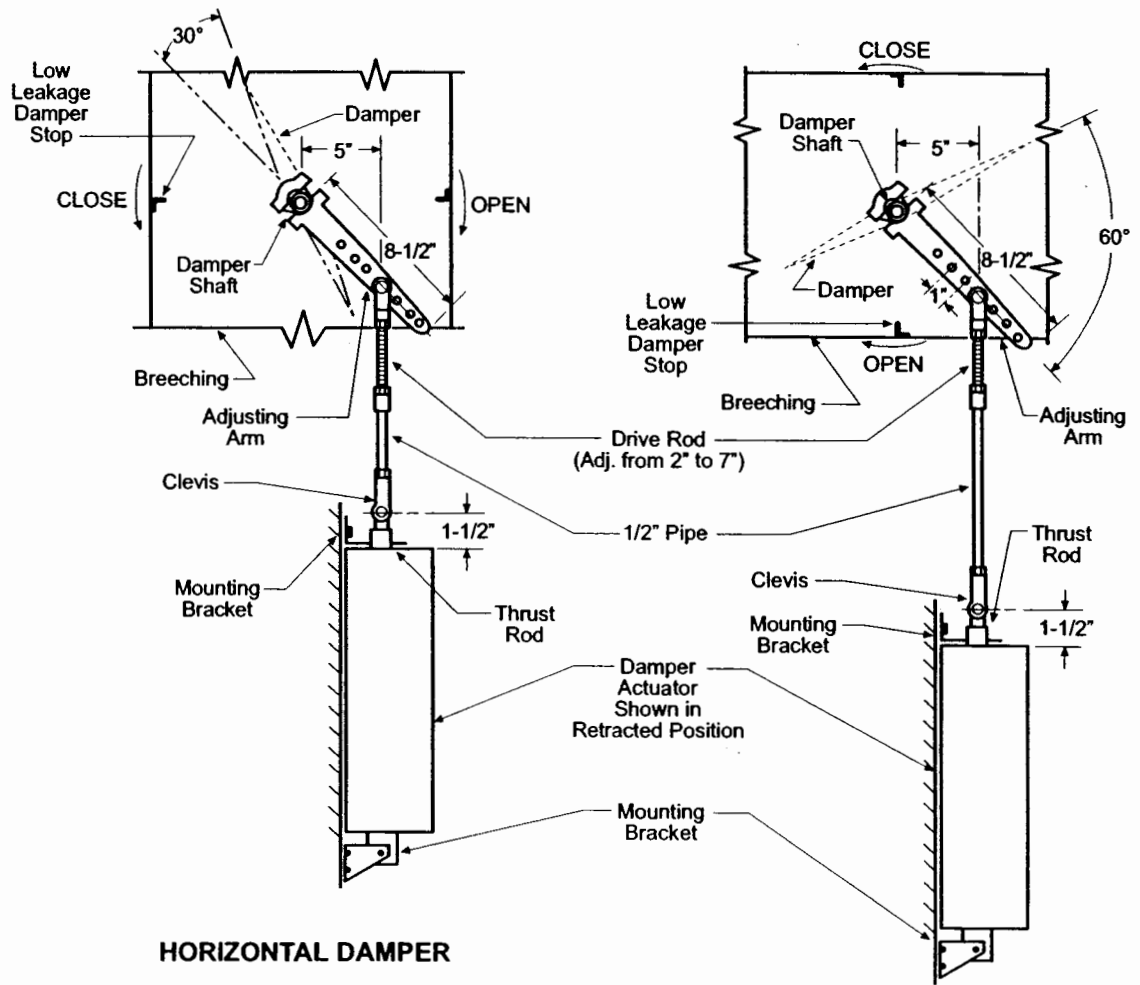
LINKAGE ADJUSTMENT

ADJUSTING ARM	MOTOR ARM
Distance from damper shaft to ball joint assy.	Distance to place ball joint assy. from damper shaft (See Note #1)
2-3/4"	2-3/4"
4"	4"

NOTE

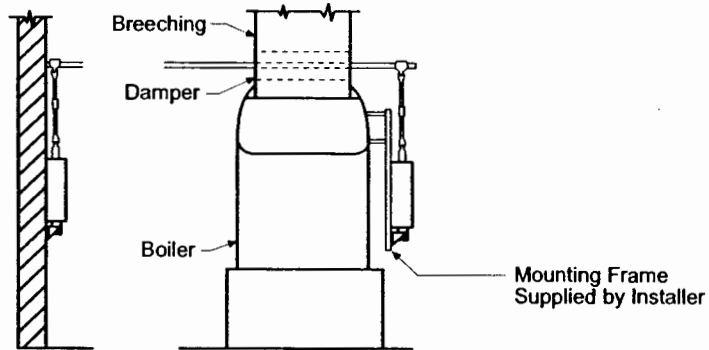
1. Lengths shown achieve the 90° stroke for motor arm and 90° stroke for adjusting arm.
2. Refer to actuator manufacturers instructions to adjust position proving switches.

FIGURE 6 - LINKAGE ADJUSTMENT



HORIZONTAL DAMPER

VERTICAL DAMPER

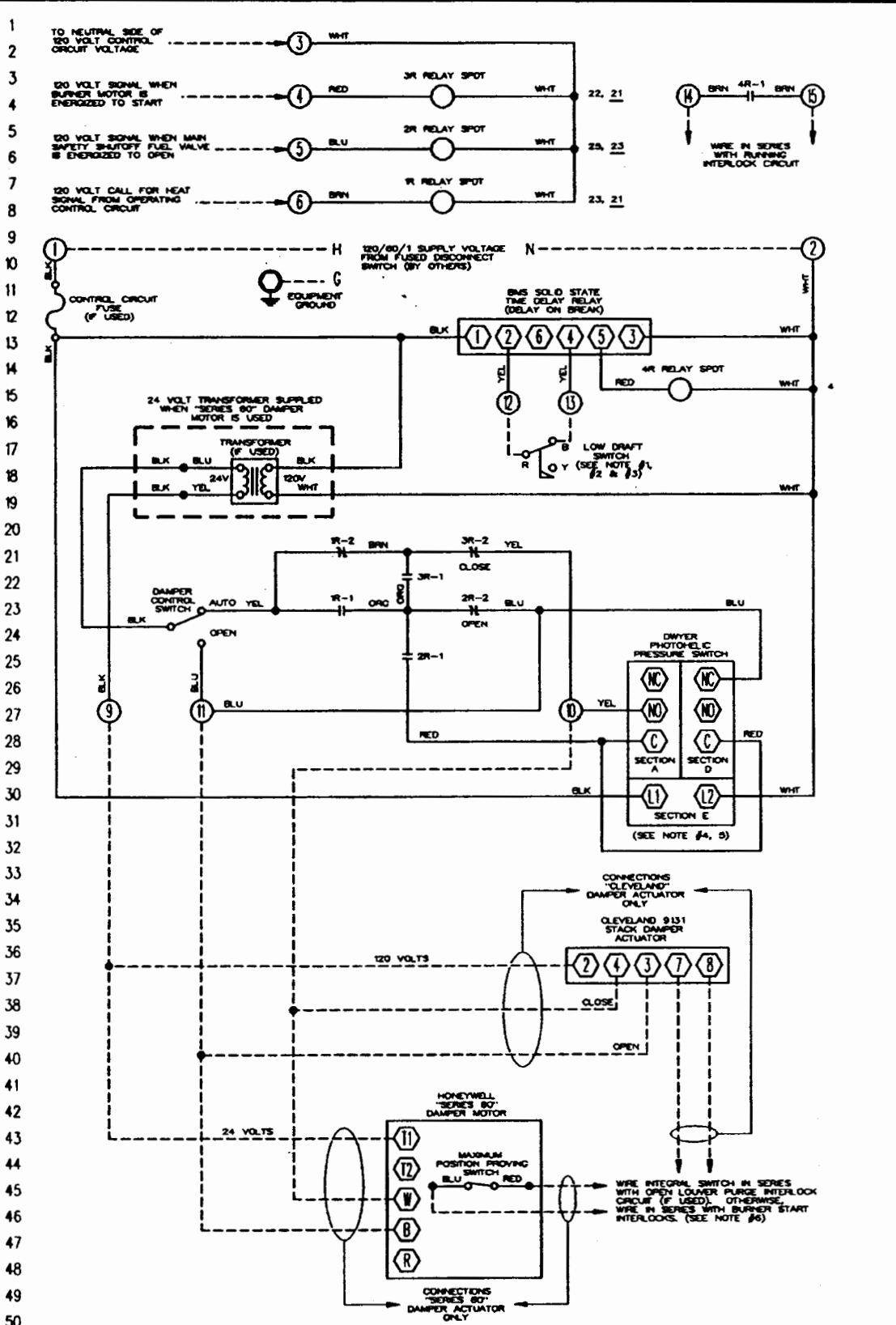


SUGGESTED MOUNTING LOCATIONS

CAUTION

Damper must be tight-fitting, but with enough clearance to move freely in breeching. A low leakage damper stop must be used to insure proper control at low fire rates.

FIGURE 7 - SUGGESTED MOUNTING LOCATIONS

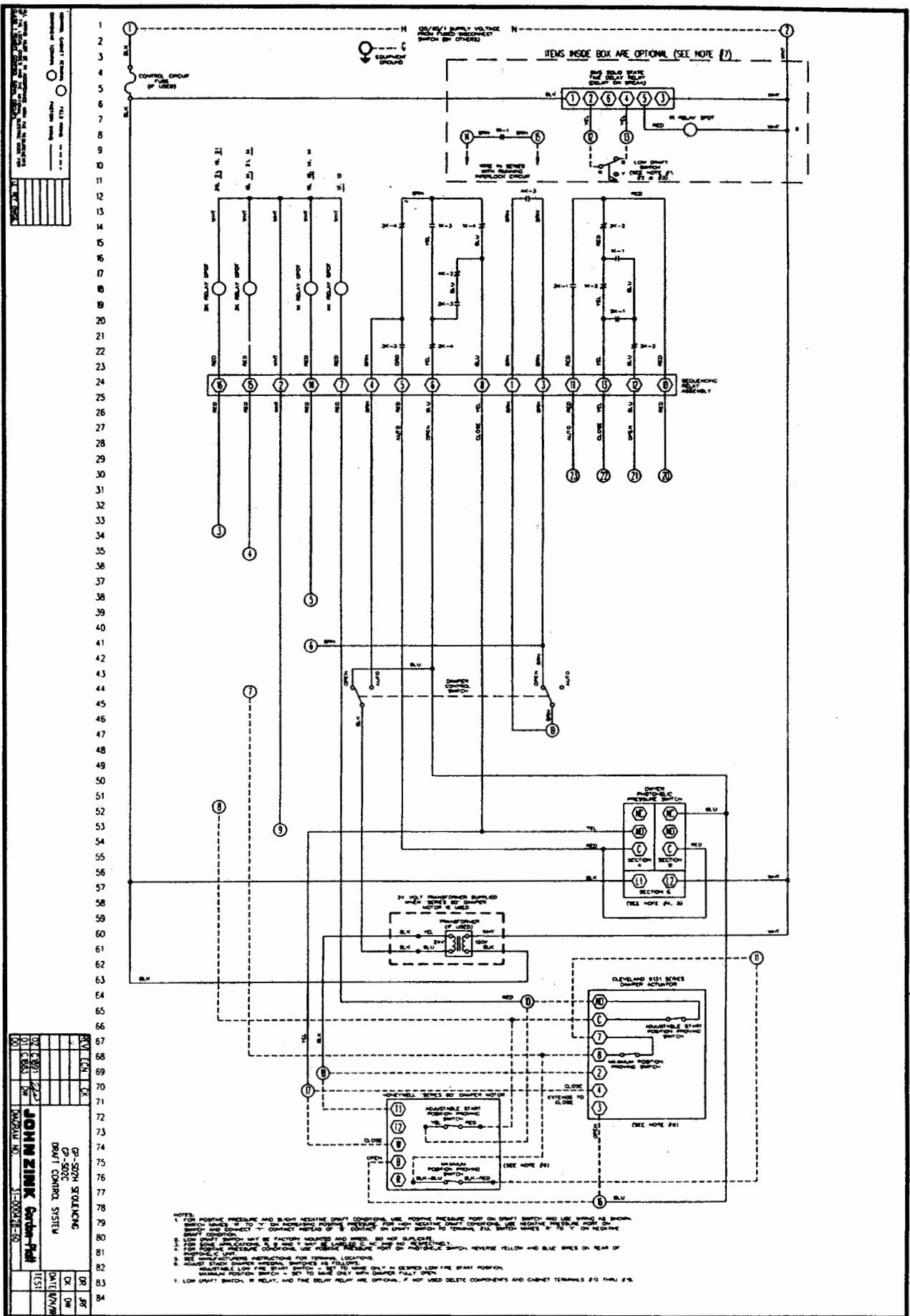


DR	RWT	CK	DW	DATE	7/20/89	TEST	
REV	ECN	OK					
GP-SD1H DRAFT CONTROL SYSTEM GP-SD1C						JOHN ZINK Gordon-Platt	
						DIAGRAM NO.	31-001853-20
						01	C1871
						00	

- NOTES:
- FOR POSITIVE PRESSURE AND SLIGHT NEGATIVE DRAFT CONDITIONS, USE POSITIVE PRESSURE PORT ON DRAFT SWITCH AND USE WIRING AS SHOWN. SWITCH MAKES "R" TO "Y" ON INCREASING POSITIVE PRESSURE. FOR HIGH NEGATIVE DRAFT CONDITIONS, USE NEGATIVE PRESSURE PORT ON DRAFT SWITCH AND CONNECT "Y" CONTACT INSTEAD OF "B" CONTACT ON DRAFT SWITCH TO TERMINAL #13. SWITCH MAKES "R" TO "Y" ON NEGATIVE DRAFT CONDITION.
 - LOW DRAFT SWITCH MAY BE FACTORY MOUNTED AND WIRED. DO NOT DUPLICATE.
 - FOR SOME APPLICATIONS, R, B AND Y MAY BE LABELLED C, NC AND NO RESPECTIVELY.
 - FOR POSITIVE PRESSURE CONDITIONS, USE POSITIVE PRESSURE PORT ON PHOTOHELIC SWITCH. REVERSE YELLOW AND BLUE WIRES ON REAR OF PHOTOHELIC UNIT.
 - SEE MANUFACTURERS INSTRUCTIONS FOR TERMINAL LOCATIONS.
 - ADJUST STACK DAMPER ACTUATOR MAXIMUM POSITION SWITCH TO MAKE ONLY WITH STACK DAMPER FULLY OPEN.

CONTROL CIRCUIT TERMINAL	FIELD WIRING	ALL WIRING MUST BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE FOR CLASS 1 CONTROL SYSTEMS.
COMPONENT TERMINAL	FACTORY WIRING	
UL REF. DIVISION		

TYPICAL WIRING ARRANGEMENT FOR GP-SD1H AND GP-SD1C



REV	DATE	BY	CHK
1	1-15-68	JZ	JZ
2	1-15-68	JZ	JZ
3	1-15-68	JZ	JZ
4	1-15-68	JZ	JZ
5	1-15-68	JZ	JZ
6	1-15-68	JZ	JZ
7	1-15-68	JZ	JZ
8	1-15-68	JZ	JZ
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TYPICAL WIRING ARRANGEMENT FOR GP-SD2H AND GP-SD2C

NOTES: