Axial Fans

Axial Heaters

Chicago 26" Heater

Solid State

Owner's
Installation and Operation Manual

Sukup Manufacturing Company
1555 255th Street, Box 677
Sheffield, Iowa, USA 50475-0677

Phone: 641-892-4222 **Fax: 641-892-4629**
Website: www.sukup.com **E-mail: info@sukup.com**

REVISIONS

2010/11 – Added Heater BTU Ratings and Heater Designation pages ----------Pgs. 7, 8
2010/01 – Electrical Components----------(Pg. 44)
2009/03 – Electrical Diagrams----------(Pg. 15)
2009/02 – Burner Recept. replaced with Htr. Power Block (Diagrams/Parts Lists)(Pgs. 12-15, 38, 39, 42, 43)

Manual L1400
2010/12

CONTENTS

Proper management is essential to insure satisfactory performance. Sukup Manufacturing is not liable for damage to grain resulting from improper management during drying or storage.

ATTENTION: Sukup cannot warrant any roof damages due to excessive vacuum or internal pressure caused by operating fans. Adequate ventilation should be provided for all powered air systems. Sukup does not recommend the use of downward flow systems (suction). Severe roof structural damage can result from any blockage of air passages.

To prevent structural damage to bin roof, roof vents and discharge louvers must be free of ice and other obstructions before starting aeration fans. Operation of aeration fans during certain adverse weather conditions can cause icing of roof vents and/or discharge louvers, which may result in roof failure.

Operating fan with bin empty may dislodge floor supports and cause floor to fail when bin is filled.

Sukup Manufacturing Company
PO Box 677 Sheffield, IA 50475
Phone: 641-892-4222 **Fax:** 641-892-4629
E-mail: Info@sukup.com Visit us at: www.sukup.com

LIMITED WARRANTY

SUKUP MANUFACTURING COMPANY (Sukup) warrants to original retail purchaser that within time limits set forth, new equipment shall be free from defects in material and workmanship. A part will not be considered defective if it substantially fulfills performance specifications. Should any part prove defective within the warranty period, the part will be replaced without charge F.O.B. Sukup Mfg. Co., Sheffield, Iowa USA or Distribution Centers - Arcola, Illinois; Aurora, Nebraska; Cameron, Missouri; Defiance, Ohio; Jonesboro, Arkansas; Watertown, South Dakota. To obtain warranty, a copy of original invoice is required.

THE FOREGOING LIMITED WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF MERCHANTABILITY, FITNESS OR PURPOSE AND OF ANY OTHER TYPE, WHETHER EXPRESSED OR IMPLIED. Sukup neither assumes nor authorizes anyone to assume for it any other obligation or liability in connection with said part, and will not be liable for incidental or consequential damages. THE REMEDIES STATED HEREIN SHALL BE THE EXCLUSIVE REMEDIES AVAILABLE UNDER THIS LIMITED WARRANTY.

Sukup reserves the right to change specifications, add improvements or discontinue manufacture of any of its equipment without notice or obligation to purchasers of its equipment. This warranty gives you specific legal rights. You may also have other rights which vary according to state or province.

WARRANTY EXCLUSIONS - Labor, transportation, or any cost related to a service call is not provided by Sukup. This Limited Warranty does not apply to damage resulting from misuse, neglect, normal wear, accident or improper installation or maintenance. ITEMS NOT MANUFACTURED BY SUKUP (i.e. Tires, Belts, Motors, etc.) ARE COVERED UNDER WARRANTIES OF THEIR RESPECTIVE MANUFACTURERS AND ARE EXCLUDED FROM COVERAGE UNDER THE SUKUP WARRANTY. Since the down augers are so critical to the successful operation of the stirring machine, Sukup Mfg. will not warranty any machines unless they are equipped with Sukup down augers.

BASIC WARRANTY - All Sukup manufactured products are warranted for one year from date of purchase.

EXTENDED STIRRING MACHINE WARRANTY - Sukup warrants Stirring Machines for two years from date of purchase.

EXTENDED STIRRING AUGER WARRANTY - Stirring Augers are warranted for two years from date of purchase. Must return top 18" of down auger to obtain credit.

EXTENDED FAN WARRANTY - Sukup warrants fans for two years from date of purchase.

EXTENDED GRAIN DRYER WARRANTY - Sukup warrants portable grain dryers for two years from date of purchase.

EXTENDED HEATER CIRCUIT BOARD WARRANTY - Sukup warrants heater circuit boards for three years from date of purchase.

ELECTRIC MOTOR WARRANTY - The manufacturers of electric motors warranty their motors through authorized service centers. Contact motor manufacturer for nearest location. If motor warranty is refused by a service center based upon date of manufacture, use the following procedure: Have the motor repair shop fill out the warranty report form as if they were providing warranty service. State on the report the reason for the refusal. Send the report, motor nameplate, and proof of purchase date to Sukup. If electric motor warranty is not satisfactorily handled by motor service center, contact Sukup for assistance. Warranty may also be obtained by returning motor to Sukup Mfg. Co. or Distribution Centers with prior authorization. **NOTE**: Sukup will not be responsible for unauthorized motor replacement or repair.

WARRANTY CERTIFICATION - Warranty registration card should be mailed within two weeks of product delivery to certify warranty coverage.

UNAPPROVED PARTS OR MODIFICATION - All obligations of Sukup under this warranty are terminated if: unapproved parts such as stirring augers are used, or if equipment is modified or altered in any way not approved by Sukup.

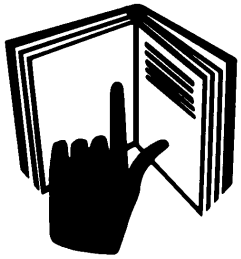
AXIAL FAN & HEATER SAFETY SECTION

RECOGNIZE SAFETY ALERT SYMBOL

The American Society of Agricultural and Biological Engineers (ASABE) safety alert symbol means "ATTENTION! Be Alert! Your personal safety is involved." This symbol draws your attention to important instructions concerning your personal safety. Read the messages carefully to avoid personal injury or death.

FOLLOW MACHINE SAFETY SIGNS & MESSAGES

Observe safe operating practices. Carefully read this manual and all safety signs on your equipment. Safety signs must be kept in good condition. Replace missing or damaged safety decals or shields free of charge by contacting Sukup Manufacturing Co., Box 677, Sheffield, Iowa 50475.



Learn how to use controls and operate equipment. Do not let anyone operate unit without thorough training of basic operating and safety procedures.

Make no unauthorized modifications to equipment. Modifications may endanger function and/or safety of unit. Periodically check all mechanical and electrical components. Keep unit in good working condition.

EMERGENCIES - KNOW WHAT TO DO

Have emergency numbers near your telephone:

Doctor: _____

Emergency Medical Squad: _____

Ambulance Service: _____

Hospital: _____

Fire Department: _____

911 Address: _____

Written Directions to Your Location: _____

WARNING:
TO PREVENT EXPLOSION OR FIRE

* Carefully review operators manual.
* Clean under floor, as fines may cause a bin fire.
* Check for gas leaks, (spray soapy solution on piping and joints.)
* Run fan at least a half minute before starting heater.
* NEVER start heater if you smell gas or hear a hissing sound.
* NEVER run heater with inspection door open.
* Check fan blade, hub and shaft for cracks.
* Replace immediately if cracks are visible.

Failure to heed these warnings may cause serious injury or death.

WARNING:
KEEP CLEAR OF ALL MOVING PARTS

Keep people (ESPECIALLY YOUTH) away from equipment, particularly during operation.

Keep away from all moving parts. Entanglement can cause serious injury or death. Keep inlet guard in place and in good working condition.

If fan is wired for suction, outlet must be shielded to protect individual from moving parts.

Failure to follow the above precautions may cause serious injury or death.

AXIAL FAN & HEATER SAFETY SECTION

CAUTION:
To avoid electrocution, all equipment must be properly wired and grounded according to electrical codes. Have unit wired by a qualified electrician.

Have your electrician install a main power disconnect switch capable of being locked only in the OFF position. Mark disconnect clearly as to the equipment it operates.

Always LOCK OFF main power disconnect switch whenever equipment is not in use or when servicing unit.

DANGER:
Never enter bin, unless all power is locked off and another person is present.

Rotating augers can kill or dismember!

NEVER, NEVER, clean out bin with augers running!

Flowing grain may trap and suffocate. If you enter a bin of flowing grain you can be completely submerged in grain in about 8 seconds.

Failure to heed these warnings may cause serious injury or death.

WARNING: Heater must be electrically interlocked with fan. When this is not possible (example PTO or direct engine drive fan), an air switch kit needs to be added to heater. **NEVER** operate heater without airflow.

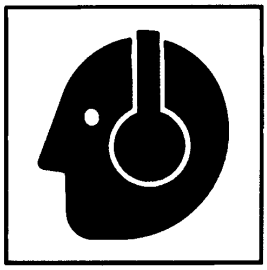
Failure to do so may cause serious injury or death.

CAUTION:
To avoid personal injury, frequently inspect all mechanical and electrical components. LOCK OFF all power whenever servicing equipment. For PTO driven units shut tractor off, disconnect PTO drive shaft, and remove ignition key from tractor. Repair and/or replace worn parts. Be sure all electrical wires are in good condition.

DANGER: Disconnect electricity before inspecting or servicing. Lock out all power and have another person present. **Always** lock off all power and check with voltage meter before servicing.

Failure to do so may cause serious injury or death.

CAUTION:
Wear hearing protection when near Axial Fan.



Safety Decal Placement for Axial Fans & Heaters

Safety decals and shields are mounted whenever possible at factory.

Yearly and prior to equipment use, please check that all decals are in place according to these drawings and in good legible condition. To order a replacement decal or shield free of charge, contact your dealer or Sukup Manufacturing. Co. - P.O. Box 677 - Sheffield, IA, 50475. Please specify computer number.

IMPORTANT! The following safety decals should be mounted on your equipment as shown below. If suggested locations are not clearly visible, place safety decals in a more suitable area. Never cover up any existing safety decals.

Make sure location area for decal is free from grease, oil and dirt. Remove backing from decal and place in proper position.

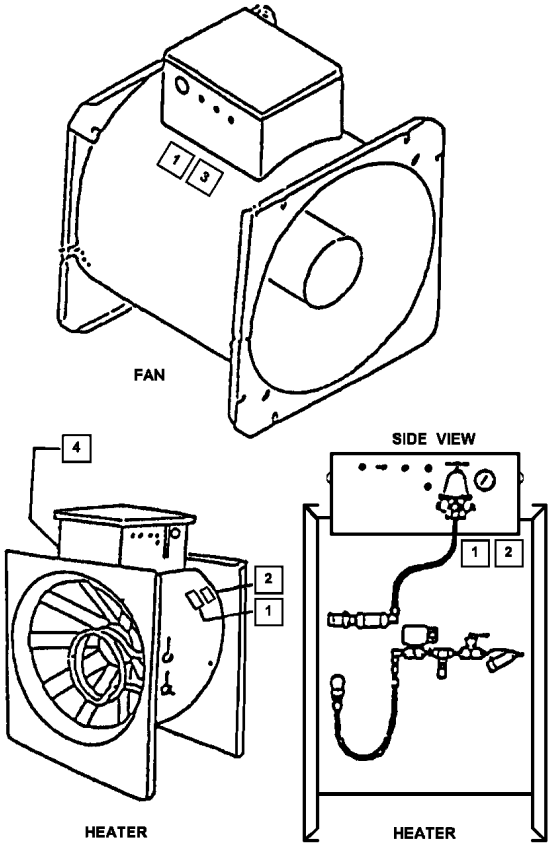
1. **WARNING - L0281** - Safe operation decal.

2. **WARNING - L0165 -** Disconnect Electricity; Bleed gas

3. **WARNING - L0166 -** Keep guards, shields in place; Disconnect electricity; Check fan blade for tightness.

4. **DANGER - L0204 -** Do not operate with service door removed.

The numbers on the drawings below refer to the location of the safety decals listed above.



HEATER BTU RATINGS
AXIAL HEATERS – Propane

HIGH TEMPERATURE

(½" Vapor piping) Approx. 50-180° temperature rise

VAPOR PROPANE No Vaporizer	LIQUID PROPANE With Vaporizer, for colder climates	
COMP #	**COMP #**	**MAX. BTU/hr***
D4601	D4611	1.4
D4602	D4612	"
D4603	D4613	"
D4701	D4711	2.0
D4702	D4712	"
D4703	D4713	"
D5101	D5111	2.0
D5102	D5112	"
D5103	D5113	"
D4801	D4811	2.7
D4802	D4812	"
D4803	D4813	"
D4902	D4912	5.0
D4903	D4913	"
D4907	D4917	6.0
D4908	D4918	"

*Btu/hr = $\frac{\text{Temp. Rise X CFM}}{.93}$

LOWER TEMPERATURE

(Vapor Propane – ¼" piping)

LOW TEMP Typically 25-75° F temperature rise		SUPER LOW TEMP Typically 10-30° F temperature rise	
COMP #	**MAX. BTU/hr***	**COMP #**	**MAX. BTU/hr***
D4631	.42	D4681	.3
D4636	"	D4686	"
D4634	"	D4684	"
D4632	"	D4682	"
D4731	.72	D4781	.5
D4736	"	D4786	"
D4734	"	D4784	"
D4732	"	D4782	"
D5131	.72	D5181	.5
D4831	1.44	D4881	1.0
D4836	"	D4886	"
D4834	"	D4884	"
D4832	"	D4882	"

HEATER BTU RATINGS
AXIAL HEATERS – Natural Gas

HIGH TEMPERATURE MODELS

(Natural Gas – ½" piping on 18"; 3'4" on 24" & 28"; 1¼" on 38" & 44")

Approx. 50-180° F temperature rise

COMP #	MAX. BTU/hr*
D4621	1.1
D4622	"
D4623	"
D4721	1.6
D4722	"
D4723	"
D4821	2.1
D4822	"
D4823	"
D49221	4.0
D49231	"
D49271	5.0
D49281	"

*Btu/hr = $\frac{\text{Temp. Rise X CFM}}{.93}$

LOWER TEMPERATURE MODELS

(Natural Gas – ½" piping)

LOW TEMP Typically 25-75° F temp rise		SUPER LOW TEMP Typically 10-30° F temp rise	
COMP #	**MAX. BTU/hr***	**COMP #**	**MAX. BTU/hr***
D4641	.33	D4691	.2
D4646	"	D4696	"
D4644	"	D4694	"
D4642	"	D4692	"
D4741	.58	D4791	.4
D4746	"	D4796	"
D4744	"	D4794	"
D4742	"	D4792	"
D4841	1.15	D4891	.8
D4846	"	D4896	"
D4844	"	D4894	"
D4842	"	D4892	"
D4847	"	D4897	"

HEATER DESIGNATION

V24L-M

V = Vane Axial Heater

24 = Housing Diameter

Fuel
L = Liquid propane
V = Vapor propane
N = Natural gas

Control Method
M = Modulating Valve
T = Thermostat
HL = High-Low Thermostat

D10L-M

D	**10**	**L**	**M**
Downstream Centrifugal Heater	Fan Horsepower	Fuel L = Liquid propane V = Vapor propane N = Natural gas	Control Method M = Modulating Valve T = Thermostat HL = High-Low Thermostat

HEATER SELECTION

1. High-Low control or modulating valve (continuous flame) recommended for high temperature continuous flow drying. High-low burner cycles between high and low flame for more even temperature control. It is NOT for low temperature drying. A special low-temperature heater is batch-in bin or stir drying. Thermostat or Humidistat recommended for low temperature drying.

2. Liquid propane model (with vaporizer) recommended to dry when colder than 32º or when using over one million BTU per hour. See tables page 18. Order vaporizer kit to convert vapor models to liquid. Refer to page 56 for correct computer number.

On vapor heaters a manual (*shut-off-valve*) and a 100-mesh gas strainer (*supplied by customer*) should be installed between heater pipe train and fuel supply line.

3. Use low-temperature burner if less than 50º-temperature rise is desired. Use regular burner for more than 50º-temperature rise.

4. When installing two fans on bin, use thermostat or high-low control and two-heater relay kit. Refer to page 56 for correct computer number. This kit allows control of both heaters with same thermostat. Order fan shutters to prevent reverse rotation of fan that is not running (e.g. when starting one fan before the other).

5. Provide one square foot roof opening per thousand-cfm fan capacity.

6. Natural gas models. Gas company regulator should deliver 15psi under flow to obtain maximum heat output. Check with gas company for pressure available and pipe size required for expected BTU/hr load. If less than 15psi, call Sukup Mfg. to see if heater with larger pipe train is needed. Regulator is not included with natural gas models. Install gate valve (not included) gas line near heater to control heat output.

7. Dial stem thermometer (J5845) is available to monitor plenum temperature. (Included with modulating valve models.)

8. Static pressure gauge is available to monitor fan performance.

9. Step-down transformer must be used to supply 115v single-phase power to heater when installed with 460v fan. Order 460v fan with heater circuit.

10. Fan inlet cover is available for off-season protection.

11. It is recommended to push air. Negative air can draw corn and trash under floor or aeration ducts into fan housing and motor, causing motor problems.

WARNING! HEATER MUST BE ELECTRICALLY INTERLOCKED WITH FAN. WHEN THIS IS NOT POSSIBLE (EXAMPLE PTO OR DIRECT ENGINE DRIVE FAN), AN AIR SWITCH KIT NEEDS TO BE ADDED TO HEATER.

NEVER

OPERATE HEATER WITHOUT AIRFLOW.

Information is available from your local extension service or Midwest Plan Service, 122 Davidson Hall, Iowa State University, Ames, Iowa 50011

1. MWPS-22 Low-temperature and Solar Grain Drying Handbook
2. AED-20 Managing Dry Grain in Storage.

NOTE: Heater is designed for drying grain and other crops typically in steel bins. Heater is not to be used within an enclosed building.

SPECIFICATIONS
CERTIFIED AXIAL FAN AIRFLOW

Airflows for Aeration Applications — CFM												
Model		Static Pressure (inches of water)										
		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
12”	3/4 hp	1900	1675	1290	815	550	325	100	0	0	0	0
12”	1hp	2308	1963	1460	876	595	305	0	0	0	0	0
14”	1½ hp	3132	2852	2526	2126	1511	1040	720	0	0	0	0
18”	1½-2 hp	5450	4850	4250	3600	2800	2000	1500	1050	0	0	0
18”	3 hp	7000	6600	6150	5575	4850	3950	3100	2400	1900	1700	1300

Certified Airflow for Axial Fans – CFM*										
Model		Static Pressure-inches of water								
		0	1	2	3	4	5	6	7	8
24”	5-7 HP	12,800	11,750	10,300	8600	6250	3350	1900	600	0
24”	7-10 HP	15,200	13,750	12,250	10,500	7600	3900	2100	400	0
28”	10-15 HP	19,050	17,300	15,600	13,600	11,100	7350	4800	2800	700

TEMPERATURE RISE* (°F)									
Million BTU/hr input									
CFM	.25	.50	1.0	1.5	2.0	2.5	3.0	4.0	5.5
10,000	18	36	73	109	145	---	---	---	---
15,000	---	24	48	73	97	121	145	---	---
20,000	---	18	36	55	73	91	109	145	---
30,000	---	---	24	36	48	61	73	97	133
40,000	---	---	18	27	36	45	55	73	100

***.80 efficiency**

BTU/hr = Temp. rise x CFM
.93

MAX. HEAT OUTPUT*		
Model #	**LP**	**Nat. Gas**
V18	1.4	1.4
V24	2.0	2.0
V28	2.7	2.2
V38	5.0	---
Low Temp	0.72	0.6

***Million BTU/hr**

HIGH-LOW LOW ORIFICE		
MODEL #	**LP**	**NATURAL GAS**
V24	1/8	19/64
V28	11/64	19/64

STANDARD ORIFICE (INCHES)		
Model #	**LP**	**Natural Gas**
V18	1/8	15/64
V24	11/64	23/64
V28	13/64	23/64
V38	19/64	23/64
Low Temp	1/8	15/64

MILLION BTU/HR PROPANE*					
	Orifice				
PSI	1/8	9/64	11/64	13/64	19/64
1	.15	.19	.29	.40	.87
2	.23	.29	.43	.59	1.3
3	.29	.37	.55	.75	1.6
4	.34	.43	.64	.88	1.9
5	.39	.49	.73	1.0	2.2
6	.43	.55	.81	1.1	2.4
8	.51	.65	.96	1.3	2.9
10	.57	.73	1.1	1.5	3.2
12	.64	.80	1.2	1.7	3.6
15	.72	.92	1.4	1.9	4.1
20	.85	1.1	1.6	2.2	4.8
30	---	---	2.0	2.7	---

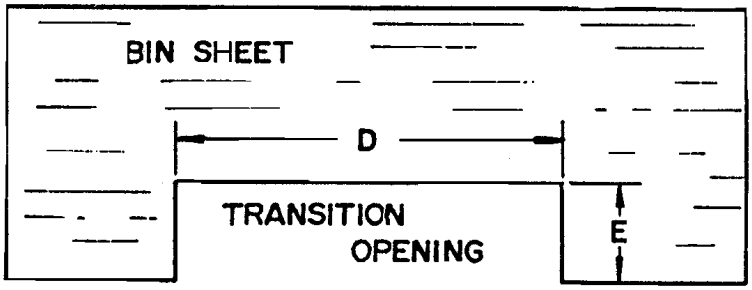
MILLION BTU/HR NATURAL GAS		
	Orifice	
PSI	15//64	23/64
1	.36	.85
2	.55	1.3
3	.69	1.6
4	.81	1.9
5	.93	2.2

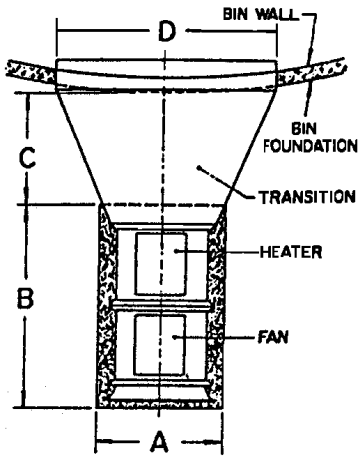
INSTALLATION

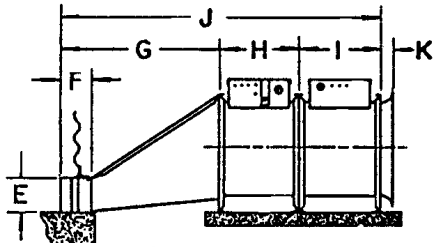
1. Install floor supports and unload for uniform airflow. Preferred arrangement is 180° between fan and unload.
   Be sure floor is strong enough to support grain column. If two fans and heaters are installed on bin, locate them about one bin sheet apart. Install single thermostat midway and use two-heater relay kit.

2. Pour concrete fan pad same height as bin pad. For company's transition, use pad location in table. For other transitions: length of transition = G.

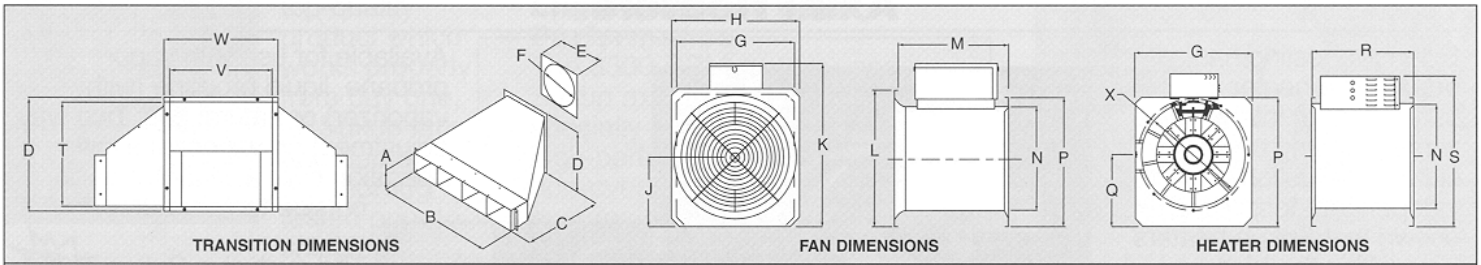
Fan	PAD SIZE A	B	C	ENTRANCE COLLAR OPENING D	E	F	G	H	I	J	K
44"	--	--	--	--	--	--	--	30	24	--	5
38"	56	X 72	46	100	X 14	9	60	30	24	114	5
28"	46	X 65	24	55-1/2	X 10	6	38	24	24	86	3
24"	36	X 65	24	55-1/2	X 10	6	38	24	24	86	4
18"	28	X 56	23	40	X 10	9	36	24	18	78	--







For more transition information see Assembly Instructions #L0516 and #L1486 packed with transition.



TRANSITION DIMENSIONS | FAN DIMENSIONS | HEATER DIMENSIONS

Axial Fan and Heater Dimensions (inches)

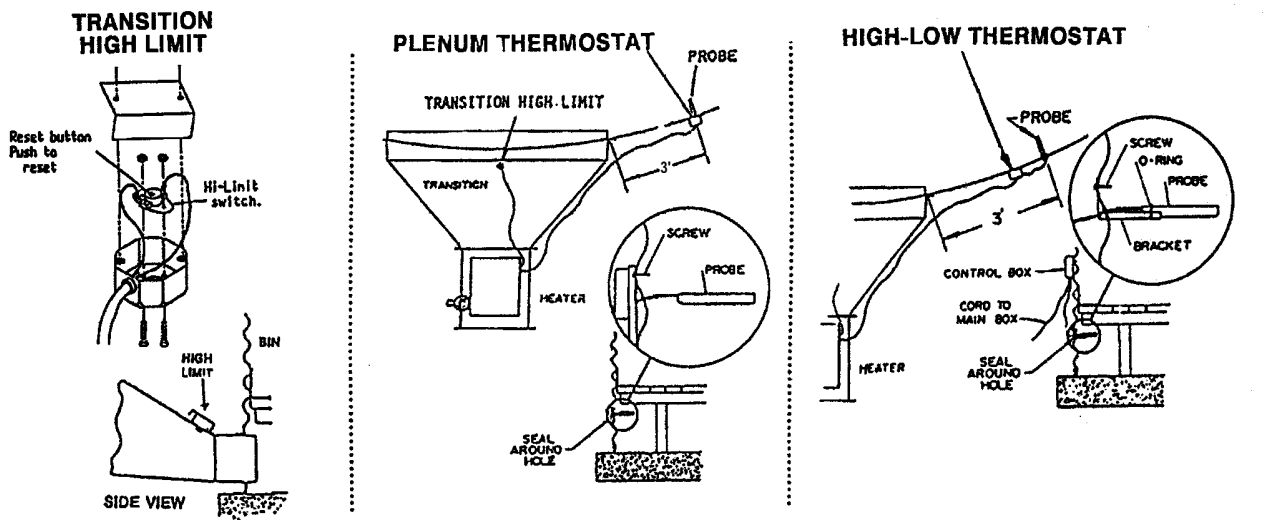
DIA	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	V	W	X
12"	10¼	40¼	36	20⅛	20	12 3/16	14⅛	14⅛	7	14¾	14⅛	16⅛	12⅛	14⅛	—	—	—	18¼	18	20	—
14"	10¼	40¼	36	20⅛	20	14 3/16	16⅛	16⅛	8	16⅞	16⅛	16⅛	14 3/16	16⅛	—	—	—	18¼	18	20	—
18"	10¼	40¼	36	20⅛	20	18 1/16	19⅞	19⅞	10	24½	19⅛	18¼	18 3/16	19⅞	10	24¼	28½	18¼	18	20	19⅝
24"	10¼	55¾	38	31½	31½	24¼	27⅝	30	16½	38	31½	26½	24 3/16	30⅛	16½	24¼	38	28½	28½	31½	26
28"	10¼	55¾	38	31½	—	—	31⅝	33⅜	18¼	42	35 1/16	26⅞	28 5/16	34⅛	18¼	24¼	41½	28½	28½	31½	29¾

3. Check size of your transition-entrance collar. Cut hole in bin sheet to fit entrance collar snugly. Push transition-entrance collar into opening until angle iron stops are against bin sheet.
4. Caulk fan, heater, and transition flanges with a material rated up to 200° F.
5. Set equipment on pad.
6. Connect fan and heater first. Be sure to center.
7. Slide fan (and heater) up to transition.
8. Bolt together.
9. Check that assembly is square with bin. Angle iron stops on each side of entrance collar should be tight against bin sheet. Shim under housing if necessary for solid, level mounting.
10. Seal entrance collar along bottom with rubber strip provided and along top and sides with caulking (rated up to 200°F). Secure angle iron stops to bin with screws. Bend slotted angle iron to fit curve of bin on top of entrance collar. Attach with screws.

11. **TRANSITION HIGH LIMIT** Cut 1-1/16" hole in top of transition for high limit. Caulk around hole. Remove cover from high limit box and secure box to transition with screws provided. Press reset button and install cover with lip so it provides weather protection.

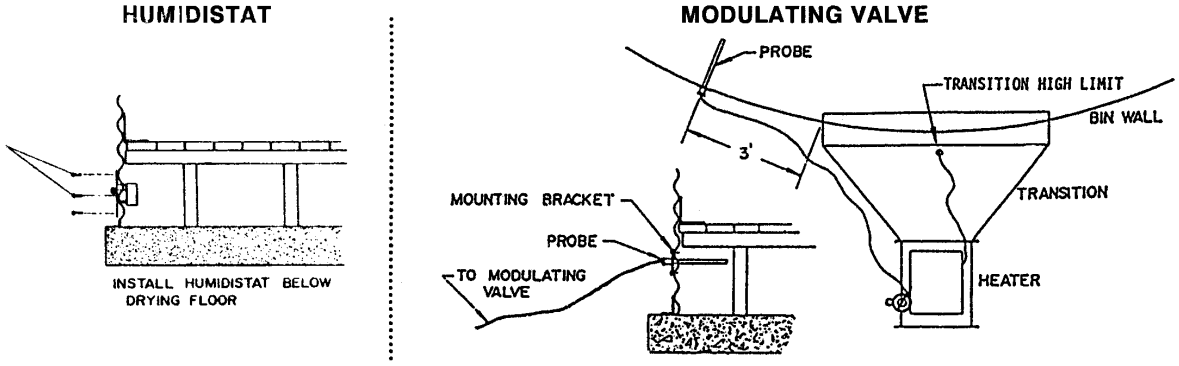
12. **THERMOSTAT** Cut 7/8" hole, 3' right* of entrance collar, below drying floor. Insert sensing bulb with holder, insuring that bulb is completely inserted through bin wall into plenum chamber. Attach to bin with screws. Seal opening.

HIGH-LOW THERMOSTAT Cut 7/8" hole, 3' right* of entrance collar, below drying floor. Insert sensing bulb with holder, insuring that bulb is completely inserted through bin wall into plenum chamber. Attach to bin with screws. Mount control portion in convenient position with screws. Seal opening.



13. **MODULATING VALVE** Cut ¾" hole 3' left* of entrance collar, below drying floor. Attach bracket over hole with screws. Insert probe in bracket with word “TOP” (stamped on probe) upward. Install dial thermometer near probe.

* When using other than Sukup transition, it may be necessary to place heat probe in another location to adequately sense heat.



14. **HUMIDISTAT** Locate humidistat approximately 3' to the right of entrance collar. Cut a rectangular hole in bin wall into plenum chamber. Hole should be 3-1/2" wide x 4" tall. Attach faceplate to bin wall, using 6 self-tapping screws. Use caulk or some other sealer to seal between mounting pate and bin wall.

15. Plug heater power cord into burner receptacle on fan. Heater must be interlocked with fan. Never operate heater without airflow.

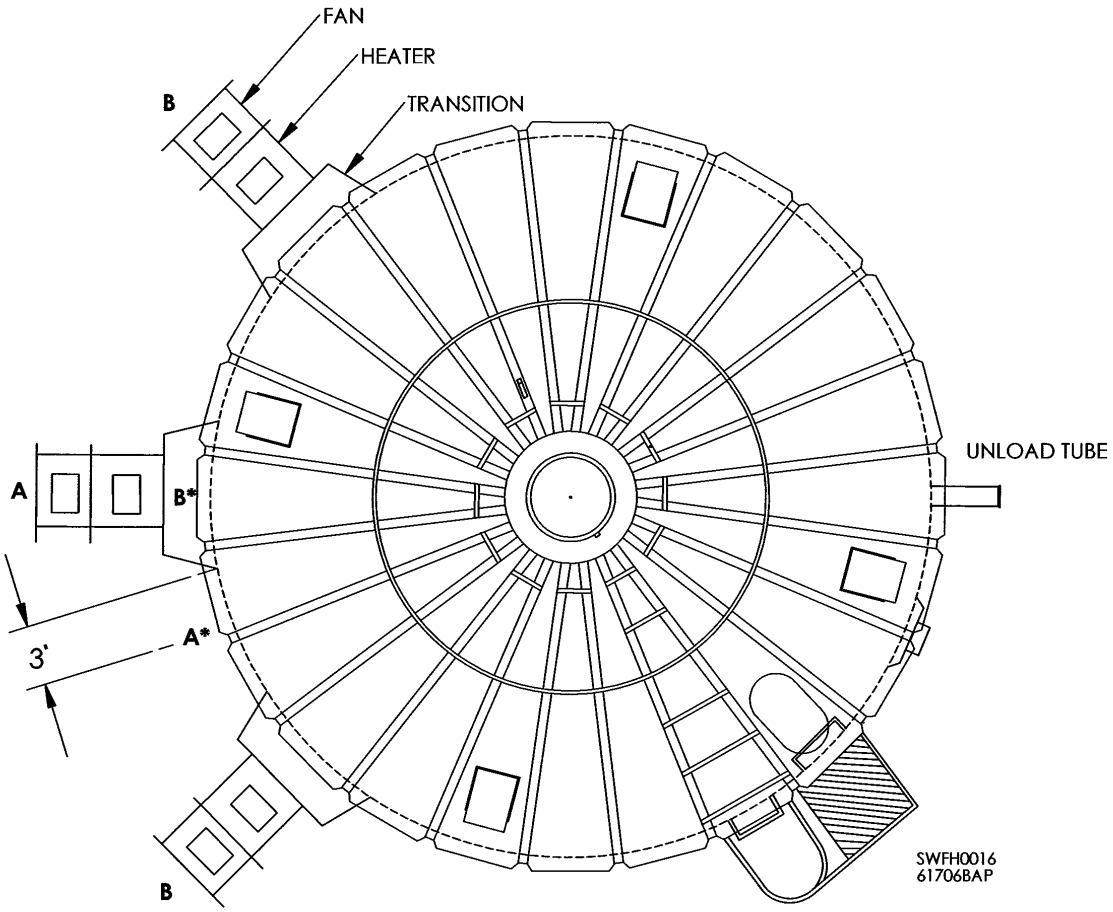
IMPORTANT: If heater is not mounted to typical grain bin, as shown in drawing, make sure that thermostat sensor and transition hi-limit are mounted so that they will sense the maximum air temperature. Make sure the air going into the dryer is evenly mixed to eliminate hot spots.

FAN/HEATER & CONTROLLER LOCATIONS

When utilizing 2 or 3 fan and heater combinations on the same bin, the use of a dual or triple burner control is required. (Modulating valve-controlled heaters may not be used in any dual or triple applications.) The control must be located between the primary and one of the secondary fan and heater units. Also, monitor the plenum temperature on the outboard sides of any dual or triple fan and heater combinations. See illustration below. **It is always suggested that plenum temperature be monitored all the way around the bin.** By checking the sidewall of the bin in the plenum area with a bare hand, it will be easy to detect hot or cold spots.

A - Single Fan/Heater Location
A* - Single and Triple Burner Control Location
B - Dual Fan/Heater Location
B* - Dual Burner Control Location
A & B - Triple Fan/Heater Location

Note: When triple Fan/Heater units are used, "A" becomes primary unit. On dual Fan/Heater units, either unit may be primary.



ELECTRICAL

All electrical work must be done by a qualified electrician and in accordance with local and federal codes.

Provide manual disconnect on or near bin in clear view from fan. Use properly sized time-delay fuses or time limit circuit breakers. Use properly sized safety ground and neutral wire.

Use table as guide to copper wire size. Increase 1-2 sizes for aluminum conductors.

HP	PHASE	VOLTS	MAX. RUN AMPS	RECOMMENDED BREAKER SIZE**	MINIMUM ALLOWABLE COPPER WIRE SIZE DISTANCE - TRANSFORMER TO FAN			
					50 FT	100 FT	250 FT	500 FT
3/4	1	115	10	20	12	10	6	3
"	1	208-230	5	15	12	12	10	8
"	3	230	2.6	15	12	12	12	10
"	3	460	1.3	15	12	12	12	12
1	1	115	12	25	12	6	3	0
"	1	230	6	15	12	10	8	6
"	3	230	3.6	15	12	12	12	10
"	3	460	1.8	15	12	12	12	12
1.5	1	230	8.5	15	12	10	8	6
"	3	230	4.8	15	12	12	12	8
"	3	460	2.4	15	12	12	12	12
2	1	230	10	20	12	10	8	6
"	3	230	5.6	15	12	12	10	8
"	3	460	2.8	15	12	12	12	12
3	1	230	13	25	12	8	6	3
"	3	230	7.6	15	12	12	8	6
"	3	460	3.8	15	12	12	12	12
5-7	1	230	35	70	8	6	3	0
"	3	230	19	35	12	10	6	3
"	3	460	9.5	20	12	12	10	8
7-10	1	230	42	80	8	6	3	0
"	3	208-230	25-24	45	10	8	4	2
"	3	460	12	20	12	12	10	8
10-15	1	230	55	90	6	4	1	0
"	3	230	38	80	8	6	3	0
"	3	460	19	35	12	12	8	6

**Breaker sizes are recommendations only. Check motor nameplate amperage, National Electric Code and local codes to size breakers properly.

Punch hole in convenient location on fan control box for incoming power. Connect wires as shown. On three phase systems, connect wild line to center terminal on magnetic contactor.

On 230-volt fans when a heater will be used, a neutral line must be supplied with the incoming power.

REVISION EFFECTIVE JANUARY, 2009: Burner Receptacle replaced with Heater Power Block

Conversion Instructions

Wiring heater without electrical plug to fan with receptacle:

DISCONNECT POWER BEFORE WORKING ON UNITS!!

1. Drill 7/8" hole in fan control box close to receptacle for heater cord to go into box.
2. On neutral block in fan control box, remove jumper across terminals.
3. Remove red wire from receptacle and attach to terminal of block that is not connected to the neutral side.
4. Remove white wire from neutral block that goes to receptacle.
5. Bring cord from heater into fan control box thru hole drilled in box. Insert plastic bushing around heater cord to protect cord from edges of fan control box.
6. Attach black wire from heater cord to terminal on block with red wire. Attach white wire from heater cord to terminal on block with neutral or white wire. Attach green wire to ground lug.

Wiring fan without receptacle to heater with electrical plug on heater cord:

DISCONNECT POWER BEFORE WORKING ON UNITS!!

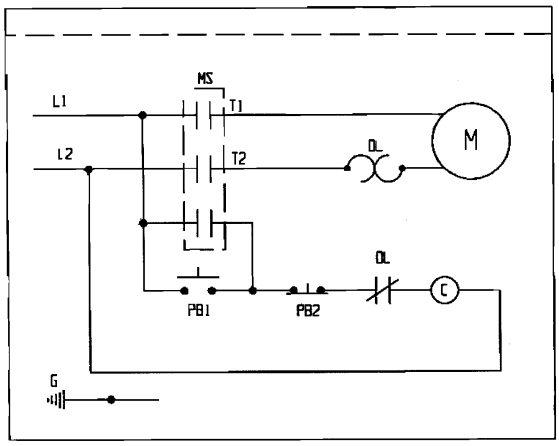
1. Remove plug from heater cord.
2. Remove plastic plug from fan control box and insert heater cord. Protect heater cord from edges of hole on fan control box.
3. Attach black wire of heater cord to red or power side of power block. Attach white wire of heater cord to white or neutral side of power block. Attach green wire of heater cord to ground lug.

AERATION FAN ELECTRICAL DIAGRAMS

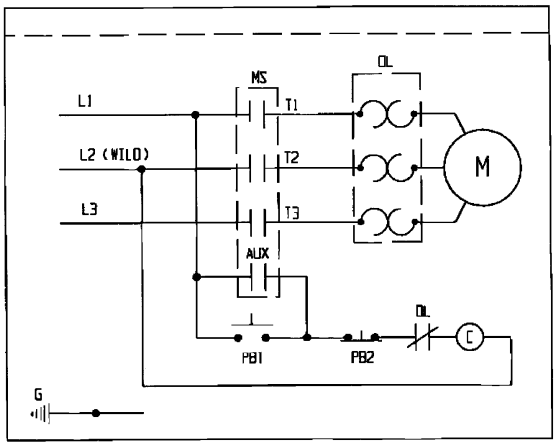
NOTES:

1. Customer must provide means of disconnect, short circuit, and ground fault protection.
2. Control circuit voltages are the same as that of the incoming power supply.
3. Wire motor as per nameplate diagram.

230 VOLT - SINGLE PHASE WITHOUT INHERENT PROTECTION



200/600 VOLT - THREE PHASE WITHOUT INHERENT PROTECTION



KEY:

M = Motor
MS = Magnetic Starter
C = Magnetic Starter Coil
OL = Overload Relay
PB1 = Start Button (Black)
PB2 = Stop Button (Red)
G = Ground Terminal
Aux = Auxiliary Contact

Sukup Manufacturing Co.
1555 255th St, Box 677
Sheffield, Iowa 50475 USA

FAN
(with heater power block)
ELECTRICAL DIAGRAMS

NOTES:

- **Customer must provide means of disconnect, short circuit, and ground fault protection**
- **For motors without internal protection, correctly sized thermal units must be used in overload relay.**
- **Control circuit voltages are the same as that of the incoming power supply.**
- **Wire motor as per nameplate diagram.**

KEY:

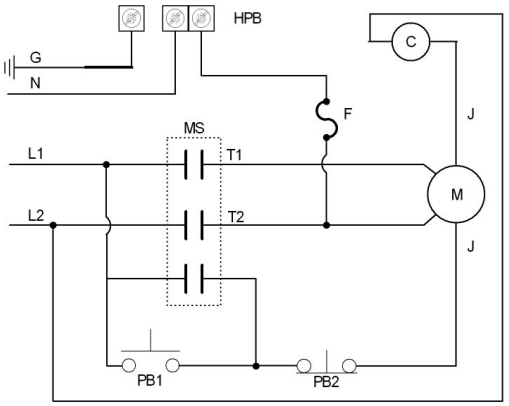
M - Motor
MS - Magnetic Starter
C - Magnetic Starter Coil
OL - Overload Relay
PB1 - Start Button (Green)
PB2 - Stop Button (Red)
HPB - Heater Power Block
F - Fuse

N - Neutral Terminal
G - Ground Terminal

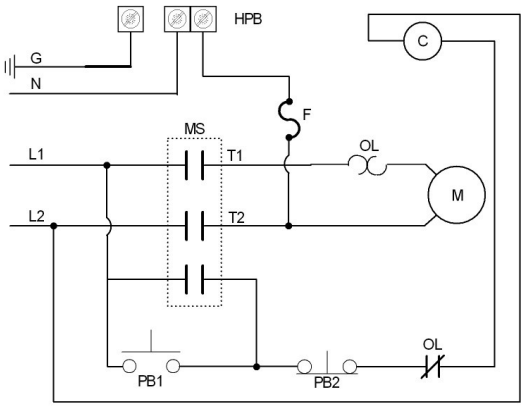
AUX - Auxiliary Contact
XFMR - Control Transformer
L1,L2,L3 - Incoming Lines
T1,T2,T3 - Contactor Terminals
J - Motor Leads w/ Internal Protection

208 - 230 VOLT, SINGLE PHASE

With internal motor protection (J leads)

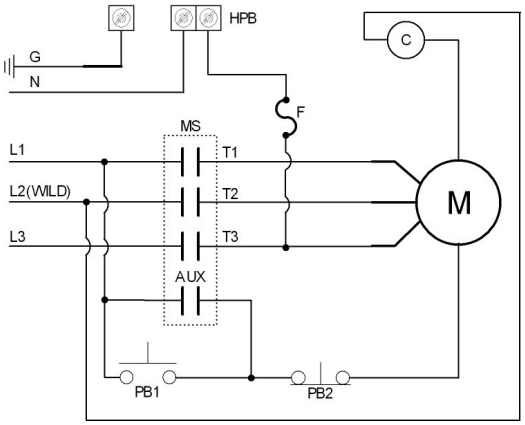


Without internal motor protection (J leads)

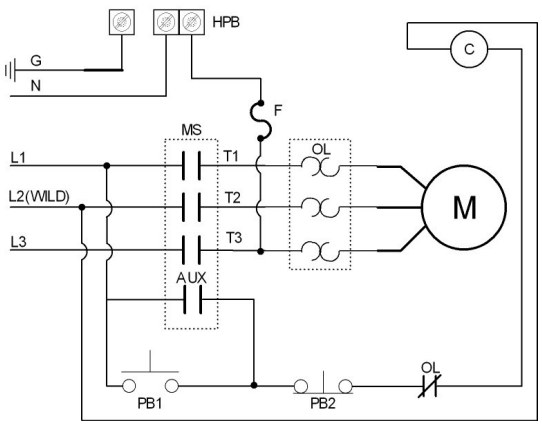


208 - 230 VOLT, THREE PHASE

With internal motor protection (J leads)

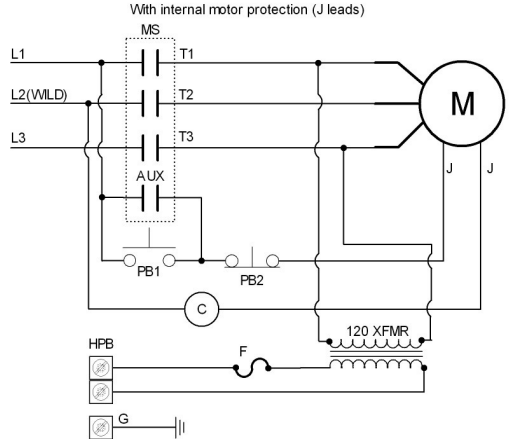


Without internal motor protection (J leads)

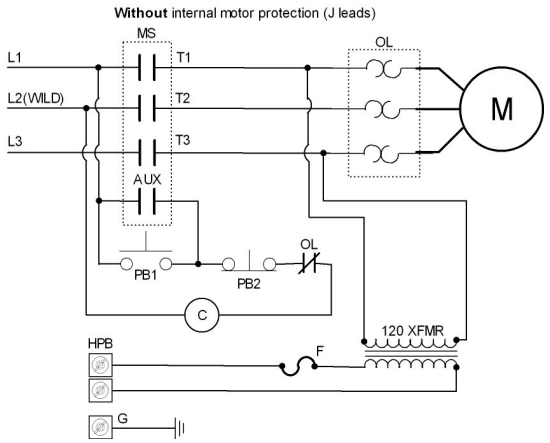


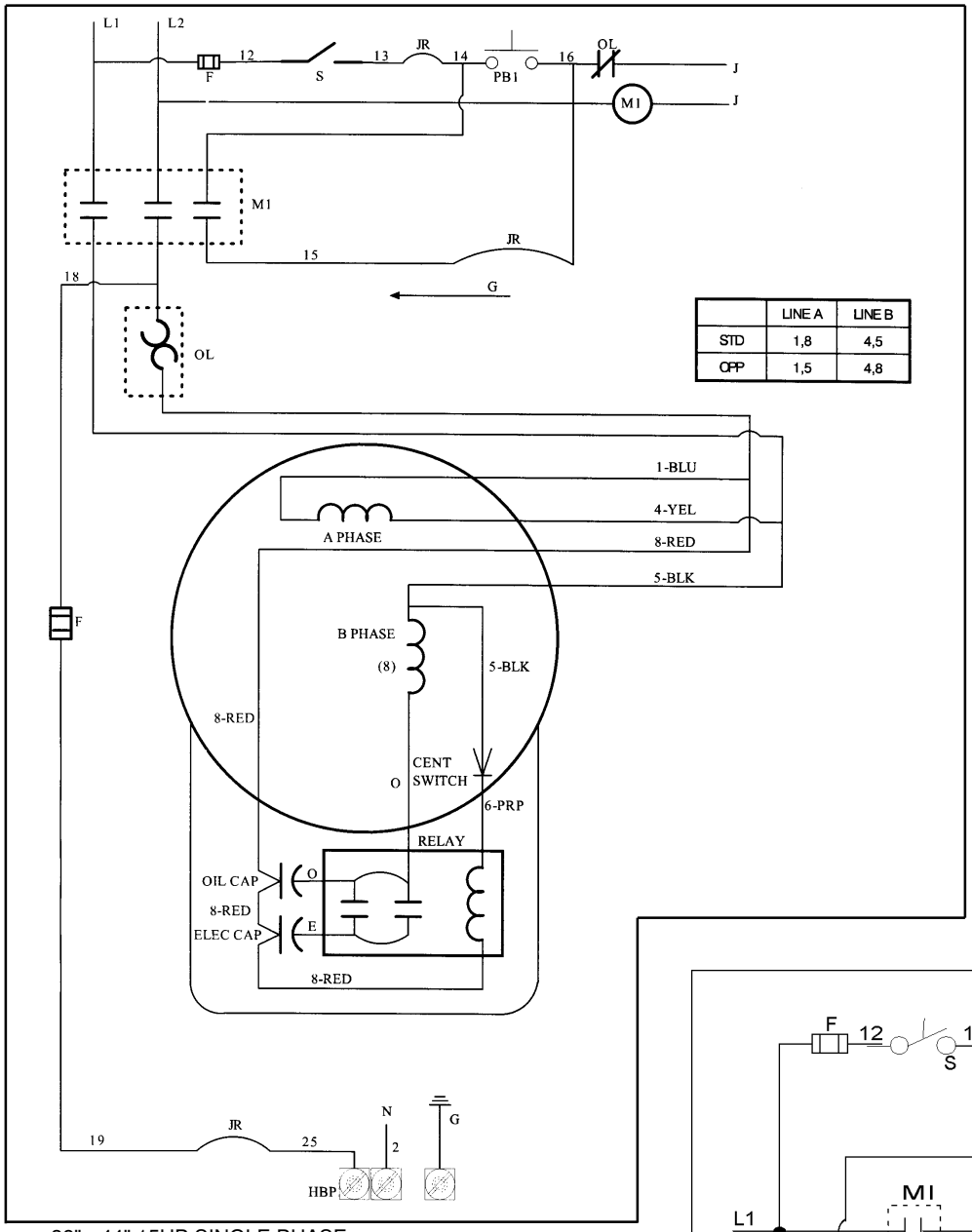
380 - 460 VOLT, THREE PHASE

With internal motor protection (J leads)



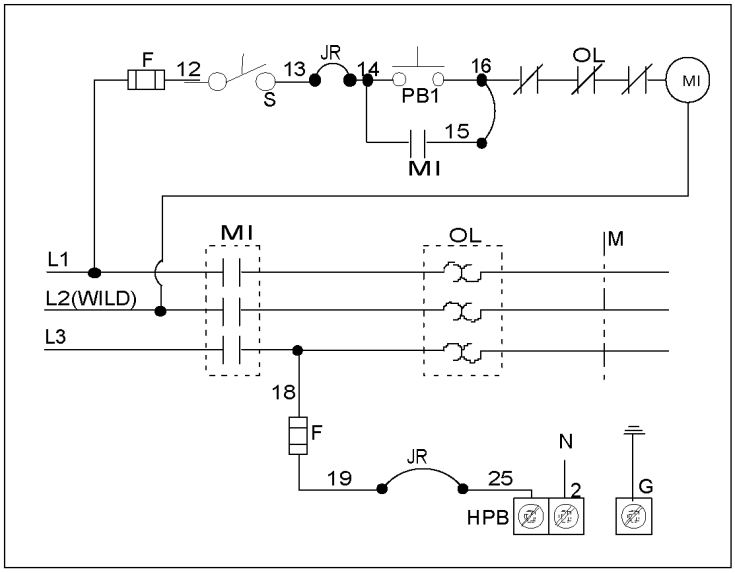
Without internal motor protection (J leads)





	LINE A	LINE B
STD	1,8	4,5
OPP	1,5	4,8

38" - 44" 15HP SINGLE PHASE



38"-44" 30HP THREE PHASE

38" & 44" FAN ELECTRICAL DIAGRAMS
230 V CONTROL

M	MOTOR
MJB	MOTOR JUNCTION BOX
M1	CONTACTOR
OL	OVERLOAD
S	TOGGLE SWITCH (SPST)
PB1	PUSH BUTTON (START)
F	FUSE
HPB	HEATER POWER BLOCK
JR	JUMPER
G	GROUND
N	NEUTRAL

PROPANE

Local gas supplier will install tank and proper tank fittings. Tell him whether vapor or liquid service is required. Vapor is drawn from top of tank. On vapor heaters a manual (*shut-off valve*) and a 100-mesh gas strainer should be installed between heater pipe train and fuel supply line. Liquid is drawn from near bottom of tank.

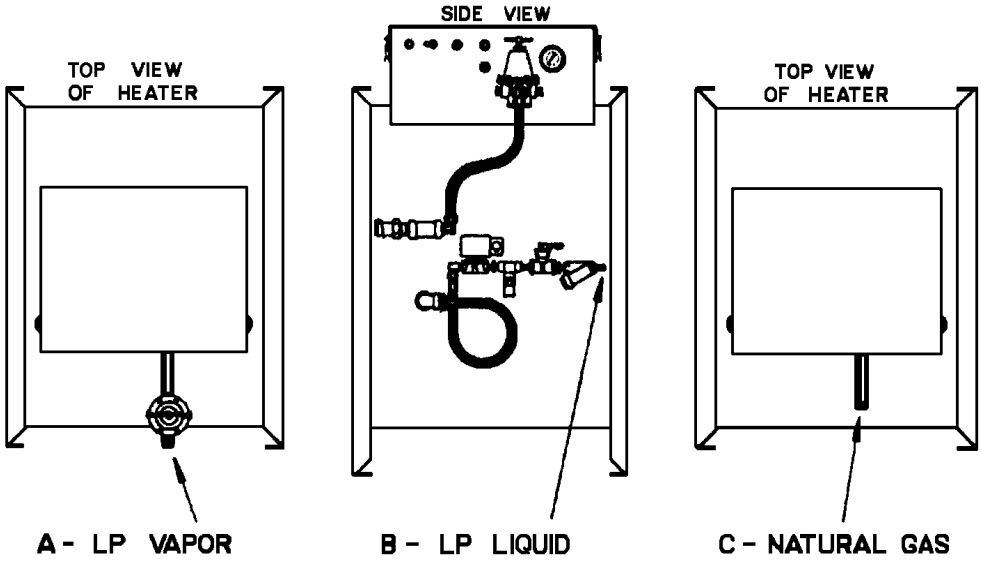
LPG Tank Size (Gallons) for Vapor Withdrawal

BTU/HR[2]	Lowest Average 24-HR Outdoor Temperature (°F)						
	32	20	10	0	-10	-20	-30
125,000	115	115	115	250	250	400	600
250,000	250	250	250	400	500	1000	1500
375,000	300	400	500	500	1000	1500	2500
500,000	400	500	750	1000	1200	2000	3500
750,000	750	1000	1500	2000	2500	4000	5000

Source: LP Gas Handbook of Technical Data (Fisher Controls Co.)
1. Tank is assumed to be half full.
2. Average rate in 8-hour period.

For LP fuel line, use 5/8" OD type K copper tubing or ½" schedule 80 black steel pipe. Use 3-5 ft. of flexible LP hose between fuel line and heater. Before connecting to heater, purge gas line to blow out any dirt in pipe. Connect to vapor heater at regulator (point A in drawing). Connect to liquid heater at Y strainer (point B in drawing).

AFTER ADJUSTING REGULATOR, MAKE SURE NUT BELOW T- HANDLE IS TIGHTENED SO NO MOISTURE GETS IN.



NATURAL GAS

Check with gas company to determine fuel line size. Gas company will install regulator on fuel line. Regulator not included with natural gas models. Install gate valve (not included) in fuel line near heater to control heat output. A 100-mesh gas strainer should be installed between heater pipe train and fuel supply line.

*** Note: Vapor high limit with auto reset is located as shown.**
Vapor high limit with manual reset is on pipe train in control box.

DUAL RELAY HEATER OPERATION

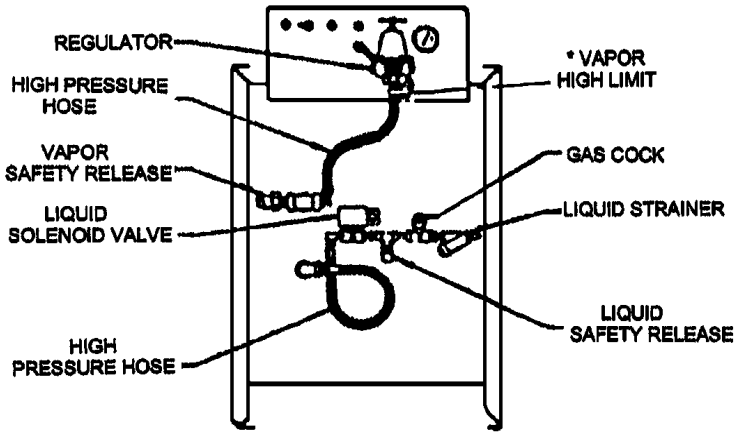
1. **Heater Power Cord** must be plugged into burner receptacle on fan for safe operation. This interlock assures fan is on before heater. Never operate heater without airflow. Heater operates on 115V, 60 hz., 1 phase.
2. After heater is turned on, a 45-second purge delay will occur before ignition. This allows fan to blow out any gas that may be in bin.
3. **Red Light** on indicates power to solenoid valves and ignition transformer. Flame should be present.
4. **Amber Light** on indicates flame probe has detected heat. If it does not detect heat 30 seconds after red light comes on, flame safety delay button will pop out and shut heater off. Purpose is to avoid raw gas entering bin if ignition does not occur. Reset flame safety delay by depressing button. Adjust flame probe by bending bracket. Bend tip into hotter area if button pops out. Small dull red area on tip indicates correct adjustment. Bend tip into cooler area if it is cherry red. Flame probe is close on temperature rise type. If amber light comes on before ignition, check flame probe. Flame probe is probably burned off.
5. **Solenoid Valves** are electrically operated gas shut-off valves. Open when energized (red light on). Feel for click when valve opens. Arrow on valve body indicates direction of gas flow.
6. **Regulator** delivers constant pressure to burner. Turn handle clockwise to increase pressure. Tighten lock nut to hold adjustment. Ports are marked in and out.
7. **Spark Plug** receives high voltage from ignition transformer to produce spark. Spark is continuous when red light is on.
8. **Burner High Limit** detects high temperature inside heater housing. Open on temperature rise. Reset manually by depressing red button with pencil.
9. **Transition High Limit** detects high temperature in transition. Open on temperature rise. Reset manually by depressing red button.

SOLID STATE HEATER OPERATION

1. **Heater Power Cord** must be plugged into burner receptacle on fan for safe operation. This interlocks the fan with heater, assuring fan will be on before the heater. Never operate the heater without airflow.
2. After heater is switched on, a 45-second purge delay will occur. Then the red light on control panel will come on, indicating power to solenoid valves and ignition transformer. This 45-second purge delay allows the fan to blow out any gas that may be in the bin.
3. After the purge delay, the solenoids will open and ignition should occur.
4. If flame is not detected within 10 seconds, the solid state board will "lockout." The purpose of this is to prevent raw gas from entering the bin. The circuit is reset by turning the toggle switch off for 2 seconds. (The only time the red light goes off is if lockout occurs.)
5. **Solenoid Valves** are electrically operated shut-off valves, opening when energized. A sharp snap will be heard when valves open. (An arrow on solenoid body indicates direction of gas flow.)
6. **Regulator** delivers a constant pressure to the burner. Turn handle clockwise to increase pressure. (Regulator ports are marked to indicate direction of fuel flow.)
7. **Spark Plug** relieves high voltage energy necessary to ignite fuel.
8. **Burner High Limit** is located inside the burner housing. It trips upon excessive heat in burner. It is reset with pencil from inside electrical box.
9. **Transition High Limit** detects high temperature in transition. Manually reset by depressing red reset button.
10. **Plenum Control** regulates drying temperature (See Plenum Control section.)

LIQUID HEATERS ONLY: DUAL RELAY OR SOLID STATE

1. **Coiled vaporizer** converts liquid propane into vapor propane by using heat from burner. Upper hose should be warmer than lower hose. **There should not be frost on regulator or on piping inside control box.** Loosen bolts in locking collars and slide vaporizer in for warmer operation. **Vapor high limit** shuts gas off if upper hose is too hot. Slide vaporizer out if very hot. Vapor high limit is open on temperature rise. Vapor high limit with red reset button must be manually reset if tripped. Vapor high limit without red reset button will reset automatically. Vaporizer must be adjusted before operating. Loosen bolts in locking collar and slide vaporizer out; approximately 8-9" downstream; 3-4" vane axial. Vaporizer pipe should be warm to the touch but not so hot you can't hold onto it.
2. **Y fuel strainers** filter fuel. Remove plug to clean screen. Some heaters are equipped with **Trapit fuel filters**, which must be replaced if plugged.
3. **Pressure relief valves** bleed excessive pressure in piping.



***Note: Vapor high limit with auto reset is located as shown. Vapor high limit with manual reset is on pipe train in control box.**

PLENUM CONTROL

Thermostat Operation

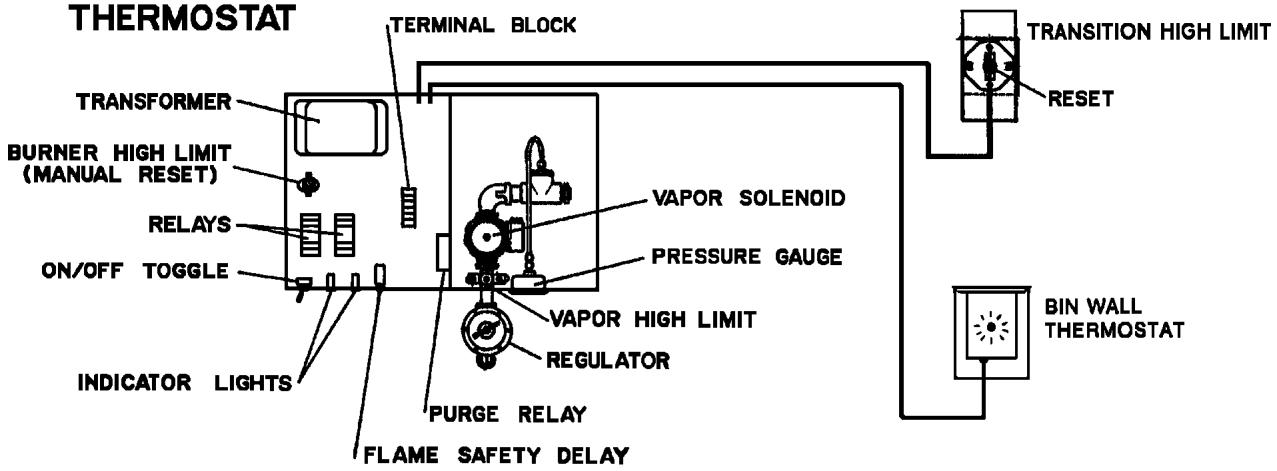
1. Open fuel supply valve (and gas cock on liquid models).
2. Loosen regulator lock nut. Turn regulator handle counterclockwise to minimum setting.
3. Set plenum thermostat at desired temperature.
4. Start fan.
5. Turn on heater. Wait for 45-second delay.
6. Red light comes on.
7. Adjust regulator until flame is on longer than off. Tighten lock nut.
8. Check flame probe (dual relay only). See page 19.
9. Check vaporizer (liquid models only). See above.

Operator's troubleshooting guide starts on page 28.

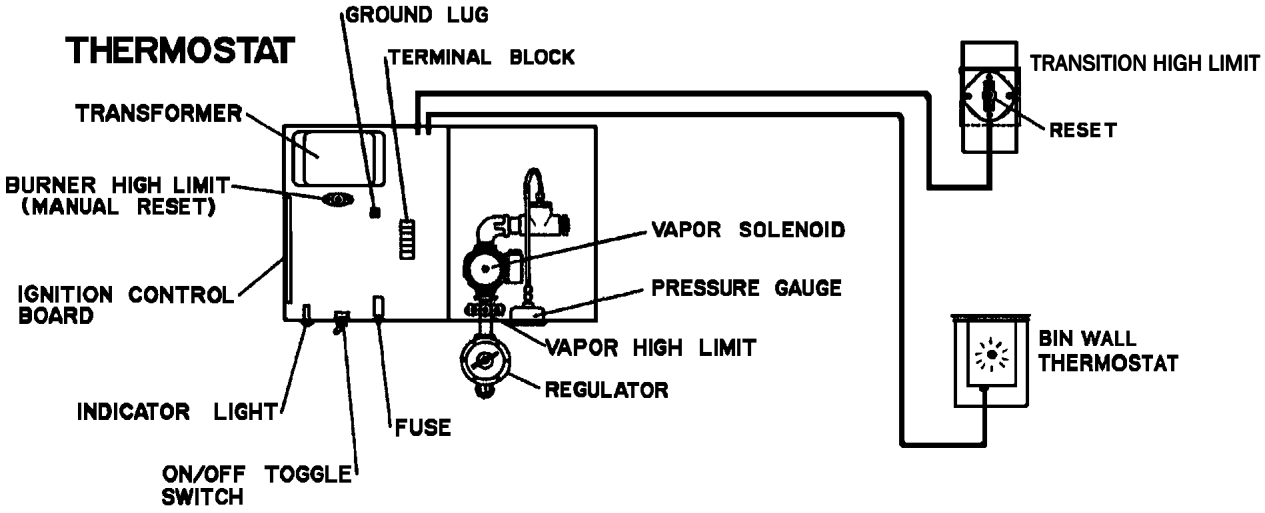
SHUT-OFF PROCEDURE:

1. Close fuel supply valve. Wait for fuel to burn out of line.
2. Test flame detection device. (Flame safety delay on dual relay or solid state board should lock out for a properly-operating flame probe or flame sensor.)
3. Turn off heater.
4. Turn off fan.

Dual Relay



Solid State



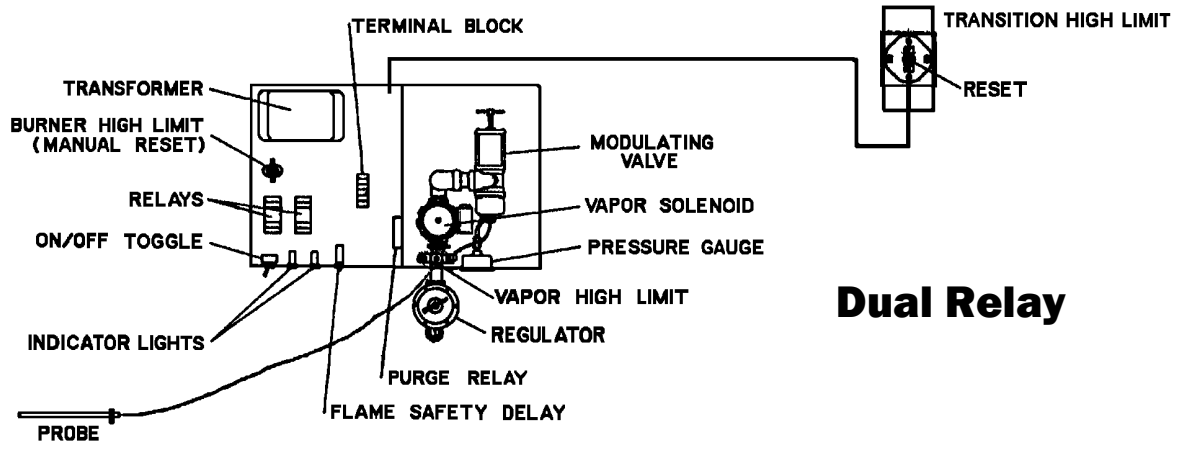
Modulating Valve Operation

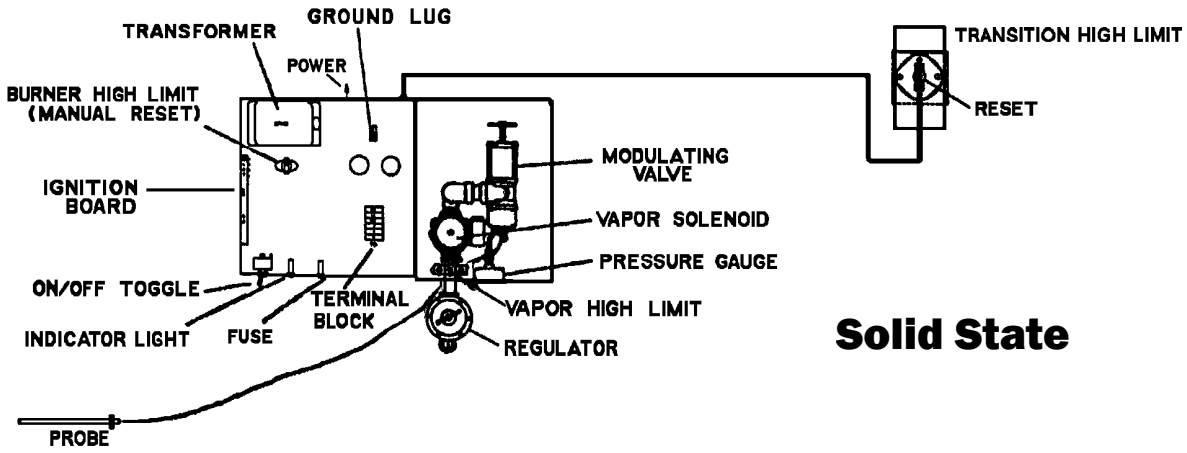
1. Open fuel supply valve (and gas cock on liquid models).
2. Turn modulating valve counterclockwise to minimum setting. Never adjust regulator (factory-set at 15psi).
3. Start fan.
4. Turn on heater. Wait for 45-second delay.
5. Red light comes on.
6. Adjust modulating valve until dial thermometer in bin stabilizes at desired drying temperature.
7. Check flame probe (dual relay only). See page 19
8. Check vaporizer (liquid models only). See page 20

Operator's troubleshooting guide starts on page 28.

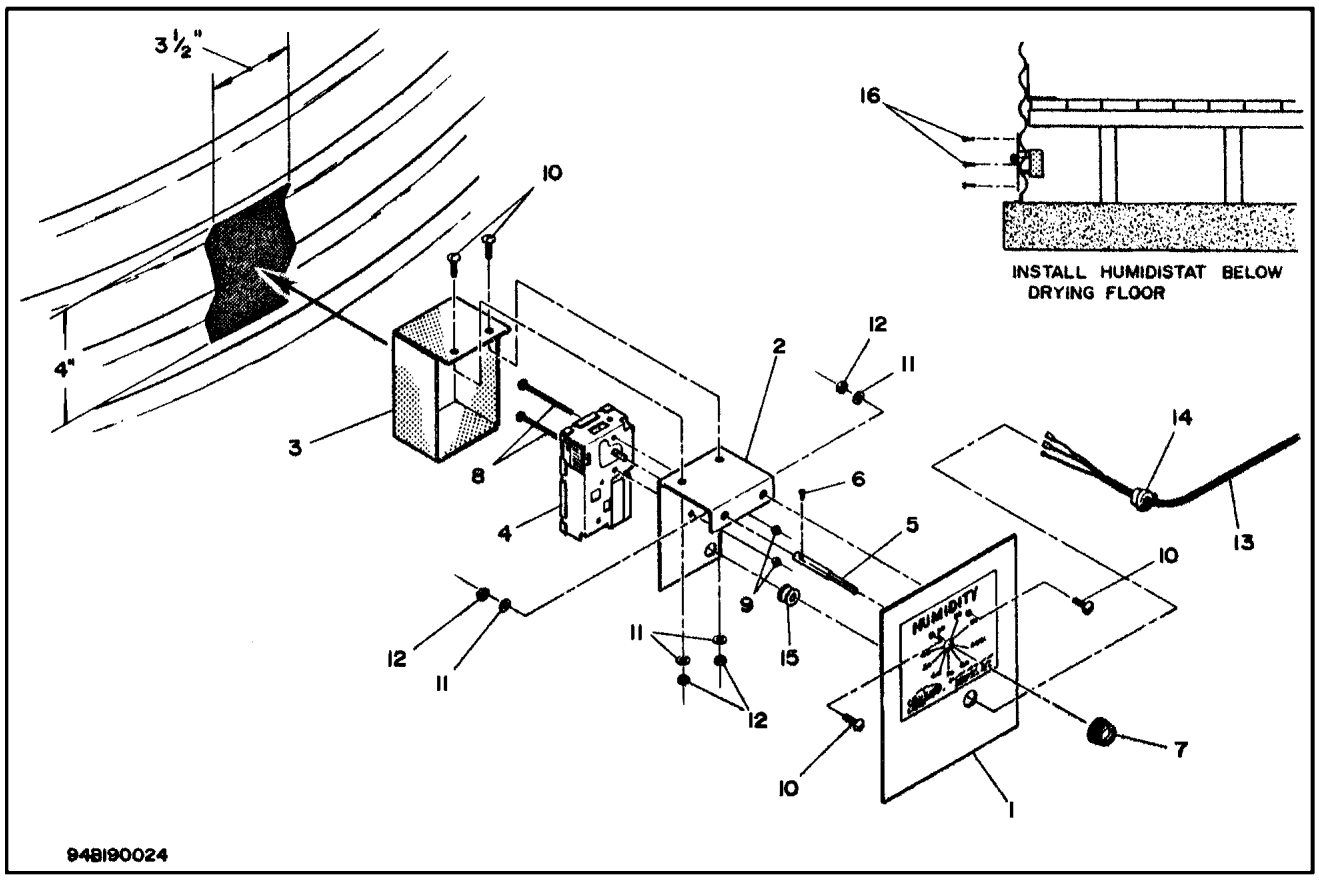
SHUT-OFF PROCEDURE:

1. Close fuel supply valve. Wait for fuel to burn out of line.
2. Test flame detection device. (Flame safety delay on dual relay or solid state board should lock out for a properly operating flame probe or flame sensor.)
3. Turn off heater.
4. Turn off fan.





HUMIDISTAT



HUMIDISTAT PARTS & INSTRUCTIONS

HUMIDISTAT PARTS LIST
Complete Humidistat D4029

REF#	PART#	DESCRIPTION	QTY
1	D4032	Mounting plate w/decal	1
2	D4031	Mounting plate	1
3	D4033	Screen	1
4	J5850	Humidistat	1
5	D4034	Regulator extension	1
6	J0455	Screw, #6-32 x ¼" machine	1
7	J4160	Knob	1
8	J0450	Screw, #5-40 x 2" machine	2
9	J0980	Nut, #5-40, plated	2
10	J0480	Screw, #10-24 x ½" machine	4
11	J1190	Washer, #10-Lock star	4
12	J0985	Nut, #10-24, plated	4
13	D4035	Cord, 18-3, 11'	1
14	J5025	Heyco bushing, SP6P3-4	1
15	J4970	Rubber grommet, P4349-001	1
16	J0474	Screw, #10-16 x 1 self tap, #3TEK	6

HUMIDISTAT INSTALLATION & OPERATION

1. Locate humidistat approximately 3' to the right of entrance collar. Cut a rectangular hole in bin wall into plenum chamber. Hole should be 3 ½" wide x 4" tall. See above.
2. Attach faceplate to bin wall, using 6 self-tapping screws. Use caulk or some other sealer to seal between mounting plate and bin wall.
3. To operate heater with humidistat:
   - 3.1 Open fuel supply valve (and gas cock on liquid models).
   - 3.2 Loosen regulator lock nut. Turn regulator handle counterclockwise to minimum setting.
   - 3.3 Set humidistat at lowest setting.
   - 3.4 Start fan.
   - 3.5 Turn on heater. Wait for 45-second delay.
   - 3.6 When red light comes on, turn regulator handle clockwise until ignition occurs.
   - 3.7 Adjust regulator to pressure between 2 and 4 psi. Pressure may be adjusted further if a smaller or larger temperature rise is desired. Tighten lock nut.
   - 3.8 Check flame probe.
   - 3.9 Check vaporizer (liquid models only).
   - 3.10 Adjust humidistat to desired relative humidity of the drying air. Heater will remain on if relative humidity of drying air is above this setting.

Operator's troubleshooting guide begins on page 28.

SHUT-OFF PROCEDURE:

1. Close fuel supply valve. Wait for fuel to burn out of line. Close gas cock (on liquid models).
2. Test flame detection device. (Flame safety delay on dual relay or solid state board should lock out for a properly operating flame probe or flame sensor.
3. Turn off heater.
4. Turn off fan.

HIGH-LOW OPERATION

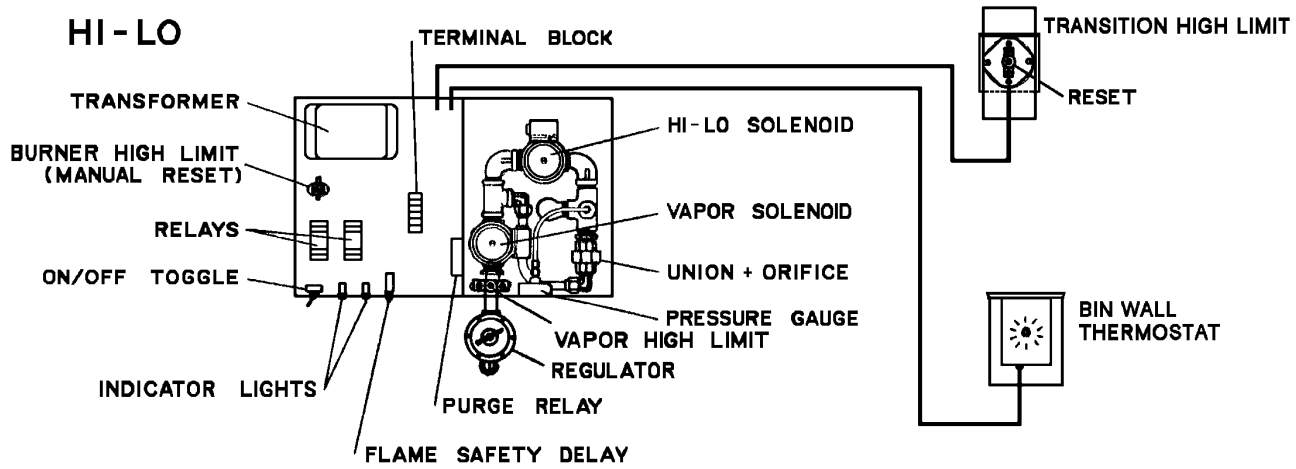
1. Open fuel supply valve (and gas cock on liquid models).
2. Loosen regulator lock nut. Turn regulator handle counterclockwise to minimum setting.
3. Set high-low thermostat at desired drying temperature.
4. Start fan.
5. Turn on heater. Wait for 45-second delay.
6. Red light comes on. Turn regulator handle clockwise until ignition occurs.
7. Adjust regulator until heater cycles evenly between high and low flame (watch pressure gauge). **If flame cycles off**, regulator is set too high. **If flame does not cycle** from high to low, regulator is set too low. Tighten regulator locknut.
8. Check flame probe. See page 19.
9. Check vaporizer (liquid models only). See page 20.

Operator's troubleshooting guide starts on page 28.

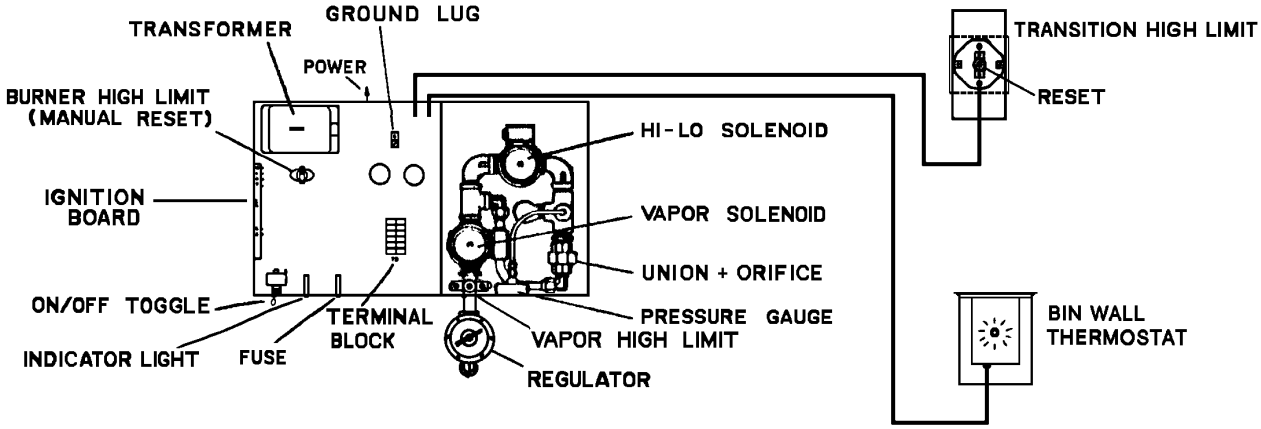
SHUT-OFF PROCEDURE:

1. Close fuel supply valve. Wait for fuel to burn out of line.
2. Test flame detection device. (Flame safety delay on dual relay or solid state board should lock out for a properly operating flame probe or flame sensor.
3. Turn off heater.
4. Turn off fan.

DUAL RELAY



SOLID STATE



Drying Precautions

IMPROPER USE OF EQUIPMENT MAY CAUSE A FIRE!

Carefully read all the information listed below. Failure to do so can cause fire damage to grain, equipment, storage units, and may result in serious injury or even death.

Table 11 – Max Plenum Temp.* For Corn to Avoid an In-Bin Fire and Maintain Grain Quality

	Max Plenum Temperature	
In-Bin Drying - without a Stirring Machine	10° F (5° C) above ambient (outside) air	
In-Bin Drying - with Stirring Machine	120° F	50° C
In-Bin Continuous Flow Drying	160° F	70° C
Portable Dryer	220° F	105° C

***Note:** The above temperatures are only recommendations. Drying temperatures for other grains vary due to ambient temperature, moisture content, and rate of drying. Consult your local extension office for further information on specific plenum temperatures when drying other grains.

Precautionary Steps to help prevent an in-bin fire.

- The maximum plenum temperature for drying without stirring should be no more than 10°F (5°C) above the ambient (outside) air. This will help prevent a fire as well as maintain grain quality.
- **DO NOT** combine drying equipment from various companies. Sukup designed heaters are intended to be used with Sukup designed fans only. Heaters have a variety of automatic controls to shut them down in case of ignition failure, high temperature limits, or airflow failure. Combining equipment from various companies may cause a lack of safety controls needed to cut power. Check these items regularly for proper operation to reduce the chance of fire.
- Keep area beneath perforated floor clean of all fines and foreign material as they may cause a bin fire. For even heat distribution, floor supports should not block transition.
- It is recommended that grain be screened before going into bin to avoid formation of fines and trash. The use of a grain spreader will help distribute the fines.
- Thoroughly ventilating the bins with the dryer fan before igniting the heater will reduce the risk of a fire or explosion from leaking fuel.
- Inadequate electrical wiring can also cause fires. Be certain that components are wired by a qualified electrician.

If a fire is suspected. Follow these basic fire safety procedures to ensure the safety of yourself, family, and employees.

- Always account for all co-workers, neighboring farmers, and first responders.
- Shut off gas at heater and supply tank. Shut off fan. Call Fire Department.
- Seal fan inlet and any other openings to smother fire.
- Remove fan and heater from transition. Sandbag transition opening. If possible, flood bottom of bin (plenum) with water to a depth of 4" (100 mm) above perforated floor. This will protect steel floor supports and may extinguish fire, depending upon its location.
- If fire is located higher in bin, a long pipe with small holes may be inserted through the bin wall or manhole and into grain to direct water at source of fire. This may help keep the fire in a centralized location, but it's nearly impossible to extinguish a fire in a grain bin by simply pouring water on it. These fires can only be extinguished by completely emptying the bin.
- Take note of bin surroundings to avoid heat transfer onto neighboring structures. Be extra observant of propane tanks and cool if necessary.
- **ALL GRAIN MUST BE REMOVED FROM BIN TO REACH POINT OF FIRE**. Do not cut holes in bin to remove grain. Do not enter a bin that is on fire. The danger of getting buried in flowing grain exists.
- Grain may smolder for days. Do not restart fan in hope that fire has gone out unless all grain has been removed from bin.

Note: These are general guidelines. Be sure to consult with your local extension office for your specific situation.

MAINTENANCE

WARNING! KEEP ALL GUARDS AND SCREENS IN PLACE
DISCONNECT ALL POWER SOURCES
BEFORE DOING ANY REPAIR, MAINTENANCE OR INSPECTIONS!

BEGINNING OF EACH DRYING SEASON:

1. Remove inlet screen. Check for foreign material on fan blade. With power off, turn fan by hand to be sure it rotates freely.
2. Lubricate fan motor bearings with high temperature grease as indicated on motor nameplate or motor fact sheet. Do not over-grease. Check ventilation openings in motor for any blockage.
3. Check wiring of fan and heater. Look for loose connections, bare wires, or rodent damage. Be sure to check ignition wire and flame sensor wires for any damage.
4. Examine the flame rod for cracked insulation.
5. Examine the spark plug for proper gap. The gap should be approximately 1/8". Spark plug and flame rod should be examined periodically throughout drying season.
6. All plenum controls should be checked.
7. Check all plumbing connections for leaks, using soapy solution.
8. Check vaporizer adjustment daily. Weather condition changes can demand new adjustment.

AFTER DRYING SEASON:

The balance of a vane axial blade is very critical. Vibration can cause the fan housing to crack. To prevent this, check behind the blade for dirt, dust or foreign material.

Burn fuel out of lines and turn off at source.

Cover fan inlet to keep out weather, pests, and to prevent “windmilling” which can cause wear on the start switch in single phase motors.

DURING OFF SEASON:

Every six weeks, remove inlet cover and operate fan to redistribute grease in bearings. Let motor warm up enough to force out any accumulated moisture.

Make sure control box cover is in place and secured. Turn off power and fuel at source.

NOTE: One drop of liquid LP will expand 270 times as it converts to vapor. It would be very dangerous to have a vaporizer coil develop a leak during heater operation. **Be sure to check vaporizer coil yearly. Vaporizer should be replaced every 5 years.**

SOLID STATE OPERATOR'S GUIDE

1. **Start fan and turn heater on.**
2. **If operating light comes on immediately, thermostat is open.** To proceed turn thermostat up. After a 45-second purge delay, operating light will come on. The gas solenoids should snap open and spark should occur.
3. **Operating light will remain on as long as heater operates and cycles properly.** If this light is off, the heater is locked out.
4. **If solenoids do not snap open or operation light does not glow…**
   a. Are heater and fan on?
   b. Is heater plugged to fan outlet?
   c. Check both the fuses in the fan and at the heater. 3-amp fuses are used. Never over-fuse.
   d. Is thermostat (or modulating valve) calling for heat?
   e. Reset transition high limit.
   f. Reset burner high limit.
5. **Operating light is on. Solenoids snap open, but no spark…**
   a. Check the spark plug. Adjust gap to 1/8" (check spark gap periodically throughout drying season).
   b. Check spark plug wire for grounding or an open condition.
6. **Operating light is on, spark is present, but no ignition occurs…**
   a. Is gas being supplied to the burner? Check gauge. Are fuel valves open? Adjust regulator. Check storage tank.
   b. Are solenoids opening? Put hand on valve and turn heater on. After a 45-second delay, you should feel valve snap open.
   c. Is there an obstruction in the line? Check strainers and orifice.
7. **Heater starts properly, but locks out after 10 seconds…**
   a. Check condition of flame rod. If cracked or burned off, replace it.
   b. Check flame sensor wires and electrical connectors.
   c. Flame rod needs only to make contact with the flame. Flame is sensed directly with electronics. It is not a heat sensor.
8. **Freezes up while starting…**
   a. Start on minimum pressure and increase after ignition.
   b. Moisture in fuel. Call gas supplier.
9. **Frost on regulator or inside control box. Upper hose is not warmer than lower hose. Flame is present…** Vaporizer is not hot enough. Adjust vaporizer in. To adjust the vaporizer, loosen the 2 pivot bolts (1 top, 1 bottom) of the vaporizer adjustment bracket and then pivot the vaporizer either in or out of the flame as necessary to regulate the temperature at the vaporizer outlet. The U-bolts mounting the vaporizer to the adjustment bracket fan can also be loosened and vaporizer can be moved in and out to adjust. Viewing hole is present to watch vaporizer adjustment.

CAUTION: Vaporizer should be replaced only by qualified service personnel. Shut off fuel supply & bleed all fuel lines. Run fan several minutes to purge gas from heater. Check all piping joints for leaks with soapy solution before operating heater after turning vaporizer.

10. **Upper hose very hot. Gas shuts off…**
    a. Vaporizer is too hot. Adjust vaporizer out. To adjust vaporizer, see #9 above. If vapor high limit has red reset button, reset manually by depressing button.
    b. Is tank hooked up for vapor rather than liquid? Call gas supplier.
11. **Fan will not start…**
    Is power supply to fan turned on? Is thermal overload button depressed?
12. **Fan vibrates…**
    a. Is there foreign material (dirt, etc.) on blade? Blade must be clean to be in balance.
    b. Check to be sure housing is solid and level.
13. **Overload continues to kick out…**
    Have serviceman check fan.
14. **Do not operate heater with service door removed.**

Heater Troubleshooting Guide
Solid State
Sukup Ignition Board

Check and Correction Procedure
(Refer to electrical schematic on pages 34-37)

CAUTION! Bleed fuel lines Before servicing unit.
The procedures outlined below are for use only by qualified service personnel.
Use caution when checking electrical components.

1. Start fan and heater. Visually check (after approximately 20 second delay) red light on control panel and also for spark at burner.

OPERATING LIGHT IS NOT ON:

2. Connect one lead of voltmeter to neutral (wire #2) at terminal block. This will remain connected throughout procedure.

3. Check power supply. Connect lead to wire (L1) (Power) at toggle switch.
   If meter does not show voltage, check power supply to heater and heater fuse.

4. Check on-off toggle switch: Connect lead to wire #5 for vapor unit, wire #3 on liquid unit, at switch while switch is on.
   If meter does not show voltage, replace toggle switch.
   For liquid LP, unit with vaporizer, check vapor high limit. Connect voltmeter to wire #5 at burner high limit.
   Be sure vapor high limit is reset. If still no voltage, replace vapor high limit.

5. Check heater high limit: Connect lead to wire #6 at heater high limit terminal. Be sure the heater high limit is reset. If still no voltage, replace heater high limit.

6. Check transition high limit: Connect lead to wire #7 at terminal block. If meter does not show voltage, push the reset. If still no voltage, replace transition high limit.

7. Check thermostat: Connect lead to wire #8 at terminal on ignition board. If meter does not show voltage adjust thermostat to higher setting. If still no voltage, replace thermostat. If power is present at terminals #7 & #8, the 45-second delay time has past, and NO power has come out at terminals #9 & 10, replace the solid state circuit board.

   CAUTION!!! CIRCUIT BOARD MAY BE DAMAGED BY STATIC ELECTRICITY. Before handling circuit board, ground yourself by touching the heater to discharge any static potential that may have built up. Transport circuit board in a static shielding bag. Following these procedures will give maximum life span for the board.

LIGHT IS ON, BUT NO SPARK:

8. Check for power at terminal #9 during trial for ignition period.

9. Disconnect ignition wire from transformer. Ground one end of screwdriver to heater housing. Bring screwdriver shaft to about 1/8" from transformer high voltage terminal to establish an arc. If no arc is obtained, replace transformer.

10. Connect ignition wire to transformer. Disconnect ignition wire from spark plug. Carefully using insulated pliers, hold ignition wire by insulation, try to get arc between wire and heater housing.

CAUTION! Shut off fuel supply and bleed all lines. Run fan several minutes to purge gas from heater.

WARNING! HIGH VOLTAGE! Stay clear of end of ignition wire. If arc is obtained, replace igniter. If arc is not obtained replace ignition wire.

SPARK IS PRESENT, BUT NO FLAME:

11. Check for power at terminal #10 during trial for ignition period.
12. Check solenoid valves: Remove screw from top of valve. Coil will lift off easily. Insert screwdriver into hole in bottom of coil. Screwdriver should be "grabbed" magnetically.

    If coil fails to "grab" screwdriver, check electrical connections or replace coil.

BURNER IGNITES, BUT LOCKS OUT IN 10-20 SECONDS:

13. Look for cracked porcelain on the flame-sensing rod. If cracked, replace.
14. Check flame-sensing rod wire for grounding or weak connection. Check burner ground for weak connection.
15. Check current in the flame-sensing circuit.
    Test equipment required: Volt-Ohm meter with a 50 micro-amp, DC scale

    PROCEDURE:
    a. Insert meter (set at the 50 micro-amp, DC scale) in series with the flame sensor.
    b. Turn on heater unit
    c. Observe meter reading:
       (1) During lighting period the meter may move erratically due to spark interference.
       (2) After the spark ceases the meter reading should be constant and should read between 10 and 25 micro-amps.

       Note: A reading of at least 3 micro-amps is needed to maintain operation. Any reading below 3 micro-amps will cause lockout.
    d. If amp meter readings are above 3 micro-amps, but lockout still occurs, replace solid state circuit board.

BURNER IGNITES AND OPERATES, BUT NUISANCE LOCKOUT OCCURS:

16. Replace spark plug or gap at 1/8".
17. Check transformer spark plug, and ignition wire as in #s 8, 9, and 10 on previous page.
18. Check tank pressure, line, and strainer for blockage. On vapor heaters a manual (*shut off valve*) and a 100-mesh gas strainer (*supplied by customer*) should be installed between heater pipe train and fuel supply line.
19. Is there possible freezing-up of regulator? If so, allow heater to warm up. If vaporizer is still not warm, adjust vaporizer. Follow instructions on page 27, Item #9.

CAUTION: Check all piping joints for leaks with soapy solution before operating heater.

FAN TROUBLESHOOTING GUIDE
FOR SERVICE PERSONNEL

CAUTION! THE PROCEDURES OUTLINED BELOW ARE FOR USE ONLY BY QUALIFIED SERVICE PERSONNEL.
USE CAUTION WHEN CHECKING ELECTRICAL COMPONENTS.

CHECK AND CORRECTION PROCEDURE

1. Check line voltage:
   Single phase:
   Line voltage should be present between terminals L1 and L2 on the top of the magnetic starter.
   Three phase:
   Check line voltage between terminals L1 and L2, L1 and L3, L2 and L3.
   If voltmeter does not indicate proper voltage, check power supply.

MAGNETIC STARTER DOES NOT ENERGIZE

2. Connect one lead of voltmeter to the neutral block.
   If fan does not have neutral block, connect lead to L2 on single phase units and to L3 on three phase units.
   This lead will remain connected at this point throughout test procedure.

3. Check START button:
   Connect lead at a point between the start and stop button. Depress start button, meter should show a voltage reading. If no reading, replace start button.

4. Check STOP button:
   Connect lead at a point between the stop button and the overload relay. Depress start button, meter should show voltage reading. If no reading, replace stop button.

5. Check Overload Relay: (When Applicable)
   Connect lead to magnetic starter coil. Depress start button, meter should show a voltage reading. If no reading, reset overload relay. If meter shows proper voltage but magnetic starter does **NOT** energize, replace starter coil.

MAGNETIC STARTER CLOSES, FAN DOES NOT START PROPERLY

6. Check magnetic starter contacts: (Magnetic starter energized)
   Connect voltmeter leads to T1 and T2 on magnetic starter. On three phase power also check between T1 and T3, and between T2 and T3. If meter DOES NOT indicate proper voltage, replace magnetic starter. If meter DOES indicate proper voltage, check motor.

FAN RUNS ONLY WHEN START BUTTON IS DEPRESSED

7. Single phase: Clean contact points between L3 and T3 on magnetic starter.
   Three phase: Replace auxiliary contact on the side of the magnetic starter.

FAN SHUTS OFF, OVERLOAD TRIPPED

8. Check incoming voltage, both no load and while fan is running. If voltage is low consult power company.

FAN BLADE REMOVAL AND INSTALLATION

DANGER: IMPROPER INSTALLATION CAN RESULT IN SERIOUS INJURY OR DEATH.

The fan blade is secured to the motor shaft by use of tapered bushing, motor shaft key, three capscrews and lockwashers.

REMOVING FAN BLADE WITH TAPERED BUSHING

NOTE: During manufacturing the blade and bushing are balanced together. Before taking the blade and bushing off it is recommended that you **mark original alignment position with two small dots**.

1. Lock out fan power supply.

2. Remove fan guard.

3. Remove capscrews and lockwashers from tapered bushing.

4. Install two capscrews into the threaded holes of tapered bushing and tighten by hand until they bottom against the front surface of the blade.

5. Block blade to prevent it from turning. **Gradually turn in capscrews (up to 1/4 turn at a time) until blade breaks loose from the bushing and motor shaft**. With the blade free, a wheel puller may be used to pull bushing off motor shaft.

INSTALLATION

NOTE: The threaded bushing holes within the bushing are provided for disassembly only. Do not use holes to reassemble, as they don't allow the parts to lock on shaft. This could cause serious injury or death.

1. Place blade on motor shaft.

2. Place tapered bushing with key on motor shaft pressing it to tapered bore of fan blade. Insert capscrews through unthreaded holes of tapered bushing. This causes the blade to be pulled forward onto the tapered bushing. Line up the two small dots that marked original alignment position before you took blade off.

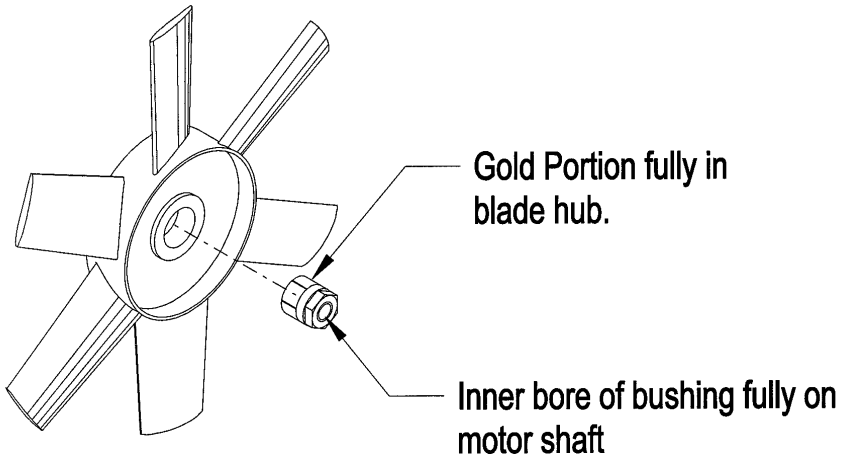
3. Tighten each bolt slightly in rotation to draw tapered bushing into tapered bore of fan. Torque 5/16" bolts to 12-1/2 ft-lbs. and ¼" bolts to 7 ft-lbs. Exceeding these torques may strip the aluminum threads or crack blade.

CHECK BLADE EVERY YEAR

TAPER-LOCK SPECIFICATIONS

FAN SIZE	HP	BUSHING	BORE SIZE	BUSHING BOLT	TORQUE
28	15	P1	1.125	5/16"	156IN-LBS
28	20	SDS	1.375	1/4"	108IN-LBS
38	10	P1	1.375	5/16"	156IN-LBS
44	15	SK	1.625	5/16"	180IN-LBS
44	30	SD	1.875	1/4"	108IN-LBS
44	40	SK	2.125	5/16"	180IN-LBS

AXIAL FAN BUSHING



SPFH0079
JRW 081500

We have changed from a split taper bushing in the bore of the axial fan blade to a straight bore with a Trantorque bushing. This Trantorque bushing goes into the round bore of the blade and expands like a taper lock. There is a large nut that must be tightened on this bushing but **it is important that this nut not be over tightened**. Following are the specifications for the correct amount of torque to be used on this:

5/8" shaft - 16 ft. lbs.
7/8" shaft - 75 ft. lbs.
1 1/8" shaft - 100 ft. lbs.
1 5/8" shaft - 230 ft. lbs.
1 7/8" shaft - 400 ft. lbs.

When installing blade with Trantorque bushing, be sure blade will rotate in proper direction and all the gold portion of the bushing is in blade hub and fully on motor shaft.

BUSHING SIZE	BLADE WITH BUSHING	BLADE ONLY	BUSHING ONLY	FAN SIZE	HP
5/8"	D3851	D38511	J0429	12"	.75
5/8"	D3864	D38641	J0429	12"	1
5/8"	D3861	D38611	J0429	14"	1.5
7/8"	D3862	D38621	J0414	14"	1.5
7/8"	D3874C	D38741	J0414	18"	1.5 - 2
7/8"	D3874	D38741	J0414	18"	2
7/8"	D3871	D38711	J0414	18"	3
7/8"	D3871C	D38711C	J0414	18"	3 - 4
7/8"	D3886C	D38862C	J0414	22"	5 - 7
7/8"	D3881C	D38812C	J0414	22"	7.5 - 8.5
7/8"	D3886	D38862	J0414	24"	5 - 7
7/8"	D3881	D38812	J0414	24"	7 - 10
1 1/8"	D38861C	D388613C	J0436	22"	5 - 7
1 1/8"	D38811C	D38813C	J0436	22"	7.5 - 8.5
1 1/8"	D38861	D38863	J0436	24"	5 - 7
1 1/8"	D38811	D38813	J0436	24"	7 - 10
1 1/8"	D3891C	D38911C	J0436	26"	10 - 12
1 1/8"	D3891	D38911	J0436	28"	10 - 15
1 5/8"	D3901	D39011	J0435	38"	15
1 7/8"	J30671	J3067	J04371	44"	30

TRANTORQUE GT BUSHING

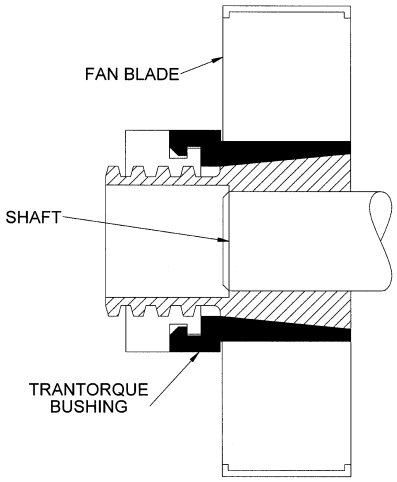


Figure 1

INSTALLATION INSTRUCTIONS

WARNING: Do not lubricate the Trantorque GT bushing or shaft. The use of any lubricant on the contact surfaces could result in bushing failure and will void all warranties.

1. Insert the Trantorque GT unit into the component to be mounted, making sure the mating hub is flush against the shoulder at the hex flats.

2. Position the assembly at the desired location on the shaft and hand-tighten the nut (clockwise) until the assembly becomes snug on the shaft.

WARNING: Do not hammer or use any type of impact to force the Trantorque GT assembly along the shaft.

WARNING: The shaft must fully engage the shaft gripping area of the Trantorque GT unit. Figure 1 illustrates minimum shaft engagement.

3. Using a torque wrench, tighten the nut to the proper installation torque. See table for torque value. The hex flats on the outer ring are provided for counter-torque, eliminating the need to hold the component or shaft while applying installation torque.

4. **Note:** At full installation torque, the assembly will have moved approximately 1/16" axially along the shaft away from the unit. If axial position is critical it may be necessary to loosen the nut and reposition the assembly.

WARNING: Over-tightening the nut could damage the Trantorque GT unit and /or the mounted component.

TRANTORQUE SPECIFICATIONS

PART #	FAN SIZE	HP	BUSHING	BORE SIZE	NUT SIZE	TORQUE
J0435	38	15	TRANTORQUE	1.625	2.25"	230FT-LBS
J0435	38	20	TRANTORQUE	1.625	2.25"	230FT-LBS
J0435	44	15	TRANTORQUE	1.625	2.25"	230FT-LBS
J04371	44	30	TRANTORQUE	1.875	2.5"	400FT-LBS
J04372	44	40	TRANTORQUE	2.125	2.75"	400FT-LBS

SUKUP IGNITION BOARD

SOLID STATE

Sukup

SUKUP MFG. CO.
SHEFFIELD, IA. 50475

AXIAL &
CENTRIFUGAL
HEATER

THERMOSTAT
OR
HUMIDISTAT
OR
MODULATING
VALVE

VAPOR &
NATURAL
GAS

115 V

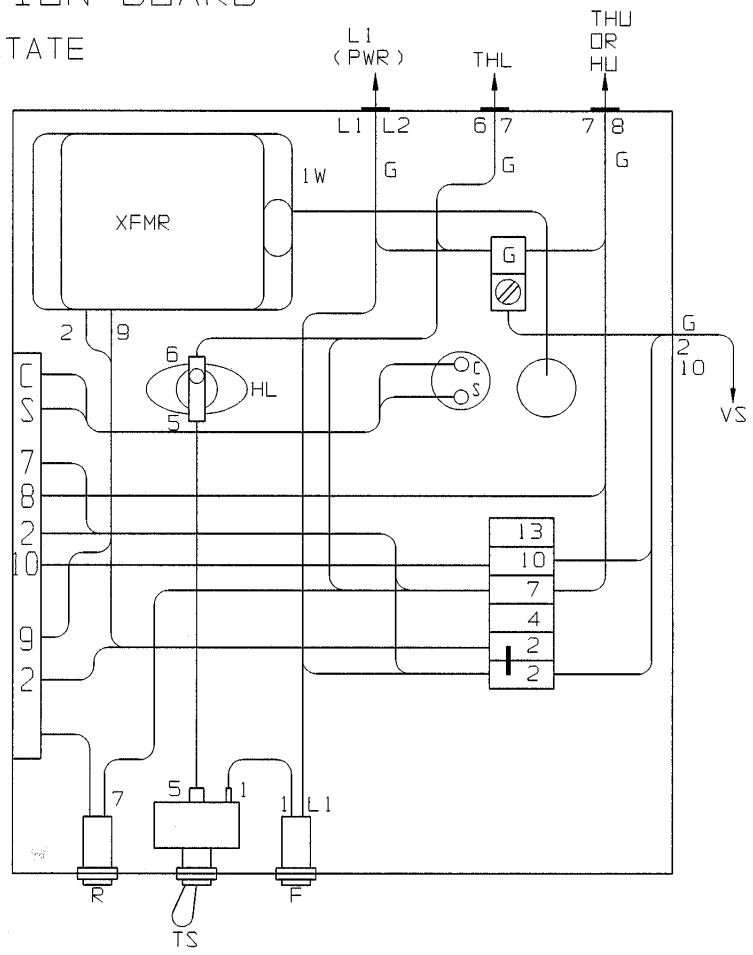
MODEL NO.S
D10 OR 20V-T
D10 OR 20V-H
D10 OR 20V-M
D10 OR 20N-T
D10 OR 20N-H
D10 OR 20N-M
DLT10 OR 20V-T
DLT10 OR 20V-H
DLT10 OR 20V-MT
DLT10 OR 20N-T
DLT10 OR 20N-H
DLT10 OR 20N-MT
V18,24,OR 28V-T
V18,24,OR 28V-H
V18,24,OR 28V-MT
V18,24,OR 28N-T
V18,24,OR 28N-H
V18,24,OR 28N-MT
VLT18,24,OR 28V-T
VLT18,24,OR 28V-H
VLT18,24,OR 28V-MT
VLT18,24,OR 28N-T
VLT18,24,OR 28N-H
VLT18,24,OR 28N-MT

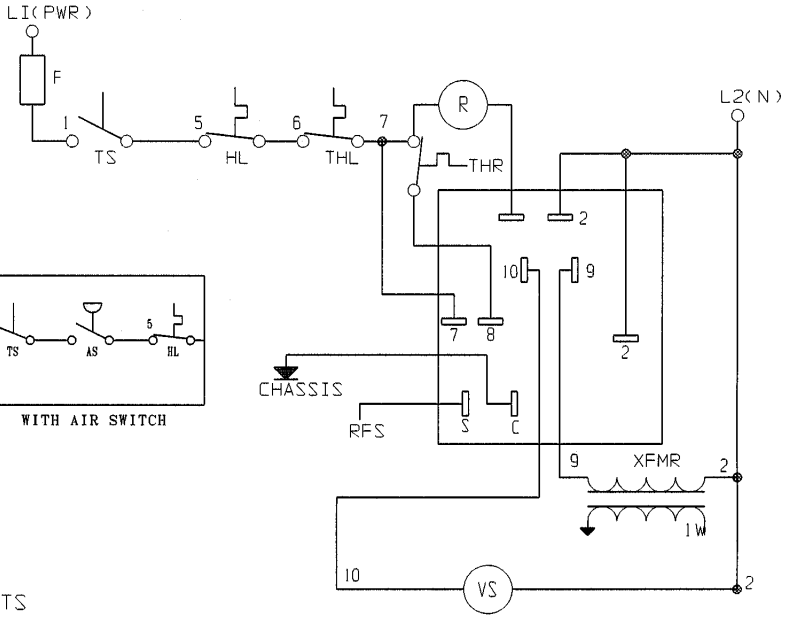
L0468 950113JB

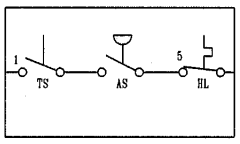
TS	TOGGLE SWITCH (ON - OFF)
HL	HIGH LIMIT (MANUAL RESET)
THL	TRANSITION HIGH LIMIT
THR*	THERMOSTAT
HU	HUMIDISTAT
VS	VAPOR SOLENOID VALVE
F	FUSE
G	GROUND
XFMR	TRANSFORMER
RFS	REMOTE FLAME SENSOR
R	RED LIGHT
SIBI	SUKUP IGNITION BOARD
AS	AIR SWITCH

THR* NOT USED ON MODULATING VALVE UNITS

THL NOT USED ON LOW TEMP SERIES







WITH AIR SWITCH

Sukup Manufacturing Co.
1555 255th St, Box 677
Sheffield, IA 50475 USA

HEATER ELECTRICAL DIAGRAM

SOLID STATE

AXIAL or CENTRIFUGAL HEATER

THERMOSTAT, HUMIDISTAT or MODULATING VALVE

LIQUID PROPANE, VAPOR PROPANE or NATURAL GAS

---

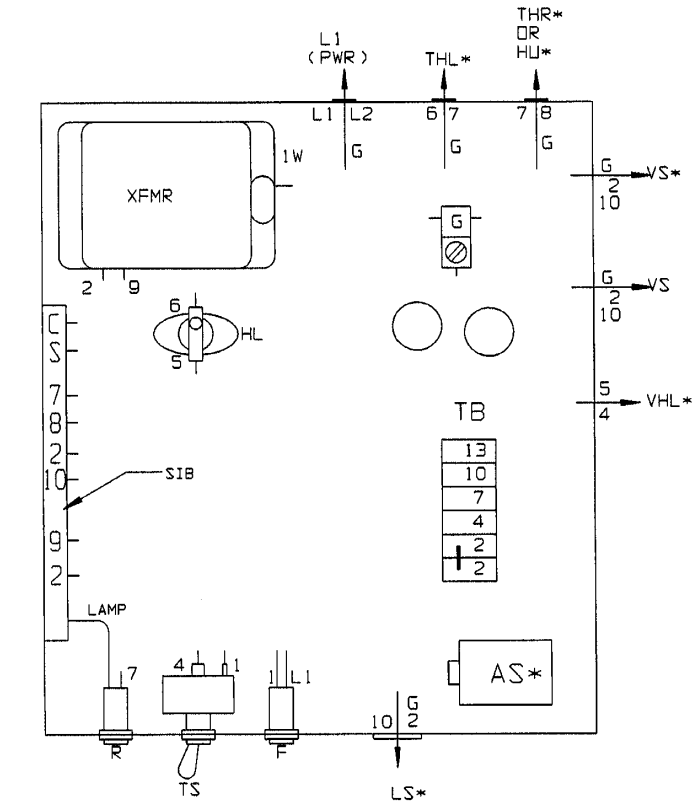
115 VOLT

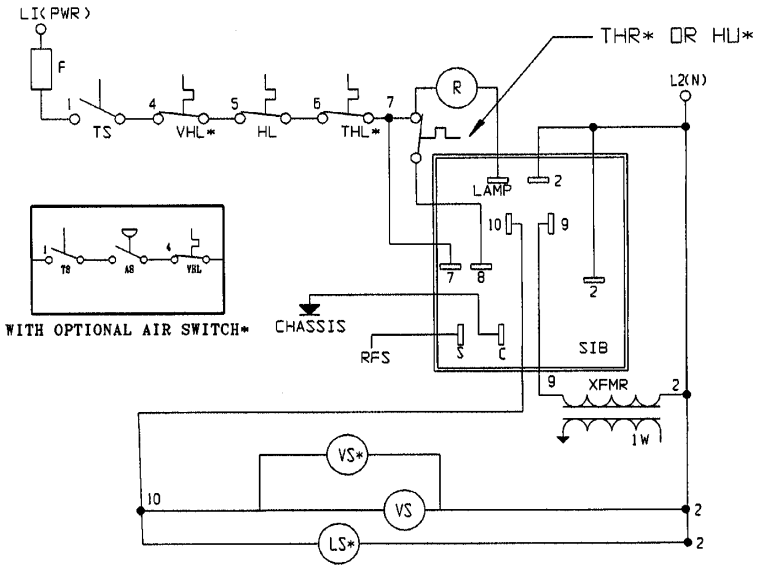
KEY:

1W	connects to Igniter
AS	Air Switch (optional)
C	to Chassis
F	Fuse
G	Ground
HL	High Limit (manual reset)
HU	Humidistat
L1 (PWR)	Power Line (115V) - must be interlocked with fan.
L2 (N)	Neutral Line
LS	Liquid Solenoid Valve
R	Red Light
RFS	Remote Flame Sensor
S	to Sensor (RFS)
SIB	Sukup Ignition Board
TB	Terminal Block
THL	Transition High Limit
THR	Thermostat
TS	Toggle Switch
VHL	Vapor High Limit
VS	Vapor Solenoid Valve
XFMR	Transformer

*NOTES:

- Liquid Solenoid Valve (LS) & Vapor High Limit (VHL) used on liquid propane units only.
- Thermostat (THR) or Humidistat (HU) not used on Modulating Valve units.
- Transition High Limit (THL) not used on low temperature series.
- Air Switch used only on CSA Heaters or when heater can not be electrically interlocked to fan (ex: engine driven).
- Second Vapor Solenoid used on vapor propane and natural gas units only.





L0463-04

SUKUP IGNITION BOARD

SOLID STATE

Sukup

SUKUP MFG. CO.
SHEFFIELD, IA. 50475

AXIAL &
CENTRIFUGAL
HEATER

HI-LO

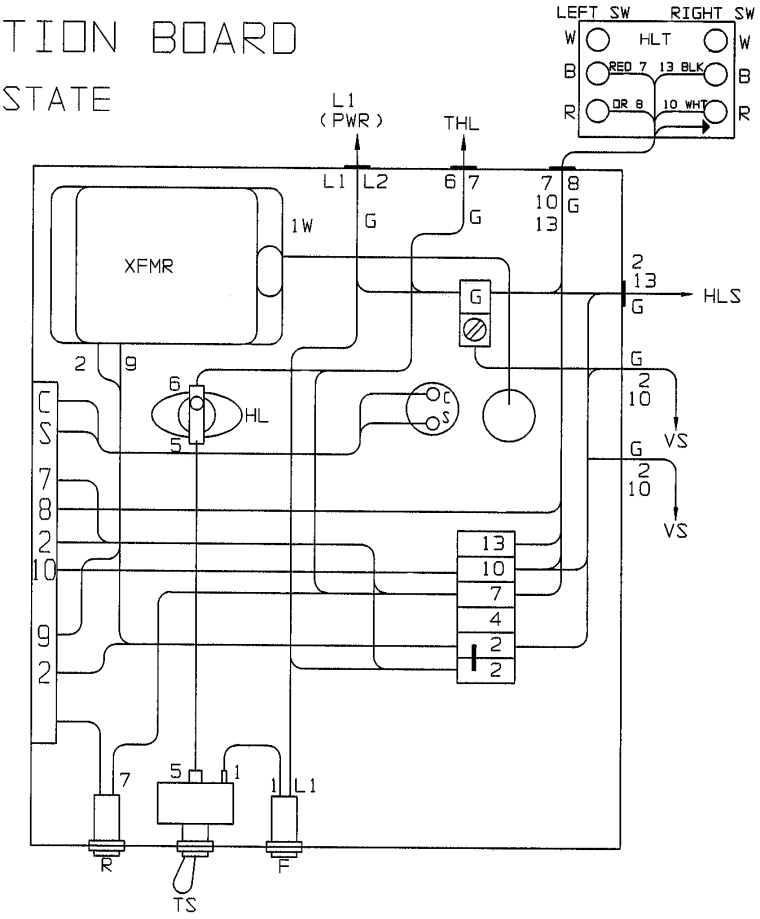
VAPOR &
NATURAL
GAS

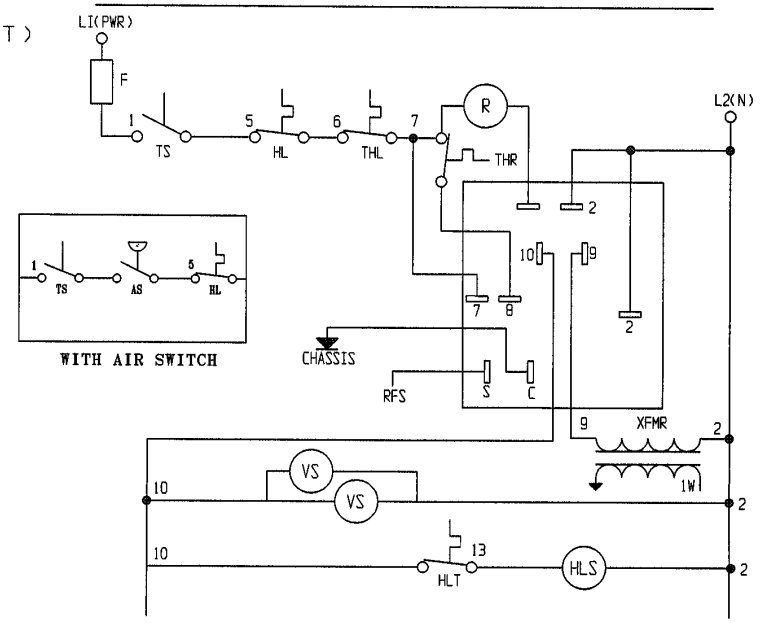
115 V

MODEL NO.S
D10 OR 20V-HL
D10 OR 20N-HL
V18,24,OR 28N-HL
V18,24,OR 28V-HL

L0465 970731JB

TS	TOGGLE SWITCH (ON-OFF)
HL	HIGH LIMIT (MANUAL RESET)
THL	TRANSITION HIGH LIMIT
HLT	HI-LO THERMOSTAT
VS	VAPOR SOLENOID VALVE
XFMR	TRANSFORMER
HLS	HI-LO SOLENOID VALVE
RFS	REMOTE FLAME SENSOR
R	RED LIGHT
G	GROUND
F	FUSE
SIBI	SUKUP IGNITION BOARD
AS	AIR SWITCH





WITH AIR SWITCH

Sukup Manufacturing Co.
1555 255th St, Box 677
Sheffield, IA 50475 USA

HEATER ELECTRICAL DIAGRAM

SOLID STATE

AXIAL or CENTRIFUGAL HEATER

HIGH - LOW

LIQUID PROPANE, VAPOR PROPANE or NATURAL GAS

---

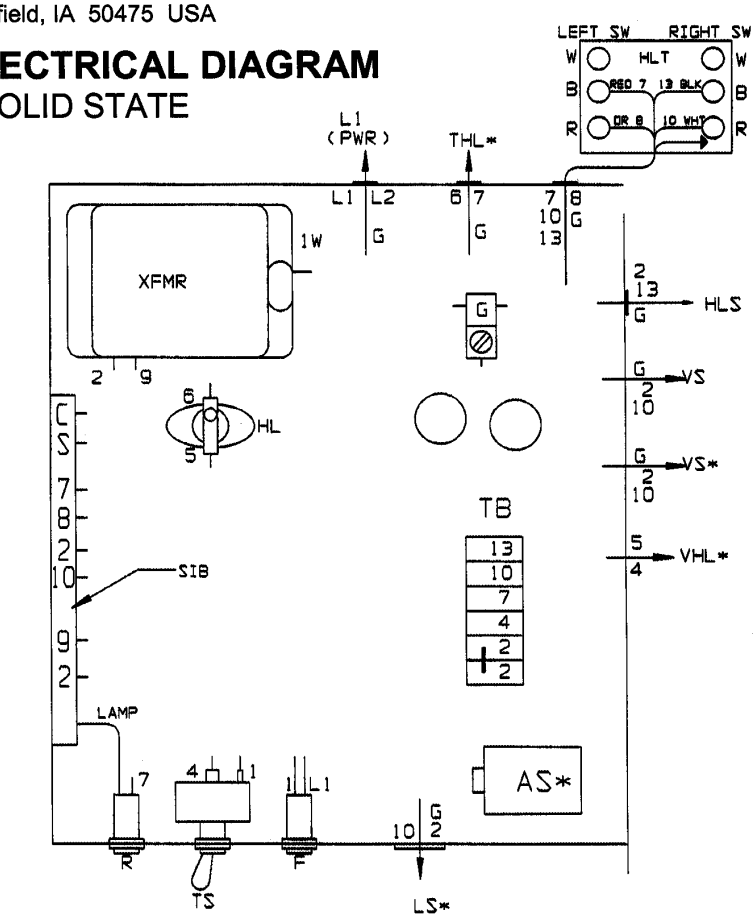
115 VOLT

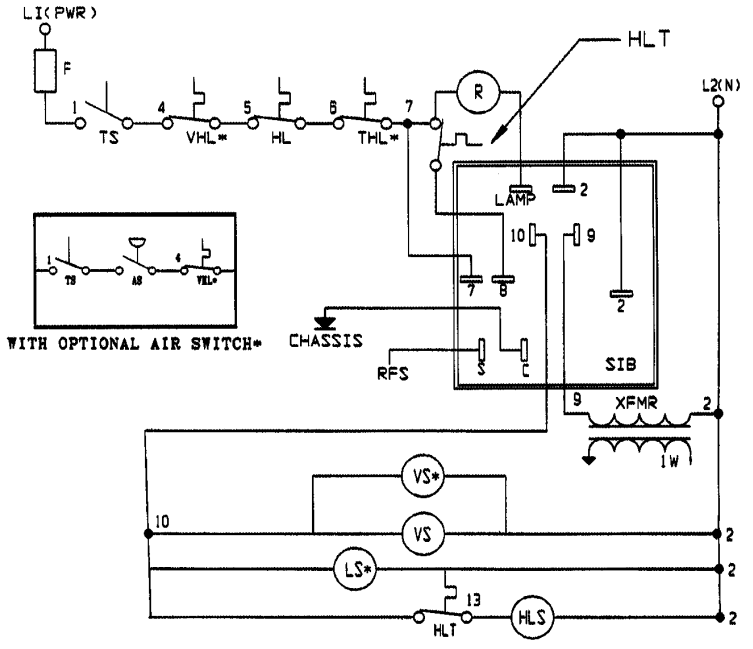
KEY:

1W	connects to Igniter
AS	Air Switch (optional)
C	to Chassis
F	Fuse
G	Ground
HL	High Limit (manual reset)
HLS	High-Low Solenoid
HLT	High-Low Thermostat
L1 (PWR)	Power Line (115V) - must be interlocked with fan.
L2 (N)	Neutral Line
LS	Liquid Solenoid Valve
R	Red Light
RFS	Remote Flame Sensor
S	to Sensor (RFS)
SIB	Sukup Ignition Board
TB	Terminal Block
THL	Transition High Limit
TS	Toggle Switch
VHL	Vapor High Limit
VS	Vapor Solenoid Valve
XFMR	Transformer

*NOTES:

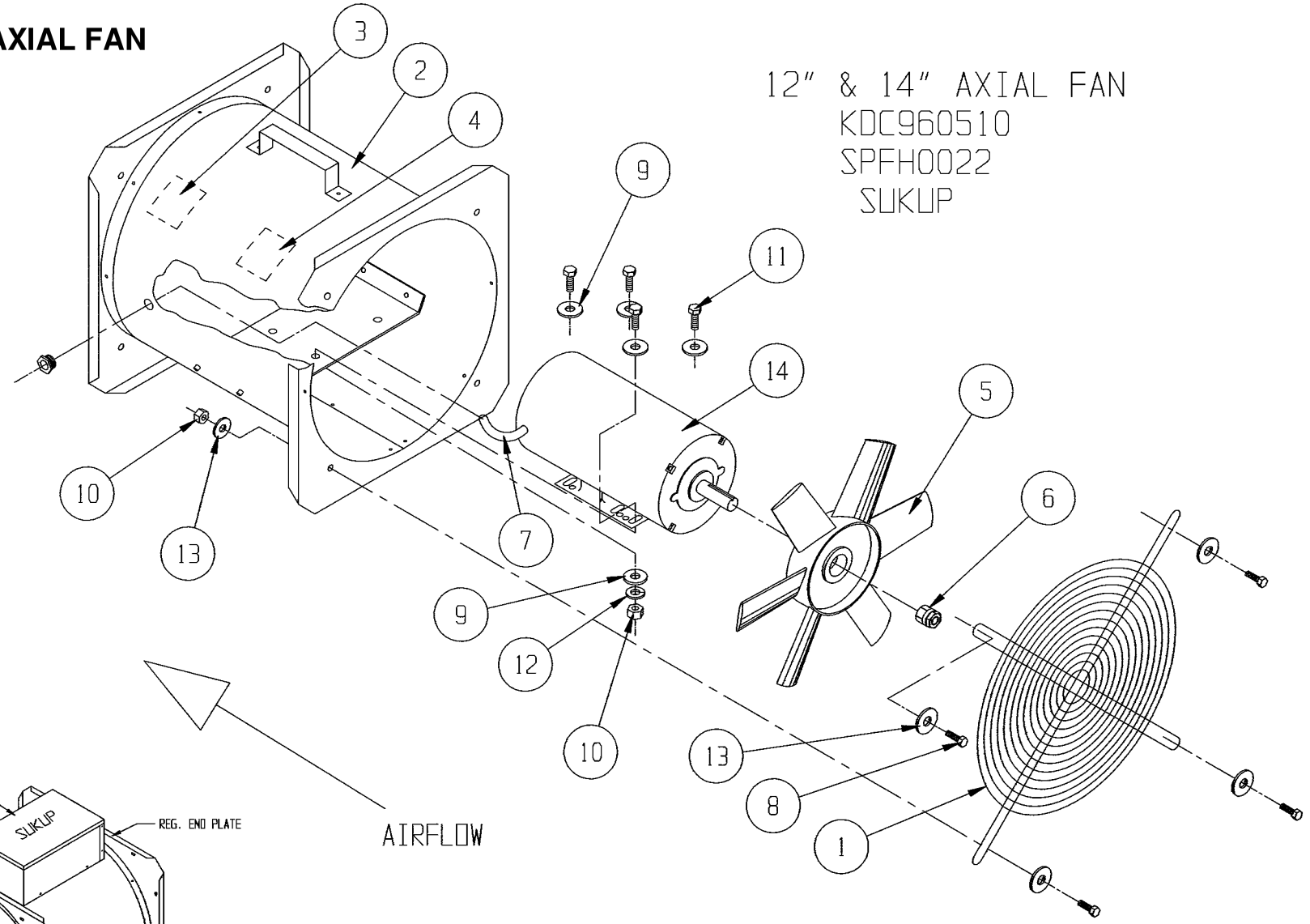
- Liquid Solenoid Valve (LS) & Vapor High Limit (VHL) used on liquid propane units only.
- Transition High Limit (THL) not used on low temperature series.
- Air Switch used only on CSA Heaters or when heater can not be electrically interlocked to fan (ex: engine driven).
- Second Vapor Solenoid used on vapor propane and natural gas units only.

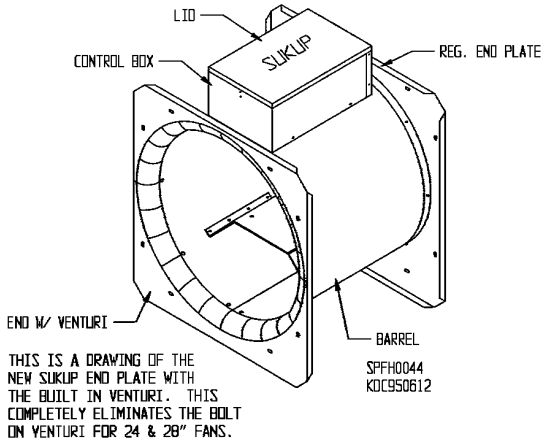




L0464-04

12" & 14" AXIAL FAN





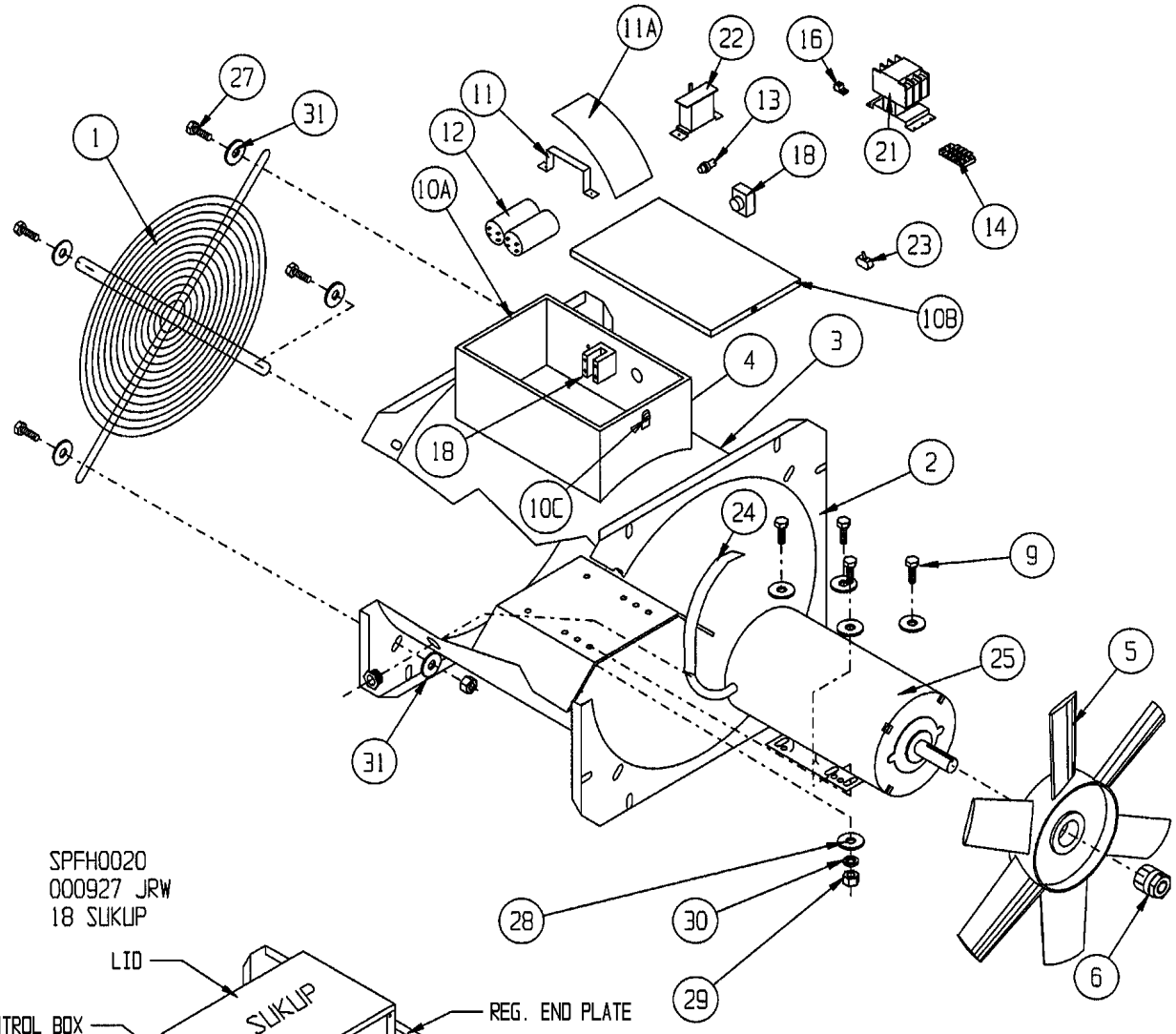
THIS IS A DRAWING OF THE NEW SUKUP END PLATE WITH THE BUILT IN VENTURI. THIS COMPLETELY ELIMINATES THE BOLT ON VENTURI FOR 24 & 28" FANS.

12" & 14" AXIAL FAN

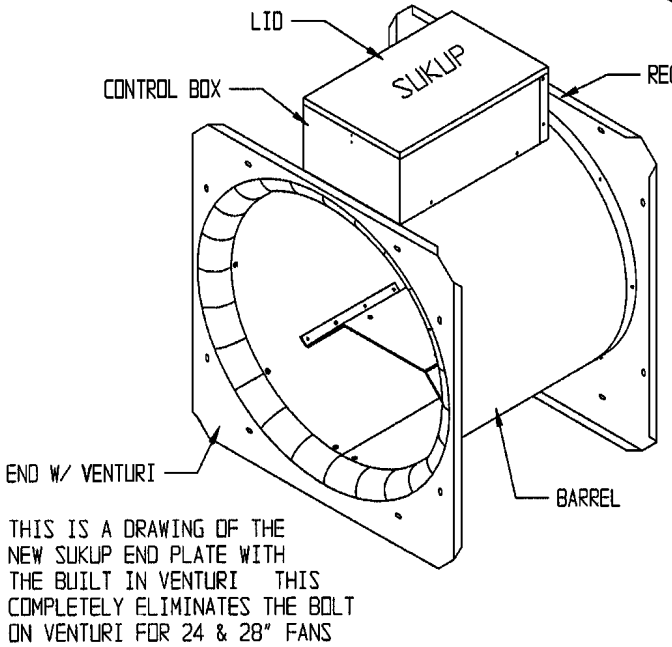
REF#	DESCRIPTION	NOTES	QTY	3450 RPM 12" 3/4HP	3450 RPM 12" 1HP	3450 RPM 14" 1.5HP
1	Screen guard		1	D3820	D3820	D3820
2	Fan housing		1	D3857	D3857	D3858
3	Decal - Safe Operation		1	L0281	L0281	L0281
4	Decal - Discon. elec, grds, shlds		1	L0166	L0166	L0166
5	Blade w/trantorque bushing		1	D3851	D3864	D3861
	Blade w/trantorque bushing 7/8"		1	------	------	D3862
6	Trantorque bushing 5/8"			J0429	J0429	J0429
	Trantorque bushing 7/8" 3ph			------	------	J0414
7	Cord Assembly 1ph 115v		1	D7490C	D7490C	------
	" " 1ph 230v			D7491	D7491	D7495
	" " 3ph 230v			D7492	D7492	D7497
	" " 3ph 440v			D7493	D7493	D7498
	Heyco bushing	b	1	J5005	J5005	J5005
	Plastic tubing	b	1	K5206	K5206	K5206
	4' Cord only 1ph 115v/230v	b	1	D3852C	D3852C	D3852C
	4' Cord only 3ph 230v/460v	b	1	D3853	D3853	D3853
	½" Electrical connector	b	1	J4079	J4079	J4079
	115v Plug only	b,c		J3735	J3735	J3735
8	Bolt, 5/16 x 1", Truss head		4	J0528	J0528	J0528
9	Flat Washer, 5/16"		8	J1111	J1111	J1111
10	Nut, 5/16"		8	J1002	J1002	J1002
11	Bolt, 5/16" x 1" Gr 5		4	J0527	J0527	J0527
12	Lock Washer, Split, 5/16"		4	J1200	J1200	J1200
13	Flat Washer, 3/8"		8	J1117	J1117	J1117
14	Motor, 1 phase 5/8" shaft		1	H0700	H1000	H1605
	" 3 phase 5/8" shaft			H0950	H1050	------
	" 3 phase 7/8" shaft			------	------	H1900
	Decals:					
	Airflow Sticker	b	1	L0403	L0403	L0403
	Rotation Sticker	b	1	L0292	L0292	L0292
	Sukup Logo Sticker	b	1	L03161	L03161	L03161
	Serial #	b	1	L0383	L0383	L0383
	Voltage Decal 115V 1PH	b	1	L0126	L0126	------
	" " 230V 1PH	b	1	L0127	L0127	L0127
	" " 230V 3PH	b	1	L0107	L0107	L0107
	" " 460V 3PH	b	1	L0128	L0128	L0128

NOTES:
b - Not shown;
c - For control circuits above 250 volts

18" - 44" AXIAL FAN



SPFH0020
000927 JRW
18 SUKUP



THIS IS A DRAWING OF THE NEW SUKUP END PLATE WITH THE BUILT IN VENTURI THIS COMPLETELY ELIMINATES THE BOLT ON VENTURI FOR 24 & 28" FANS

18" - 44" AXIAL FAN

				3450 RPM					1750 RPM	
				18"	18"	24"	24"	28"	38"	44"
REF. #	DESCRIPTION	NOTES *	QTY	2HP	3HP	5-7HP	7-10HP	10-15HP	10-17HP	30HP
1	Screen guard		1	D3822	D3822	D3823	D3823	D3824	J3132	J2957
2	Fan Housing - Galvanized 1PH		1	D3867	D3867	D3882	D3882	D3885	D5210	T20980
	" " " 3PH								D5211	
3	Decal - Safe Operations		1	L0281	L0281	L0281	L0281	L0281	L0281	L0281
4	Decal - Fan Safety		1	L0166	L0166	L0166	L0166	L0166	L0166	L0166
5	Blade w/trantorque bushing (7/8)	f	1	D3874	D3871	D3886	D3881	------	------	------
	" " " " " (1-1/8")		1	------	------	D38861	D38811	D3891	-----	-----
	" " " " " (1-5/8")		1	------	------	------	------	------	T12175	------
	Blade w/Taper Lock Bushing (1-7/8")		1	------	------	------	------	------	------	J3067
	Dustcover for 38 & 44"		1	------	------	------	------	------	D3898	------
6	Trantorque bushing (7/8")	f	1	J0414	J0414	J0414	J0414	------	------	------
	" " " (1-1/8")		1	------	------	J0436	J0436	J0436	------	------
	" " " (1-5/8")		1	------	------	------	------	------	J0435	------
	Taper Lock bushing (1-7/8")		1	------	------	------	------	------	------	J04284
9	Bolt, 5/16" x 1" GR 5		4	J0527	J0527	J0527	J0527	J0527	-----	-----
	Bolt, 7/16" x 2" GR 5		4	----	-----	-----	-----	-----	J0718	J0718
10	Electrical Components only 1ph 230V	i	1	D8501	D8501	D8505	D8506	D8506	D8509	------
	3ph 230v	i	1	D8510	D8510	D8514	D8515	D8515	D8518	D85171
	3ph 460v	i	1	D8519	D8519	D8524	D8524	D8524	D85181	D85172
10A	Control Box Only		1	D3842	D3842	D3841	D3841	D3841	D3841	D3841
10B	Lid Only		1	D3845	D3845	D4500	D4500	D4500	D4500	D4500
10C	Latch		2	J2310	J2310	J2310	J2310	J2310	J2310	J2310
11	Capacitor holder (1ph only)		1	------	------	------	D3833	D3833	D3832	------
	" " " " Sq. D		1	------	------	------	------	------	D3833	------
11A	Protective foam strip		1	------	------	------	D8506-01	D8506-01	D8506-01	D8506-01
12	Capacitors full name plate infor. Req'd		1							
13	Fuse holder only (38" & 44" uses 2)	a	1	------	------	J4660	J4660	J4660	J4660	J4660
	Fuse, 3 amp (38" & 44" uses 2)	ab	1	------	------	J4667	J4667	J4667	J4667	J4667
	Fuse, 2 amp for 3 ph, 460V	ab	1	------	------	J4666	J4666	J4666	J4666	-------
14	Heater Power Block	a	1	------	------	D65073	D65073	D65073	------	------
16	Ground Lug	a	1	J4049	J4049	J4049	J4049	J4049	J4049	J4049
18	Start-Stop Single Push Button	ag	1	J4482	J4482	J4482	J4482	J4482	-------	------
	Start Button for 38" & 44"		1	------	------	------	------	------	J4485	J4485
	Pushbutton Cover		1	------	------	------	------	------	J4500	J4500
21	Magnetic Contactor - see page 43	ag	1							
22	Overload relay - see page 43	a	1							
	Heater strip - see page 46	a	1-3							
23	Accessory contact (3ph) see page 43	ad	1							
	Carling toggle switch	b	1	-----	------	------	------	------	J4475	J4475
	Transformer, 460v/115v	bh	1	------	------	J4907	J4907	J4907	J4907	J4903
24	Conduit w/wires & fitting (1ph) 230v		1	D8600	D8600	D8606	D8606	D8606	D8608	------
	" " (3ph) 230v		1	D8602	D8602	D8606	D8606	D8606	D8610	D8620
	" " (3ph) 460V		1	D8602	D8602	D8606	D8606	D8606	D8612	D86202
	¾" Strgt Conn.		2	------	------	J4077	J4077	J4077	-------	------
	½" Connector Straight		2	J4078	J4078	------	------	------	------	------
	1" Strgt & 1" 90 degree Conn.		1	------	-------	-----	------	------	J4144&J4147	------
	1-1/4" Strgt & 1-1/4" 90 degree Conn.		1	-----	------	------	------	------	------	J4150&J4155

18"- 44" AXIAL FAN (*continued*)

				3450 RPM					1750 RPM	
				18"	18"	24"	24"	28"	38"	44"
REF.#	DESCRIPTION	NOTES*	QTY	2HP	3HP	5-7HP	7-10HP	10-15HP	10-17HP	30HP
25	Motor - 1ph (7/8" shaft)		1	H2000	H2945	H4390	H5020	------	------	------
	" " " (1-1/8" shaft)		1	------	------	H4395	H5022	H5760	------	------
	" " " (1-5/8" shaft)		1	------	------	------	------	------	H5755	------
	" 3ph (7/8" shaft)		1	H2050	H3000	H4425	H5050	------	------	------
	" " " (1-1/8" shaft)		1	------	------	H4430	H5055	H5775	------	------
	" " " (1-5/8" shaft)		1	------	------	------	------	-------	H6275	-------
	" " " (1-7/8" shaft)		1	------	------	------	------	-------	------	H7125
26	Venturi for 1994 & older for 24 & 28"		1	------	-------	J3075	J3075	J3080	J3085	J3090
27	Bolt, (Truss head) 5/16" x 1"		4	J0528	J0528	J0528	J0528	J0528	-------	-------
28	Flat Washer, 5/16"		10	J1111	J1111	J1111	J1111	J1111	J1111	J1111
29	Nut, 5/16"		8	J1002	J1002	J1002	J1002	J1002	J1002	J1002
30	Lock Washer, Split, 5/16"		6	J1200	J1200	J1200	J1200	J1200	J1200	J1200
31	Flat Washer, 3/8"		8	J1117	J1117	J1117	J1117	J1117	------	------
	Electrical Hardware - Not Shown									
	Flanged Spade			------	------	-------	------	------	J3805	J3805
	Female Spade, Part. Insulated			------	------	J3829	J3829	J3829	J3829	J3829
	Wire Nut			------	------	J4045	J4045	J4045	J4045	J4045
	Red Scotchlock			J4005	J4005	------	------	------	J4005	------
	Yellow Scotchlock			J4010	J4010	J4010	J4010	J4010	J4010	J4010
	Reducer bushing (* = 3 phase)		1	------	------	J4162	J4162 *	J4162 *	J4159 *	J4158
	Std Hardware – Not Shown									
	½" #5-40 Screw, SL, RHMS			------	------	J0442	J0442	J0442	J0442	J0442
	½" #8-18 Screw, Self drill			J0460	J0460	J0460	J0460	J0460	J0460	J0460
	¾" #8-18 Screw, Self drill			J0465	J0465	J0465	J0465	J0465	J0465	------
	5/16 -18 x 2" bolt, GR 5			-----	-----	J0585	J0585	J0585	J0585	J0585
	5/16 - 14 x 1-1/4" Bolt, GR 5			J0550	J0550	-----	-----	-----	------	------
	#5 - 40 Hex Nut			-----	-----	J0980	J0980	J0980	J0980	J0980
	5/16 - 18 x 1" Screw, GR 8 TR SL		8	------	------	------	------	------	J0528	J0528
	7/16 - 14 Hex Nut			-----	-----	-----	-----	-----	J1035	J1035
	7/16" Flat Washer			-----	-----	-----	-----	-----	J1120	J1120
	3/8" Flat Washer		16	------	------	------	------	------	J1117	J1117
	7/16" Split Lock Washer			-----	-----	-----	-----	-----	J1210	J1210
	Airflow Decal		1	L0403	L0403	L0403	L0403	L0403	L0403	L0403
	Rotation Decal		1	L0292	L0292	L0292	L0292	L0292	L0292	L0292
	Serial #		1	L0383	L0383	L0383	L0383	L0383	L0383	L0383
	Sukup Decal		2	L03161	L03161	L03171	L03171	L03171	L03171	L03171
	Voltage Decal 3PH Only 230V		1	L0107	L0107	L0107	L0107	L0107	L0107	L0107
	Voltage Decal 3PH 460V		1	L0128	L0128	L0128	L0128	L0128	L0128	L0128

* a - Not included on fan less controls;
b - Not shown;
c - For control circuits above 250 volts;
e - Available as optional items on 18" fans;
f - Includes indented parts that follow;
g - For control circuits below 250v;
h - Used on 460v, 3 phase only
i - Control circuit voltage: 230v except 460v uses 110v coil.
NOTE: 24"-28" Fans produced after 4/01/92, the overload protection is built into motor so overload is not supplied.

AXIAL FAN ELECTRICAL COMPONENTS

Fan Size			Magnetic Contactor With Coil (Square D)			
1PH 230V	3PH 230V	3PH 460V	FLA	Vendor#	Comp#	Series C* Comp#
2-3, 5-7	2-3, 5-7	----	40	DPA43V09	J5250M	J52502
----	----	2-15	40	DPA43V06	J5254M	J5252
----	----	----	60	DPA63V02 (V09)	J5247	----
7-15	7-15 (38")	----	60	DPA63V09	J5251M	----
15 (38")	30 (44")	----	90	----	J5252M	----
----	----	----	90	DPA93V06	J5256M	----

* Series “C” Square D contactor used, beginning 2010

Fan Size				Coil Only (Square D)			
1PH 230V	3PH 230V	3PH 460V	Coil Volt	FLA	Vendor#	Comp#	Series C** Comp#
2-3, 5-7	2-3, 5-7	-----	230V	40	DA1V09	J5281	----
----	----	2-3	460V	40	DA1V06	J5285	----
----	----	5-15	460V	40	DA1V06	J5285	----
----	----	----	115V	60	DA2V02	J5276	----
7-15	7-15 (38")	----	230V	60	DA2V09	J5282	----
15 (38")	30 (44")	----	230V	90	DA3V09	J5279	----

** Series “C” Square D contactor coil is not replaceable

Fan Size			Overload Relay (Square D)		
1PH 230V	3PH 230V	3PH 460V	FLA	Vendor#	Comp #
2-3	----	----	30	SE04S1	J5267
15 (38")	----	----	86	9065U01	J5274
----	2-3	2-3	30	SE05	J5268
----	15 (38")	----	60	SE08	J5270
----	30(44")	----	90	SE012	J5271

NOTE: On 24" – 28" Fans produced after **04-01-92**, the overload protection is built into motor so overload relay is not required.

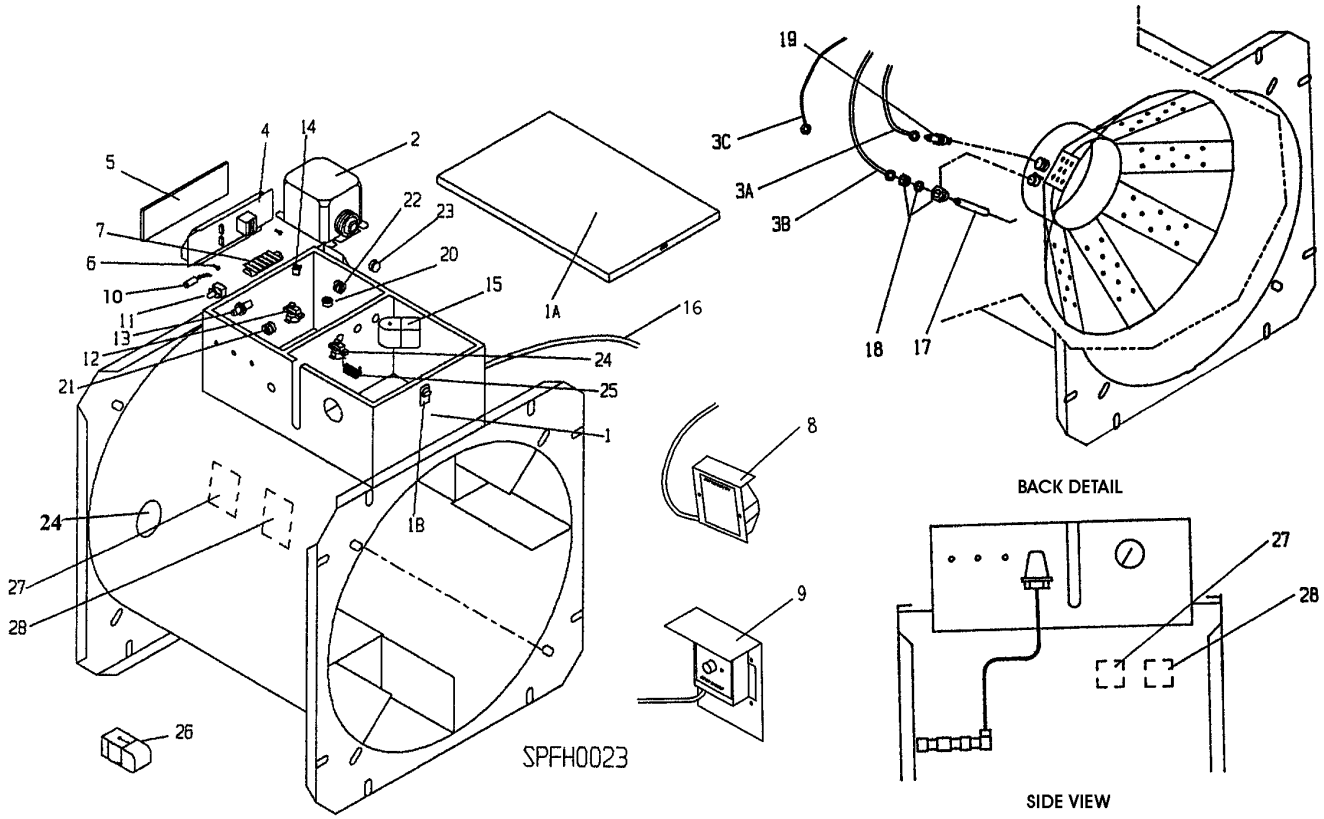
ACCESSORY CONTACT KIT (used on all 3 phase)

Mag Str Amperage	Square D			
			Series C***	
	Vendor #	Comp#	Vendor #	Comp#
30-90	9999D10	J5260	9999DD11	J52605

*** Auxiliary contactor J52605 is for Series “C” Square D contactor only; it WILL NOT interchange with earlier Square D contactor. J5260 WILL NOT interchange on newer Series “C” Square D contactor.

Contactor, coil and accessory contact kit must be all the same brand (all Square D).
Heater strip must be same brand as overload. However, a Furnas overload relay may be used with Square D contactor, or vice versa.

AXIAL HEATER ELECTRICAL COMPONENTS



			Thermostat or Humidistat		Mod Valve		High Low	
REF#	**DESCRIPTION**	**NOTES**	**QTY**	**COMP#**	**QTY**	**COMP#**	**QTY**	**COMP#**
1	Heater Control Box only		1	D4501	1	D4501	1	D4501
1A	Lid only		1	D4500	1	D4500	1	D4500
1B	Latch		2	J2310	2	J2310	2	J2310
2	Ignition transformer w/spades		1	D4400	1	D4400	1	D4400
	Female spade		2	J3830	2	J3830	2	D3830
	Complete Wire Kit (wires only)	a		D4435		D4435		D4435
3	Ignition wire harness (except 18" SLT)	b	1	D4010	1	D4010	1	D4010
3A	20" Black wire w/term			D7043		D7043		D7043
	Eyelet ring terminal	c		J3815		J3815		J3815
	Ignition eyelet terminal	d		J3816		J3816		J3816
3B	20" Red #18 wire w/terminals			D7045		D7045		D7045
	Eyelet ring terminal	d		J3815		J3815		J3815
	Male spade	c		J3822		J3822		J3822
3C	17.5" & 11.5" Green #18 wire w/terminals			D7046		D7046		D7046
	Eyelet ring terminal	d		J38151		J38151		J38151
	Female spade	c		J3826		J3826		J3826
	Ignition wire harness (18" SLT heaters)			D40101		D40101		D40101
	32" Black wire w/term			D70431		D70431		D70431
	26" Red #18 wire w/term			D70451		D70451		D70451
	27" & 11.5" Green #18 wire w/terminals			D70461		D70461		D70461
4	Sukup ignition board w/holder		1	D3948	1	D3948	1	D3948
5	Foam pad 3" x 10.5"		1	D4411	1	D4411	1	D4411
6	#5-40 x ½ slotted screw		2	J0442	2	J0442	2	J0442
	#5-40 hex nut		2	J0980	2	J0980	2	J0980

			Thermostat or Humidistat		Mod Valve		High Low	
REF#	**DESCRIPTION**	**NOTES**	**QTY**	**COMP#**	**QTY**	**COMP#**	**QTY**	**COMP#**
7	Terminal block w/strips & jumpers		1	D4401	1	D4401	1	D4401
8	Transition high limit assy. 1990	a	1	D39901	1	D39901	1	D39901
	4" Octagon junction box		1	J4609	1	J4609	1	J4609
	8' Cord (18-3) w/terminals		1	D3994	1	D3994	1	D3994
	Heyco bushing 7K-2		1	J5040	1	J5040	1	J5040
	Burner high limit w/reset		1	J5772	1	J5772	1	J5772
	3/16 x ½" bolt		2	J0454	2	J0454	2	J0454
	3/16" hex nut		2	J0983	2	J0983	2	J0983
	Cover plate		1	D3992	1	D3992	1	D3992
9	Thermostat assembly	a	1	D4012	-	- - -	1	D4011
	Thermostat only		1	J5840	-	- - -	1	J5843
	Bulb holder		1	D3999	-	- - -	1	D3999
	O-ring, R-206 .484IDx.139 C/S		1	J3535	-	- - -	1	J3535
	Cord w/terminals		1	D7101	-	- - -	1	D40111
	Heyco bushing		1	J5040	-	- - -	1	J5005
	Humidistat w/holder & cord	e	1	D4029	-	- - -	-	- - -
	Cord w/terminals		1	D4035	-	- - -	-	- - -
	Humidistat less knob		1	J5850	-	- - -	-	- - -
	Knob, only		1	J4160	-	- - -	-	- - -
10	Red light w/spades		1	D4402	1	D4402	1	D4402
	Female spade		2	J3830	2	J3830	2	J3830
11	Carling toggle switch 4x846		1	J4475	1	J4475	1	J4475
	On/off plate 2x642		1	J4520	1	J4520	1	J4520
12	Burner high limit w/reset		1	J5772	1	J5772	1	J5772
13	Fuse holder only			J4660		J4660		J4660
	3 amp fuse			J4667		J4667		J4667
14	Ground bar		1	J47903	1	J47903	1	J47903
15	Vapor solenoid, coil only	g						
	For ¼" pipe train		1	J6030	1	J6030	1	J6030
	For ½" & ¾" pipe train		1	J6268	1	J6268	1	J6268
	For 1 ¼" pipe train		1	J6252	1	J6252	1	J6252
16	Power cord w/terminals	a	1	D7103	1	D7103	1	D7103
	8' of 18-3 Cord only		1	D7101	1	D7101	1	D7101
	Female spade		2	J3830	2	J3830	2	J3830
17	Flame sensor – See small chart on page 47							
18	Compression fitting for flame sensor		1	J5748	1	J5748	1	J5748
19	Spark plug #64 (3.5" overall length)		1	J5739	1	J5739	1	J5739
20	Heyco universal bushing (ignition wires)		2	J5003	2	J5003	2	J5003
21	Heyco bushing 7W-2 (18-3 & 18-5 wire, plastic tubing)			J5005		J5005		J5005
22	Heyco bushing SR7K2 (18-3 wire)			J5040		J5040		J5040
23	Black hole plug DP875			J5085		J5085		J5085
24	Sight Glass		1	D6251	1	D6251	1	D6251
	Hardware for mounting components:							
	#8-18 x ½ TEK screw		4	J0460	4	J0460	4	J0460
	#8-18 x ¾ TEK screw		4	J0465	4	J0465	4	J0465
For units with vaporizer only:								
	Vapor high limit assembly w/reset	f	1	D4037	1	D4037	1	D4037
	Plastic tube ½" ID x 3" lg		1	D4413	1	D4413	1	D4413
	19" Red wire w/terminal		2	D44104	2	D44104	2	D44104
24A	Hi-limit switch w/reset		1	J5901	1	J5901	1	J5901
25	Pawl spring		1	J2360	1	J2360	1	J2360
26	Liquid solenoid, coil only	f, g	1	J6030	1	J6030	1	J6030
27	Decal – Safe Operation		1	L0281	1	L0281	1	L0281
28	Decal – Disconnect elec., guards, shields in place; check fan blade		1	L0165	1	L0165	1	L0165
29	Pipe Brace for 38" & 44" heaters – not shown		1	D3893	1	D3893	1	D3893

NOTES:

a. Includes indented parts that follow;
b. Used w/all heaters except 18" super low temp;
c. Used on control box end of wire;
d. Used on burner end of wire;
e. Humidistat is optional on thermostat or mod valve heaters;
f. Used only for liquid propane (with vaporizer);
g. See also pipe train section.

SQUARE D HEATER STRIPS FOR VARIOUS MOTOR AMPERAGES*

*For 1.15 to 1.25 service factor motors use motor full load current as listed. For 1.0 service factor motors use 90% of motor full load current.

SINGLE PHASE

30 Amp Overload (J5267, SE04S1)			60 Amp Overload (J5269, SE07S1)		
1.15 SF*	Strip	Comp. #	1.15 SF*	Strip	Comp. #
2.2-2.4	B3.00	J5300	3.5-3.9	B4.85	J5304
2.4-2.7	B3.30	J5301	3.9-4.5	B5.50	J5305
2.7-3.0	B3.70	J5302	4.5-4.9	B6.25	J5306
3.0-3.5	B4.15	J5303	4.9-5.5	B6.90	J5307
3.5-4.0	B4.85	J5304	5.5-5.8	B7.70	J5308
4.0-4.6	B5.50	J5305	5.8-6.6	B8.20	J5309
4.6-5.0	B6.25	J5306	6.6-7.4	B9.10	J5310
5.0-5.6	B6.90	J5307	7.4-8.3	B10.2	J5311
5.6-6.0	B7.70	J5308	8.3-9.2	B11.5	J5312
6.0-6.6	B8.20	J5309	9.2-10.0	B12.8	J5313
6.6-7.3	B9.10	J5310	10.1-11.2	B14	J5314
7.3-8.2	B10.2	J5311	11.3-12.5	B15.5	J5315
8.2-9.1	B11.5	J5312	12.6-14.2	B17.5	J5316
9.1-9.9	B12.8	J5313	14.3-16.1	B19.5	J5317
9.9-10.7	B14	J5314	16.2-18.4	B22	J5318
10.8-12.1	B15.5	J5315	18.5-20.5	B25	J5319
12.2-13.5	B17.5	J5316	20.6-23.2	B28.0	J5320
13.6-15.1	B19.5	J5317	23.3-26.6	B32	J5321
15.2-17.0	B22	J5318	26.7-29.6	B36	J5322
17.1-18.9	B25	J5319	29.7-33.5	B40	J5323
19.0-21.5	B28.0	J5320	33.6-37.2	B45	J5324
21.6-24.0	B32	J5321	37.3-41.5	B50	J5325
24.1-26.0	B36	J5322	41.6-44.0	B56	J5326
-----	B40	J5323	44.1-46.3	B62	J5327
-----	-----	-----	46.4-52.5	B70	J5329
-----	-----	-----	52.6-56.0	B79	J5330

THREE PHASE

40 Amp Overload (J5268, SE05)			60 Amp Overload (J5270, SE08S1)			90 Amp Overload (J5271, SE012)		
1.15 SF*	Strip	Comp. #	1.15 SF*	Strip	Comp. #	1.15 SF*	Strip	Comp. #
1.9-2.1	B3.00	J5300	3.4-3.6	B4.85	J5304	50.4-54.5	CC68.5	J5335
2.2-2.3	B3.30	J5301	3.7-4.1	B5.50	H5305	54.6-58.3	CC74.6	J5337
2.4-2.7	B3.70	J5302	4.1-4.4	B6.25	J5306	58.4-63.1	CC81.5	J5338
2.7-3.2	B4.15	J5303	4.4-5.2	B6.90	J5307	63.2-68.4	CC87.7	J5339
3.2-3.5	B4.85	J5304	5.2-5.6	B7.70	J5308	68.5-73.8	CC94.0	J5340
3.5-3.9	B5.50	J5305	5.6-6.0	B8.20	J5309	73.9-78.9	CC103	J5342
3.9-4.1	B6.25	J5306	6.0-6.8	B9.10	J5310	79.0-86.0	CC112	J5341
4.2-4.7	B6.90	J5307	6.8-7.9	B10.2	J5311			
4.7-5.3	B7.70	J5308	7.9-9.1	B11.5	J5312			
5.3-5.6	B8.20	J5309	9.1-10.0	B12.8	J5313			
5.7-6.4	B9.10	J5310	10.1-10.7	B14	J5314			
6.4-7.4	B10.2	J5311	10.8-12.0	B15.5	J5315			
7.4-8.6	B11.5	J5312	12.1-13.5	B17.5	J5316			
8.6-9.4	B12.8	J5313	13.6-14.6	B19.5	J5317			
9.4-10.0	B14	J5314	14.7-16.7	B22	J5318			
10.1-11.2	B15.5	J5315	16.8-18.9	B25	J5319			
11.3-12.5	B17.5	J5316	19.0-21.6	B28.0	J5320			
12.6-13.5	B19.5	J5317	21.7-24.1	B32	J5321			
13.6-15.4	B22	J5318	24.2-27.6	B36	J5322			
15.5-17.5	B25	J5319	27.7-31.2	B40	J5323			
17.6-19.9	B28.0	J5320	31.3-35.5	B45	J5324			
20.0-22.2	B32	J5321	35.6-37.8	B50	J5325			
22.3-25.5	B36	J5322	37.9-41.5	B56	J5326			
25.6-26.0	B40	J5323	41.6-44.0	B62	J5327			
-----	-----	-----	44.1-49.9	B70	J5329			
-----	-----	-----	50.0-56.0	B79	J5330			

If you have any questions regarding heater strip sizing, call Sukup Mfg. with the following information: Brand of overload, model number on overload (Example-SE04S1), full load amperage on motor name plate, and service factor on motor name plate.

FURNAS HEATER STRIPS FOR VARIOUS MOTOR AMPERAGES

To select heater strip, go to appropriate overload section, find column for motor service factor (SF), then select heater strip based on nameplate amperage of motor.

SINGLE PHASE

25 Amp Overload (48DA17AA4)				60 Amp Overload (48GA17AA4)			
1.00 SF	1.15 SF	Strip	Comp. #	1.00 SF	1.15 SF	Strip	Comp. #
8.9-9.7	8.0-8.9	E51	J4200	16.9-18.7	13.7-15.2	E57	J4215
9.8-10.5	8.9-9.7	E52	J4205	18.8-20.0	16.9-18.7	E60	J4220
10.6-11.5	9.8-10.5	E53	J4206	20.1-22.5	18.8-20.0	E61	J4225
11.6-12.3	10.6-11.5	E54	J4207	22.6-23.3	20.1-22.5	E62	J4226
12.4-13.4	11.6-12.3	E55	J4210	23.4-25.5	22.6-23.3	E65	J4230
13.5-15.2	12.4-13.4	E56	J4212	25.6-27.9	23.4-25.5	E66	J4235
15.3-17.2	13.5-15.2	E57	J4215	28.0-30.8	25.6-27.9	E67	J4236
17.3-18.4	15.3-17.2	E60	J4220	30.9-33.2	28.0-30.8	E69	J4240
18.5-20.6	17.3-18.4	E61	J4225	33.3-36.6	30.9-33.2	E70	J4245
20.7-21.3	18.5-20.6	E62	J4226	36.7-38.9	33.3-36.6	E71	J4260
21.4-23.4	20.7-21.3	E65	J4230	39.0-43.1	36.7-38.9	E72	J4250
23.5-25.5	21.4-23.4	E66	J4235	43.2-47.4	39.0-43.1	E73	J4251
25.6-30.8	23.5-25.5	E67	J4236	47.5-50.0	43.2-47.4	E74	J4255
--------	25.6-30.8	E69	J4240	50.1-55.2	47.5-50.0	E76	J4257
				55.3-60.0	50.1-55.2	E77	J4258
				------	55.3-60.0	E78	J4259

THREE PHASE

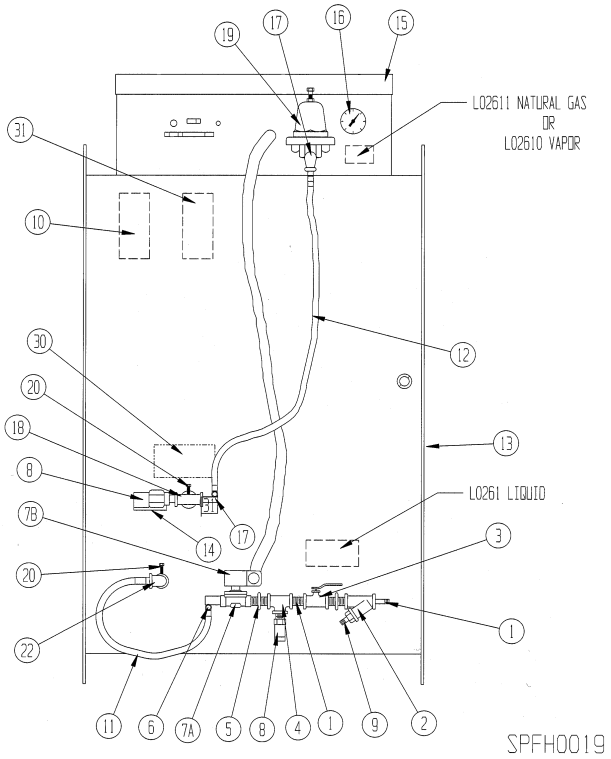
30Amp Overload (48DC37AA4)				60Amp Overload (48GC37AA4)			
1.00 SF	1.15 SF	Strip	Comp. #	1.00 SF	1.15 SF	Strip	Comp. #
3.2-3.4	2.6-2.7	E36	J4185	17.5-19.4	16.4-17.4	E61	J4225
3.4-3.8	2.9-3.1	E38	J4187	19.5-20.9	17.5-19.4	E62	J4226
3.8-4.3	3.4-3.8	E41	J4190	21.0-23.3	19.5-20.9	E65	J4230
4.3-4.6	3.8-4.3	E42	J4191	23.4-26.2	21.0-23.3	E66	J4235
5.1-5.6	4.3-4.6	E44	J4193	26.3-29.1	23.4-26.2	E67	J4236
5.6-5.9	5.1-5.6	E47	J4196	29.2-30.0	26.3-29.1	E69	J4240
5.9-6.2	5.6-5.9	E48	J4198	30.1-32.7	29.2-30.0	E70	J4245
6.2-6.7	5.9-6.2	E49	J4197	32.8-34.1	30.1-32.7	E71	J4247
6.7-7.5	6.2-6.7	E50	J4199	34.2-36.9	32.8-34.1	E72	J4250
7.6-8.3	6.7-7.5	E51	J4200	37.0-40.7	34.2-36.9	E73	J4251
8.3-8.9	7.6-8.3	E52	J4205	40.8-44.9	37.0-40.7	E73A	J4252
9.0-9.9	8.3-8.9	E53	J4206	45.0-47.9	40.8-44.9	E74	J4255
9.9-10.4	9.0-9.9	E54	J4207	48.0-53.0	45.0-47.9	E76	J4257
10.5-12.0	9.9-10.4	E55	J4210	53.1-60.0	48.0-53.0	E77	J4258
12.1-13.6	10.5-12.0	E56	J4212	------	53.1-60.0	E78	J4259
13.7-15.6	12.1-13.6	E57	J4215				
15.7-17.0	13.7-15.6	E60	J4220	100 Amp Overload (48HA38AA4)			
17.1-19.4	15.7-17.0	E61	J4225	1.00 SF	1.15 SF	Strip	Comp. #
19.5-20.9	17.1-19.4	E62	J4226	62.9-69.1	57.1-62.8	E77	J4258
21.0-22.5	19.5-20.9	E65	J4230	69.2-75.0	62.9-69.1	E78	J4259
22.6-25.6	21.0-22.5	E66	J4235	75.1-83.3	69.2-75.0	E79	J4260
25.7-29.1	22.6-25.6	E67	J4236	-----	75.1 -83.3	E80	J4261
29.2-30.0	25.7-29.1	E69	J4240				
------	29.2-30.0	E70	J4245	180 Amp Overload (48JA37AA4)			
				1.00 SF	1.15 SF	Strip	Comp. #
				98.0-107.9	93.0-97.9	E98	J4272

Contactor, coil and accessory contact kit must be all the same brand (all Furnas or all Square D). Heater strip must be same brand as overload, however, a Furnas overload and assembly may be used with Square D contactor, or vice versa.

46

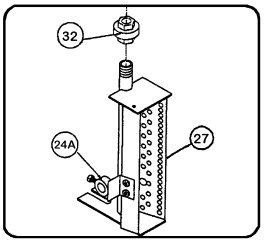
LIQUID PIPE TRAIN & COMPONENTS

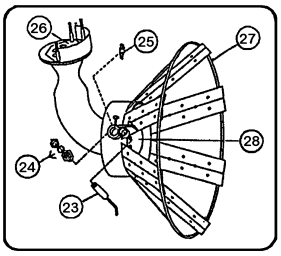
REF#	DESCRIPTION		COMP#
	Liquid Pipe Train, Complete		D4006
1	1/4 x 1-1/2" Sch 80 Blk pipe nipple		J2400
2	1/4" Liquid strainer		J5990
3	1/4" LP ball valve		J6080
4	1/4" x 1/4" x 1/4" Sch 80 tee		J2470
5	5/16 - 18 x 4 x 5/8" ID eyebolt		J0850
6	3/8" Flare x 1/4" pipe 90 degree elbow		J2740
7	1/4" Liquid solenoid, complete		J6020
7A	Liq. Solenoid body only RS303		J6025
7B	Liq. Solenoid coil only		J6030
8	1/4" relief valve 3127G		J6050
	1/2" relief valve 3129G		J6170
	Reducing Bushing 3/4 x 1/2 for 38" & 44"		J2568
9	3/8" Black Plug		J2610
10	Decal-Disconn elec; bleed gas, screen		L0165
11	3/8" x 18" High pressure hose		J5929
12	3/8" x 28" High pressure hose - 18-28" htr		J5936
	3/4" x 48" High pressure hose - 39-44" htr		J5928
13	Heater housing - Gal.	Service door:	
	18" Axial - D6300	18" Axial - D6301	
	24" Axial - D6305	24" Axial - D6306	
	26" Axial - D6309	26" Axial - D6311	
	28" Axial - D6310	28" Axial - D6311	
	38" Axial - D5200	38" Axial - T12992	
	44" Axial - D4970	44" Axial - T12992	
	Sight glass for all models for 18"		D6250
	Sight glass for all models for 24-44"		D6251
14	Raincap		J6200
15	Control box only		D4501
	Lid only		D4500
16	Pressure gauge, (0-30) Liquid		J5959
	Vapor Train		D4000
	Vapor Train 38" & 44" Htr		D40001
17	1/2" Flare x 1/2 pipe 90 degree elbow		J2745
	3/4" x close nipple, Sch 80, 38" & 44"		J2416
18	1/2" Sch 80 tee		J2472
	¾ x 3/4 x 1/2" tee 38" & 44" Sch 80		J2482
19	Regulator, see pipe train diagrams		
20	5/16 x 1" bolt		J0527
21	Bushing, 1/2" x 1/4" (not shown)		J2569
	Brace for 3/4" regulator 38" & 44" (not shown)		D3893
22	1/2" x 90 Degree Sch 40 Elbow		J2523
23	Flame sensor - see chart across		
24	Compression fitting for flame sensor		J5748
24A	Ignitor holder, Lo temp.		D7051
25	Spark plug #64		J5739
	Spark plug holder for natural gas		D4589
26	Orifice plate		D4038
27	Burner assembly - See chart on this page		
28	Port cup - See chart on this page		
29	Vaporizer coil, 10.5" (24",26", 28") Paint		D7031
	" " " " galvanized		D70321
	" " " Top Dry		D70311
	" 5" (18" heater)		D7032
	" " " (for 38" heater)		D7034
	" " " (for 44" heater)		D7035
30	Label - Attention - Vap. Must be adj.		L0141
31	Decal - Safe operation		L0281
32	Union 3/4", black, #150		J2710
33	Slot Cover (Not shown)		D7151
	Slot Cover Natural Gas Only (N/S)		D7152
	Slot Cover-Mod. Valve - (Not shown)		D7147
	Slot Cover-Mod.Valve Natural Gas (N/S)		D7146

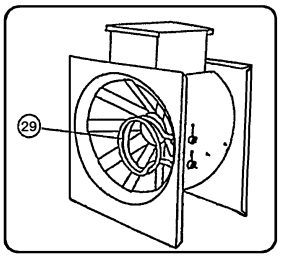


LOWER AND HIGH TEMP HEATERS				
Size	Burner Assembly	Port Cup Lower Temp	High Temp	Flame Sensor
18"	D4036	D4028	D4025	D4054
24"	D4016	D4028	D4025	J5747
26"	D40161	D4028	D4025	J5747
28"	D4017	D4028	D4025	J5747
38"	D4043	-----	D4044	J5747
44"	D4048	-----	D4044	J5747

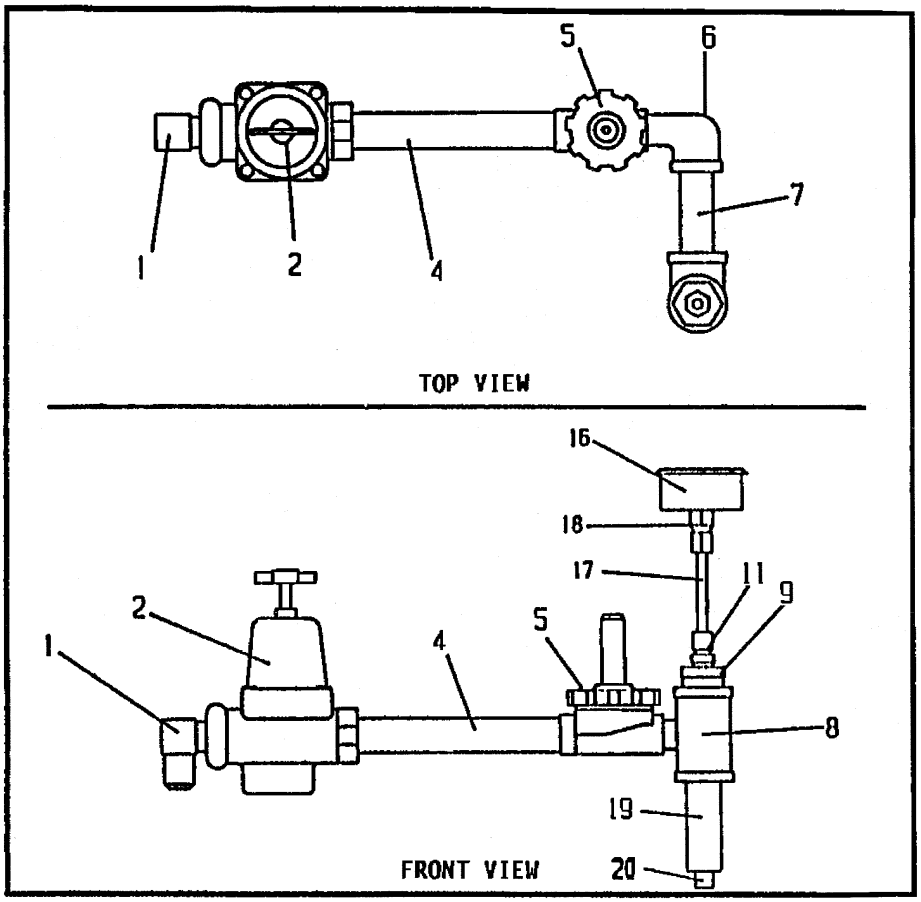
SUPER LOW TEMP HEATERS			
Size	Burner Assembly	Port Cup	Flame Sensor
18"	D3897	----	J5745
24"	D4434	D4028	J5747
26"	D4434	D4028	J5747
28"	D4434	D4028	J5747
38"	----	D40441	----
44"	----	----	----







THERMOSTAT PIPE TRAIN

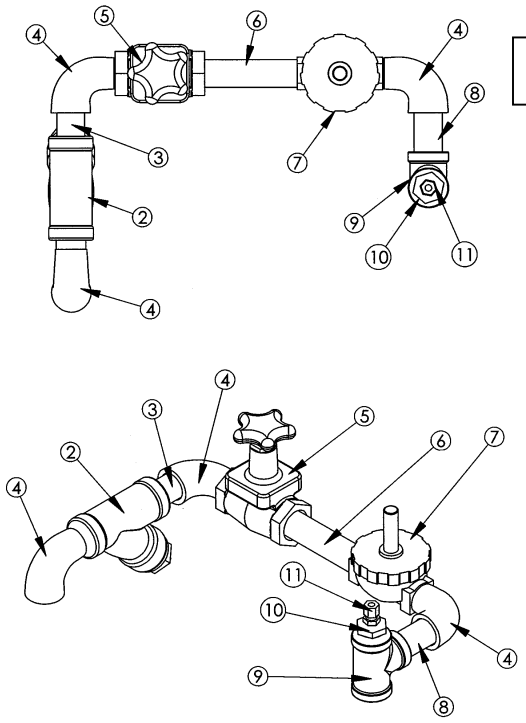


1/2" THERMOSTAT PIPE TRAIN

REF. #	DESCRIPTION	NOTES	1/4"	1/2"	3/4" (NG)	3/4" (38")
	Thermostat (or Humidistat) pipe train, complete	a	D3963	D3982	D4002	D40592
1	90° Brass elbow FLxMIP		J2744	J2745	-----	-----
	Union, 3/4 MFL x 3/4 MIP		----	----	----	J2842
2	Regulator, Cash Acme	a	J6109	J6110	----	J6112
	Globe valve	c	----	----	J2875	----
4	Nipple-Long		J24111	J2409	J2424	J2427
5	Solenoid valve, Complete	a	J6020	J6255	J6260	J6260
	Coil only	b	J6030	J6268	J6268	J6268
	Solenoid body only		J6025	J6254	J6264	J6264
	Diaphragm kit		J6002	J6001	J6000	J6000
6	90° Street Elbow		J2517	J2520	J2530	J2530
7	Nipple		J2411	J2408	J2420	J2420
8	Tee		J2469	J2480	J2485	J2485
9	Bushing, Reducing, 3/4" x 1/4"		-----	J2570	J2570	J2570
10	Bushing, 3/4 x 1/2"	b	----	----	----	J2568
11	Compression fitting, 1/4" x 1/4"		J2772	J2772	J2772	J2772
	Nipple, 1/4 x 1-1/2"	d	J2400	----	----	----
	Coupling, Reducing, 3/4 x 1/4"	d	J2574	----	----	----
16	Pressure gauge	e	J5959	J5959	J5959	J5959
17	Tube to Pressure gauge	e	D7150	D7150	D7150	D7170
18	Compression Conn, 1/4 x 1/8"	e	J2771	J2771	J2771	J2771
19	Orifice pipe - See page 54	e				
20	Orifice - See page 54	e				

a - Includes indented parts that follow;
b - Not shown;
c - Used only on Nat. Gas;
d - Used only on 1/4" pipe train.
e - Not included with pipe train

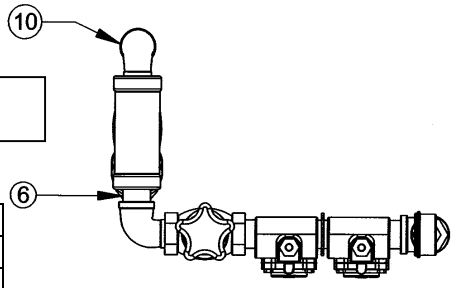
THERMOSTAT PIPE TRAIN
With Strainers



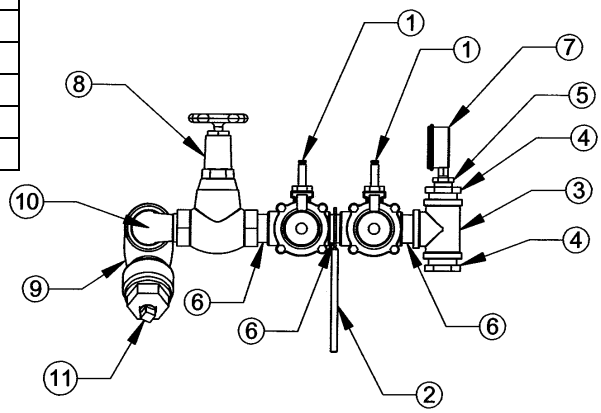
¾" Pipe Train

REF. #	DESCRIPTION	QTY	COMP #
1	Plug, 3/8, Pipe, Black	1	J2610
2	Strainer, 3/4	1	J6231
3	Nipple, ¾" x Close	1	J2410
4	Elbow, Street, ¾", 90°, Sch 40	3	J2530
5	Valve, Globe, ¾"	1	J2875
6	Nipple, ¾" x 4, Sch 40	1	J2424
7	Valve, solenoid, Body, ¾", GP600	1	J6264
8	Nipple, ¾" x 2, Sch 40	1	J2420
9	Tee, 3/4 x 3/4 x 3/4, Sch 40	1	J2485
10	Bushing, Reducing, 3/4 x 1/4, Sch 40	1	J2570
11	Coupling, 1/4 Comp x 1/4 MIP	1	J2772

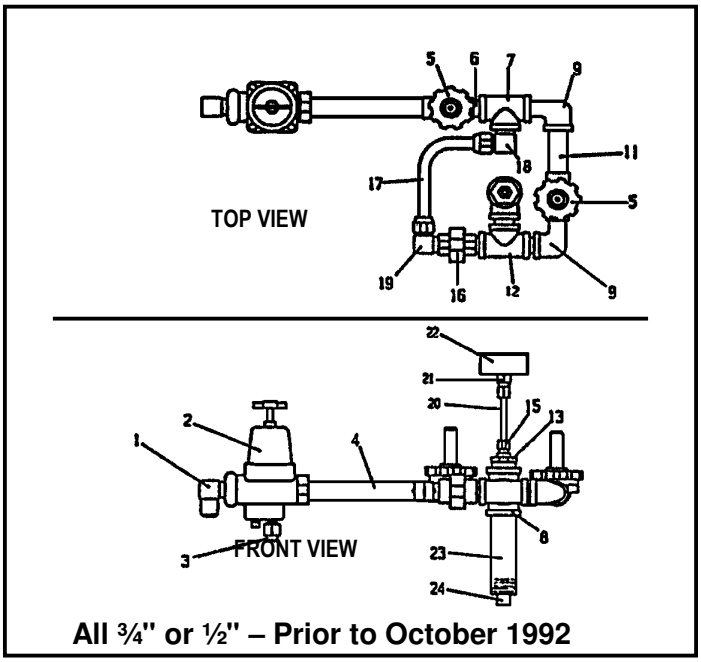
1¼" Pipe Train



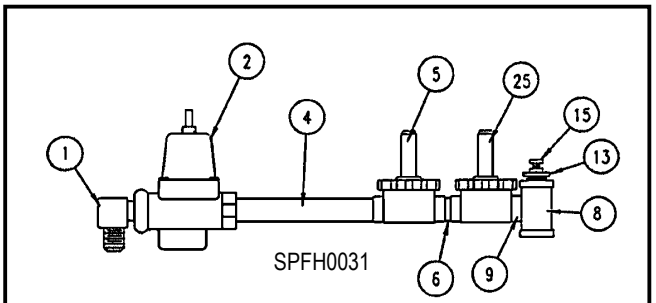
REF#	DESCRIPTION	QTY	COMP #
1	Valve, Solenoid, Body	2	J6251
2	Eyebolt, Pipe Train	1	D7116
3	Tee, 1.25, Black	1	J2510
4	Bushing, 1-1/4 x 3/4	2	J2580
5	Bushing, Reducing, 3/4 x 1/4, Sch 40	1	J2570
6	Nipple, 1.25 x Close	4	J2500
7	Gauge, Pressure, 0-30, Liquid 1/4BTM, MT	1	J5960
8	Valve, 1-1/4", Globe	1	J6266
9	Strainer, 1-1/4" Wye (Not Shown)	1	J6233
10	Elbow, Street, 1.25, 90°	2	J2511
11	Pipe Plug, ¾"	1	J2620



HI-LO PIPE TRAINS



All ¾" or ½" – Prior to October 1992



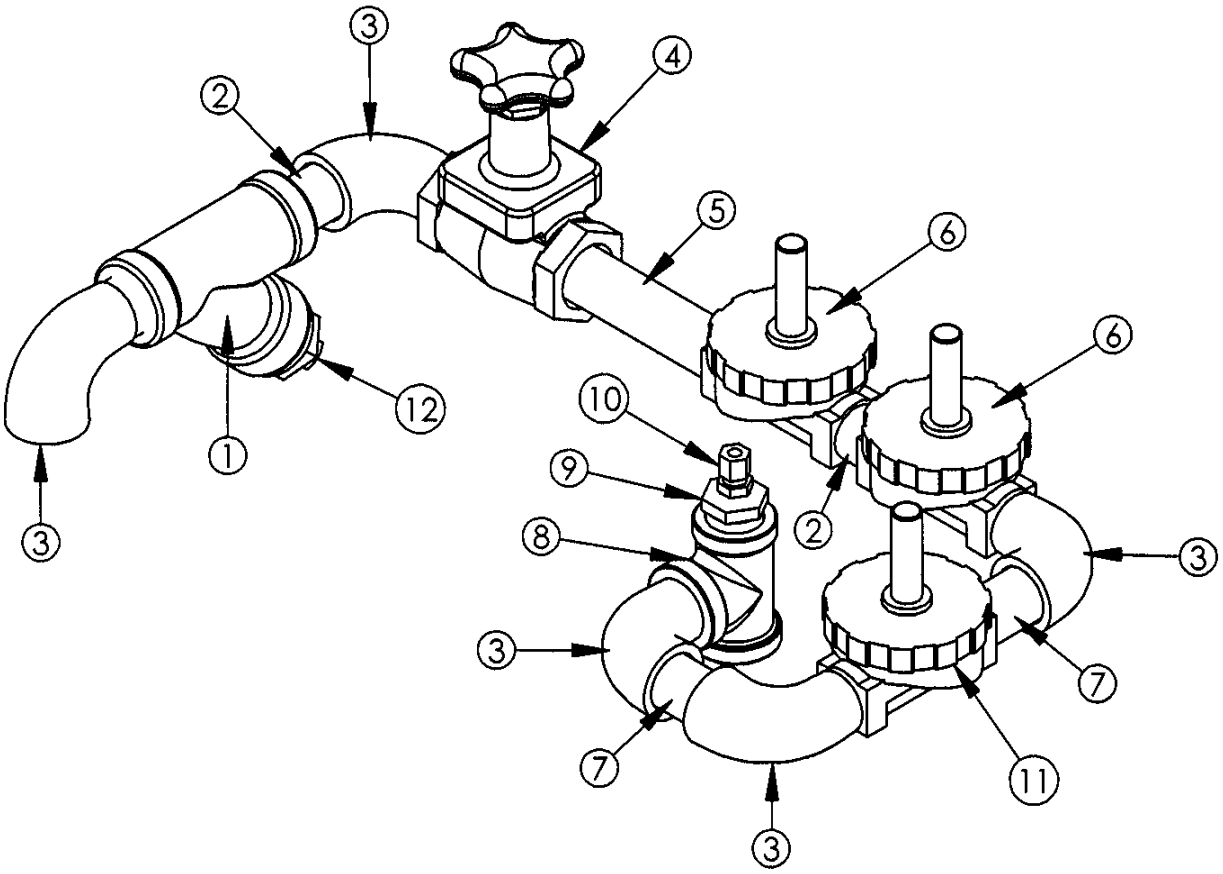
½" Only – October 1992 & later

REF#	DESCRIPTION	NOTES	½"	¾" (NG)
	Hi-Lo pipe train	a	D3981	D4001
	Hi-Lo pipe train, 11/64" (red)		D39812	-----
	Hi-Lo pipe train, 13/64" (orange)		D39813	-----
	Hi-Lo pipe train, 15/64" (green)		D39814	-----
1	90° Elbow FL x MIP		J2745	-----
2	Regulator, Rego	a	J6110	-----
	Globe valve	b	-----	J2875
3	¼" Plug		J2612	-----
4	Nipple-long		J2409	J2427
5	Vapor solenoid complete	a	J6255	J6260
	Solenoid body only		J6254	J6264
	Coil only	b	J6268	J6268
	Diaphragm kit		J6001	J6000
5A	Vapor solenoid complete 1 ¼"		-----	-----
	Solenoid body only		-----	-----
	Coil only		-----	-----
6	Nipple close, ½"		J2405	-----
	Nipple close, ¾"		-----	J2410
	Nipple close, 1 ¼"		-----	-----
7	Tee		J2471	-----
8	Reducing tee		J2480	J2480
9	Street elbow 90°		J2520	J2530
10	90° Elbow		J2522	-----
11	Nipple-short		J24062	-----
12	Side outlet tee		-----	J2490
13	Reducing bushing, ¾" x ¼"		J2570	J2570
14	Reducing bushing, 1 ¼" x ¾"		-----	-----
15	Coupling, ¼" Comp x ¼" MIP		J2772	J2772
16	Union		J2705	J2710
	Low side orifice – see page 54	b	-----	-----
17	6 ¼" tube w/nuts		D7118	D7118
18	90° Elbow FL x MIP		J2745	J2745
19	90° Elbow FL x MIP		J2745	J2750
20	Tube to pressure gauge	d	D7150	D7150
21	Compression fitting, ¼" x 1/8"	d	J2771	J2771
22	Pressure gauge liquid	d	J5959	J5959
23	Orifice pipe – see page 54	d		
24	Orifice – see page 54	d		
25	Valve body w/1/8 orifice (white)	c	D7074	-----
	Valve body w/11/64 orifice (red)	c	D7075	-----
	Valve body w/13/64 orifice (orange)	c	D7076	-----
	Valve body w/15/64 orifice (green)	c	D7077	-----

a: Includes indented parts that follow;
b: Not shown;
d: Not included with pipe train

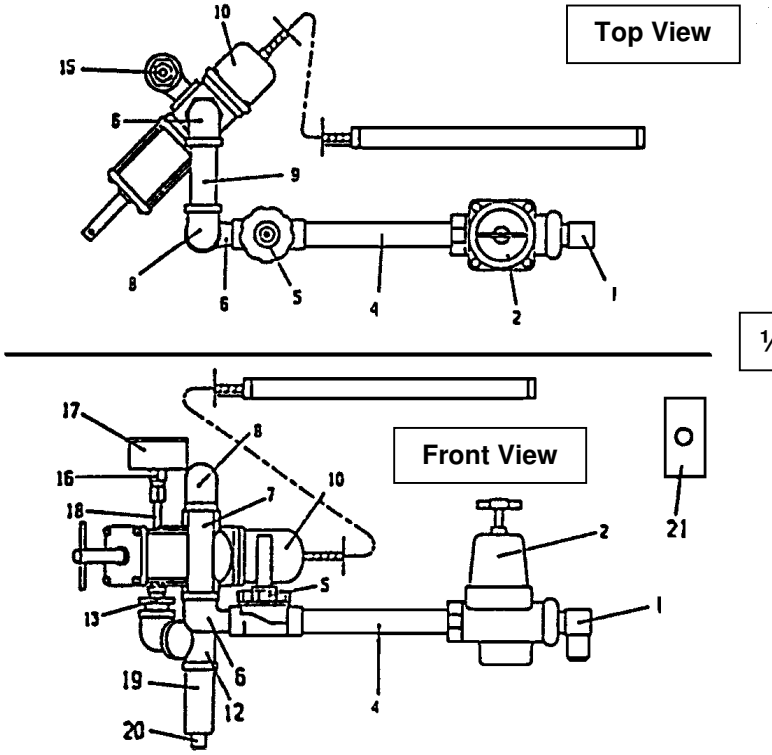
c: The low side orifice is drilled into this valve on the ½" Hi-Lo pipe train on models manufactured after Oct 1992.

3/4" HI/LO PIPE TRAIN FOR NATURAL GAS - D4001



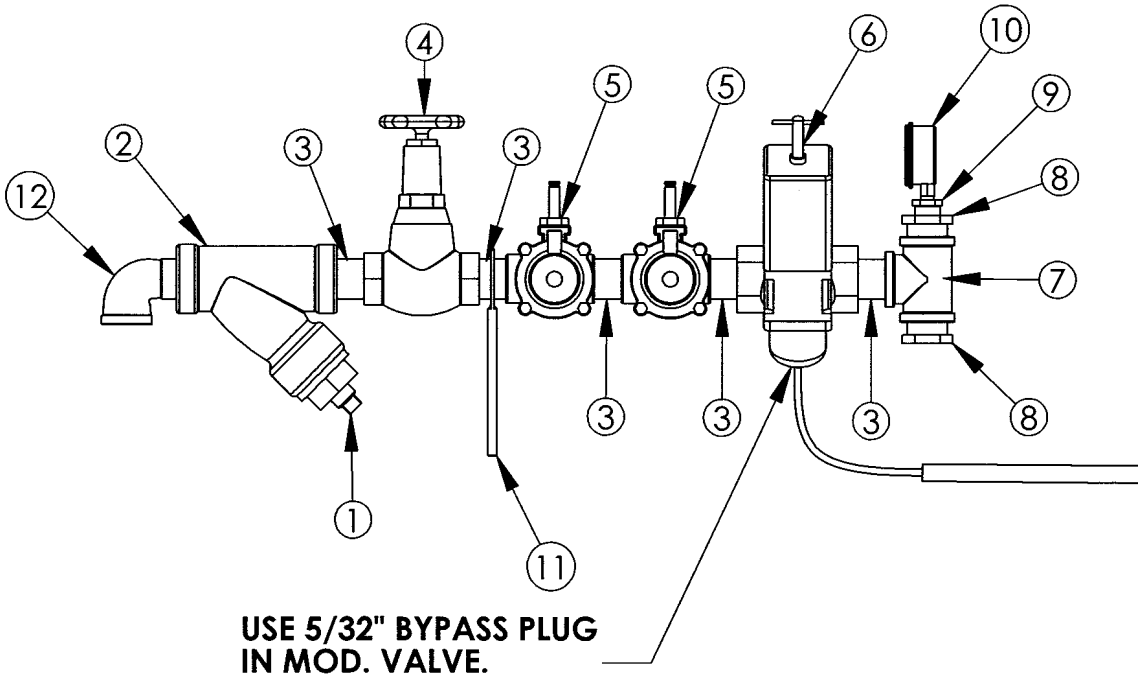
REF. #	DESCRIPTION	QTY	COMP. #
1	Strainer, 3/4"	1	J6231
2	Nipple, 3/4" x CLOSE	2	J2410
3	Elbow, Street, 3/4", 90°, Sch 40	5	J2530
4	Valve, Globe, 3/4"	1	J2875
5	Nipple, 3/4" x 4, Sch 40	1	J2424
6	Valve, Solenoid, Body, 3/4, GP600	2	J6264
7	Nipple, 3/4" x 2, Sch 40	2	J2420
8	Tee, 3/4" x 3/4" x 3/4", Sch 40	1	J2485
9	Bushing, Reducing, 3/4" x 1/4, Sch 40	1	J2570
10	Coupling, 1/4 Comp x 1/4 MIP	1	J2772
11	Valve, Solenoid, Body, 3/4", 7/32"	1	D40597
12	Plug, 1/2, SQ HD, Black	1	J2617
	The following items are not included with pipe train assembly		
	Pressure Gauge	1	J5959
	Compression Fitting, 1/4" x 1/8"	1	J2771
	Tube to Pressure Gauge	1	D7150
	Orifice Pipe see page 54	1	

MODULATING VALVE PIPE TRAIN



REF #	DESCRIPTION	NOTES	¼"	½"	¾" (NG)	¾" (38")
	Mod-Valve pipe train, Complete		D3964	D4003	D4026	D4069
	Mod-Valve 38 & 44" pipe train complete		-----	-----	-----	D4069
1	Elbow, 90° MIPxFL		J2744	J2745	-----	-----
	Union, 3/4 MFL x 3/4 MIP		-----	-----	-----	J2842
2	Regulator	A	J6109	J6110	-----	J6112
	Globe Valve	B	-----	-----	J2875	-----
4	Nipple-long		J2412	J2409	J2427	D71281
5	Solenoid Valve Complete	A	J6020	J6255	J6260	J6260
	Coil Only	B	J6030	J6268	J6268	J6268
	Solenoid Body Only	A	J6025	J6254	J6264	J6264
	Diaphragm kit		J6002	J6001	J6000	J6000
6	Elbow, 90° street		J2517	J2520	J2520	J2520
	Elbow, 90° street, 3/4"	B	-----	-----	J2530	J2530
7	Nipple, 4"		-----	J2401	J2425	J2424
8	Elbow, 90°		-----	J2522	J2525	J2525
9	Nipple		J2411	J2402	J2420	J2420
10	Mod. Valve 90-210F		-----	J6140	J6144	J6144
	Mod. Valve 55-155F	C	J6143	J6143	-----	-----
11	Close Nipple	B	J2400	J2405	J2410	J2410
12	Tee		J2470	J2481	J2485	J2480
13	Reducing Bushing		J2569	J2569	J2569	J2569
14	Reducing Bushing		-----	-----	-----	J2569
15	Compression fitting 1/4 x 1/4"	D	J2772	J2772	J2772	J2772
16	Compression fitting 1/4 x 1/8"	D	J2771	J2771	J2771	J2771
17	Pressure gauge	D	J5959	J5959	J5959	J5959
	Pressure gauge for 1-1/4"		-----	-----	-----	-----
18	Tube to pressure gauge	D	D7150	D7150	D7150	D7150
19	Orifice pipe - See pg. 54	D				
20	Orifice - See pg. 54	D				
21	Mounting Bracket (Mod valve)	D	D7108	D7108	D7108	D7108
22	Thermometer Bracket	B & D	D7049	D7049	D7049	D7049
23	4" Stem thermometer (60-220)	B & D	J5845	J5845	J5845	J5845
24	Strainer		-----	-----	-----	-----
25	Plug, 3/4" Pipe		-----	-----	-----	-----
26	Eyebolt		-----	-----	------	------

MODULATING VALVE PIPE TRAIN - 1-1/4" – D4058



REF #	DESCRIPTION	QTY	COMP. #
1	Plug, 3/4, Pipe	1	J2620
2	Strainer, 1-1/4"	1	J6233
3	Nipple, 1.25 x Close	5	J2500
4	Valve, 1-1/4", Globe	1	J6266
5	Valve, Solenoid, Body	2	J6251
6	Valve, Mod, 1-1/4"	1	J6145
7	Tee, 1.25, Black	1	J2510
8	Bushing, 1-1/4 x 3/4"	2	J2580
9	Bushing, Reducing, 3/4 x 1/4", Sch 40	1	J2570
10	Gauge, Pres, 0-30, Liquid, 1/4"	1	J5967
11	Eyebolt, Pipe Train	1	D7116
12	Elbow, Street, 1.25, 90°	1	J2511

ORIFICES AND ORIFICE PIPE SPECIFICATIONS

HIGH TEMPERATURE

Axial Heater Size	ORIFICES												ORIFICE PIPE			
	Thermostat/Humidistat or High side of High-Low				LOW SIDE OF HIGH-LOW				Modulating Valve				Thermostat/Humidistat High side of High-Low		Modulating Valve	
	Propane		Natural Gas		Propane		Natural Gas		Propane		Natural Gas		Propane	Natural Gas	Propane	Natural Gas
	Size	Comp#	Size	Comp#	Size	Comp#	Size	Comp#	Size	Comp#	Size	Comp#	Comp#	Comp#	Comp#	Comp#
18"	1/8"	D7109	15/64"	D7111	1/8"	D7136	11/64"	D7133	1/8"	D7136	15/64"	D7135	D71220	D71220	D71220	D71220
24"	11/64"	D7125	23/64"	D7113	1/8"	D7136	19/64"	D7112	11/64"	D7133	23/64"	D7113	D71220	D71220	D71220	D71220
26"	11/64"	D7125	23/64"	D7113	1/8"	D7136	19/64"	D7112	11/64"	D7133	23/64"	D7113	D71220	D71220	D71220	D71220
28"	13/64"	D7110	23/64"	D7113	11/64"	D7133	19/64"	D7112	13/64"	D7134	23/64"	D7113	D7119	D7119	D7119	D7119
38"	19/64"	D7112	23/64"	D7113	15/64"	D7135	19/64"	D7112	19/64"	D7137	23/64"	D7113	D71190	D71190	D71190	D71190
44"	23/64"	D7113	23/64"	D7113	19/64"	D7112	19/64"	D7112	23/64"	D7113	23/64"	D7113	D7129	D7129	D7129	D7129

NOTE: October 1992 and LATER - The lowside orifice is drilled into the lowside solenoid valve of the 1/2" of the High-Low pipe train.

LOW TEMPERATURE

Axial Heater Size	ORIFICES								ORIFICE PIPE	
	Thermostat/Humidistat				Modulating Valve				Thermostat/ Humidstat	Modulating Valve
	Propane		Natural Gas		Propane		Natural Gas			
	Size	Comp#	Size	Comp#	Size	Comp#	Size	Comp#	Comp#	Comp#
18"	1/8"	D7109	15/64"	D7111	1/8"	D7136	15/64"	D7135	D71220	D71220
24"	1/8"	D7109	15/64"	D7111	1/8"	D7136	15/64"	D7135	D71220	D71220
26"	1/8"	D7109	15/64"	D7111	1/8"	D7136	15/64"	D7135	D71220	D71220
28"	1/8"	D7109	15/64"	D7111	1/8"	D7136	15/64"	D7135	D7119	D7119

SUPER LOW TEMPERATURE

Axial Heater Size	ORIFICES								ORIFICE PIPE	
	Thermostat/Humidistat				Modulating Valve				Thermostat/ Humidstat	Modulating Valve
	Propane		Natural Gas		Propane		Natural Gas			
	Size	Comp#	Size	Comp#	Size	Comp#	Size	Comp#	Comp#	Comp#
18"	3/32"	D7139	1/8"	D7109	3/32"	D7138	1/8"	D7136	D71220	D71220
24"	1/8"	D7109	15/64"	D7111	1/8"	D7136	15/64"	D7135	D71220	D71220
26"	1/8"	D7109	15/64"	D7111	1/8"	D7136	15/64"	D7135	D71220	D71220
28"	1/8"	D7109	15/64"	D7111	1/8"	D7136	15/64"	D7135	D71220	D71220

OLDER VANE AXIAL HEATERS

1980-82 SINGLE RELAY CIRCUIT

J3880 Dayton relay 5X838 (F77-9)
J3881 Dayton square socket (H80-4)
J5590 Time delay reset ETA (H78-43)
J5681 Flame probe (normally open) (H80-47)
D4437 Complete wire kit (wires only)
J5745 Igniter #151D (H80-49)
J5620 Amperite purge tube (H80-2)
J3884 Amperite socket, 8 pin (H80-3)
J5595* Purge relay 1983 (black box)
D4008* Vapor high limit (H78-46)
J5710 Transformer (H78-48)
J5772* Burner hi-limit w/reset (H78-44)
J5810 Bin high limit, only

1983-85 DUAL RELAY (FLAME PROBE)

J3880 Dayton relay 5X838 (2 required)
J3881 Dayton square socket (2 required)
J5590 Time delay reset ETA
J5681 Flame probe (normally open)
J5745 Igniter #151D
J5595 Purge relay 1983 (black box)
D4008* Vapor high limit
J5710 Transformer
J5772* Burner high limit w/reset
J5810 Bin high limit
D4437 Complete wire kit - Reg. thermostat
D4438 Complete wire kit – Hi-Low thermostat
D40102 Ignition wire harness (flame probe)
D70431 26" Spark plug wire w/term
D70452 20.5" Flame sensor wire w/term
D70463 20.5" Flame sensor wire w/spade

1984-89 FENWALL (Alternate on Axial)

J5720 Fenwall board
J5721 Relay switch
J5595 Purge relay 1983 (black box)
J5772* Burner high limit w/reset
J5739 #64 Spark plug - 24" heater
J5741 Ignitor spark plug Abrn - 28" heater
J5747* Flame sensor
J5748* Flame sensor compression set
J5810 Bin high limit only
D4435 Complete wire kit - Reg. thermostat
D4436 Complete wire kit – Hi-Low thermostat
D4439 Complete wire kit - Reg. thermostat
D4440 Complete wire kit – Hi-Low thermostat
D40103 Ignition wire harness, Fenwall
D70432 26" Spark plug wire (red) w/term
D70453 25" Flame probe wire (red) w/term
D70464 25" & 11.5" ground wire (green) w/term
J5721 Relay Switch for Fenwall Board
J0155 Bushing, 9/16, Dravo

*Not identical, but suitable replacement

1985 SUKUP SOLID STATE IGNITION

D3948* Sukup ignition board w/holder
J5745 Igniter #151D (short)
D4008* Vapor high limit
J5710 Transformer
J5772* Burner high limit w/reset
J5810 Bin high limit only
D4010 Ignition wire harness, solid state
D7043 20" Spark plug wire w/term
D7045 20" Flame sensor wire (red)
D7046 17" & 11.5" ground wire (green)

1986+ SUKUP IGNITION BOARD

D3948 Sukup ignition board w/holder
D4054 Flame sensor (18")
J5747 Flame sensor (24", 28")
J5748 Flame sensor compress set
J5739 #64 Spark plug
D4008* Vapor high limit
J5710 Transformer
J5772* Burner high limit w/reset
D3990 Bin wall high limit
D39901 Transition high limit
J5772* High limit w/reset only

Kits for Vane Axial Heaters

Solid State Conversion Kit: Flame probe to solid state (Board, flame sensor, fuse, spark plug)

D3975 for 18"
D3974 for 24"-28"

TO CONVERT FENWALL USE CONV. KIT # PLUS D4400 (TRANSFORMER)

Flame Sensor Update Kit: Converts pre-1986 & before old style sensor [igniter] to new style:

D4053 For 18"
D4051 For 24"-28"

D3965 Hi-Lo Thermostat Replacement Kit (Hi/Lo/Off)
D3950 Flame Probe Replacement Kit (from N/C(1978-79) to N/O)
D3979A Air Switch Kit
D4009 Vaporizer Kit - 18"
D4005 " " - 24", 28"
D4066 " " - 38"
D40661 " " - 44"
D4424 Spark Plug Kit (replaces igniter)
J5739 #64 Spark plug
D7054 1/2" threaded collar
D3954 Purge Update Kit (from glass tube to black box)

Control box w/all electrical components:

D4550 L-T (liq) " "
D4552 L-M (liq) " "
D4555 L-HL (liq) " "
D4560 V-T " "
D4562 V-M " "
D4565 V-HL " "
D4580 N-T " "
D4582 N-M " "
D4585 N-HL " "
D4587 LT-T (low temp) " "

KITS & ACCESSORIES FOR CURRENT HEATERS

Burner Controls

Description		Comp#
Deluxe Single	w/Hi-Lo Thermostat	D4040
	w/Humidistat	D4042
	w/Reg Thermostat	D40451
	w/Humidistat/Thermostat	D40471
Deluxe Dual	w/Thermostat	D39691
	w/Hi-Lo Thermostat	D3970
Standard Dual	w/Reg Thermostat	D4480A
	w/Hi-Lo Thermostat	D4479

Vaporizers

Description	Comp#
For Vane Axial Heaters:	
18"	D4009
24-28" - galvanized housing	D4005
24-28" - painted housing	D40051
38"	D4066
44"	D40661
Vapor pipe train 18"-28"	D4000
Vapor pipe train 38" & 44"	D40001
Liquid pipe train ¼"	D4006
Liquid pipe train ½"	D40061
Vapor hi-limit w/reset	D4037
Spring, pawl	J2360
Liquid Solenoid Coil w/wires:	
18"-28"	D4408
38" & 44"	D4409

Contact Information

Owner's manuals are available from Sukup and additional copies can be requested at the address, phone number, or e-mail address shown below. **Please indicate manual number L1400 when requesting the Axial Fans & Heaters, and Chicago 26" Heater Owner's Installation and Operation Manual.**

Sukup Dealer Information

Dealer Name:

Address:

Cell phone:

Office phone:

Fax:

In Case of Emergency

Have emergency numbers and written directions to your location near a phone, and arrange and practice a safety plan.

Doctor: _____

Emergency Medical Squad: _____

Ambulance Service: _____

Hospital: _____

Fire Department: _____

Written Directions to Your Location: _____

Sukup Manufacturing Company
1555 255th Street, Box 677
Sheffield, Iowa, USA 50475-0677
Phone: 641-892-4222 **Fax: 641-892-4629**
Website: www.sukup.com **Email: info@sukup.com**