FAN AND HEATER INFORMATION BOOKLET

97/01

SAFETY

1. CHECK TO INSURE THAT ALL EQUIPMENT IS PROPERLY WIRED AND GROUNDED.
2. LOCK OUT ALL POWER BEFORE SERVICING ANY EQUIPMENT.
3. SHUT OFF AND BLEED GAS PRESSURE BEFORE SERVICING GAS COMPONENTS.
4. NEVER OPERATE HEATER UNIT WITH INSPECTION DOOR OPEN.
5. INSURE HEATER UNIT IS ELECTRICALLY INTERLOCKED WITH FAN.
6. KEEP ALL GUARDS AND SCREENS IN PLACE.
7. INSURE THAT ALL DECALS ARE IN PLACE AND IN LEGIBLE CONDITION.
8. CAREFULLY READ OPERATORS MANUAL BEFORE OPERATING OR SERVICING ANY HEATER UNIT.

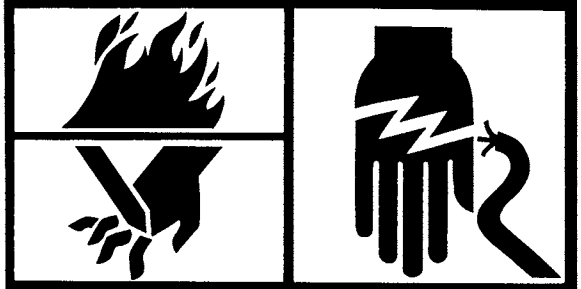
⚠ WARNING

HEATER MUST BE ELECTRICALLY INTERLOCKED WITH FAN. THIS WILL PREVENT HEATER FROM OPERATING WHEN FAN IS TURNED OFF.

NEVER OPERATE HEATER WITHOUT AIR FLOW.

L0319-90 Sukup Mfg. Co., Sheffield, Iowa 50475

⚠ WARNING



DISCONNECT ELECTRICITY AND BLEED GAS LINES BEFORE INSPECTING OR SERVICING.

KEEP ALL GUARDS AND SCREENS IN PLACE.

NEVER RUN FAN OR HEATER WITH INSPECTION DOOR OPEN.

BEFORE OPERATING:

- CAREFULLY REVIEW OPERATORS MANUAL.
- CLEAN UNDER FLOOR, AS FINES MAY CAUSE A BIN FIRE.
- CHECK FOR GAS LEAKS.

FAILURE TO HEED THESE WARNINGS MAY CAUSE SERIOUS INJURY OR DEATH.

L0165

HEATER ELEMENTS

CENTRIFUGAL - Fin type heater element
High Temperature - 50-200 degree heat rise

Low Temperature - 25-75 degree heat rise

Super Low Temperature - 10-30 degree heat rise

AXIAL - Starfire type heater element
High Temperature - 50-200 degree heat rise
3/8" holes in port cup

Low Temperature - 25-75 degree heat rise
1/4" holes in port cup

Super Low Temperature - 10-30 degree heat rise
uses centrifugal heater element

ELECTRIC HEATER - 2-20 degree heat rise

TYPES OF HEATER CONTROL

THERMOSTAT CONTROL - cycles heater on and off according to the temperature in the plenum area.

HUMIDISTAT CONTROL - cycles heater on and off according to the humidity in the plenum area.

HI-LO CONTROL - A control used to cycle a heater between a high flame and a low flame to maintain a nearly constant temperature in the plenum area. A dual stage thermostat will cycle heater completely off if low flame temperature exceeds set point. Pipe train w/bypass line used up to Oct. 1992. Pipe train w/orifice hole in solenoid valve used from Oct. 1992 until present.

MODULATING VALVE CONTROL - A control used to constantly adjust gas pressure to maintain a constant temperature in the plenum area.

HEATER COMPONENTS

TOGGLE SWITCH (TS) - An electrical switch that is used to disconnect power to the heater.

AIR SWITCH (AS) - A normally open switch that detect the flow of air through the heater housing.

VAPOR HIGH LIMIT (VHL) - A normally closed switch that senses the temperature of the vapor propane. This high limit switch is physically attached to the gas pipe train.

HEATER HIGH LIMIT (HL) - A normally closed switch used to shut the heater off due to high temperature in the heater housing.

TRANSITION HIGH LIMIT (THL) - A normally closed switch used to shut the heater off due to high temperature in the transition area.

THERMOSTAT (THR) - A device that automatically responds to temperature changes and activates a switch to control the heater.

HUMIDISTAT (HU) - A device that automatically responds to humidity changes and activates a switch to control the heater.

TRANSFORMER (TFMR) - A device that increases voltage to produce a spark for the ignition of the air-fuel mixture.

SPARK PLUG - A device used to provide a high voltage spark for the purpose of igniting the fuel.

SOLENOID VALVE - An electrically operated valve used to start and stop gas flow to the heater element.

REMOTE FLAME SENSOR (RFS) - An electrical device used in conjunction with a solid state control board to provide proof of flame.

FUEL SOURCES

PROPANE

Propane is stored in liquid form under pressure and must be evaporated or vaporized before combustion can take place.

1. Vapor withdrawal from tank
    A. Propane tank acts as a vaporizer
    B. Vapor propane is taken from the top of the tank
    C. Evaporation rate of the tank depends on:
        1. Outside temperature
            a. Primary factor in rate of vaporization
            b. As outside temp. decrease, vaporization rates decrease, vapor demand increases.
        2. Sunshine
        3. Wind
        4. Size and shape of tank
        5. Amount of fuel in tank
    D. When vapor is consumed faster than it is vaporized a refrigeration process takes place. It forms ice on the tank and gas lines which acts as an insulator further reducing vaporization.

2. Liquid withdrawal from tank.
    A. External Vaporizer
        1. Liquid propane is heated in a boiler that is separate from the crop dryer.
        2. Vapor propane from the vaporizer is then supplied to the crop dryer.

    B. Internal Vaporizer
        1. Liquid propane is heated in coiled tube or pipe that is placed in front of the heater element.
        2. This vaporizer must be adjusted to obtain the proper vapor temperature.
            a. <u>Vaporizer too cold</u> - frost develops on pipe train.
            b. <u>Vaporizer too hot</u> - damage occurs to rubber and plastic components in pipe train.
        3. A <u>Vapor High Limit Switch</u> is used to shut solenoid valves in the event of high vapor temperature. Vapor high limits with both auto and manual reset have been used.
        4. Vaporizer coils should be checked annually and replaced every 5 years for Sukup and every 2 years for Chicago burners.

NATURAL GAS

1. Gas company regulator should deliver 15 psi under flow to obtain maximum heat output.
2. Regulator not included with heater. Customer must provide valve to regulate gas flow.
3. Heaters using natural gas have larger orifices than propane units.

ORFICE CHART					
HIGH-LOW ORFICE VALVE COLORS					
1/8	White				
11/64	Red				
13/64	Orange				
15/64	Green				
19/64	Black				
	STANDARD ORFICE			**HI-LO "LOW" ORFICE**	
FAN	LP	NAT GAS		LP	NAT GAS
V18	1/8	15/64		####	####
V24	11/64	23/64		1\8	19/64
V26	11/64	23/64		1/8	19/64
V28	13/64	23/64		11/64	19/64
V38	19/64	23/64		15/64	19/64
V44	23/64	23/64		19/64	19/64
VL18	1/8	15/64		####	####
VL24	1/8	15/64		####	####
VL26	1/8	15/64		####	####
VL28	1/8	15/64		####	####
VS18	3/32	1/8		####	####
VS24	1/8	15/64		####	####
VS26	1/8	15/64		####	####
VS28	1/8	15/64		####	####
D10	13/64	23/64		11/64	19/64
D20	15/64	23/64		13/64	19/64
D40	13/64*	23/64*		15/64	19/64
DL10	1/8	15/64		####	####
DL20	1/8	15/64		####	####
DL40	1/8*	15/64*		####	####
DS10	1/8	11/64		####	####
DS20	1/8	11/64		####	####
DS40	1/8*	11/64*		####	####
* - Has two orfices					

MAINTENANCE CHECKS

1. Check for rodent damage to wiring.

2. Check for rodent or hornet nests in axial heater port cup or primary air intake.

3. Check spark plug or ignitor for proper gap (approx. 1/8").

4. Inspect flame sensor or flame probe to ensure that they are in good physical condition.

5. Inspect vaporizer coil (liquid propane models only) annually and replace coil every 5 years for Sukup, every 2 years for Chicago.

6. Check burner element on propane units for the presence of a dark oily residue. Residue comes from:
   A. Operating with vapor temperature too hot.
   B. Withdrawing liquid from a tank that has residue on the bottom.
   C. Using contaminated tank (anhydrous ammonia tank)without proper cleaning.

7. Clean solenoid valve bodies.
   IMPORTANT: Bleed gas pressure from all gas lines before disassembling solenoid valves.

8. Clean liquid strainer on liquid propane units. (do not overtighten cast fitting)

9. Check transition high limit, thermostat, and heater power cord for cuts, frayed wires, and weather checking.

10. Check for gas leaks with a soapy water solution.

11. Check fan wheels for any dirt build up that could cause vibration.

12. Check fan screen for damage or loose wires.

SUKUP HEATER HISTORY

1978-1980

No relay
Flame probe (N/C) (Type L)
No purge relay
Air switch standard on all units
Champion W95D spark plug
Vapor high limit w/auto reset
Ignition transformer

1981-1982

Single relay
Flame probe (N/O) (Type F)
Amperite purge tube
Champion W95D spark plug
Vapor high limit w/auto reset
Ignition transformer

1983-1985

Dual relay
Flame probe (N/O) (Type F)
ETA purge relay
Champion W95D spark plug or ignitor
Vapor high limit w/auto reset
Ignition transformer

1984-1989

Fenwal ignition board (alternate on axial heaters)
ETA purge relay
Autolite spark plug on 24" heaters
Auburn spark plug on 28" heaters
Vapor high limit w/auto reset
No ignition transformer

1985

Sukup SS ignition board (w/continuous spark)
Short flame sensor
Ignitor
Vapor high limit w/auto reset
Ignition transformer

1986-Present

Sukup SS ignition board (w/momentary spark)
Long flame sensor
Autolite spark plug
Vapor high limit w/manual reset
Ignition transformer

Sukup®

HEATER TROUBLESHOOTING GUIDE

AXIAL
OR
DOWNSTREAM
HEATER

SOLID STATE
1994 & NEWER

TROUBLESHOOTING PROCEDURE

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

1. Start fan and heater: After a delay of approx. 20 seconds the red light should come on, spark should be present at spark plug, and gas pressure should register on the pressure gauge.

RED OPERATING LIGHT IS OFF:

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

3. Check power supply: Connect lead to wire #1 (power) at the toggle switch. If meter does not show voltage, check both fan and heater fuses. If fuses are good, check for proper wiring in fan control.

4. Check on/off toggle switch: Connect lead to wire #4 (for liquid propane units) or wire #5 (for vapor propane or natural gas units). Turn on toggle switch. If meter does not show voltage, replace toggle switch.

5. Check vapor high limit (liquid propane units only): Connect lead to wire #5 at the vapor high limit. Be sure vapor high limit is reset. If no voltage, replace vapor high limit.

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

7. Check transition high limit: Connect lead to wire #7 at terminal block. Be sure transition high limit is reset. If no voltage, replace transition high limit.

8. Check thermostat: Connect lead to wire #8 at terminal #8 of the ignition board. If no voltage, adjust thermostat to higher setting. If still no voltage, replace thermostat.

LIGHT IS ON, BUT NO SPARK

9. Check power to ignition transformer: Connect lead to wire #9 on ignition board. Cycle unit on, after purge delay time is complete, power should be present at terminal #9 for approximately 7 seconds. If no power, replace ignition board.

CAUTION: Shut off fuel supply, bleed all lines, and run fan several minutes to purge gas from area, before doing steps #10 and #11.
WARNING: HIGH VOLTAGE!!

10. If ignition transformer has power, but still no spark at spark plug. Disconnect ignition wire from spark plug. Carefully using insulated pliers, hold ignition wire on the insulation. Energize unit after purge time try to get an arc to jump between wire and heater element. If arc is obtained, replace spark plug.

11. If arc was not obtained in step #10, disconnect ignition wire from transformer. Use a well insulated screwdriver and ground it to the bottom of the control box. Then lean the shaft of the screwdriver toward the high voltage stud of the transformer. A bright blue arc should be established at not less than an 1/8" gap. If an arc is obtained, replace the ignition wire. If no arc is obtained, replace the ignition transformer.

SPARK IS PRESENT BUT NO IGNITION

12. Check power to the gas solenoids. Connect voltmeter lead to terminal #10 on the terminal block. Cycle unit on, after purge delay time is complete power should be present at terminal #10. If no power, replace ignition board.

13. Check solenoid valves. Remove screw from top of valve coil. Lift coil off of the solenoid body. Insert a screwdriver into the hole in the bottom of the coil. Energize the unit, after the purge cycle the solenoid coil should "grab" the screwdriver magnetically. If coil fails to "grab" screwdriver, check electrical connections or replace coil.
CAUTION: DAMAGE CAN OCCUR TO SOLENOID COILS IF THEY ARE ALLOWED TO BE ENERGIZED FOR AN EXTENDED PERIOD OF TIME WITHOUT BEING ATTACHED TO THE SOLENOID BODY.

HEATER IGNITES, BUT LOCKS OUT IN 10 SECONDS

14. Look for cracked porcelain on the flame sensing rod. If cracked, replace flame sensor.

15. Check flame sensor wire for grounding or a weak connection.

16. Check burner ground for poor connection.

SUKUP IGNITION BOARD

SOLID STATE

SUKUP MFG. CO.
SHEFFIELD, IA. 50475

AXIAL &
CENTRIFUGAL
HEATER

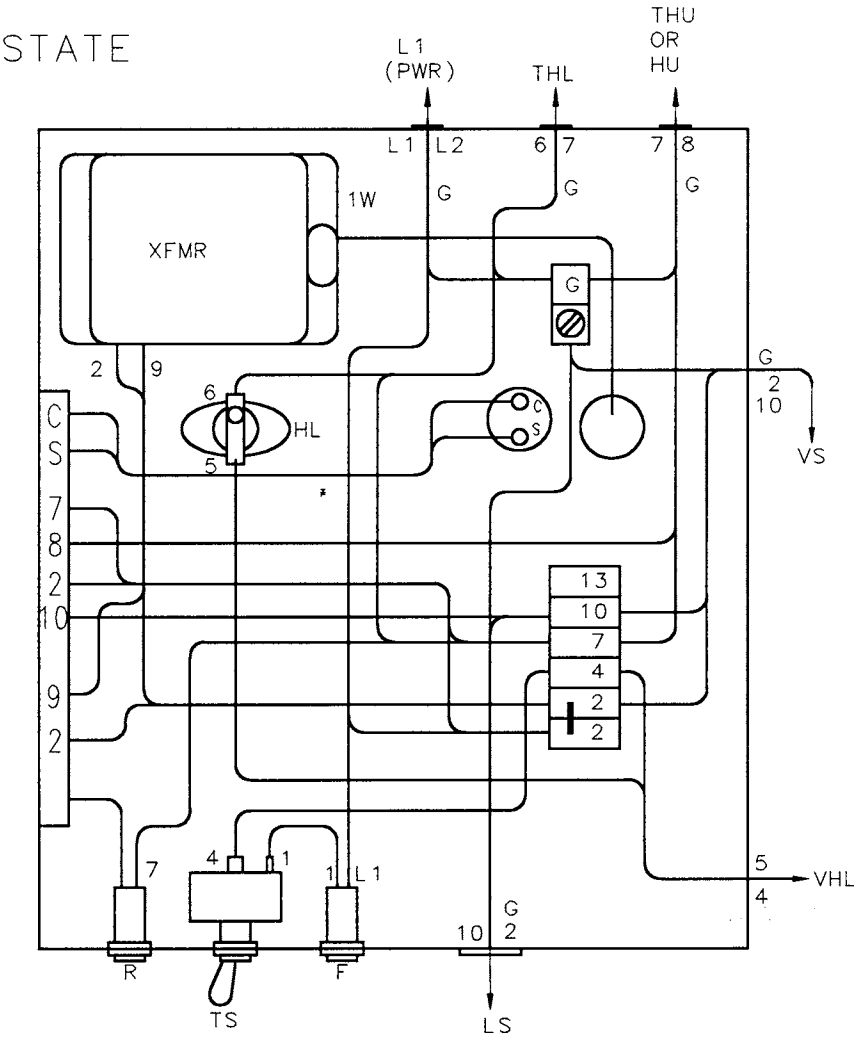
THERMOSTAT
OR
HUMIDISTAT
OR
MODULATING
VALVE

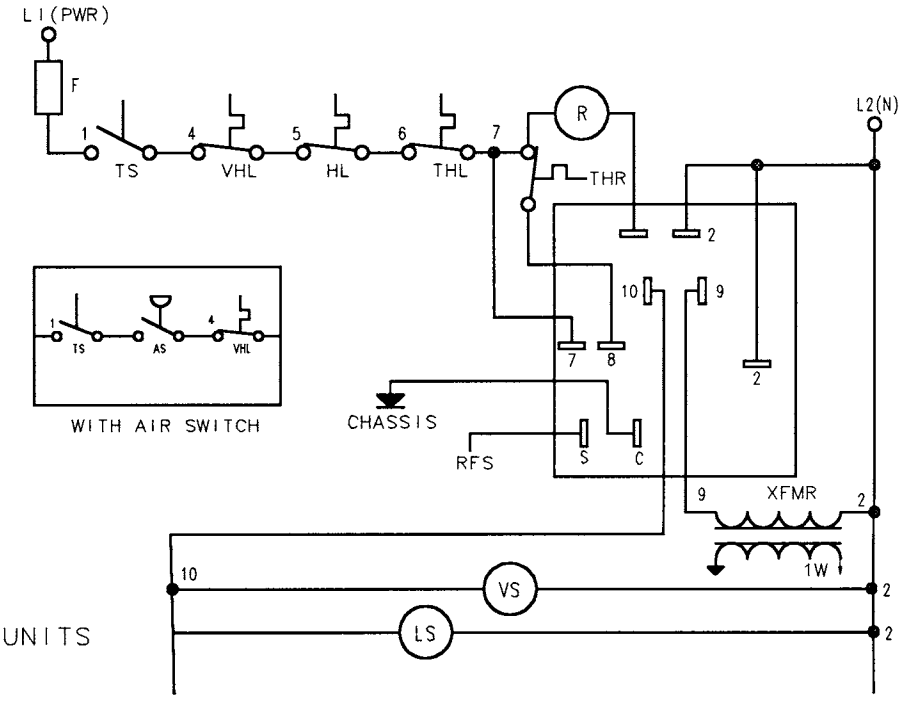
LIQUID
LP
ONLY

115 V

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

L0463 950113JB





WITH AIR SWITCH

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

THR* NOT USED ON MODULATING VALVE UNITS
THL NOT USED ON LOW TEMP SERIES

SUKUP IGNITION BOARD

SOLID STATE

Sukup

SUKUP MFG. CO.
SHEFFIELD, IA. 50475

AXIAL &
CENTRIFUGAL
HEATER

HI-LO

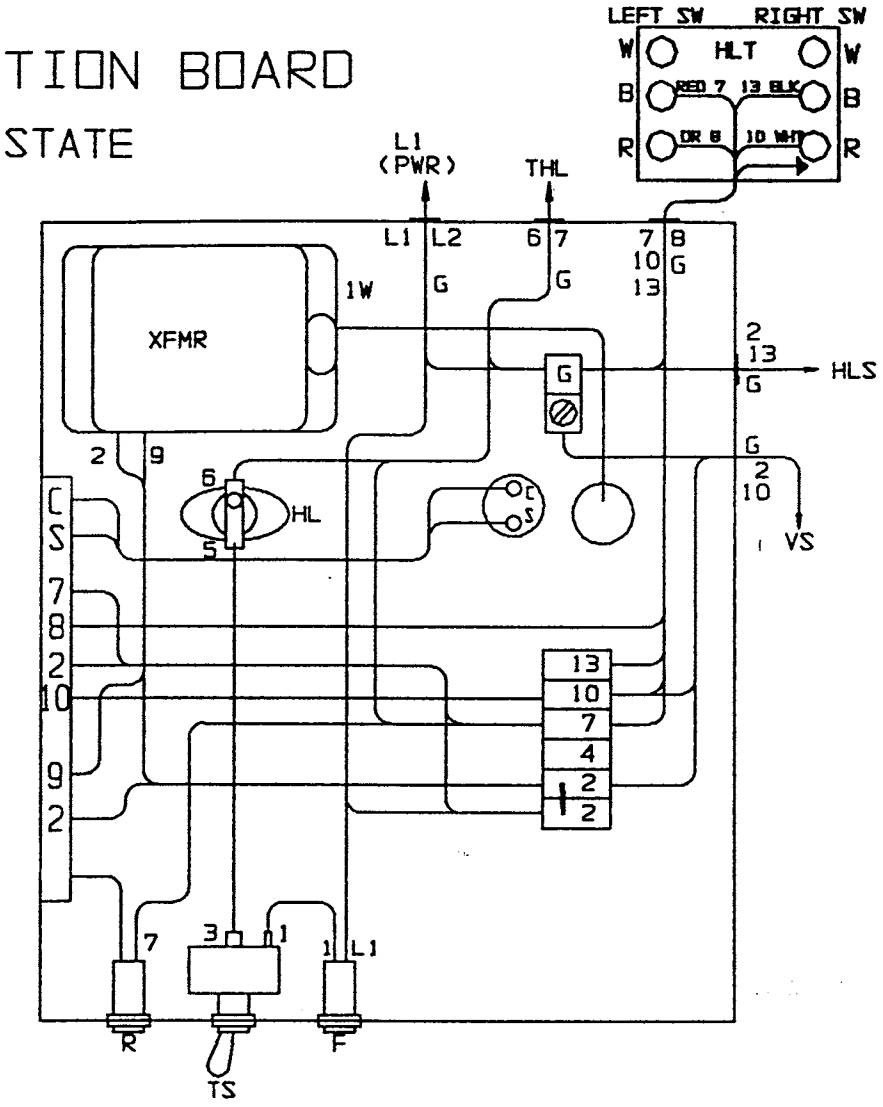
VAPOR &
NATURAL
GAS

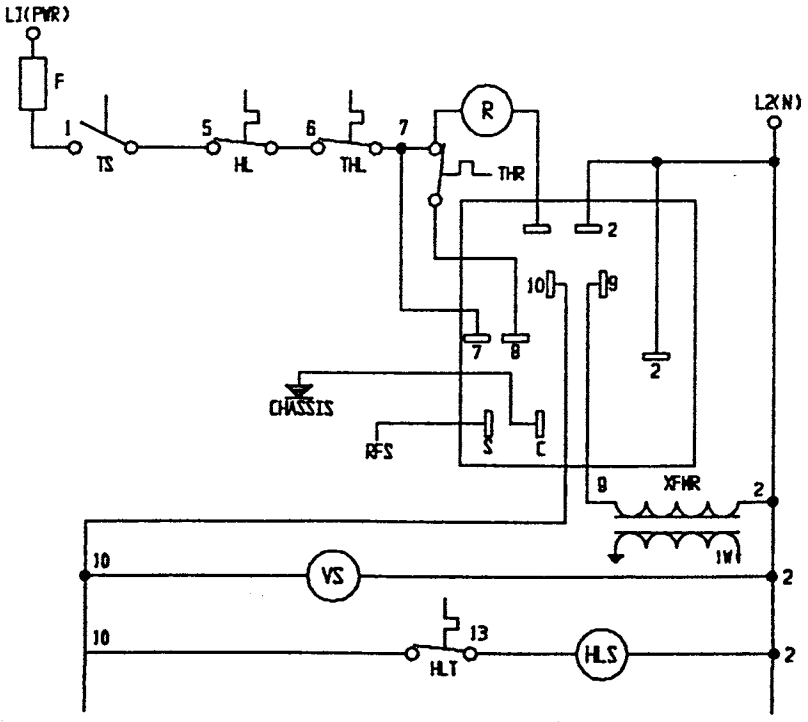
115 V

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

L0465 930309JB

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





Sukup
SUKUP MFG. CO.
SHEFFIELD. IA. 50475

SUKUP IGNITION BOARD
SOLID STATE

30. 40. & 50 HP

CENTRIFUGAL HEATER

HI-LO

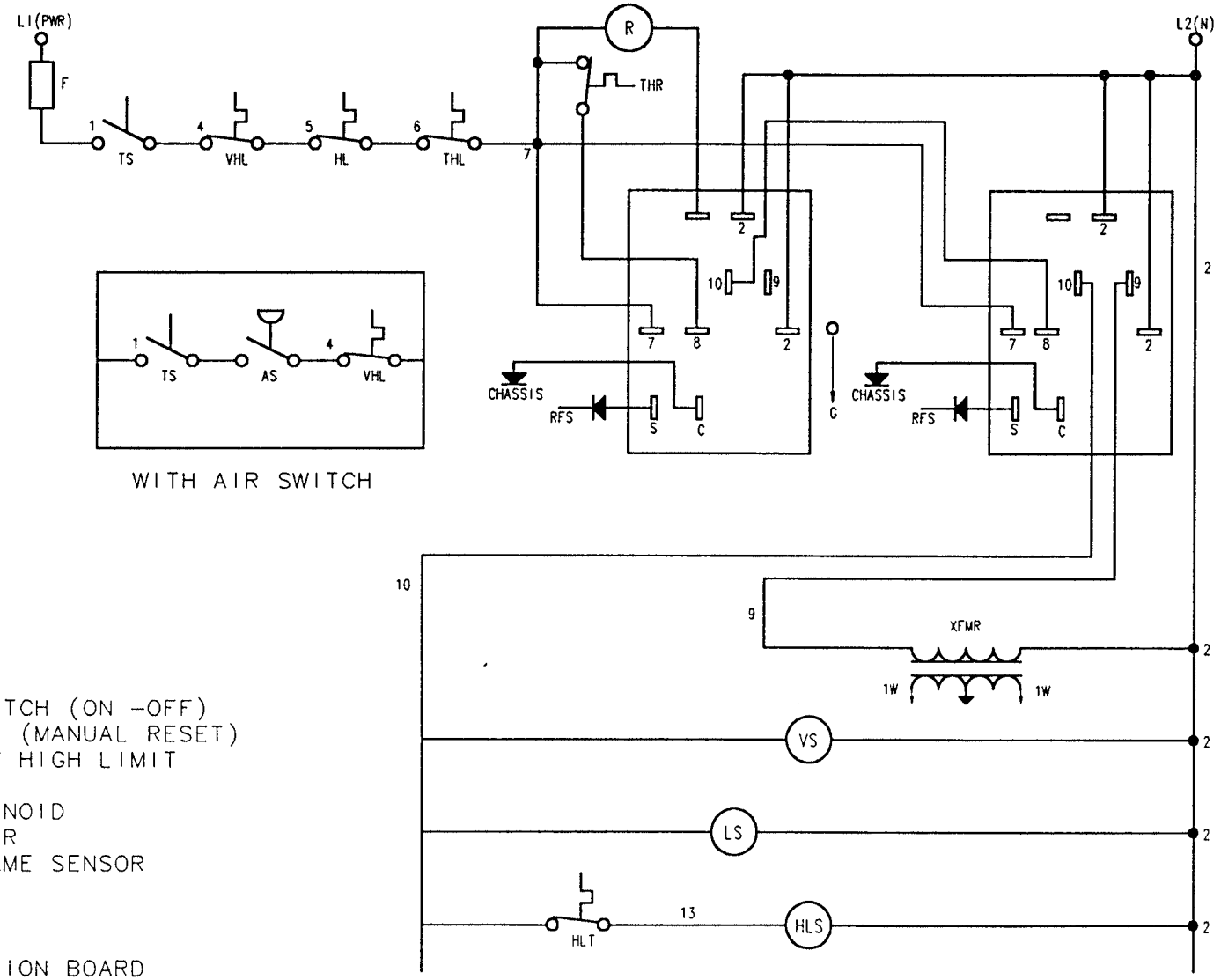
LIQUID LP ONLY

115 V

MODEL NO.S

D30. 40. 50L-HL

L0460 950113JB



WITH AIR SWITCH

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

Sukup

SUKUP MFG. CO.
SHEFFIELD. IA. 50475

SUKUP IGNITION BOARD
SOLID STATE
WITH OPTIONAL AIR SWITCH

30. 40. & 50 HP

CENTRIFUGAL HEATER

THERMOSTAT OR HUMIDISTAT OR MODULATING VALVE

LIQUID LP ONLY

115 V

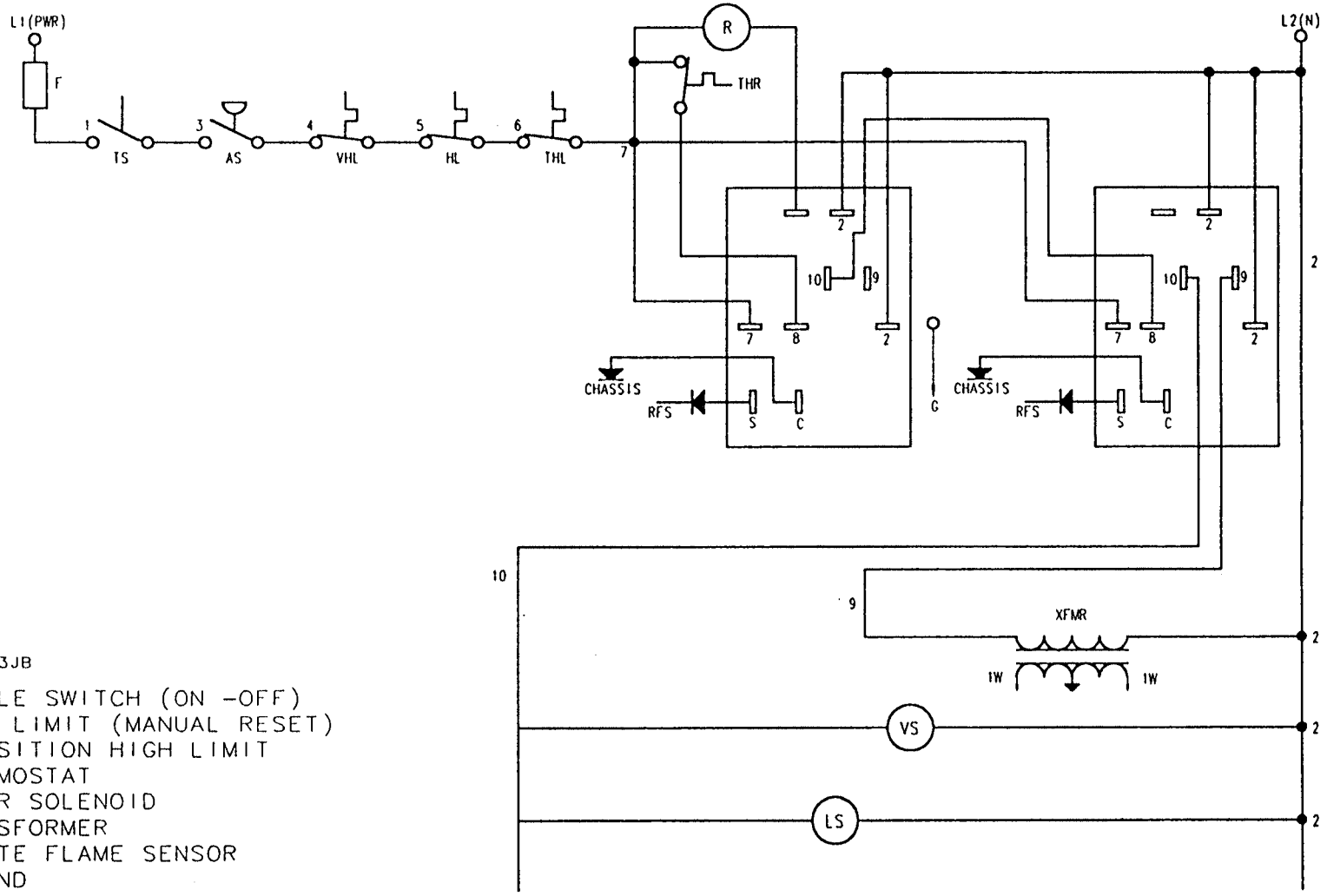
MODEL NO.S

D30. 40. 50L-T

D30. 40. 50L-H

D30. 40. 50L-M

L04611 931203JB



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

THR * NOT USED ON MODULATING VALVE UNITS

AXIAL
OR
DOWNSTREAM
HEATER

SOLID STATE
1985 TO 1993

TROUBLESHOOTING PROCEDURE

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

1. Start fan and heater: After a delay of approx. 20 seconds the red light should come on, spark should be present at spark plug, and gas pressure should register on the pressure gauge.

RED OPERATING LIGHT IS OFF:

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

3. Check power supply: Connect lead to wire #1 (power) at the toggle switch. If meter does not show voltage, check both fan and heater fuses. If fuses are good, check for proper wiring in fan control.

4. Check on/off toggle switch: Connect lead to wire #5. Turn on toggle switch. If meter does not show voltage, replace toggle switch.

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

6. Check bin high limit: Connect lead to wire #7 at terminal block. Be sure bin high limit is reset. If no voltage, replace bin high limit.

7. Check thermostat: Connect lead to wire #8 at terminal #8 of the ignition board. If no voltage, adjust thermostat to higher setting. If still no voltage, replace thermostat.

LIGHT IS ON, BUT NO SPARK

8. Check power to ignition transformer: Connect lead to wire #9 on ignition board. Cycle unit on, after purge delay time is complete, power should be present at terminal #9 for approximately 7 seconds. If no power, replace ignition board.

CAUTION: Shut off fuel supply, bleed all lines, and run fan several minutes to purge gas from area, before doing steps #9 and #10.
WARNING: HIGH VOLTAGE!!

9. If ignition transformer has power, but still no spark at spark plug. Disconnect ignition wire from spark plug. Carefully using insulated pliers, hold ignition wire on the insulation. Energize unit after purge time try to get an arc to jump between wire and heater element. If arc is obtained, replace spark plug.

10. If arc was not obtained in step #10, disconnect ignition wire from transformer. Use a well insulated screwdriver and ground it to the bottom of the control box. Then lean the shaft of the screwdriver toward the high voltage stud of the transformer. A bright blue arc should be established at not less than an 1/8" gap. If an arc is obtained, replace the ignition wire. If no arc is obtained, replace the ignition transformer.

SPARK IS PRESENT BUT NO IGNITION

11. Check power to the gas solenoids. Connect voltmeter lead to terminal #10 on the terminal block. Cycle unit on, after purge delay time is complete power should be present at terminal #10. If no power, replace ignition board.

12. For liquid propane units with vaporizer, check vapor high limit. Connect meter lead to neutral as in step #2. Connect other meter lead to wire #12 on the terminal block. If meter **DOES** show voltage, replace vapor high limit if it does not have a reset button. If vapor high limit has a reset button, depress button and check again. If voltage is still present, replace vapor high limit.

13. Check solenoid valves: Remove screw from top of valve coil. Lift coil off of the solenoid body. Insert a screwdriver into the hole in the bottom of the coil. Energize the unit, after the purge cycle the solenoid coil should "grab" the screwdriver magnetically. If coil fails to "grab" screwdriver, check electrical connections or replace coil.
CAUTION: DAMAGE CAN OCCUR TO SOLENOID COILS IF THEY ARE ALLOWED TO BE ENERGIZED FOR AN EXTENDED PERIOD OF TIME WITHOUT BEING ATTACHED TO THE SOLENOID BODY.

HEATER IGNITES, BUT LOCKS OUT IN 10 SECONDS

14. Look for cracked porcelain on the flame sensing rod. If cracked, replace flame sensor.

15. Check flame sensor wire for grounding or a weak connection.

16. Check burner ground for poor connection.

SUKUP MANUFACTURING COMPANY
SHEFFIELD, IOWA, USA 50475

AXIAL & DOWNSTREAM HEATER

THERMOSTAT OR MODULATING VALVE OR HUMIDISTAT

LIQUID LP ONLY

115 V

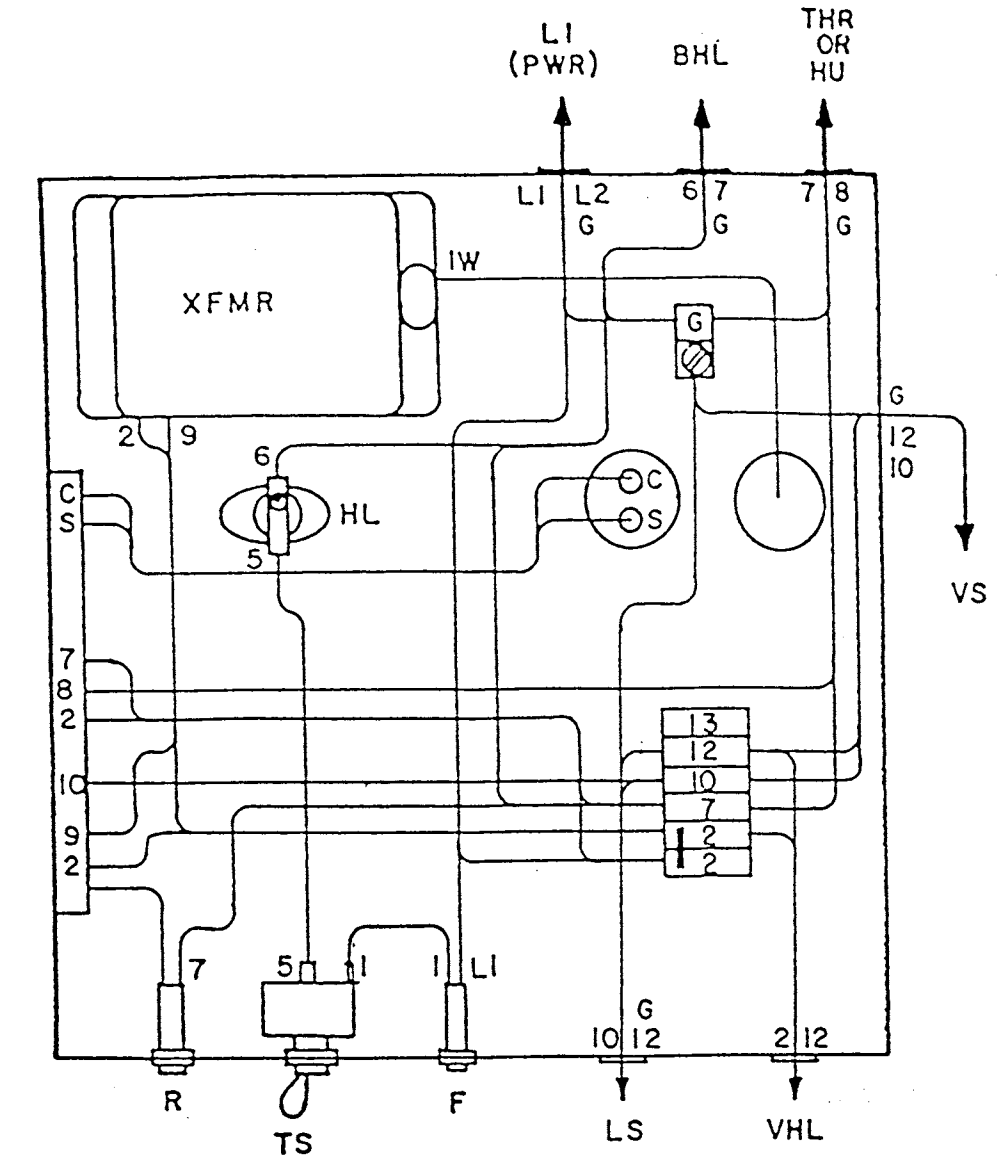
MODEL NOS

DIO OR 20L-T
DIO OR 20L-H
DIO OR 20L-M
DLTIO OR 20L-T
DLTIO OR 20L-H
DLTIO OR 20L-M
VI8,24,OR 28L-T
VI8,24,OR 28L-H
VI8,24,OR 28L-M
VLTI8,24,OR 28L-T
VLTI8,24,OR 28L-H
VLTI8,24,OR 28L-M

508280069 870907MS

TS	TOGGLE SWITCH
HL	HIGH LIMIT (MANUAL RESET)
BHL	BIN HIGH LIMIT
VS	VAPOR SOLENOID VALVE
LS	LIQUID SOLENOID VALVE
THR*	THERMOSTAT OR HUMIDISTAT
XFMR	TRANSFORMER
VHL	VAPOR HIGH LIMIT
RFS	REMOTE FLAME SENSOR
F	FUSE
G	GROUND
R	RED LIGHT
SIBI	SUKUP IGNITION BOARD

THR* NOT USED ON MODULATING VALVE UNITS



SUKUP IGNITION BOARD

Solid State

SUKUP MANUFACTURING COMPANY
SHEFFIELD, IOWA, USA 50475

AXIAL &

DOWNSTREAM

HEATER

HI-LO

115 V

LIQUID

LP

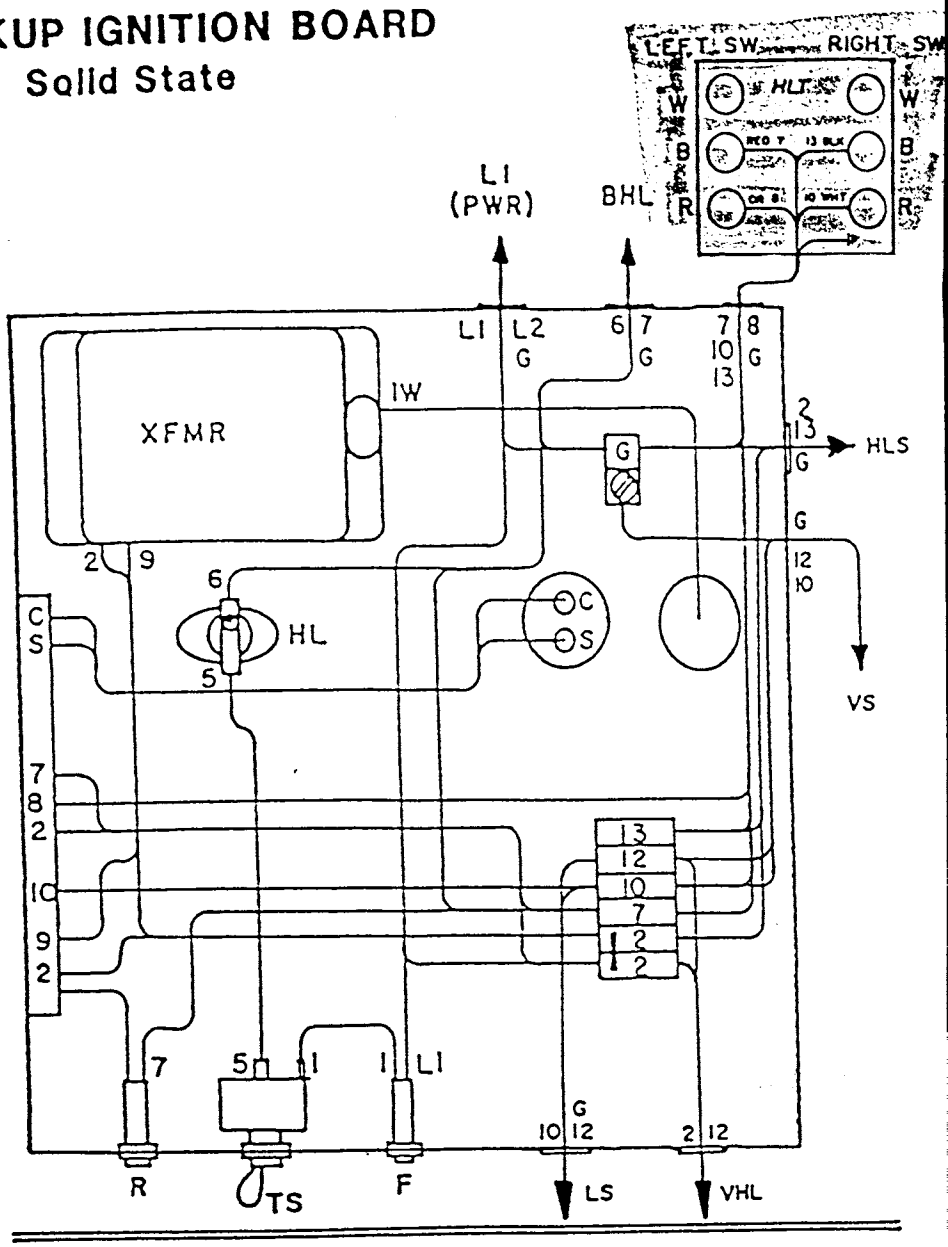
ONLY

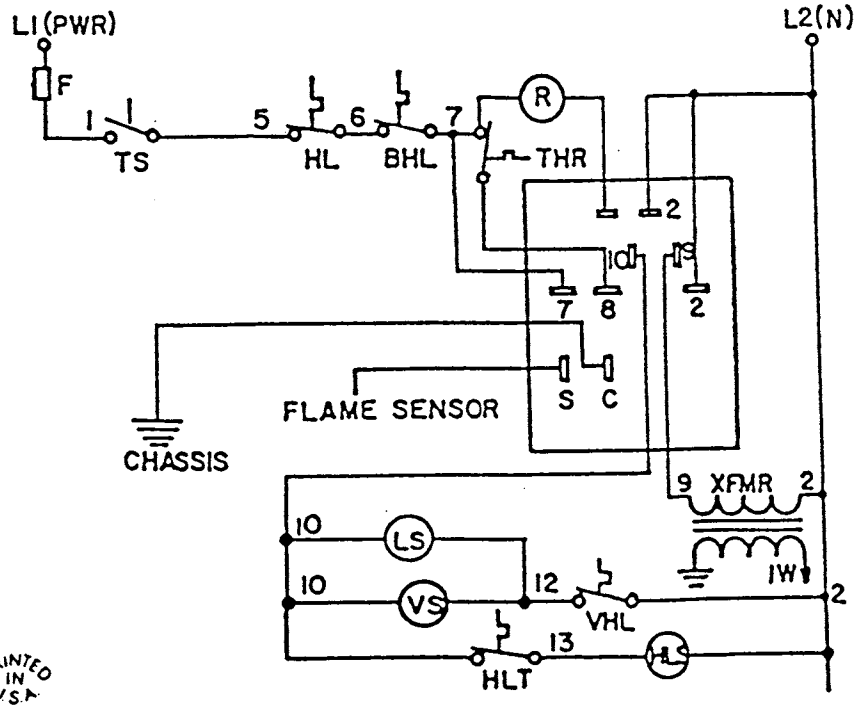
MODEL NO.S

DIO OR 20L-HL
V18, 24, OR 28L-HL

508280070A 870907MS

TS	TOGGLE SWITCH
HL	HIGH LIMIT (MANUAL RESET)
BHL	BIN HIGH LIMIT
VS	VAPOR SOLENOID VALVE
LS	LIQUID SOLENOID VALVE
HLS	HI-LO SOLENOID VALVE
HLT	HI-LO THERMOSTAT
VHL	VAPOR HIGH LIMIT
XFMR	TRANSFORMER
RFS	REMOTE FLAME SENSOR
F	FUSE
G	GROUND
R	RED LIGHT
SIB	SUKUP IGNITION BOARD





PRINTED IN U.S.A.

AXIAL
OR
DOWNSTREAM
HEATER

FENWAL IGNITION BOARD
1984

TROUBLESHOOTING PROCEDURE

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

1. Start fan and heater: After a delay of approx. 30 seconds the red light should come on, spark should be present at spark plug, and gas pressure should register on the pressure gauge.

RED OPERATING LIGHT IS OFF:

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

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

4. Check on/off toggle switch: Connect meter lead to wire #3 at the toggle switch. Turn the switch on, if the meter does not show voltage replace the toggle switch.

5. Check purge relay: Connect meter lead to wire #4 at terminal #3 of the purge relay. If meter does not show voltage (after 30 second delay), replace purge relay.

6. Check heater high limit: Connect meter lead to wire #6 at heater high limit. Be sure heater high limit is reset. If meter does not show voltage, replace heater high limit.

7. Check bin high limit: Connect meter lead to wire #7 at terminal block. Be sure the bin high limit is reset. If no voltage, replace bin high limit.

8. Check thermostat: Connect lead to wire #8 at terminal L1 of solid state board. If meter does not show voltage, adjust thermostat to a higher temperature. If still no voltage, replace thermostat.

RED LIGHT IS ON, BUT NO SPARK

CAUTION: Shut off fuel supply, bleed all lines, and run fan several minutes to purge gas from area, before doing steps #9 and #10.
WARNING: HIGH VOLTAGE!!

9. Disconnect ignition wire from spark plug or ignitor. Using an insulated pliers, carefully hold the ignition wire by the insulation and attempt to get an arc between the wire and the heater housing. If arc is obtained, replace spark plug.

10. If arc was not obtained disconnect ignition wire from high voltage terminal on board. Ground one end of a screwdriver to heater control box, then bring screwdriver shaft to about 1/8" from high voltage terminal to establish an arc. If arc was not obtained, replace board.

RED LIGHT IS ON, SPARK IS PRESENT, BUT NO IGNITION

11. For liquid propane units with vaporizer, check vapor high limit. Connect meter lead to neutral as in step #2. Connect other meter lead to wire #12 on the terminal block. If meter **DOES** show voltage, replace vapor high limit.

12. Check solenoid valves: Remove screw from top of valve coil. Lift coil off of the solenoid body. Insert a screwdriver into the hole in the bottom of the coil. Energize the unit, after the purge cycle the solenoid coil should "grab" the screwdriver magnetically. If coil fails to "grab" screwdriver, check electrical connections or replace coil.
CAUTION: DAMAGE CAN OCCUR TO SOLENOID COILS IF THEY ARE ALLOWED TO BE ENERGIZED FOR AN EXTENDED PERIOD OF TIME WITHOUT BEING ATTACHED TO THE SOLENOID BODY.

Sukup®

SUKUP MANUFACTURING COMPANY
SHEFFIELD, IOWA, USA 50475

AXIAL HEATER

HI-LO WITH REMOTE FLAME SENSING

LIQUID LP ONLY

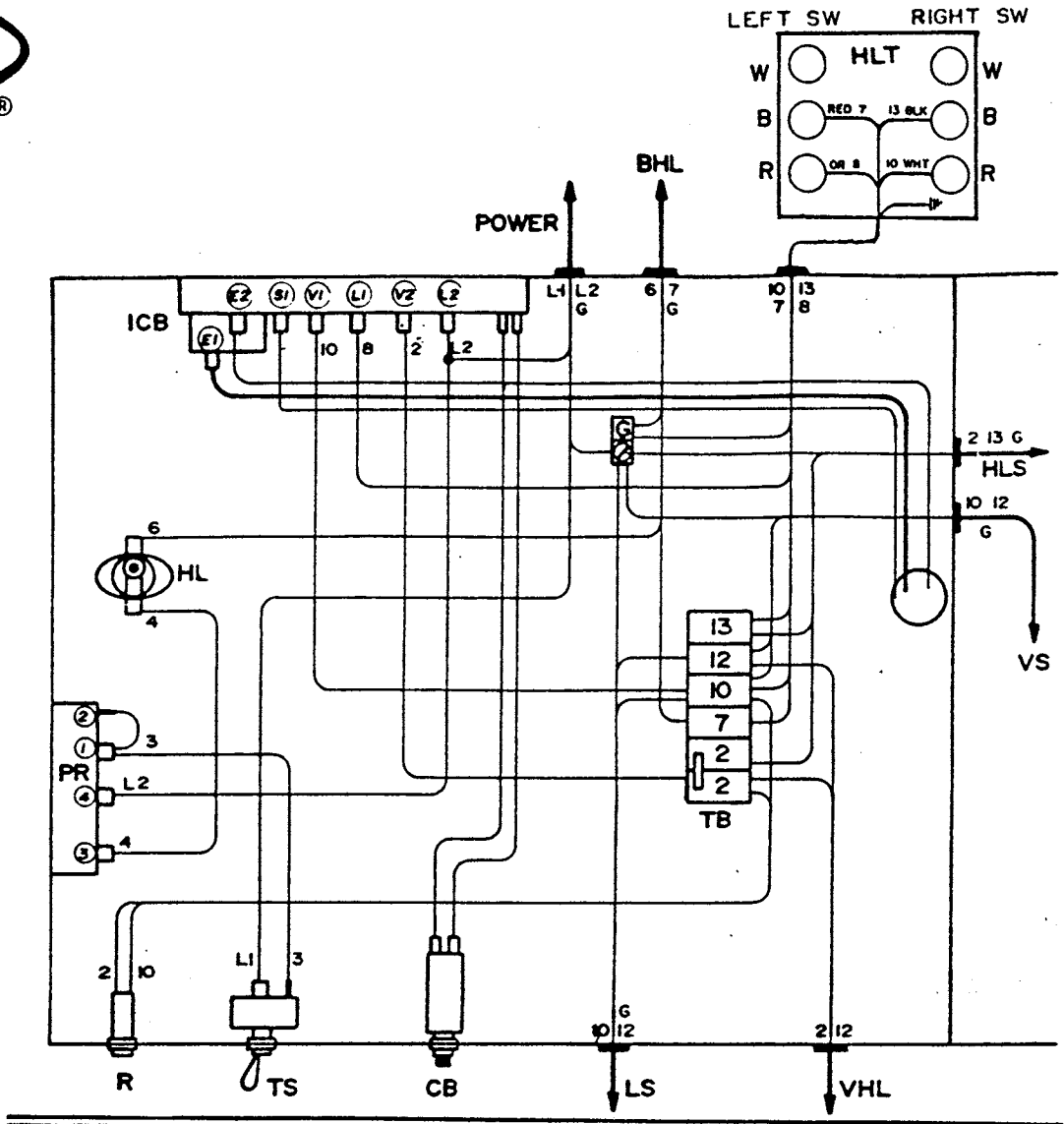
115 V.

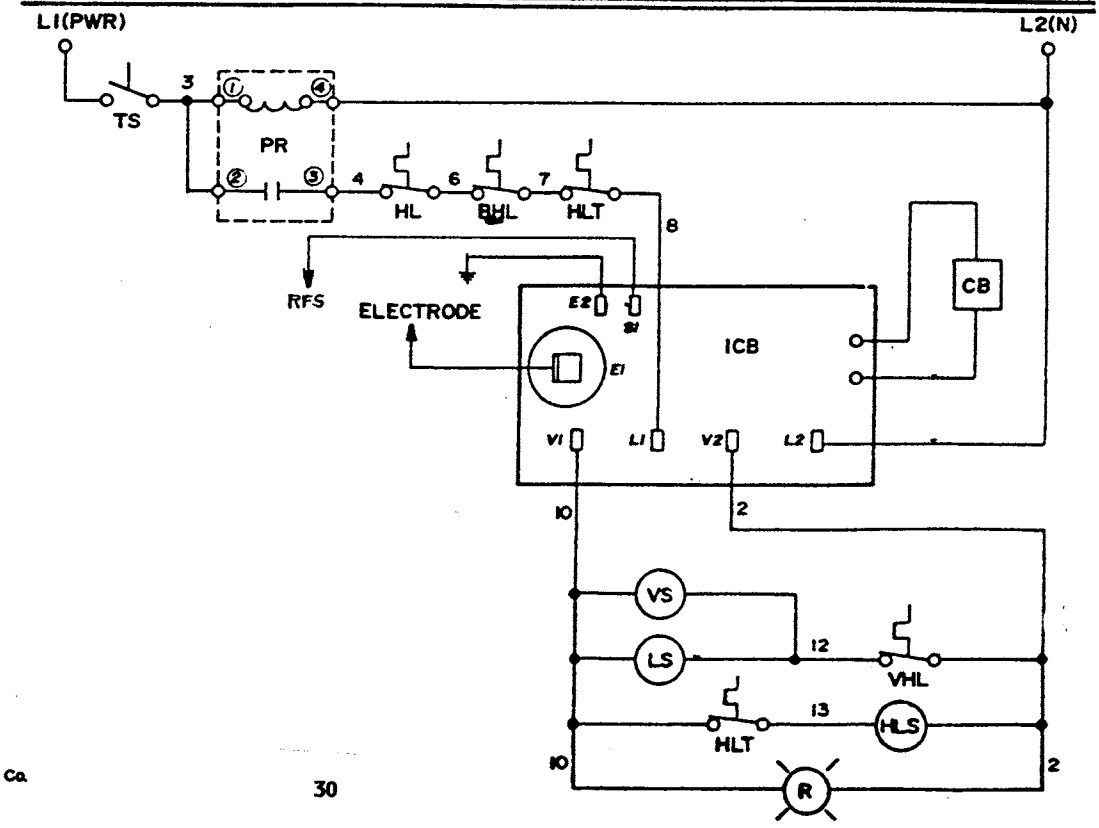
MODEL NO.S

V24L-HL

V28L-HL

84A400021A 840806MS





TS TOGGLE SWITCH - SPST (ON-OFF)
PR PURGE RELAY
HL HIGH LIMIT (MANUAL RESET)
BHL BIN HIGH LIMIT
HLT HI-LO THERMOSTAT
RFS REMOTE FLAME SENSING
ICB IGNITION CONTROL BOARD
CB CIRCUIT BREAKER
R RED LIGHT
VS VAPOR SOLENOID VALVE
LS LIQUID SOLENOID VALVE
HLS HI-LO SOLENOID VALVE
VHL VAPOR HIGH LIMIT
TB TERMINAL BLOCK

Sukup

SUKUP MANUFACTURING COMPANY
SHEFFIELD, IOWA, USA 50475

AXIAL HEATER

THERMOSTAT OR HUMIDISTAT OR MODULATING VALVE WITH REMOTE FLAME SENSING

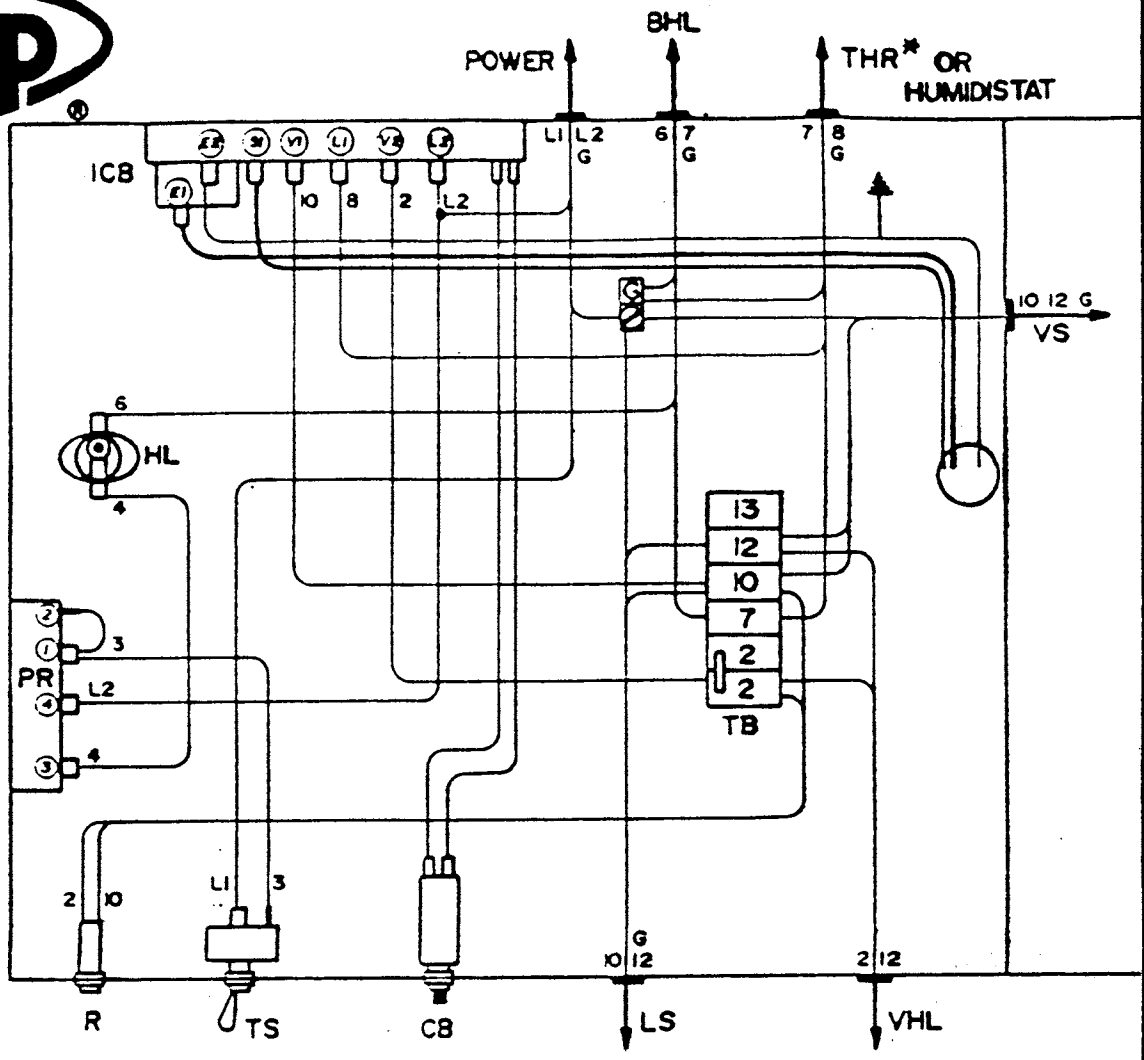
LIQUID LP ONLY

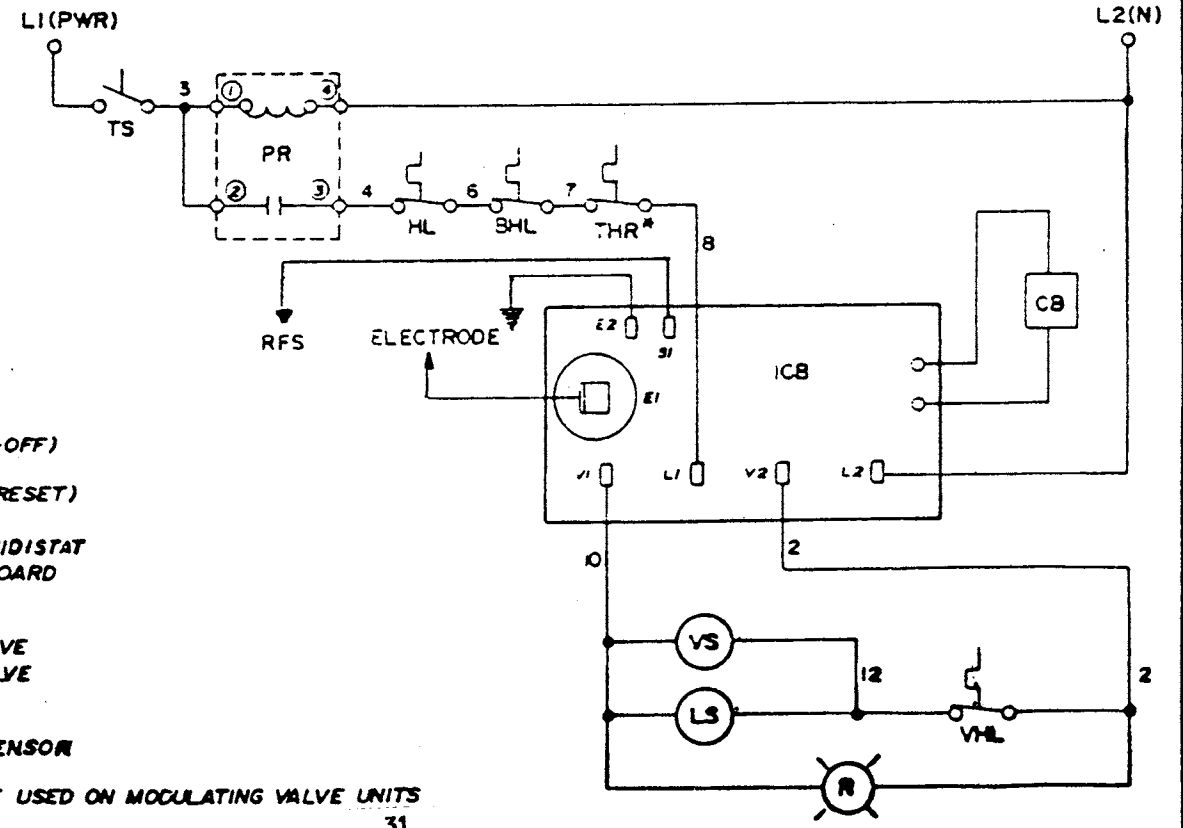
115 V

MODEL NOS

V24L-T	V24L-M
V28L-T	V28L-M

84A400022 84080.7MS





TS TOGGLE SWITCH (ON-OFF)
PR PURGE RELAY
HL HIGH LIMIT(MANUAL RESET)
BHL BIN HIGH LIMIT
**THR* THERMOSTAT OR HUMIDISTAT
ICB IGNITION CONTROL BOARD
CB CIRCUIT BREAKER
R RED LIGHT
VS VAPOR SOLENOID VALVE
LS LIQUID SOLENOID VALVE
VHL VAPOR HIGH LIMIT
TB TERMINAL BLOCK
RFS REMOTE FLAME SENSOR

* NOT USED ON MODULATING VALVE UNITS

AXIAL
OR
DOWNSTREAM
HEATER

DUAL RELAY
1982 TO 1985

TROUBLESHOOTING PROCEDURE

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

1. Start fan and heater: After a delay of approx. 30 seconds the red light should come on, spark should be present at spark plug, and gas pressure should register on the pressure gauge.

RED OPERATING LIGHT IS OFF:

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

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

4. Check on/off toggle switch: Connect meter lead to wire #3 at the toggle switch. Turn the switch on, if the meter does not show voltage replace the toggle switch.

5. Check purge relay: Connect meter lead to wire #4 at terminal #3 of the purge relay. If meter does not show voltage (after 30 second delay), replace purge relay.

6. Check heater high limit: Connect meter lead to wire #6 at heater high limit. Be sure heater high limit is reset. If meter does not show voltage, replace heater high limit.

7. Check bin high limit: Connect meter lead to wire #7 at terminal block. Be sure the bin high limit is reset. If no voltage, replace bin high limit.

8. Check thermostat: Connect lead to wire #8 at terminal #3 of "C" relay. If meter does not show voltage, adjust thermostat to a higher temperature. If still no voltage, replace thermostat.

9. Check relay interlock: Connect lead to terminal #9 of "C" relay. If meter does not show voltage, and amber light is not on, replace "C" relay. If still no voltage replace amber light and flame probe.

10. Check "M" relay: Connect lead to wire #5 at terminal #1 of flame safety delay. If meter does not show voltage, replace "M" relay.

11. Check flame safety delay: Connect lead to wire #10 at flame safety delay. If meter does not show voltage, push reset button. If still no voltage, replace flame safety delay. If meter does so voltage, but red light is not on, replace red light. A faulty light will not prevent heater from working.

RED LIGHT IS OFF, AMBER LIGHT IS ON

12. Replace flame probe. Adjust new probe to a cooler position in heater.

RED LIGHT IS ON, BUT NO SPARK

CAUTION: Shut off fuel supply, bleed all lines, and run fan several minutes to purge gas from area, before doing steps #9 and #10.

WARNING: HIGH VOLTAGE!!

13. Disconnect ignition wire from spark plug or ignitor. Using an insulated pliers, carefully hold the ignition wire by the insulation and attempt to get an arc between the wire and the heater housing. If arc is obtained, replace spark plug.

14. If arc was not obtained disconnect ignition wire from high voltage terminal on board. Ground one end of a screwdriver to heater control box, then bring screwdriver shaft to about 1/8" from high voltage terminal to establish an arc. If arc was not obtained, replace board.

RED LIGHT IS ON, SPARK IS PRESENT, BUT NO IGNITION

15. For liquid propane units with vaporizer, check vapor high limit. Connect meter lead to neutral as in step #2. Connect other meter lead to wire #12 on the terminal block. If meter **DOES** show voltage, replace vapor high limit.

16. Check solenoid valves: Remove screw from top of valve coil. Lift coil off of the solenoid body. Insert a screwdriver into the hole in the bottom of the coil. Energize the unit, after the purge cycle the solenoid coil should "grab" the screwdriver magnetically. If coil fails to "grab" screwdriver, check electrical connections or replace coil.

CAUTION: DAMAGE CAN OCCUR TO SOLENOID COILS IF THEY ARE ALLOWED TO BE ENERGIZED FOR AN EXTENDED PERIOD OF TIME WITHOUT BEING ATTACHED TO THE SOLENOID BODY.

HEATER STARTS PROPERLY, BUT FLAME SAFETY DELAY TRIPS

17. Amber light is on (after 5-10 sec. delay). Replace "C" relay.
18. Amber light is off. Adjust flame probe as per operator's manual.

Sukup®

SUKUP MANUFACTURING COMPANY
SHEFFIELD, IOWA, USA 50475

AXIAL & DOWNSTREAM HEATER

HI-LO

LIQUID LP ONLY

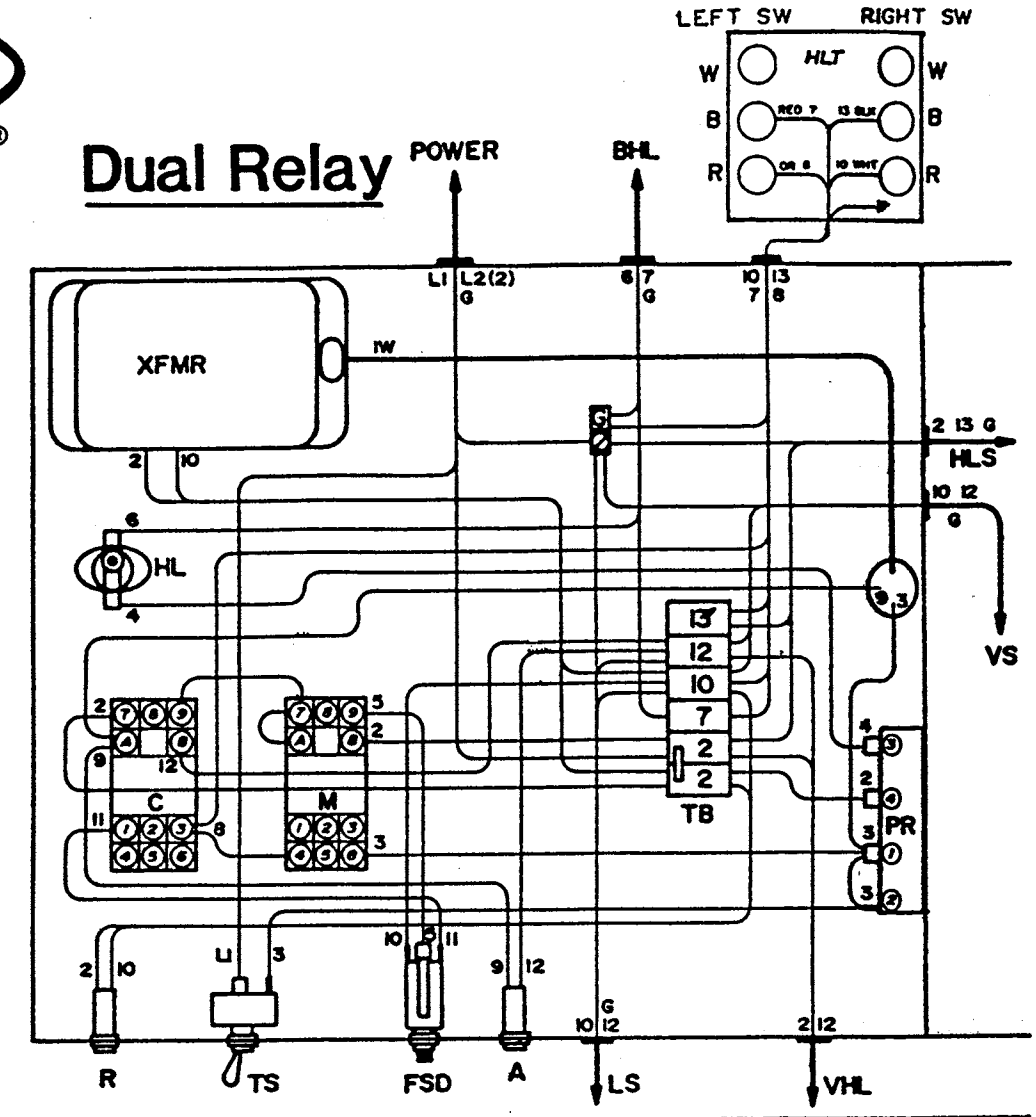
115 V.

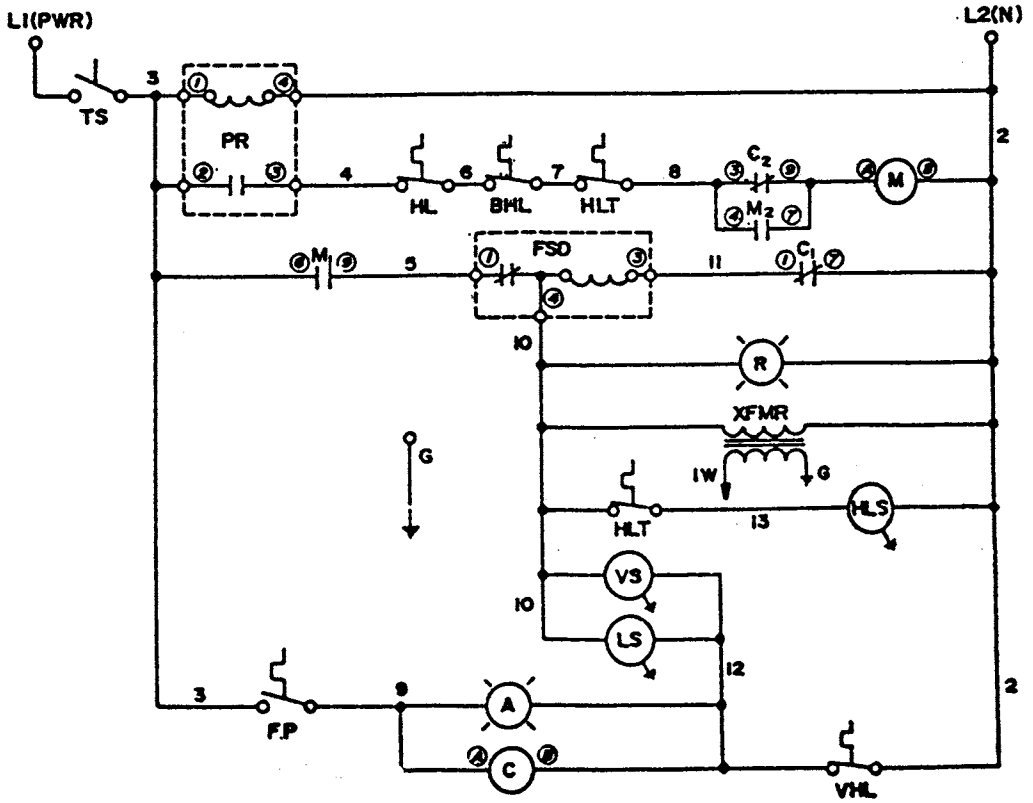
MODEL NO.S

V24L-HL V28L-HL
D10L-HL D20L-HL

50B280017A 830427DD

Dual Relay





TS	TOGGLE SWITCH - SPST (ON-OFF)
PR	PURGE RELAY
HL	HIGH LIMIT (MANUAL RESET)
BHL	BIN HIGH LIMIT
HLT	HI-LO THERMOSTAT
FSD	FLAME SAFETY DELAY
FP	FLAME PROBE
C	RELAY
M	RELAY
R	RED LIGHT
A	AMBER LIGHT
XFMR	TRANSFORMER
VS	VAPOR SOLENOID VALVE
LS	LIQUID SOLENOID VALVE
HLS	HI-LO SOLENOID VALVE
VHL	VAPOR HIGH LIMIT
TB	TERMINAL BLOCK
IW	IGNITION WIRE
G	GROUND

PRINTED IN U.S.A.

Sukup®

SUKUP MANUFACTURING COMPANY
SHEFFIELD, IOWA, USA 50475

AXIAL & DOWNSTREAM HEATER

THERMOSTAT OR HUMIDISTAT OR MODULATING VALVE

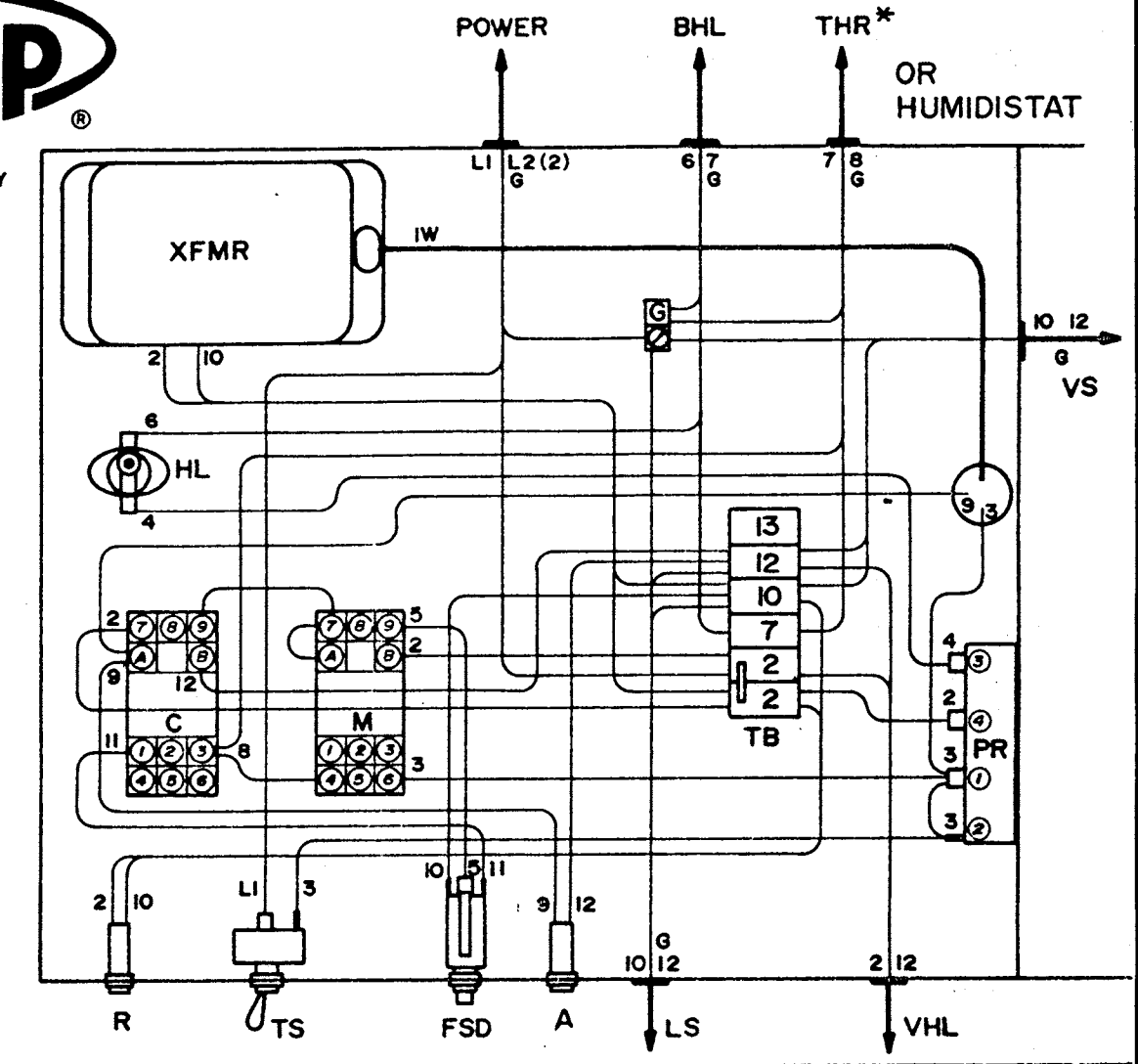
LIQUID LP ONLY

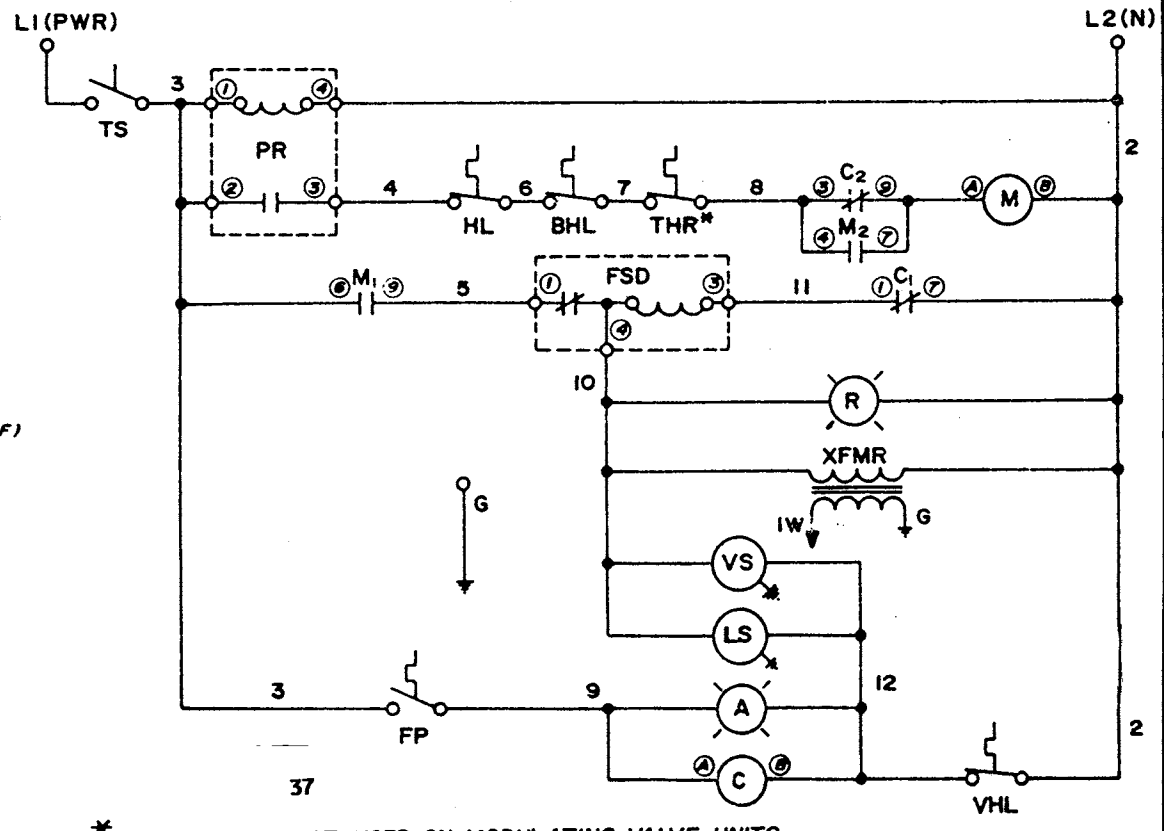
115 V.

MODEL NO.S

V24L-T	V24L-M
V28L-T	V28L-M
D10L-T	D10L-M
D20L-T	D20L-M

50B280019 830427DD





TS	TOGGLE SWITCH - SPST(ON-OFF)
PR	PURGE RELAY
HL	HIGH LIMIT (MANUAL RESET)
BHL	BIN HIGH LIMIT
*THR	THERMOSTAT
FSD	FLAME SAFETY DELAY
FP	FLAME PROBE
C	RELAY
M	RELAY
R	RED LIGHT
A	AMBER LIGHT
XFMR	TRANSFORMER
VS	VAPOR SOLENOID VALVE
LS	LIQUID SOLENOID VALVE
VHL	VAPOR HIGH LIMIT
IW	IGNITION WIRE
TB	TERMINAL BLOCK
G	GROUND

*THERMOSTAT NOT USED ON MODULATING VALVE UNITS

PRINTED IN USA

AXIAL
OR
DOWNSTREAM
HEATER

SINGLE RELAY
1980 TO 1982

TROUBLESHOOTING PROCEDURE

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

1. Start fan and heater: After a delay of approx. 30 seconds the red light should come on, spark should be present at spark plug, and gas pressure should register on the pressure gauge.

RED OPERATING LIGHT IS OFF:

2. Connect one lead of voltmeter to neutral (wire #12) at the terminal block. This lead will remain connected throughout the procedure.

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

4. Check on/off toggle switch: Connect meter lead to wire PR2 at the toggle switch. Turn the switch on, if the meter does not show voltage replace the toggle switch.

5. Check purge relay: Connect meter lead to terminal #7 of the purge relay. If meter does not show voltage (after 30 second delay), replace purge relay.

6. Check relay interlock: Connect lead to terminal #9 of relay. If meter does not show voltage, replace relay.

7. Check heater high limit: Connect meter lead to wire #16 at heater high limit. Be sure high limit is reset. If meter does not show voltage, replace high limit.

8. Check bin high limit: Connect meter lead to wire #10 at terminal block. Be sure the bin high limit is reset. If no voltage, replace bin high limit.

9. Check thermostat: Connect lead to wire #15 located on flame safety delay. If meter does not show voltage, adjust thermostat to a higher temperature. If still no voltage, replace thermostat.

10. Check flame safety delay: Connect lead to wire #13 at flame safety delay. If meter does not show voltage, push reset button. If still no voltage, replace flame safety delay. If meter does so voltage, but red light is not on, replace red light. A faulty light will not prevent heater from working.

RED LIGHT IS ON, BUT NO SPARK

CAUTION: Shut off fuel supply, bleed all lines, and run fan several minutes to purge gas from area, before doing steps #9 and #10.

WARNING: HIGH VOLTAGE!!

11. Disconnect ignition wire from spark plug or ignitor. Using an insulated pliers, carefully hold the ignition wire by the insulation and attempt to get an arc between the wire and the heater housing. If arc is obtained, replace spark plug.

12. If arc was not obtained disconnect ignition wire from high voltage terminal on board. Ground one end of a screwdriver to heater control box, then bring screwdriver shaft to about 1/8" from high voltage terminal to establish an arc. If arc was not obtained, replace board.

RED LIGHT IS ON, SPARK IS PRESENT, BUT NO IGNITION

13. For liquid propane units with vaporizer, check vapor high limit. Connect meter lead to neutral as in step #2. Connect other meter lead to wire #11 on the terminal block. If meter **DOES** show voltage, replace vapor high limit.

14. Check solenoid valves: Remove screw from top of valve coil. Lift coil off of the solenoid body. Insert a screwdriver into the hole in the bottom of the coil. Energize the unit, after the purge cycle the solenoid coil should "grab" the screwdriver magnetically. If coil fails to "grab" screwdriver, check electrical connections or replace coil.

CAUTION: DAMAGE CAN OCCUR TO SOLENOID COILS IF THEY ARE ALLOWED TO BE ENERGIZED FOR AN EXTENDED PERIOD OF TIME WITHOUT BEING ATTACHED TO THE SOLENOID BODY.

HEATER STARTS PROPERLY, BUT FLAME SAFETY DELAY TRIPS

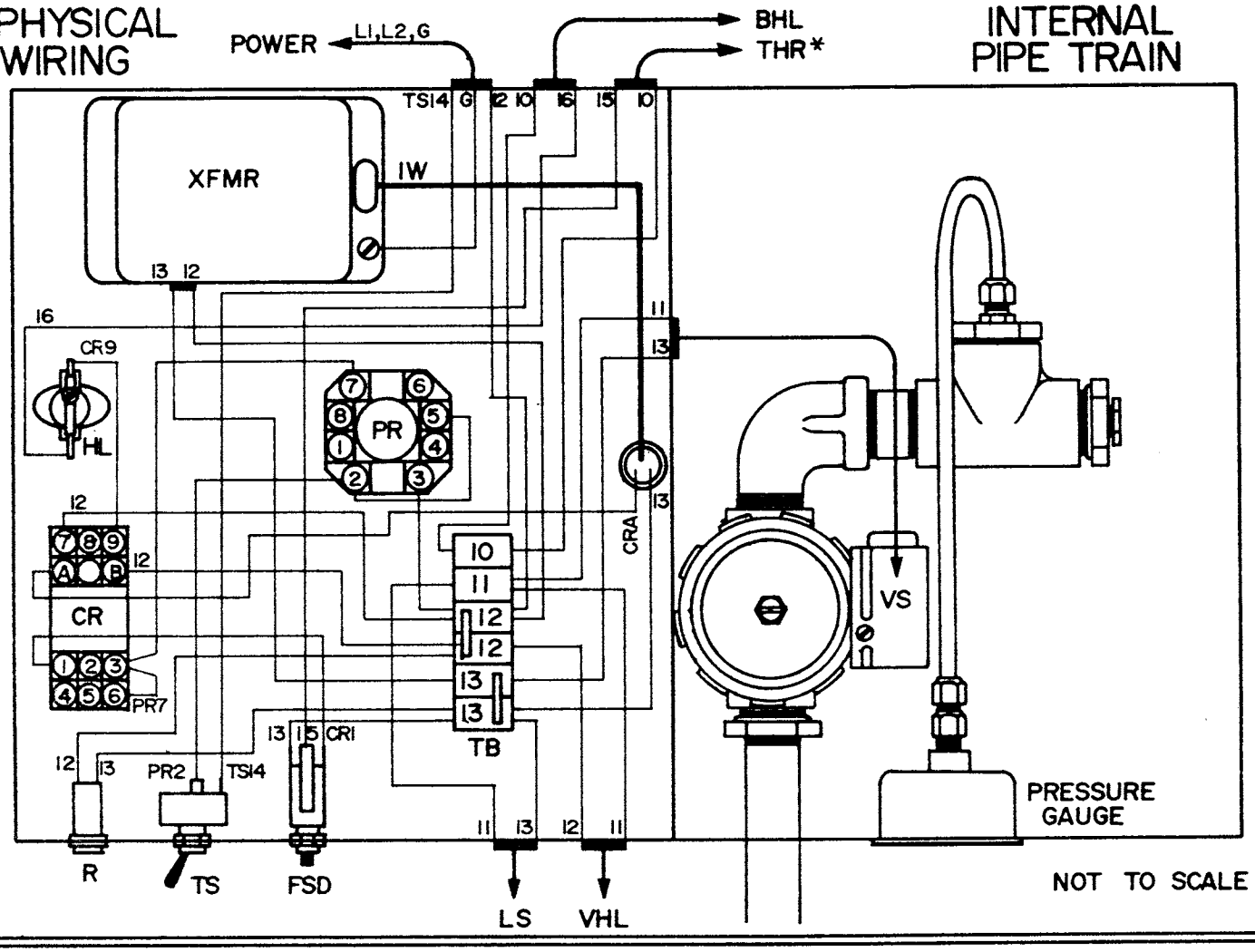
15. Adjust flame probe so that it is just hot enough to operate.

ELECTRICAL DIAGRAM, THERMOSTAT OR MODULATING VALVE (LIQUID LP ONLY)

Model No.s **V28L-T , V28L-M , V24L-T , V24L-M, D10L-T D20L-T , D10L-M , D20L-M, D40L-T, D40L-M**

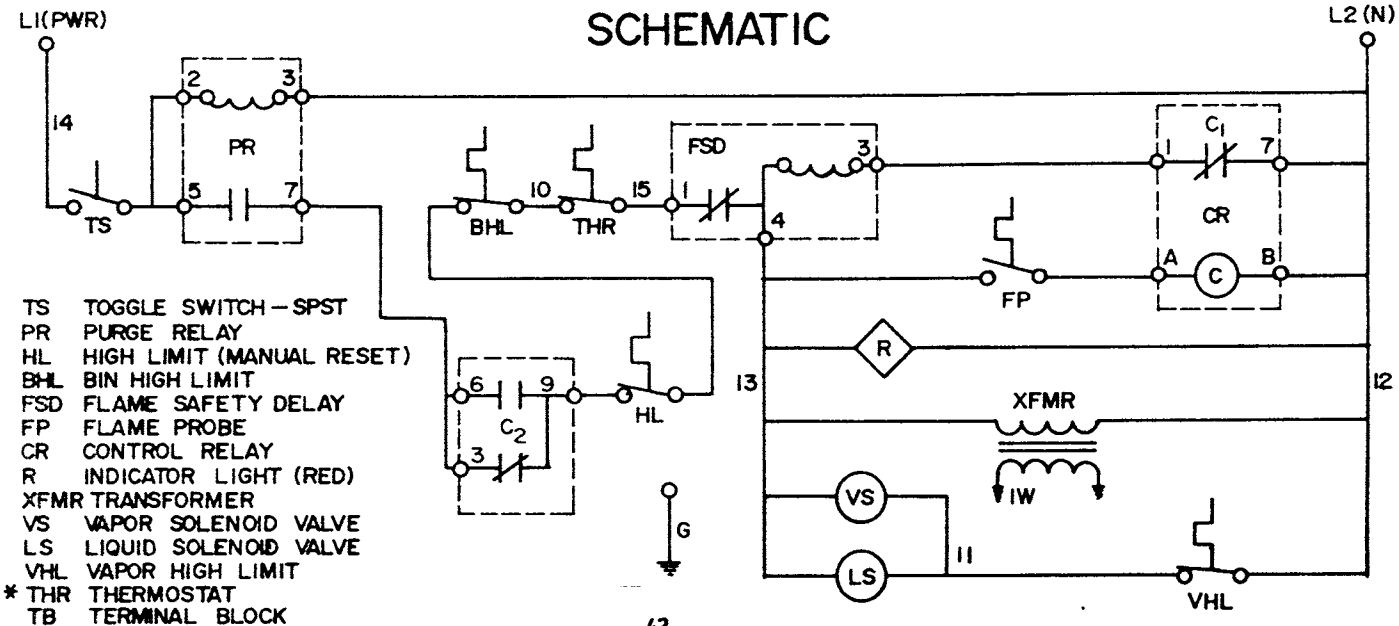
84A130009 DD801110

PHYSICAL WIRING



INTERNAL PIPE TRAIN

SCHEMATIC



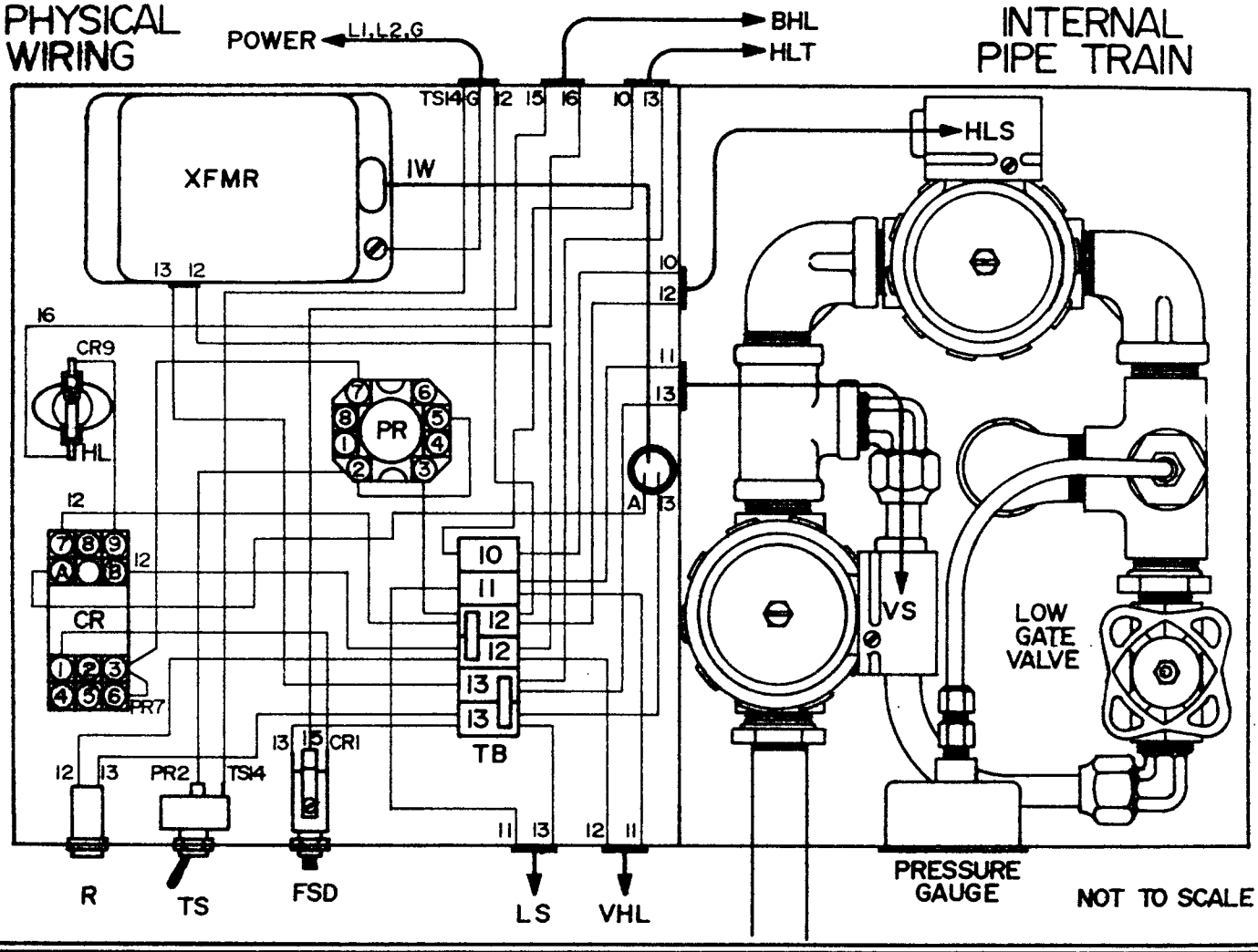
TS TOGGLE SWITCH – SPST
PR PURGE RELAY
HL HIGH LIMIT (MANUAL RESET)
BHL BIN HIGH LIMIT
FSD FLAME SAFETY DELAY
FP FLAME PROBE
CR CONTROL RELAY
R INDICATOR LIGHT (RED)
XFMR TRANSFORMER
VS VAPOR SOLENOID VALVE
LS LIQUID SOLENOID VALVE
VHL VAPOR HIGH LIMIT
* THR THERMOSTAT
TB TERMINAL BLOCK
G GROUND
IW IGNITION WIRE

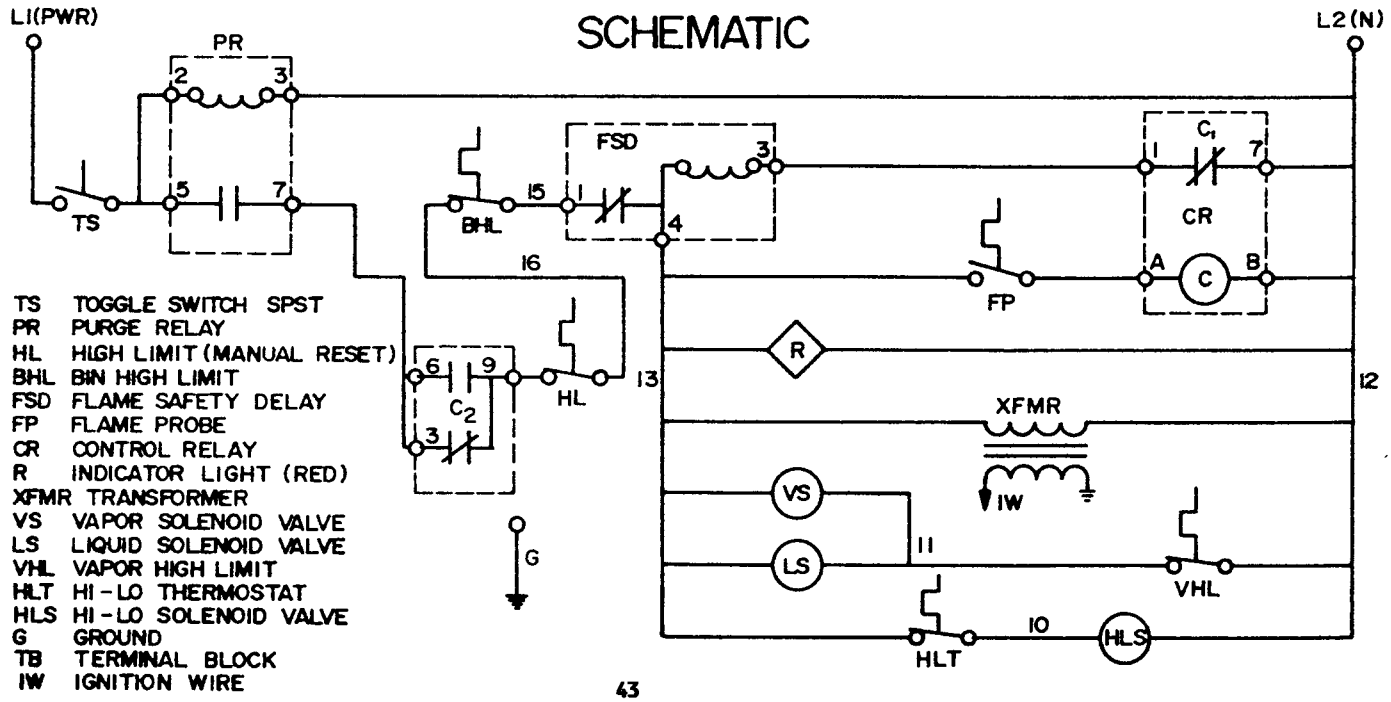
* THERMOSTAT NOT USED ON MODULATING VALVE UNITS

ELECTRICAL DIAGRAM, HI-LO (LIQUID ONLY)

Model No.s V28L-HL , V24L-HL , D10L-HL , D20L-HL
D40L-HL

84A130006 DD801104





TS TOGGLE SWITCH SPST
PR PURGE RELAY
HL HIGH LIMIT (MANUAL RESET)
BHL BIN HIGH LIMIT
FSD FLAME SAFETY DELAY
FP FLAME PROBE
CR CONTROL RELAY
R INDICATOR LIGHT (RED)
XFMR TRANSFORMER
VS VAPOR SOLENOID VALVE
LS LIQUID SOLENOID VALVE
VHL VAPOR HIGH LIMIT
HLT HI-LO THERMOSTAT
HLS HI-LO SOLENOID VALVE
G GROUND
TB TERMINAL BLOCK
IW IGNITION WIRE

DOWNSTREAM HEATER

1978 TO 1980

TROUBLESHOOTING PROCEDURE

CAUTION: DISCONNECT ELECTRICITY AND BLEED GAS LINES BEFORE DOING ANY MAINTENANCE WORK ON THE HEATER.

A. Red light dies not come on when toggle switch is turn to "on".
   1. No power to heater
      a. Turn on fan. Plug heater into 110v burner receptacle.
      b. Check that receptacle has 110v.
      c. Check fuse in fan fuse holder.
      d. Be sure that time delay reset is reset.
      e. Be sure that reset on heater high limit is reset.
      f. Check that thermostat is set above ambient temperature.
      g. Check that copper tubing to air switch is not blocked and that tubing is pointed toward fan.
      h. Check that heater is properly wired.
      i. Check for defective toggle switch.

B. No spark, but gas present.
   1. Spark plug wire disconnected.
   2. Spark plug wire grounded to heater housing.
   3. Excessive carbon on spark plug.
   4. Spark plug or transformer defective.
      a. Turn off gas and bleed gas lines. Then carefully hold plug wire about 1/8" from heater housing. If spark is present, plug is defective. Install new plug. If no spark, transformer is defective. Install new transformer.

C. Spark but no flame - gas not present.
   1. No gas to heater. - Turn gas on, turn valves on at heater.
   2. Solenoid valves may not be opening, - Put hand on top of solenoid valves. Turn power switch on and off several times. If valve is operating correctly, you will feel a click in the valve when the power is turned on. If the valve does not click, a replacement is necessary.
   3. Check for obstruction in gas line.
      a. Strainers may need to be cleaned or copper may have a kink in it.
      b. Take union apart to see that orifice is not plugged.

D. Flame is present, but time delay pops out, shutting off heater after 30-60 seconds of operation.
    1. Flame probe not hot enough or is defective.
        a. Probe should be cherry red in color. If it is not, the flame probe will have to be moved into the flame more.
    2. Flame probe is defective.
        a. If probe is cherry red, but time delay continues to pop out, the probe is defective.

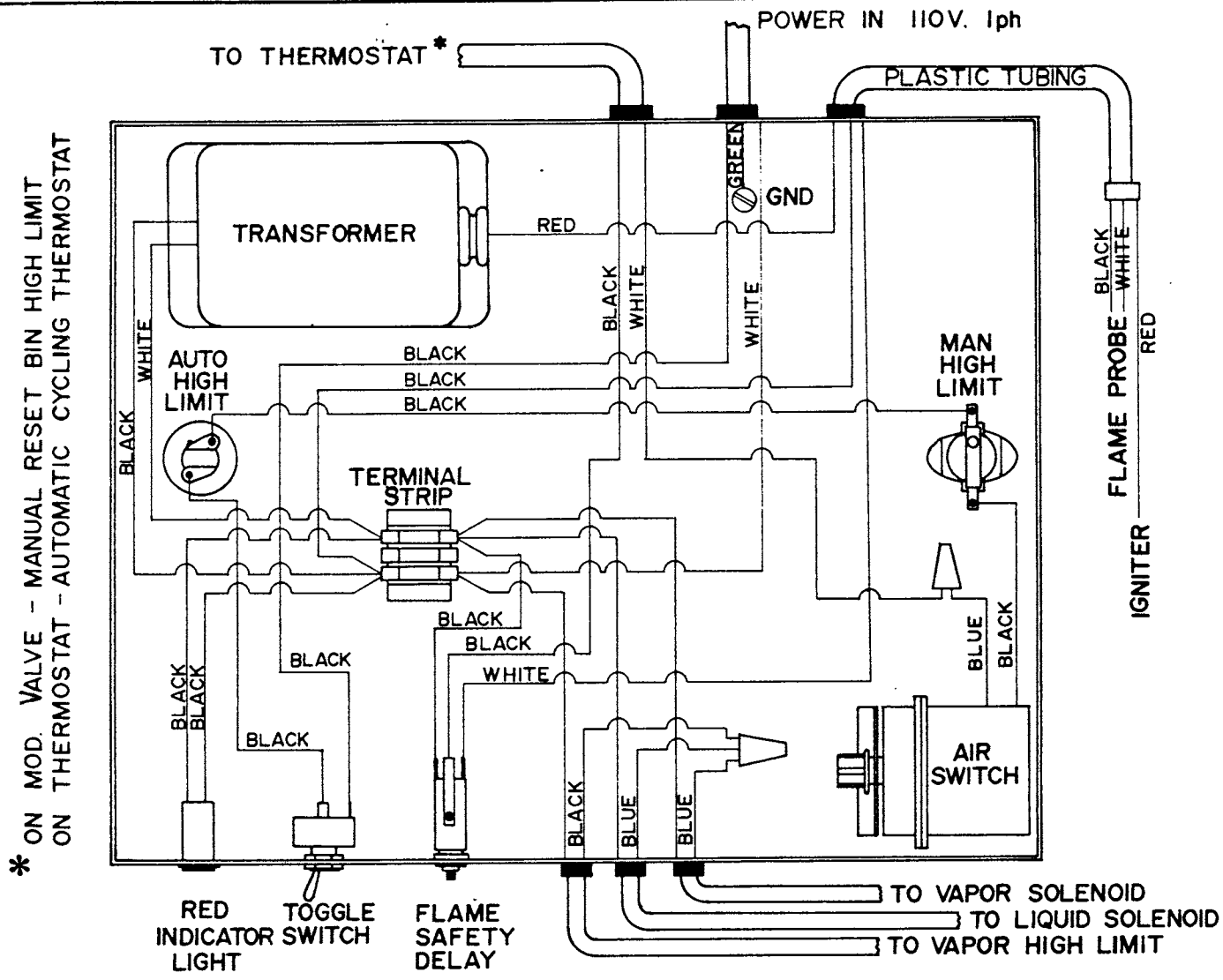
E. Flame is present, but burner goes out at a later time.
    1. Vaporizer too hot, vaporizer high limit is kicking out.
        a. Pull vaporizer out of flame until copper tubing going into the regulator can be held without burning your hand.
    2. Temperature high limit pops out.
        a. Fan inlet blocked. Remove debris.
        b. Static pressure too high. Decrease static pressure by removing some grain from bin.
        c. Decrease temperature by decreasing gas flow.
    3. Fan motor failure.
        a. Have electrician check out unit.

F. Burner works but not enough heat.
    1. Not enough gas pressure at heater.
    2. Plugged orifice.
    3. Plugged strainers.
    4. Taking vapor rather than liquid from tank (when heater has a vaporizer.)

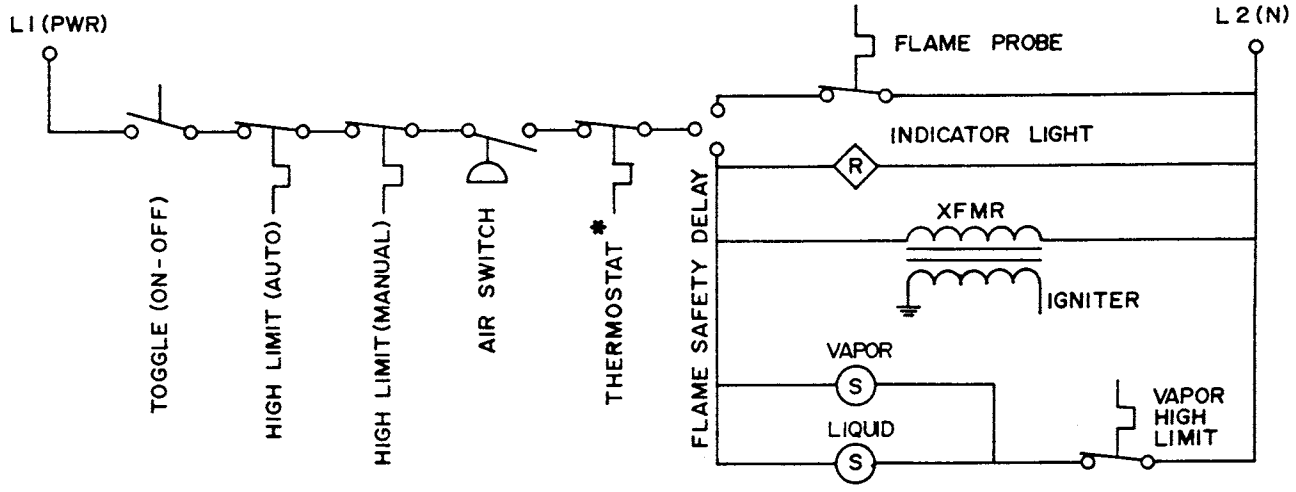
Electric Diagram FOR Modulating Valve OR Thermostat (liquid LP only)

MODEL NO. D1OL-T, D1OL-M, D2OL-T, D2OL-M

L-M-T
7982 DD



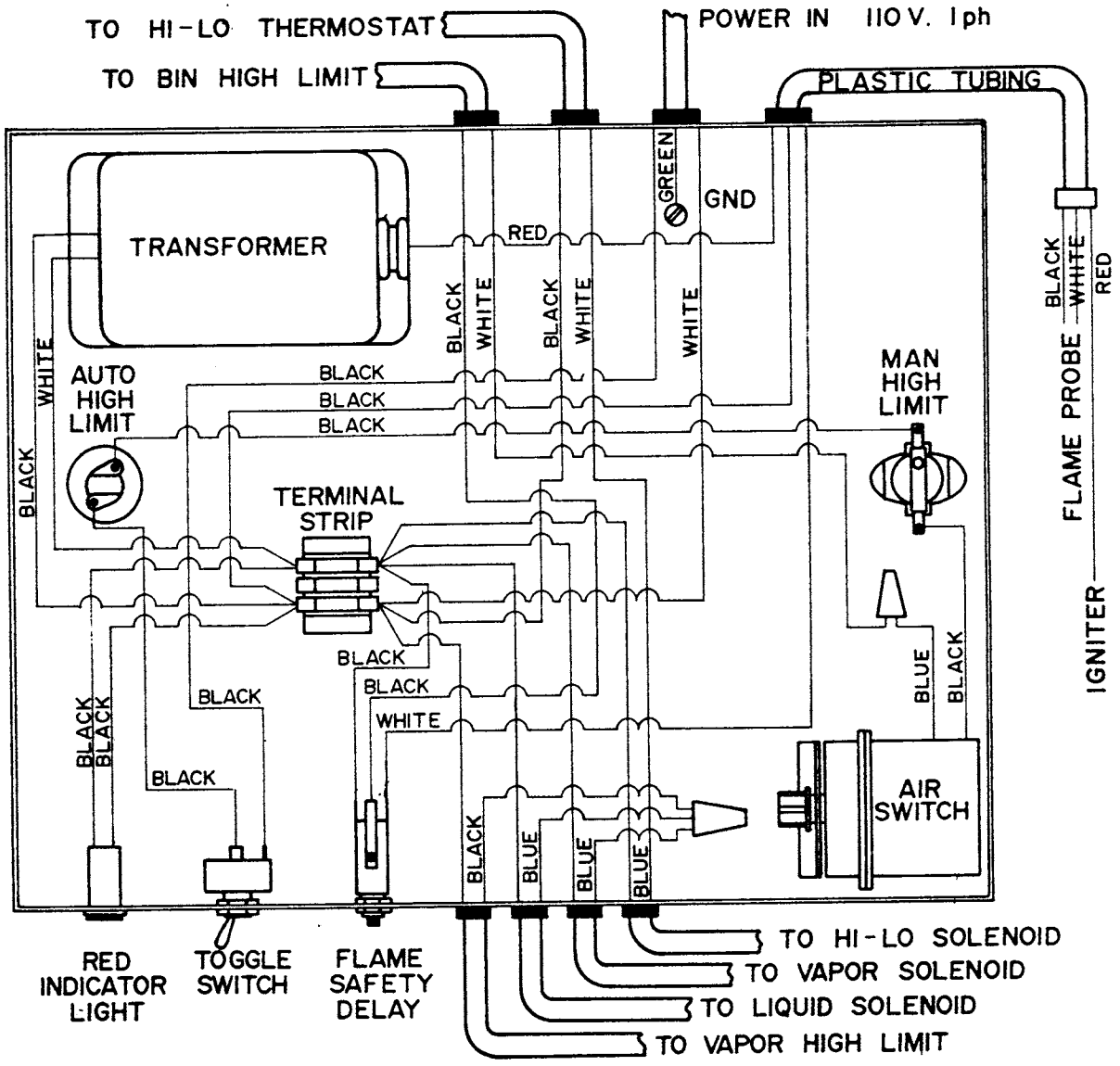
Schematic



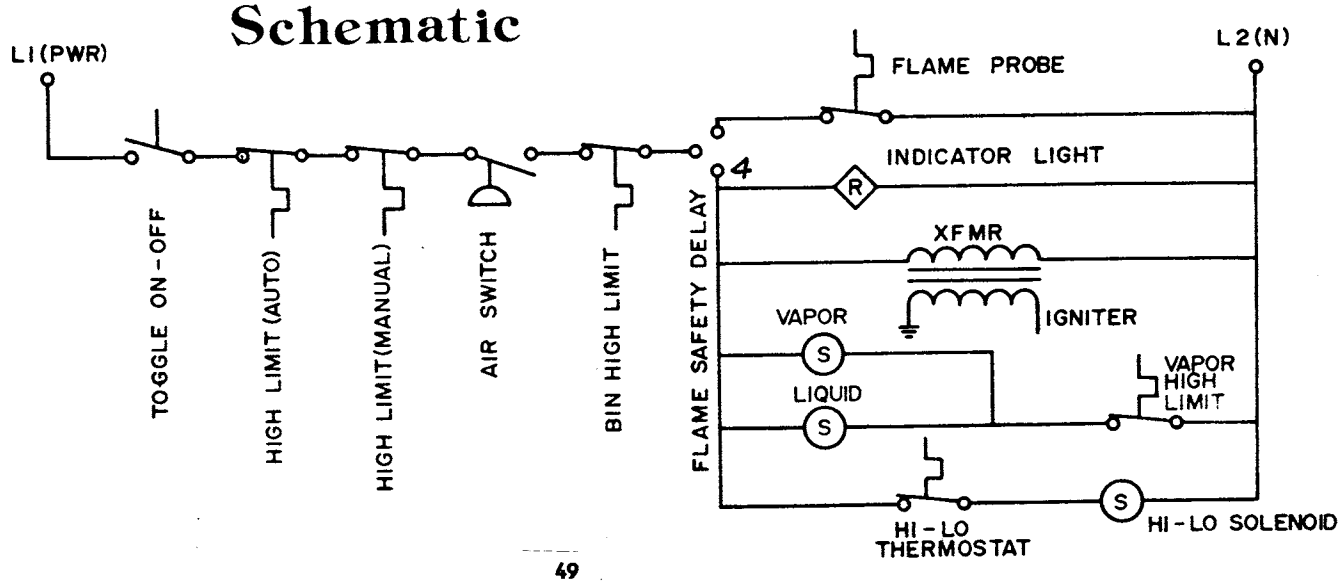
Electric Diagram FOR Hi-Lo (liquid only)

MODEL NO. D10L-HL, D20L-HL

L-HL
798IDD



Schematic



SERVICE

GUIDES

CENTRIFUGAL
&
AXIAL
FANS

TROUBLESHOOTING PROCEDURE

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

1. Listen for sound of magnetic starter closing as you push start button.
2. Check line voltage: Connect voltmeter leads to L1 and L2 at magnetic starter. If 3ph electricity, also check between L1 and L3, and between L2 and L3. If voltmeter does not indicate proper voltage, check power supply.

MAGNETIC STARTER DOES NOT CLOSE

3. Connect one lead of voltmeter to 7, neutral. This lead will remain connected throughout procedure.
4. Check voltage between neutral and power lines: Connect second voltmeter lead to L1 and L2 (also L3 for 3ph). If voltmeter does not indicate proper voltage, check power supply.
5. Check start button: Connect lead to 6 (11 for 3ph) on magnetic starter. Push start button while checking with voltmeter. If meter does not show voltage, replace start button.
6. Check stop button: Connect lead to 8 on overload relay. Push start button while checking with voltmeter. If meter does not show voltage, replace stop button.
7. Check overload relay: Connect lead to 10 on magnetic starter coil. Push start button while checking with voltmeter. If meter does not show voltage, replace overload relay. If meter does show voltage, but magnetic starter is not closing, replace coil.

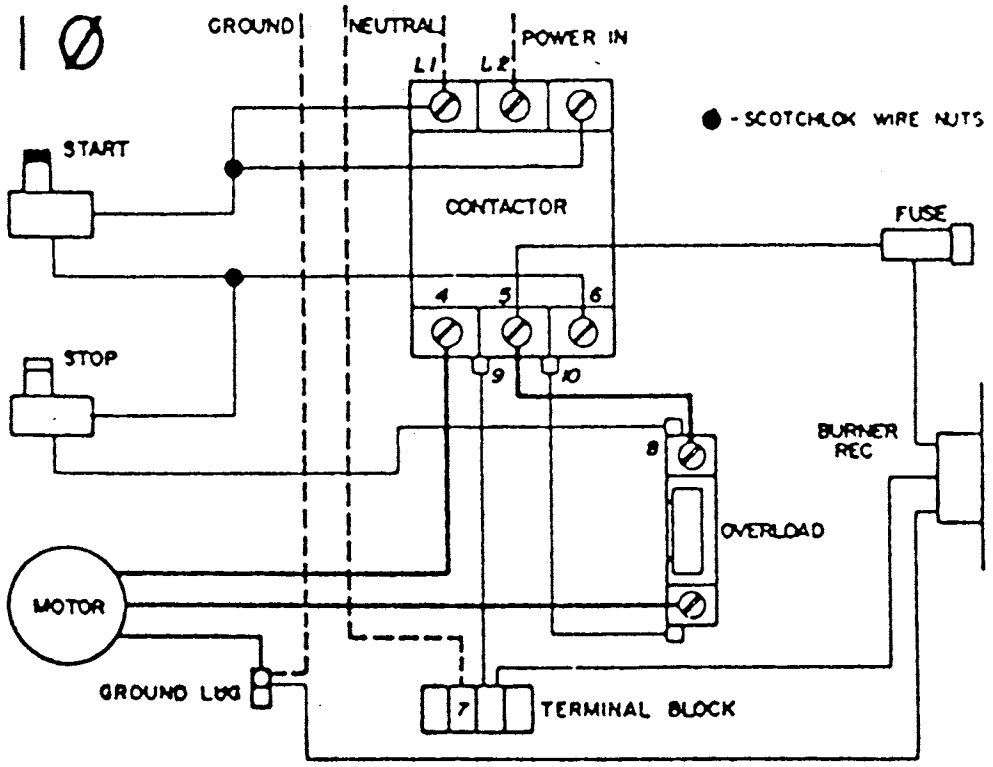
MAGNETIC STARTER CLOSES, FAN DOES NOT START PROPERLY

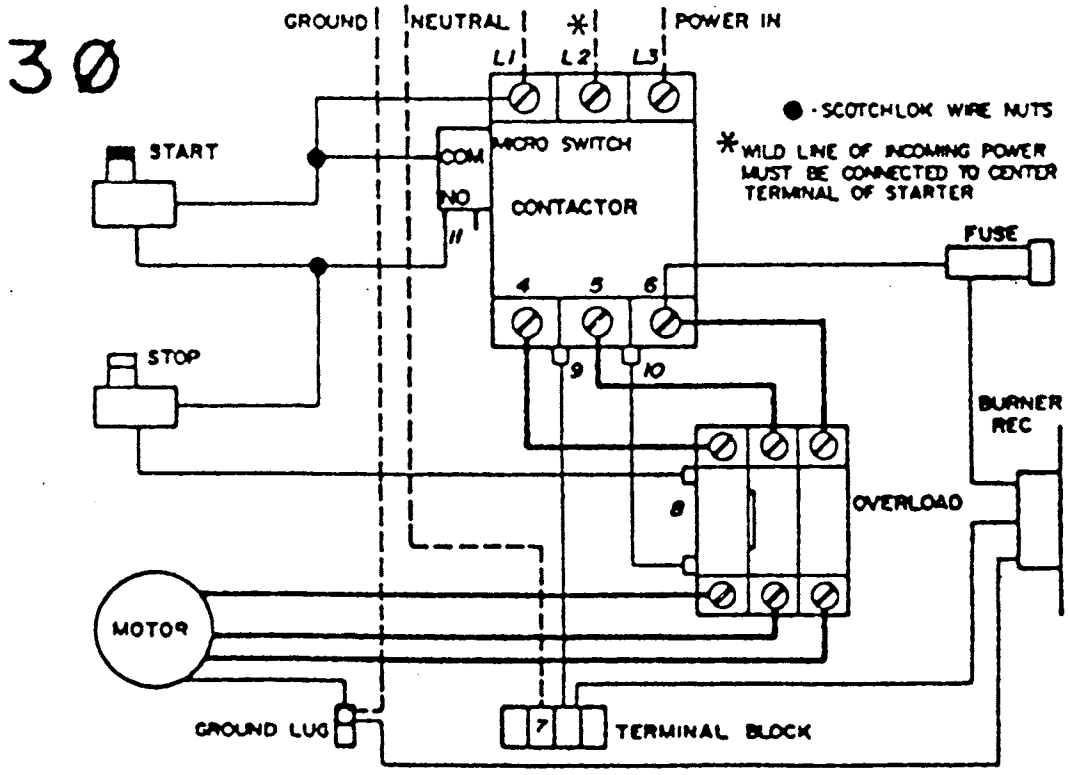
8. Check magnetic starter contacts: Connect voltmeter leads to 4 and 5 on magnetic starter. If 3ph electricity, also check between 4 and 6, and between 5 and 6. If voltmeter does not indicate proper voltage, replace magnetic starter. If proper voltage is indicated, problem is in the motor.

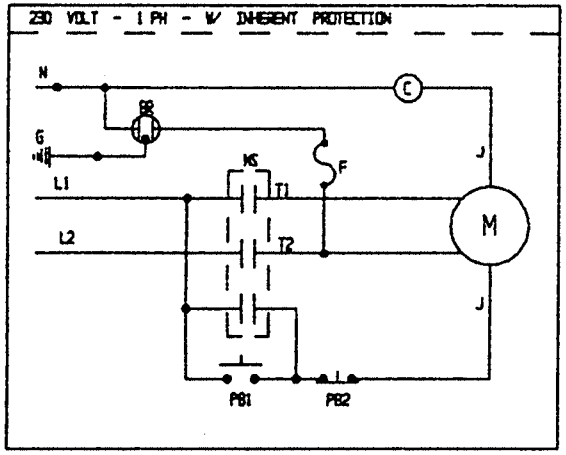
FAN RUNS ONLY WHEN START BUTTON IS DEPRESSED

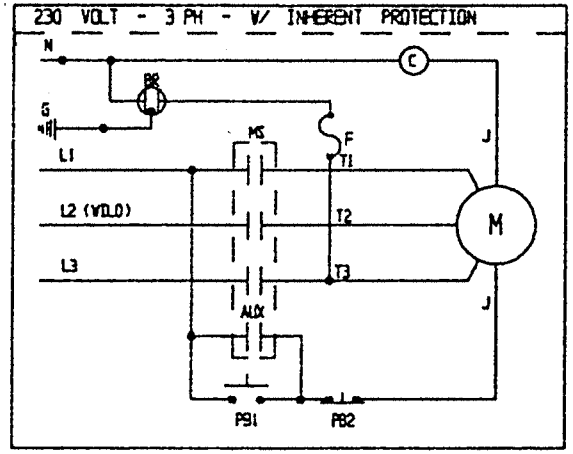
9. Three phase: Replace micro-switch on side of magnetic starter.
   Single phase: Clean contacts between 3 and 6 on magnetic starter. If still problem, replace magnetic starter.
10. Check volts while fan is running. If volts are low, check wire size and transformer size.

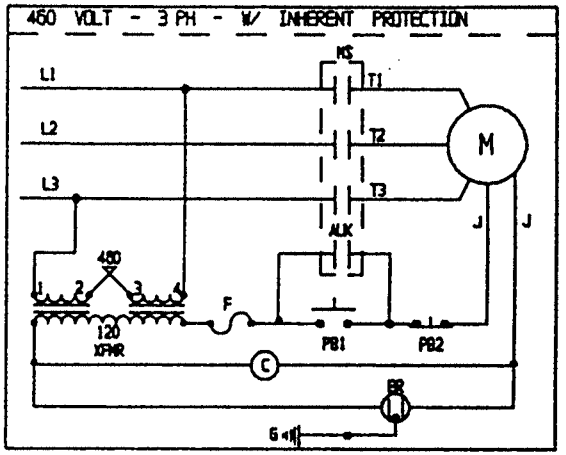
FANS

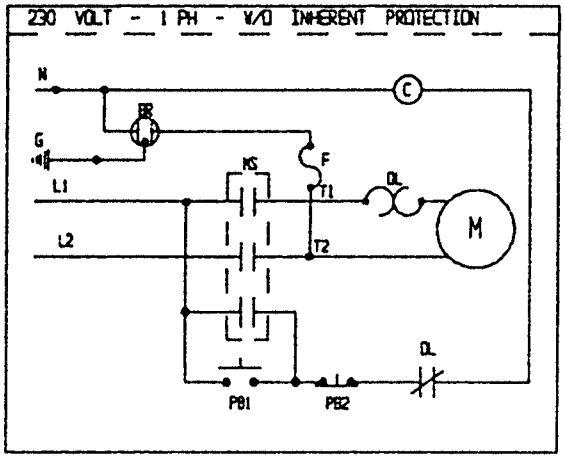

1 Ø
GROUND
NEUTRAL
POWER IN
L1
L2
● - SCOTCHLOK WIRE NUTS
START
CONTACTOR
FUSE
4
5
6
STOP
9
10
BURNER REC
8
OVERLOAD
MOTOR
GROUND LUG
7
TERMINAL BLOCK

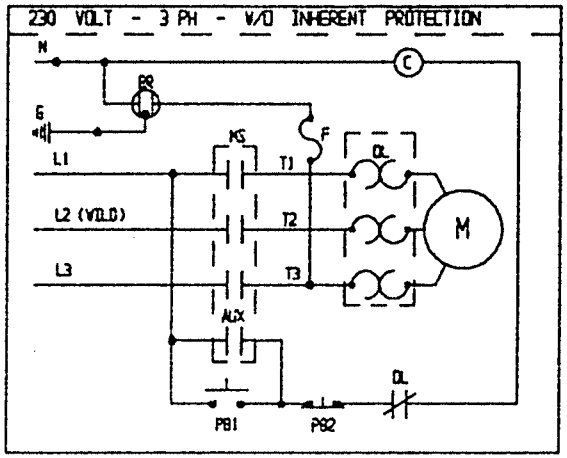

3 Ø
GROUND
NEUTRAL
*
POWER IN
L1
L2
L3
● - SCOTCHLOK WIRE NUTS
* WILD LINE OF INCOMING POWER MUST BE CONNECTED TO CENTER TERMINAL OF STARTER
START
COM
MICRO SWITCH
NO
CONTACTOR
11
FUSE
4
5
6
STOP
9
10
BURNER REC
8
OVERLOAD
MOTOR
GROUND LUG
7
TERMINAL BLOCK

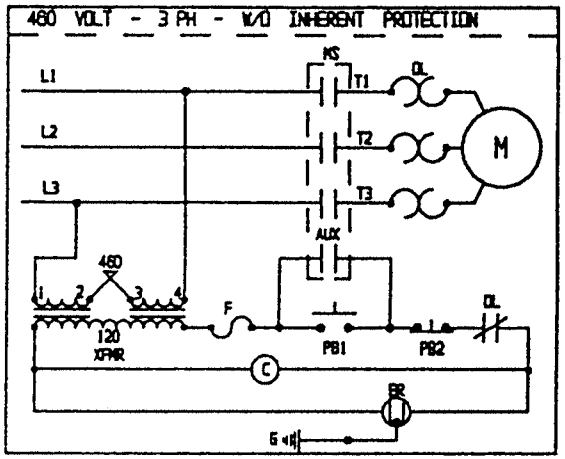












NOTES:

1. Customer must provide means of disconnect, short circuit, and ground fault protection.
2. For motors without inherent protection, correctly size thermal units must be used in the overload relay.
3. Wire motor as per nameplate diagram.

KEY:

M	-	Motor
MS	-	Magnetic Starter
C	-	Magnetic Starter Coil
OL	-	Overload Relay
PB1	-	Start Button (Black)
PB2	-	Stop Button (Red)
BR	-	Burner Receptacle
F	-	Fuse
N	-	Neutral Terminal
G	-	Ground Terminal
AUX	-	Auxiliary Contact
XFMR	-	Control Transformer

Sukup

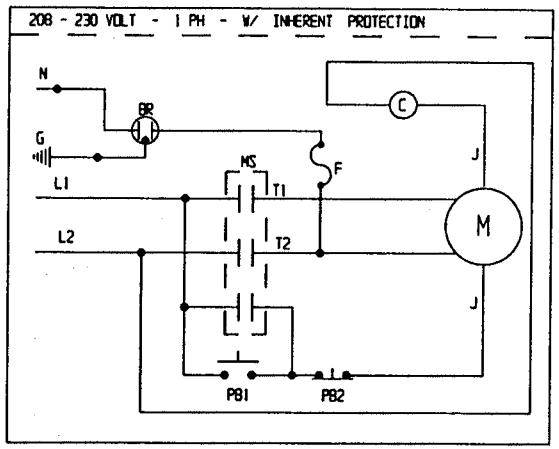
SUKUP MFG. CO.

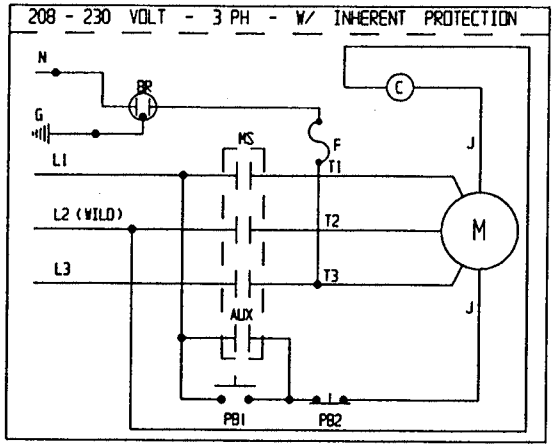
SUKUP PARKWAY
SHEFFIELD, IA. 50475

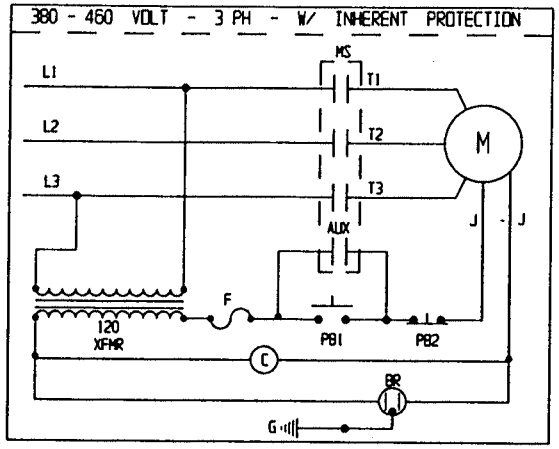
FAN
ELECTRICAL
DIAGRAMS

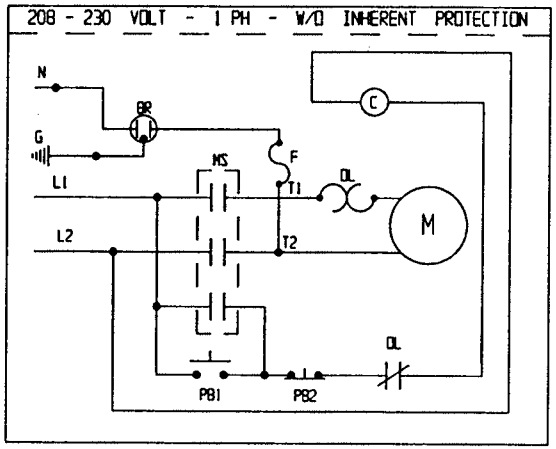
L0386

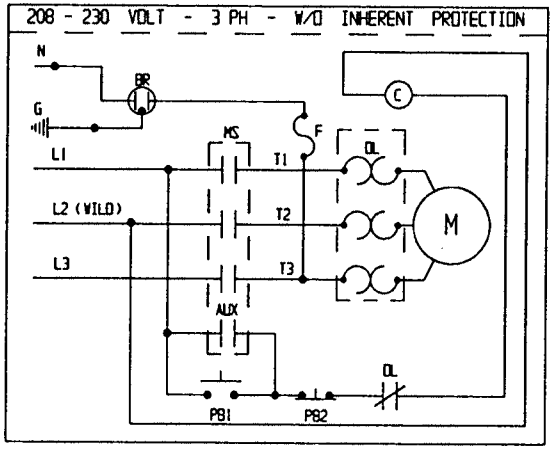
120 Volt Control

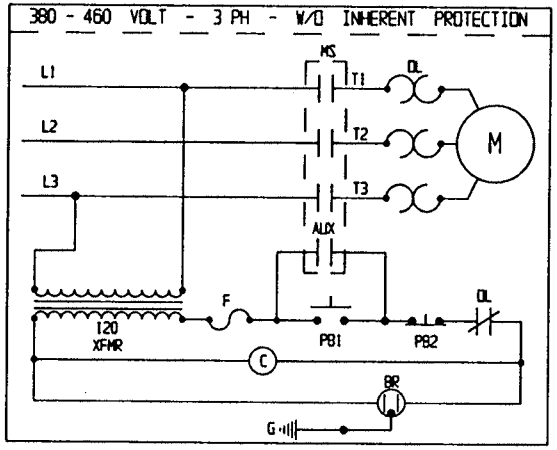












NOTES:

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3. Wire motor as per nameplate diagram.

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XFMR	-	Control Transformer

Sukup

SUKUP MFG. CO.

SUKUP PARKWAY
SHEFFIELD, IA. 50475

FAN
ELECTRICAL
DIAGRAMS

L03861 960613JB

230 Volt Control

Sukup Manufacturing Company
Sheffield, Iowa 50475

SERVICE GUIDE

COMP #: L0197
MACHINE: HEATERS
DATE: 920628MS
PAGE: 1 OF 6
 96A500006

SUBJECT: **Solid State Conversion Kit**

D3974	24"-28" Axial SS conversion kit
D3975	18" Axial SS conversion kit
D3976	High-temp. Downstream SS conversion kit
D3977	Low-temp. Downstream SS conversion kit

PURPOSE: Convert dual relay heater to solid state. For all Sukup heaters except Model 30,40, & 50.

CONSISTS OF:

1	D3948	Sukup Ignition board with holder
1	D6503	Fuse holder assembly
1	J5739	Spark plug
1	D7054	Threaded collar
1 of the following flame sensor update kits:		
	D3984	High-temp. downstream FS update kit
	D3983	Low-temp. downstream FS update kit
	D4051	24"-28" Axial FS update kit
	D4053	18" Axial FS update kit
1	-----	Complete set of instructions & electrical decals.
1	D4411	Foam gasket for board
2	J0980	1/8" nuts
2	J0442	1/8" bolts
1	J5069	3/8" plug
1	J3829	Female spade

Plus all wires, etc. required to install components listed.

⚠ **CAUTION: DISCONNECT and LOCK OFF all power sources before doing any repair or inspection.** Always check with voltage meter before servicing. The procedures outlined are for use only by qualified service personnel.

Failure to heed this warning may cause serious injury or death!

INSTRUCTIONS:

A. Remove:

1."C" and "M" relays and sockets with all wires attached except Thermostat wire no. 8 on terminal 3 of "C" relay socket.

2. Flame safety delay with wires attached.

3. Purge relay with wires attached.

4. Flame probe and wires.

5. Amber light.

6. Ignitor (leave wire)

(instructions continued)

B. Install:

1. P.C. board and holder to side of control box with 1/8" bolts provided. (use foam gasket between board holder and box.

2. Fuseholder in hole once used for amber light.

3. Plug 3/8" hole in box with plastic hole plug.

4. Flame sensor per instruction.

5. Spark plug per instruction.

6. Proper electrical diagram in box lid.

C. Connect:

1. Incoming power (L1) to fuseholder.

2. Wire #1 from fuseholder to toggle switch.

3. Wire #5 from toggle switch to High Limit.

4. Red light to terminal 7 on terminal block and to P.C. board at terminal marked "lamp."

5. Wires #2 to terminal block #2.

6. Wire #10 to terminal block #10.

7. Ignition transformer lead #10 to P.C. Board at terminal #9.

8. Red wire (36" long) from terminal S on P.C. board to the flame sensor.

9. Green wire from terminal C on P.C. board to ground lug in control box and to burner ring.

10. Wire #8 from thermostat to P.C. board at terminal #8(cut off flange spade, crimp on female spade.)

11. Wire #7 to terminal block #7.

SUBJECT: **Converting Fenwal Ignition System to Sukup Solid State**

J5710	Ignition Transformer
	and
D3974	24"-28" Axial SS conversion kit
D3975	18" Axial SS conversion kit

Consists of:

1	D3948	Sukup Ignition board with holder
1	D6503	Fuse holder assembly
1	J4667	3 amp fuse
1	J5739	Spark plug
1	D7054	Threaded collar
2	J0514	3/16-24 x 1/2 FH SLSB
2	J1190	#10 Star washer
2	J0985	#10 Plated nuts
1	of the following flame sensor update kits:	
	D4051	24"-28" Axial FS update kit
	D4053	18" Axial FS update kit
1	--------	Complete set of instructions & electrical decals
1		Foam gasket for board
2		1/8" nuts and bolts
1		3/8" plug

Plus all wires, etc. required to install components listed.

⚠ **CAUTION: DISCONNECT and LOCK OFF all power sources before doing any repair or inspection.** Always check with voltage meter before servicing. The procedures outlined are for use only by qualified service personnel.
Bleed fuel lines before servicing unit.

Failure to heed this warning may cause serious injury or death!

INSTRUCTIONS;

A. Remove:

1. Fenwal Board
2. Circuit Breaker
3. Purge relay with wires attached
4. Ignitor
5. Flame Sensor

(instructions continued)

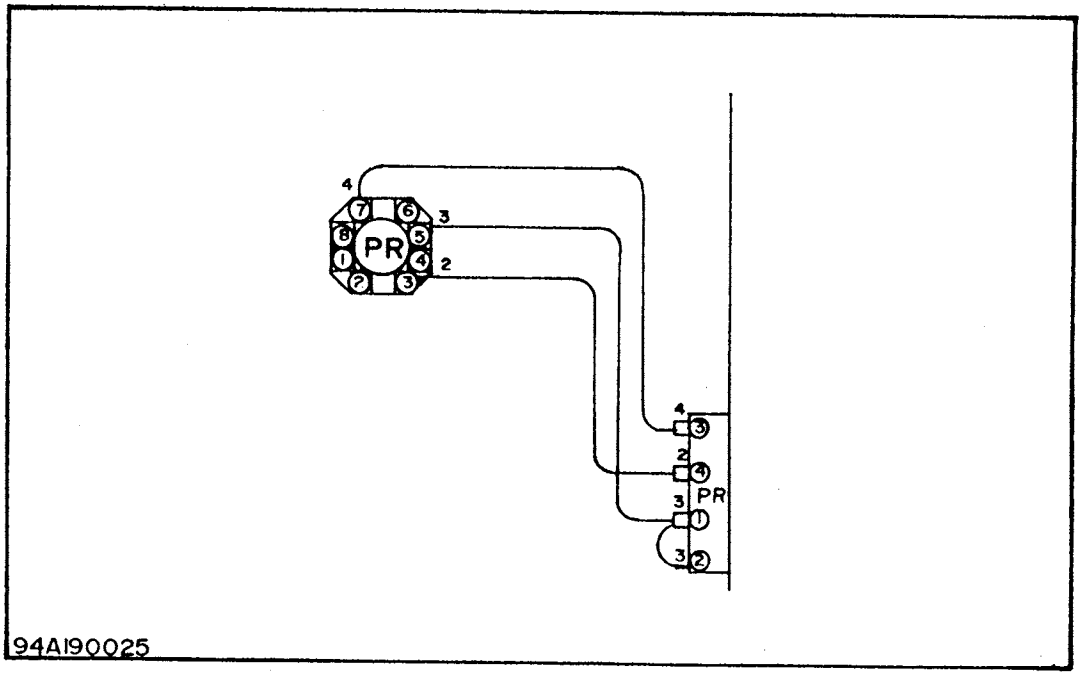
B. Install:

1. P.C. board and holder to side of control box with 1/8" bolts provided. (Use foam gasket between board holder and box.)
2. Fuseholder in hole once used for circuit breaker.
3. Flame sensor per instruction.
4. Spark plug per instruction.
5. Proper electrical diagram in box lid.

C. Connect:

1. Incoming power (L1) to fuseholder.
2. Wire #1 from fuseholder to toggle switch.
3. Wire #5 from togggle switch to High Limit.
4. Red light to terminal 7 on terminal block and to P.C. board at terminal. marked "lamp".
5. Wires #2 to terminal block #2.
6. Wire #10 to terminal block #10.
7. Ignition transformer lead #9 to P.C. board at terminal #9
8. Red wire (36" long) from terminal S on P.C. board to the flame sensor.
9. Green wire from terminal C on P.C. board to ground lug in control box and to burner ring.
10. Wire #8 from thermostat to P.C. board at terminal #8.
11. Wire #7 to terminal block #7.
12. Spark plug wire to spark plug and transformer.

PURGE RELAY UPDATE KIT D3954



Part No.	Description	No. Reqd.
J5595	ETA Purge relay	1
J0445	#5 x 40 x 1 1/4" bolts	2
J0980	#5 nuts	2
--------	11" 18ga. Red wire w/flange & female spade	1
--------	11" 18 ga. red wire w/flange & female spade & 3" 18 ga. jumper wire w/ female spade	1
--------	12" 18ga. white wire w/spades	1

INSTALLATION

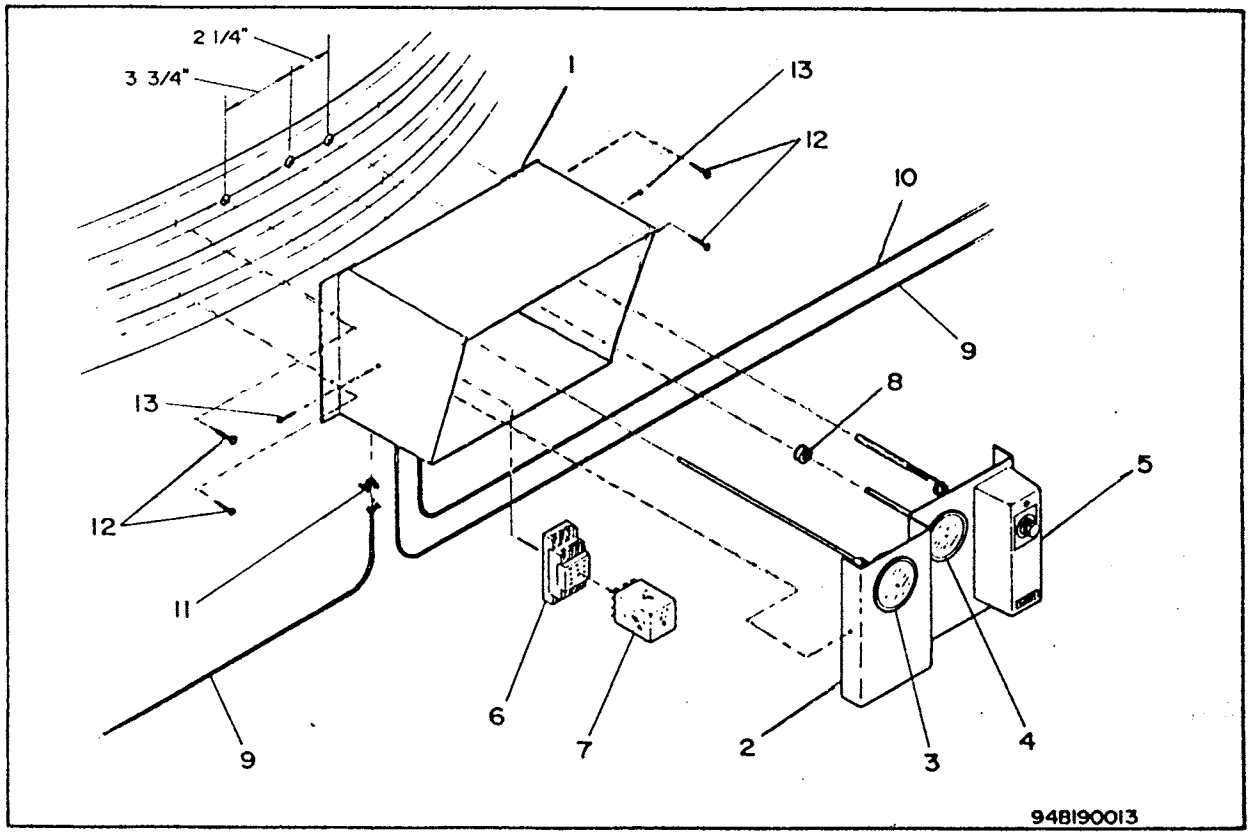
1. Using rectangular purge relay as a guide, mark and drill 2 - 1/8" holes in center divider panel of control box. Mount purge relay on electrical side of control box with 2 - #5 x 1¼" bolts and nuts provided.
2. Remove glass purge tube from octagonal socket. Do not remove octagonal socket. It will be used as a terminal board. Leave all wires attached to it.
3. Loosen screw of terminal #3 of purge socket and insert flange of wire #2 from rectangular purge. Re-tighten screw.

   Loosen screw of terminal #5 of purge socket and insert flange of wire #3 from rectangular purge. Re-tighten screw.

   Loosen screw of terminal #7 of purge socket and insert flange of wire #4 from rectangular purge. Re-tighten screw.
4. See heater manual for operating instructions. Delay on heater ignition will now be about 45 seconds.

96A500002

SUBJECT: DUAL BURNER CONTROL FOR HI-LOW HEATER



Parts list for Hi-Lo Relay Kit: D3970
D4479*

Ref. #	Part #	Description	Qty Req.
1	D3972	Box	1
2	D39733*	Gauge panel	1
	D39734	Gauge panel	1
3	D3940	Static Pressure Gauge, w/tube & conn.	1
4	J5845	60-220 4" stem thermometer	1
5	J5843	Hi-lo thermostat	1
6	J3881	Relay 11 pin socket 5x583	2
7	J3880	Relay 5x838	2
8	J4970	5x561 Rubber grommet	3
9	D4485	18-5 cord, 25' w/terminals	2
10	D44822	18-3 cord, 25' w/ring terminal	1
11	J5040	7K2 Heyco bushing	1
12	J0470	#10-16 x 1" TEK screw	4
13	J0460	#8-18 x 1/2" TEK screw	2

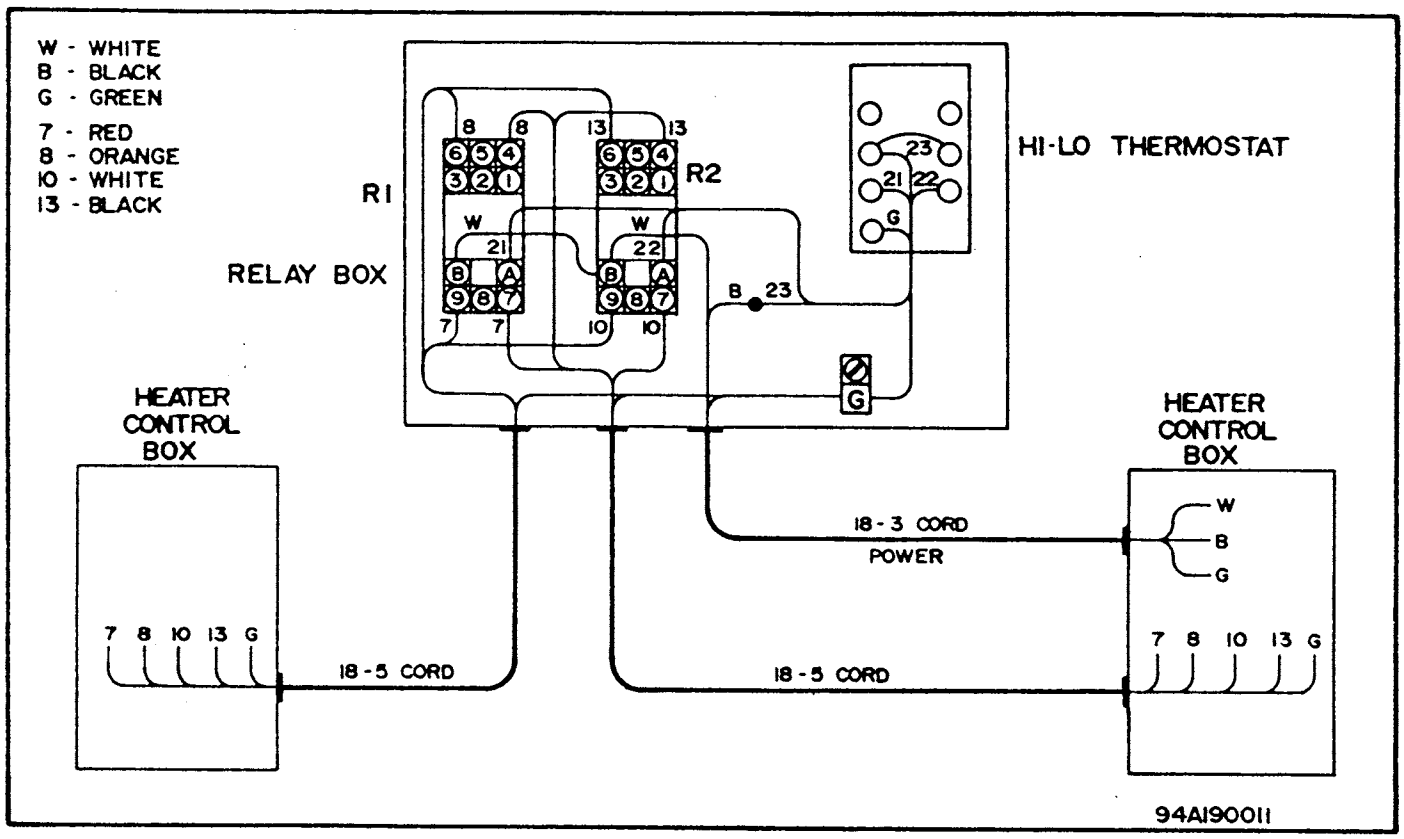
*D4479 parts list is the same, less static pressure gauge D3940, thermometer J5845, and two rubber grommets J4970.

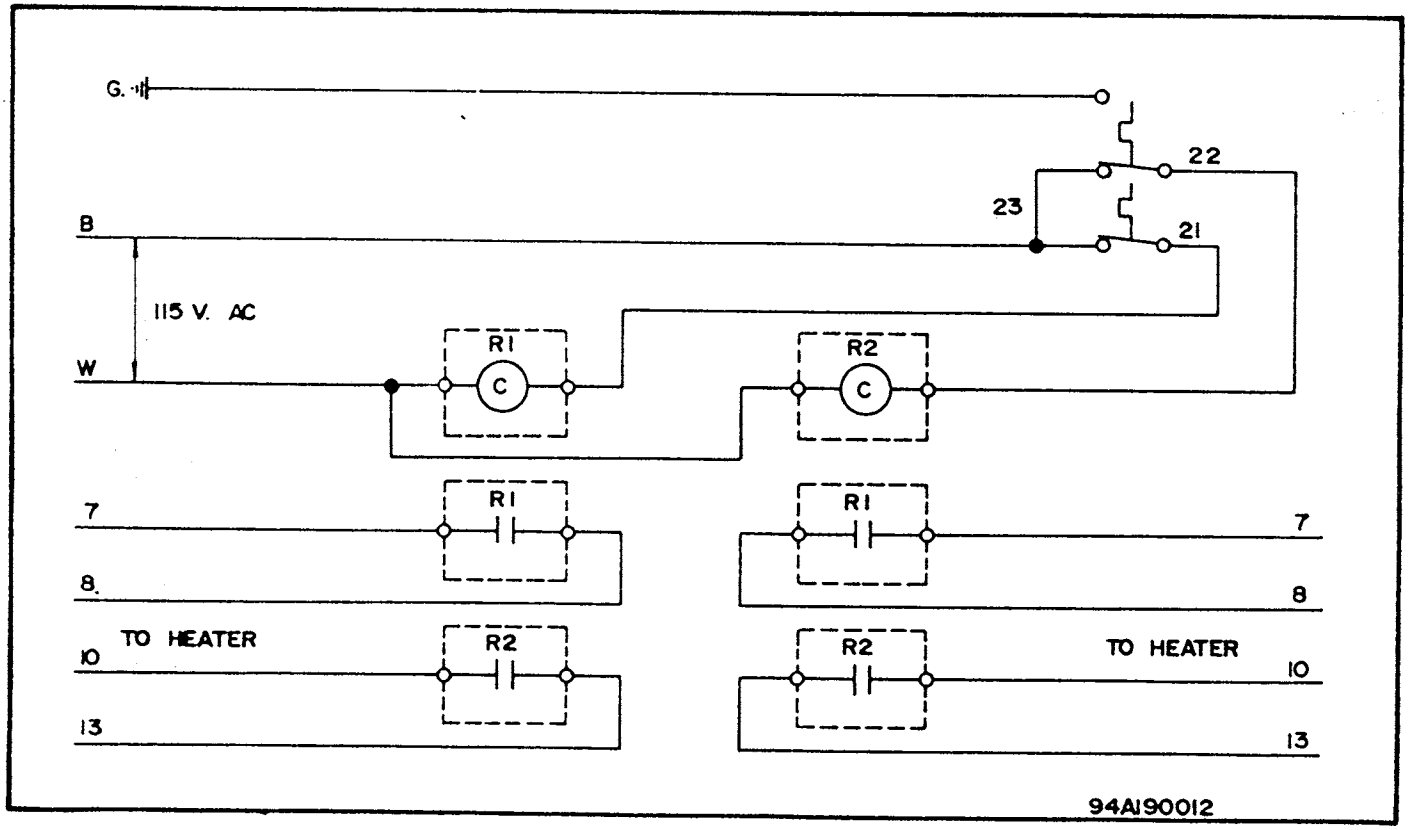
THE FOLLOWING PARTS NOT SHOWN IN ILLUSTRATION

Part #	Description	Qty Req.
J4010	Yellow scotch lock	1
J5005	7W-2 Heyco bushing	2
D6566-02	#16 wire, 16", red	2
D3970-05	# 16 wire, 18", green w/terminals	1
J3830	Female spade insulated	8
J3815	Eyelet ring terminal	4
J1125	1/2" flat washer	2
J0996	Pipe locknuts 1/4"	1
D3970-04	#16 Red wire 10" x 3" w/terminals	1
J5080	DP562 Heyco hole plug	1

INSTALLATION STEPS

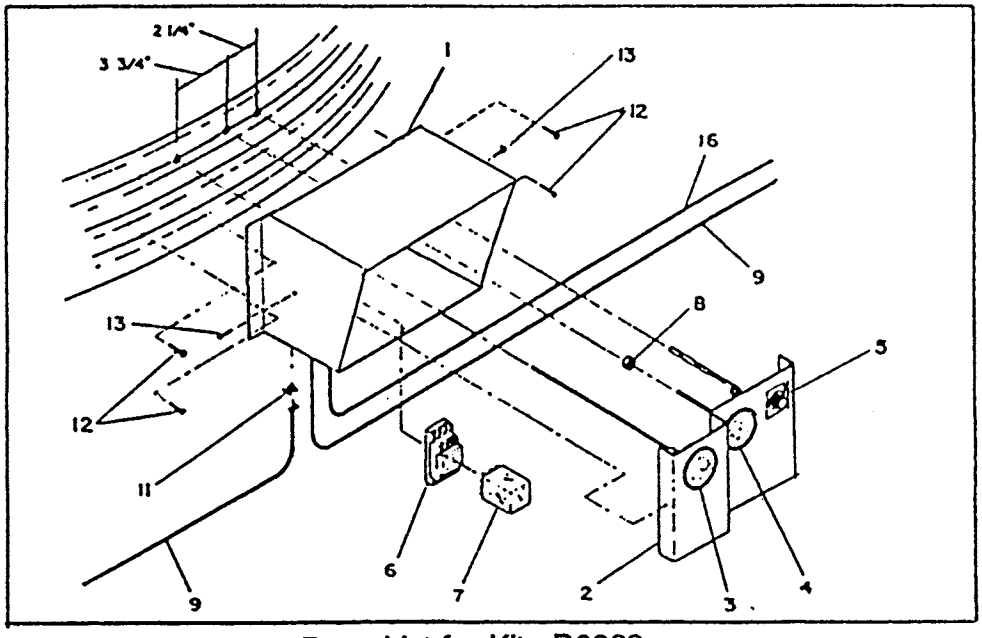
1. Locate relay box on bin wall half way between the two heaters. Heaters should be one bin sheet apart. Relay box should be located low enough so that when holes are drilled they enter plenum chamber under floor.
2. After selcting best location for relay box, drill 3 - 1/2" holes on a hill of the bin wall corrugation. Holes should be 3 3/4" apart and 2¼" apart and in a straight line on the hill. See illustration.
3. Carefully insert plastic tube, thermometer stem, and thermostat bulb into the proper holes. Mount box to bin wall with 4 - #10-16 x 1" self-tapping screws.
4. Remove hi-lo thermostats from heaters. Run 18-5 cords from relay box to each heater. Connect wires of new cords to same terminals as hi-lo thermostat. Re-connect by numbers on wires.
5. Connect power cord to one heater. Drill 7/8" hole in back of one control box. Insert remaining 18/3 cord in hole. Secure with Heyco bushing. Connect black wire to L1, white wire to 2, and green wire to ground.
6. Test run heaters. Heaters should now cycle simultaneously. Check with heater manual in hi-lo section for setting thermostat. If heaters do not operat correctly, check all connections.
7. Thermostat and relays control both heaters. Thermometer shows plenum temperature. Pressure gauge shows static pressure.





96A500002

SUBJECT: Deluxe Dual Burner Control - Regular Thermostat



Parts List for Kit: D3969
D4480*

Ref. #	Part #	Description	Req'd.
1	D3972	Box	1
2	D39731*	Gauge panel	1
	D39732	Gauge panel	1
3	D3940	Static Pressure Gauge w/ tube & conn.	1
4	J5845	60-220 4" stem thermometer	1
5	J5842	Thermostat	1
6	J3881	Relay II pin socket 5 x 853	1
7	J3880	Relay 5 x 838	1
8	J4970	5 x 561 Rubber grommet	3
9	D4482	18-3 cord, 25' w/terminals(red & silver)	2
11	J5040	7k-2 Heyco bushing	3
12	J0470	#10-16 x 1" TEK screw	4
13	J0460	#8-18 x 1/2" TEK screw	2
16	D44821	18-3 cord, 25' long w/terminals,(pink)	1

*D4480 parts list is the same, less static pressure gauge D3940, thermometer J5845, and two rubber grommets J4970.

INSTALLATION STEPS

1. Two heaters should be installed about one bin sheet apart. Select location for relay box half-way between two heaters and low enough so that when holes are drilled for thermostat, thermometer, and pressure gauge, they enter plenum chamber below floor.
2. After selecting location for relay box, drill 3 - 1/2" holes on hill of bin sheet. See illustration.
3. Carefully insert plastic tube, thermometer stem and thermostat bulb into the proper holes. Mount box to bin wall with four #10 - 16 x 1 self-tapping screws.

4. Remove thermostats from heaters. Run one 18-3 cord (#9) to each heater. Connect wires of these cords to same terminals that thermostats were connected to.

5. Drill 7/8" hole in back of one control box. Insert remaining 18-3 cord (#10) in hole. Secure with Heyco bushing. Connect black wire to L1, white wire to L2, and green wire to ground.

6. Check with heater manual for setting thermostat. Test run heaters. They should now cycle simultaneously. If they do not, check all wire connections.

7. Thermostat controls both heaters, thermometer shows plenum temperature, and pressure gauge shows static pressure.