



IM-278-TS
Feb. 1991

NA-3N and NA-3NF
NA-3S and NA-3SF
NA-4

SEC. L6.8 TROUBLESHOOTING GUIDE



THE LINCOLN ELECTRIC COMPANY

World's Leader in Welding and Cutting Products • Premier Manufacturer of Industrial Motors

Sales and Service through Subsidiaries and Distributors Worldwide

Cleveland, Ohio 44117-1199 U.S.A.



WARNING

ARC WELDING can be hazardous.

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety information it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting - ANSI Standard Z49.1" from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974. A Free copy of "Arc Welding Safety" booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.



ELECTRIC SHOCK can kill.

- 1.a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
- 1.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:
 - Semiautomatic DC Constant Voltage (Wire) Welder.
 - DC Manual (Stick) Welder.
 - AC Welder with Reduced Voltage Control.
- 1.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically "hot".
- 1.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.
- 1.e. Ground the work or metal to be welded to a good electrical (earth) ground.
- 1.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.
- 1.g. Never dip the electrode in water for cooling.
- 1.h. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.
- 1.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.
- 1.j. Also see Items 4.c. and 6.



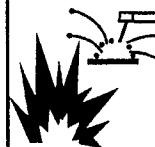
ARC RAYS can burn.

- 2.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.
- 2.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- 2.c. Protect other nearby personnel with suitable non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.



FUMES AND GASES can be dangerous.

- 3.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fumes. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and below Threshold Limit Values (TLV) using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.
- 3.b. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
- 3.c. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.
- 3.d. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer's safety practices. MSDS forms are available from your welding distributor or from the manufacturer.
- 3.e. Also see item 7b.



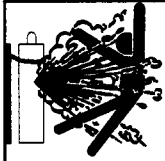
WELDING SPARKS can cause fire or explosion.

- 4.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.
- 4.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.
- 4.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
- 4.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned." For information purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1 from the American Welding Society (see address above).
- 4.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.

4.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

4.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

4.h. Also see item 7c.



CYLINDER may explode if damaged.

5.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.

5.b. Always keep cylinders in an upright position securely chained to an trailer or fixed support.

5.c. Cylinders should be located:

- Away from areas where they may be struck or subjected to physical damage.
- A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

5.d. Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.

5.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

5.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

5.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.



7.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.



7.d. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

7.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

7.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

7.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.



7.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.



FOR ELECTRICALLY powered equipment.

6.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

6.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.

6.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.



FOR ENGINE powered equipment.

7.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.



7.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.



ELECTRIC AND MAGNETIC FIELDS may be dangerous

8.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines.

8.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

8.c. Exposure to EMF fields in welding may have other health effects which are now not known.

8d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

8.d.1. Route the electrode and work cables together - Secure them with tape when possible.

8.d.2. Never coil the electrode lead around your body.

8.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

8.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

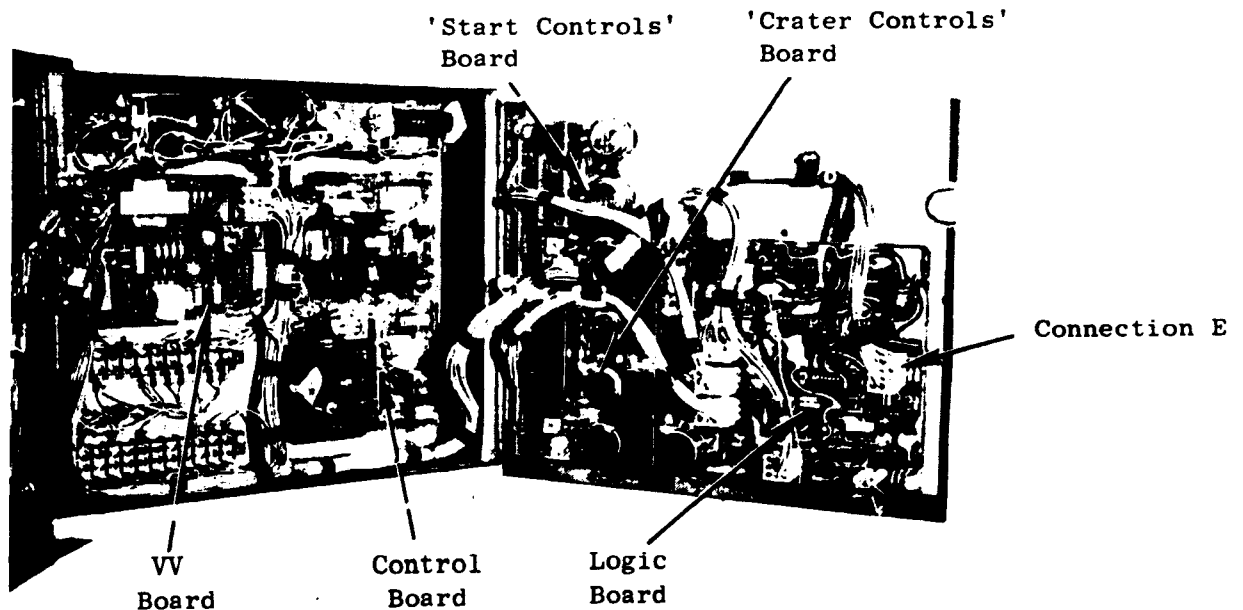
8.d.5. Do not work next to welding power source.

HOW TO USE THIS GUIDE

1. Locate your general problem from among the CAPITALIZED problems in the index on pages 8 and 9.
2. Locate your specific problem on the list under the appropriate general problem. Be certain you determine in which mode or modes the problem occurs. Following instructions for a problem in the inch mode, for example, when the problem actually occurs in all modes can lead to the wrong conclusion.
3. Turn to the page indicated and follow the step-by-step instructions to find the solution.
4. When a P.C. Board is to be replaced, follow procedure outlined on page 2.

Caution: Before making or breaking any connections inside the control box, turn the input power to the control box off at the power source. Turning the 'Control Power' switch 'Off' removes voltage from the circuitry but 115 volt input power is still present at #31 and #32 on the terminal strip and at the hot side of the 'Power Switch'.

Whenever the 'Start' button is pressed, power source output voltage is present between the head or electrode and the work and between the terminals on the voltmeter until the 'Stop' button is also pressed.



P. C. BOARD LOCATION

PROCEDURE FOR REPLACING P. C. BOARDS

Before replacing a P. C. board which is suspected of being defective, visually inspect the P. C. board in question for any electrical or mechanical damage to any of its components and conductors on the back of the board.

- A. If there is no visible damage to the P. C. board, install a new one and see if this remedies the problem. If the problem is remedied, re-install the old P. C. board to see if the problem still exists. If it no longer exists with the old P. C. board, then:
 1. Check the P. C. board harness connector pins for corrosion, contamination, or looseness.
 2. Check leads in the plug harness for loose or intermittent connection.

- B. If P. C. board is visibly damaged electrically, before possibly subjecting the new P. C. board to the same cause of failure, check the following:
 1. Inspect for possible shorts, opens or grounds caused by:
 - a. Frayed or pinched lead insulation.
 - b. Poor lead termination, such as a poor contact or a short to adjacent lug or surface.
 - c. Shorted or open motor or other external leads.
 - d. Foreign matter or interference behind the P. C. boards or inside control box.
 2. If any special connections or rewiring was done, make certain it was done precisely per factory wiring diagrams and/or instructions.

- C. If P. C. board is visibly damaged mechanically, inspect for cause then remedy before installing a replacement P. C. board.

LIGHT STATUS TABLE

NA-3N or NA-3S Connected to Cor

(See page 5 when NA-3S is connec

OPERATOR OR MACHINE FUNCTION		IDLE	PRESS "INCH UP"	PRESS "INCH DOWN"		
FUNCTION INDICATED BY LIGHT	LIGHT NUMBER	P.C. BOARD LOCATION			ELECTRODE NOT TOUCHING WORK	ELECTRODE NOT TOUCHING WORK
Inch Up Switch Pressed	1A	Control		ON		
Logic Signal for Motor to "Run"	1B	Control			ON	
"Down" Field Voltage Applied	1C	Control			ON	
"Up" Field Voltage Applied	1D	Control	ON	ON		
Armature Voltage Applied	1E	Control		ON	ON	
"OCV Control" and Inch Speed Control Operative	2A	Logic	ON	ON	ON	
Start Switch Pressed	2B	Logic				
Stop Switch Pressed	2C	Logic				
Welding Current Present	2D	Logic	DIM	DIM	DIM	
Signal to Apply "Down" Field Voltage	2E	Logic			ON	
Signal to Operate Flux or Water Solenoid	2G	Logic				
Signal to Energize Travel Circuit	Optional Modes of Travel					
	Travel Start	Travel Stop				
	Press Start Switch	Press Stop Switch	2H	Logic		
	Start of Welding Current	End of Welding Current	2H	Logic		
	Start of Welding Current	Press Stop Switch	2H	Logic		
	Press Start Switch	After Crater Fill	2H	Logic		
Inch Down Switch Pressed	2J	Logic			ON	
Signal to Operate Power Source Contactor	2K	Logic				
Weld Current Control and Weld Voltage Control Operative	2L	Logic				
Electrode Voltage (Output from VV Board)	3A	Variable Voltage	ON	ON	ON	
Electrode Voltage (Input to VV Board)	3B	Variable Voltage	*	*	ON	
Start Current & Voltage Control Operative	4A	Start				
Start Cycle "Ready"	4B	Start	ON	ON	ON	
"Crater" Current & Voltage Control Operative	4A	Crater Fill				
Crater Fill Cycle "Ready"	4B	Crater Fill	ON	ON	ON	

* Light on only when NA-3 is connected to power source output contactor and idle OCV is

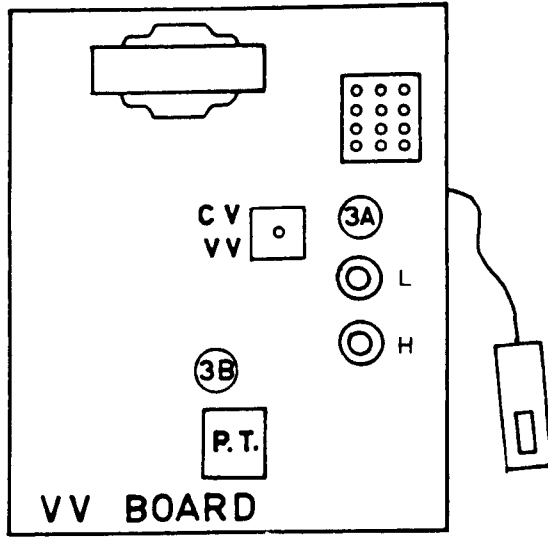
LIGHT STATUS TAB

ON only while switch is pressed.

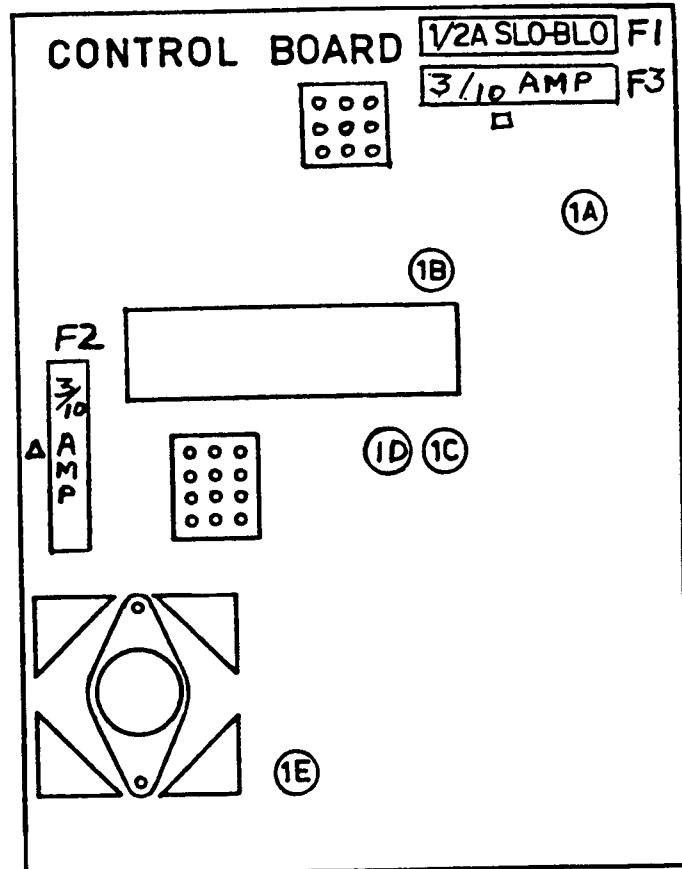
FUNCTION INDICATED BY LIGHT	LIGHT NUMB	OPERATOR OR M. OF BURN-BACK			IDLE
		NCH UP DELAY	WIRE FEED INCH UP NO CONTACTOR DELAY		
			ARC OUT	BEGIN INCH UP	
Inch Up Switch Pressed	1A				
Logic Signal for Motor to "Run"	1B	ON	ON		
"Down" Field Voltage Applied	1C				
"Up" Field Voltage Applied	1D	ON	ON		ON
Armature Voltage Applied	1E	ON	ON		
OCV Control and Inch Speed Control Operative	2A	ON	ON		ON
Start Switch Pressed	2B				
Stop Switch Pressed	2C	ON	ON		
Welding Current Present	2D	DIM	DIM		DIM
Signal to Apply "Down" Field Voltage	2E				
Signal to Operate Flux or Water Solenoid	2G				
Signal to Energize Travel Circuit	Optional Modes of Travel				
	Travel Start	Travel Stop			
	Press Start Switch	Press Stop Switch	2H		
	Start of Welding Current	End of Welding Current	2H		
	Start of Welding Current	Press Stop Switch	2H		
	Press Start Switch	After Crater Fill	2H		
Inch Down Switch Pressed	2J				
Signal to Operate Power Source Contactor	2K	ON			
Weld Current Control * and Weld Voltage Control Operative	2L				
Electrode Voltage (Output from VV Board)	3A	ON	*		*
Electrode Voltage (Input to VV Board)	3B	ON	*		*
Start Current * & Voltage Control Operative	4A				
Start Cycle "Ready"	4B	ON	ON		ON
"Crater" Current * & Voltage Control Operative	4A				
Crater Fill Cycle "Ready"	4B	†	†		ON

† if cycle time second. ① Machines below Code 7432 *
 ② Machines above Code 7432 *

NA-3 and NA-4 COMPONENT LOCATIONS

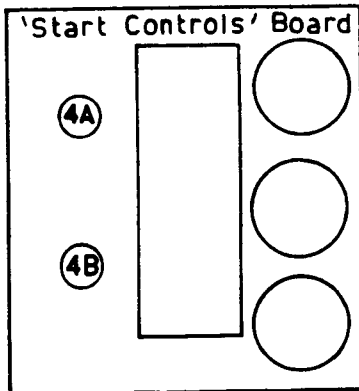


Standard on NA-3S and NA-4
Optional on NA-3N

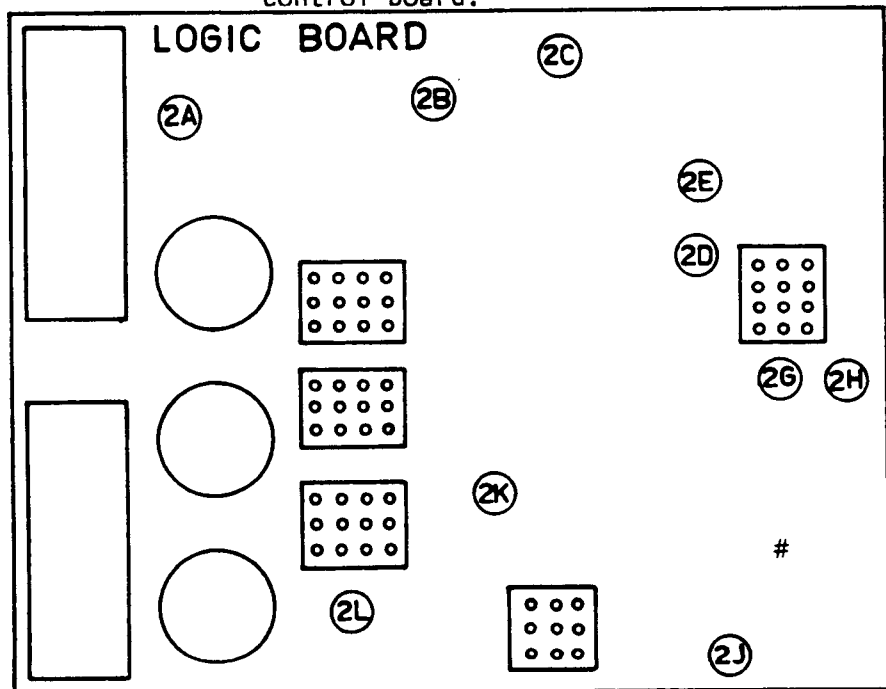
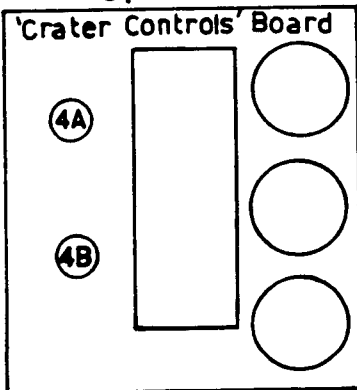


△ F2 was 2/10A on superseded L-5244-1 Control Bd.
□ F3 was not included on superseded L-5244-1 Control Board.

(Optional)



(Optional)

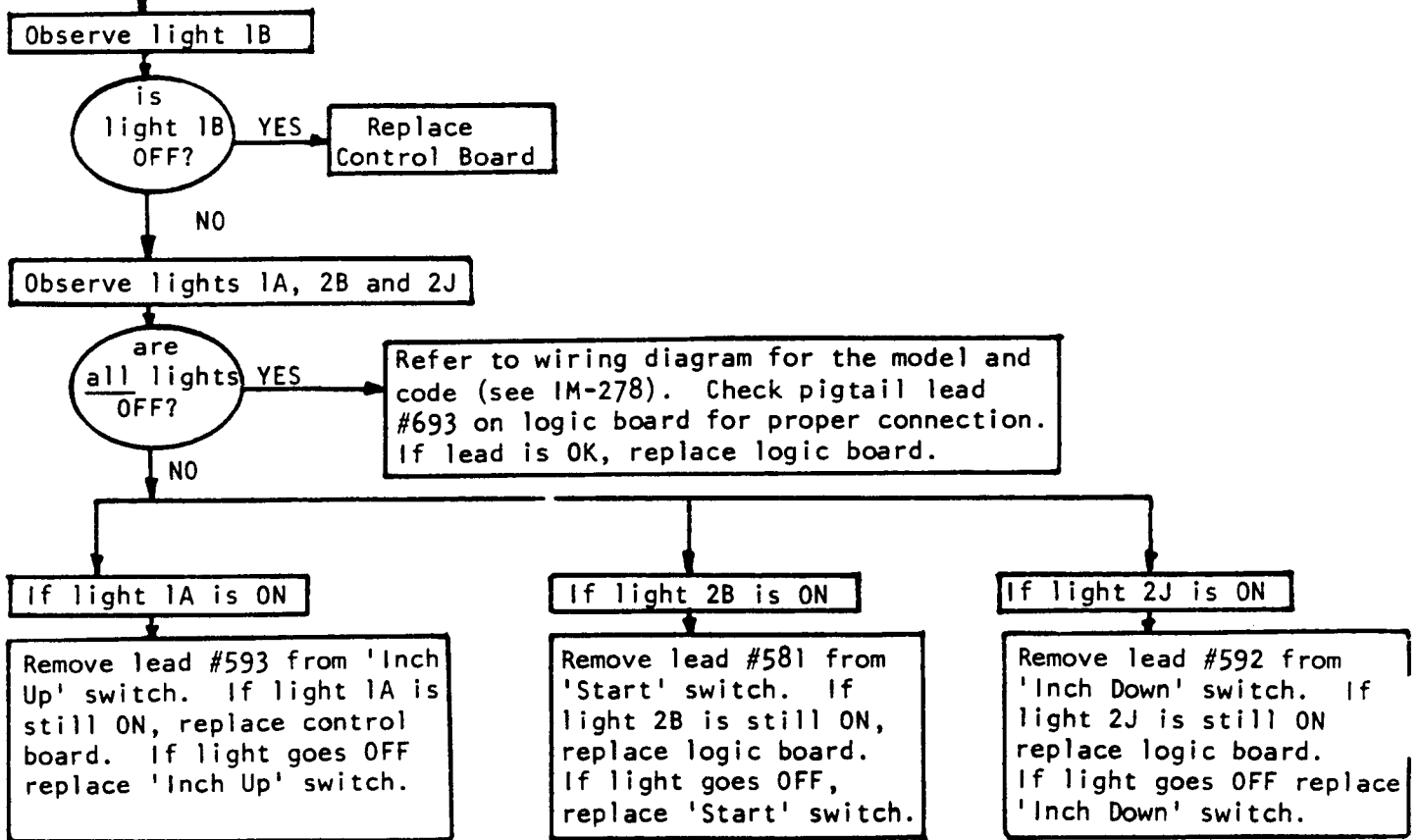


* Jumper lead present on boards made after last quarter of 1976.

PROBLEM NUMBER	DESCRIPTION	SEE PAGE
A	<u>CONTINUOUS WIRE FEED</u> (whenever 'Power Switch' is 'On')	10
B	<u>NO WIRE FEED OR WRONG WIRE FEED DIRECTION:</u> { When pressing 'Inch Up', 'Inch Down' or 'Start' buttons:	
B1	No wire feed at all.	11
B2	Wire won't feed and circuit breaker trips	12
B3	Wire won't feed and no reading on voltmeter when the 'Start' button is pressed. Wire inches up and down OK	12
B4	Wire feeds up when it should feed down and vice versa Wire won't inch down but inches up OK. Press the 'Start' button:	12
B5	If the wire feeds down, see page	13
B6	If the wire does not feed, see page	13
B7	If the wire feeds up instead of down, see page	14
B8	Wire feeds up instead of down when the 'Start' button is pressed. Inches OK with 'Inch Down' button (with VV boards only)	20
B9	Wire doesn't stop when it touches the work with cold starting	14
B10	Wire won't inch up but inches down and welds OK	15
B11	Wire feeds only up with both 'Inch' buttons	15
B12	Wire feeds only down with both 'Inch' buttons	15
C	<u>WIRE FEEDS AT FULL SPEED</u> (no control) or <u>POOR CONTROL OF FEED SPEED</u> (minimum speed, limited or erratic control):	
	Wire Feeds at Full Speed (no control):	
C1	during inch mode only	16
C2	during weld mode only	27
C3	during inch and weld modes	16
C4	during start mode only (optional 'Start Controls')	17
C5	during crater mode only (optional 'Crater Controls')	17
C6	Limited wire feed speed in more than one mode	16
C7	Minimum speed, limited speed control or erratic speed control in one or more modes	18
C8	No control of voltage and current in weld mode only	19
D	<u>NO POWER SOURCE OUTPUT</u> (no voltmeter reading):	
D1	Power source contactor not pulling in. Check contactor operation. If OK, see Problem D2.	
D2	No output (voltmeter reading) when pressing 'Start' button	20
E	<u>POOR CONTROL OF POWER SOURCE OUTPUT</u> with 'Voltage Control', 'Current Control' or optional 'Start Controls' and 'Crater Controls':	
	No output control (usually full output or very low output):	
E1	in all modes	21
E2	in start mode only (optional 'Start Controls')	17
E3	in weld mode only	27
E4	in crater mode only (optional 'Crater Controls')	17
	Limited or erratic control:	
E5	in start mode only (optional 'Start Controls')	17
E6	in weld mode only	21
E7	in crater mode only (optional 'Crater Controls')	17
E8	in more than one mode	16

PROBLEM NUMBER	DESCRIPTION	SEE PAGE
F	<u>POOR ARC STARTING:</u>	
F1	Wire does not feed when 'Start' button is pressed --- see Problem B	
F2	No power source output --- see Problem D	
F3	Poor control of power source output --- see Problem E	
F4	No control of motor-generator power source OCV with 'Open Circuit Voltage' control	21
F5	Limited or erratic control of motor-generator OCV with 'Open Circuit Voltage' control only	21
F6	Wire feeds at full speed --- see Problem C	
F7	Poor control of wire feed speed --- see Problem C	
F8	Wire doesn't stop when it touches the work with cold starting	14
G	<u>WILL NOT WELD PROPERLY:</u>	
G1	Circuit breaker trips while feeding wire	22
G2	Wire feeds at full speed or poor control of feed speed --- see Problem C	
G3	Poor control of power source output --- see Problem E	
G4	No control of voltage <u>and</u> current in weld mode only	19
H	<u>TRAVEL CIRCUIT DOES NOT FUNCTION PROPERLY:</u>	
H1	Won't run at all	23
H2	Won't run with switch on 'Automatic Travel'	23
H3	Runs continuously with switch on 'Automatic Travel'	23
H4	Won't run with switch on 'Hand Travel'	23
J	<u>CIRCUIT BREAKER TRIPS:</u>	
J1	while feeding wire	22
J2	while pressing the 'Inch' or 'Start' buttons	12
J3	with wire feeder at idle	22
K	<u>DOES NOT STOP WELDING PROPERLY</u> when 'Stop' button is pressed: With optional 'Crater Controls' board:	
K1	wire feeds at full speed --- see Problem C	
K2	poor control of power source output --- see Problem E	
K3	Power source contactor does not drop out	24
K4	Welding does not stop	24
K5	Burnback time cannot be properly set	24
L	<u>FLUX VALVE OR OPTIONAL GAS/WATER SOLENOID:</u>	
L1	does not open at all	25
L2	remains open continuously	25
L3	Flux valve does not open when 'Start' button is pressed but does open when electrode touches work	25
L4	(When cold starting) flux valve does not open when wire touches the work while pressing 'Inch Down' button	25
M	<u>OPTIONAL USER INSTALLED CURRENT ACTUATED RELAY (5CR):</u>	
M1	will not operate	26
M2	remains pulled in continuously	26

PROBLEM A CONTINUOUS WIRE FEED (WHENEVER THE 'CONTROL POWER' SWITCH IS ON)



PROBLEM B1 WIRE DOES NOT FEED AT ALL - UP OR DOWN

Make sure 'Control Power' switch is 'ON'.

Check circuit breaker on left side of cover to see if it is tripped.

Is breaker tripped?

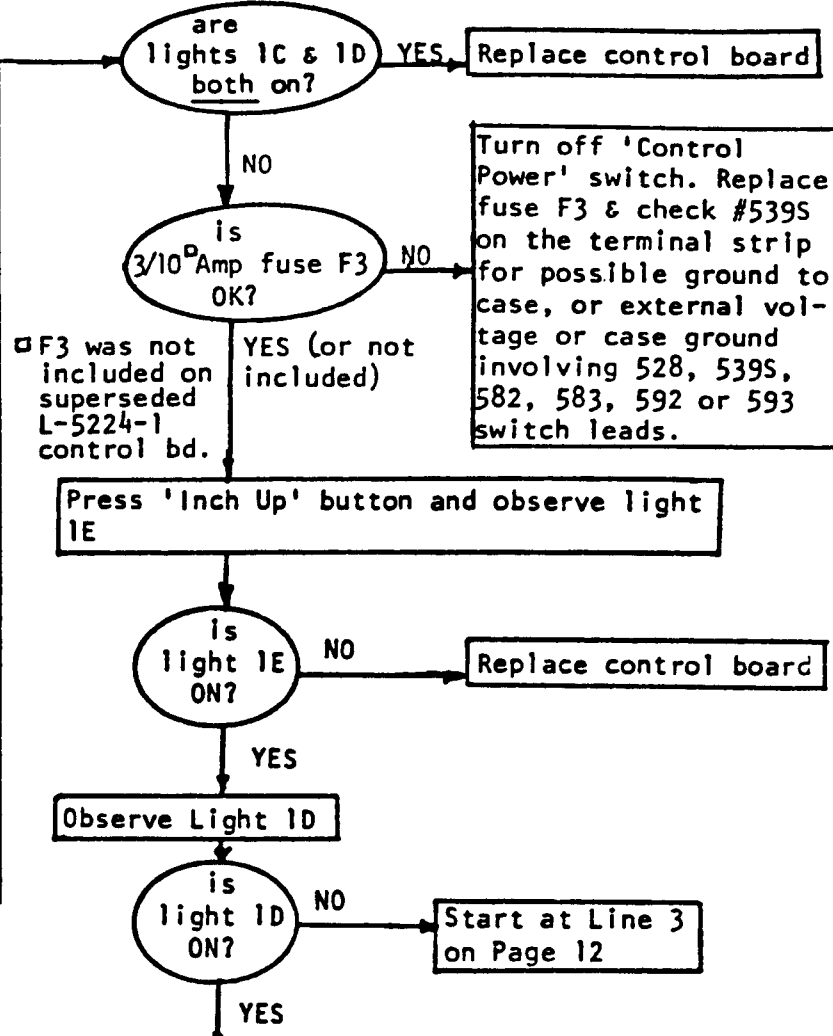
Reset breaker. See Problem J on Page 9

NO

Open the sub panel and see if any of the lights on the P.C. boards are ON

are any lights ON?

YES



□ F3 was not included on superseded L-5224-1 control bd.

Press 'Inch Up' button and observe light 1E

is light 1E ON?

NO

Replace control board

YES

Observe Light 1D

is light 1D ON?

NO

Start at Line 3 on Page 12

YES

Check wire feed motor for worn brushes, bad connections, etc. Check continuity of motor leads back to control board.

Check 3/10^A amp fuse F2 on control board.

^A F2 was 2/10 A on superseded L-5224-1 control board.

is fuse OK?

YES

No A.C. input to control box. Check #31 and 32 connections and continuity.

NO

Turn off 'Control Power' switch on door and replace fuse F2. Check #510 on the terminal strip for possible ground to case, short to adjacent leads, or external voltage or short between 510 and 681, 682, 585 or 589. If no faults are found, unplug all P.C. boards, except the Control Board. Turn on 'Control Power' switch and check fuse F2:

is fuse OK?

NO

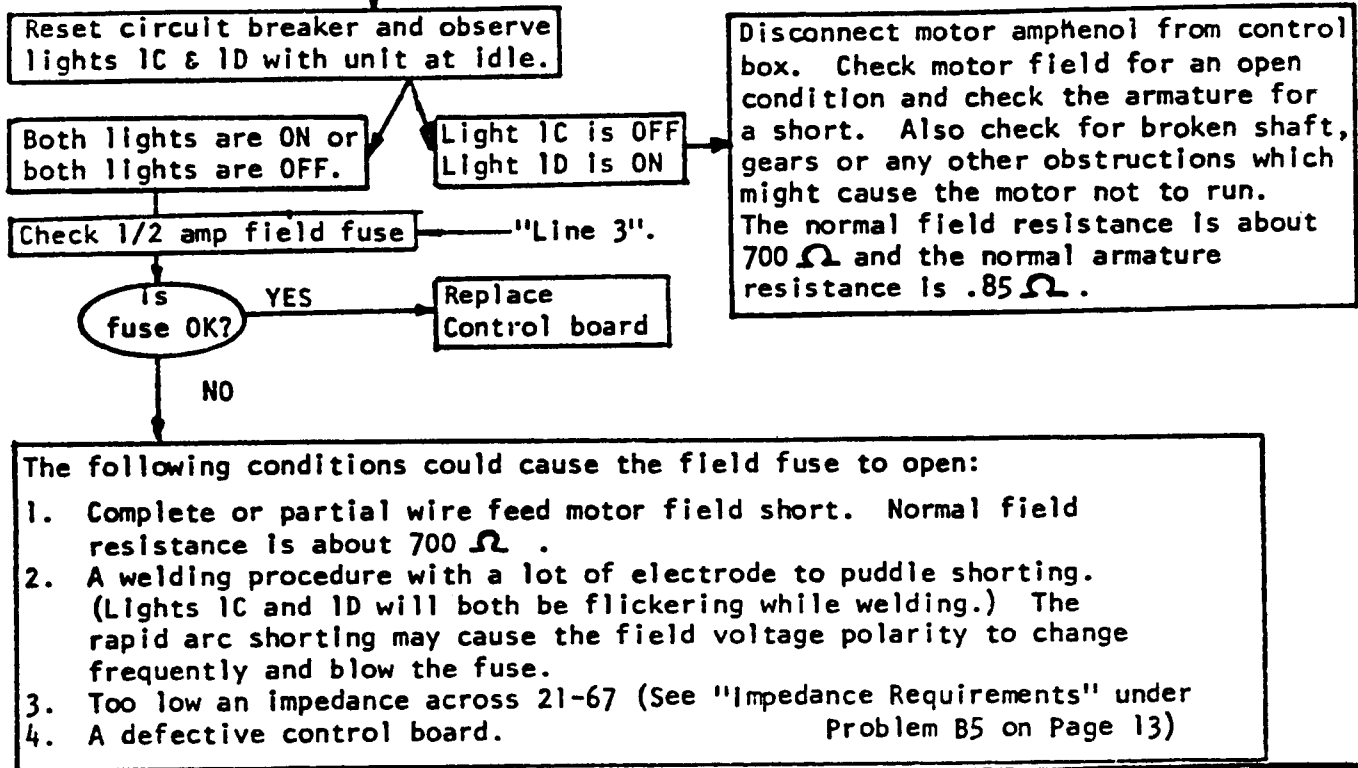
Replace control board

YES

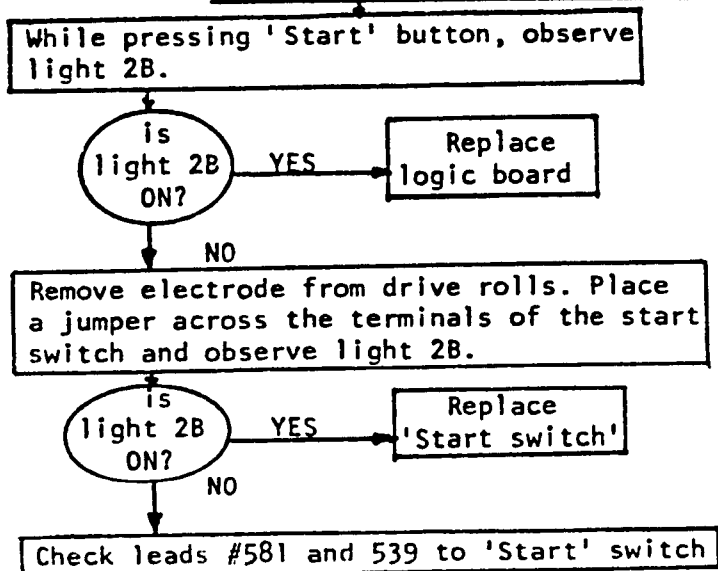
Turn off 'Control Power' switch. Continue to plug the P.C. boards back into the lead harness until the one is found which causes fuse F2 to blow. Replace that particular board. Connect boards back in this order:

- 1) Logic board
- 2) V.V. Board
- 3) Optional start and crater boards

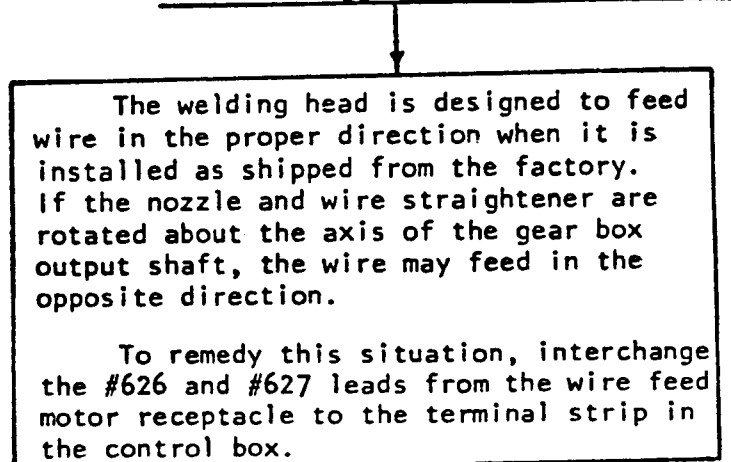
PROBLEM B2 & J2 WIRE WON'T FEED AND CIRCUIT BREAKER TRIPS WHILE PRESSING 'INCH' OR 'START' BUTTONS



PROBLEM B3 WIRE WON'T FEED AND NO VOLTMETER READING WHEN 'START' BUTTON PRESSED. WIRE INCHES UP AND DOWN OK.

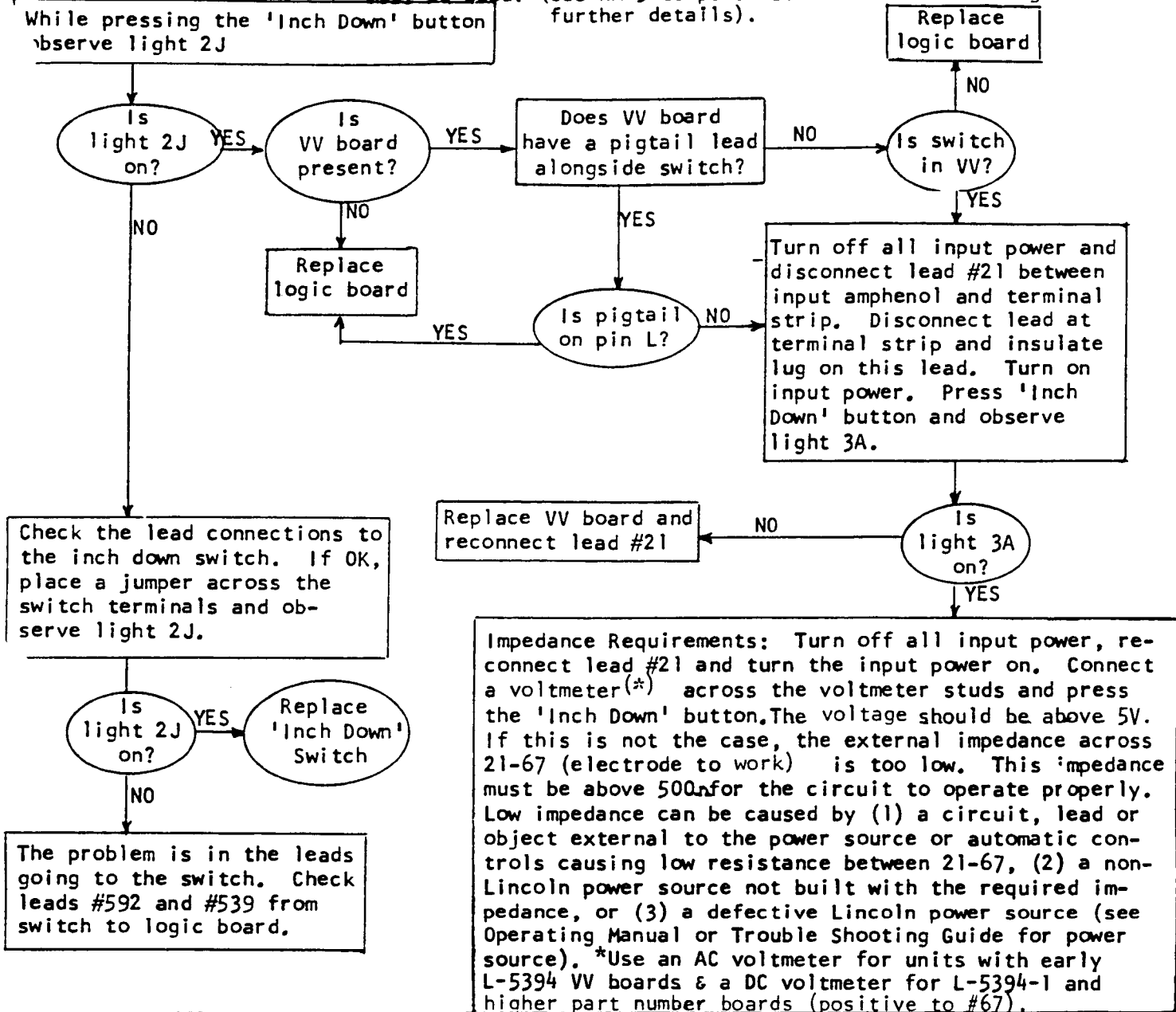


PROBLEM B4 WIRE FEEDS UP WHEN IT SHOULD FEED DOWN & FEEDS DOWN WHEN IT SHOULD FEED UP

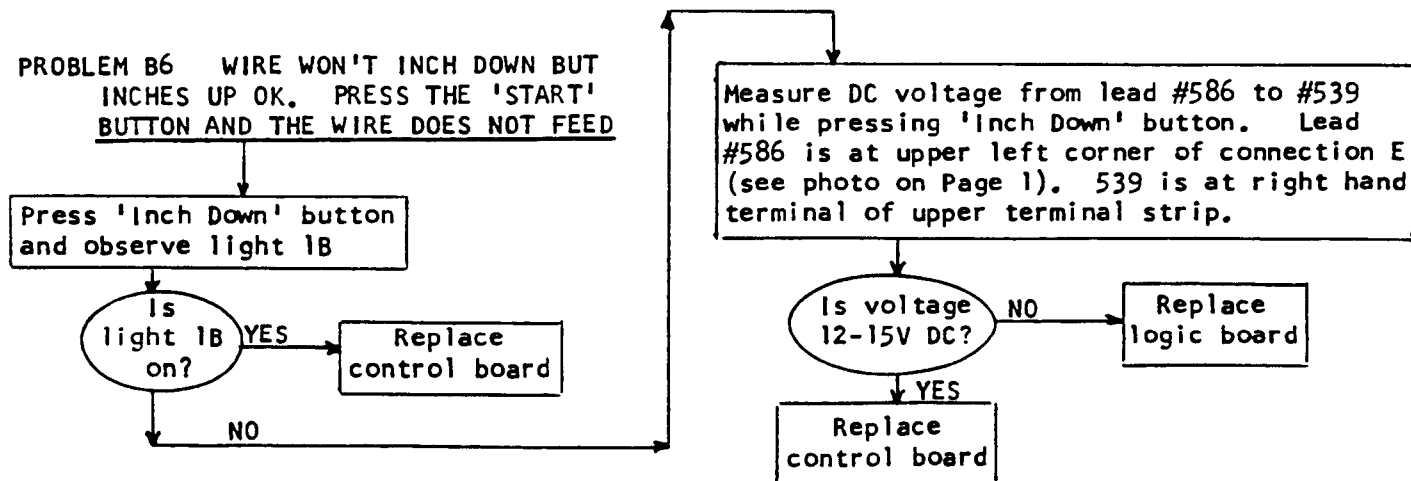


**PROBLEM B5 WIRE WON'T INCH DOWN BUT INCHES UP O.K.
PRESS THE 'START' BUTTON AND THE WIRE FEEDS DOWN.**

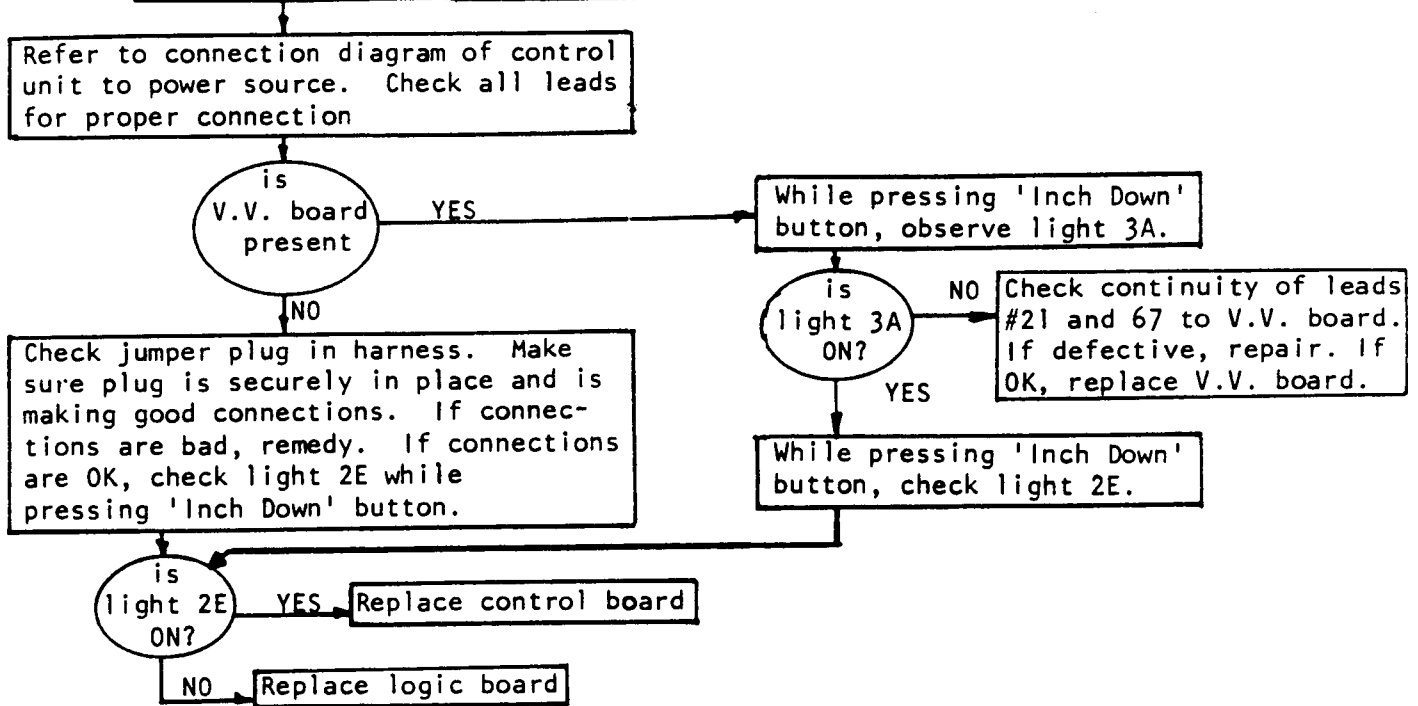
NOTE: If using a DC-400, CV-400 or PP-500 power source, the Diode Option must be used. (See NA-3 to power source connection diagram for further details).



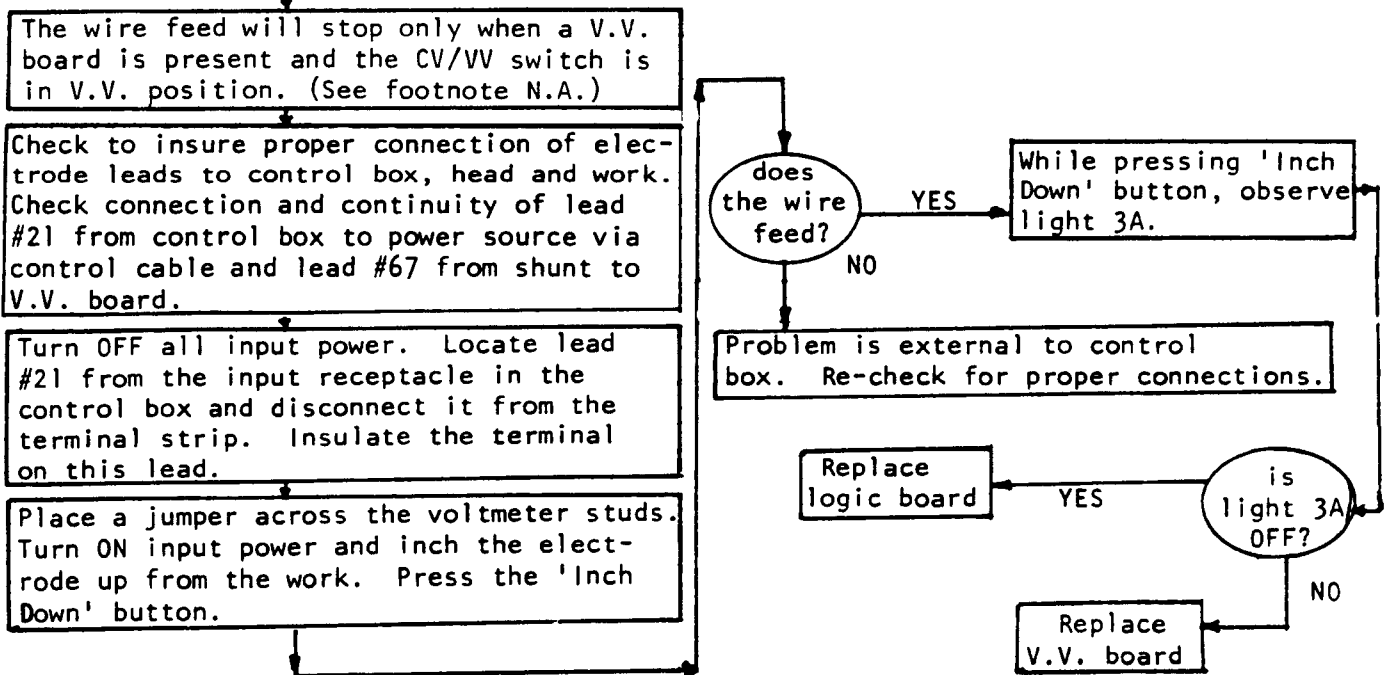
PROBLEM B6 WIRE WON'T INCH DOWN BUT INCHES UP OK. PRESS THE 'START' BUTTON AND THE WIRE DOES NOT FEED



PROBLEM B7 WIRE WON'T INCH DOWN BUT INCHES UP OK. PRESS THE 'START' BUTTON AND THE WIRE FEEDS UP INSTEAD OF DOWN.

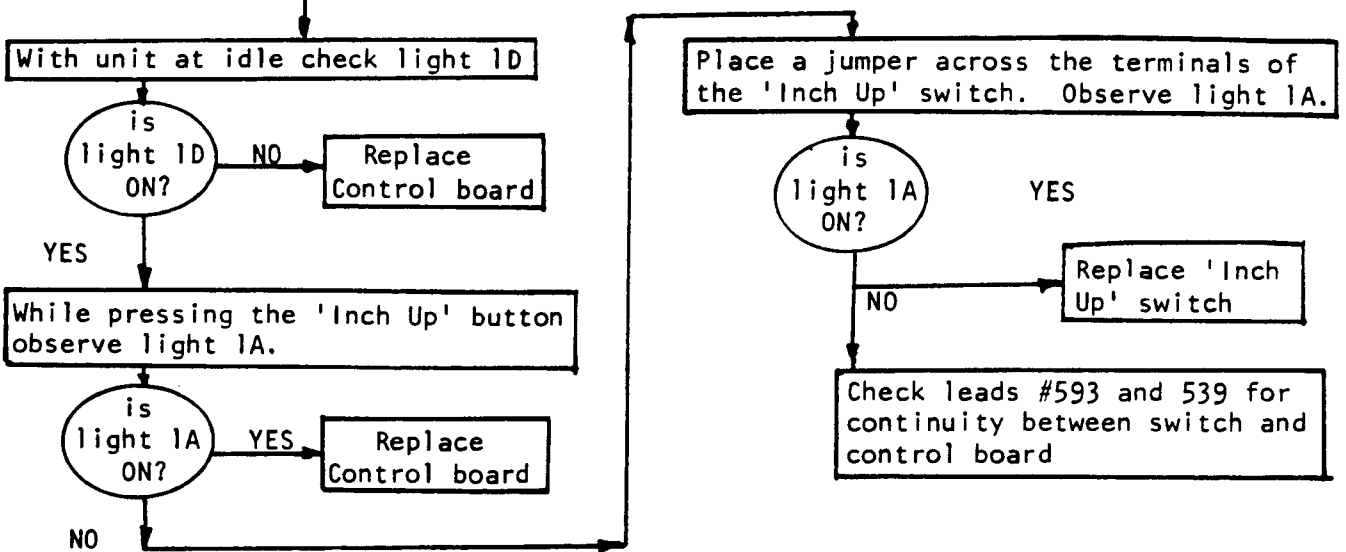


PROBLEM B9 & F8 WIRE DOESN'T STOP WHEN IT TOUCHES THE WORK WITH COLD STARTING.

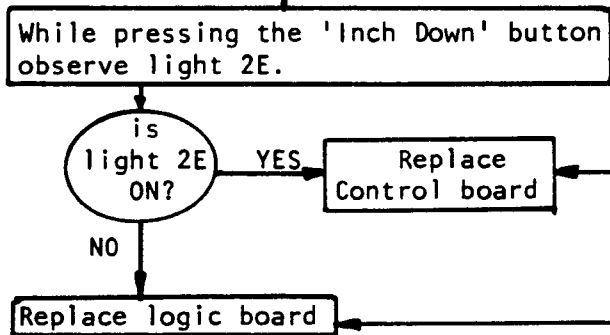


N.A. On older V.V. boards only. On V.V. boards made after last quarter of 1976 the wire will stop in either C.V. or V.V. mode as long as the jumper lead on the V.V. board is on pin H. If jumper lead is on pin L, the wire will not stop no matter where switch is set.

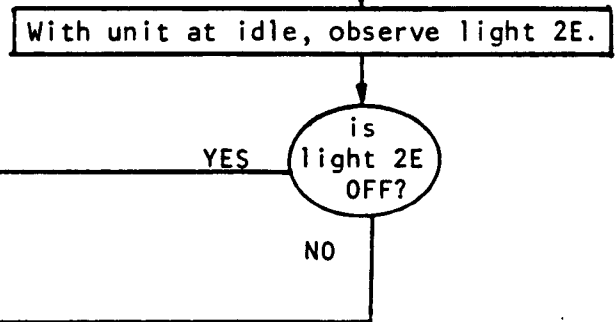
PROBLEM B10 WIRE WON'T INCH UP BUT INCHES DOWN AND WELDS OK.



PROBLEM B11 WIRE FEEDS UP WITH BOTH 'INCH' BUTTONS.



PROBLEM B12 WIRE FEEDS DOWN WITH BOTH 'INCH' BUTTONS.



PROBLEM C1 WIRE FEEDS AT FULL SPEED DURING INCH MODE ONLY (1)

With unit at idle, check light 2D

is light 2D ON?

NO

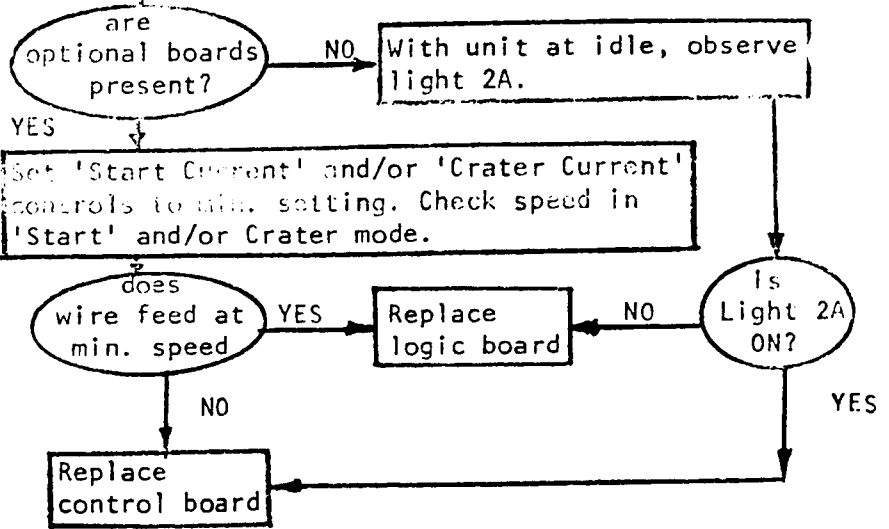
Replace logic board

YES

If control box is an NA-3, replace reed switch 4CR. If it is an NA-4 replace the current sensor P.C. board.

(1) To check weld mode, remove electrode from drive rolls and place a jumper across #528 and #539 on the terminal strip in the control box. Press 'Start' button. CAUTION: Power source output voltage is across head and work. Press 'Stop' button. If wire also feeds full speed in weld mode with no control, see Problem C3.

PROBLEM C3 WIRE FEEDS AT FULL SPEED IN INCH AND WELD MODE.



PROBLEM C6 & E8 LIMITED WIRE FEED SPEED AND/OR LIMITED POWER SOURCE OUTPUT CONTROL IN MORE THAN ONE MODE (INCH, START, WELD OR CRATER).

If V.V. board is present, place CV/VV switch in CV position. (See Note N.A.)

Place a jumper across #528 and #539 on terminal strip in control box. Observe lights 2A, 2L and 4A on the start or crater fill board, if present.

are all these lights OFF?

YES

If wire feed speed control(2) is the problem, see Problem C7 on Page 18. If power source output control is the problem, see trouble shooting for the power source or optional K224 'Solid State Remote Field Control'

NO

Whatever light is ON, replace the board on which it is located.

(2) For CV applications, the current control adjusts the wire feed speed. For VV applications, the wire feed speed is determined by the voltage control.

N.A. On V.V. boards made after last quarter of 1976, place the pigtail jumper lead alongside the CV/VV switch on pin L. After testing is completed, return lead to original position.

PROBLEM C4 & E2 WIRE FEEDS AT FULL SPEED AND/OR NO POWER SOURCE OUTPUT CONTROL IN START MODE ONLY.(1)

Remove electrode from drive rolls. Place a jumper across #528 and #539 on the terminal strip in the control box. Set start time to max. Press 'Start' button while observing light 4B on start board. CAUTION: When 'Start' button is pressed full power source voltage is across head and work.

does light 4B go OFF?

YES

Press 'Stop' button. Replace 'Start Controls' board.

NO

Press 'Stop' button. Replace logic board.

PROBLEM E5 LIMITED POWER SOURCE OUTPUT CONTROL OR ERRATIC CONTROL IN START MODE ONLY. START TIME CANNOT BE SET ACCURATELY.(1)

Press 'Stop' button. Replace 'Start Controls' board.

(1) Applies only to units with optional 'Start Controls' board installed

PROBLEM C5 & E4 WIRE FEEDS AT FULL SPEED AND/OR NO POWER SOURCE OUTPUT CONTROL IN CRATER MODE ONLY. (2)

Remove electrode from drive rolls. Push 'Start' button. CAUTION: Full power source output voltage is across head and work.

Set crater time to max. Press 'Stop' button while observing light 4B on crater board.

does light 4B go OFF?

YES

Press 'Stop' button.

Replace crater board

NO

Replace logic board

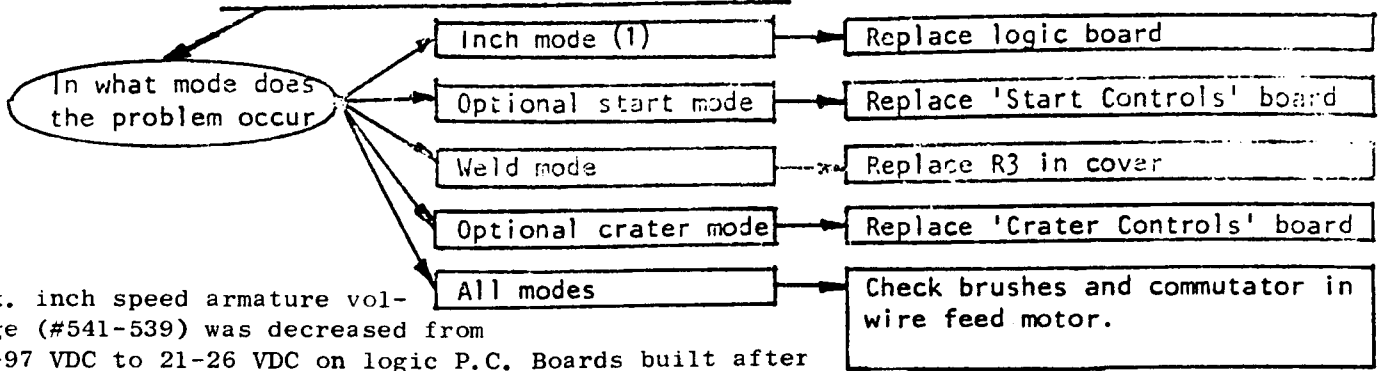
PROBLEM E7 LIMITED POWER SOURCE OUTPUT CONTROL OR ERRATIC CONTROL IN CRATER MODE. CRATER TIME CANNOT BE SET ACCURATELY.(2)

Press 'Stop' button.

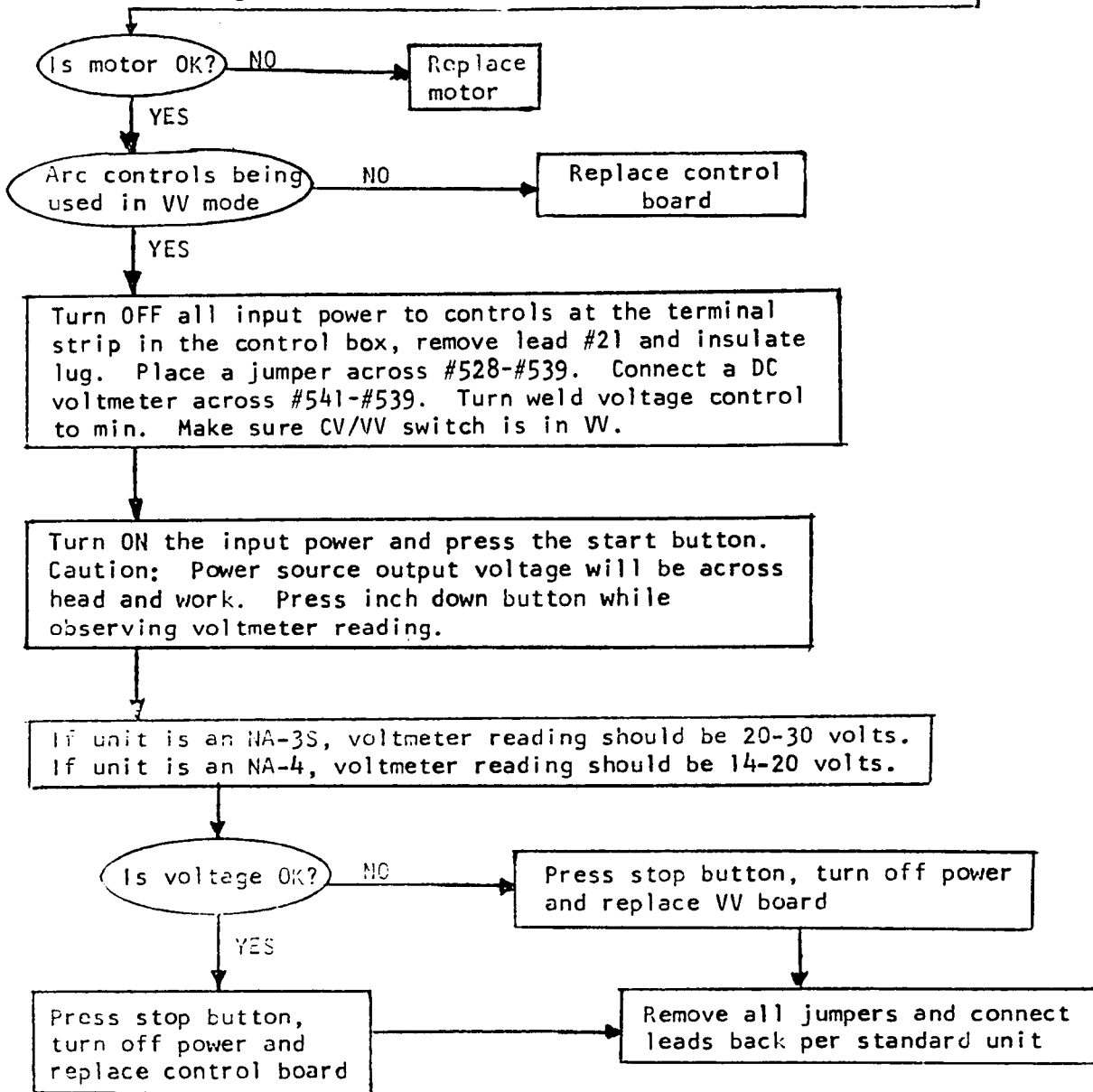
Replace crater board

(2) Applies only to units with optional 'Crater Controls' boards installed.

PROBLEM C7 MINIMUM FEED SPEED, LIMITED SPEED CONTROL OR ERRATIC SPEED CONTROL IN ONE OR MORE MODES.



(1) Max. inch speed armature voltage (#541-539) was decreased from 86-97 VDC to 21-26 VDC on logic P.C. Boards built after December 1976. (Logic P.C. Board date codes higher than 612)



PROBLEM C8 and G4 NO CONTROL OF VOLTAGE
AND CURRENT IN WELD MODE ONLY.

Turn OFF 'Control Power' switch and place a jumper across 528-539 on terminal strip.

Turn ON 'Control Power' switch, press 'Start' button and observe light 2D.

Is light 2D
ON bright?

NO

Check continuity of lead #528 from terminal strip to logic board, if OK replace logic board.

YES

Is Start P. C.
Board present?

YES

Turn start time to Min. Is light 4A on start board ON continuously?

NO

YES

Is light 2L ON?

Replace Start Board

NO

YES

Trouble is in reed switch of NA-3 or Current Sensor P. C. Board of NA-4 or in leads from either of these units to terminal strip. Press 'Stop' button.

Replace Logic Board

PROBLEM D2 NO POWER SOURCE OUTPUT
(NO VOLTMETER READING) WHEN
PRESSING 'START' BUTTON.

PROBLEM B8 WIRE FEEDS UP INSTEAD OF DOWN
WHEN 'START' BUTTON IS PRESSED.
INCHES OK WITH 'INCH DOWN' BUTTON.
(APPLIES ONLY TO MODELS WITH VV BOARDS.)

- 1) Check for proper connection of electrode leads and for proper connection of control cable leads to power source. (See connection diagram of control unit to appropriate power source.)
- 2) Check pigtail lead #690 on logic board for proper connection (See wiring diagram for the model and code - see IM-278.)

Remove electrode from drive rolls and press 'Start' button. Observe light 2K. CAUTION: When 'Start' button is pressed, full power source voltage is across head and work.

is
light 2K
ON?

NO

Turn OFF 'Control Power' switch on cover. Remove lead #682 from 3CR. Check resistance of relay coil between this relay terminal and #510. Resistance should be $10K \pm 10\%$.

YES

Turn OFF 'Control Power' switch on cover. Disconnect lead #2 going from input amphenol to terminal strip at terminal strip. Insulate the lug on this lead. Turn on 'Control Power' switch, press 'Start' button and measure resistance between #2 and #4 on terminal strip.

is
coil resistance
OK?

YES

Replace logic
board

NO

Replace relay 3CR

is
reading
zero

NO

Replace relay 3CR
in control box

YES

Turn OFF input power to control box.
Reconnect lead #2 to terminal strip.

is
'Solid State
Remote Field Control'
being used with
an MG set?

YES

Place a jumper across #2 and 24 at MG terminal strip. Turn ON input power. Press 'Start' button and observe voltmeter reading on the NA control box. Press 'Stop' button.

NO

Problem is in power source or in control cable leads from control box to power source. Check continuity of leads 75, 76 and 77 from Logic Board and lead #21 from V.V. Board to power source. Also check lead connections at power source.

was
voltage
present?

NO

YES

Problem is in solid state field control. Consult troubleshooting guide for the unit.

PROBLEM E1 NO CONTROL OF POWER SOURCE OUTPUT IN ALL MODES (POWER SOURCE OUTPUT IS PRESENT.)

Refer to connection diagram of control unit to power source. Check all leads for proper connections.

Turn off all power. Disconnect leads 75, 76, and 77 at power source. Connect an ohmmeter across 76 and 77 of control cable and then turn control power back on. At the NA control box, turn the 'Open Circuit Voltage' through its full range. Repeat with ohmmeter connected between 75 and 76.

Does resistance vary from 0 to 10KΩ in both cases?

NO

YES

If a 'Solid State Remote Field Control' is being used, consult troubleshooting guide for the unit.
If solid state field control is not being used consult troubleshooting guide for the power source.

PROBLEM E6 LIMITED OR ERRATIC CONTROL OF POWER SOURCE OUTPUT IN WELD MODE ONLY.

Replace rheostat R2 in control box cover

If problem still occurs, replace logic board.

Trouble is in:
1) Control cable
2) Leads from connector on control to rheostat.

PROBLEM F4 NO CONTROL OF MOTOR-GENERATOR POWER SOURCE OCV WITH 'OPEN CIRCUIT VOLTAGE' CONTROL.

With unit at idle check light 2D.

is light 2D ON?

NO

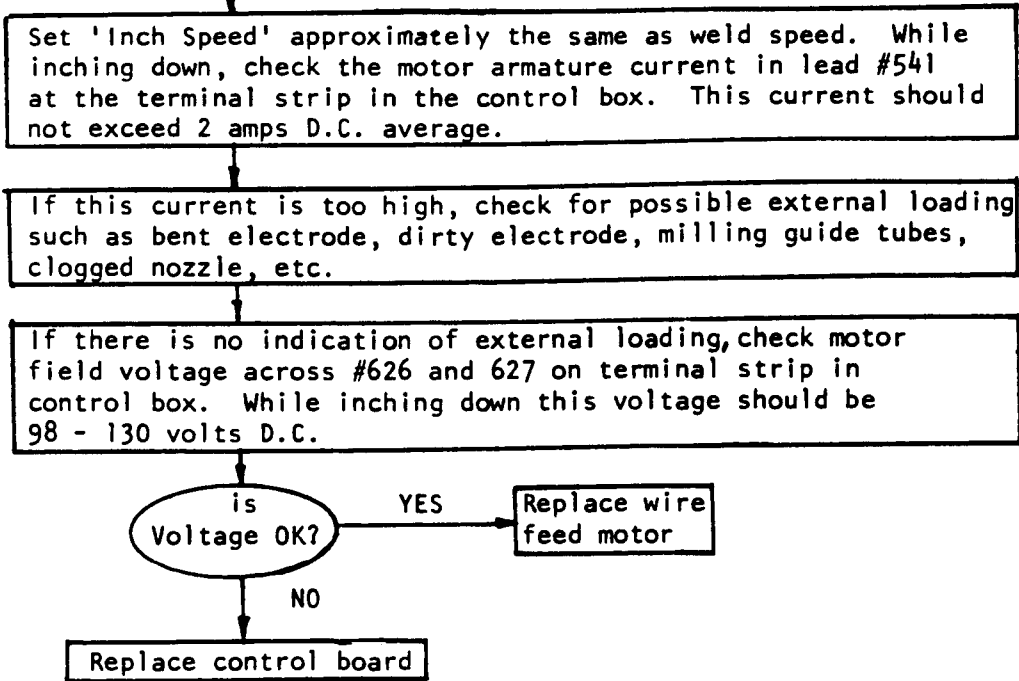
YES

Replace logic board

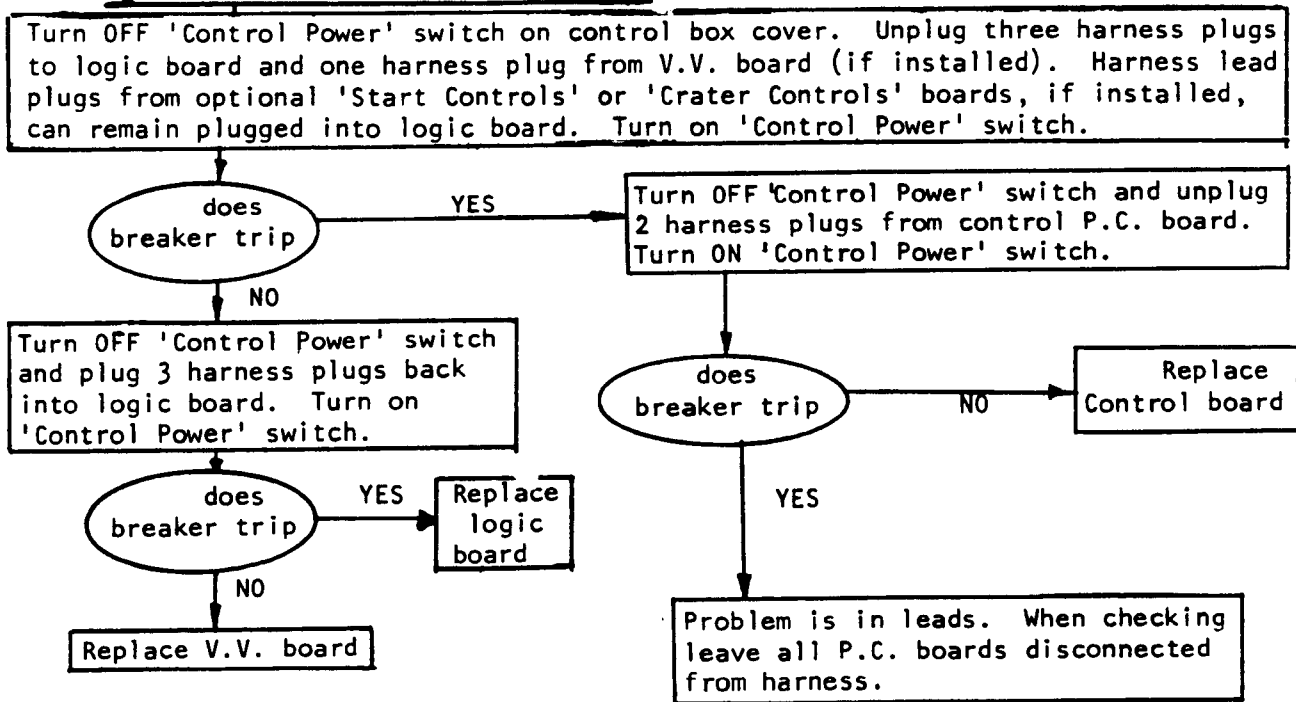
If unit is an NA-3, replace reed switch, 4CR. If it is an NA-4, replace circuit sensor P.C. board.

PROBLEM F5 LIMITED OR ERRATIC CONTROL OF MOTOR-GENERATOR POWER SOURCE OCV WITH 'OPEN CIRCUIT VOLTAGE' CONTROL ONLY.

PROBLEM G1 & J1 CIRCUIT BREAKER TRIPS WHILE FEEDING WIRE



PROBLEM J3 CIRCUIT BREAKER TRIPS WITH WIRE FEEDER AT IDLE.



PROBLEM H1 TRAVEL CIRCUIT WON'T RUN AT ALL.

1. Faulty travel switch.
2. Wiring between travel switch and travel unit.
3. Travel unit is defective

PROBLEM H4 TRAVEL CIRCUIT WON'T RUN WITH SWITCH ON 'HAND TRAVEL'. RUNS OK WITH SWITCH SET TO 'AUTOMATIC TRAVEL'

Replace travel switch, S2.

PROBLEM H2 TRAVEL CIRCUIT WON'T RUN WITH SWITCH SET ON 'AUTOMATIC TRAVEL'.

Check light 2H when travel should normally be running in auto position.

is light 2H ON?

YES

Check voltage between leads #532 & 625 at 2CR.

is voltage zero volts AC

NO

is light 2H OFF?

YES

Replace 2CR

Remove lead #589 from 2CR. Check resistance of 2CR coil

NO

is coil resistance $10K\Omega \pm 10\%$

NO

Replace travel switch, S2

YES

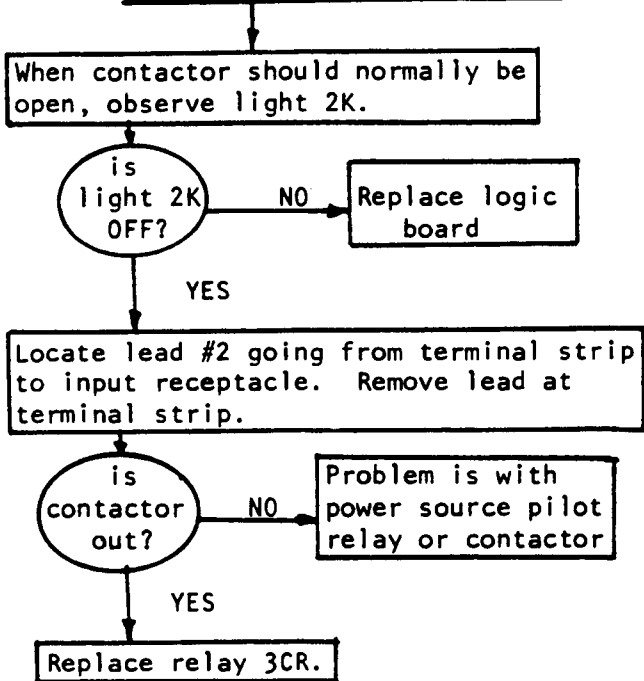
Refer to wiring diagram for the model and code - See IM-278. Check pigtail leads #691 and 692 on logic board for proper connection. If these are ok, replace logic board.

PROBLEM H3 TRAVEL CIRCUIT RUNS CONTINUOUSLY WITH SWITCH SET ON 'AUTOMATIC TRAVEL'

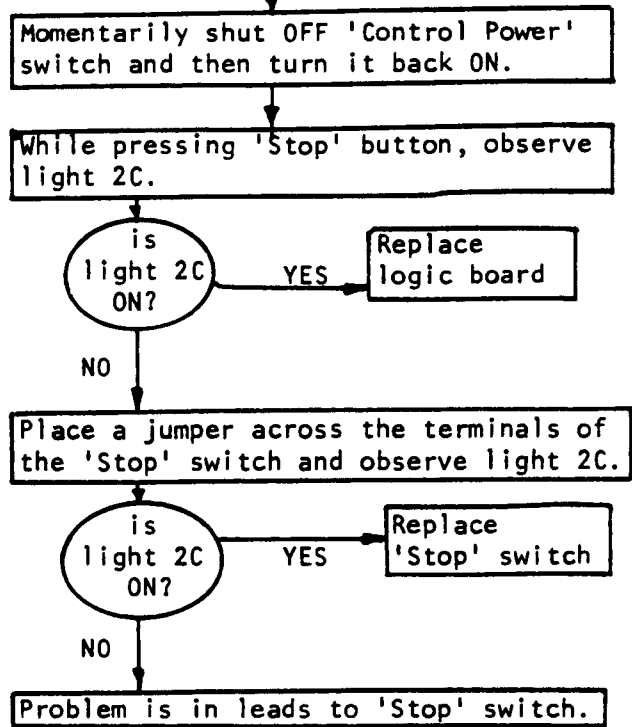
Check light 2H when travel should normally be OFF.

NO

PROBLEM K3 POWER SOURCE CONTACTOR DOES NOT DROP OUT



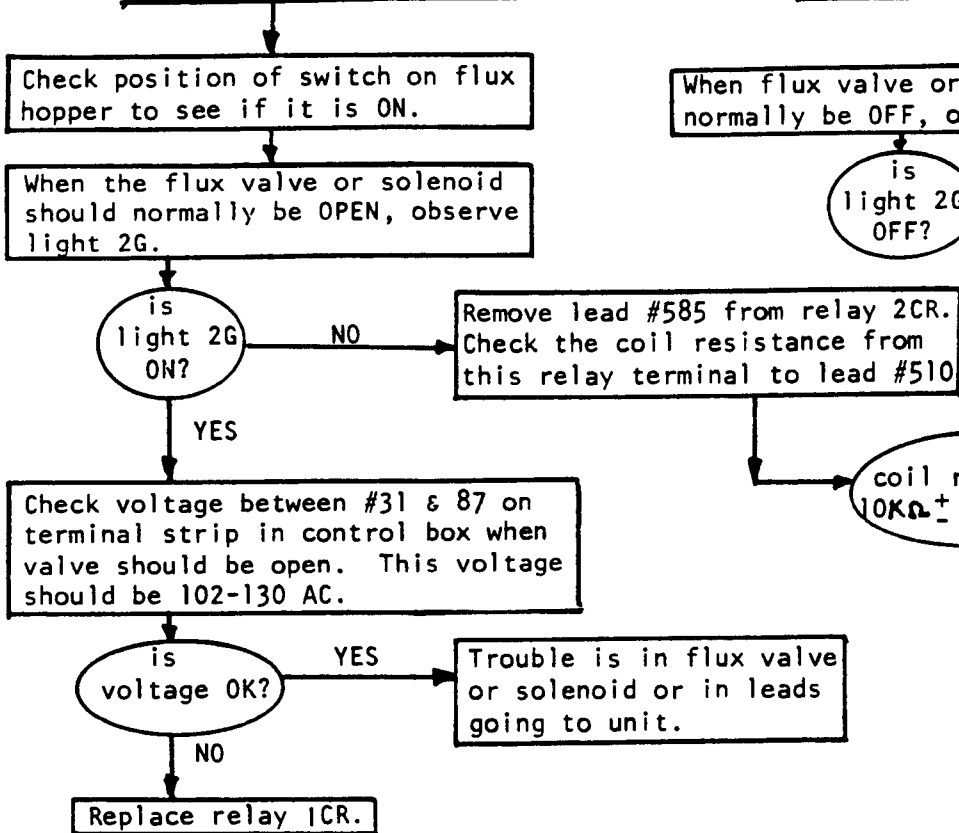
PROBLEM K4 WELDING DOES NOT STOP WHEN 'STOP' BUTTON IS PRESSED.



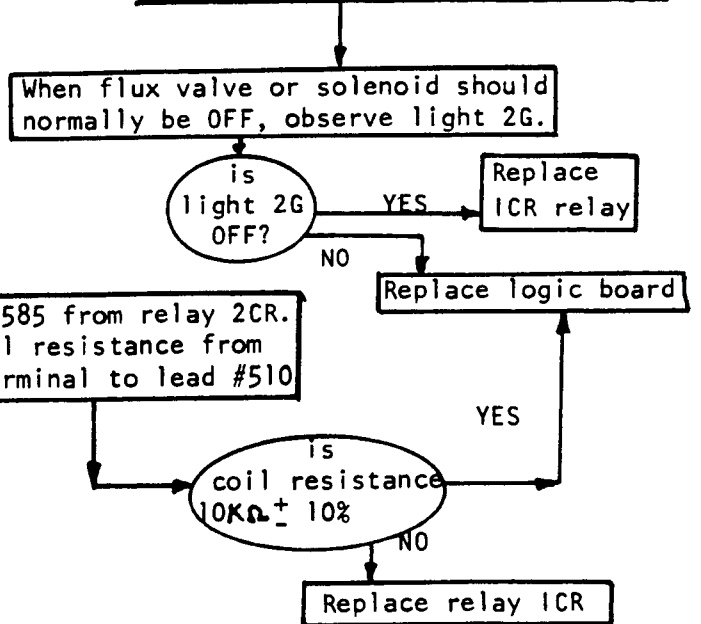
PROBLEM K5 BURNBACK TIME CANNOT BE SET PROPERLY.



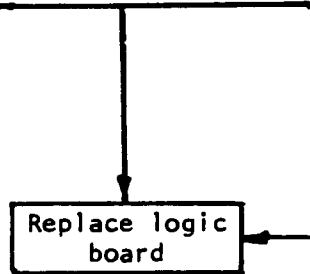
PROBLEM L1 FLUX VALVE OR WATER/GAS SOLENOID DOES NOT OPEN AT ALL.



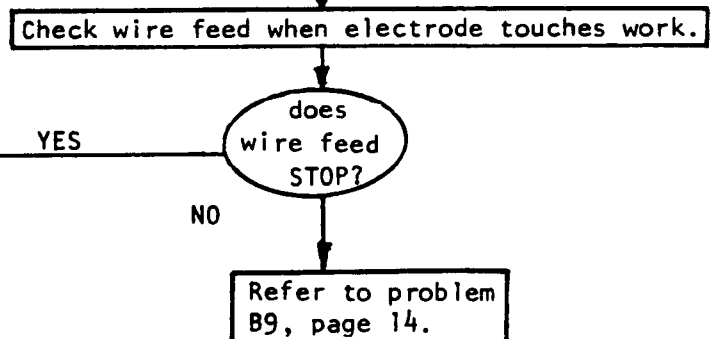
PROBLEM L2 FLUX VALVE OR WATER/GAS SOLENOID REMAINS OPEN CONTINUOUSLY.



PROBLEM L3 FLUX VALVE DOES NOT OPEN WHEN 'START' BUTTON IS PRESSED. OPENS WHEN ELECTRODE TOUCHES WORK.



PROBLEM L4 (WHEN 'COLD' STARTING ONLY) FLUX VALVE DOES NOT OPEN WHEN WIRE TOUCHES THE WORK WHILE PRESSING 'INCH DOWN' BUTTON. WORKS OK WHEN 'START' BUTTON IS PRESSED.



PROBLEM M1 OPTIONAL USER INSTALLED
CURRENT ACTUATED RELAY (5CR)
DOES NOT OPERATE AT ALL

Place a jumper across #528 & #539
on the terminal strip in control box.
Check voltage across #510 & 681 on
the terminal strip.

is
voltage 90-120
volts DC

NO → Replace
logic
board

YES

Problem is in current actuated
relay itself or in leads from
terminal strip to relay

PROBLEM M2 OPTIONAL USER INSTALLED CURRENT
ACTUATED RELAY (5CR) REMAINS PULLED
IN CONTINUOUSLY.

With unit at idle, check voltage across
#510 & #681 on terminal strip in control
box.

is
voltage 90-120
volts DC

NO → Problem is in
optional relay

YES

Observe light 2D

is
light 2D
ON?

NO → Replace logic
board

YES

If unit is an NA-3, replace reed
switch 4CR. If it is an NA-4,
replace the current sensor P.C.
board.

PROBLEM C2 & E3 WIRE FEEDS FULL SPEED AND/OR NO POWER SOURCE OUTPUT CONTROL DURING WELD MODE ONLY

Remove electrode from drive rolls and place a jumper across #528-#539 on terminal strip on control box. Press start button. Caution: power source output is across head and work. Observe light 2D.

