

**SOLUTION 3Ø DC
MODEL 9480D**

UNITROL

ELECTRONICS, INCORPORATED
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NORTHBROOK, IL 60062
847-480-0115

SOLUTION #9480

THREE PHASE DC SPOT/SEAM WELD/ROLL SPOT TABLE OF CONTENTS

OPERATING SPECIFICATION CHART

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SOLUTION #9480
RESISTANCE WELDING CONTROL SYSTEM

OPERATING SPECIFICATION CHART

STANDARD FUNCTIONS

NAME	OPERATION	RANGE	APPLICATION
SCHEDULE MEMORY	INSTANT RECALL OF COMPLETE WELD SCHEDULES	75	INSTANT SET-UP OF REPETITIVE JOBS
COUNTER	COUNTS WELDS OR PARTS	0-65,500	CONTROL OF PRODUCTION
DUAL SCHEDULE	USES ANY OF THE 75 WELD SCHEDULES	-	WELDING OF VARIOUS THICKNESS COMBINATIONS
WATER SAVER DRIVER	TURN WATER OFF 1 MIN. AFTER LAST WELD	1 MINUTE	
SQUEEZE	DWELL BEFORE FIRING	0-99 CY	ALLOWS TIPS TO FULLY CLOSE BEFORE WELDING
WELD	MAIN HEAT & WELD TIME	0-99 CY. 0-99% HEAT	ALL PROGRAMS
HOLD	DWELL AFTER WELDING	0-99 CY.	ALLOWS NUGGET TO COOL
PREHEAT	SETTING BEFORE UPSLOPE	0-99 CY. 0-99% HEAT	TO PREHEAT PARTS FOR FIT-UP PROBLEMS
UPSLOPE	RAMPS CURRENT UPWARD TO WELD HEAT %	0-99 CY. 0-99 INIT. %	GALVANIZED AND COATED METAL; PROJECTIONS
DOWNSLOPE	RAMPS CURRENT DOWNWARD FROM WELD HEAT %	0-99 CY. 0-99 FINAL %	ALUMINUM; HIGH CARBON STEEL
POSTHEAT	SETTING AFTER DOWNSLOPE	0-99 CY. 0-99% HEAT	REDEFINES GRAIN STRU- CTURE IN STEEL
IMPULSATION	REPEATS WELD SEQUENCE WITHOUT OPENING TIPS	0-99 PULSES 0-99 INTERPULSE	HEAVY METAL WELDING
QUENCH & TEMPER	COOL AND REHEAT AT END OF WELDING CYCLES	0-99 CY. HEAT 0-99% HEAT 0-99 CY. COOL	REDUCES BRITTLINESS IN HIGH CARBON STEELS
REPEAT MODE	CONTROLS OPENING AND CLOSING OF TIPS WHILE INITIATION IS CLOSED	0-9.9 SECONDS	ALLOWS "AUTOMATIC" RUN OF WELDER
FORGE DELAY	FORGE VALVE ON DELAY	0-99 CY.	HEAT TREATABLE MAT'L
MOTOR ON	TURNS PILOT RELAY ON	0-99 CY.	SEAM/ROLL SPOT
PRECOMP.	FORGE BEFORE WELD	0-99 CY.	LOWERS RESISTANCE
RETRACT	FOLLOWS INPUT SWITCH	-	OPERATES RETRACT VALVE

STANDARD MODES: SPOT, SEAM, ROLL-SPOT

STANDARD INITIATION MODES

SINGLE STAGE	MOMENTARY INITIATION
DUAL STAGE	HOLDING INITIATION
TWO SWITCH ANTI-TIEDOWN	

KEYBOARD PROGRAM SELECT OR BINARY PROGRAM SELECT

OPTIONAL FUNCTIONS

NAME	OPERATION	RANGE	APPLICATION
PRESSURE TRANSDUCER	STARTS WELD WHEN PRESSURE IS REACHED	1-99psi/1-6.7bar KEYPAD SET	PRECISION TIP PRESSURE FOR CONSISTENT WELDS
CURRENT MONITOR	MONITORS AND SETS UPPER/LOWER LIMITS	0-200 KA	CONTINUOUS PRODUCTION CONTROL
PRINTER	RECORDS WELD SCHEDULE WELD CURRENT/FORCE	0-200 KA 0-9990 LBS 0-67,000n	PRODUCTION CONTROL

ELECTRICAL SPECIFICATIONS

VOLTAGE RANGE=208, 230, 380, 460, 575. FREQUENCY=60/50 Hz, 3Ø

INSTALLATION

SOLUTION #9480
INSTALLATION INSTRUCTION
PAGE I-1

1. Carefully unpack system and inspect for damage. Report any problems to the factory at once. If damage is obvious from outside of carton, report to carrier immediately.
2. Select location for power supply cabinet being sure that the cabinet door will clear all welder components when open. It is usually an advantage to locate this cabinet as close to eye level as possible for easy installation and servicing.
3. Drill welder to match the four mounting holes in the cabinet. Install cabinet.
4. Drill or punch power cable hole either through the back, side or bottom of the cabinet. Drill or punch a second hole to handle the return cable to the welder transformer. **IT IS IMPORTANT THAN NO METAL CHIPS ENTER ANY OF THE ELECTRONIC COMPONENTS IN THE CABINET! PROTECT POWER SUPPLY AND CONTACTOR DURING THESE DRILLING AND INSTALLATION OPERATIONS. WHEN COMPLETE, REMOVE ALL CHIPS FROM THIS CABINET BEFORE APPLYING POWER.**
5. Drill or punch an access hole to handle the foot pedal or palm buttons at a convenient location in the bottom of the cabinet. **OBSERVE THE CAUTIONS IN THE STEP ABOVE.** After cleaning interior of all chips, install liquid tight or rigid conduit at all locations. Consult local codes for proper wire size. Wire should be sized for a maximum of 50% duty cycle load.
6. Connect power wires from the three phase line as shown in the WIRING HOOK-UP DIAGRAM shown on page I-5 of this book.

PHASE ROTATION TEST

Before going any further, it is CRITICAL that the line voltage phase rotation be correct. If the phase rotation is not correct, this welding control will not operate properly and can cause damage to the welder!

A PHASE ROTATION TESTER has been included with this welding control. With **POWER OFF** to the weld control:

1. Connect the clamp on the BLACK wire to the terminal or bottom circuit breaker block marked L1.
2. Connect the clamp on the RED wire to the terminal or bottom circuit breaker block marked L2.
3. Connect the clamp on the WHITE wire to the remaining terminal or bottom circuit breaker block marked L3.
4. Turn power ON. If the wires are in the correct order, all three upper yellow lights (L1, L2, and L3) will be on and the center yellow CLOCKWISE rotation light will be ON. If this is correct, the control is wired in the correct phase.
5. If the lower COUNTERCLOCKWISE yellow light glows, turn power OFF, interchange **any two** incoming wires, turn power ON, and check to be sure that the center yellow CLOCKWISE light is ON. If this is correct the control is wired in the correct phase.

SOLUTION #9480
INSTALLATION INSTRUCTION
PAGE I-2

7. Connect foot pedal, palm buttons, or machine contacts per WIRING HOOK-UP DIAGRAM in this section. If proximity switches, limit switches, pressures switch, SCR overtemp thermostats, or transformer overtemp thermostats are used, connect per WIRING HOOK-UP DIAGRAM. If any of these are not being used, install jumpers as shown (usually supplied from factory installed).

IMPORTANT NOTE: If using the SCR overtemp (terminals #22 - #23) or transformer overtemp inputs (terminals #23 - #24), be sure that these are connected to static thermostats and not to relay contacts.

8. Connect valve wires to the terminal on the right side of the main board as shown on the HOOKUP diagram in this section.

WELDER PNEUMATIC SYSTEM TYPES

It is next necessary to identify the type of pneumatic (air) system in your welder. Knowing this will allow you to properly connect the solenoid valves to the SOLUTION control and also understand the operation.

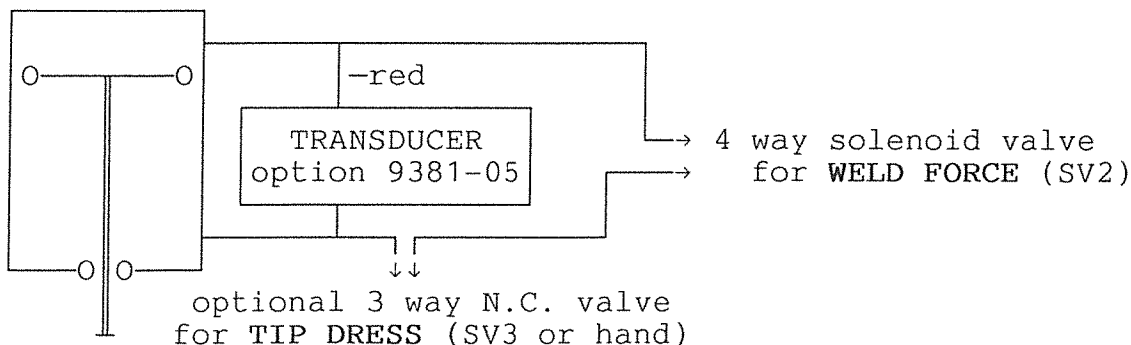
NOTE: In all diagrams, the FLOW CONTROL arrow (→) indicates the **controlled** flow direction of this device.

A. WELDERS THAT DO NOT USE BUCKING PRESSURE: These welders will normally have a **single 4-way solenoid valve** to operate the weld stroke. If a RETRACT function is in this welder, a 3-way solenoid valve will be installed for this purpose. They may also have an additional 3-way solenoid or hand valve to operate a TIP DRESS.

A. (continued)

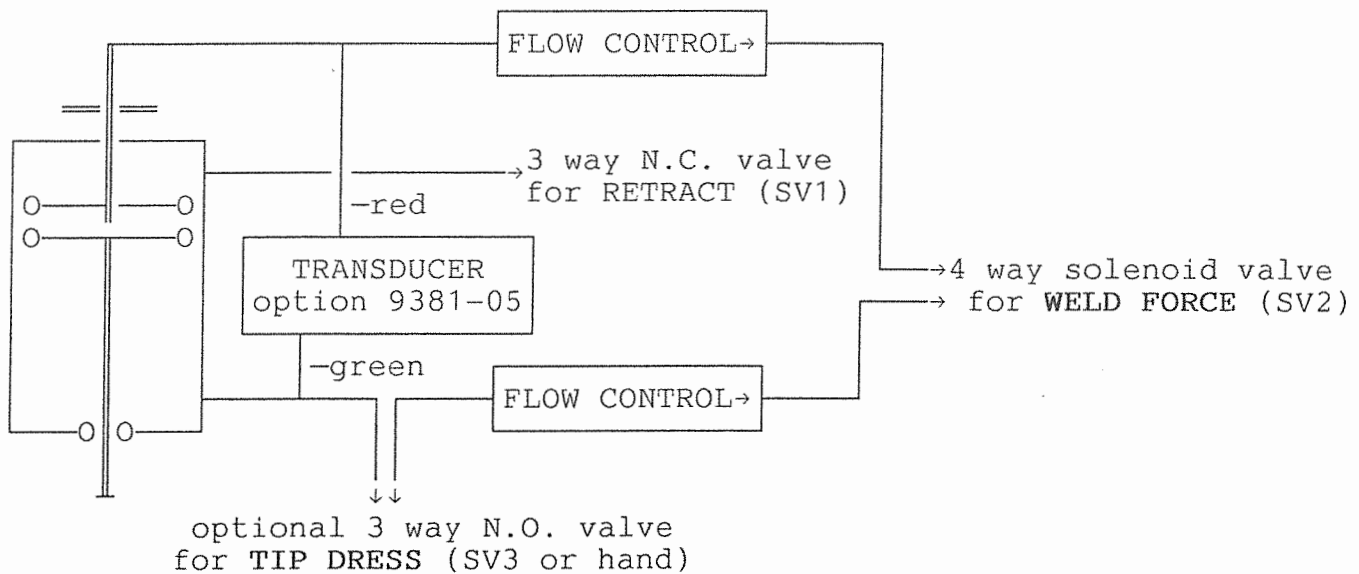
For these welders, the FORGE function of the SOLUTION will **not** be operational and should be turned off in the control (Set to CONSTANT LOW in PROGRAM 76).

WITHOUT RETRACT WITHOUT BUCKING PRESSURE



SOLUTION #9480
INSTALLATION INSTRUCTION
PAGE I-3

**WITH RETRACT
WITHOUT BUCKING PRESSURE**

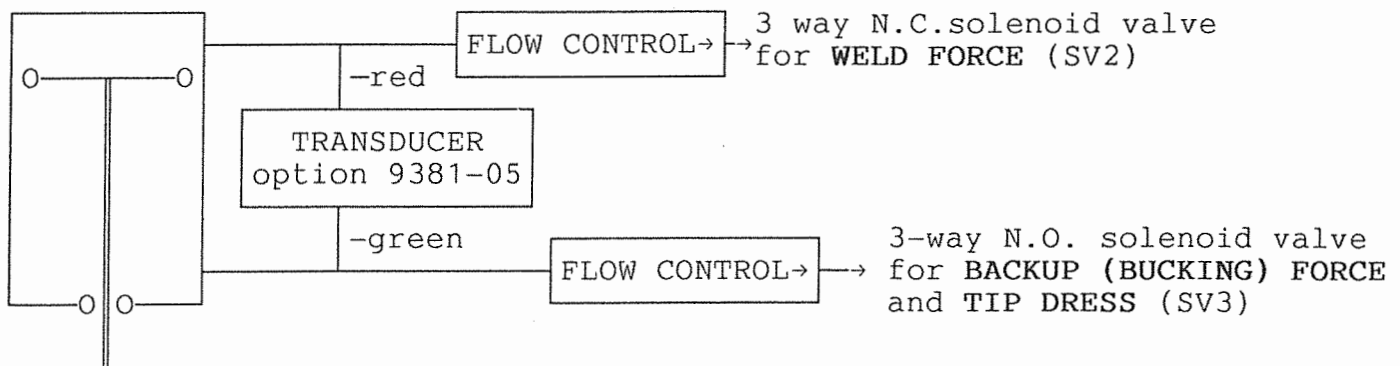


- B. WELDERS THAT USE BUCKING PRESSURE:** These welders will normally have **two 3-way solenoid valves** to operate the weld stroke and BACKUP (bucking) pressure ports of the cylinder. The BACKUP valve also can operate the TIP DRESS function. For these welders, the FORGE function of the SOLUTION **can** be operational and should be turned on in the control if desired.

If a RETRACT function is on this welder, a 3-way solenoid valve will be installed for this purpose.

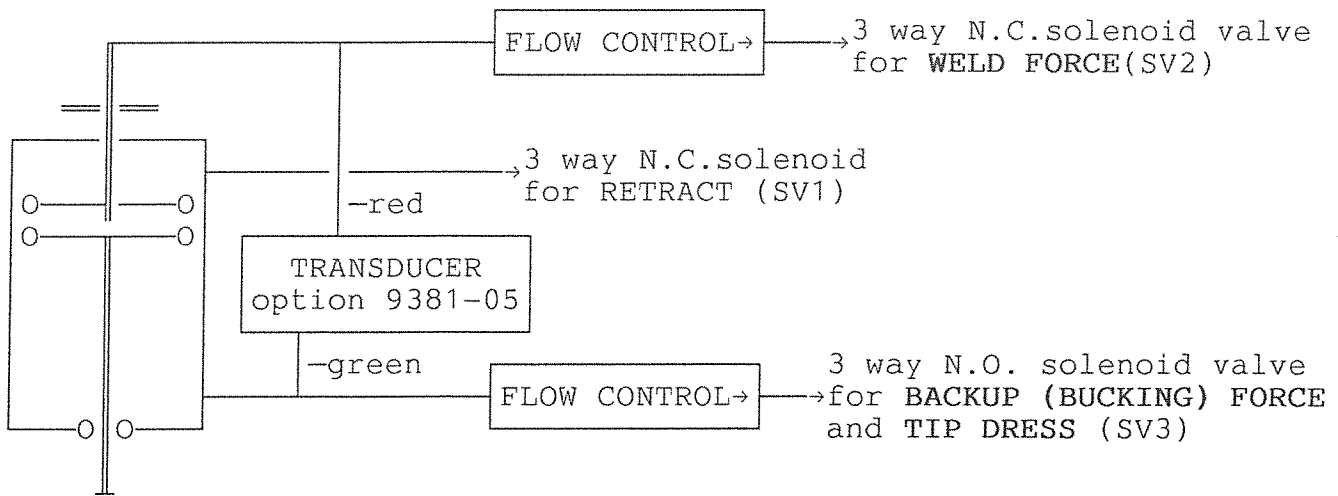
Note that to operate BUCKING PRESSURE effectively, a special back pressure regulator must be installed before the BACKUP valve so that air pressure will be quickly equalized during each weld stroke.

**WITHOUT RETRACT
WITH BUCKING PRESSURE**



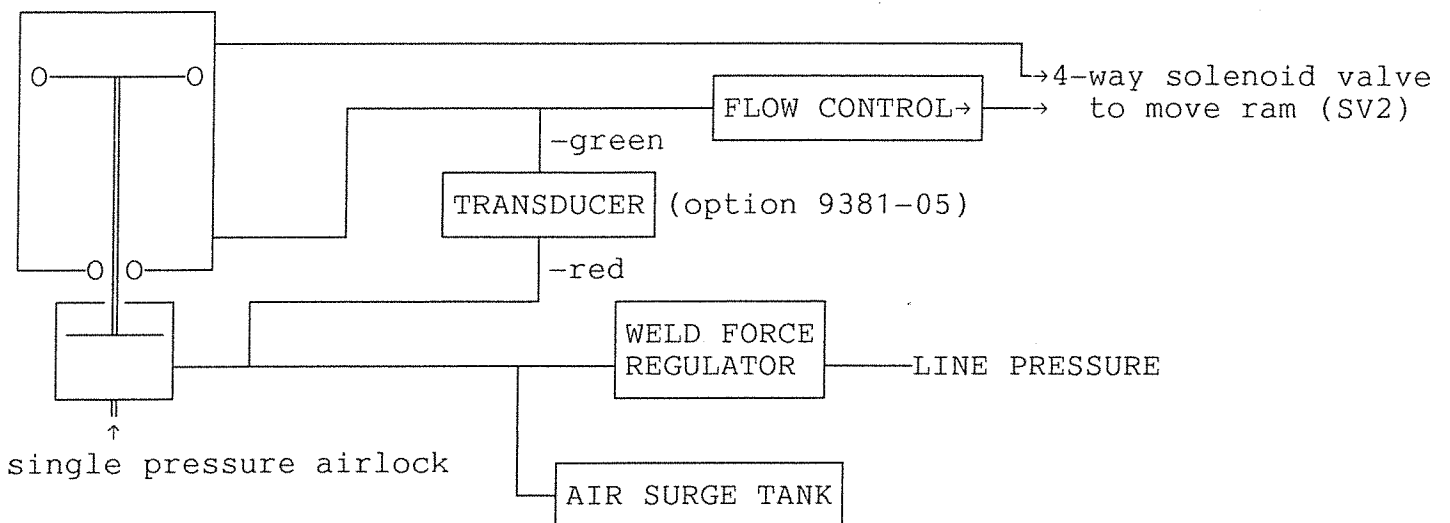
SOLUTION #9480
INSTALLATION INSTRUCTION
PAGE I-4

**WITH RETRACT
WITH BUCKING PRESSURE**



C. WELDERS WITH AIRLOCK RAMS: These welders normally have a cylinder which pushes the ram forward, but have an additional single pressure or double pressure AIRLOCK mounted to the cylinder rod just before the electrode holder. In this type of system, air pressure is placed on the AIRLOCK at all times to provide an air spring effect for very fast follow-up during the weld.

**SINGLE PRESSURE AIRLOCK
WITHOUT RETRACT**

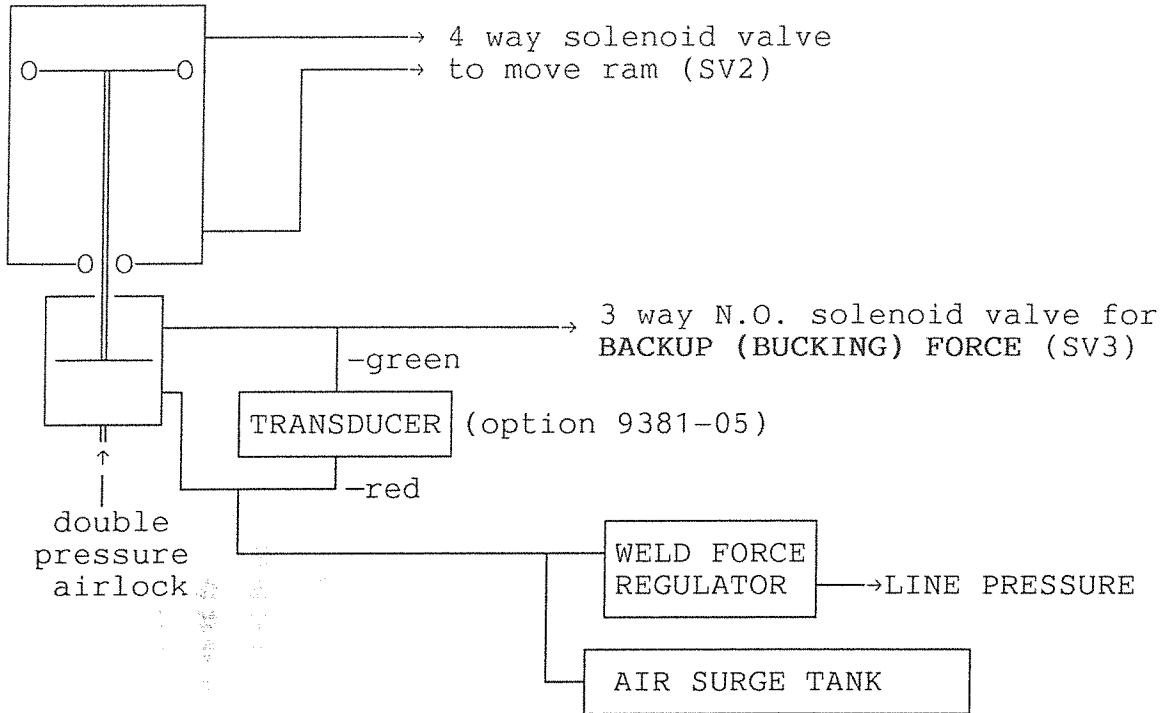


IMPORTANT NOTE: For this type of pneumatic system, the AIRLOCK LIMIT SWITCH **must** be connect to PS4 for proper operation.

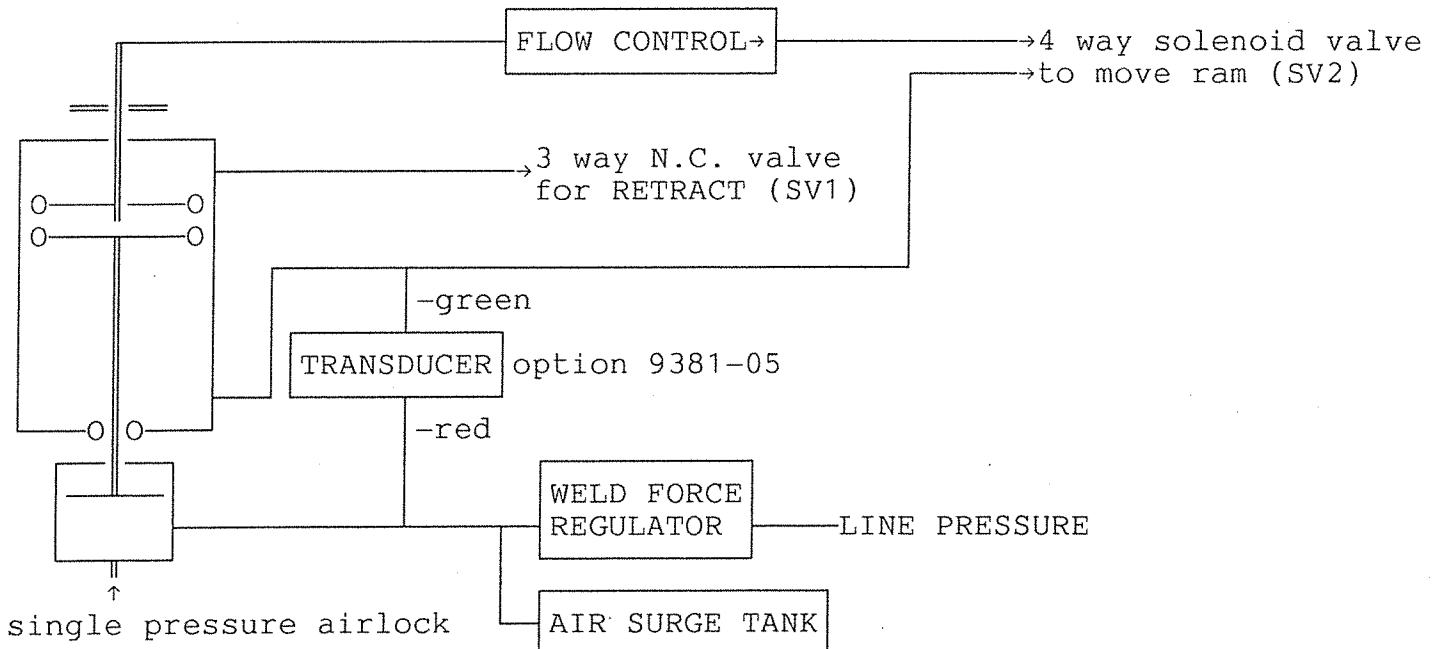
SOLUTION #9480
INSTALLATION INSTRUCTION
PAGE I-5

C. continued

**DOUBLE PRESSURE AIRLOCK
WITHOUT RETRACT**

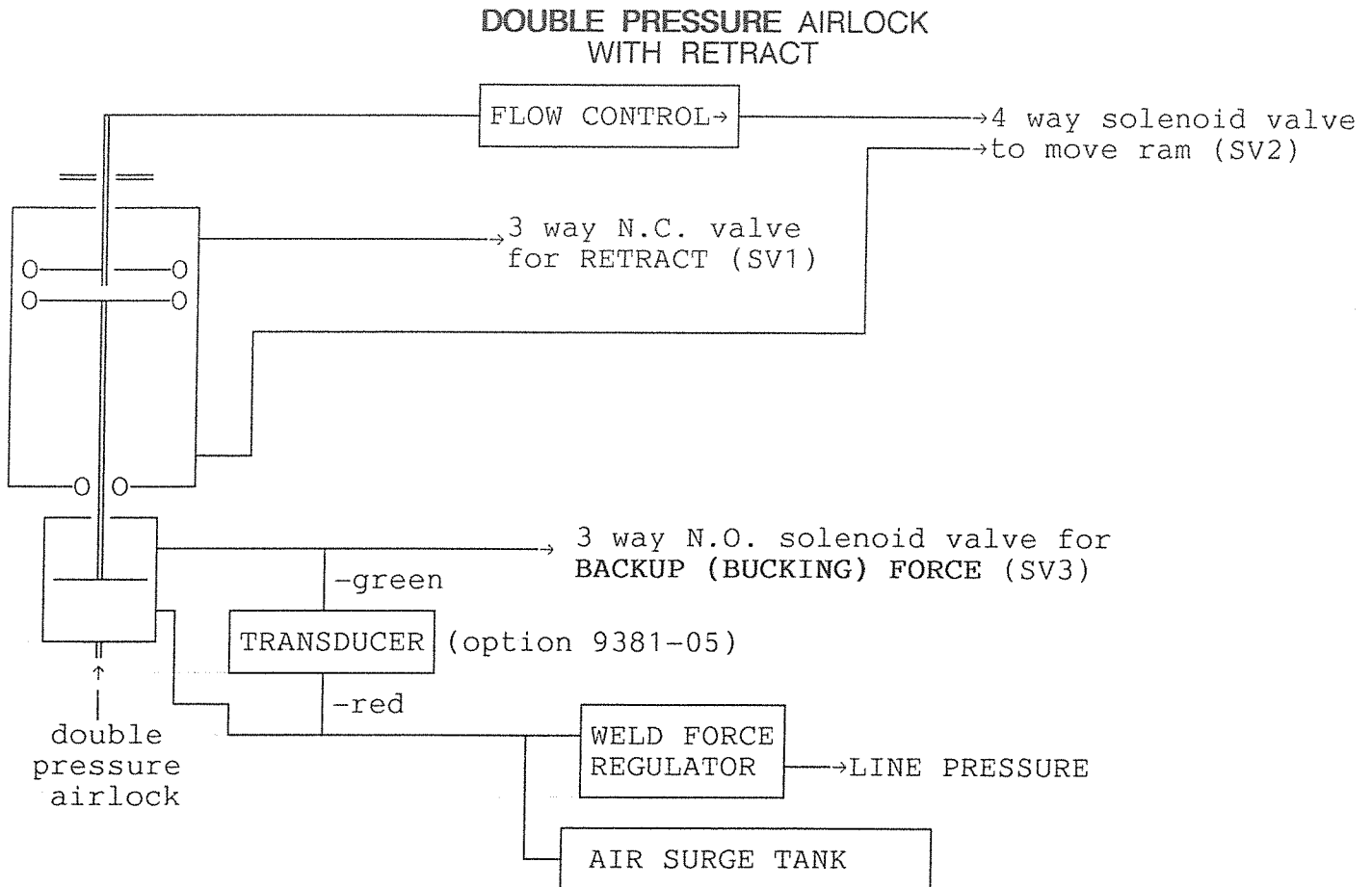


**SINGLE PRESSURE AIRLOCK
WITH RETRACT**



IMPORTANT NOTE: For this type of pneumatic system, the AIRLOCK LIMIT SWITCH must be connect to PS4 for proper operation.

SOLUTION #9480
INSTALLATION INSTRUCTION
PAGE I-6



IMPORTANT NOTE: For this type of pneumatic system, the AIRLOCK LIMIT SWITCH **must** be connect to PS4 for proper operation.

9. Connect water hoses to the two bulkhead ports in the cabinet. In/out direction of water is not important unless the system has been supplied with the #9181-28 water flow switch.
10. Select appropriate location for the SOLUTION control console. Be sure that the console face is clear of the worst anticipated location of parts to be welded, and is not in the direct path of weld flash. Use the supplied swivel bracket as shown on drawing in this section.
11. Carefully plug control cable into the rear of console. Fasten with the two jack screws on the cable plug. **HAND TIGHTEN ONLY. DO NOT USE A SCREW-DRIVER. DO NOT USE EXCESSIVE FORCE ON THESE JACK SCREWS AS DAMAGE WILL OCCUR.**
12. Route the cable to the power supply cabinet and push the excess cable into the large compression fitting supplied on the cabinet top. Be sure that there is enough of a loop at the console to allow full movement of the console. Tighten fitting.
13. Secure all wires inside power supply cabinet and check to be sure that connections are made correctly and that no loose strands of wire are at any terminal point.

SOLUTION #9480
INSTALLATION INSTRUCTION
PAGE I-7

14. Locate wire at lower right of power supply chassis that is marked "F1" and connect to voltage terminal that most closely matches your supply.
15. If the factory circuit breaker is in this system, locate adjustment setting on breaker and set to the closest or higher range calculated from the following formula:

$$\text{SETTING} = (\text{KVA} \div \text{Line voltage}) \times 3,000$$

Where **KVA** is that shown on the welder nameplate.

As an example: **KVA=75**
Line voltage=460

$$\text{SETTING} = (75 \div 460) \times 3,000 = .163 \times 3,000 = 489.13$$

The circuit breaker should be set to the nearest higher level. Note that this circuit breaker has a MAGNETIC mechanism only to protect the SCR contactor against very fast and high current surges.

16. Turn power on and check the control module. If the system is working correctly, the control will go through the diagnostic program and finish with the read-out showing "PROGRAM # " if the memory was cleared at the factory or previous installation, or will display, "PROGRAM ## READY" if program was left in the memory. If no display is present, check that line voltage is present and matches that selected in step 14 .

If some other phrase is displayed, check page S-13 in SERVICE SECTION (back of book) to find problem. Consult factory service department if difficulty is encountered at this point. Do not attempt to service control without proper information.
17. **If your welder includes the #9381-05 DIFFERENTIAL PRESSURE TRANSDUCER option**, install hoses per diagram in this section, and check page OP-1 in the OPTION section at the end of this direction book.
18. **If your welder included an ELECTRONIC AIR REGULATOR PACKAGE #9381-16 or #9181-16**, install regulators per directions starting on page OP-13 in the OPTION section at the end of this direction book.
19. System should now be ready for operation.

DATA INPUT BOARD

PRESSURE TRANSDUCER OPTION

LOAD CELL OPTION

INFRARED THERMOMETER OPTION

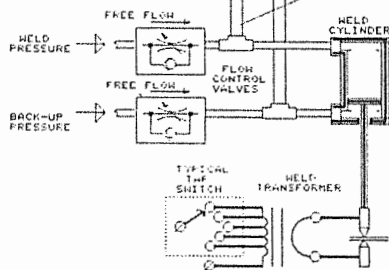
a) ONE COLOR

b) TWO COLOR

SOLUTION
POWER SUPPLY &
INPUT/OUTPUT BOARD

DATA INPUT
BOARD
9180-SPT
(PRESSURE TRANSDUCER
OPTION)

RED GREEN
HIGH LOW
PNEUMATIC TUBING
Type "POLY-FLO" 44-P-1/4



I. PRESSURE TRANSDUCER PNEUMATIC HOOK-UP DIAGRAM

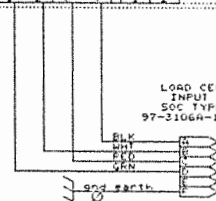
NOTES

- ATTENTION!
MAX PRESSURE = 100psi
- TO USE PRESSURE TRANSDUCER
SEE "SOLUTION" MANUAL
"INITIAL SET-UP PROCEDURE" AND
CHAPTER "SETTING TWP FORCE CALCULATOR"

SOLUTION
POWER SUPPLY &
INPUT/OUTPUT BOARD

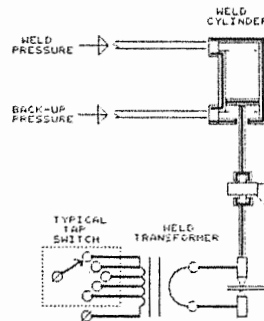
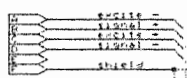
DATA INPUT
BOARD
9180-SPT
(LOAD CELL OPTION)

LOAD CELL
INPUT
SOC TYPE
97-3106A-14S-6S



LOAD CELL
INPUT
SOC TYPE
97-3106A-14S-6S

LOAD CELL
PLUG TYPE
97-3106A-14S-6P



II. LOAD CELL HOOK-UP DIAGRAM

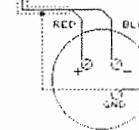
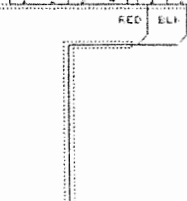
NOTES

- USE ONLY COMPRESSION TYPE
LOAD CELLS.
- TO USE LOAD CELL
SEE "SOLUTION" MANUAL
"INITIAL SET-UP PROCEDURE" AND
CHAPTER "SETTING TWP FORCE CALCULATOR".

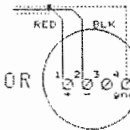
SOLUTION
POWER SUPPLY &
INPUT/OUTPUT BOARD

DATA INPUT
BOARD
9180-SPT
(INFRARED THERMOMETER
OPTION)
ONE COLOR

LOAD CELL
INPUT
SOC TYPE
97-3106A-14S-6S



INFRARED THERMOMETER
"MICRON M75 OR M76"
(ONE COLOR)

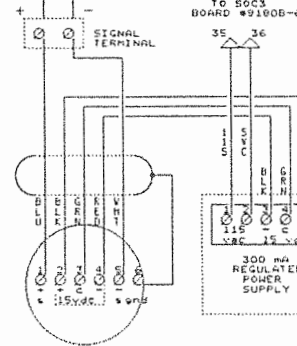
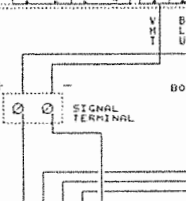


INFRARED THERMOMETER
"MICRON M75"
(ONE COLOR)

SOLUTION
POWER SUPPLY &
INPUT/OUTPUT BOARD

DATA INPUT
BOARD
9180-SPT
(INFRARED THERMOMETER
OPTION)
TWO COLOR

LOAD CELL
INPUT
SOC TYPE
97-3106A-14S-6S



INFRARED THERMOMETER
"MICRON M75 OR M76"
(TWO COLOR)

III. INFRARED THERMOMETER HOOK-UP DIAGRAM

NOTES

- ALL METAL PARTS OF THE INFRARED THERMOMETER:
THERMOHEAD ENCLOSURE, FIBER OPTIC SHIELD AND
LENS ASSEMBLY MUST BE ISOLATED FROM THE
GROUND EARTH.
- TO USE INFRARED THERMOMETER
SEE MANUAL "TEMPERATURE FEEDBACK AND WELDING CONTROL"

APPROVED:

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NORTHBROOK IL, 60062

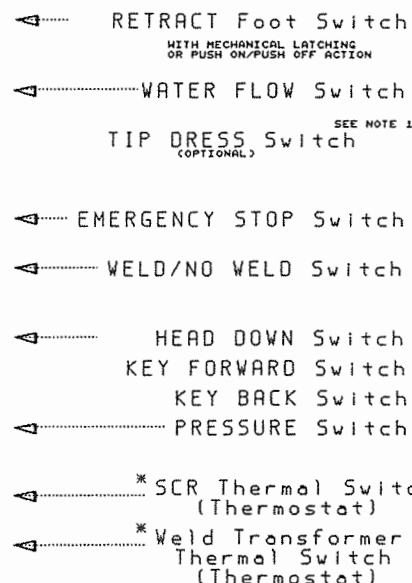
Title DATA INPUT BOARD 9180-SPT
SOLUTION HOOK-UP DIAGRAM

Size Document Number 91725-1

Date: November 8, 2006 Sheet 1 of 1

JUMPER CHART

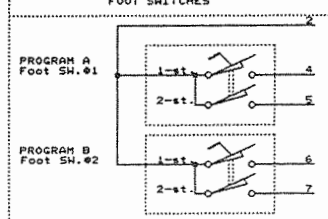
IF RETRACT SWITCH IS NOT USED INSTALL JUMPER	2	9
IF WATER FLOW SWITCH IS NOT USED INSTALL JUMPER	2	9
IF EMERGENCY STOP SW IS NOT USED INSTALL JUMPER	12	13
IF WELD/NO WELD SW IS NOT USED INSTALL JUMPER	14	15
IF HEAD DOWN SWITCH IS NOT USED INSTALL JUMPER	16	17
IF PRESSURE SWITCH IS NOT USED INSTALL JUMPER	16	20
IF SCR's thermostat IS NOT USED INSTALL JUMPER	22	23
IF WELD TRANSFORMER THERMOSTAT IS NOT USED INSTALL JUMPER	23	24



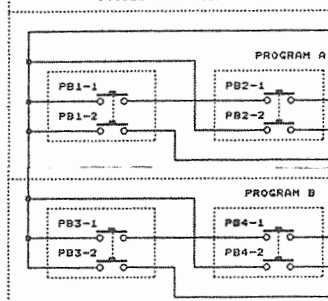
SEE INITIATION METHODS BELOW

INITIATION METHODS

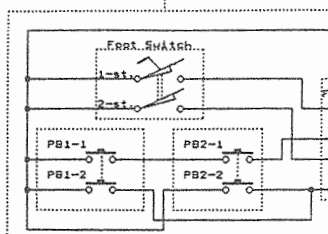
Two Stage Pilot Foot Switches



ANTI-TIEDOWN DOUBLE HAND PUSHBUTTON



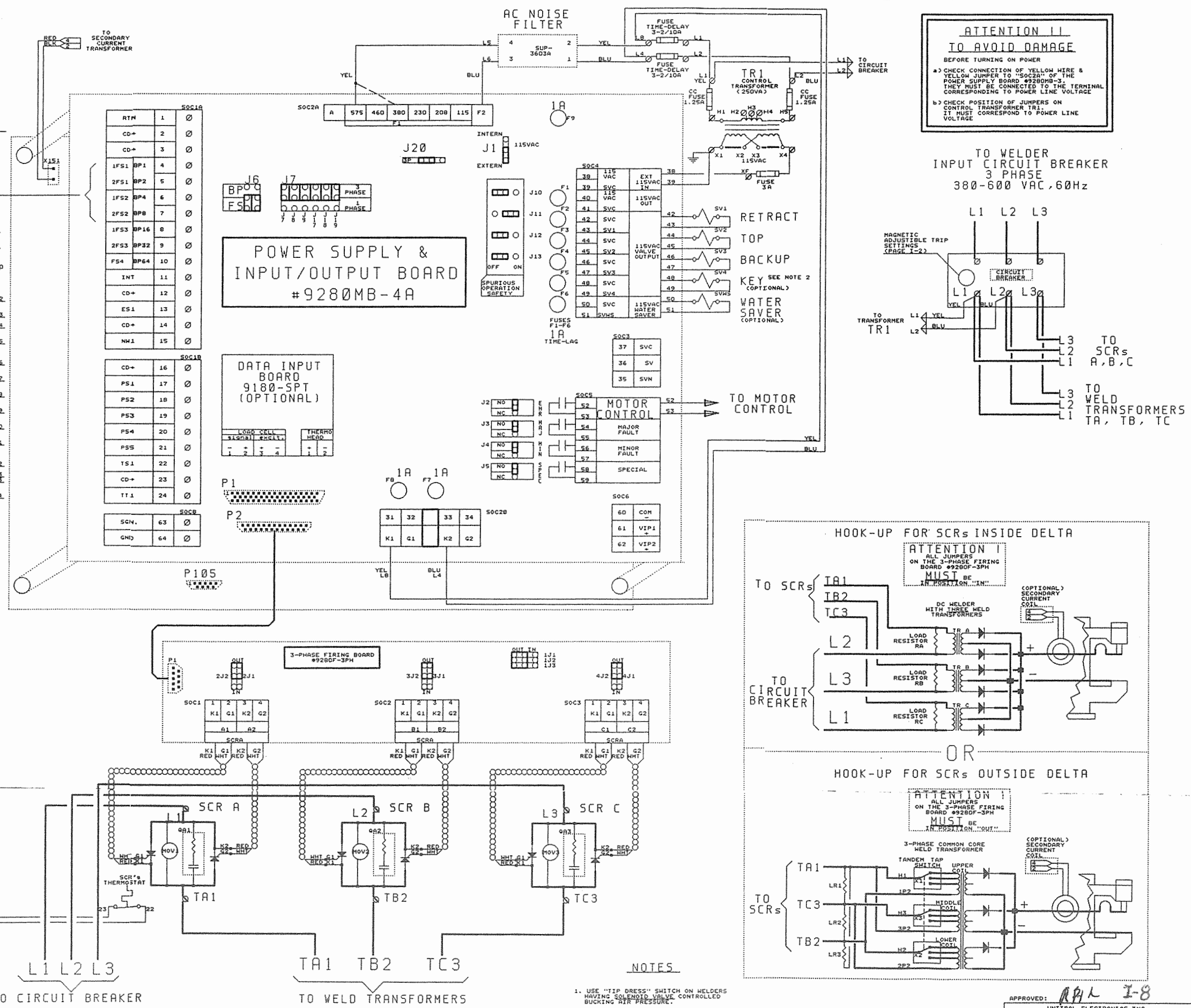
ANTI-TIEDOWN TWO-STAGE FOOT SWITCH OR DOUBLE HAND PUSHBUTTON



* IMPORTANT

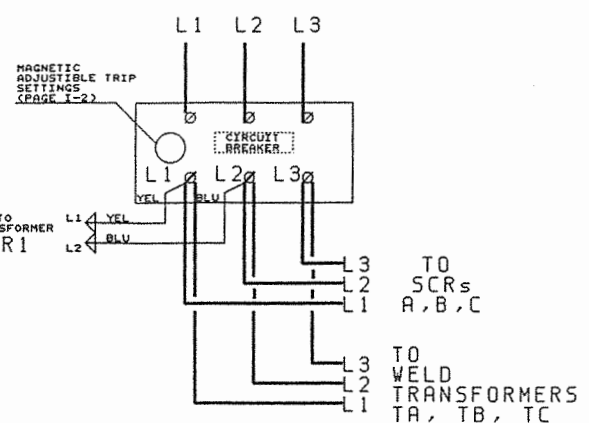
Only connect thermal switches (thermostats) to terminals 22-23 (SCR overtemperature) and 23-24 (Transformer overtemperature). Do not connect these terminals to relay contacts of any kind.

TERMINAL CONNECTIONS	PROGRAM A	PROGRAM B
2	2	
4	6	
5	7	

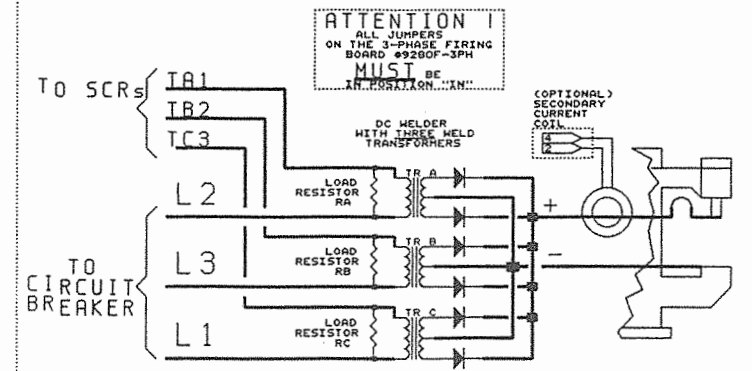


ATTENTION !!
TO AVOID DAMAGE
BEFORE TURNING ON POWER
a) CHECK CONNECTION OF YELLOW WIRE & YELLOW JUMPER TO "SOC2A" OF THE POWER SUPPLY BOARD #9280MB-3. THEY MUST BE CONNECTED TO THE TERMINAL CORRESPONDING TO POWER LINE VOLTAGE
b) CHECK POSITION OF JUMPERS ON CONTROL TRANSFORMER TR1. IT MUST CORRESPOND TO POWER LINE VOLTAGE

TO WELDER
INPUT CIRCUIT BREAKER
3 PHASE
380-600 VAC, 60Hz

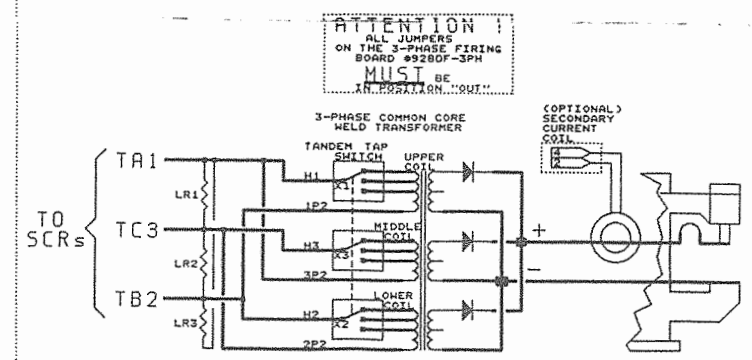


HOOK-UP FOR SCR's INSIDE DELTA



OR

HOOK-UP FOR SCR's OUTSIDE DELTA



NOTES

- USE "TIP DRESS" SWITCH ON WELDERS HAVING SOLENOID VALVE CONTROLLED BUCKING AIR PRESSURE. DO NOT USE IT ON SYSTEMS WITH HYDRAULIC RAMS.
- USE "KEY" VALVE ON WELDERS WITH CYLINDER OPERATED MECHANICAL RAM KEY.

SPECIAL OPTIONS

SOLUTION OPTION #9381-16

ELECTRONIC PRESSURE REGULATOR SYSTEM

PAGE 1 OF 2

HARDWARE:

This system consists of two ½" pressure regulators that use a proportional 0-5VDC control signal to provide 0-99psi or 0-6.82bar (field selectable).

One regulator, marked TOP, is used to provide air pressure for the top (forward) port in the welder's air cylinder or diaphragm.

One regulator marked BACKUP, is used to provide air pressure for the bottom (return) port in the welder's air cylinder or diaphragm.

One voltage control board is supplied to operate each of these regulators. This control board is factory mounted inside the control box, and a cable is provided through the control wall to connect to each of the regulators. The cables are marked TOP and BACKUP.

An arrow is molded on each side of the regulator to indicate the proper direction, with the line pressure on the input of the arrow, and the line going to the solenoid valves on the output side of the arrow.

A digital readout is provided in each regulator.

OPERATION:

1. Before starting, be sure that this function is operating on your control. To do this, press: PROGRAM, 87, ENTER, 51. The display will show: VIP IS ON. Then it will show lines about SPAN. Just push the 0 for each question and exit out of this program.
2. Each welding program (1 – 75) in the SOLUTION's memory has an entry position for WELD FORCE and FORGE FORCE.
 - a. If FORGE FORCE =00, the control will revert to the BACKUP pressure in PROGRAM 96.
 - b. If FORGE FORCE is greater than 00, then the computer will calculate the required TOP PRESSURE needed to reach this FORGE FORCE when there is 0 pressure on the BACKUP side of the cylinder, and also the required BACKUP pressure needed to counteract the FORGE FORCE to produce the selected WELD FORCE. See the main directions for the TIP FORCE CALCULATOR section to more fully understand how this operates.
3. After data has been entered in a program and the SINGLE, NO WELD or REPEAT button has been pushed, the SOLUTION computer will calculate and display the required air pressure required for the TOP and BACKUP pressures to reach the selected WELD FORCE and FORGE FORCE in that program.
4. The computer now sends a pulse width signal to the PULSE WIDTH TO VOLTAGE converter board (9180-PWC-2) mounted inside the control cabinet for each of the two channels.

SOLUTION OPTION #9381-16 ELECTRONIC PRESSURE REGULATOR SYSTEM

PAGE 2 OF 2

- a. You will see a red LED briefly light up on each board.
 - b. The signal length is: 10ms = 0 psi or 0 bar, 500ms = 99psi or 6.82 bar.
5. This pulse width signal is converted to a 0-5VDC output control signal that is sent to the outside proportional pressure regulators. This reference voltage controls the pressure output of the regulators, and the selected pressure can be shown on the readout.

ACCURACY: This system should have an accuracy of +/- .5psi or +/-0.4 bar.

ADJUSTMENT OF SYSTEM:

The entire control has been calibrated prior to shipment from Unitrol. If it is desired to check the settings, first enter the desired WELD FORCE and FORGE FORCE in the program. Then press the NO WELD button. The display will show the computed WELD and BACKUP pressures, and then will send the PWM signal to each board.

If the readings are out of the accuracy range requested, the following calibration can be done:

1. Press: PROGRAM, 87, ENTER, 51. The display will show:

VIP IS ON
VIP SPAN 1 = #.## CHANGE1=YES,0=NO

This is the span adjustment for the #1 regulator for setting pressure on the TOP. The factory setting is typically 1.03.

If the pressure setting is LOWER than requested, INCREASE this setting .01 at a time.

If the pressure setting is HIGHER than requested, DECREASE this setting .01 at a time.

Press ENTER. The display will show:

VIP SPAN 2 = #.## CHANGE1=YES,0=NO

This is the span adjustment for the #2 regulator for setting pressure on the BACKUP side of the cylinder or diaphragm. The factory setting is typically 1.03.

If the pressure setting is LOWER than requested, INCREASE this setting .01 at a time.

If the pressure setting is HIGHER than requested, DECREASE this setting .01 at a time.

INITIAL SETUP OF SYSTEM

**SOLUTION #9480
INITIAL SETUP PAGE SU-1**

Your Unitrol **SOLUTION** microcomputer control has been designed to allow use without the use of special codes. All functions can be entered and checked by answering the questions on the control's readout.

It is recommended that the you first identify the options installed on this control by checking the first page in this booklet. Each option can be found in the TABLE OF CONTENTS, and should be checked **after** the basic instructions have been read.

If at any time during the setup of this SOLUTION control a question occurs, please do not hesitate to call the Unitrol Technical Assistance Department. We at Unitrol want to be sure that all of the unique features in the system are being used to improve your company's product. The U.S. factory number is 847-480-0115, FAX number 847-480-0932. Thanks for choosing Unitrol. Your business is appreciated.

SYSTEM DESIGN

This control is designed to operate three separate single phase welding transformers whose output is connected through rectifiers to the welding electrodes. Each phase has a separate SCR firing board that is fired 120° from each other.

INITIAL SETUP OF SYSTEM

It is very important that all of the following INITIAL SETUP instructions are performed before trying to run this SOLUTION welding control. Once these steps have been performed, the control will match your welder's functions.

MOST PROBLEMS with welding controls occur because one or more of the setup steps was not followed properly.

Turn power on. If the display shows: **OPEN INITIATION**, an initiation input is closed and must be opened before going further.

The control will go through the following readout sequence indicating the condition of the system when last used. If you make changes in the system setup, these lines will change on future power up.

**DIAGNOSTIC TEST
UNITROL SOLUTION
TEST COMPLETED
HOLDING (OR MOMENTARY) MODE
PRESSURE TRANSDUCER ON (OR OFF)*
60 HZ (OR 50HZ) SYSTEM
SECONDARY I SYSTEM*
AVC ON (OR OFF)
SPOT (or SEAM or ROLL SPOT) MODE
"EPSON" PRINTER (or IMP-56 PRINTER)*
PROGRAM ## READY**

* If these optional functions are not installed on this control, the lines will not appear.

SOLUTION #9480
INITIAL SETUP PAGE SU-2

The SOLUTION control contains many functions that can be set to match your welder's operational characteristics. These can be reached by using the PROGRAM NUMBER in the following chart, or for most functions, by pressing: **PROGRAM, 0, ENTER**, and stepping down to the desired function, and pressing **PROGRAM**. Exact instructions required for making settings on a new control installation follow this chart.

UTILITY PROGRAM CHART

PROGRAM NUMBER	FUNCTION NAME	OPERATIONAL FUNCTION/OPTION	PAGE
76	FORGE DELAY STARTING POINT	Sets starting point where forge delay begins timing	SU-4
77	PRINT PROGRAMS DATA	#9181-22A/B printer options	OP-17
78	UNIT NUMBER	Used if sending data on RS-232 line to a central computer (data collection)	-
79	NOT USED		-
80	HEAD WEIGHT	Installs weight of ram	SU-4
81	PRINT FAULTS/WELDS	#9181-21A/B PRINTER & PORT	OP-19
82	SELECT MODE OF FAULT REACTION (AUTO/MANUAL RESET)	#9181-22A/B CURRENT MONITOR #9181-05C TRANSD. HIGH/LOW #9181-06A AVC HIGH/LOW	OP-10
83	CURRENT BLANKING	#9181-22A/B CURRENT MONITOR	OP-8
84	I-READ/REACT/OFF	#9181-22A/B CURRENT MONITOR	OP-10
85	I-CALIBRATION	#9181-22A/B CURRENT MONITOR	OP-7
86	SOFTWARE VERSION	standard function	-
87/54*	BALANCE PHASES B & C	Increases or decreases phase B and C P.F. to balance output (default: B=64, C=32)	**
87/55*	POSITIVE OR NEGATIVE FIRST CYCLE FIRING SELECT	Compensates if gates on all SCR contactors are installed 180° out of order	**
87/71*	SELECT 60 HZ OR 50HZ	MATCH SYSTEM TO LINE FREQ.	SU-5
87/81*	KEY/KEYLESS OPERATION	Selects operation sequence for welders with or without ram keylock	SU-5
87/91*	SET NEW 1% DEFINITION	Allows modification of 1% timing to compress or open heat range (default = 64)	**

* For these programs, press: **PROGRAM, 87, ENTER, ##(NUMBER)**

** These utility programs are normally **not** adjusted by user. Consult factory before using these programs.

continued on next page

**SOLUTION #9480
INITIAL SETUP PAGE SU-3**

UTILITY PROGRAM CHART (continued)

PROGRAM NUMBER	FUNCTION NAME	OPERATIONAL FUNCTION/OPTION	PAGE
87/92*	MAX. WELDING CURRENT and MAX. WELDING TIME LIMIT SAFETY SYSTEMS	Stops weld operation if weld current or weld time is out of maximum set values	SU-14 SU-15
87/96*	INSIDE/OUTSIDE DELTA	are inside or outside the delta. Also change jumpers!!	**
87/97*	SET TYPE OF PRINTER	#9181-21A/B PRINTER	-
87/99*	SET CURRENT RANGE	#9181-22A/B CURRENT MONITOR	OP-5
88	POWER FACTOR CORRECT	Offsets firing to match sys- tem power factor(default=15)	SU-6**
89	AVC VOLTAGE SETUP	Initial setup of voltage compensation base line	SU-6
90	INITIATION MODE	Selects MOMENTARY or HOLDING	SU-7
91	WELD/PART COUNTER	standard function	U-4
94	KEYBOARD/BINARY	Program select from keypad or binary program select	SU-17
95	SELECT WELDING MODE	SPOT, SEAM, ROLL SPOT: SINGLE OR DUAL PROGRAM	SU-8
95	SINGLE or DUAL PROGRAM SELECT	Weld with last-entered prog. or any two assigned to A/B	SU-9
96	TRANSDUCER PROGRAM	#9181-05 PRESSURE TRANSDUCER	OP-1
97	MAJOR\MINOR\SPECIAL FAULT OUTPUT	select relay output for various fault conditions	OP-12
98	AVC ON/OFF	standard function	SU-7
99	CLEAR MEMORY PROGRAM	standard function	-

* For these programs, press: PROGRAM, 87, ENTER, ##(NUMBER)

** These utility programs are normally not adjusted by user. Consult factory before using these programs.

SETUP STEPS

It is quite simple to set the SOLUTION to match your requirements.

When each setup program is called from the SOLUTION control, the display will first alternately show the present condition of that function and the following display:

CHANGE1=YES, 0=NO

This means that if you want to **change** the setting on the display, **PRESS** the number 1 on the keypad. If there is more than one possible choice, the display will show the choices one at a time with each followed by a number. By pressing the desired number at any time, the SOLUTION will now set the system with your choice.

SOLUTION #9480
INITIAL SETUP PAGE SU-4

If you want to **leave** the setting on the display, **PRESS** the number **0** on the keypad and no change will be made. If you press any other number than 1 or 0, the display will show:

INCORRECT ENTRY

and continue to show the original display sequence. If any non-number button is pushed at this time, the control will go back to the original condition and exit the program.

When installing a new control, go through all of the following **SETUP** steps before operating the welder. Note that some program numbers are skipped in this section. They will be used in the **DIRECTION FOR USE** portion of this direction book.

1. **FORGE DELAY:** This program sets the point at which **FORGE DELAY** timing starts. Press: **PROGRAM, 76, ENTER**, and the display will show:

CONSTANT LOW = 2

 or other phrase

CHANGE1=YES, 0=NO

Press **1**, and Push the number of the desired mode from the lines displayed:

CONSTANT HIGH =1

Turns on the BACK-UP (FORGE) valve for the entire weld sequence to provide full HIGH ELECTRODE FORCE. Used only where LOW FORCE is not of a high enough value.

CONSTANT LOW = 2

Leaves BACK-UP (FORGE) valve turned off for the entire sequence to provide LOW ELECTRODE FORCE. This is the proper setting when FORGE is not being used.

FORGE-PREHEAT =3

Turns on BACK-UP (FORGE) valve for PRECOMPRESSION and FORGE sequences. Starts the FORGE DELAY timing from the start of PREHEAT.

FORGE-WELD =4

Turns on BACK-UP (FORGE) valve for PRECOMPRESSION and FORGE sequences. Starts the FORGE DELAY timing from the start of WELD (or start of the last WELD impulse).

FORGE-TEMPER =5

Turns on BACK-UP (FORGE) valve for PRECOMPRESSION and FORGE sequences. Starts FORGE DELAY timing from the **start** of TEMPER (or start of the last TEMPER impulse)

NOTE: If your welder does **not** have a pneumatic systems designed for FORGE, this function should be set on **CONSTANT LOW**.

2. **HEAD WEIGHT:** This program sets the **HEAD WEIGHT** of the welder into the **SOLUTION's** memory. This value is used for all air pressure calculations.

- a. Use a mechanical scale or electronic tip force measurement device between electrodes when the power is turned on and the electrodes are in the **WORK** position (not in the **RETRACT** or fully open position). If necessary, adjust the electrode holder so that the space between electrodes is slightly more than the height of the measurement device.

SOLUTION #9480
INITIAL SETUP PAGE SU-5

- b. If the welder has a TIP DRESS switch or hand valve, place in the TIP DRESS position to allow the welder ram to drop. If welder does not have a TIP DRESS switch or valve, remove all air from the welder. This should allow the electrodes to close on the measurement device with just the weight of the welder's ram.
 - c. Measure the value.
 - d. Press: **PROGRAM, 80, ENTER**, and enter this value. If the value entered is not accurate, all calculations of the pressure system (and #9381-16 ELECTRONIC PRESSURE REGULATOR option) will be incorrect. Be sure the value is reasonable for this welder. Press **ENTER** to exit.
3. **LINE FREQUENCY:** The line frequency setting on the SOLUTION control must match that of your power line. If during the power up displays, as shown on page SU-1, the line frequency (50Hz. or 60Hz) is not correct, or just to check this setting, press: **PROGRAM 87, ENTER, 71**. The display will show:

50 HZ SYSTEM

or

60 HZ SYSTEM

CHANGE1=YES, 0=NO

If the frequency shown is correct, press **0** and the system will not be changed.

If the frequency shown is **not** correct, press **1** and the system will change to the proper value.

IMPORTANT: IF THE FREQUENCY SELECTED DOES NOT MATCH YOUR LINE FREQUENCY, ALL HEAT FUNCTIONS OF THE WELDER WILL BE INCORRECT AND CAN PUT THE WELDER OUT OF BALANCE TO CAUSE POTENTIAL DAMAGE TO THE WELDER TRANSFORMER AND CONTROL!

4. **KEY/KEYLESS OPERATION:** This control supports two types of welders:
- A. **KEY OPERATION** = welders that use a air operated keylock mechanism to lock the ram in the WORK (down) position. This is typically welders manufactured by Sciaky.
 - B. **KEYLESS OPERATION:** Welders that do not use a ram lock key. This is the common type of welder that is **not** manufactured by Sciaky.

Press: **PROGRAM 97, ENTER, 81** and choose the correct type of operation.

If a KEY OPERATION is chosen on a welder without a key, the control will be looking for a special key limit switch sequence and will not allow operation.

If KEYLESS OPERATION is chosen on welders that **do** have a key lock on the ram, electrode force will never exceed the weight of the ram, and the HEAD DOWN LIMIT SWITCH will open each time to prevent welder operation.

**SOLUTION #9480
INITIAL SETUP PAGE SU-6**

5. **POWER FACTOR CORRECTION:** This program adjusts the timing of the control compensate for the weld transformer and DC pack's power factor. It has been set at the factory for 15%. **This should be correct for most welders.**

THIS ADJUSTMENT SHOULD ONLY BE DONE BY QUALIFIED TECHNICIANS FAMILIAR WITH THIS TYPE OF EQUIPMENT.

By **raising** the PF CORRECTION value, all heat setting will result in **lower** current on the secondary. If this number is set too **high**, it is possible to start firing into the wrong quadrant to create very high surges of power.

By **lowering** the PF CORRECTION value, all heat settings will result in **higher** current on the welder secondary. If this number is too **low**, some weld cycles will be lost and the welder output will be erratic.

To change the number, press: **PROGRAM, 88, ENTER**, and enter the desired number. At 99% HEAT, an oscilloscope picture across the A SCR contactor should have only a 1-2% voltage notch on the first half cycle of each full cycle.

A **qualified technician** can also balance the three phases by use of PROGRAM 87/54. This is factory set at a default of 54 on B and 32 on C, and should be correct for most applications. By increasing these numbers, these phases will have reduced output. By decreasing these numbers, the output of these phases will be increased.

6. **AUTOMATIC VOLTAGE COMPENSATION:** This program is used to set a "baseline" position of voltage for the voltage compensation (AVC) function.

Even if this program has been set at another location, it must be set again if the welder is being connected to a new power line!

During the welding sequence, the SOLUTION checks the line voltage, compares it to this "baseline" setting, and then instantaneously adjusts the heat percent values to compensate for changes at that time (see AVC section of this

To make this initial setting, press: **PROGRAM, 89, ENTER**.

Using a volt meter, measure the L1 to L2 (R to S) voltage and enter this value from the keypad. Then push ENTER. The system will now display

READING VOLTAGE

for 20 seconds while it is making hundreds of voltage readings. At the end of this time, the SOLUTION will have averaged all readings and set a digital value that represents this average at the time being measured. It will use this level as a "baseline" setting as long as the AVC function is turned on.

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INITIAL SETUP PAGE SU-7

AVC continued:

If a voltage had been previously entered into this program, the display will show:

SYSTEM VOLT. = ###

CHANGE1 = YES, 0 = NO

Press **1** to change, and then enter the value as shown above.

IMPORTANT NOTE: If a new baseline is **not** entered, the AVC function will probably not operate correctly and will cause the welder to have a large variation of welding current as the line voltage changes.

Now press: **PROGRAM, 98, ENTER.** The display will show:

AVC IS ON

or

AVC IS OFF

CHANGE1 = YES, 0 = NO

If **AVC IS ON** shows on the display, press **0** to leave the function ON.

If **AVC IS OFF** shows on the display, press **1** to turn it ON. The only time the welder should be operated with **AVC OFF** will be if this automatic voltage compensation system is not properly functioning.

The Automatic Voltage Compensation system is designed to maintain the welder voltage within $\pm 2\%$ maximum variation when the line voltage has a $\pm 10\%$ variation. This means that swings in incoming line voltage to the welder should not have a major effect on the welder output.

Turning the AVC function ON will **not** make a major change to the heat settings (does not offset program values of %HEAT as is done in some other control systems).

7. **INITIATION MODE:** The SOLUTION control can be set for one of two types of initiation.

A. **HOLDING MODE** which requires the initiation switch to be held closed **until the start of the first heat cycle.** If released during or before the end of **SQUEEZE TIME**, the control will release the solenoid and stop the cycle.

HOLDING MODE is the mode that should **always** be used on welders where the space between the electrodes is **greater** than $3/8"$ and/or the electrode area is **not** guarded against insertion of the operator's hand.

INITIATION (continued)

B. **MOMENTARY MODE** which locks the control into the electrode closing and weld cycle **even if** the initiation switches **are** released **before** the end of SQUEEZE TIME.

MOMENTARY MODE is the normal position used with single level switch closure from an automatic control (PLC) system on properly guarded welders. **This MOMENTARY MODE should NEVER be used on welders where the tips are open more than 3/8" and/or the weld area is unguarded!**

To select the desired **INITIATION MODE**, press: **PROGRAM, 90, ENTER**. If the desired mode is shown on the display, press **0** to **not** change. If the mode shown is **not** the desired one, press **1** to **change**.

8. **SELECT TYPE OF WELDER:** The SOLUTION can control three types of welders. When a welder type has been chosen, the welding programs (75 in memory) will each be modified by the computer to contain only the proper functions for that type of welder.

Press: **PROGRAM, 95, ENTER**, and the display will show:

SPOT WELD MODE=1

or other phrase

CHANGE1=YES, 0=NO

Press **1**, and the display will show:

SPOT WELD MODE=1

For welders using two fixed (non-rotating) electrodes to make one spot at a time.

ROLL-SPOT MODE=2

For welders that use rolling electrode wheels with a motor drive rolls the wheels a distance, stops, makes a weld in one place, rotates again, and continues this sequence.

SEAM WELD MODE=3

For welders that use rolling electrode wheels but have the motor operate continuously as welds are being made.

Choose the desired welder by entering the proper number. If this welder has the ability to do more than one type of welding, the mode can be changed at any time as desired.

Sample programs in the **DIRECTION FOR USE** section of this book will show program lines for each of these three types of welders. If a program has been set using one of the welder types, and then this type selection has been changed, only those lines shown in the program on the display will function even though values in lines that are not visible have been previously entered.

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9. **SINGLE or DUAL PROGRAM:** After the above choice for type of welder has been made, press **ENTER**, and the display will show:

SINGLE HEAT MODE

or

DUAL HEAT MODE

CHANGE1=YES, 0=NO

The SOLUTION control has inputs to support two initiations (either foot switch or anti-tiedown hand buttons).

If only **one** initiation is being used, the control should be set in SINGLE HEAT MODE. This means that the program chosen from the keypad (as will be shown in the DIRECTION FOR USE section of this book), will be used.

If **two** initiations are wired to the control and the SINGLE HEAT MODE has been chosen, closing of either initiation will use just the keypad chosen weld program. However, if the DUAL HEAT MODE has been chosen above, the display will show:

PROG A=--, & B=---

CHANGE1=YES, 0=NO

Press **1**, and then the display will show:

PROGRAM A = _ _

At this time, enter any of the 75 weld program numbers. If this program has no values previously entered, the display will show:

PROGRAM # EMPTY

PROGRAM A = _ _

and continue to request a program number that has data.

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INITIAL SETUP PAGE SU-10

Once a program number has been entered that has data, the display will show:

PROGRAM B = _ _

Enter the desired welding program from the 75 numbers in memory. If this program number has data, the display will show:

PROG A=##, & B=##

To confirm your selection.

10. **PRESSURE CALCULATING SYSTEM SETUP:** A value must now be entered that represents the welder's air cylinder (or diaphragm) area. This value will be used by the SOLUTION to calculate required air pressure settings to obtain the desired ELECTRODE WELDING FORCE and ELECTRODE FORGE FORCE (if FORGE is being used).

If this SOLUTION control does not have PRESSURE TRANSDUCER or ELECTRONIC PRESSURE REGULATOR options, the PRESSURE CALCULATING system will display the required air pressure regulator settings needed to obtain desired welding forces.

If the PRESSURE TRANSDUCER option (#9381-05) and/or ELECTRONIC PRESSURE REGULATOR option (#9381-16) are in this control, the values calculated will be used by the control to electronically set the air pressures (#9281-16 option) and then wait until the correct calculated force has been reached (#9381-05 option) before welding will start.

- A. **AIRLOCK TYPE RAM:** If this welder uses a SINGLE PRESSURE or DOUBLE PRESSURE AIRLOCK ram, **skip** to sections D and E on the following pages.
- B. **PRESS TYPE WELDER:** If this welder uses a **DIRECT** acting (PRESS type) ram **without** an AIRLOCK, this value is calculated by using the following formula:

$$\text{CYLINDER AREA} = \text{CYLINDER INSIDE DIA.} \times \text{CYLINDER INSIDE DIA.} \times .785.$$

This value is often listed on the welder nameplate.

Software is available in INCH or METRIC measurement. Use the appropriate example that follows to match your software:

INCH SYSTEMS:

MEASUREMENT EXAMPLE: Calculation for a 10" diameter cylinder is:

$$\text{CYLINDER AREA} = 10 \times 10 \times .785 = 100 \times .785 = 78.5^2$$

METRIC SYSTEMS:

MEASUREMENT EXAMPLE: Calculation for a 20cm diameter cylinder is:

$$\text{CYLINDER AREA} = 20 \times 20 \times .785 = 314 \text{ cm}^2$$

SOLUTION #9480
INITIAL SETUP PAGE SU-11

PRESSURE CALCULATING SYSTEM SETUP (continued)

For a PRESS TYPE welder,

INCH SYSTEMS:

$$\text{ELECTRODE FORCE} = \text{CYLINDER AREA} \times \text{AIR PRESSURE}$$

As an example, for the same 10" diameter cylinder PRESS TYPE welder that has an air pressure of 30 psi (differential pressure in cylinder),

$$\text{TIP FORCE} = \text{CYLINDER AREA (IN}^2\text{)} \times \text{PRESSURE (psi)} = 78.5\text{in}^2 \times 30 \text{ PSI} = 2,355 \text{ LB.}$$

METRIC SYSTEMS:

$$\text{ELECTRODE FORCE} = \text{CYLINDER AREA (cm}^2\text{)} \times \text{AIR PRESSURE (bar)} \times 10$$

As an example, for the same 20cm diameter cylinder PRESS TYPE welder that has an air pressure of 3.2bar (differential pressure in cylinder),

$$\text{TIP FORCE} = \text{CYLINDER AREA} \times \text{PRESSURE} = 314 \text{ cm}^2 \times 3.2 \text{ bar} \times 10 = 10,048\text{n.}$$

It is now necessary to set the CYLINDER AREA into the SOLUTION's memory. PRESS: **PROGRAM, 96, ENTER.**

- C. **ENTERING LB\PSI VALUES:** If this control has been supplied with the #9381-05 PRESSURE TRANSDUCER option, the display will show:

TRANSDUCER IS ON

OR

TRANSDUCER IS OFF

CHANGE1=YES, 0=NO

Select **0** or **1** to turn (or keep) the transducer ON.

If this control has **not** been supplied with the #9381-05 PRESSURE TRANSDUCER option, or after the above entry, the display will show:

TOP CYL. AREA
---LB FORCE\PSI

OR

TOP CYL. AREA
--- SQ. CM

CHANGE1=YES, 0=NO

SOLUTION #9480
INITIAL SETUP PAGE SU-12

Enter the CYLINDER AREA as previously calculated at this point. After ENTER has been pushed, the display will show:

BACKUP CYL AREA ----LB SQ. IN	OR	BACKUP CYL.AREA ---- SQ. CM
CHANGE1=YES, 0=NO		

This is the area on the **underside** of the cylinder or diaphragm. This value is typically smaller than the value on the TOP side since the area of the piston subtracts from the effective area. **In most cases, you can use the same value as entered in TOP above.** However if better accuracy is desired, subtract the shaft area from the TOP value and enter as the BACKUP number.

- D. **SINGLE PRESSURE AIRLOCK TYPE RAMS:** This type of welder uses a captivated air cushion mounted in line with the main ram cylinder. This AIRLOCK contains air at all times and acts as an "air spring" to provide fast follow-up for the electrode.

The SINGLE PRESSURE AIRLOCK system has only a **single** air input port on the AIRLOCK (see pages I-4 and I-5 for a pictorial for this system). With a SINGLE PRESSURE AIRLOCK, a welder cannot be used with a FORGE function.

When the ram cylinder pushes forward, the electrode contacts the metal and starts to compress this AIRLOCK. The pneumatic system connected to this AIRLOCK maintains the pressure. The main ram air cylinder will bottom before the AIRLOCK has fully bottomed. **Therefore the ELECTRODE FORCE pushing against the part being welded will be calculated by the area of the AIRLOCK times the air pressure in the AIRLOCK.**

For this **SINGLE PRESSURE AIRLOCK TYPE RAM**, enter the manufacturer's AIRLOCK area value for **both TOP and BACKUP LB\PSI** following the basic directions in section C above.

- E. **DOUBLE PRESSURE AIRLOCK TYPE RAMS:** This type of welder also uses a captivated air cushion mounted in line with the main ram cylinder that also contains air at all times and acts as an "air spring" to provide fast follow-up for the electrode.

However, the DOUBLE PRESSURE AIRLOCK contains **two** air input lines to put air on **both sides** of the cushion (see pages I-4 and I-5 for a pictorial diagram of this system).

When the ram cylinder pushes forward, the electrode contacts the metal and starts to compress this AIRLOCK. The pneumatic system connected to this AIRLOCK maintains the pressure. The main ram air cylinder will bottom before the AIRLOCK has fully bottomed.

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INITIAL SETUP PAGE SU-13

Since air can be on **both** sides of the cushion, the **ELECTRODE FORCE** pushing against the part being welded will be calculated the formula:

INCH SYSTEMS:

$$\text{ELECTRODE FORCE} = (\text{FINAL FORCE AREA} \times \text{PSI}) - (\text{LIFTING FORCE AREA} \times \text{PSI})$$

METRIC SYSTEMS:

$$\text{ELECTRODE FORCE} = (\text{FINAL FORCE AREA} \times \text{BAR}) - (\text{LIFTING FORCE AREA} \times \text{BAR}) \times 10$$

The FINAL FORCE area is typically the lowest port on the AIRLOCK. The LIFTING FORCE AREA is usually the highest port on the AIRLOCK. These AREA values can be obtained from the welder manufacturer and are almost impossible to calculate from looking at the AIRLOCK from the outside.

The DOUBLE PRESSURE AIRLOCK allows for a differential pressure to be created that allows FORGE operations.

For the DOUBLE PRESSURE AIRLOCK, enter the manufacturer's value for the FINAL FORCE area as the TOP in² or cm² and the value for LIFTING FORCE AREA as the BACKUP in² or cm² using the general directions in section C above.

- F. **ROCKER ARM TYPE WELDERS:** If the welder is a ROCKER ARM type (main welding arm pivots), then this value must take into consideration both the force provided by the air cylinder as well as the mechanical leverage of the welder. For a ROCKER ARM welder, the value to be entered is calculated as:

$$\text{AFFECTIVE AREA} = \text{CYLINDER AREA} \times (A \div B)$$

Where:

A = the distance from the welder cylinder rod and the rocker arm pivot point

B = the distance from the rocker arm pivot point to the center of the electrode.

See the section on DIFFERENTIAL PRESSURE TRANSDUCER in the DIRECTIONS FOR USE area of this book for more information on electrode force and these options.

11. If your control contains any of the following options, follow setup instructions in the OPTION section of this book before **going** to the DIRECTIONS FOR USE section.

CURRENT MONITOR/LIMITER (#9181-22B) = OP-5
DIFFERENTIAL PRESSURE TRANSDUCER (#9281-05) = OP-1
PRINTER PORT (option #9181-21A) = OP-16
PRINTER AND PORT (option #9181-21B) = OP-16
ELECTRONIC PRESSURE REGULATOR (option #9381-16) = OP-13

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MAXIMUM WELDING CURRENT LIMIT SAFETY

This feature allows monitoring of high current on controls that have the #9281-22B current option.

FUNCTION: While a weld is in process, the SOLUTION checks the welding current every cycle. It then compares this reading to the **MAXIMUM CURRENT** value set in the control.

The **MAXIMUM CURRENT** value = **HIGH I X HIGH I LIMIT%**

The **HIGH I** value is set in each welding program. Step down in any of the 75 welding programs to the line: **HIGH I - 000,000A**. This is a customer setting of the maximum current limit for this program.

The **HIGH I LIMIT%** is set by pressing: **PROGRAM, 87, ENTER, 92**. The display will show:

HIGH I LIMIT=00%

CHANGE1=YES, 0=NO

If this number is left at **00**, the **MAXIMUM CURRENT LIMIT** function will not operate.

If the number is set at a number higher than 00%, then the SOLUTION computer will calculate the high limit safety as:

HIGH WELDING LIMIT SAFETY = (1 + HIGH I LIMIT)X HIGH I (in welding program being used).

EXAMPLE: If the welding program being used has **HIGH I = 025,100A**, and **HIGH I LIMIT = 20%** in **PROGRAM 87/92**, then the calculation is:

HIGH WELDING CURRENT LIMIT SAFETY=(1+.20)X25,100=1.20 X 25,100 = 30,120A.

WHAT HAPPENS:

If **PROGRAM 84** is set in **READ ONLY** or **READ & REACT** mode, and welding current at any time during a sequence exceeds 30,120A, the control will stop the welding sequence, the display will show:

I>LIMIT, 35,240A

where 35,240A is the current measured when the weld current was stopped. Note that even if a long welding time has been entered in this program, the control will stop weld current flow as soon as the over-limit current has been detected.

If Program 87/92 is set in **READ OFF**, **THIS FUNCTION WILL NOT OPERATE.**

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MAXIMUM WELDING CURRENT LIMIT SAFETY (continued)

REMEMBER: For this function to operate, you have to:

1. Have secondary current monitor option #9381-22B installed on the control
2. Have a percentage higher than 00% entered into PROGRAM 87/92
3. Have a HIGH I value set in the program being used
4. Have PROGRAM 84 set in READ & REACT or READ ONLY MODE.

SETTING RECOMMENDATION: It is recommended that this limit value be set fairly high to prevent false stopping of a weld. A value of 30% is a recommended value.

MAXIMUM WELD TIME LIMIT SAFETY

FUNCTION: Monitors all WELD TIME numbers as they are being entered in welding programs and will not allow a number to be entered that exceeds the limit.

SETTING LIMIT:

1. Press: **PROGRAM, 87, ENTER, 92.** Press **STEP** until the display shows:

MAX WELD CYC=000

CHANGE1=YES, 0=NO

2. Press **1**, and enter the maximum number of WELD CYCLES you will allow to be entered in **any** welding program.
3. Press **ENTER**, and this global number will now be used to monitor all welding programs.
4. If a WELD TIME that exceeds this **MAX WELD CYC** number is entered in any welding program, the display will show:

WELD CYC > MAX

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DIRECTIONS FOR USE PAGE SU-16

MAXIMUM WELDING TIME LIMIT SAFETY (continued)

5. At this time, you must reduce the WELD TIME number or the control will not allow this program to be used.

NOTE: If you change this MAX WELD CYC number after programs have been entered and the WELD TIME in those programs is higher than the **MAX WELD CYC** number, the display will show:

WELD CYC > MAX

and require that you lower this number until it is below the **MAX. WELD CYC** number.

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PROGRAM SELECT MODES

The SOLUTION control can be used in two PROGRAM SELECT modes:

KEYBOARD PROGRAM SELECT:

When the control is set in this mode, the last program number that was entered will be used for the weld.

If, in **PROGRAM 95**, the control is set in DUAL PROGRAM, then the welding program used will be the program assigned to A in PROGRAM 95 when initiation A is closed, or the welding program assigned to B in PROGRAM 95 when initiation B is closed. See SU-6 for more information on DUAL PROGRAM mode.

To set the control into KEYBOARD PROGRAM SELECT mode, press: **PROGRAM, 94, ENTER**. The display will show:

KEYBRD PROG. SEL

or

BINARY PROG. SEL

CHANGE1=YES, 0=NO

If the display shows **KEYBRD PROG. SEL**, press **0** to not change. If the display shows **BINARY PROG. SEL**, press **1** to change.

SETTING INITIATION MODE JUMPER:

Locate **J6** on the upper left corner of the power supply. This is a small pull-out jumper. To use the control in **KEYBOARD PROGRAM SELECT** mode, put the jumper in the **FS** position. The welding sequence will not start if jumper **J6** is left in the **BP** position.

BINARY PROGRAM SELECT: When the control is set in this mode, up to 15 welding programs can be selected using BINARY CODE switches.

To set the control into BINARY PROGRAM mode, press: **PROGRAM, 94, ENTER**. The display will show:

KEYBRD PROG. SEL

or

BINARY PROG. SEL

CHANGE1=YES, 0=NO

If the display shows **BINARY PROG. SEL**, press **0** to not change. If the display shows **KEYBRD PROG. SEL**, press **1** to change.

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BINARY PROGRAM SELECT

SETTING BINARY INPUT CODE:

Connect switches per the hookup diagram with the common connected to any **CD+** terminal.

BINARY PROGRAM NUMBER	BP1 (4)	BP2 (5)	BP4 (6)	BP8 (7)
1	X			
2		X		
3	X	X		
4			X	
5	X		X	
6		X	X	
7	X	X	X	
8				X
9	X			X
10		X		X
11	X	X		X
12			X	X
13	X		X	X
14		X	X	X
15	X	X	X	X

SETTING INITIATION MODE JUMPER:

Locate **J6** on the upper left corner of the power supply. This is a small pull-out jumper. To use the control in **BINARY PROGRAM SELECT** mode, put the jumper in the **BP** position. If the jumper is left in the **FS** position, welding will start as soon as the binary code has been selected. This is not a correct method since the program selected might vary if the binary code switches bounce. Also, if the control is in the **FS** position and the binary code remains selected, the control will lock out and not make any more welds.

SEQUENCE:

After selecting the desired binary code to match programs 1-15, wait for a minimum of 50ms, and then close a contact between **INIT** (terminal 11) and **CD+**. The binary code can be left closed if desired as long as **INIT** is released between welds.

DIRECTIONS FOR USE

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If at any time during your use of this SOLUTION control a question occurs, please do not hesitate to call the Unitrol Technical Assistance Department. We at Unitrol want to be sure that all of the unique features in the system are being used to improve your company's product. The U.S. factory number is 847-480-0115, FAX 847-480-0932

WELDER INITIATION MODES: The SOLUTION can be operated using one of these switches:

SINGLE STAGE FOOT SWITCH which closes weld tips and goes through the welding cycle on closing of a single switch contact.

DOUBLE STAGE FOOT SWITCH where the tips are closed on closing of the first switch, and the weld sequence started on closing of the second.

SINGLE CONTACT CLOSURE typically used in automatic machine operations using a PLC or cam switch closure. Welding tips are closed and the weld cycle is started on a single signal.

DOUBLE HAND SWITCHES WITH ANTI-TIEDOWN that requires the closing of two double pole switches within one second of time to close the welding tips and start the weld cycle. If one of the switches has been permanently closed ("tied down"), no welding will occur, and this switch must be opened before another weld sequence can be started.

The **SOLUTION** control automatically knows what type of switch is being used by the sequence in which the first and second level initiation inputs are closed.

LEVEL I initiation for the first program input would be terminal **1FS1**. **LEVEL II** input for the first program would be terminal **2FS1**.

If a second program is being used (DUAL PROGRAM), **LEVEL I** for the second program would be terminal **1FS2**, and **LEVEL II** would be **2FS2**.

If **LEVEL I** input is closed first, then **LEVEL II**, the SOLUTION control will operate in the **DOUBLE STAGE FOOT SWITCH** mode.

If **LEVEL II** input is closed first, then **LEVEL I**, the SOLUTION control will operate in the **DOUBLE HAND SWITCH ANTI-TIEDOWN** mode.

If **BOTH LEVEL I and LEVEL II** are closed at the same time, the SOLUTION control will operate in the **SINGLE SWITCH/SINGLE STAGE FOOT SWITCH** mode.

There is no keypad entry required to obtain any of the above initiation modes. In this way, the welder will be operated in the proper mode as dictated by the hard wiring of the initiation switch devices.

IMPORTANT: To achieve these modes, the welder must be wired per the hook-up diagram for the selected type of switches. If more than one initiation is desired, ie. foot switch and double hand switches, a customer installed switch can be added per diagrams available from Unitrol. In any case, selection of initiation can be made externally without the need to operate the SOLUTION keypad.

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KEYBOARD LOCK SYSTEM: A keylock is located on the keypad. If the key switch is in the **locked** position and any change is attempted to any program, the control will refuse to make such a change, and the display will show

KEYBOARD LOCKED

The system will, under locked conditions, only allow review of programs, selection of existing programs, and MODE selection.

WATER SAVER CIRCUIT: Your UNITROL SOLUTION comes standard with electrics to operate a solenoid valve to control cooling water. In operation, the valve, connected to terminals 50 and 51 of the power supply board, will turn on during all welding cycles, and remain on for one minute after the last weld has been made. If no new weld is made at that time, the valve will go off. This feature, extra cost on other controls, will save you on water usage as well as prevent unexpected water baths while dressing tips!

USING WELD/NOWELD/REPEAT FUNCTIONS:

As noted earlier in the SETUP section, this control has several operating modes. Therefore, when a particular operating mode (SPOT WELD, SEAM WELD, ROLL SPOT) is selected in PROGRAM 95, the system will respond to the pushing of these three keypad buttons in different ways.

When **SPOT WELD MODE** has been selected in PROGRAM 95:

If the **SINGLE** button is pushed the GREEN keypad LED will turn on. In this SINGLE MODE, the welder will make one weld sequence after initiation has been closed even if the initiation switch remains closed (ANTI-REPEAT feature).

If the **NO-WELD** button is pushed only **ONCE**, both the GREEN and YELLOW keypad LEDs will turn on. In this SINGLE/NO WELD MODE, the welder will go through the weld sequence only **one** time after initiation without welding and stop even if the initiation switch remains closed (ANTI-REPEAT feature).

If the **NO-WELD** button is pushed **TWICE**, both the YELLOW and ORANGE keypad LEDs will turn on. In this REPEAT/NO WELD MODE, the welder will go through the weld sequence one time after initiation **without welding**. If the initiation switch is still closed at the end of this sequence, the welder will release the weld solenoid for a time as set in the program (REPEAT OFF TIME), then start the same sequence again. This will continue until the initiation switch has been opened prior to the start of a new sequence.

If the **REPEAT** button is pushed, the ORANGE keypad LED will turn on. In this REPEAT MODE, the welder will go through one weld sequence after initiation. If the initiation switch is still closed at the end of this sequence, the welder will release the weld solenoid for a time as set in the program (REPEAT OFF TIME), then start the weld sequence again. This will continue until the initiation switch has been opened prior to the start of a new weld sequence.

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USING WELD/NOWELD/REPEAT FUNCTIONS, continued:

If **SEAM WELD MODE** or **ROLL SPOT MODE** has been selected in **PROGRAM 95**:

If the **SINGLE** button is pushed the GREEN keypad LED will turn on. In this **SINGLE MODE**, the welder will continue to weld until the initiation switch has been opened. The control will then finish the balance of one loop in the schedule and then stop.

If the **NO-WELD** button is pushed only **ONCE**, both the GREEN and YELLOW keypad LEDs will turn on. In this **SINGLE/NO WELD MODE**, the welder will go through the same sequence as **SINGLE** but will not weld (no current).

If the **NO-WELD** button is pushed **TWICE**, both the YELLOW and ORANGE keypad LEDs will turn on. In this **REPEAT/NO WELD MODE**, the welder will go through NO-WELD sequence and will only stop **when** the initiation switch has been **RELEASED AND CLOSED A SECOND TIME**. At that time the sequence will stop. This is a useful mode when the part is very large and the operator cannot hold the initiation switch closed and handle the part at the same time.

If the **REPEAT** button is pushed **TWICE**, both the YELLOW and ORANGE keypad LEDs will turn on. In this **REPEAT/NO WELD MODE**, the welder will go through sequence (with welding current flowing) and will only stop **when** the initiation switch has been **RELEASED AND CLOSED A SECOND TIME**. At that time the sequence will stop. This is a useful mode when the part is very large and the operator cannot hold the initiation switch closed and handle the part at the same time.

NOTE: If one of the above modes has **not** been pushed after a welding program has been chosen, and the welder is initiated, the display will show:

CHOOSE MODE

and flash the GREEN, YELLOW, and ORANGE indicator lights on the keypad.

COUNTER SYSTEM

The SOLUTION control contains a system that will count either **individual WELDS** or **total WELDED PARTS**.

- a. To set the counter system, press: **PROGRAM, 91, ENTER**. The display will show:

WELDS MADE

RESET COUNTER ?

PRESS: 1=YES, 0=NO

- b. If it is desired to **RESET THE COUNTER**, press 1. If the count is to be left as shown, press 0. The display will now show:

COUNTER IS ON

or

COUNTER IS OFF

CHANGE1=YES, 0=NO

- c. Press 1 to change the displayed condition, or 0 to leave the function unchanged. The display will now show:

WELDS\PART ###

IF the system is set in PROGRAM 95 for **SPOT WELD MODE**, Enter the number of single welds that will be made during this weld process, then press **ENTER**.

If the system is set in PROGRAM 95 for **SEAM WELD** or **ROLL-SPOT WELD**, this number will equal the weld passes needed to complete a part, then press **ENTER**.

If only one spot weld, or one seam weld pass is used to complete the part, enter either 000 or 001, then press **ENTER**.

- d. If the counter system has been set for 000 WELDS\PART or 001 WELDS\PART, the SOLUTION will count each weld made and display after each weld:

WELDS MADE

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COUNTER SYSTEM (continued)

- e. If the counter system has been set for **002 WELDS\PART** or higher, the SOLUTION control will increment the counter after that number of welds has been made, and will display:

PARTS MADE

If the counter has been turned **OFF**, the display will not show any counter functions. After each weld, with the counter **OFF**, the display will show the first letter of the weld function just performed (will leave blank functions not used in the weld sequence). Also, if the **NO WELD** button on the keypad has been pushed, the counter will not change.

The letter display can be used as a diagnostic tool to verify which welding function have just been used and also confirm that the SOLUTION is **NOT** counting parts or welds.

The displays will be different for each welding mode:

For a welder set in the **SPOT WELD MODE**, the display for a weld sequence that used all available functions will be:

S P U W D P Q TH

where:

S = SQUEEZE TIME
P = PREHEAT
U = UPSLOPE
W = WELD
D = DOWNSLOPE
P = POSTHEAT
Q = QUENCH TIME
T = TEMPER

For a welder set in the **ROLL-SPOT MODE**, the display for a weld sequence that used all available functions will be:

S P U W D P QTHM

where:

S = SQUEEZE TIME
P = PREHEAT
U = UPSLOPE
W = WELD
D = DOWNSLOPE
P = POSTHEAT
Q = QUENCH TIME
T = TEMPER
M = MOTOR ON CYCLES

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COUNTER SYSTEM (continued)

For a welder set in the **SEAM WELD MODE**, the display for a weld sequence that used all available functions will be:

S	U	W	D	QTHI
---	---	---	---	------

where:

S = SQUEEZE TIME
U = UPSLOPE
W = WELD
D = DOWNSLOPE
H = HOLD TIME
I = INTERHEAT TIME

SETTING WELDING PROGRAMS

Your SOLUTION control has space for **75 WELDING PROGRAMS**. Each program contains all heat and time functions required for the chosen type of welding as selected in PROGRAM 95 (SPOT WELD, ROLL-SPOT, or SEAM).

To enter a **new** program, follow these steps.

1. Press: **PROGRAM, ##, ENTER** where **##** is 01 to 75. Each number represents a memory storage location in the SOLUTION. The number can be selected randomly, or it can match the part being welded (ie. PROGRAM 22 for 22 gage steel, etc.).
2. After ENTER has been pressed, the display will show:

PROGRAM ## EMPTY

 if no data is in this number

or

PROGRAM ## READY

 if a program has been previously entered in this number

3. If data is already in this program number, you can either change it or select a new program number. If the program is empty, you can enter data. To do this, press: **STEP** and the first line of this program will be displayed.

The lines of data in the program will depend on the type of welder that has been selected in PROGRAM 95 (SPOT WELD, ROLL-SPOT, or SEAM WELD).

4. **STEP/ENTER BUTTON:** This keypad button is used to both enter a value into the system as well as just step to another line in the program.

As each line is displayed, enter a number and push this button. Be sure that the displayed number is correct. If not, continue to enter numbers until the display is correct.

If the line is to be left as displayed, press the same button. **It is not necessary to enter 00 on a line that will not be used.**

5. **BACK STEP BUTTON:** This keypad button (upward triangle) will move the program back one line every time it is pushed.
6. **BLOCK STEP BUTTON:** This keypad button (downward triangle) moves the program to the next logical block of data. Each of the three weld type sections that follow will show how these blocks are organized.
7. **HIGH SPEED PROGRAM SEARCH:** Once data has been entered into a program, you can **hold down** the **STEP/ENTER** button to have the control display only the program lines that have data at a rate of about two lines per second.

If you want to make a change on one of these lines, release the **STEP/ENTER** button when that line is being displayed, make the change, and then either continue down the program by pressing **STEP/ENTER**, or exit out by pushing either **SINGLE, NO WELD, or REPEAT** button. **It is not necessary to push ENTER after the last change has been made.**

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SETTING WELD PROGRAMS (continued)

If the **STEP/ENTER** button is held down past the last used data line, the display will show:

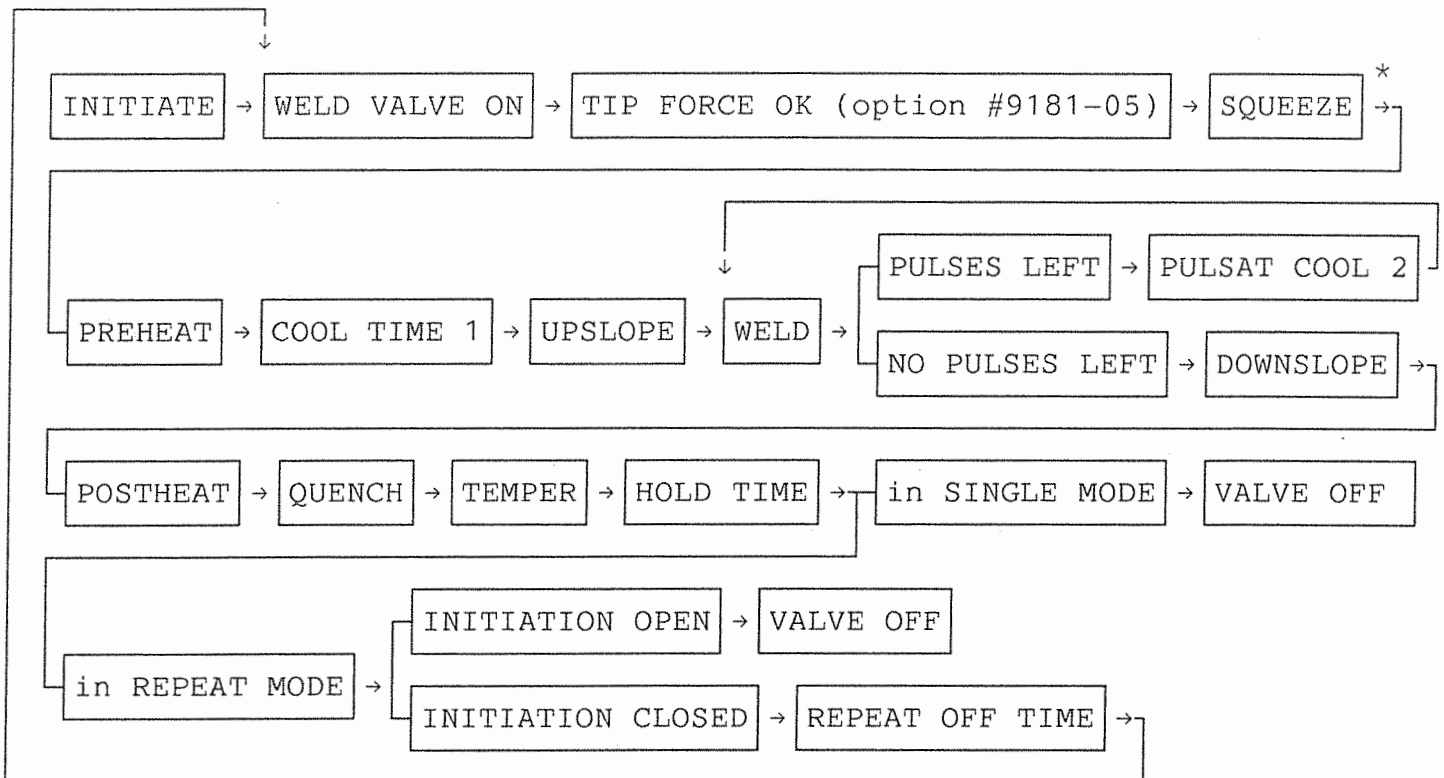
DATA TABLE END

and stop. If you want to start at the top of the program again, press the **STEP/ENTER** button.

Each of the following sections shows how to enter data into each of the WELDING MODES.

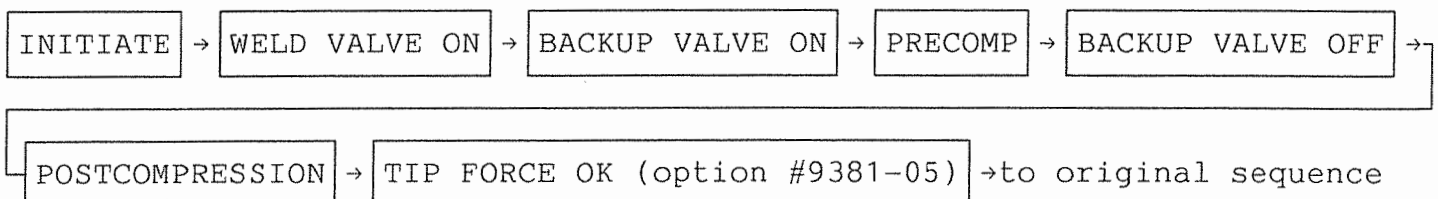
INSTALLING A SPOT WELD PROGRAM

1. Be sure that the control is in the **SPOT WELD MODE** by following directions found on page SU-8.
2. The SPOT WELD MODE sequence can use a variety of functions to control both the weld heat as well as electrode force and timing. All functions are shown in the following sequence string except PRECOMPRESSION and FORGE which are shown later. If one or more function is not being used (value of 00 in program), the control jumps directly to the next one without any lost time.



* Note that if using the REPEAT sequence above, the **first** time a weld sequence is run, the **INITIAL SQUEEZE** time will be used rather than **SQUEEZE TIME** as shown. On each repeat sequence, the **SQUEEZE TIME** will then be used.

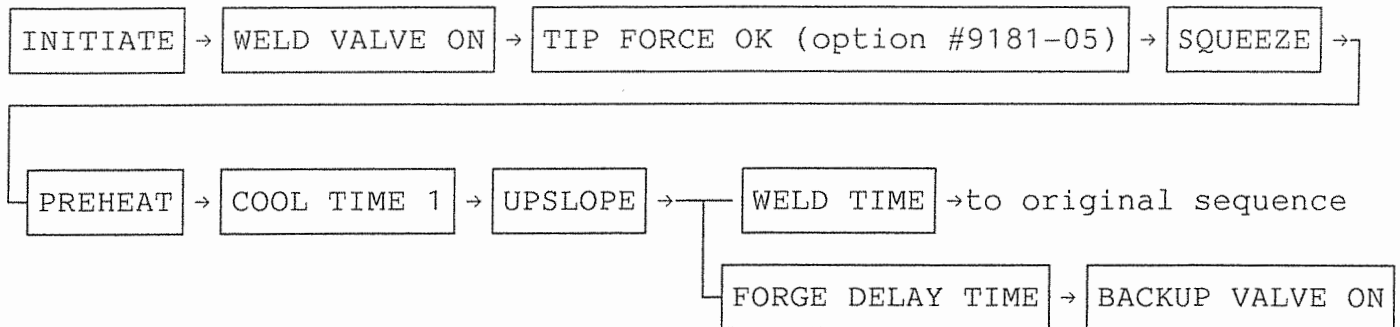
3. If **PRECOMPRESSION** is used, the sequence is:



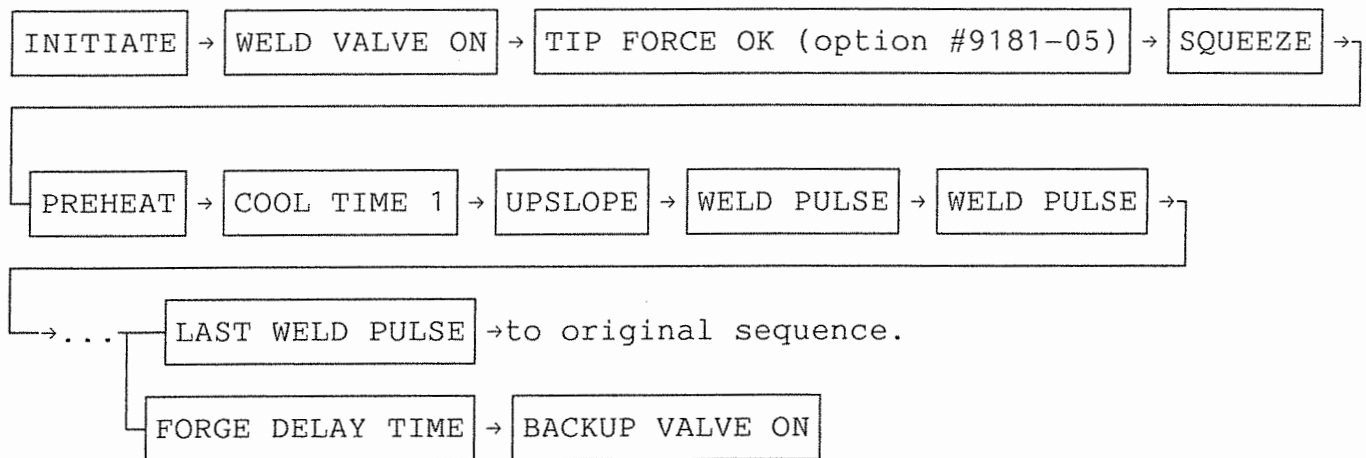
INSTALLING A SPOT WELD PROGRAM (continued)

4. **FORGE DELAY** allows a high force to be applied to the electrodes at some time near or at the end of the welding sequence. The starting point for this timing is set in Program 76 (see page SU-4 for setting instructions).

If the control is set for: **FORGE-WELD**, the start of FORGE DELAY timing will be from the start of WELD TIME:



If the control is set for: **FORGE-WELD**, and the weld program uses **PULSATION**, the sequence will be:



If PROGRAM 76 is set for **FORGE-PREHEAT**, the timing will start from the **PREHEAT** sequence.

If PROGRAM 76 is set for **FORGE-TEMPER**, the timing will start from the **TEMPER** sequence.

INSTALLING A SPOT WELD PROGRAM (continued)

5. Each of the 75 welding PROGRAMS in the SOLUTION contain lines for data entry. These lines are shown in the sequence diagram on the previous pages. As viewed from the control for this SPOT WELD mode:

Pushing the **BLOCK** button on the keypad will step the program to the next **-BLOCK-** section.

INITIAL SQUEEZE:

With control set in REPEAT MODE, the time between initiation and start of the first heat cycle for the **first** weld in a continuous group. After the first weld, each subsequent uses SQUEEZE TIME. If set to 00, SQUEEZE TIME will operate. This is used to allow time for the welder head to travel downward from the fully open position. If control is Note that if this control has the #9381-05 DIFFERENTIAL PRESSURE TRANSDUCER option, INITIAL SQUEEZE TIME starts **after** electrode force has been reached.

SQUEEZE TIME:

Time between initiation and start of the first heat cycle. Note that if this control has the #9381-05 DIFFERENTIAL PRESSURE TRANSDUCER option, SQUEEZE TIME starts **after** electrode force has been reached.

WELD TIME/WELD HEAT %: Duration and percent of maximum available heat.

HOLD TIME: Time after last heat cycle before weld head solenoid voltage is released.

TRANSFORMER TAP: Documents the welder's tap switch position. This number does not effect the welding sequence in any way.

REPEAT TIME: When the control is in REPEAT MODE operation, the time between the opening of electrodes and closing of electrodes for the next weld.

- BLOCK -

WELD FORCE: The electrode force (in pounds or newtons) that will be used when not in PRECOMPRESSION or FORGE. Value is used to calculate required air pressure settings. When used with the #9181-05 transducer option, this value must be reached before weld heat will start. When used with the #9381-16 electronic regulator option, this value will be used to set the air regulators.

FORGE FORCE: The electrode force (in pounds or newtons) that will be used when the sequence is in PRECOMPRESSION or FORGE. Value is used to calculate required air pressure settings. When used with the #9381-16 electronic regulator option, this value will be used to set the air regulators.

INSTALLING A SPOT WELD PROGRAM (continued)

FORGE DELAY: See page SU-4 for function.

PRECOMPRESSION: Time of high force starting after SQUEEZE TIME.

POSTCOMPRESSION: Time after PRECOMPRESSION to allow electrode force to lower down to WELD FORCE level. If this value is too short, welding will start when the electrode force is too high.

- BLOCK -

HIGH I: Maximum current setting of window in optional #9181-22B Current function. See option section.

LOW I: Minimum current setting of window in optional #9181-22B Current function. See option section.

- BLOCK -

NUMBER OF PULSES: Number of times control repeats **WELD TIME/WELD %HEAT** (pulsation welding). Each pulse is spaced from the next by **PULSATION COOL** cycles. If pulsation is not being used, this can be set to 00.

PULSATION COOL: Time between pulses when doing pulsation welding.

PREHEAT TIME/PREHEAT%: Duration and percent of maximum available heat that occurs just after SQUEEZE TIME.

UPSLOPE TIME/INIT. %: Duration and starting percent of maximum available heat that occurs after PREHEAT and leads to WELD. The UPSLOPE ramp is linear and automatically finishes at the percent of the next heat function (normally WELD).

DOWNSLOPE TIME/END %: Duration and final percent of maximum available heat that occurs after WELD and leads to POSTHEAT. The DOWNSLOPE ramp is linear and automatically starts at the percent of the previous heat function (normally WELD).

QUENCH TIME: A dwell time that starts after POSTHEAT. This is classically used to allow temperature to drop before the TEMPER sequence that follows.

TEMPER TIME/TEMPER %: Duration and percent of maximum available heat that occurs after QUENCH TIME.

SAMPLE SPOT WELD PROGRAM

FOR A WELDER THAT USES INDIVIDUAL WELDING ELECTRODES (NOT WHEELS)

NOTE: See other sample programs for use with the SEAM WELD or ROLL SPOT modes.

1. Be sure that the control is set in the SPOT WELD mode in PROGRAM 95.
2. Now enter the following sample program as PROGRAM 20.

SQUEEZE TIME=35 CYCLES
WELD TIME=08 CYCLE
WELD PERCENT(HEAT)=40%
HOLD TIME = 10 CYCLES

STEP	PRESS	CONTROL WILL DISPLAY	NOTES
1.	PROGRAM 20	PROGRAM 20	desired program number
2.	ENTER	PROGRAM 20 EMPTY	
3.	ENTER	SQUEEZE TIME 00	
4.	35	SQUEEZE TIME 35	enter squeeze time
5.	ENTER	WELD TIME 00	
6.	10	WELD TIME 10	enter no.of weld cycles
7.	ENTER	WELD HEAT 00 %	
8.	40	WELD HEAT 40%	enter weld heat percent
9.	ENTER	HOLD TIME 00	
10.	10	HOLD TIME 10	
11	NO WELD	REPEAT 00 CYC	skip function
	-	TRANSF. TAP #00	
	-	SPOT WELD MODE	
	-	PROGRAM 20 READY	

3. To verify the program content, press the **STEP** button and hold to view only the selected functions above. Release the **STEP** button at any desired point to view or change the data. At the end of all chosen functions, the display will show

DATA TABLE END

4. To run the program, close the foot pedal or hand switches on the welder.

Because the control is in NO WELD, no current will flow between the electrodes, but electrodes will close, the display will show all functions, and then the electrodes will open.

5. For the next step, be sure that proper eye protection is being worn. Press the **SINGLE** button. Then close the foot pedal or hand switches. The welder should make a complete cycle to produce welding heat.
6. After operating the SAMPLE SPOT WELD on page U-9, choose a schedule to enter as a test on actual material. Enter the desired values into any PROGRAM number from 01-75 as was done in the SAMPLE SPOT WELD section.

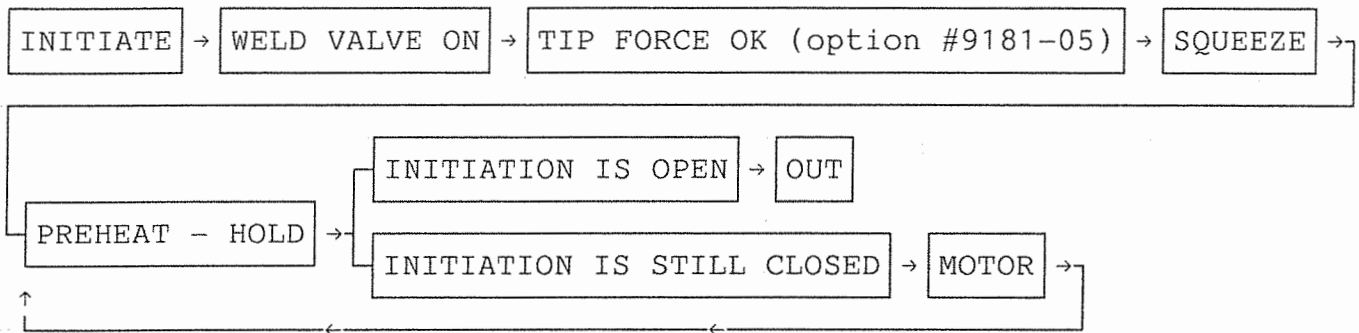
INSTALLING A ROLL-SPOT PROGRAM

FOR A WELDER THAT USES WHEEL TYPE ELECTRODES WHICH ROTATE TO POSITION OF A WELD, STOP, WELD, ROTATE TO THE NEXT POSITION, ETC.

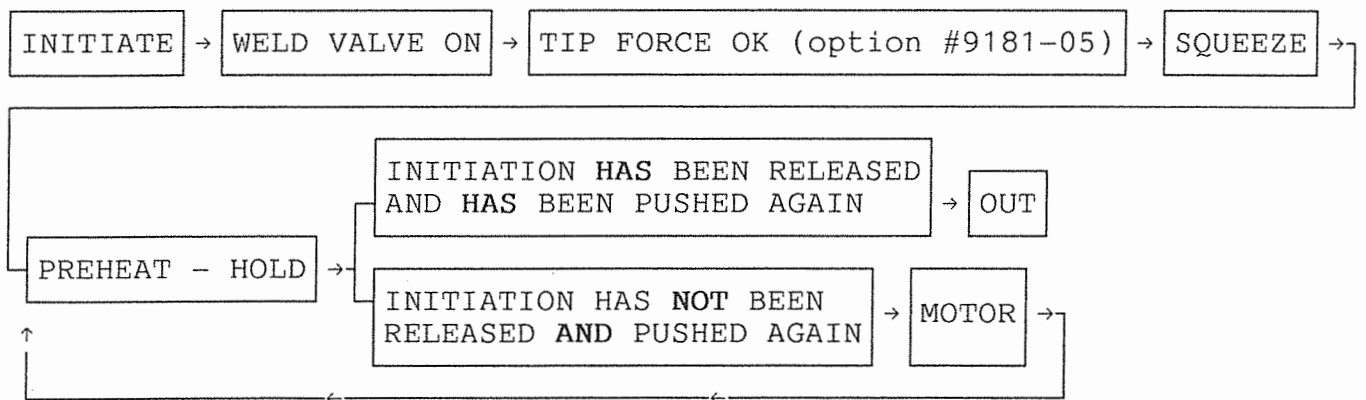
NOTE: See other sample programs for use with the SPOT WELD or SEAM WELD modes.

1. Be sure that the control is in the **ROLL SPOT MODE** by following directions found on page SU-8.
2. The ROLL SPOT MODE is identical to the SPOT WELD MODE with the addition of **MOTOR CYCLES**. This function times how long a pilot relay closes in the SOLUTION CONTROL that drives the welder's motor drive control.

The sequence with the control in the **SINGLE** mode is:



3. The sequence with the control in the **REPEAT** mode is:

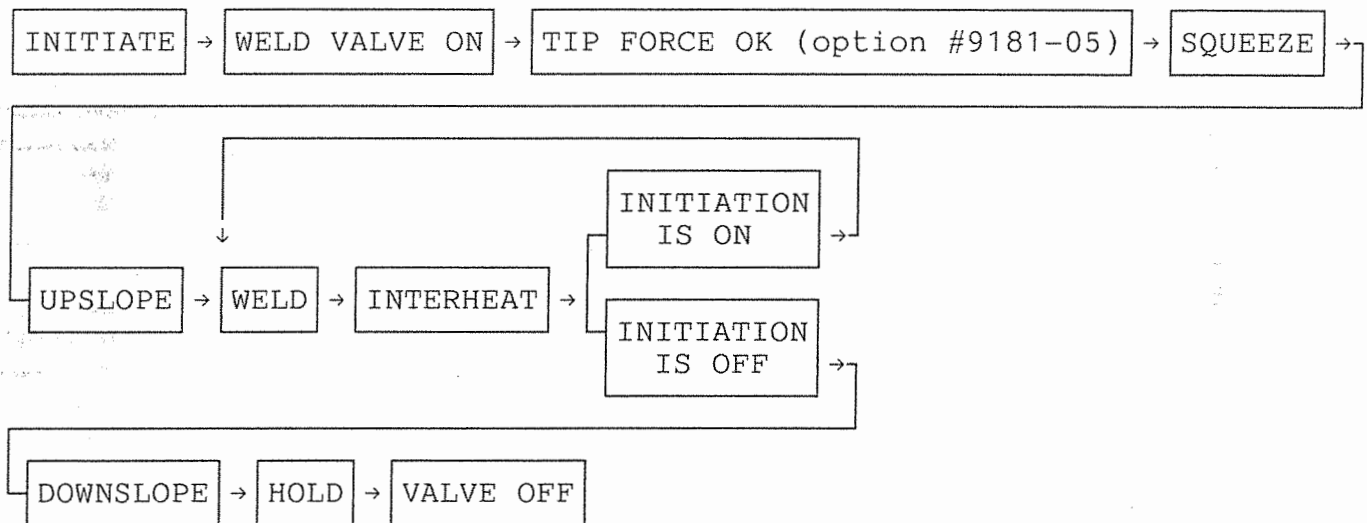


INSTALLING A SEAM WELD PROGRAM

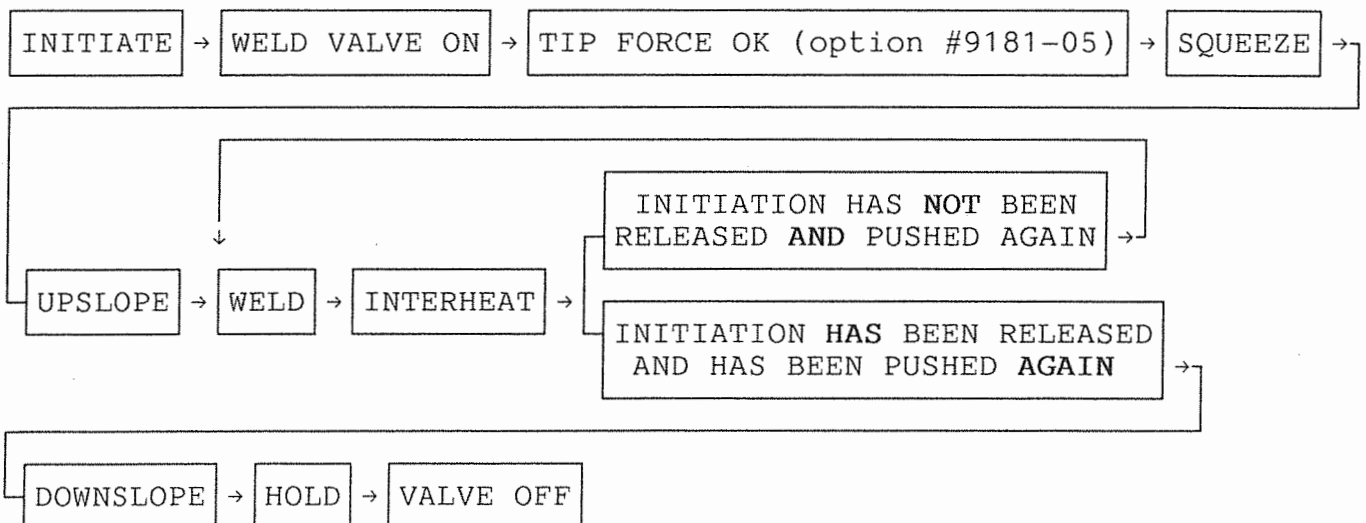
FOR A WELDER THAT USES WHEEL TYPE ELECTRODES THAT CONTINUOUSLY ROTATE WHILE WELDING.

NOTE: See other sample programs for use with the SPOT WELD or ROLL-SPOT.

1. Be sure that the control is in the **SEAM WELD MODE** by following directions found on page SU-8.
2. The SEAM WELD MODE sequence can use a variety of functions to control both the weld heat as well as electrode force and timing. All functions are shown in the following sequence string. If one or more function is not being used (value of 00 in program), the control jumps directly to the next one without any lost time.
3. This is the SEAM WELD sequence that operates when the **SINGLE** button has been pushed:



4. This is the SEAM WELD sequence that operates when the **REPEAT** button has been pushed:



INSTALLING A SEAM WELD PROGRAM (continued)

5. Each of the 75 welding PROGRAMS in the SOLUTION contain the following lines for data entry to match the sequence diagram on the previous pages. Pressing **BLOCK** on the keypad will step to the next **-BLOCK-** group as shown.

INITIAL SQUEEZE:	NOT USED IN SEAM WELD SEQUENCE. LEAVE AT 00.
SQUEEZE TIME:	Time between initiation and start of the first heat cycle. Note that if this control has the #9381-05 DIFFERENTIAL PRESSURE TRANSDUCER option, SQUEEZE TIME starts after electrode force has been reached.
WELD TIME/HEAT%:	Duration and percent of maximum available heat.
HOLD TIME:	Time after last heat cycle before weld head solenoid voltage is released.
TRANSFORMER TAP:	Documents the welder's tap switch position. This number does not effect the welding sequence in any way.
INTERHEAT TIME/%:	The welding function between each WELD pulse. If INTERHEAT is set to 00%, this will function as a classic COOL TIME for the seam welder and just put non-heat time between WELD pulses. If a %INTERHEAT is entered higher than 00%, that level of heat will occur between WELD pulses. If INTERHEAT TIME = 00 , continuous heat will be produced without any breaks.
WELD FORCE:	The electrode force (in pounds or N) that will be used when not in PRECOMPRESSION or FORGE. Value is used to calculate required air pressure settings. When used with the #9181-05 transducer option, this value must be reached before weld heat will start. When used with the #9381-16 electronic regulator option, this value will be used to set the air regulators.
FORGE FORCE:	NOT USED IN SEAM WELD. LEAVE SET AT 00. used to set the air regulators. - BLOCK -
HIGH I:	Maximum current setting of window in optional #9181-22B Current function. See option section.
LOW I:	Minimum current setting of window in optional #9181-22B Current function. See option section. - BLOCK -
UPSLOPE TIME/INIT. %:	Duration and starting percent of maximum available heat that occurs after SQUEEZE and leads to the first WELD pulse. The UPSLOPE ramp is linear and automatically finishes at WELD%.
DOWNSLOPE TIME/END%	Duration and final percent of maximum available heat that occurs at the end of the seam after the last WELD pulse. The DOWNSLOPE ramp is linear and automatically starts WELD%.

SAMPLE SEAM WELD PROGRAM

NOTE: See other sample programs for use with SPOT WELD or ROLL SPOT modes.

1. Be sure that the control is set in the SEAM WELD mode in PROGRAM 95.
2. Now enter the following sample program as PROGRAM 20.

SQUEEZE TIME=35 CYCLES		INTERHEAT = 30%
WELD TIME=03 CYCLE		INTERHEAT CYCLES = 2
WELD PERCENT(HEAT)=65%		
HOLD TIME = 10 CYCLES		

STEP	PRESS	CONTROL WILL DISPLAY	NOTES
1.	PROGRAM 30	PROGRAM 30	enters program number
2.	ENTER	PROGRAM 30 EMPTY	verify empty program
3.	ENTER	SQUEEZE TIME 00	
4.	35	SQUEEZE TIME 36	enter 36 cy. SQUEEZE
5.	ENTER	WELD TIME 00	
6.	3	WELD TIME 03	enter 3 cy. WELD TIME
7.	ENTER	WELD HEAT 00%	
8.	65	WELD HEAT 65%	enter 65% WELD HEAT
9.	ENTER	HOLD TIME 00	
10.	10	HOLD TIME 10	enter 10 cy. HOLD TIME
11.	ENTER	INTERHEAT 00%	
12.	30	INTERHEAT 30%	heat % between welds*
13.	ENTER	INTERHEAT CYC 00	
14.	2	INTERHEAT CYC 2*	cy. heat between welds
15.	SINGLE	TRANSFORMER TAP = 00	
	-	SEAM WELD MODE=1	
	-	PROGRAM 30 READY	

* Note that Interheat occurs between weld pulses. If INTERHEAT % is set to zero (00), the system will have no current flow between pulses. Use of INTERHEAT allows somewhat lower weld heat settings by preventing total cooling of the metal between weld pulses. It also aids in improving sealing ability of the seam weld and extending life on welding wheels.

SOLUTION #9480
DIRECTIONS FOR USE PAGE U-18
LIGHT CURTAIN FUNCTION

If you are not going to connect a LIGHT CURTAIN to this control, be sure that terminal PS5 is connected to CD+.

If you are going to connect a LIGHT CURTAIN to this control, connect it to input port **PS5**. This is a standard function of the SOLUTION control. The sequence operates as follows:

1. When the control is initiated, the **PS5** input port is monitored. If the **LIGHT CURTAIN** has been penetrated (**PS5** input port is **OPEN**), the solenoid valve will **not** be activated and the welding sequence will **not** start.
2. If the **LIGHT CURTAIN** is cleared (**PS5** input port is **CLOSED**) when the control is initiated, the solenoid valve will come forward and the welding sequence will start.
3. If before the **start** of any **weld heat** the **LIGHT CURTAIN** is penetrated (**PS5** is opened), the solenoid valve will be turned off and the sequence will be aborted. At this time, clearing of the **LIGHT CURTAIN** will **not** start the weld sequence. Initiation must be released and then closed again for the sequence to start again.

SOLUTION #9480
DIRECTIONS FOR USE PAGE U-19

WARNING CODES

DISPLAY	MEANING	REQUIRED ACTION
HEAD DN LS OPEN	LIMIT SWITCH THAT CLOSSES WHEN RAM IS IN THE WORK POSITION IS OPEN (PS1 SHOULD BE AT 24V)	ADJUST LIMIT SWITCH REPLACE LIMIT SWITCH
TRANS OVERTEMP	TRANSFORMER THERMOSTAT TRIPPED (TT1 IS OPEN) JUMPER LOOSE OR MISSING IN TT1	CHECK TRANSFORMER THERMOSTAT, INPUT TT1 SHOULD BE AT 24V. IF NO TRANS THERMOSTAT IS IN SYSTEM, BE SURE A JUMPER IS IN TT1.
SCR OVERTEMP	THERMOSTAT ON SCR (INPUT TS1 IS OPEN)	CHECK WATER FLOW IN SCR REPLACE SCR THERMOSTAT
EMERGENCY STOP	EMERGENCY STOP PUSHED (INPUT ES1 IS OPEN)	RELEASE EMERGENCY STOP SWITCH. INPUT ES1 SHOULD BE AT 24V
CHOOSE MODE	NO MODE HAS BEEN SELECTED	PUSH SINGLE, NO WELD OR REPEAT
OPEN INITIATION	INITIATION CLOSED ON POWER UP	CHECK AND OPEN SWITCHES
PB RELEASED EARLY	INITIATION RELEASED BEFORE WELD SEQUENCE	HOLD BUTTONS TO END OF SQUEEZE TIME
KEYBOARD LOCKED	KEY SWITCH IN LOCKED POSITION WHEN TRYING TO MAKE A CHANGE BAD KEYLOCK SWITCH. SWITCH SHOULD BE CLOSED IN LOCK POSITION	INSERT KEY AND ROTATE TO OPEN LOCK. REPLACE KEYLOCK SWITCH
INCORRECT ENTRY	INAPPROPRIATE ENTRY MADE	USE ONLY NUMBERS SHOWN IN QUESTION ON DISPLAY
PLEASE PROGRAM	TRYING TO WELD WITHOUT SPECIFYING PROGRAM	ENTER DESIRED PROGRAM NUMBER
CHECK SCR\Z-CROSS	SCR IS SHORTED NO ZERO CROSS SIGNAL	CHECK & REPLACE CHECK U10 & U9
LIM\PRES SW OPEN	DEVICE CONNECTED TO TERMINAL PS4 IS OPEN	CHECK SWITCHES OR JUMP TERMINAL

continued on next page

SOLUTION #9480
DIRECTIONS FOR USE PAGE U-20

WARNING CODES (continued)

DISPLAY	MEANING	REQUIRED ACTION
LOW WATER FLOW	DEVICE CONNECTED TO TERMINAL PS3 IS OPEN	TURN ON WATER CHECK WATER FLOW SWITCH
	SYSTEM HAS NO WATER FLOW SWITCH, AND THERE IS NO JUMPER IN PS3	INSTALL PS3 JUMPER
PLEASE INITIATE	WAITING FOR INITIATION ON TIP FORCE OPTION	CLOSE FOOT SW. TO READ ELECTRODE FORCE
I>LIMIT, ##,###A	MEASURED WELD CURRENT DURING WELD HIGHER THAN HIGH I X HIGH I LIMIT%	LOWER HEAT% OR RAISE HIGH I LIMIT % IN PROG. 87/92. SEE PAGE SU-14
WELD CYC > MAX	NUMBER OF WELD CYCLES ENTERED IN A PROGRAM IS GREATER THAN THE MAX. WELD CYC NUMBER IN PROGRAM 87/92	1.WELD TIME TO 00 2.CHECK MAX WELD CYC NUMBER 3.IN PROGRAM 87/92. 4.SET WELD TIME LOWER THAN THIS NUMBER.SEE PAGE SU-15
OPEN LIGHTCURTIN	LIGHT CURTAIN INPUT PS5 IS OPEN	CLOSE LIGHT CURTAIN IF USED, OR JUMP PS5 TO CD+
POWERING DOWN	NORMAL PHRASE WHEN THE CONTROL IS TURNING OFF	NO ACTION REQUIRED
TIP FORCE IS LOW	PRESSURE TRANSDUCER NOT SATISFIED (OPTION 9381-05)	INCREASE PRESSURE SET- TING ON AIR REGULATOR

SAMPLE SETUP SHEETS

WELDING SET-UP SHEET

SPOT WELD MODE

PART NAME: _____ , NUMBER _____

MATERIAL: _____

DATE: _____, TECHNICIAN: _____

WELDING MACHINE: NUMBER: _____ KVA: _____ TYPE: _____

TRANSFORMER TAP NUMBER: _____ , SERIES/PARALLEL: _____

ELECTRODES:

UPPER: RWMA: _____ , ALLOY: _____ , SHAPE: _____

LOWER: RWMA: _____ , ALLOY: _____ , SHAPE: _____

TIP FORCE: _____ POUNDS / NEWTONS , FORGE FORCE: _____ POUNDS / NEWTONS

WELD PROGRAM NUMBER: _____

INITIAL SQUEEZE TIME: _____

SQUEEZE TIME: _____ CYCLES

WELD: _____ CYCLES, _____, _____ % HEAT

HOLD TIME: _____ CYCLES

REPEAT: _____ OFF CYCLES

FORGE DELAY: _____ CYCLES, DELAY FROM _____ PREHEAT, _____ WELD, _____ TEMPER

PULSATION: NO OF PULSES _____ , INTERPULSE _____ CYCLES

PREHEAT: _____ CYCLES, _____, _____ % HEAT

UPSLOPE: _____ CYCLES, _____ % INITIAL HEAT

DOWNSLOPE: _____ CYCLES, _____ % FINAL HEAT

POSTHEAT: _____ CYCLES, _____ , _____ % HEAT

QUENCH: _____ CYCLES, TEMPER: _____ CYCLES, _____ % HEAT

SPECIAL FUNCTIONS

UPPER CURRENT LIMIT: _____ AMPS

LOWER CURRENT LIMIT: _____ AMPS

PROCESS NOTES:

WELDING SET-UP SHEET

SEAM WELD MODE

PART NAME: _____ , NUMBER _____

MATERIAL: _____

DATE: _____, TECHNICIAN: _____

WELDING MACHINE: NUMBER: _____ KVA: _____ TYPE: _____

TRANSFORMER TAP NUMBER: _____ , SERIES/PARALLEL: _____

ELECTRODES:

UPPER: RWMA: _____ , ALLOY: _____ , DIAMETER: _____ , FACE SHAPE:

LOWER: RWMA: _____ , ALLOY: _____ , DIAMETER: _____ , FACE SHAPE:

TIP FORCE: _____ POUNDS / NEWTONS

LINEAR SPEED: _____ INCHES PER SECOND / CM PER SECOND

WELD PROGRAM NUMBER: _____

SQUEEZE TIME: _____ CYCLES

WELD: _____ CYCLES, _____, _____ % HEAT

HOLD TIME: _____ CYCLES

UPSLOPE: _____ CYCLES, _____ % INITIAL HEAT

DOWNSLOPE: _____ CYCLES, _____ % FINAL HEAT

SPECIAL FUNCTIONS

UPPER CURRENT LIMIT: _____ AMPS

LOWER CURRENT LIMIT: _____ AMPS

PROCESS NOTES:

WELDING SET-UP SHEET

ROLL-SPOT WELD MODE

PART NAME: _____ , NUMBER _____

MATERIAL: _____

DATE: _____, TECHNICIAN: _____

WELDING MACHINE: NUMBER: _____ KVA: _____ TYPE: _____

TRANSFORMER TAP NUMBER: _____ , SERIES/PARALLEL: _____

ELECTRODES:

UPPER: RWMA: _____ , ALLOY: _____ , DIAMETER: _____ , FACE SHAPE:

LOWER: RWMA: _____ , ALLOY: _____ , DIAMETER: _____ , FACE SHAPE:

TIP FORCE: _____ POUNDS / NEWTONS

LINEAR SPEED: _____ INCHES PER SECOND / CM PER SECOND

WELD PROGRAM NUMBER: _____

SQUEEZE TIME: _____ CYCLES

WELD: _____ CYCLES, _____ , _____ % HEAT

MOTOR CYCLES: _____

HOLD TIME: _____ CYCLES

FORGE DELAY: _____ CYCLES, DELAY FROM _____ PREHEAT, _____ WELD, _____ TEMPER

PULSATION: NO OF PULSES _____ , INTERPULSE _____ CYCLES

PREHEAT: _____ CYCLES, _____ , _____ % HEAT

UPSLOPE: _____ CYCLES, _____ % INITIAL HEAT

DOWNSLOPE: _____ CYCLES, _____ % FINAL HEAT

POSTHEAT: _____ CYCLES, _____ , _____ % HEAT

QUENCH: _____ CYCLES, TEMPER: _____ CYCLES, _____ % HEAT

SPECIAL FUNCTIONS

UPPER CURRENT LIMIT: _____ AMPS

LOWER CURRENT LIMIT: _____ AMPS

PROCESS NOTES:

OPTIONS

SOLID STATE PRESSURE TRANSDUCER

OPTION #9381-05

THEORY:

A major variable in the resistance welding process is tip force. Since the electrical resistance between parts being joined **decreases** as force between the welding electrodes **increases**, the heat generated during the weld changes accordingly.

Additionally, since the tip force also acts as a **forge** in the nugget development process, variations will greatly effect weld strength and ductility.

Lastly, if current starts to flow before proper tip force has been reached, metal expulsion (flash) will occur causing part indentation, tip pick-up of metal, and potential danger to the operator and others in the area of the welder.

Welding before proper tip force has been reached **DRASTICALLY** lowers the quantity of welds possible between tip dressing , and **REDUCES** overall weld strength, consistency, and appearance.

APPLICATION:

This **SOLUTION** option is designed to start current flow in the welder at the **EXACT** tip force desired. As shown in the graph on the next page, air pressure in the welding cylinder, as measured by the **DOUBLE SIDED** (differential) **PRESSURE TRANSDUCER** supplied with this option changes in three steps:

1. As the welder head starts to move, and before the electrode touches the electrode, volume in the upper half of the cylinder starts to **INCREASE**. Therefore, during this same time, air pressure in the **VARIABLE** volume cylinder builds only slightly as required to overcome friction and inertia. This varies depending on air temperature, viscosity, oil content in air, temperature of welder bearings, etc. The **SOLUTION** read-out will show: **TIP FORCE IS LOW** during this time.
2. When the weld electrode touches the work piece, the cylinder stops moving, and the now **FIXED** volume of the cylinder causes each additional amount of air to increase pressure. This continues until the pressure inside the cylinder has reached that of the welder's pressure regulator. **THIS IS THE EXACT POINT THAT WELD CURRENT FLOW SHOULD BE STARTED**, and the **TIP FORCE IS LOW** readout will be turned off.
3. This level now remains as long as the welder's solenoid is on.

SOLID STATE PRESSURE TRANSDUCER (continued)

TIP FORCE (in pounds) , as shown in the graph, remains at zero (0) until the electrode touches the work piece. Then the tip force increases in direct proportion to the change in air pressure.

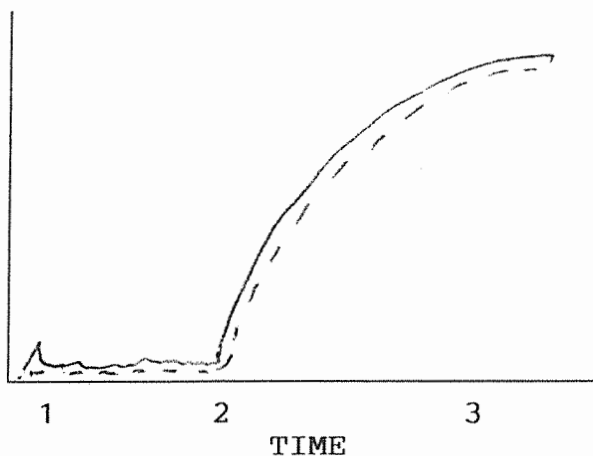
The #9181-05 **DIFFERENTIAL PRESSURE TRANSDUCER** option connects to the weld cylinder as shown on pages I-2 through I-5 depending on your welder's pneumatic system. **IF THE TRANSDUCER IS NOT CONNECTED EXACTLY AS SHOWN ON THESE PAGES, THE FUNCTION WILL NOT OPERATE PROPERLY AND CAN START WELD HEAT FLOWING BEFORE ELECTRODE FORCE HAS BEEN REACHED. THIS CAN CAUSE EXCESSIVE METAL FLASH WHICH CAN INJURE THE OPERATOR!**

BE SURE THAT THE TRANSDUCER CONNECTIONS ARE ALWAYS INSTALLED BEFORE THE FLOW CONTROLS AS SHOWN. OTHERWISE, THE SYSTEM WILL BE RESPONDING TO THE SETTING OF THE FLOW CONTROLS RATHER THAN TO THE ACTUAL WELDING CYLINDER RESPONSE.

The transducer, provided in the option, subtracts the air pressure on the underside of the cylinder piston from that of the top. The resultant is the exact air pressure acting on the cylinder rod. Note that the pressure measurement is taken **BEFORE** any flow control devices. If this welder uses an **AIRLOCK TYPE RAM** (see page SU-11 and SU-12), the air is measured at the **AIRLOCK**.

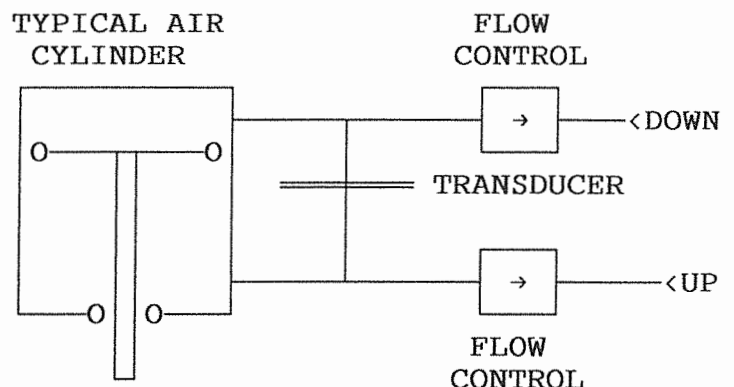
Use of a **DIFFERENTIAL** type transducer eliminates error and false signals caused by changes in **welder head advance speed** as set by flow controls in the air system. Also, unlike mechanical pressure switches, this device is accurate to better than 1/2 psi. and will not change even under large temperature swings and changes in air density and composition.

Use of this option will present the **SAME EXACT FORCE CONDITIONS** every time that the weld has started. Because of this, the inter resistance of the parts being joined will be constant and, therefore, reproduce weld strength and ductility throughout the production run.



LEGEND

AIR CYLINDER PRESSURE —————
TIP FORCE - - - - -



SOLID STATE PRESSURE TRANSDUCER (continued)

AIRLOCK RAM WELDERS: If this welder has an AIRLOCK RAM, this transducer option will be used to be sure that the differential pressure created by the AIRLOCK at the time the AIRLOCK RAM LIMIT SWITCH has been closed, is correct. Since pressure is always present within an AIRLOCK, the transducer option cannot use this pressure to start the welding process. It does, however, use this transducer option to be sure that the force created by the AIRLOCK after the AIRLOCK LIMIT SWITCH has been closed is correct before the welder can be fired. When working with a welder that has an AIRLOCK RAM, the AIRLOCK RAM LIMIT SWITCH must be adjusted properly and used for each weld sequence. Otherwise, the weld control will start the welding sequence as soon as the welder has been initiated.

TO SET AND CHECK TRANSDUCER OPTION:

1. Follow the directions on page SU-10 to calculate the value of cylinder area in in² or cm².
2. Be sure that this value has been entered in PROGRAM 96 as directed in section SU-10. Without this value in the control, it will not be possible to operate the transducer functions.
3. Now select a weld schedule from the 75 in memory by pressing: **PROGRAM, ##, ENTER** (## = desired program number 01 - 75). Press **BLOCK** button twice and the line should read: **WELD FORCE=—LB (KG)**. Enter the desired welding force.

If FORGE is being used in this welder, push the **STEP** button once and enter the desired **FORGE FORCE** on that line. **IF NO FORGE IS BEING USED, LEAVE THIS LINE AT 0000 LB.** The control will use these two values to calculate the required air pressure for both the TOP and BACKUP pressure regulators.

When you are through, press **NO WELD**, and the display will show the required TOP PSI and BACKUP PSI settings to achieve the selected WELD FORCE (and FORGE FORCE if any). Set the welder's pressure regulators to these values. If the #9381-16 electronic pressure regulator option is installed in this control, this will be done automatically (see OP-13 section).

4. Press : **PROGRAM 96, ENTER**

If the readout shows **PRESS. TRANSD. OFF**, turn on by pressing #1 to answer the question on the readout. The readout should now show:

PRES. TRANSD ON

5. **TO CHECK TIP FORCE:**

Press the **STEP** button until the display shows:

READ WELD FORCE?

PRESS: 1=YES, 0=NO

Press 1 and the display will now show:

PLEASE INITIATE

6. Close the foot switch or hand buttons (initiate the welder). The welding tips will now close and remain there automatically while you adjust the pressure gage to

SOLID STATE PRESSURE TRANSDUCER (continued)

the desired **WELD FORCE**. Note that, while the display shows readings every 1/2 second, the computer is updating continuously. If necessary, adjust the TOP PRESSURE regulator so that the value being read is slightly higher than that requested in the program.

To release, press **STEP**.

6. TO CHECK CALIBRATION ON YOUR PRESSURE GAGE:

After the above step, the readout will show:

READ WELD PRES?

Press 1 and the display will now show:

PLEASE INITIATE

Close the foot switch or hand buttons again. Once you have done this, the welding tips will stay closed automatically. Check the **SOLUTION** reading against your pressure gage. If the welder has a FORGE system that leaves BACK-UP pressure on the underside of the cylinder, the pressure will be the **difference** between the TOP and BACK-UP pressures. To release the welder, press **STEP**. The **SOLUTION** will continue the same questions for **FORGE FORCE** and **FORGE PSI**. and then exit. These are only meaningful if FORGE is installed on this unit.

USING TRANSDUCER OPTION IN PRODUCTION:

1. With the desired weld program entered, press **SINGLE, NO WELD, or REPEAT** as desired to set the control for welding.
2. When the foot pedal or hand switches are closed, and before the selected tip force has been reached, the readout will show:

TIP FORCE IS LOW

and welding will not start. Once the differential air pressure meets or exceeds the setting, welding will go through all sequences starting with **SQUEEZE**.

NOTE:

- a. If this welder has an AIRLOCK RAM, the control will first monitor the AIRLOCK RAM LIMIT SWITCH connected to the LIMIT SWITCH input. Until this switch is closed, it will display: **PRES\LIM SW OPEN**. Once this limit switch has been closed, the control will monitor the differential pressure transducer as above.
- b. If the control is in **HOLDING MODE** as set in **PROGRAM 90**, and the air pressure is below that required for your setting, releasing of the foot or hand initiation switch will open the electrodes.
- c. If the control is in **MOMENTARY MODE** as set in **PROGRAM 90**, and the air pressure is below that required for your setting, releasing of the foot or hand initiation switch will **not** open the electrodes. To release, either increase the air pressure, push the EMERGENCY STOP button, or push any button on the keypad.

CURRENT MONITOR/LIMITER OPTION #9181-22B

PURPOSE:

This option allows the setting of upper and lower limits for current measurement on each weld. If the average RMS current measured during the WELD portion only is either ABOVE or BELOW the customer set window, the SOLUTION control will keep the electrodes closed, and the display will show the average RMS current measured during the WELD.

IMPORTANT NOTE: If your control was **not** ordered with the CURRENT MONITOR/LIMITER option, and there are HIGH CURRENT and LOW CURRENT lines in each welding program, these can be used as "scratch pad" to compare against an external current monitor system connected to the welder. **If the option is turned on in program 84 without the input circuitry, the control may see a "fault" on each weld and lock out.**

THE SOLUTION SOFTWARE EXCLUDES CURRENT MEASUREMENT DURING ALL OTHER NEMA FUNCTIONS (PREHEAT, UPSLOPE, DOWNSLOPE, POSTHEAT, AND TEMPER). THIS VALUE IS A MORE USABLE NUMBER THAN THAT MEASURED ON PORTABLE CURRENT MONITORS ("WELD CHECKERS") AND CAN BE COMPARED TO THE VALUES ON WELDING CHARTS DIRECTLY.

THE VALUES MEASURED BY THE SOLUTION WILL TYPICALLY BE HIGHER THAN THOSE ON PORTABLE CURRENT MONITORS IF ANY NEMA FUNCTION IS USED BECAUSE THESE OTHER CYCLES ARE NOT AVERAGED INTO THE CALCULATION.

Before trying to measure weld current, it will be necessary to make some adjustment to the system. This is required to allow accurate measurement for a desired current range.

This option uses a current pickup coil on the **SECONDARY** (output side) of the welder. The coil should be clamped around a convenient point on the lower welding arm if possible. Route the coil cable to clear any parts that will be welded, and insert the plug on this cable into the mating socket extending from the SOLUTION console.

Determine the maximum SECONDARY current range for your welder by checking the welder nameplate for MAXIMUM SECONDARY AMPERAGE. If it is not listed, check with the welder manufacturer or contact the Unitrol Service Department for recommendation. Set the control selection switch to a range above your expected maximum current. **The ranges are: 1 = 250,000A, 2 = 150,000A, 3 = 100,000A, 4 = 50,000A.**

1. On **9480D** and **9480L** controls (control in one enclosure), locate the four DIP switches at the top center of the front microprocessor board. Push the desired range switch FORWARD towards the front white metal plate, and have all three other switches pushed back. open the back of the console (keypad unit).

On **9480** controls (with remote console), remove the blue metal plate on back of the remote console and locate the four position DIP switch on the lower left corner of the circuit board. Turn ON the switch for the desired range by pushing it down towards the selected range number. Push the other three switches to the other side.

CURRENT MONITOR/LIMITER OPTION #9181-22B (continued)

2. Turn control ON, and after diagnostics have been completed, press: **PROGRAM 87, ENTER,99**. The display should now show the range set at the factory. If this does **not** match that set on the back of the control in step 3 above, press 1 to change, and then press the number from the displayed menu that matches properly. **If the computer range and the DIP switch range do not match, the control will show current that is off by 100% or more.**

3. The system is now set. Replace cover on back of keypad console.

CALIBRATING THE SECONDARY CURRENT MONITORING SYSTEM:

This control has been shipped with the current measurement system factory calibrated to Unitrol standards. If it is desired to change this calibration to match a different standard, do the following procedure to match this system to an external CURRENT MONITOR DEVICE.

1. Press: **PROGRAM, 84, ENTER**. The display will show:

I-READ ONLY = 1

 or other phrase

CHANGE1=YES, 0=NO

2. Press 1, and the display will show:

I-READ ONLY = 1

 read and display current only

I-READ & REACT=2

 compare readings to program HIGH-I and LOW-I values, and FAULT if out of this range

I-READ OFF = 3

 do not read or display current

Push 1 to set the control for the **I-READ ONLY** mode.

2. Install the **SECONDARY CURRENT COIL** provided with this control option over the lower welder arm. Location along the arm is not important, but the coil should be positioned so that it will not be damaged by parts being welded.
3. Plug the cable from this coil into the waiting socket hanging from the keypad console.
4. Install the cable from the external CURRENT MONITOR DEVICE at the same place as the above coil.

CURRENT MONITOR/LIMITER OPTION #9181-22B (continued)

5. Push: **PROGRAM, 85, ENTER.** The display will show:

I ZERO ADD

CHANGE1=YES, 0=NO

Press **0**, and the display will show:

I CALIBRATION=##

CHANGE1=YES, 0=NO

This is the factory calibration for this system.

6. Connect an external current monitor that you want to use as your standard with the coil to the same location as the pickup coil for the SOLUTION control.
7. Press: **PROGRAM 50, ENTER.** Set values as: SQUEEZE TIME = 99, WELD HEAT = 30%, WELD TIME = 05 CY, HOLD TIME = 03. **IMPORTANT:** Be sure that the heat% of all other weld functions (PREHEAT, UPSLOPE, DOWNSLOPE, POSTHEAT, TEMPER) are set to 00%.
8. Press: **PROGRAM 51, ENTER.** Set values as: SQUEEZE TIME = 99, WELD HEAT = 70%, WELD TIME = 05 CY, HOLD TIME = 03. **IMPORTANT:** Be sure that the heat% of all other weld functions (PREHEAT, UPSLOPE, DOWNSLOPE, POSTHEAT, TEMPER) are set to 00%.
9. Adjust the welding air pressure to the maximum value for the electrodes installed in the welder.
10. With the control still in PROGRAM 51, close the foot pedal (or hand buttons) to cycle the welder and write down the values recorded by the external CURRENT MONITOR DEVICE and the current measured on the SOLUTION display. It is not necessary to have metal between the electrodes for this test.
11. Subtract the SOLUTION control current value from the value read on the external current monitor and write down this value as "high current difference".
12. Press: **PROGRAM, 50, ENTER.** Close the foot pedal (or hand buttons) to cycle the welder and write down the values recorded by the external CURRENT MONITOR DEVICE and the current measured on the SOLUTION display. It is not necessary to have metal between the electrodes for this test.

CURRENT MONITOR/LIMITER OPTION #9181-22B (continued)

13. Subtract the SOLUTION control current value from the value read on the external current monitor and write down this value as "low current difference".
14. If the "high current difference" is **larger** than the "low current difference", increase the I-CALIBRATION number in PROGRAM 85, **increase** the I-CALIBRATION number in program 85 by 1 to 2 numbers.

If the "high current difference" is **smaller** than the "low current difference", **decrease** the I-CALIBRATION number in PROGRAM 85, **decrease** the I-CALIBRATION number in program 85 by 1 to 2 numbers.
15. Repeat steps 10 through 14 until the **LOW CURRENT DIFFERENCE** and **HIGH CURRENT DIFFERENCE** are as close to the same number as possible.
16. Subtract the current reading of SOLUTION control from the current reading of the external current monitor.

If the result is **positive (+)**, **increase** the ZERO value in PROGRAM 85 by the difference.

If the result is **negative (-)**, **decrease** the ZERO value in PROGRAM 85 by the difference. Note that if the difference requires a negative ZERO number, change the zero to 1 ZERO SUBTRACT at the beginning of PROGRAM 85.
17. Check values in PROGRAM 50 and 51 to be sure that the values measured are reasonably close. Note that if the external monitor is not absolutely linear, values at other heat percentages will not exactly match.

SETTING CURRENT BLANKING:

Before measuring welding current, it is necessary to decide if any portion of the welding sequence is to be blanked. This procedure is usually necessary to produce more stable results since typically the first cycle of each weld involves INRUSH current, and stabilization of the electrode contact to the work piece. With **BLANKING** in the system, the SOLUTION will eliminate readings from the selected number of half cycles during the CURRENT CALCULATION process.

BLANK -- HALF CY

Enter the desired number of HALF cycles. A typical number is 1 for a weld count of 1-3 cycles, and 2 for a weld count of over 3 cycles.

After the desired number has been entered, press ENTER, and this portion of the system will be ready.

CURRENT MONITOR/LIMITER OPTION #9181-22B (continued)

MEASURING CURRENT DURING PRODUCTION

SETTING CURRENT LIMITS

Each program has a setting for UPPER and LOWER current limits. Do the following for each welding schedule that is being used:

1. Set the desired welding schedule and make welds on coupons until an acceptable weld has been achieved. Ignore the lines in the program that show HIGH I and LOW I settings.
2. The average RMS current of the weld will be displayed on the upper readout after each sequence has been completed. Make several welds to be sure that this number is reasonably constant.
3. Decide on the limits of current above and below that observed in step #2 above. To do this, make welds as you continue to **LOWER** the %HEAT setting in 1% steps until the weld has **fallen below** minimum desired strength. **Increase** the displayed current value slightly and write down this number as the **LOW I** (low current) number in that program.
4. Now go back to the original %HEAT and start **RAISING** it in 1% steps until metal **expulsion** has started. **Lower** this value slightly and write down this number as **HIGH I** (high current) in the program.
5. Now press the STEP button until the display shows:

HIGH I = ----- A

6. Enter the HIGH I value from the above step. Note that the right hand **00** will not change. Be sure that the number displayed is as desired.
7. Now press the STEP button one more time and the display will show:

LOW I = ----- A

8. Enter the LOW I value from step #3.
9. Now press **SINGLE**, and these values will be in the system. The control should now be set for production.

CURRENT MONITOR/LIMITER OPTION #9181-22B (continued)

USING CURRENT MONITORING IN PRODUCTION:

Use the following procedure to utilize the current comparison QC system during production.

1. Press: **PROGRAM, 84, ENTER**, and the display will now show:

I-READ ONLY = 1

CHANGE1=YES, 0=NO

2. Press **1**, and the display will show:

I-READ ONLY = 1

read and display current only

I-READ & REACT=2

compare readings to program
HIGH-I and LOW-I values, and
FAULT if out of this range

I-READ OFF = 3

do not read or display current

3. **FAULT REACTION SETUP:**

Press: **PROGRAM, 82, ENTER**, and the display will show:

MAN. FAULT RESET

or

AUTO FAULT RESET

CHANGE1=YES, 0=NO

This is used to set the SOLUTION for the desired reaction when any fault is detected. The two choices are:

- A. **MAN. FAULT RESET** will keep the electrodes closed after a fault, show the fault on the display, and require pressing of the foot or hand initiation switch to release. This is the **normal** setting for a **manually** operated welder.
- B. **AUTO FAULT RESET** will open the electrodes as normal after a fault, but will close an assigned relay in the control to signal an external system that a fault has occurred (see section below on FAULT RELAY ASSIGNMENT). This is the **normal** setting for automatic welding systems that are **not** run by an operator.

For SPOT WELD MODE, the fault relay will close for about 50ms. and then open.

CURRENT MONITOR/LIMITER OPTION #9181-22B (continued)

For ROLL-SPOT MODE, the relay will close for 50ms. for each out of range weld.

For SEAM WELD MODE, the relay will close as long as a fault continues to be detected. The RMS measurement for SEAM WELD mode is made for each weld nugget as set by WELD TIME. If INTERHEAT is set to 00, the welder will operate continuously but will make current measurements in groups determined by the WELD TIME.

If the FAULT RESET mode shown on the display is **not** correct, press **1** to change.

If the FAULT RESET mode shown on the display **is** correct, press **0** to leave the mode as shown.

4. Now enter the weld schedule used earlier and start welding. As each weld is made, the system will show the current as averaged over the WELD portion of each sequence.

NOTE: When the **READ & REACT** function is active in the SOLUTION, an "*" will show on the upper right corner of the display. IF THIS "*" IS NOT SHOWN BUT CURRENT READINGS ARE SHOWN, THE SYSTEM IS IN READ ONLY MODE AND NO FAULT INDICATION WILL BE MADE UNDER ANY CIRCUMSTANCES.

5. If the current, as shown on the upper display, is **ABOVE** or **BELOW** that in the weld schedule, go into the FAULT sequence and react by either keeping the electrodes closed or just closing a fault relay. The reaction will be as selected in **PROGRAM 82** as set in step 3 on the previous page.

6. TURNING OFF CURRENT MONITOR SYSTEM:

To fully remove the CURRENT MONITOR system, press: **PROGRAM, 84, ENTER**, and the display will show:

I-READ & REACT=2

CHANGE1=YES, 0=NO

2. Press **1**, and the display will show:

I-READ ONLY = 1

read and display current only

I-READ & REACT=2

compare readings to program
HIGH-I and LOW-I values, and
FAULT if out of this range

I-READ OFF = 3

do not read or display current

Press **3** to turn the CURRENT MONITOR system OFF.

SOLUTION #9480
DIRECTIONS FOR USE PAGE OP-12

ASSIGNING FAULT RELAY OUTPUTS

This SOLUTION system includes three FAULT RELAY outputs if one or more of the following options has been included in this control:

#9381-05C DIFFERENTIAL PRESSURE TRANSDUCER

9181-22B SECONDARY CURRENT MONITOR/LIMITER

#9181-06A AVC WITH HI/LOW FEATURE

If a fault condition has been detected in any of the above functions, the welder will either lock the electrodes closed and require pushing of the initiation switch again to release, or will continue without interrupting the sequence. This decision is set in **PROGRAM 82** as shown on page OP-9.

When a fault has been detected in either reaction mode, one of three relays can be closed to provide an output to an external system. These relays are marked: **MAJOR FAULT**, **MINOR FAULT**, and **SPECIAL FAULT** on the power supply terminal.

SETTING FAULT RELAY JUMPERS: A jumper plug next to each of these relays can be set for **N.O.** (contacts close for 150ms. every time a fault has been detected) or **N.C.** (contacts open for 150ms. every time a fault has been detected).

To assign a function to one of these output channels, press: **PROGRAM, 97, ENTER.** The display will show:

CURRENT FAULT IS
NOT ASSIGNED = 1

CHANGE1=YES, 0=NO

If this control has the #9181-22B SECONDARY CURRENT MONITOR/LIMITER option, and you want to direct the fault signal to one of the FAULT RELAYS, press 1, and the display will show:

CURRENT FAULT IS
NOT ASSIGNED = 1

CURRENT FAULT IS
A MAJOR FAULT= 2

CURRENT FAULT IS
A MINOR FAULT= 3

CURRENT FAULT IS
A SPEC. FAULT= 4

SOLUTION #9480
DIRECTIONS FOR USE PAGE OP-13

ASSIGNING FAULT RELAY OUTPUTS (continued)

By pressing **1**, the system will have no FAULT RELAY output assigned.

By pressing **2**, an out of range current reading will cause the MAJOR FAULT RELAY to close for about 150ms.

By pressing **3**, an out of range current reading will cause the MINOR FAULT RELAY to close for about 150ms.

By pressing **4**, an out of range current reading will cause the SPECIAL FAULT RELAY to close for about 150ms.

Once a choice has been entered, the display will show:

FORCE FAULT IS
NOT ASSIGNED = 1

CHANGE1=YES, 0=NO

If this control contains the #9381-05 DIFFERENTIAL PRESSURE TRANSDUCER option, an air pressure that, at the end of HOLD TIME, is above or below the VARIATION value set in PROGRAM 96, the selected FAULT RELAY will close for 150ms.. Select the desired FAULT RELAY as in the first example.

Once a choice has been entered, the display will show:

VOLTAGE FAULT IS
NOT ASSIGNED = 1

CHANGE1=YES, 0=NO

If this control contains the #9181-06A AVC WITH HI/LOW FEATURE option, a line voltage detected more than +/-11% from the center line (as set in PROGRAM 89) will cause the chosen relay to close for 150ms. Select the desired FAULT RELAY assignment for this function.

This is the last assignment and control will exit out of this program at this time.

SOLUTION #9480
DIRECTIONS FOR USE PAGE OP-14

DOUBLE ELECTRONIC PRESSURE REGULATOR SYSTEM OPTION #9381-16 (VIP)

PURPOSE: This system replaces manual air pressure regulators with an electronic system to set WELD and BACKUP pressures automatically.

1. Two double level blue circuit boards are mounted inside the SOLUTION control cabinet and have been factory plumbed and wired.
2. Install one of the Fairchild regulators provided in this option kit to replace the existing manual regulator that feeds air to the **TOP PRESSURE** solenoid valve as shown in the drawing below. Note the IN and OUT marking on the casting. **IT IS IMPORTANT THAT TEFLON TAPE BE USED FOR THIS PROCESS. BE SURE THAT NO TEFLON TAPE GETS ON THE FIRST THREE THREADS OF THE PIPE SO THAT THIS TAPE WILL NOT GET INTO THE REGULATOR MECHANISM!. DO NOT OVERTIGHTEN pipes as the casting on the regulator can be destroyed this way and warranty will be void.**

Be sure that the oiler is **DOWNSTREAM** from the regulator as shown on the plumbing diagram. Oil that enters the regulator can do damage to the mechanism **and will void the warranty on this component.**

Install the air gauge provided on either side of the regulator by first removing the silver 1/8" pipe plug as desired and then installing using teflon tape.

3. Install the remaining Fairchild regulator in place of the manual regulator that provides air to the **BACKUP PRESSURE** solenoid valve as shown on the drawing below.
4. Connect line pressure (maximum 120 psi.) to outside box fitting marked **S** using the clear 1/4" polyflow tubing provided in this kit. A 1/4" fitting is also provided in the kit for connection at the source end of the tubing.

BE SURE THAT THE AIR LINE HAS A WATER FILTER/TRAP INSTALLED PRIOR TO THIS POINT. EXCESSIVE WATER IN THIS MODULE CAN CAUSE PERMANENT DAMAGE AND WILL VOID WARRANTY.

BE SURE THAT THERE IS NO OILER INSTALLED IN THIS "S" AIRLINE. OIL ENTERING THE REGULATORS CAN CAUSE PERMANENT DAMAGE AND WILL VOID WARRANTY.

5. Connect one end of the BLACK polyflow tubing provided in this kit to the cabinet port marked **RT**, and the other end to the top of the Fairchild regulator that feeds the **TOP PRESSURE** solenoid installed in step 2 above. A fitting is provided in this kit for this purpose. If this welder uses an AIRLOCK RAM, see drawings below for color and component variations for this type of system.

Be sure that the polyflow tubing is fully seated prior to tightening of the nut. If the connection leaks on either end, the system will "hunt" continuously in operation.

SOLUTION #9480
DIRECTIONS FOR USE PAGE OP-15

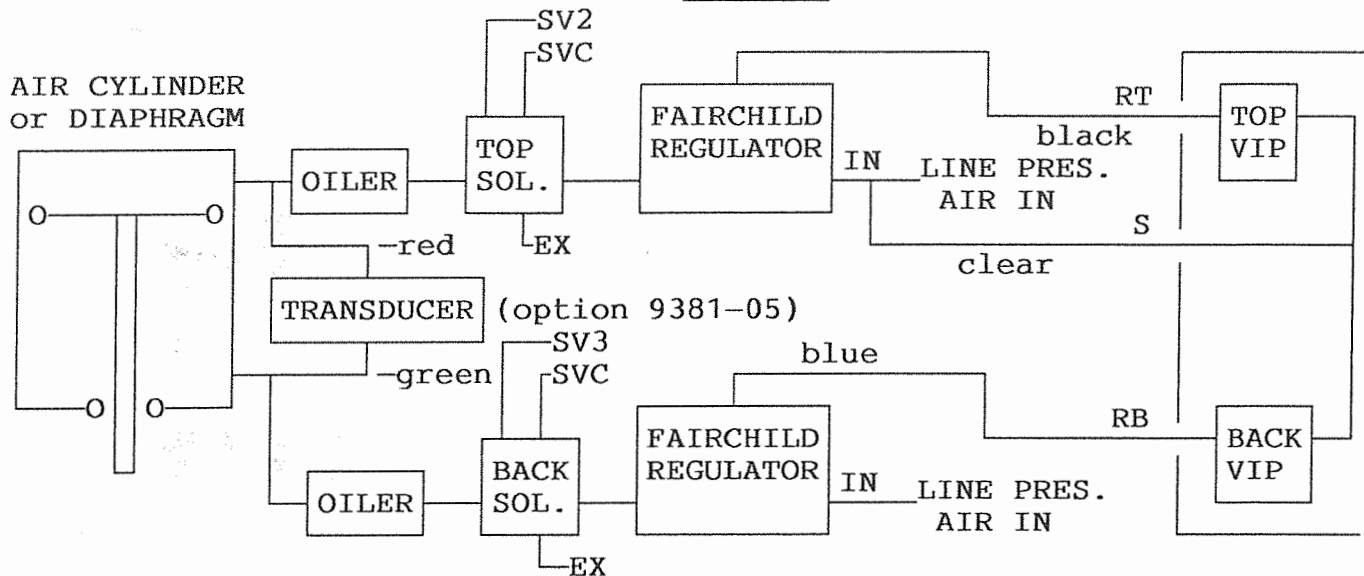
DOUBLE ELECTRONIC PRESSURE REGULATOR SYSTEM OPTION #9381-16 (VIP)
(continued)

6. Connect one end of the BLUE polyflow tubing provided in this kit to the cabinet port marked **RB**, and the other end to the top of the Fairchild regulator that feeds the **BACKUP PRESSURE** solenoid installed in step 3 above. A fitting is provided in this kit for this purpose. If this welder uses an **AIRLOCK RAM**, see drawings below for color and component variations for this type of system.

Be sure that the polyflow tubing is fully seated prior to tightening of the nut. If the connection leaks on either end, the system will "hunt" continuously in operation.

7. System should be ready for operation.

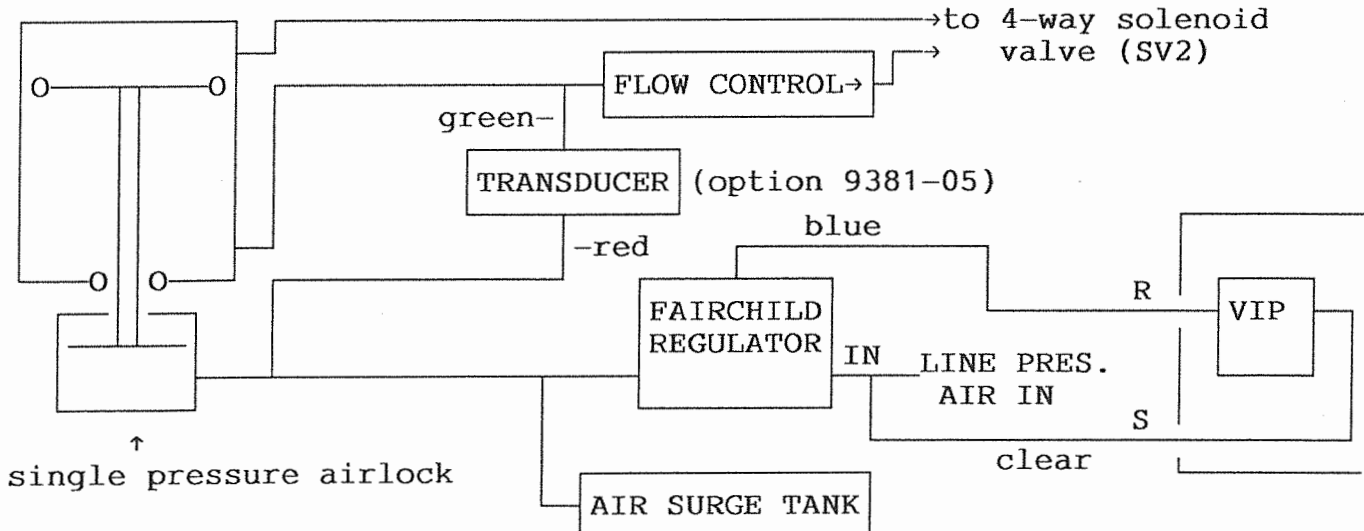
FOR PRESS WELDERS WITHOUT AIRLOCK RAM



FOR PRESS WELDERS WITH SINGLE PRESSURE AIRLOCK RAM

NOTE: Welders that use a **SINGLE PRESSURE AIRLOCK** only require one electronic pressure regulator. This is option #9181-16.

AIR CYLINDER

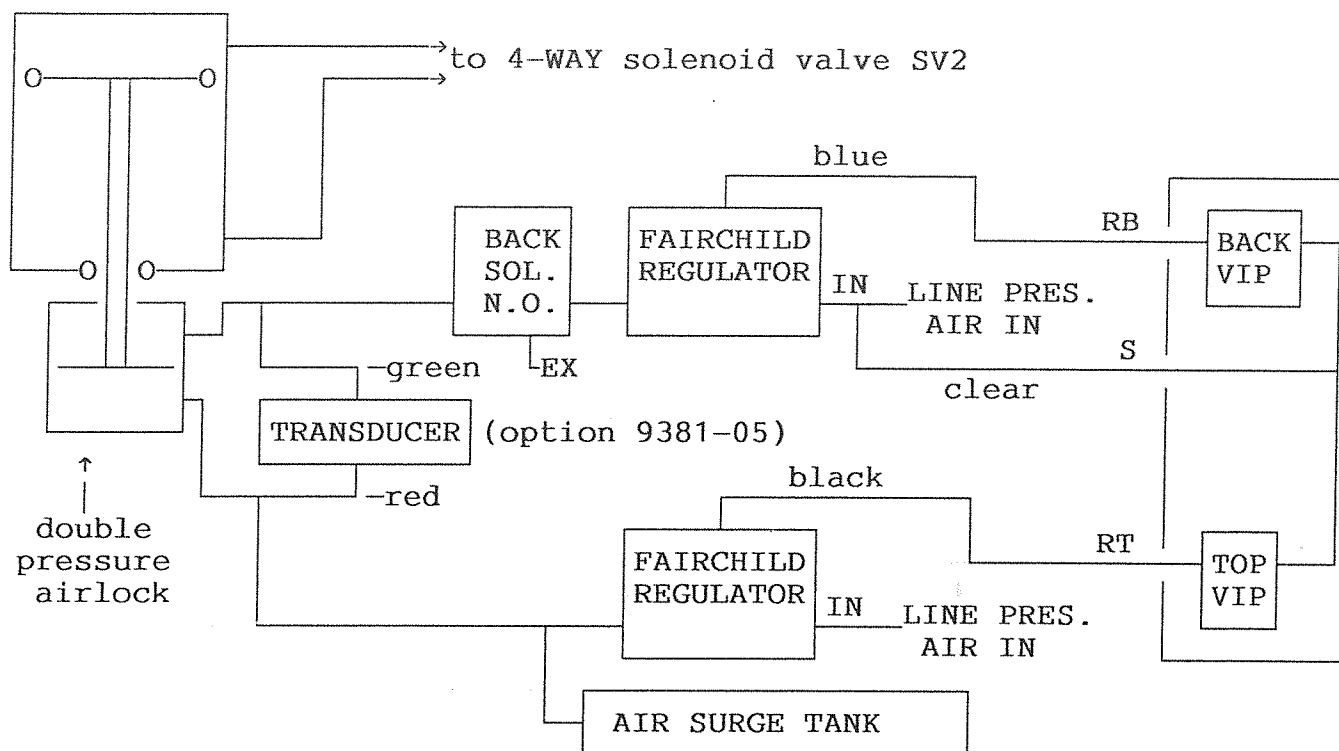


SOLUTION #9480
DIRECTIONS FOR USE PAGE OP-16

DOUBLE ELECTRONIC PRESSURE REGULATOR SYSTEM OPTION #9381-16 (VIP)
(continued)

FOR PRESS WELDERS WITH DOUBLE PRESSURE AIRLOCK RAM

AIR CYLINDER



DIRECTIONS FOR USE:

1. When a TIP FORCE has been entered into a welding program, the SOLUTION will compute the required air pressure for TOP and BACKUP sides of the welding cylinder as explained in sections SU-10 and OP-1.
2. The SOLUTION display will show: SET TOP ## PSI, and SET BACKUP ## PSI every time the SINGLE, NO WELD, or REPEAT BUTTON has been pushed. This same value will be used to electronically set the two VIP board sets inside the control cabinet.
3. Each of these modules will send an air pressure to match these values out of the control cabinet from the RT (regulated TOP) and RB (regulated BACKUP) ports to their respective Fairchild regulators installed earlier.
4. These two regulators will use this pilot line air pressure to set the main regulator output.

ADJUSTMENTS:

This system has been factory calibrated. If the values reached are not proper, consult the factory for field calibration information. **Do not adjust anything in this system without proper instructions.**

SOLUTION #9480
DIRECTIONS FOR USE PAGE OP-17
#9181-21A PRINTER PORT/#9181-21B BUILT-IN PRINTER

PURPOSE:

This option allows export of welding data from the SOLUTION console directly to a printer.

INSTALLATION:

Printer port or built-in printer options must be factory installed. Field installation requires return of the console to factory for installation of the circuit components and software.

SPECIFICATIONS:

System includes an RS-232C asynchronous protocol terminated at a 9 pin subminiature C socket mounted on the back of the console.

If this control was supplied with the #9181-21B built-in printer option, all cables and connections were done at the factory. Skip to the USE section below.

If this is the #9181-21A printer port, customer must supply cable and plugs to match this socket and printer. Wiring for this cable is shown on page FOUR of this direction set.

Printer settings:

SERIAL communication
BAUD rate = 9600
NO parity check (PARITY OFF)
MARK (1) = -3V to -27V
SPACE (0) = +3V to +27 V

This option supports IBM and Epson formats, but should work with most other printers. If there is a question on printer interface, contact the Unitrol Service Department at 847-480-0115.

USE:

The option will print the following for each weld:

1. Complete weld schedule each time it is changed
2. Weld (or part) number
3. Tip Force at the **end** of the weld sequence if option #9381-05 (Differential Pressure Transducer) is installed
4. RMS current averaged during the **weld** portion of the sequence only. In case of IMPULSATION welding, this will be the average of **all** impulses. Other areas of measurement can be made with software changes (special order).
5. Indication of fault in weld. The SOLUTION will sound a short tone and send the following to the printer under the conditions listed. Phrases shown below in () will be printed on the #9181-21B built-in printer option.
 - a. **CURRENT FAULT* (I-FAULT)** when average RMS WELD CURRENT falls out of the customer set window (set in amps)
 - b. **PRESSURE FAULT* (F-FAULT)** when the TIP FORCE at the end of HOLD falls out of the customer set window (requires #9181-05 or #9181-05D options)
 - c. **CURRENT & PRES. FAULT* (I&F FLT.)** when both TIP FORCE and CURRENT falls out of selected windows.

SOLUTION #9480
DIRECTIONS FOR USE PAGE OP-18

#9181-21A PRINTER PORT/#9181-21B BUILT-IN PRINTER (continued)

TYPICAL PRINT-OUT:

*** PROGRAM #04 ***

SQUEEZE TIME 09
WELD TIME 05
WELD HEAT 78%
HOLD TIME 05
TIP FORCE 660 LB
TRANSF. TAP # 03
HIGH I = 09500 A
LOW I = 09100 A

AVC IS ON
PRESS. TRANSD.ON
I-READ & REACT

WELD #:	00034	TIP FORCE =	0670 LB	CURRENT =	09,450 A	
WELD #:	00035	TIP FORCE =	0668 LB	CURRENT =	09,480 A	
WELD #:	00036	TIP FORCE =	0672 LB	CURRENT =	09,370 A	
WELD #:	00037	TIP FORCE =	0665 LB	CURRENT =	09,580 A	CURRENT FAULT
WELD #:	00038	TIP FORCE =	0668 LB	CURRENT =	08,960 A	CURRENT FAULT
WELD #:	00039	TIP FORCE =	0652 LB	CURRENT =	09,440 A	PRESSURE FAULT
WELD #:	00040	TIP FORCE =	0650 LB	CURRENT =	09,560 A	CURRENT & PRES FAULT

*** PROGRAM #08 ***

SQUEEZE TIME 12
WELD TIME 07
WELD HEAT 83%
HOLD TIME 06
TIP FORCE 660 LB
TRANSF. TAP # 03
HIGH I = 10500 A
LOW I = 09800 A
UPSLOPE INIT 55%
UPSLOPE TIME 03

AVC IS ON
PRESS. TRANSD.ON
I-READ & REACT

WELD #:	00041	TIP FORCE =	0670 LB	CURRENT =	10,300 A	
WELD #:	00042	TIP FORCE =	0668 LB	CURRENT =	10,150 A	
WELD #:	00043	TIP FORCE =	0672 LB	CURRENT =	09,870 A	
WELD #:	00044	TIP FORCE =	0665 LB	CURRENT =	09,470 A	* CURRENT FAULT

SOLUTION #9480
DIRECTIONS FOR USE PAGE OP-19

#9181-21A PRINTER PORT (continued)

The print-out on page two shows that:

- a. Before the first weld, the control was set to use PROGRAM #04 with the data as shown.
- b. In weld #00037, the current was above the window.
- c. In weld #00038, the current was below the window.
- d. In weld #00039, the tip force at the end of HOLD was below the allowed variation (set in +/-psi. elsewhere in the program).
- e. In weld #00040, both the tip force at end of HOLD was below the allowed variation, and weld current was below the window.
- f. After weld 40 was completed, a new program #08 was selected for welding using the data as listed.
- g. In weld #00044, the current was below the window.

If the CURRENT or TIP FORCE option is not turned on, the printer will show - - - as a value for each line.

If the welder is operating faster than the printer, data will be sent continuously to the printer's buffer. If the printer is turned off, **no** storage of data will be maintained in the SOLUTION.

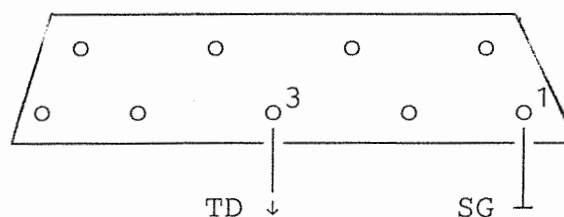
DUAL OR MULTI-SCHEDULE DATA: If two weld schedules (DUAL HEAT), or multi-channel welding is being done in the system, the print-out will identify which one is being used for each transmission.

CHANGE IN SCHEDULES: On local input systems, the RS-232 option will transmit any changes in weld schedules to allow full documentation of all welding parameters being used. This prevents local change in weld schedules to be made without a permanent record being made.

SELECTIVE PRINTING: The system can print data on ALL WELDS or just welds that have a FORCE or CURRENT error. By using the ALL WELDS feature during early set-up of the system, data can be collected for later comparison of "good" welds. Then during production, the FAULT WELDS option can be selected to eliminate excessive paper use.

To select between PRINT ALL WELDS and PRINT FAULTS ONLY, press: PROGRAM, 81, ENTER and make the desired selection.

CABLE WIRING DIAGRAM



Wire other end of cable according to requirements of printer. If a remote printer is not operational, try connecting the SG wire to point 5 on the above plug.

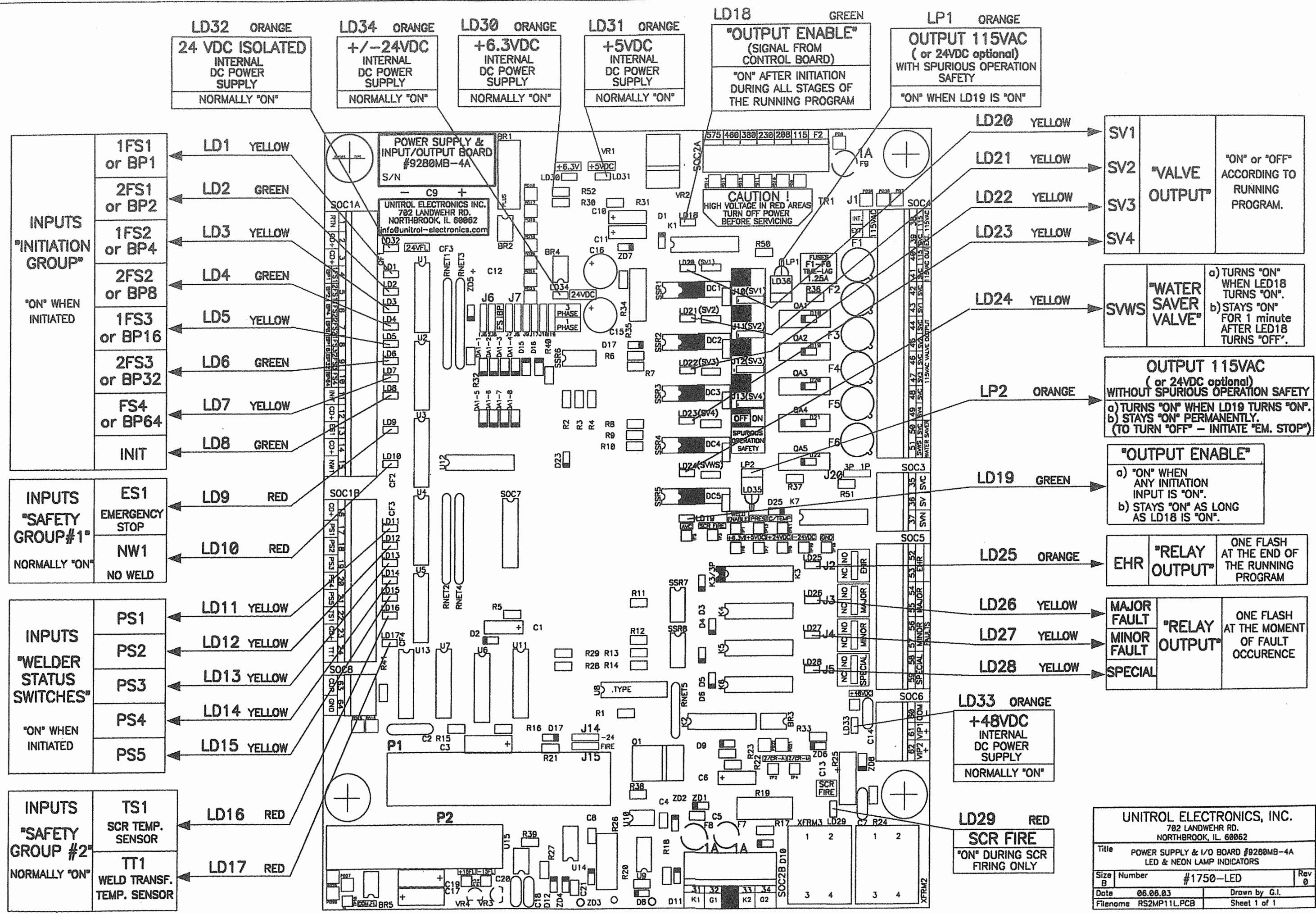
SERVICE INFORMATION

SOLUTION #9480
TROUBLE SHOOTING CHART
PAGE S-13

Before using this chart, check page U-23 (WARNING CODES) for corrective actions.

The factory number is 800-621-4244, 847-480-0115

PROBLEM	PROBABLE REASON
No readout on CONSOLE, AND no pilot lights on POWER SUPPLY	1. No incoming power 2. Fuses F1 or F2 blown (check voltage selection for correct position) 3. CIRCUIT BREAKER or HIGH SPEED FUSE open
No readout on CONSOLE ONLY	1. Plug on CORD BETWEEN CONSOLE AND BACK OF POWER SUPPLY not fully connected on both ends 2. F1 WIRE (LINE IN VOLTAGE SELECT) on wrong terminal
CHECK PHASE ROTATION shows on readout. Indicator light is OFF on PHASE ROTATION relay	1. Power lines are out of phase. Interchange any two power lines.
TRANSF. OVERHEAT shows on readout, will not clear	1. Left hand GREEN INPUT PLUG on POWER SUPPLY not fully inserted 2. Failure of CHIPS U5 OR U13
SCR OVERTEMP., TRANSFORMER OVERTEMP, or LIM/PRES SWITCH OPEN will not clear.	1. Failure in chips U4 or U13
OPEN INITIATION is on readout when power is turned on	1. Foot switch (or other initiation) is closed when power is turned on.
KEYBOARD LOCKED shows on readout, will not clear	1. Bad connection on KEY SWITCH PLUG 2. Bad KEYSWITCH
WELDER SOLENOID WILL NOT operate when green SOLENOID LIGHT ON CONSOLE is on	1. Failure of SSR1-B TO SSR4-B RELAYS
Welder welds ONCE but will not operate on second time	1. Initiation switch not opening (ANTI-REPEAT CIRCUIT)



SV1
SV2
SV3
SV4

"VALVE OUTPUT"

"ON" or "OFF" ACCORDING TO RUNNING PROGRAM.

SVWS

"WATER SAVER VALVE"

a) TURNS "ON" WHEN LED18 TURNS "ON".
b) STAYS "ON" FOR 1 minute AFTER LED18 TURNS "OFF".

OUTPUT 115VAC
(or 24VDC optional)
WITHOUT SPURIOUS OPERATION SAFETY

a) TURNS "ON" WHEN LD19 TURNS "ON".
b) STAYS "ON" PERMANENTLY.
(TO TURN "OFF" - INITIATE "EM. STOP")

"OUTPUT ENABLE"

a) "ON" WHEN ANY INITIATION INPUT IS "ON".
b) STAYS "ON" AS LONG AS LD18 IS "ON".

EHR

"RELAY OUTPUT"

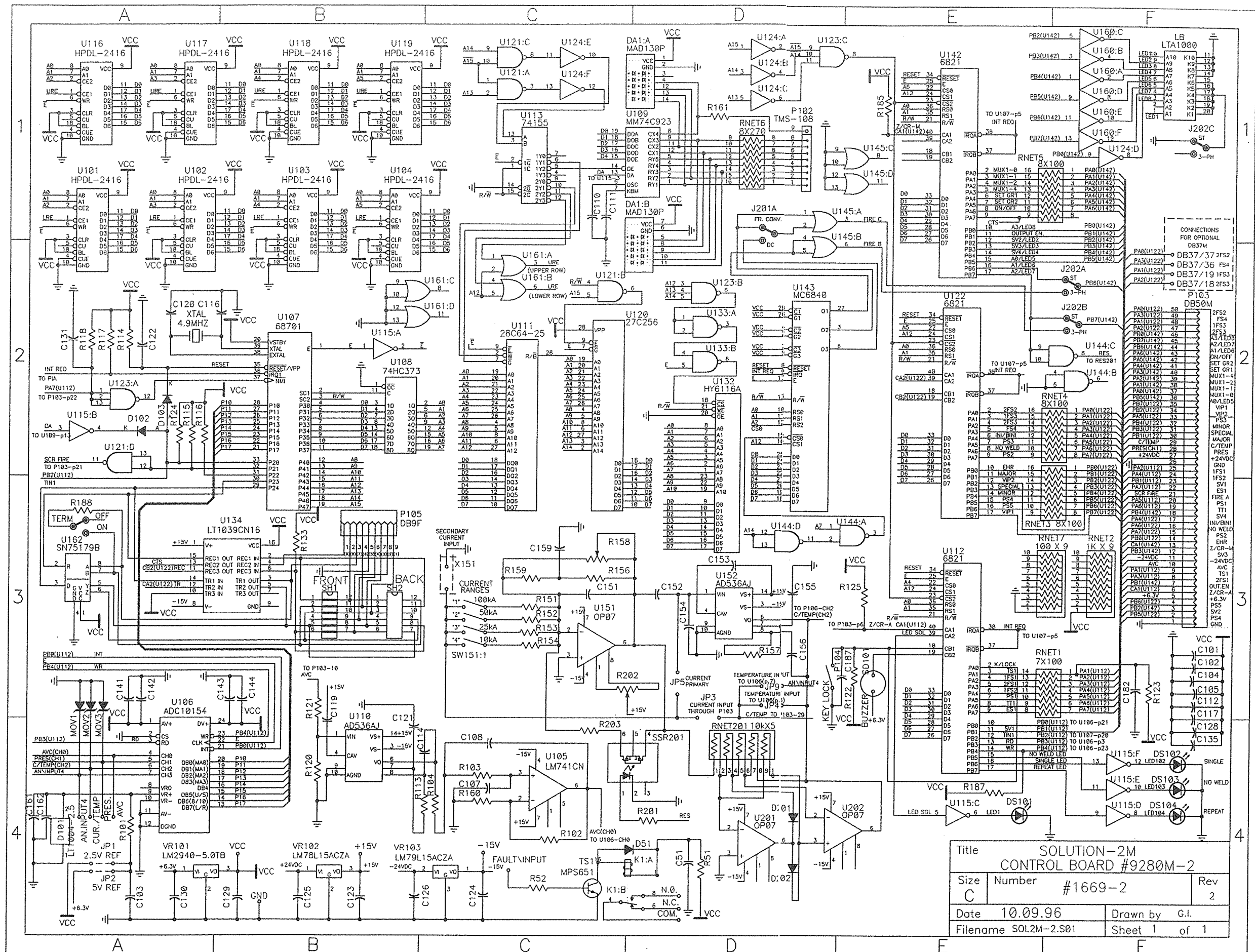
ONE FLASH AT THE END OF THE RUNNING PROGRAM

MAJOR FAULT
MINOR FAULT
SPECIAL

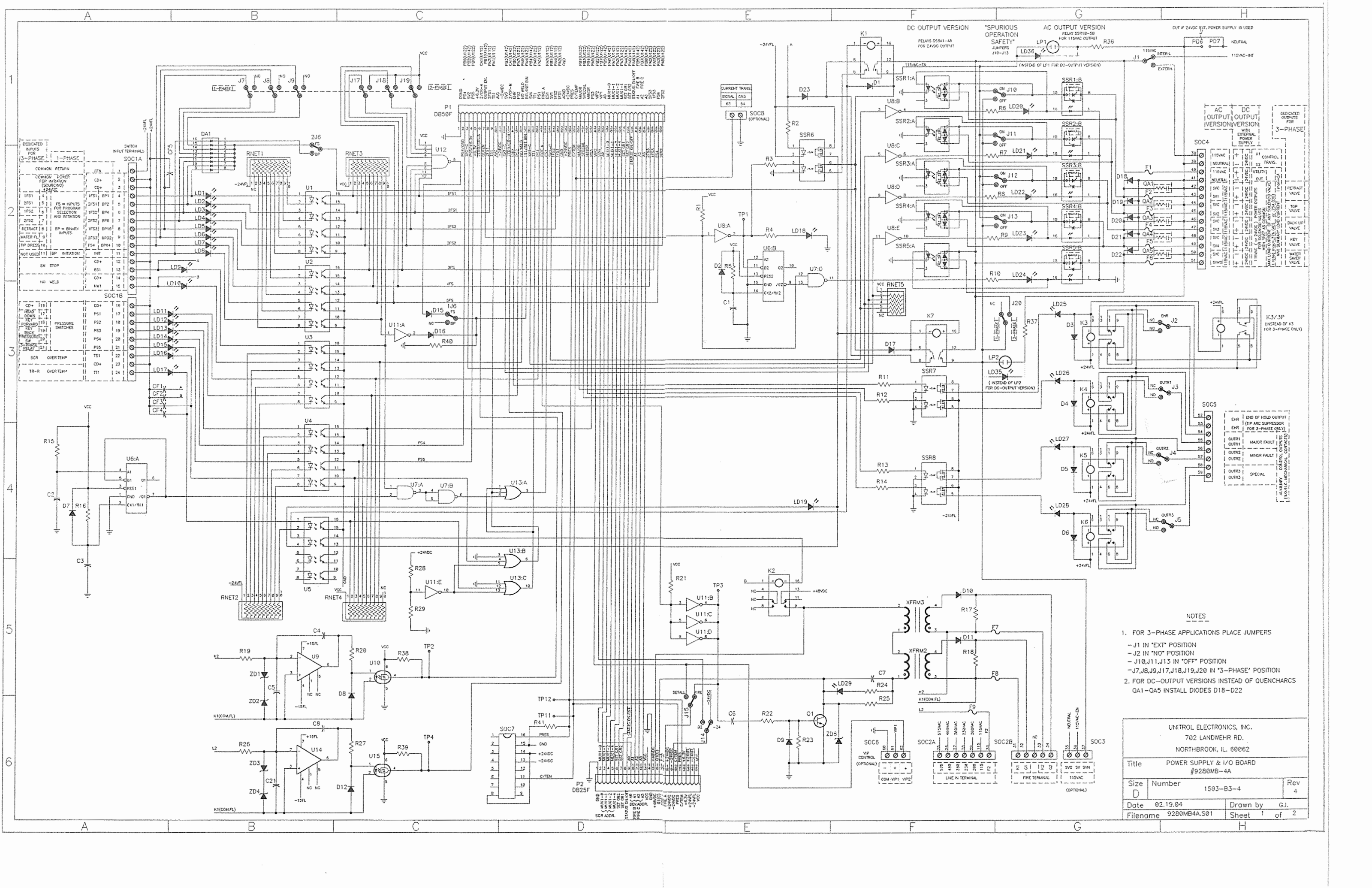
"RELAY OUTPUT"

ONE FLASH AT THE MOMENT OF FAULT OCCURENCE

UNITROL ELECTRONICS, INC. 702 LANDWEHR RD. NORTHBROOK, IL. 60062			
Title POWER SUPPLY & I/O BOARD #9280MB-4A LED & NEON LAMP INDICATORS			
Size B	Number #1750-LED	Rev 0	
Date 06.06.03	Drawn by G.I.		
Filename RS2MP11L.PCB	Sheet 1 of 1		



Title		SOLUTION-2M CONTROL BOARD #9280M-2	
Size C	Number #1669-2	Rev 2	
Date 10.09.96	Drawn by G.I.		
Filename SOL2M-2.S01		Sheet 1 of 1	



NOTES

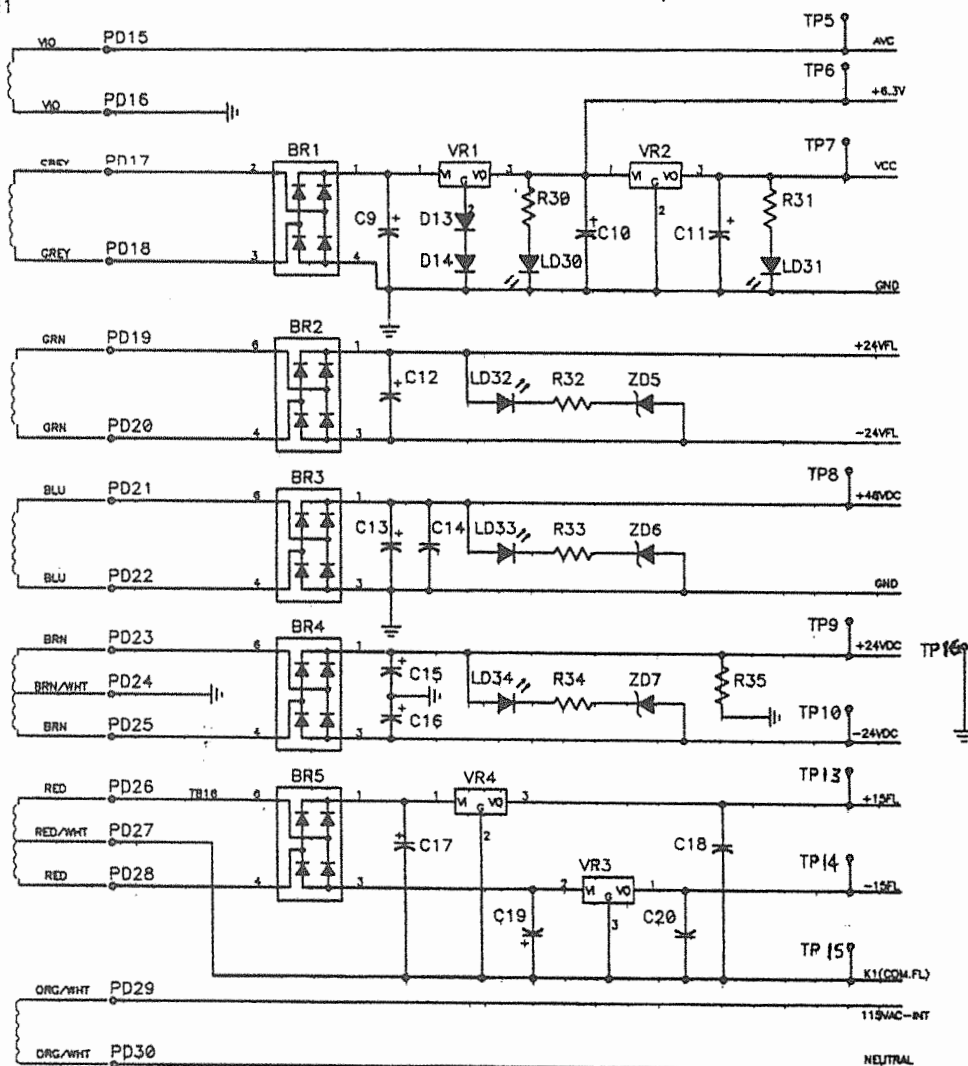
- FOR 3-PHASE APPLICATIONS PLACE JUMPERS
- J1 IN 'EXT' POSITION
- J2 IN 'NO' POSITION
- J10, J11, J13 IN 'OFF' POSITION
- J7, J8, J9, J17, J18, J19, J20 IN '3-PHASE' POSITION
- FOR DC-OUTPUT VERSIONS INSTEAD OF QUENCHARDS
Q1-Q5 INSTALL DIODES D18-D22

UNITROL ELECTRONICS, INC.
702 LANDWEHR RD.
NORTHBROOK, IL 60062

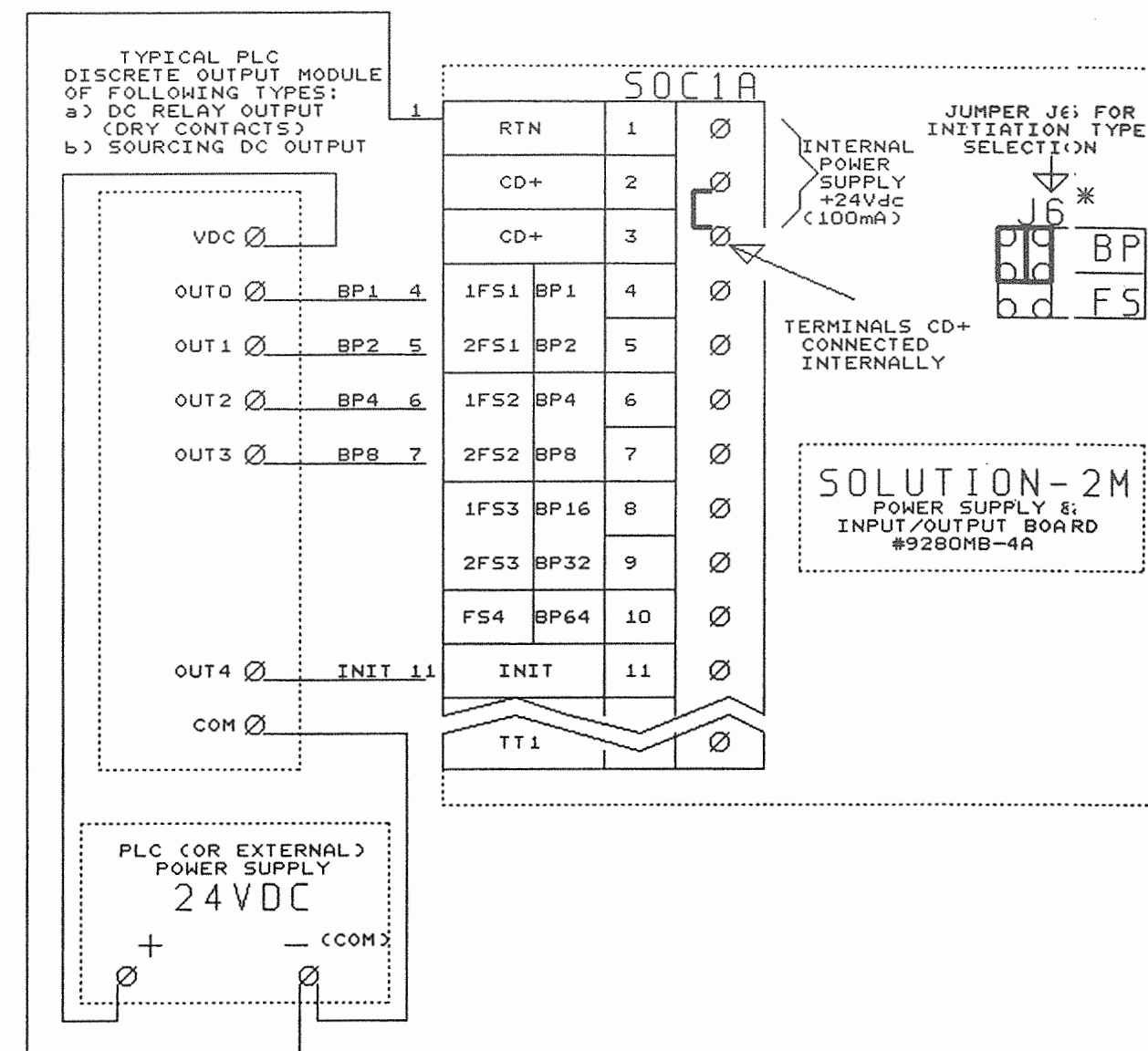
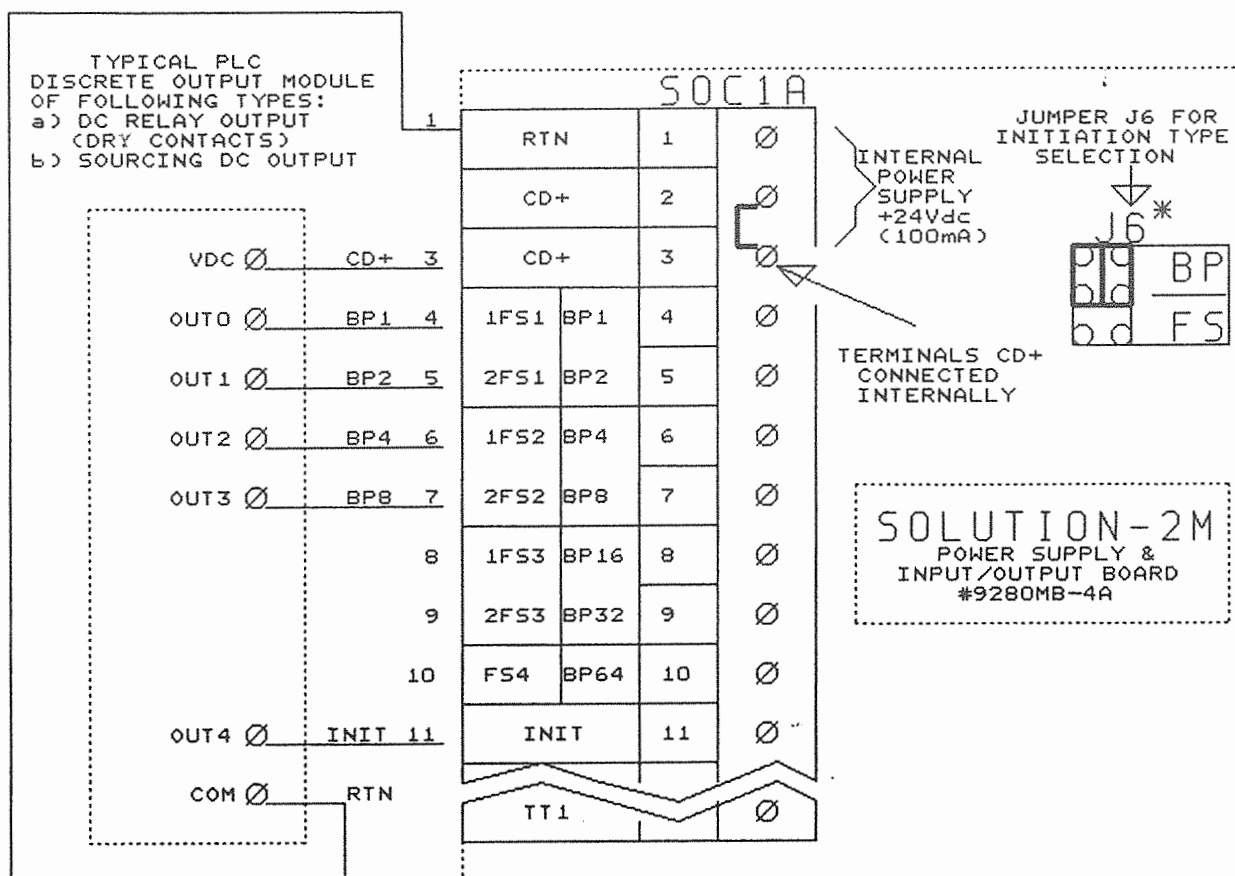
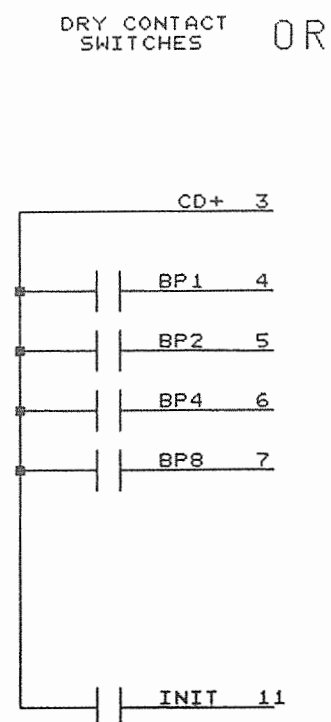
Title		
POWER SUPPLY & I/O BOARD #9280MB-4A		
Size	Number	Rev
D	1593-B3-4	4
Date	02.19.04	Drawn by
Filename	9280MB4A.S01	G.I.
Sheet		1 of 2

F2	PD8	BLK
115VAC	PD9	GRN/YEL
200VAC	PD10	BRN
230VAC	PD11	BLK/RED
300VAC	PD12	YEL
400VAC	PD13	RED/WHI
570VAC	PD14	ORG

XFRM1



UNITROL ELECTRONICS, INC. 702 LANDWEHR RD. NORTHBROOK, ILL. 60062		
Title POWER SUPPLY & I/O BOARD #9280MB-3		
Size D	Number 1593-B3	Rev 3
Date 07.30.97	Drawn by G.I.	
Filename SQL2MP1.S02	Sheet 2 of 2	



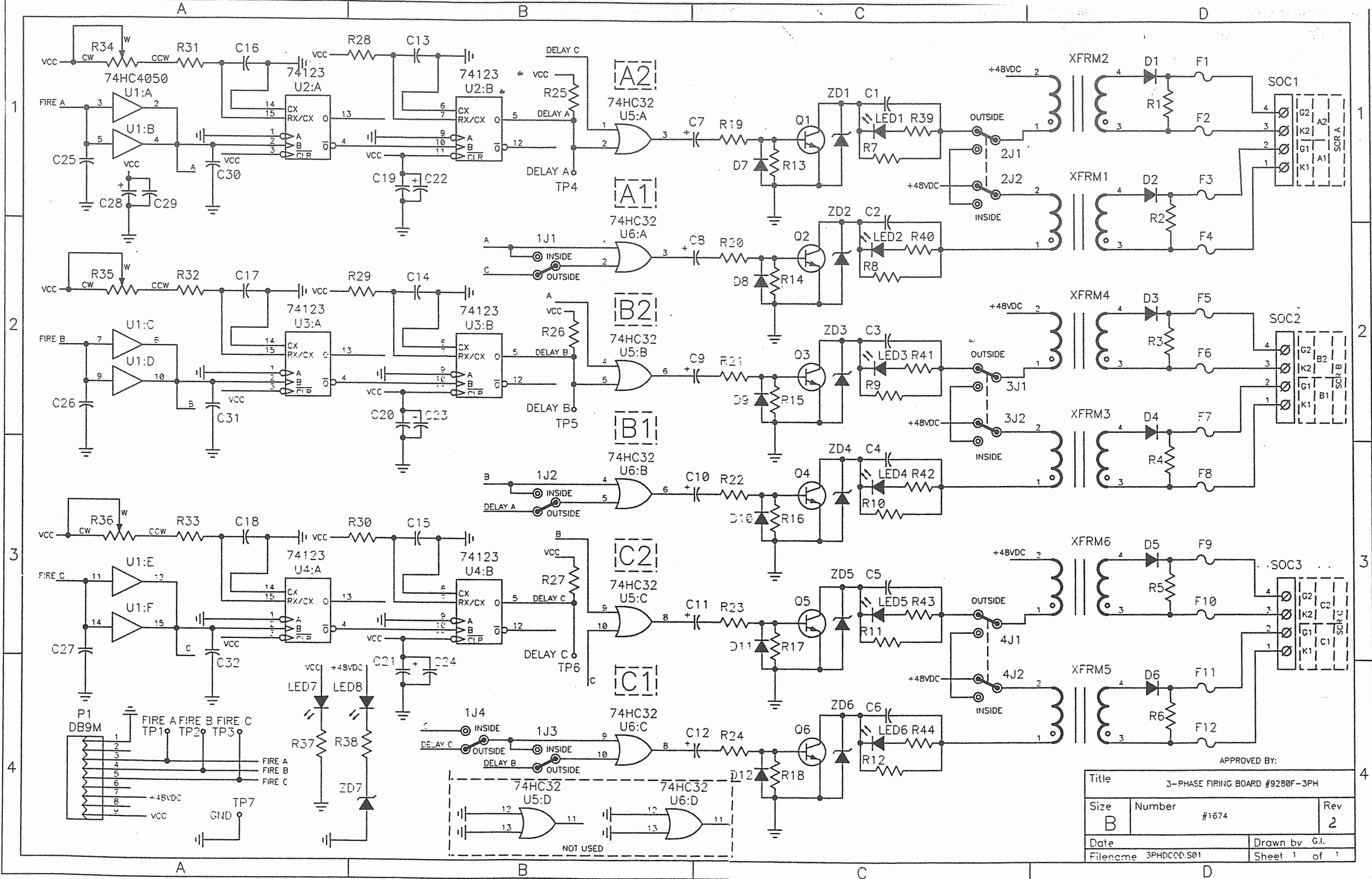
I. WIRING DIAGRAM WITH SOLUTION-2M INTERNAL POWER SUPPLY 24VDC (100mA)

NOTES

- * 1. TO USE BINARY INITIATION SOLUTION-2M MUST BE SET UP AS FOLLOWS:
-JUMPER JP6 MUST BE IN POS. "BP"
-CHOOSE INITIATION TYPE "BINARY"
(SEE CHAPTER "INITIAL SET-UP PROCEDURE" IN MANUAL)

II. WIRING DIAGRAM WITH PLC (OR EXTERNAL) POWER SUPPLY 24VDC (100mA)

IMPORTANT!
"- " or "COM" of external power supply must be isolated from chassis (earth) ground.



APPROVED BY:

Title 3-PHASE FIRING BOARD #9280F-3PH		
Size B	Number #1674	Rev 2
Date	Drawn by G.I.	
Filename 3PHDCOD.S01	Sheet 1 of 1	

