RSVP-401hd HIGH DENSITY SYSTEM
Rapid Servo Voltage Positioner

Manual P/N 718025
Revision 2
6/26/97

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Warranty

InnerLogic warrants that this product shall be free from defects in materials and workmanship, under proper and normal use for which such equipment is recommended, for a period of one (1) year from the date of installation, but in no event shall this warranty extend beyond two (2) years from the date of the original invoice.

Return Goods Procedure

InnerLogic utilizes a return goods procedure which must be followed before returning any items for repair, replacement, or restocking. This means that a return goods authorization number must be obtained prior to shipment to InnerLogic. It will be necessary for the customer to provide a description along with the stock number and serial number, if applicable, of the item to be returned. In no case will a returned shipment be accepted by InnerLogic without the proper return goods authorization number.

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1. INTRODUCTION

The RSVP-401 is the most advanced arc voltage control in the industry today for plasma cutting. It is designed to offer arc voltage control capabilities to any plasma system while cutting at high or low speeds. In addition, initial height positioning is standard. This is the first time that a system with these capabilities has been available to the industry. The arc voltage control and positioner were designed to perform as a team. Other arc voltage controls provide a full speed up or down output if a given deadband is exceeded. In order to eliminate oscillations through the deadband, the maximum travel speed for these positioning systems was severely limited. The RSVP is a servo positioning system that operates with no deadband and therefore can attain speeds of 180 inches per minute. This not only provides a highly accurate arc voltage control, but also a very responsive one.

The RSVP-401 has several features that set it apart from all previous systems. These features include an arc voltage setting resolution of one arc volt and a partial head-up feature (partial raise), and an initial height test switch for determining starting height without starting an arc.

1.1 Safety

Installation, as well as all repairs, made to the RSVP should only be performed by qualified personnel. The RSVP makes use of both A.C. and D.C. circuitry for operation. Remember, 115VAC can be fatal if not handled in a safe manner. In addition, it will be necessary to make connections to the D.C. output of the plasma power supply. Please refer to the plasma manufacturer's operating manual for additional information. These voltages can be in excess of 200 volts. Fatal shock hazard does exist. Please exercise extreme caution while working in these areas.

1.2 Components Included in the RSVP System

The RSVP System consists of:

Control console
Remote control
Positioner
Voltage divider
Torch clamp (specify size)
Cable "A", 20 feet, console to remote
Cable "B", 30 feet, console to positioner motor
Cable "C", 20 feet, console to power supply
Cable "D", 20 feet, console to voltage divider
Cable "E", 15 feet, console to work ground
Cable "F", 15 feet, console to computer
Optional: QuickStop torch protection device

1.3 Specifications

RSVP-401hd High Density System Model Number, 401142

Control Console

Stock number	401131
Input power	115VAC 50/60 hertz
Input current	3 amperes
Height	6.5 in. 165.1 mm.
Width	14 in. 355.6 mm.
Depth	16 in. 406.4 mm.
Weight	30 lbs. 13.6 kg.
Arc voltage range (adjustable)	50-250VDC
Control accuracy	± .5VDC

RSVP-401hd Positioner

Stock number	401122
Positioning speed	100 ipm. 2.54m/min.
Height	27.5 in. 698.5 mm.
Width	7.0 in. 177.8 mm.
Depth	3.78 in. 96.0 mm.
Weight	25 lb. 11.4 kg.
Stroke	9.5 in. 241.3 mm.

RSVP-401hd Remote Control

Stock number	401152
Height	2.1 in. 53.3 mm.
Width	9.3 in. 236.2 mm.
Depth	5 in. 127.0 mm.
Weight	1.5 lbs. 0.7 kg.

Voltage Divider

Stock number	301200
Height	2.0 in. 51.0 mm.
Width	3.75 in. 95.5 mm.
Depth	4.65 in. 118.0 mm.

1.4 Functions

Arc Voltage Control - This servo system is one of the most advanced voltage controls available. It continuously monitors the arc voltage while cutting, and can respond at speeds of 180 inches per minute. For the first time, this rapid response means that arc voltage control is available for high, intermediate, or low speed plasma arc cutting. The arc voltage desired may be set in increments of one arc volt.

Initial Height Positioning - Unlike initial height positioning systems of the past, the RSVP offers initial height positioning capability to any plasma system. For the first time, this feature is an integral part of the arc voltage control. It is a patented feature which utilizes a touch retract system which requires no external switches or devices. Manual positioning can be used if initial height positioning is not desired.

Partial Raise - This feature retracts the torch from the cut material approximately 1/2 of the normal full-up distance. This reduces the time between cuts. The full raise position should be used when rapid traversing or anytime the torch might contact an obstruction.

Corner - This feature allows the arc voltage control to be disabled while cutting. It is used to prevent the torch from diving into the workpiece during corners or when initially piercing heavy plate.

Limit - This feature automatically inhibits arc voltage control when the actual arc voltage exceeds the desired arc voltage by 15 volts. As soon as the actual arc voltage is less than 15 volts, the control will resume arc voltage control.

Safety Counter - The RSVP has a unique feature which is designed to protect the cutting torch from damage during initial height positioning. The safety counter is set during the first sequence of operation. Should the slow speed proximity switch fail, the counter will automatically initiate slow inching speed. This will continue to occur as long as the control power is not removed from the RSVP. The PSF (Proximity Switch Failure) LED will illuminate on the remote control, indicating that the slow speed proximity switch has failed and the safety counter is now activating fast-to-slow inching speed. The PSF LED will also illuminate if the first cycle of the day (or initial power-up) is from the partial raise position and then a cycle is started from the full raise position. This is not a malfunction. The PSF LED can be cleared by removing power from the height control.

IHS Test/Run Switch - This switch allows the starting height of the torch to be checked for proper distance without starting an arc.

Cycle Complete - This signal indicates by a contact closure that the torch has been raised to the partial or upper limit switch.

2. INSTALLATION

2.1 Initial Inspection

InnerLogic has taken special care in packaging your RSVP system to prevent damage in shipping. Before unpacking your system, please examine the shipping container for any signs of damage. If the carton is damaged, open and inspect the contents. Open the console door and inspect the p.c. boards. If the RSVP is damaged, contact the shipping carrier and file for damages. Next, it will be necessary to contact InnerLogic or your local supplier and inform them of the damage, so that replacement parts can be ordered. If no damage is evident, remove the packing slip and verify that all items have been received.

2.2 Pre-Installation Requirements

This section explains certain requirements which should be met before the RSVP is installed.

1) The torch station to which the positioner is to be installed should be as rigid as possible. All play should be removed to minimize vibration.

2) Electrically, both the "X" and "Y" drive axes should be adjusted to specifications to reduce any overshoot when the machine is being moved.

3) The RSVP is a high gain electrical system which requires specific grounding procedures. This is necessary to ensure that stray electrical noise or high frequency noise does not interfere with its normal operation. The ground stud located on the rear of the control console should be connected directly to the point known as star ground. This is generally referred to as the common ground point where all subsystems of the machine are grounded. This point is then connected to a driven earth ground which should be near the star ground. The ground rod should be at least 3/4 inch in diameter and should be driven into the earth's permanent moisture layer. The length of this ground rod varies from installation to installation. This ground rod should have been installed during the installation of the machine. Please refer to The National Electrical Code, Article 250, Section H, Ground Electrode System or other appropriate codes.

4) The X-Y controller should be capable of supplying a maintained contact closure (dry output) to provide a start signal to the RSVP (15 volt @1.5 ma. load).

5) The X-Y controller must provide a maintained contact closure (dry output) to deactivate the torch height control while entering into and departing from sharp corners (15 volt @1.5 ma. load).

2.3 X-Y Machine Control Outputs

Function	Logic Input Required
START	The RSVP requires the closing of a normally open set of contacts. This maintained contact closure to logic ground initiates the RSVP start.
STOP	The RSVP requires the normally open start contacts, which are closed during normal operation, to open. This removes the maintained input to logic ground, thus turning the RSVP off.
CORNER	The RSVP requires that these normally open contacts close when the automatic arc voltage control is to be deactivated.

2.4 Mechanical Installation

Physical Location of Components

Control Console Stock Number 401131

This unit should be installed in a secure, safe location away from the operator station. It may be mounted vertically or horizontally, but pay careful attention to the hinging of the access door. The printed circuit boards are installed on the door and on the mounting plate for easy access.

Remote Control Stock Number 401152

This unit should be installed on or near the operator station. It will be necessary for the operator to have access to the switches for various control inputs during operation.

Positioner Stock Number 401122

The positioner is installed on the torch station of a cutting machine or on the "C" frame of a punch press. It should be mounted securely to minimize any mechanical vibration when moving. Select the mounting location, but do not install at this time. Route all cables to the positioner location so it can be tested prior to mounting, as described in Section 4.1, System Check-out. The motor cable must be routed away from the torch leads.

Voltage Divider Stock Number 301200

The voltage divider should be securely mounted inside the plasma power supply. A suitable location should provide easy accessibility. Voltage divider installation is discussed in Section 2.6.

2.5 Electrical Installation

WARNING !!!!

<<<<< Turn off all power before working on equipment >>>>>

General

The RSVP has been designed for quick, safe and easy installation. All components of this system are connected with cables equipped with AMP connectors. Before attempting to make any of these connections, be sure that all electrical power to the machine, as well as the plasma power supply, has been removed.

RSVP System

After all of the components, except the positioner, have been securely mounted, use the following procedures to complete the electrical installation. Refer to Figure 1 (page 11) for interconnecting cable details.

1) 401 Cable "A" Assembly - This cable connects the various switch functions in the remote control to the control console. The keyed plug connects to the control console. Please refer to Figure 2 (page 12) for details.

2) 401 Cable "B" Assembly - This cable connects the control console to the torch positioner. Please refer to Figure 3 (page 13) for details.

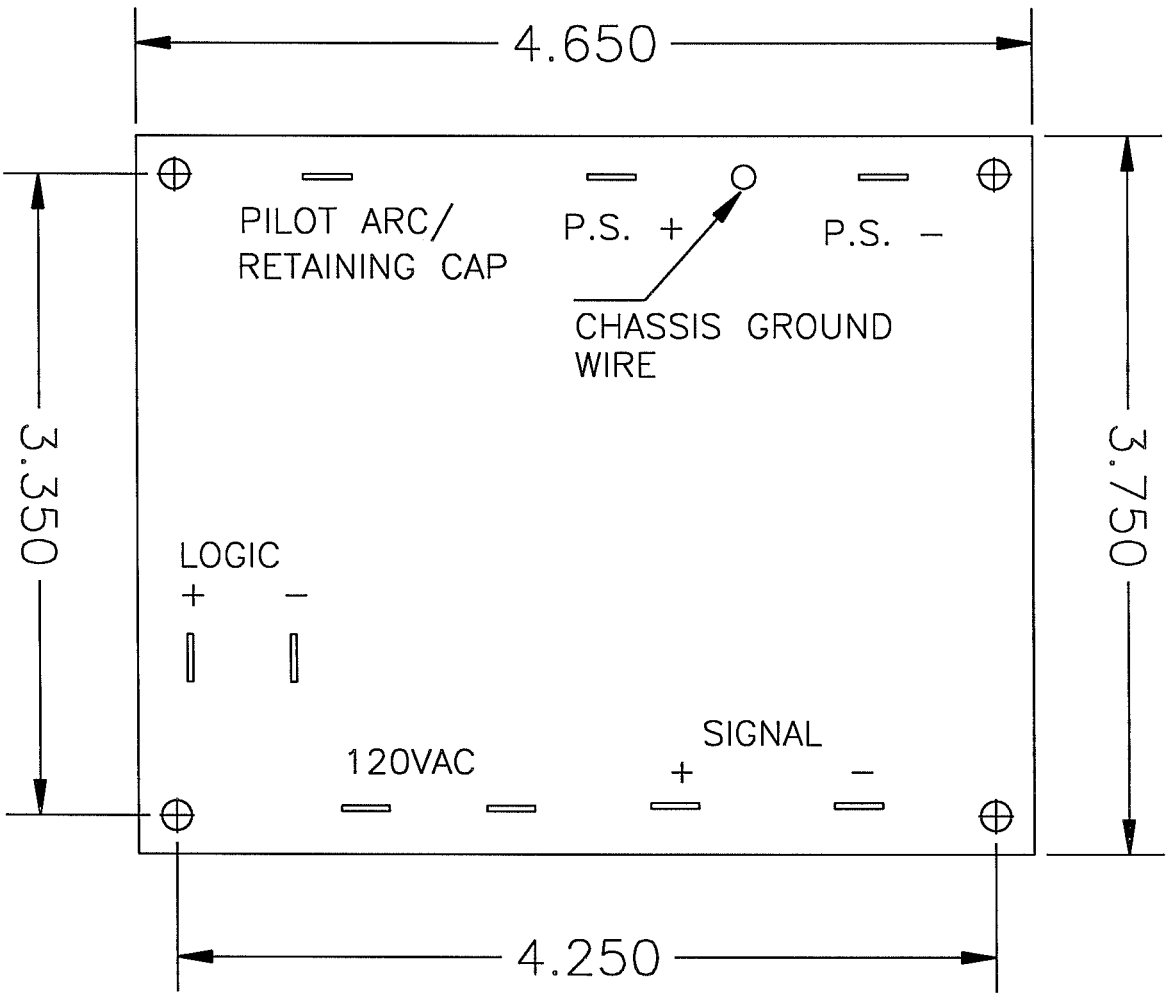
3) Cable "C" Assembly - This cable connects the control console to the plasma power supply. It provides the plasma start signal, as well as the motion signal, which activates the arc voltage control. Please refer to Figure 4 (page 14) for details.

4) Cable "D" Assembly - This cable connects the control console to the voltage divider printed circuit board located in the power supply. Please refer to Figure 5 (page 15) for cable details and Section 2.6 for specific hookup information.

5) Cable "E" Assembly - This cable connects the ground stud, located on the rear of the control console, to the star ground of the cutting table. Please refer to Figure 6 (page 16) for details.

6) 401 Cable "F" Assembly - This cable connects the start input from the X-Y controller to the control console. Please refer to Figure 7 (page 17) and the schematic provided in the front pocket of this manual for details. Figure 10 (page 19) gives interface connections.

VOLTAGE DIVIDER HOLE TEMPLATE



NOTE: OVERALL HEIGHT IS 2.00" INCLUDING STANDOFFS AND COMPONENTS.

2.6 Voltage Divider Installation

WARNING!!!!
<<<<< Turn off all power before working on equipment >>>>>

The voltage divider connections to the plasma power supply are important. The proper connection reduces high frequency noise picked up by the voltage divider. The correct connection for the PAK-3XR, PAK-5XR, PAK-10, and PAK-10XR is to connect the voltage divider power supply (P.S.) connection directly to the power supply diode bridge positive and negative outputs, and not to the output terminals of the power supply. Power supplies made by Hypertherm that have a "chopper" type control like the HT40C, require a different hookup. The voltage divider Power Supply Positive (P.S.+) connection connects directly to the positive output of the power supply. This connection point is the same as the power supply ground clamp lead connection. The voltage divider Power Supply Negative (P.S.-) lead connects to the chopper module negative output. In some HT40C power supplies this is wire #39.

In general, if your power supply is a "drooping" type power source and only has a diode bridge, then connections will be the same as the Thermal Dynamics PAK power supplies. If your power source has a "chopper" control, then connections should be made similar to the Hypertherm HT40C.

The purpose of the voltage divider is to provide a signal which is derived from the actual cutting arc voltage. The RSVP control uses the voltage divider signal to raise or lower the torch. The voltage divider used in the RSVP supplies a 40:1 signal. This simply means that a cutting voltage of 100 volts results in a signal of 2.5 volts provided to the control.

The clear-the-plate (CTP) feature is incorporated in the voltage divider p.c. board and is automatically activated any time the copper nozzle or shield cap is in direct contact with the workpiece.

The sequence of operation is as follows:

1) The torch descends toward the workpiece after a start command is given to the RSVP.

2) When a certain amount of force is developed between the nozzle and workpiece, or the CTP feature senses contact between the torch shield and workpiece, the torch begins to retract. The retraction time is set by the retract time thumbwheel on the front panel of the remote control and begins when the torch nozzle breaks contact with the workpiece on its upward movement. If the copper nozzle is in contact with the workpiece during retraction, the torch will continue to retract until that contact is broken. Then the retraction time will begin.

The advantage of the CTP circuit is that the nozzle is never in contact with the work when initiating the arc. This eliminates dragging the torch along the workpiece. Secondly, it assures the proper starting height above the workpiece for piercing which results in longer nozzle life. If the torch used does not allow the copper nozzle to touch the workpiece, the distance between the nozzle and workpiece can vary and is dependent on the spring-back of the material being cut. Simply put, the retract time begins when contact is broken between the nozzle and workpiece if the nozzle can touch the workpiece. If the nozzle cannot touch the workpiece, retract time begins when a certain force level is sensed between the torch (probably the gas shield cup) and the workpiece.

WARNING!!!!
<<<<< Turn off all power before working on equipment >>>>>

2.6.1 Hypertherm HD1070/HD3070
Voltage Divider Installation

1) Refer to Figure 21, page 10 for interconnecting the voltage divider p.c. board to the HD1070.

2) Route the end of cable assembly "D" into the power supply. See Figure 1, page 11 and Figure 5, page 15 for clarification.

   a) Connect the black wire of the "D" cable marked Signal Minus to the terminal labeled Signal Minus on the p.c. board.

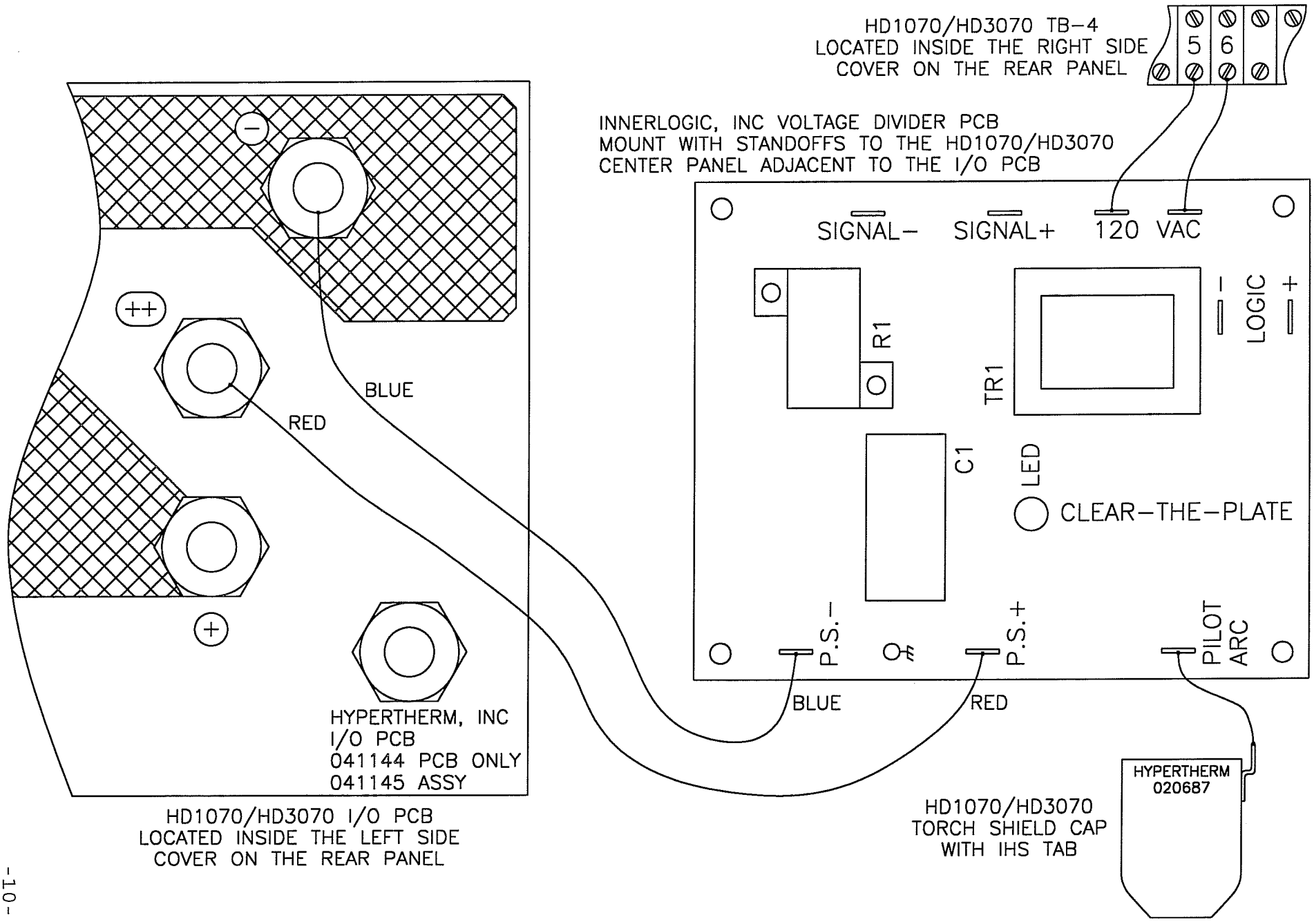
   b) Connect the red wire of the "D" cable marked Signal Plus to the terminal marked Signal Plus on the p.c. board.

   c) Connect the white wire soldered to the voltage divider p.c. board to chassis ground.

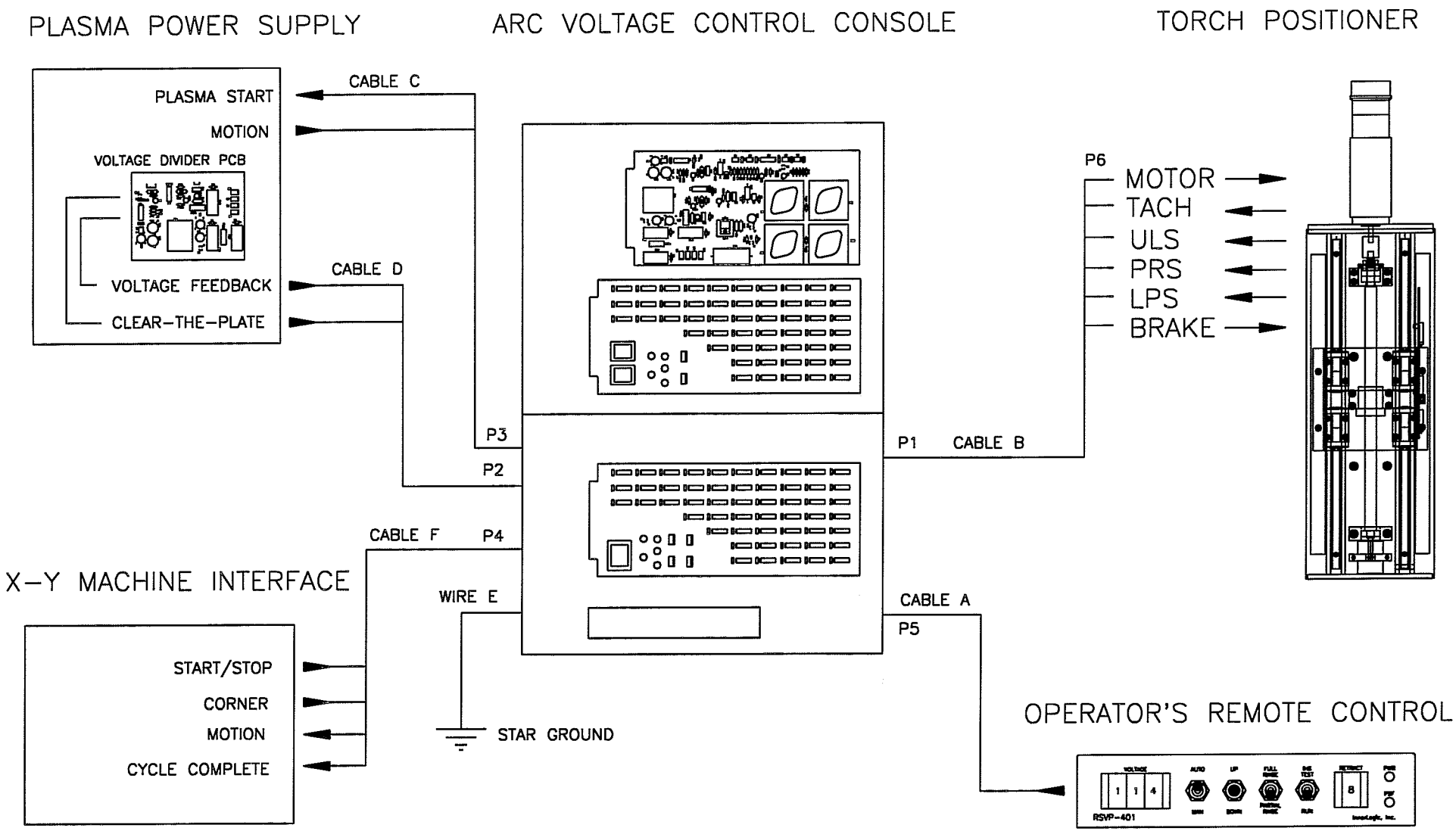
3) Clear-the-plate connections:

   a) Connect the black wire of cable "D" marked Logic Minus to the terminal labeled Logic Minus on the voltage divider p.c. board.

   b) Connect the red wire of cable "D" marked Logic Plus to the terminal labeled Logic Plus on the voltage divider p.c. board.

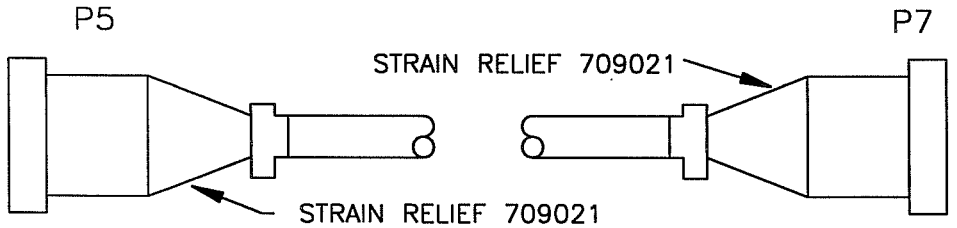


HD1070/HD3070 VOLTAGE DIVIDER INSTALLATION
FIGURE 21



SYSTEM INTERCONNECTION DIAGRAM
FIGURE 1

CABLE: 12 SHIELDED TWISTED PAIRS XX FT.



PLUG 709095 PLUG 709095

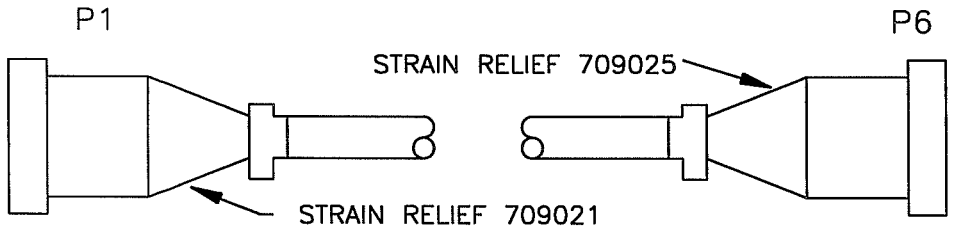
TERMINAL	POSITION NO.	COLOR	POSITION NO.	TERMINAL
709018 SOCKET	1	RED	1	709018 SOCKET
	5	BLACK	5	709018 SOCKET
	10	SHIELD	CUT	
	6	WHITE	6	709018 SOCKET
	2	BLACK	2	709018 SOCKET
	10	SHIELD	CUT	
	3	YELLOW	3	709018 SOCKET
	7	BLACK	7	709018 SOCKET
709018 SOCKET	11	SHIELD	CUT	
	8	GREEN	8	709018 SOCKET
	4	BLACK	4	709018 SOCKET
	11	SHIELD	CUT	
	9	BLUE	9	709018 SOCKET
	15	BLACK	15	709018 SOCKET
	12	SHIELD	CUT	
	23	ORANGE	23	709018 SOCKET
	18	BLACK	18	709018 SOCKET
709018 SOCKET	13	SHIELD	CUT	
	19	BROWN	19	709018 SOCKET
	24	BLACK	24	709018 SOCKET
	25	SHIELD	XX	
	21	WHITE	21	709018 SOCKET
	16	RED	16	709018 SOCKET
	12	SHIELD	CUT	
	22	GREEN	22	709018 SOCKET
	17	RED	17	709018 SOCKET
709018 SOCKET	13	SHIELD	CUT	
	34	BROWN	34	709018 SOCKET
	33	RED	33	709018 SOCKET
	25	SHIELD	CUT	
	36	BLUE	36	709018 SOCKET
	35	RED	35	709018 SOCKET
	31	SHIELD	CUT	
	32	YELLOW	32	709018 SOCKET
	37	RED	37	709018 SOCKET
709018 SOCKET	31	SHIELD	CUT	
KEY	20		XX	XX

RSVP 401
A CABLE

DRAWING NO.

FIGURE 2

CABLE: 9 SHIELDED TWISTED PAIRS XX FT.
BELDEN 9875 (711206)



PLUG 709020

PLUG 709112
(206037-1)

TERMINAL	POSITION NO.	COLOR	POSITION NO.	TERMINAL
709018 SOCKETS	4	RED	4	709018 SOCKETS
	1	BLACK	1	
	11	SHIELD	CUT	
	5	WHITE	5	
	6	BLACK	6	
	11	SHIELD	CUT	
	7	YELLOW	7	
	8	BLACK	8	
709018 SOCKETS	11	SHIELD	CUT	
	2	GREEN	2	
	3	BLACK	3	
	10	SHIELD	CUT	
	9	BLUE	9	
	12	BLACK	12	
	10	SHIELD	10	
	13	BROWN	13	
	14	BLACK	14	
	10	SHIELD	CUT	
	15	ORANGE	15	
709018 SOCKETS	16	BLACK	16	709018 SOCKETS
	20	SHIELD	CUT	
	21	WHITE	CUT	
	21	RED	CUT	
	22	SHIELD	CUT	
	23	GREEN	CUT	
	23	RED	CUT	
	22	SHIELD	CUT	

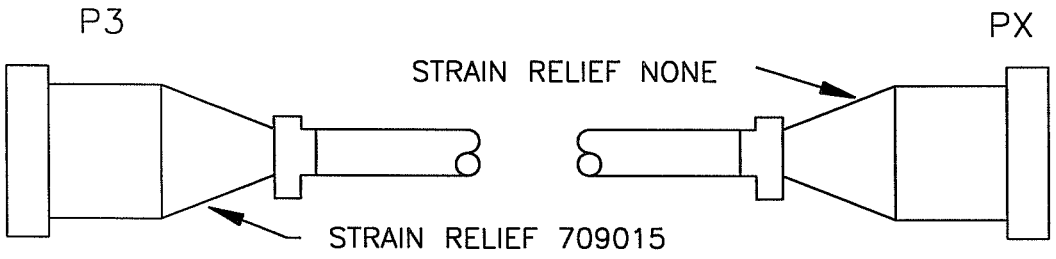
POSITIONER FREE HANGING RECEPTACLE
709113 (206036-3)

RSVP 401
B CABLE

DRAWING NO.

FIGURE 3

CABLE: 3 SHIELDED TWISTED PAIRS XX FT.



PLUG 709016

PLUG NONE

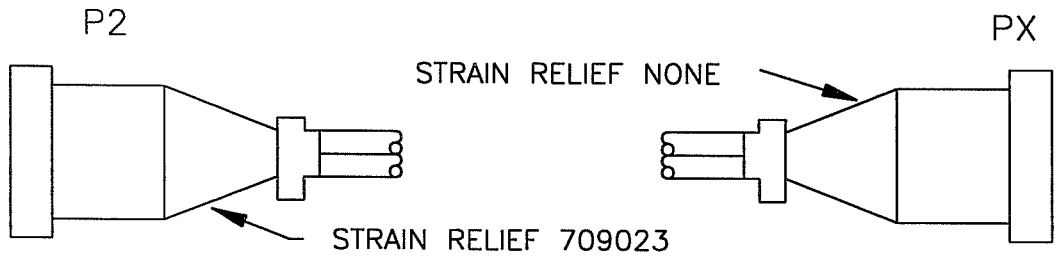
TERMINAL	POSITION NO.	COLOR	POSITION NO.	TERMINAL
709018 SOCKET	1	RED	XX	NONE
	2	BLACK	XX	
	3	SHIELD	CUT	
	7	WHITE	XX	
	8	BLACK	XX	
	3	SHIELD	CUT	
	5	GREEN	CUT	
	5	BLACK	CUT	NONE
709018 SOCKET KEY	4	SHIELD	CUT	
	9		XX	

RSVP 100, 101, 301
401 C CABLE

DRAWING NO.

FIGURE 4

CABLE: 2X2 SHIELDED TWISTED PAIRS
BELDEN 8441 (2)



PLUG 709022

PLUG NONE

TERMINAL	POSITION NO.	COLOR	POSITION NO.	FUNCTION	TERMINAL
709018 SOCKET	1	BLACK	XX	SIGNAL –	.250 FAST-ON
709018 SOCKET	4	RED	XX	SIGNAL +	.250 FAST-ON
	CUT	SHIELD	CUT		
709018 SOCKET	3	BLACK	XX	LOGIC –	.250 FAST-ON
709018 SOCKET	2	RED	XX	LOGIC +	.250 FAST-ON
	CUT	SHIELD	CUT		

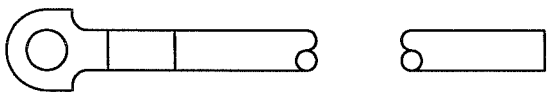
RSVP 100, 101, 301
401 D CABLE

DRAWING NO.

FIGURE 5

CABLE: #10 AWG. MACHINE WIRE

711029



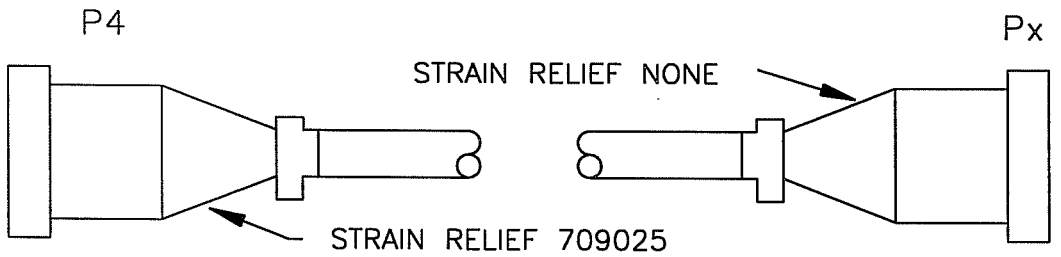
TERMINAL	POSITION NO.	COLOR	POSITION NO.	TERMINAL
709027 RING	1	GREEN	XX	NONE

RSVP 100, 101, 301
401 E CABLE

DRAWING NO.

FIGURE 6

CABLE: 6 SHIELDED TWISTED PAIRS XX FT.



PLUG 709024

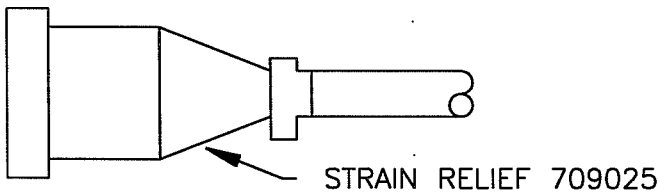
PLUG NONE

TERMINAL	POSITION NO.	COLOR	POSITION NO.	TERMINAL
709017 PINS	3	RED	CUT	
	7	BLACK		
	11	SHIELD		
	5	WHITE		
	6	BLACK		
	2	SHIELD		
	10	YELLOW		
	14	BLACK		
709017 PINS	11	SHIELD		
	1	GREEN		
	4	BLACK		
	2	SHIELD		
	12	BLUE		
	12	BLACK		
	12	SHIELD		
	13	BROWN		
	13	BLACK		
709017 PINS	13	SHIELD	CUT	

RSVP 401
F CABLE

DRAWING NO.

FIGURE 7



PLUG 709113

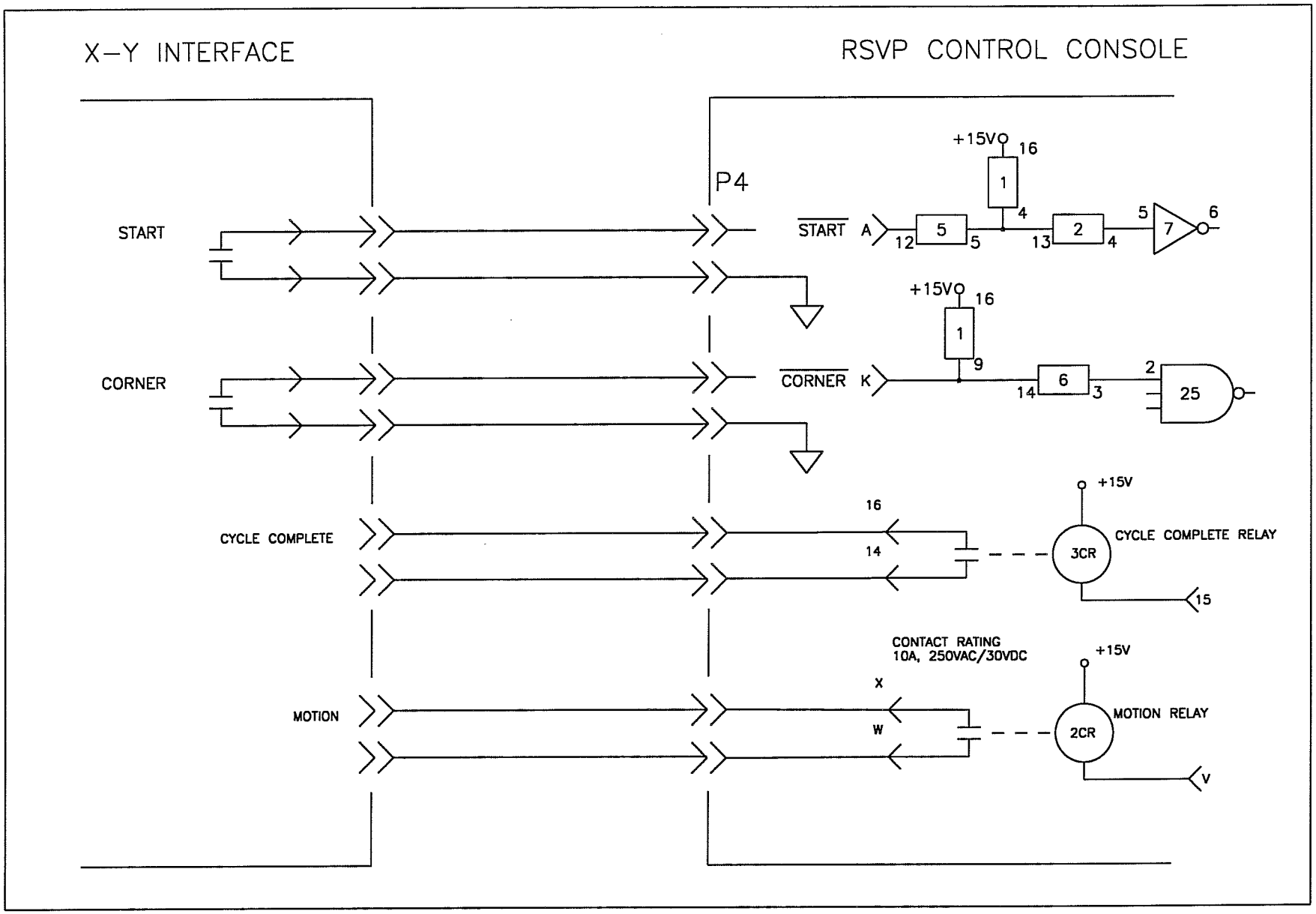
TERMINAL	POSITION NO.	COLOR	FUNCTION
709017 PINS	* 1	RED	MOTOR
	* 2	BLUE	TACH
	* 3	WHITE	TACH
	* 4	BLACK	MOTOR
	5	WHITE	UPPER LIMIT SWITCH
	6	BLACK	SWITCH COMMON
	7	GREEN	LOWER PROXIMITY SWITCH
	8	BLACK	PARTIAL RAISE SWITCH
	9	RED	SWITCH POWER
	** 10	VIOLET	SHIELD
	11		KEY
	** 12	RED	ENCODER POWER
	** 13	GREEN	ENCODER OUTPUT
	** 14	BLACK	ENCODER COMMON
	15	RED	BRAKE POWER
709017 PINS	16	BLACK	BRAKE CONTROL

* CABLE SUPPLIED W/ MOTOR
** CABLE SUPPLIED W/ ENCODER

RSVP 401
POSITIONER CABLE

DRAWING NO.

FIGURE 9



STANDARD INTERFACE
FIGURE 10

3. OPERATING INSTRUCTIONS

A complete system overview is contained in Section 5 that will help explain the following functions.

3.1 Control Functions

Retract Thumbwheel - This digital switch on the remote control divides an adjustable maximum retraction height into 15 equal distances. The maximum retraction height (thumbwheel set to position 15) can be changed by adjusting switch SW1 on the logic p.c. board, Figure 18, page 22. The initial torch retraction height settings table on page 24 should be used for setting switch SW1.

Up/Down - This switch is used to manually raise and lower the positioner. It is located on the remote control front panel.

Auto/Manual - This switch selects initial height positioning in the auto position or allows manual positioning for a manual start. If the switch is in manual, there will be no automatic arc voltage control until this switch is placed in the auto position. It is located on the remote control front panel.

Full/Partial Raise - This switch selects the full or partial raise position for the torch.

3.2 Voltage Thumbwheel - This switch is used to set the desired arc voltage. It is capable of adjusting the voltage in one volt increments from 50 on the low end to 250 volts maximum.

3.3 LED Functions

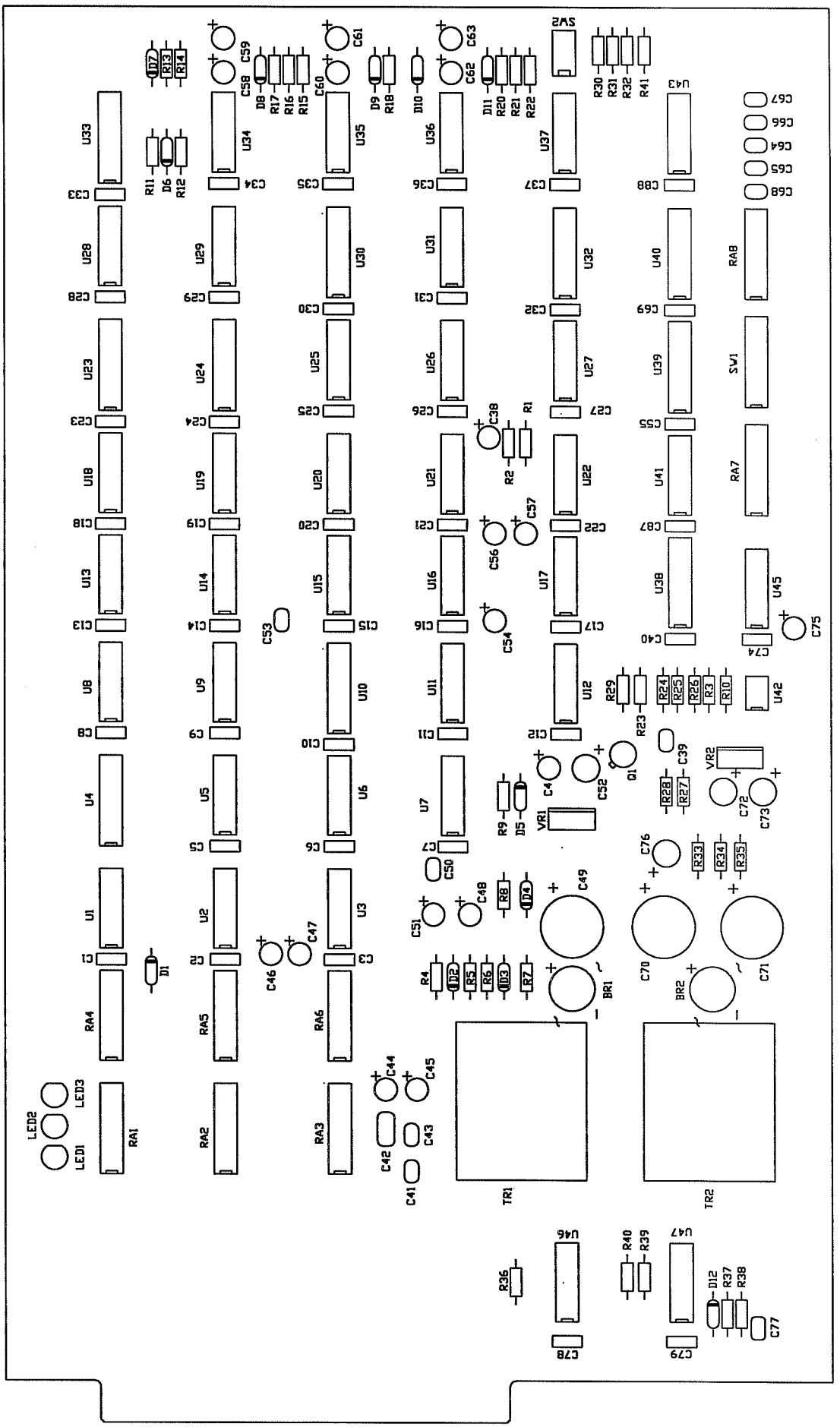
Power On - This LED is located on the front panel of the remote control. When illuminated, it is a visual indication that 115VAC has been applied to the control.

PSF Malfunction - This LED is located on the front panel of the remote control. When illuminated, it is a visual sign that the low speed proximity switch has malfunctioned or indicates that the first cut after power up was initiated from the partial raise position.

Start - This LED is located on the logic board of the RSVP system. It is used as a troubleshooting aid. When illuminated, it is a visual sign that a start command has been given to the RSVP system.

AVC - This LED is located on the logic board of the RSVP system. When illuminated, it is a visual indication that the automatic voltage control has been activated. This normally occurs when a relay in the plasma power supply activates on arc transfer.

Lower Proximity Switch (LPS) - This LED is located on the logic p.c. board of the RSVP system. When illuminated, it is a visual indication that the positioner carriage is opposite the proximity switch.



LOGIC P.C. BOARD

FIGURE 18

RSVP-401 INITIAL TORCH RETRACTION HEIGHT SETTINGS

SW1 SWITCH POSITIONS (SEE NOTE 1)								MAXIMUM RETRACTION HEIGHT (SEE NOTE 2)		RETRACTION DISTANCE PER THUMBWHEEL DIVISION	
1	2	3	4	5	6	7	8	(INCHES)	(MM)	(INCHES)	(MM)
OFF	ON	ON	ON	OFF	ON	OFF	ON	1/32	.75	.002	.05
OFF	ON	ON	ON	OFF	OFF	ON	OFF	1/16	1.65	.004	.11
ON	OFF	ON	ON	ON	ON	ON	OFF	3/32	2.40	.006	.16
OFF	OFF	ON	ON	OFF	OFF	OFF	ON	1/8	3.15	.008	.21
OFF	OFF	ON	ON	OFF	ON	ON	OFF	5/32	4.05	.0105	.27
ON	ON	OFF	ON	ON	ON	ON	OFF	3/16	4.80	.0125	.32
ON	OFF	OFF	ON	ON	OFF	OFF	ON	7/32	5.40	.014	.36
ON	OFF	OFF	ON	OFF	OFF	OFF	ON	1/4	6.30	.0165	.42
ON	OFF	OFF	ON	ON	ON	ON	OFF	9/32	7.20	.019	.48
ON	OFF	OFF	ON	OFF	ON	ON	OFF	5/16	8.10	.021	.54
ON	OFF	OFF	ON	ON	OFF	ON	OFF	11/32	9.00	.0235	.60
ON	ON	ON	OFF	ON	ON	ON	OFF	3/8	9.60	.025	.64
OFF	OFF	OFF	ON	ON	OFF	ON	OFF	13/32	10.50	.0275	.70
OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	7/16	11.25	.0295	.75
ON	ON	ON	OFF	ON	OFF	ON	OFF	15/32	12.00	.0315	.80
ON	OFF	OFF	ON	ON	OFF	OFF	OFF	1/2	12.60	.033	.84

Note 1: SW1 is located on the LOGIC PCB. See figure 18.

Note 2: The maximum retraction height is obtained by setting the retract thumbwheel on the remote to position 15.

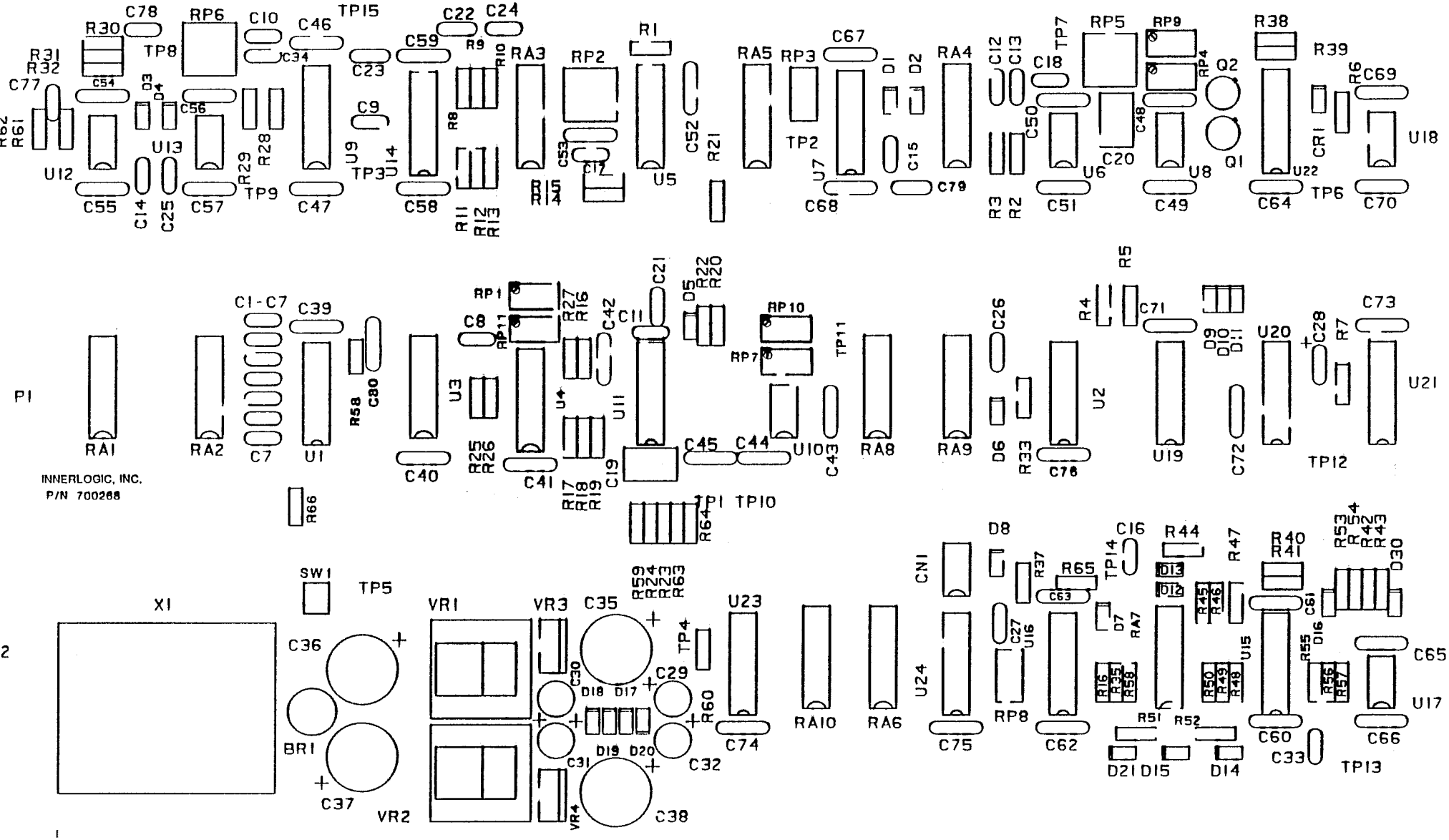
TABLE 3

RETRACTION DELAY TIMES

SW2 SWITCH POSITIONS 1	2	3	4	TIME IN SECONDS
ON	ON	ON	ON	.35
OFF	ON	ON	ON	.40
ON	ON	OFF	ON	.45
ON	OFF	ON	ON	.50
ON	ON	OFF	OFF	.55
ON	OFF	ON	OFF	.65
ON	OFF	OFF	ON	.70
OFF	ON	OFF	ON	.80
ON	OFF	OFF	OFF	1.0
OFF	OFF	ON	ON	1.1
OFF	ON	OFF	OFF	1.2
OFF	OFF	ON	OFF	1.9
OFF	OFF	OFF	ON	2.5

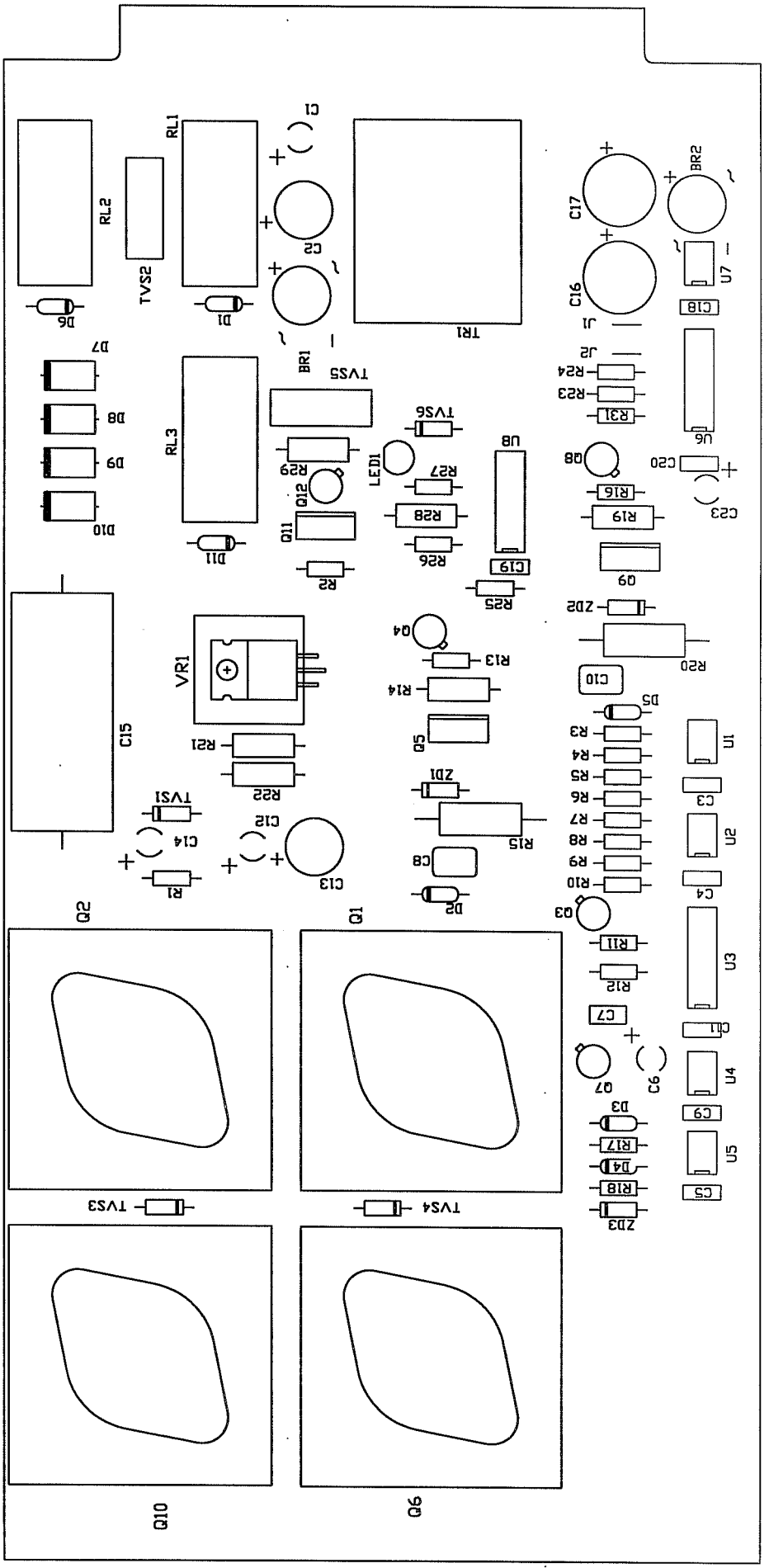
Note: SW2 is located on the LOGIC PCB. See figure 18.

TABLE 4



SERVO P.C. BOARD

FIGURE 19



H-BRIDGE P.C. BOARD

FIGURE 20

4. PRELIMINARY TESTS

4.1 RSVP System Check-out

After all of the wiring and interconnecting cables have been installed, the system may be checked for proper operation. The positioner is not mounted, but placed such that its carriage is free to move.

1) Make sure that all power to the plasma power supply is off.

2) Make sure that all control power to the X-Y machine, as well as the RSVP, is off.

3) Place the remote control auto/manual switch in the manual position.

4) Set the retract thumbwheel to position 15.

5) Apply 115VAC to the RSVP system.

6) Raise and lower the positioner carriage by using the up/down switch. The slow inching speed is 50 inches per minute. Leave the positioner carriage at the bottom of its travel.

7) Place the raise switch in the partial raise position.

8) Place the auto/manual switch in the auto position. The torch should immediately return to a position midway between top and bottom.

9) By placing the raise switch in the full raise position the carriage should return to the full up position.

10) The touch retract function can be checked as follows:

A jumper wire must be connected between Logic plus and Logic minus on the voltage divider p.c. board to test the touch retract function. Leave the cable to Logic + and Logic - connected. After the test remove the jumper. A start command is initiated by connecting a jumper wire between P4-3 and P4-7. The positioner carriage will move down rapidly (450 IPM). About midway in its travel, the lower proximity switch inside the positioner will change the speed to a slow inching speed. It will continue downward until the carriage touches the bottom of the positioner, then retract. The length of retraction is controlled by the thumbwheel, located on the front panel of the remote control. Disconnecting P4-3 from P4-7 removes the start command. The positioner will retract rapidly to the full up position. If the previous procedures were all satisfactory, it is now necessary to set the torch to its proper height above the workpiece and

mount the positioner to the machine. This is accomplished as follows:

a) Apply 115VAC to the RSVP.

b) Place the auto/manual switch in the manual position.

c) Loosely mount the torch and manually lower the positioner carriage until the lower proximity switch LED is illuminated. This LED is located on the logic p.c board in the control console and is nearest the p.c. board connector. This LED should illuminate when the positioner carriage is midway in its travel range.

d) The positioner can be mounted using the tee slots with 1/4-20 hardware (nuts are provided for the tee slots) or can be mounted using the four through extrusion mounting holes and 1/4-20 socket head cap screws. Temporarily attach the positioner to the torch station. Slide the torch down in the mounting clamp until it is approximately one inch above the thickest workpiece to be cut. Tighten the torch clamp. Next, secure the positioner to the machine. Again, the torch should be approximately one inch above the workpiece. If the cutting table is not level, it will be necessary to make this adjustment at the highest point in relation to the positioner. The objective is to adjust the torch/positioner height, so that the fast-to- slow speed transition occurs when the torch is one inch above the thickest material to be cut at the highest location of the table.

e) Place the auto/manual switch in the auto position and the torch will return to its partial or partial or full up position.

4.2 Arc Voltage Control Test

The only items remaining to be checked out are energizing the power supply and verifying that the arc voltage control is functional. This is best done by using the following procedure:

1) Apply 115VAC control power to the RSVP.

2) Apply all machine power.

3) Apply power to the plasma power supply.

4) Place the auto/manual switch in the auto position.

5) Set the retract thumbwheel as determined under system check-out.

6) The motion contacts in the power supply should activate arc voltage control ½ second after closure. The RSVP in turn provides a motion output to the X-Y machine after receiving the motion signal from the power supply.

7) Arc voltage and corner control test I.

   a) Set the arc voltage using the thumbwheel switch on the remote control.

   b) Program a 10" square.

   c) Open the RSVP console door and locate the AVC LED on the logic p.c. board. See Figure 18 (page 22).

   d) Initiate a cycle start and note when the AVC LED is on, indicating arc voltage control, and off, indicating no arc voltage control (no movement of the torch up or down). As the torch approaches a corner, the LED should go out and after leaving the corner, should turn on again. If this test is satisfactory, the X-Y controller is providing the necessary "corner" output to the InnerLogic arc voltage control.

8) Arc voltage and corner control test II.

   a) Program a 1" diameter circle.

   b) When the arc is initiated, the AVC LED illuminates momentarily, then turns off and remains off for the remainder of the circle.

9) Arc voltage and corner control test III.

   a) Program a 3" circle.

   b) Upon arc transfer, the AVC LED will illuminate momentarily then turn off. When the cutting machine reaches speed, the AVC LED illuminates again. It will remain on until the X-Y machine decelerates just before the completion of the circle.

10) The arc voltage control tests mentioned above are affected by acceleration time, deceleration distance, percent of plasma cutting speed, corner speed, and acceleration. The X-Y cutting machine manufacturer can provide you with help in adjustment of these parameters if required.

5. SYSTEM OVERVIEW

5.1 System Description

The RSVP consists of a remote control, motor driven torch positioner, control console, voltage divider p.c. board and all its necessary connecting cables. Please refer to the system interconnection diagram Figure 1, page 11.

The remote control is used by the operator to select various functions. The desired arc voltage for cutting is selected by setting the digital thumbwheel switch. The retract distance, in conjunction with the clear-the-plate feature which will be discussed later, determines the initial starting height of the torch. The arc voltage set on the thumbwheel switch selects the distance from the torch to the workpiece during the cutting operation, not the retracted distance set by the retract thumbhweel switch. The auto position of the auto/manual switch is used for automatically positioning the torch just above the workpiece in order to begin the cutting operation. The manual position of the auto/manual switch allows the operator to move the torch up or down by using the inch up/down switch. If the cutting operation is initiated while in the manual mode, arc voltage control can be achieved by simply selecting the auto position.

The motor driven torch positioner moves the torch up or down as commanded by the control console. The torch positioner contains an upper proximity limit switch (ULS) and a lower proximity switch (LPS) and a partial raise proximity switch (PRS). The ULS or PRS terminates upward movement of the torch at the completion of the cutting operation. The LPS initiates the high-to-low speed transition during initial height positioning. Tachometer information for speed control is also sent to the control console.

The voltage divider p.c. board is normally installed inside the plasma power supply and provides information about the torch height above the workpiece by monitoring the voltage output of the power supply. This voltage is divided by forty and supplied to the control console via the Signal + and Signal - outputs of the voltage divider p.c. board (In order for these signals to be meaningful, the ground stud on the control console must be connected directly to the cutting table at the point where the plasma power supply positive ground lead is attached). The white wire soldered to the voltage divider p.c. board **must** be connected to the power supply metal case. The Power Supply Minus (P.S.-) and Power Supply Plus (P.S.+) signals should be connected as found in Section 2.6. Also, this p.c. board provides clear-the-plate (CTP) information to the control console via the Logic + and Logic - outputs. Operation of CTP requires the pilot arc input and the 115VAC inputs to be connected. If CTP is not used, the red and black wires that normally connect to Logic + and Logic - must be shorted together. 115VAC will not be required if CTP is not used. The clear-the-plate function simply tells the control console when the nozzle of the torch is in contact with the workpiece. This feature is useful on thin gauge material. Proper operation can be

checked by noting that the voltage divider LED is not illuminated when the torch nozzle is in contact with the workpiece.

The control console has three p.c. boards (refer to Figure 1 page 11 for location) that provide initial height sensing, arc voltage control, and communications between the plasma power supply and the X-Y cutting machine control.

The motor drive (or H-bridge) p.c. board provides pulse width modulation for driving the positioner motor, a power source for the proximity switches which are located inside the positioner, a plasma start relay for the plasma power supply, motion enable and cycle complete relays that advise the X-Y machine that the arc has been transferred to the workpiece and cycle finished information. The motion relay may or may not be used.

The servo p.c. board provides motor speed control and arc voltage control. The motor speed control portion receives signals from the logic p.c. board that request movement up or down and at fast or slow speed, two enable signals to select between speed or arc voltage control and a sample-hold signal. The speed control portion is used during initial height positioning and manual inching. The arc voltage control portion receives the desired arc voltage setting from the remote control thumbwheel switch and compares it to the arc voltage signal received from the voltage divider p.c. board (Signal + and Signal -). Also, the servo p.c. board provides the logic board with a limit signal which will be described later.

The logic p.c. board provides the necessary sequencing for initial height positioning and retraction of the torch and selects the arc voltage control mode if the appropriate inputs are satisfied.

THE FOLLOWING ARE INPUTS TO THE LOGIC P.C. BOARD:

1. Start - This command is received from the X-Y machine control on P4-8 and P4-9 and should be a relay contact closure. It begins initial height positioning if the auto mode has been selected by the operator.

2. Auto/manual - This input from the operator's remote control selects automatic initial height positioning and arc voltage control or manual positioning and no arc voltage control.

3. Lower proximity switch (LPS) - This input from the torch positioner changes the speed from high to low during initial height positioning.

4. Upper limit proximity switch (ULS) - This input from the torch positioner stops upward movement of the positioner.

5. Partial raise proximity switch (PRS) - This input from the torch positioner stops upward movement of the carriage at the midway position.

6. Clear-the-plate (CTP) - This signal generated by the

voltage divider p.c. board, initiates the retract timer when the torch nozzle breaks contact with the workpiece.

7. Corner - This command inhibits arc voltage control. It is received from the X-Y machine control on P4-2 and P4-3, and should be a relay contact closure. This command should be generated one inch from a corner and can be used at the beginning and end of a cut.

8. Motion - This signal input on P3-7 and P3-8, which should be a relay contact closure, originates at the plasma power supply. It signals that the cutting arc has been transferred to the workpiece and arc voltage control should be initiated.

NOTE: If the plasma power supply you are using has no means of delaying the closure of the motion relay and piercing time is required or a running pierce is required, the motion signal must be connected to the X-Y machine control. The X-Y machine control can produce the necessary delay and then provide a signal on P3-7 and P3-8 to begin arc voltage control. This will prevent the torch from striking the workpiece during the pierce time.

9. Limit - This signal generated by the servo p.c. board momentarily stops arc voltage control when the actual arc voltage exceeds the desired voltage by 15 arc volts. It lasts for approximately one second.

10. Torque threshold - This signal, generated by the servo p.c. board, stops downward movement of the torch during initial height sensing.

11. Inch up - This input signal generated by the remote control inching switch requests upward movement.

12. Inch down - This input signal generated by the remote control inching switch requests downward movement.

13. IHS test switch - This switch when in the test position prevents the plasma power supply from starting and allows the operator to check his initial height.

14. Encoder input - This input from the positioner motor provides pulses per revolution for the retract counter.

<u>THE FOLLOWING ARE OUTPUT SIGNALS FROM THE LOGIC P.C. BOARD:</u>

1. Motion drive - This signal closes the motion relay on the motor drive p.c. board.

2. Start plasma - This signal closes the plasma start relay on the motor drive p.c. board.

3. Servo enable - This signal, when high, requests arc voltage control from the servo p.c. board if the position enable signal is low.

4. Position enable - This signal, when high, requests initial height positioning or manual positioning of the torch from the servo p.c. board.

5. Inch down - This low signal requests downward movement from the servo p.c. board.

6. Inch up - This low signal requests upward movement from the servo p.c. board.

7. Rapid inch - This low signal requests high speed movement from the servo p.c. board.

8. Sample/hold - This signal, generated by the logic p.c. board, is used by the servo p.c. board in the process of determining when the torch makes contact with the workpiece.

9. Cycle complete - This signal indicates by a contact closure that the torch has been raised to the partial or full up position and is only functional in the auto/manual mode. It is useful when time delays are used at the end of a cut to slope the plasma current down to preserve consumable life. The retraction delay times for current slope time can be selected by the four position switch on the logic p.c. board in the control console (see Figure 18, page 22 and Table 4, page 24).

5.2 System Operation:

A general description of operation will be described first, followed by a more technical description which includes signals generated between the X-Y machine control, arc voltage control console, and the plasma power supply.

GENERAL DESCRIPTION:

A hypothetical cut will be made in order to show the general sequence of operation. The auto/manual switch on the remote control has been placed in the auto position. A 24 inch continuous cut will be made; 12 inches in the X direction followed by 12 inches in the Y direction. The torch copper nozzle is capable of making contact with the workpiece and generating a clear-the-plate signal.

Upon reaching the starting position, the X-Y control issues a start command to the control console, the cycle complete relay opens and the torch traverses from the upper limit switch (located inside the positioner) to the lower proximity switch at high speed. At the lower limit switch the speed changes to a slower speed. The torch nozzle makes contact with the workpiece, and retracts about 3/16 of an inch. The plasma power supply starts a timed preflow of gas followed by arc transfer to the workpiece. The X-Y control starts movement in the X direction and the control console initiates arc voltage control. Approximately one inch from the direction change (90° corner), arc voltage control is terminated by the corner command from the X-Y machine control. After one inch of travel from the 90° corner, arc voltage control is resumed.

Now approaching the end of the cut, again approximately one inch from the end of the cut, arc voltage control is terminated. Upon reaching the end of the cut, the X-Y control releases the start command. The control console releases the plasma power supply start command and the power supply initiates a timed post flow of gas. The positioner retracts the torch at high speed to the upper limit switch or to the midway position as selected by the raise switch on the remote control. The cycle complete relay closes indicating the torch is up and clear. This completes the cycle.

TECHNICAL DESCRIPTION:

The technical description can be followed and understood by referencing the RSVP system schematic and input-output schematic, which are located in the front cover pocket of the manual, and component locators for the servo and logic p.c. boards located in Section 3. The reference for all voltage measurements is TB1-7.

Upon reaching the starting position, the X-Y control issues a start command to the control console. This signal cannot be an AC signal. If the appropriate signal is received by the logic board, the start LED will illuminate (L2 STRT) and U7-6 goes to 15 volts DC (high).

The logic board immediately sends three signals to the servo board, position enable goes high, inch down goes low, and rapid inch goes low. The servo board then sends a 20Khz down PWM signal out from U24-13 and a high signal on U24-10 to the motor drive p.c. board to drive the motor at high speed. The rapid inching speed changes to a slow inching speed when the lower proximity switch (LPS) pulls U14-1 low. The LPS LED (L1) flashes on momentarily as the torch moves by it. The rapid inching signal from the logic board then goes high requesting a slower inching speed. The servo speed control makes the necessary speed change. The sample-hold signal from the logic board now goes low which requests the servo board save the motor power level required to slow inch down. When the torch touches the workpiece, this slow inching power level is exceeded, which initiates the upward movement of the torch. When the nozzle does touch the workpiece, the power level of the motor is increased to continue inching, but when this level exceeds the value saved for slow inching, the power threshold output of the servo board goes low (cathode of D7) which signals the logic board. U19-11 goes high and U21-11 goes low on the logic board to change the servo board speed control from inch down to inch up. If the nozzle is still in contact with the workpiece during the upward movement, the retraction timer will not start. The retraction time begins when the torch nozzle breaks contact with the workpiece. When contact is broken, logic + with respect to logic - goes low. This is the clear-the-plate signal input to the logic p.c. board at resistor array one, pin 10 (RA1-10). The retraction counter begins and continues for a duration set by the remote control retract thumbwheel. When the retract count is complete, inch up (U21-11) goes high, and position enable (U14-6) goes low stopping the torch just above the workpiece. Start plasma (U4-16) goes low, energizing the start relay (1CR) on the motor drive board. The contacts of the 1CR relay drive the 3CR relay in the control console which starts

the plasma power supply.

The plasma power supply starts a preflow of gas for the torch followed by arc initiation and transfer of the arc to the workpiece. The motion contacts in the plasma power supply close, indicating there is a transferred arc.

Motion Note: The RSVP schematic shows the motion contacts in the plasma power supply going to the control console on Plug P3. The control console, via the 2CR relay on the motor drive p.c. board, then sends a motion signal to the X-Y machine control. This method is satisfactory if a moving pierce is not required or no pierce time at all is required. If a moving pierce or stationary pierce is required, the motion signal from the plasma power supply should be connected to the X-Y machine control. Then the X-Y machine control can supply a delayed motion signal to the RSVP control console. This will eliminate the torch striking the workpiece. Also, for a running pierce, the pierce must be completed before arc voltage control is initiated.

Arc voltage control note: Arc voltage control is enabled by a motion signal which should be a contact closure at plug P3-7 and P3-8 of the control console. However, three other signals can independently inhibit arc voltage control. They are: limit, corner, and selecting the manual position of the auto-manual switch on the operator's remote control. These signals have been previously discussed.

Resuming the sequence of events, the motion contacts in the plasma power supply close indicating there is a transferred arc. This contact closure switches U2-4 high on the logic p.c. board which then generates a .50 second delay before servo enable goes high at U31-4 and the AVC LED (L3) illuminates. This activates arc voltage control (AVC).

Arc voltage control continues until one inch from the 90° corner. A corner contact closure, generated by the X-Y machine control, disables AVC by pulling U25-2 low on the logic p.c. board. The logic p.c. board disables the servo p.c. board by making servo enable low (U31-4) which connects to U20-13 on the servo p.c. board. Arc voltage control resumes again one inch after the 90° corner with the reverse of the above signals.

Approximately one inch from the end of the cut, the X-Y machine control may or may not activate a corner signal disabling AVC. If not, the release of the start command by the X-Y machine control at the end of the cut, signals the control console to end the cutting operation. The control console stops AVC, releases the start signal for the plasma power supply, and begins retracting the torch at a rapid speed to the upper limit switch. Upon reaching the ULS, the cutting operation is complete. If another start command is received from the X-Y machine control before the ULS is reached, torch movement will continue until the ULS is satisfied, but will immediately start another initial height sensing sequence when the ULS is reached.

5.3 Arc Voltage Settings

TABLE 1
RSVP Voltage Settings

Gauge Material Thickness	Arc Voltage Setting
30	80
28	80
26	80
24	85
22	85
20	85
18	90
16	90
14	95

Plate Material Thickness	Arc Voltage Setting
1/8"	105
1/4"	105
3/8"	110
1/2"	110
5/8"	120
3/4"	125
1"	130
1-1/4"	140
1-1/2"	145
1-3/4"	150
2"	150
2-1/2"	160
3"	165

Heavy Plate Material Thickness	Arc Voltage Setting
3"	215
3-1/2"	225
4"	230
4-1/2"	235
5"	235

Notes:

1) The gauge materials voltage data refers to air plasma systems using low cutting amperage.

2) The plate materials voltage data refers to air plasma systems.

3) The heavy plate materials voltage data refers to conventional plasma cutting using H-35 gas mixtures and 800 to 1000 amperes.

4) The operator should be aware that different plasma systems could have significantly different arc characteristics. This is mainly due to nozzle design. These voltage settings are intended to serve as a starting guide. The operator can eliminate top dross and improve cut squareness by lowering the arc voltage if the cut angle is positive. Remember, too low an arc voltage setting will result in a negative cut angle.

5) Definitions:

Positive cut angle - Top dimension of piece smaller than bottom dimension.

Negative cut angle - Top dimension of piece larger than bottom dimension.

TABLE 2
RSVP Customer-Developed Voltage Settings

Gauge Material Thickness	Arc Voltage Setting
30	
28	
26	
24	
22	
20	
18	
16	
14	

Plate Material Thickness	Arc Voltage Setting
1/8"	
1/4"	
3/8"	
1/2"	
5/8"	
3/4"	
1"	
1-1/4"	
1-1/2"	
1-3/4"	
2"	
2-1/2"	
3"	

Heavy Plate Material Thickness	Arc Voltage Setting
3"	
3-1/2"	
4"	
4-1/2"	
5"	

Note: By using the positive and negative cut angle definition as described in Table I, the operator may wish to develop arc voltage settings which provide the best cut quality for the plasma system he is using. Simply make copies of these sheets and record your best cutting condition for future reference.

6. EQUIPMENT TROUBLESHOOTING

WARNING!!!!
<<<<< Turn off all power before working on equipment >>>>>

1) PWR LED on remote control not illuminated

a) Fuse F1 is open
b) No 115VAC to RSVP
c) Faulty LED
d) Open 3.3K ohm resistor in remote control
e) Open wire between P5-5 and P7-5
f) Replace logic p.c. board

2) PSF LED on remote control illuminated

a) Faulty proximity switch
b) High frequency grounding problem
c) Power supply on H-bridge failure
d) After power up, first cycle start was from PRS position instead of ULS position.
e) Replace logic p.c. board

3) No initial height sensing

a) Power supply motion contacts shorted
b) Auto/manual switch not in auto position
c) Open wire in auto/manual circuitry
d) Faulty logic p.c. board
e) A program start command has not been given to RSVP

4) No retract distance

a) Retract thumbwheel set to zero
b) SW1 on logic p.c. board not set
c) Faulty logic p.c. board
d) Faulty encoder

5) Positioner does not slow down to slow inching speed

a) If torch strikes workpiece before inch speed is activated, clamp lower down on the torch handle
b) Faulty proximity switch
c) Faulty logic p.c. board
d) Open in the tachometer circuit
e) Faulty servo p.c. board

6) Plasma power supply contactor does not energize

a) Blown fuse in power supply] Power
b) Power supply not on] Supply
c) Interlock pressure switch in power supply open]

d) Faulty logic p.c. board
e) Faulty H-bridge p.c. board
f) Open wires in interconnecting cables
} RSVP

7) No machine motion or arc voltage control on arc transfer

a) 24VAC input to the RSVP for motion signal - change to contact closure only
b) Arc transfer relay in power supply did not close
c) Open wire in arc transfer circuitry
d) Faulty logic p.c. board
e) Faulty H-bridge p.c. board
f) Faulty servo p.c. board

8) No machine motion, torch dives into workpiece

a) Replace H-bridge p.c. board
b) Replace logic p.c. board

9) Machine motion occurs, torch raises up

a) Check ground stud on case of control console to star ground of work table
b) Arc voltage set too high
c) Faulty voltage divider p.c. board
d) Faulty transorb TVS
e) Faulty servo p.c. board
f) Faulty H-bridge p.c. board
g) Faulty thumbwheel switch

10) Machine motion occurs, torch dives into workpiece

a) Arc voltage setting too low
b) Faulty voltage divider p.c. board
c) Faulty servo p.c. board
d) Faulty thumbwheel switch

11) Arc voltage corner feature inoperative

a) Relay contacts in controller not activating
b) Open wires in corner circuitry
c) Faulty logic p.c. board

12) Positioner oscillating up and down (unstable)

a) Positioner mounting bolts loose
b) Remove any "play" between positioner bearing screw and carriage assembly
c) Faulty servo p.c. board
d) Poor star ground

13) On arc transfer torch turns off, retracts

a) Computer output turning off
b) Faulty logic p.c. board
c) Grounding problem

14) Arc turns off while cutting, torch remains down when auto/manual switch in auto

a) Problems in plasma power supply/refer to manufacturer's technical information
b) Faulty logic p.c. board
c) Faulty H-bridge p.c. board

15) Either no up and/or down movement of the torch positioner

STEP 1: SET INITIAL CONDITIONS

a) Power down the RSVP system, place the auto/manual switch in the manual position, remove any start command from the X-Y controller.

b) Check both the 3 amp and 5 amp fuses with an ohmmeter and replace if necessary.

c) Remove plug P1 from the console & measure 2-3 ohms armature resistance between P1-1 and P1-4.

d) Go to step 5 if power can be applied to the system without blowing a fuse. If not, go to step 2.

STEP 2: APPLY POWER TO THE RSVP SYSTEM FOR 30 SECONDS, THEN REMOVE THE 115VAC POWER.

a) Recheck both the 3 amp and 5 amp fuses and replace if necessary.

b) If one or more fuses are blown, go to step 3. If not, go to step 5.

STEP 3: REMOVE THE P.C. BOARD CONNECTOR FOR THE MOTOR DRIVE (H-BRIDGE) P.C. BOARD.

a) Apply power to the RSVP system, then remove the power.

b) Check both fuses again. If the 5 amp fuse is blown, replace the motor drive p.c. board. If the 3 amp fuse is blown, replace and go to step 4.

STEP 4: UNPLUG ALL THREE P.C. BOARDS IN THE RSVP CONSOLE.

a) Apply power to the RSVP system - power down and check the 3 amp fuse. If it is OK, determine which p.c. board is defective by replacing them one at the time.

b) If the 3 amp fuse is still clearing, the problem is a short across the 115VAC line. Use the RSVP system schematic to trace out the short.

STEP 5: MAKE SURE THE STEP 1 CONDITIONS ARE SET UP BEFORE DOING THIS TEST.

a) If the 5 amp fuse opens when trying to inch up or down (using the up/down switch on the remote control), replace the motor drive p.c. board.

b) If no motion occurs in either direction and the 5 amp fuse is good, go to step 6.

c) If motion occurs in the up direction, not down, and the 5 amp fuse is still good, go to step 7.

d) If motion occurs in the down direction, but not up, and the 5 amp fuse is still good, go to step 9.

STEP 6: CHECK THE FOLLOWING P.C. BOARD POWER SUPPLIES:

a) Servo p.c. board, page 25. For your ground reference, use test point 5 (TP5).

U16-4	+15 volts
U16-11	-15 volts
U15-4	+12 volts
U15-11	-12 volts

b) Logic p.c. board, page 22. Use TP5 on the servo p.c. board or the metal tab of MC7815 regulator on the logic p.c. board for your ground reference.

U1-14	+15 volts

c) Motor drive p.c. board, page 26. Ground reference - minus side of 2200uf or 2600uf electrolytic.

MC7812, pin 3	+12 volts

d) Replace any p.c. board with a defective power supply.

e) Next, check the remote control auto/manual switch input by placing the switch in manual and reading:

RA2-14	+15 volts
RA2-3	+15 volts
U10-10	0 volts

If RA2-14 is not 15 volts +/- 5%, the problem is the auto/manual switch or the wiring to it. If the other two readings are not correct, replace the logic p.c. board. If they are all correct, go to step 7.

STEP 7: DOWN DIRECTION; CHECK THE REMOTE CONTROL INCHING SWITCH (REMOTE CONTROL MUST BE IN MANUAL).

a) Have someone hold the inch switch in the down position

and check the following voltages on the logic p.c. board.

RA1-8	0 volts

If not 0 volts, check wiring to remote control and inch switch.

b) If RA1-8 is 0 volts, check the following logic p.c. board connector pins with the inch switch in the down position:

Pin 3	0 volts
Pin 4	15 volts
Pin 5	15 volts
Pin 6	15 volts
Pin 7	0 volts

If any voltages are not correct, replace the logic p.c. board. Go to step 8 if all measurements are correct.

STEP 8: REMOVE POWER FROM THE SYSTEM, DISCONNECT THE MOTOR CABLE P1, AUTO/MANUAL SWITCH IN MANUAL AND APPLY POWER TO THE SYSTEM.

a) Hold the inch switch in the down position and check the following points on the servo p.c. board (TP5 for ground reference).

U24-10	12 volts
U24-11	0 volts
U24-12	12 volts
U24-13	1.6 to 2.6 volts

If any voltages are incorrect, replace the servo p.c. board. If all are correct, replace the motor drive p.c. board.

STEP 9: UP DIRECTION; CHECK THE REMOTE CONTROL INCHING SWITCH (THE REMOTE CONTROL MUST BE IN MANUAL).

a) Have someone hold the inch switch in the UP position and check the following voltages on the logic p.c. board.

RA1-7	0 volts

If not zero volts, check the wiring to the remote control and the up/down switch.

b) If RA1-7 is 0 volts, check the following logic p.c. board connector pins with the inch switch in the up direction.

Logic p.c. board connector pin	Voltage
Pin 3	15
Pin 4	0
Pin 5	15
Pin 6	15
Pin 7	0

If any voltages are not correct, replace the logic p.c. board. Go to step 10 if all measurements are correct.

STEP 10: REMOVE POWER FROM THE SYSTEM, DISCONNECT THE MOTOR CABLE P1, PLACE THE AUTO/MANUAL SWITCH IN MANUAL AND REAPPLY POWER.

a) Hold the inch switch in the up position and check the following points on the servo p.c. board (TP5 for ground reference).

U24-10	0 volts
U24-11	12 volts
U24-12	2.6 volts
U24-13	12 volts

If any voltages are incorrect, replace the servo p.c. board. If all are correct, replace the motor drive p.c. board.

7. MAINTENANCE REQUIREMENTS

The purpose of this section is to provide vital information concerning routine maintenance for the rsvp system.

Positioner Maintenance:

The ball screw and the four rail guides require cleaning and lubrication every three months of normal operation in order to maintain a normal life expectancy.

The ball screw and guides should be lubricated with a lithium grease, type AFB No. 2. Shell Alvania grease No. 2 meets these requirements. Over-lubrication is worse than under-lubrication. NEVER fill the guides or ball screw until the grease squirts out.

Normal operation and lubrication on a three month basis will require about .2cc for each guide and .3cc for the ball nut. A common hand type pump grease gun supplies about .6cc per stroke. The two rails should be lightly oiled with slide-way oil such as Super-Multi 32-68 or Vactra oil No. 25.

1) Move the positioner carriage to the midpoint of full travel.

2) Remove 115VAC control power to the RSVP console and unplug the motor cable at the positioner.

3) Remove the torch holder plate. Then remove the four screws holding the aluminum cover and remove the cover by sliding it up vertically.

4) Remove the four 10-32 screws holding the carriage to the ball screw carriage adaptor. There are 20 screws in the carriage plate - remove only the center four 10-32 screws. The carriage is now free to slide on the rails

5) Remove the two bellows that are held in place with Velcro.

6) Using a grease gun, lubricate as indicated above the four guides (4 brass fittings) and the ball screw. The ball screw flange has an opening for grease. UNDER NO CIRCUMSTANCES SHOULD THE BALL NUT BE REMOVED FROM THE BALL SCREW.

7) Clean and lubricate the rails as indicated above.

Remote Control: (Electrical)

1) Remove 115VAC control power from the RSVP.

2) Check cable clamp on P7 for any exposed wires.

3) Rotate all thumbwheel switches through all positions. This is necessary to dislodge any carbon or metallic dust which may have built up inside the switch.

4) Apply 115VAC control power.

5) Set the retract thumbwheel to position 1.

6) Initiate a cycle start and measure the torch retract distance from the workpiece.

7) Set the retract thumbwheel to position 15.

8) Initiate a cycle start and verify that the torch retract distance is further from the workpiece.

Console: (Electrical)

1) Remove 115VAC control power from the RSVP.

2) Open the console door.

3) Verify that all three edge card connectors are firmly connected to each p.c. board.

4) With a screwdriver, tighten all terminal screws on the terminal board.

5) Check that all AMP connectors are tight and secure.

6) Check all AMP cable clamps for any exposed wire.

Positioner: (Electrical)

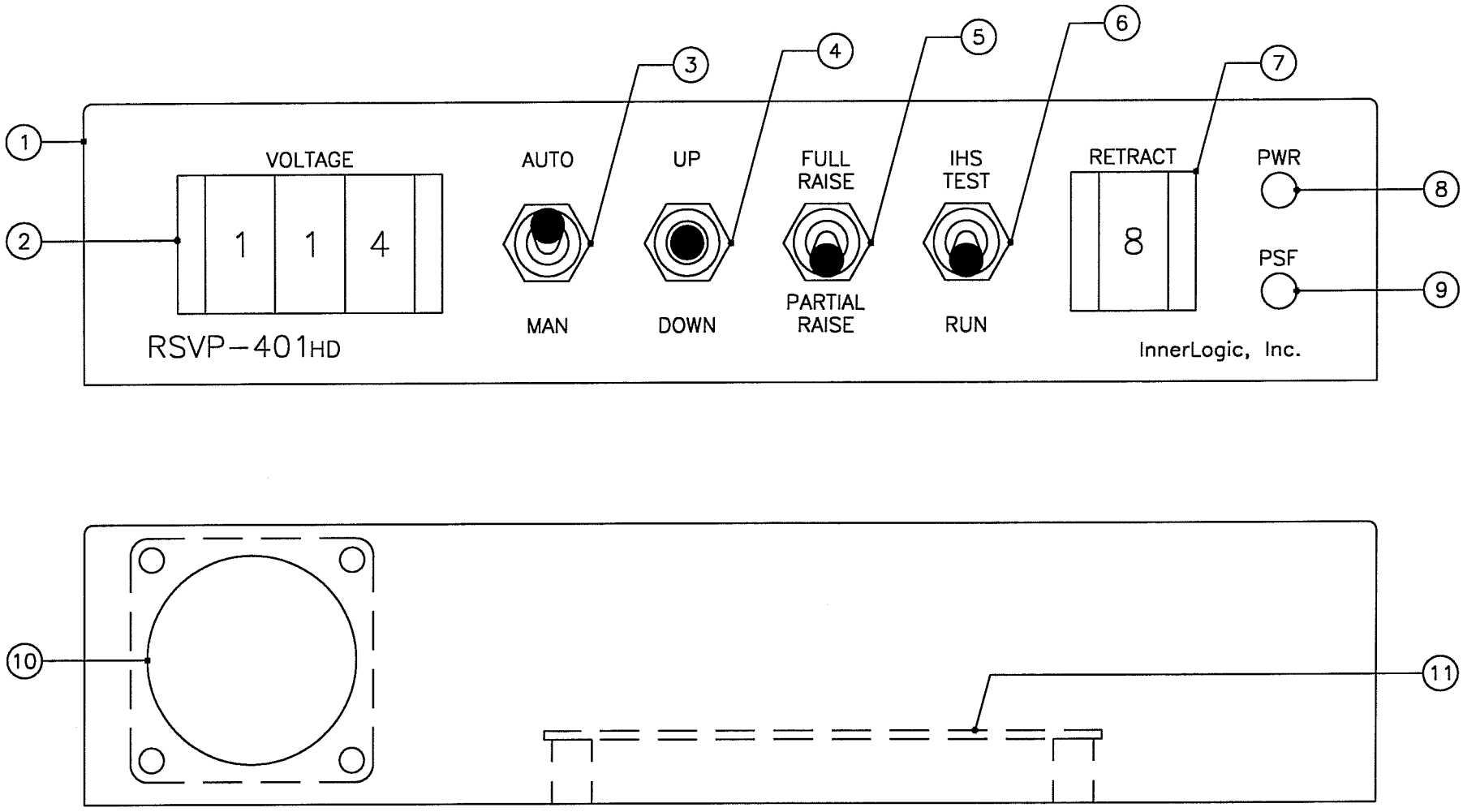
1) Remove 115VAC control power from the RSVP.

2) Disconnect P6 at the positioner motor.

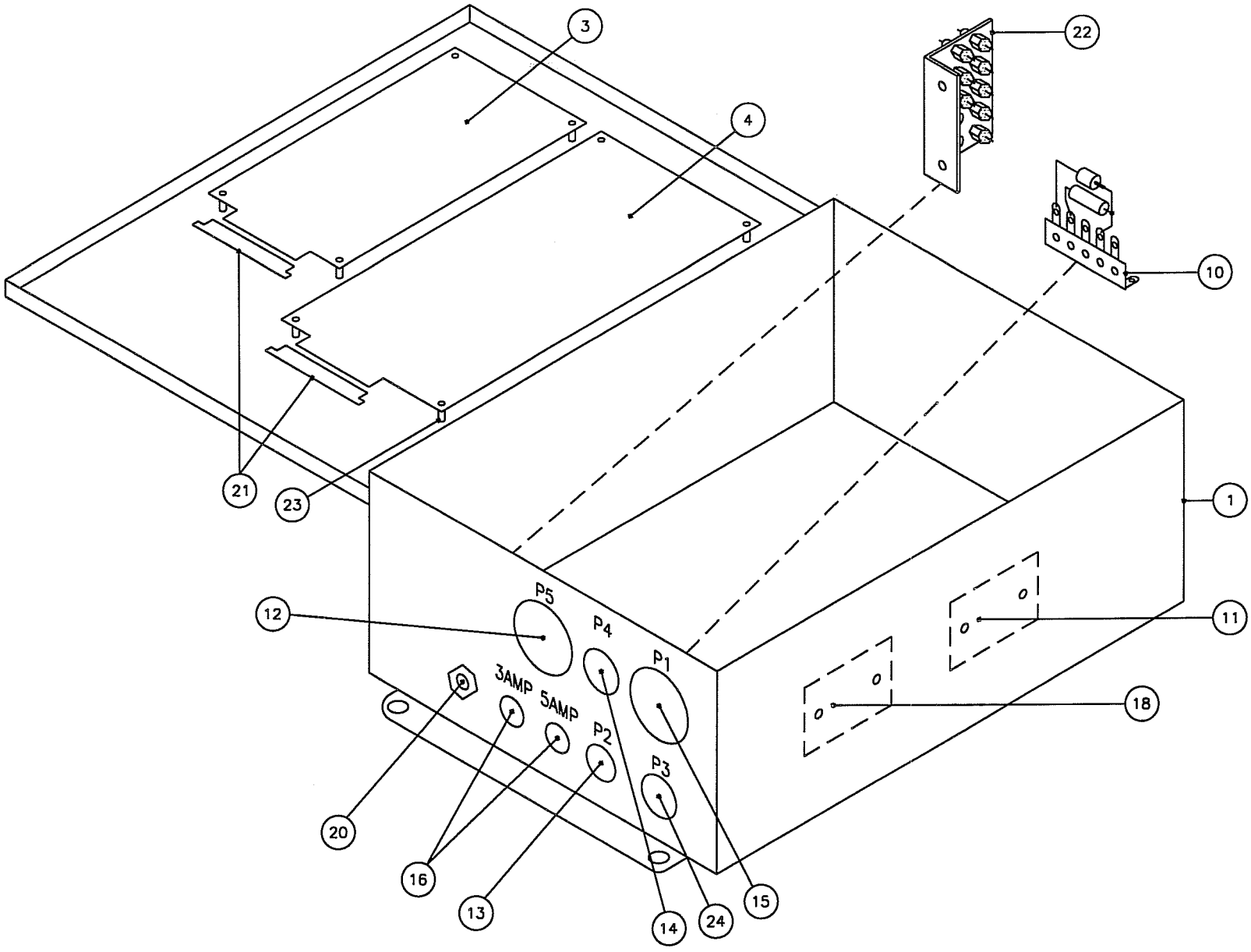
3) Measure the resistance between P6-1 and P6-4. It should measure approximately 2-3 ohms. If it is a higher reading, the brushes may need replacing.

4) Measure the resistance between P6-2 and P6-3. It should measure approximately 200 ohms. If it is a higher resistance, the brushes may need replacing.

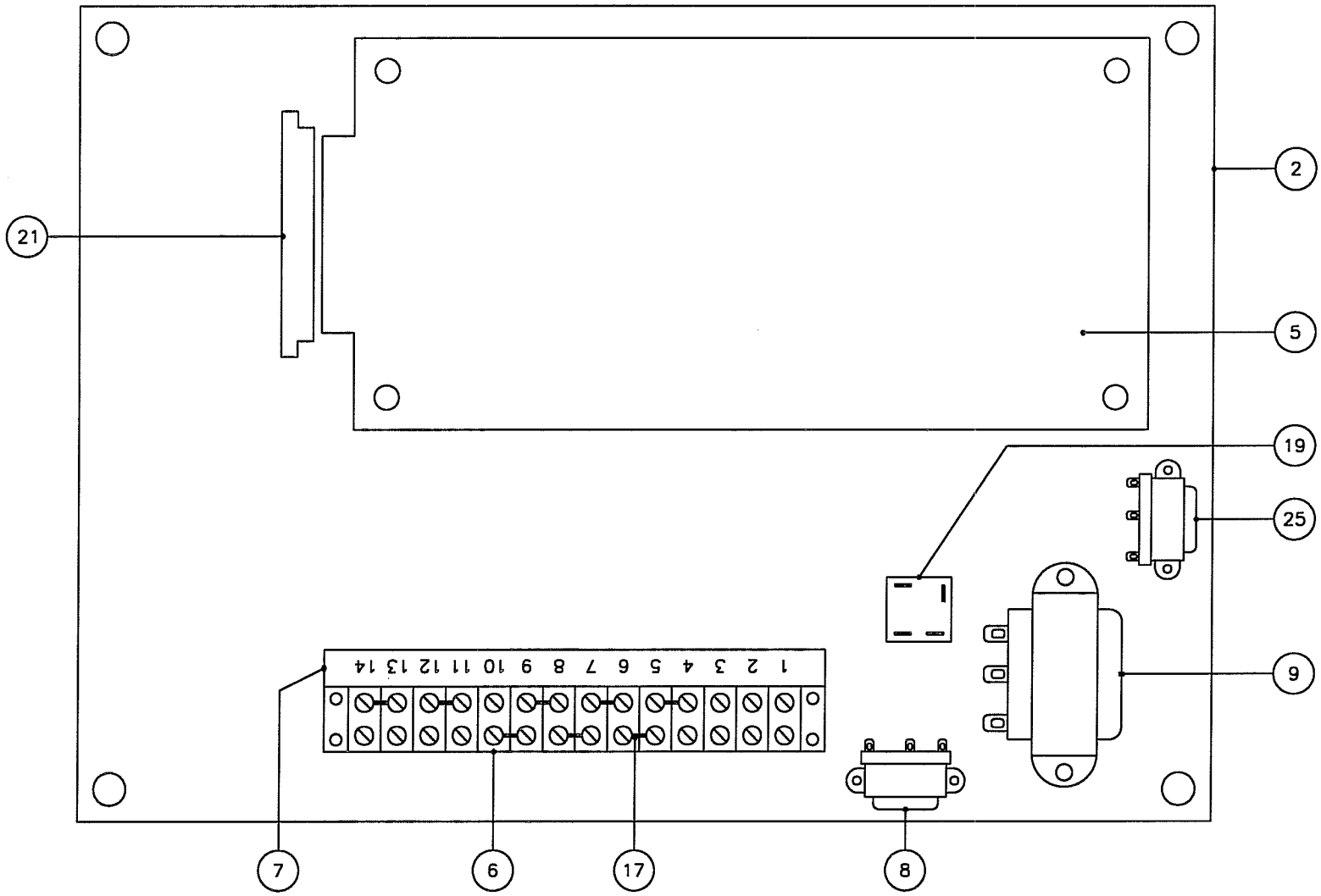
5) Reconnect P6 at the positioner motor.



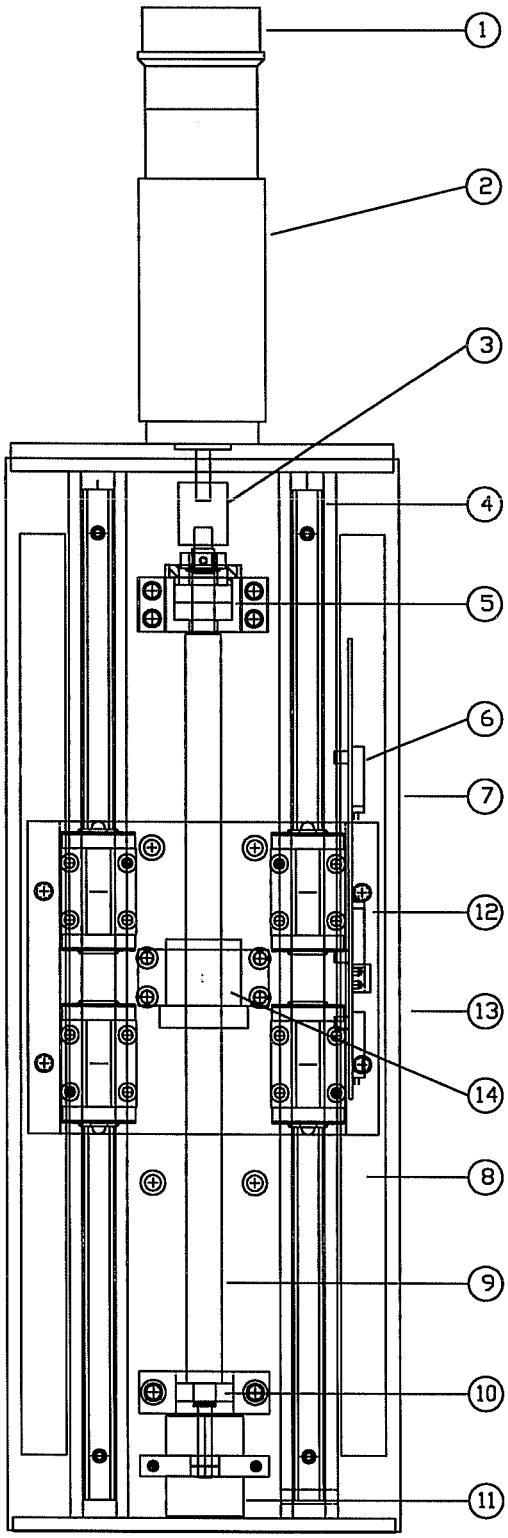
REMOTE CONTROL ILLUSTRATION
FIGURE 12



CONTROL CONSOLE ILLUSTRATION
FIGURE 13



PANEL ILLUSTRATION
FIGURE 14



POSITIONER ILLUSTRATION

FIGURE 15

8. RSVP-401hd Parts Lists

8.1 Remote Control, Figure 12, page 47
Assembly number: 401152

Item No.	Part Number	Description	Quantity
1	301004	Remote base	1
2	301018	Voltage thumbwheel assembly	1
3	708002	Auto/manual switch	1
4	708003	Up/down switch	1
5	708065	Partial raise switch	1
6	708002	IHS test switch	1
7	708037	Retract thumbwheel	1
8	704027	Power LED	1
9	704027	PSF LED	1
10	709096	Receptacle, 37 pin	1
11	700270	BCD/Binary pc board assembly	1
Not shown	401155	Wiring harness	1
Not shown	301005	Remote cover	1

8.2 Control Console, Figures 13 & 14, pages 48 & 49
Assembly number: 401131

Item No.	Part Number	Description	Quantity
1	401135	Enclosure	1
2	700048	Plate	1
3	401051	H-bridge (motor drive) board	1
4	401099	Logic p.c. board	1
5	401161	Servo p.c. board	1
6	709007	Terminal block	1
7	709009	Marker strip	1
8	706004	Transformer, 24VAC	1
9	706003	Transformer, 20VAC	1
10	700185	Voltage divider filter asmbly	1
11	708008	Power supply start relay	1
12	709096	Receptacle, 37 pin	1
13	709001	Receptacle, 4 pin	1
14	709002	Receptacle, 14 pin	1
15	709004	Receptacle, 24 pin	1
16	709010	Fuse holder	2
17	709008	Jumper	8
18	707001	Line filter	1
19	704015	Diode bridge	1
20	709005	Bushing	1
21	709013	P.C. edge card connector	3
22	700405	Filter assembly	1
23	710002	P.C. board stand off	13
24	709003	Receptacle, 9 pin	1
25	706007	Transformer, 241-4-24	1
Not shown	709011	5 amp fuse	1
Not shown	709012	3 amp fuse	1
Not shown	301014	Wiring harness assembly	1

8.3 RSVP-401hd Positioner, Figure 15, page 50
Assembly number:401122

Item No.	Part Number	Description	Quantity
1	301010	Encoder	1
2	900316	Motor	1
3	900342	Shaft coupling	1
4	401006	Rail with 2 guides	2
5	401025	Bearing	2
6	401029	Filter p.c. board assembly	1
7	401012	Cover	1
8	401002	Bellows	2
9	401007	Ball screw	1
10	401021	Bearing	1
11	401038	Brake	1
12	401013	Carriage	1
13	401170	Tool plate	1
14	401016	Carriage adaptor	1