OZO DIVERSIFIED AUTOMATION, INC.

OPERATOR'S AND TECHNICAL MANUAL

Model 18 AND Model 24

ANAHEIM DRIVER PACK VOLTAGES

ANAHEIM DRIVER PACK			AXIS MOTOR SWITCH OFF	AXIS MOTOR SWITCH ON	AXIS MOTORS NOT WIRED TO ADP.
Z AXIS	MTR. 01	1	6.4 V	4.5 V	0 V
	MTR. 03	2	6.4 V	.9 V	0 V
	1 & 3 COM	3	6.4 V	4.1 V	7.3 V
	VLV	4	5.0 V	4.7 V	
	DC/CCW	5	5.4 V	5.3 V	
	CLOCK(CW)	6	4.3 V	4.3 V	
	0 VDC	7	0 V	0 V	
	MODE SEL.	8	5.4 V	5.3 V	
	OUTPUTS OFF	9	0 V	5.2 V	
	VHV	10	53.4 V	53.3 V	
	2 & 4 COM	11	6.4 V	4.1 V	7.3 V
	MTR. 02	12	6.4 V	.9 V	0 V
	MTR. 04	13	6.5 V	4.3 V	0 V
Y AXIS	MTR. 01	1	6.4 V	4.5 V	0 V
	MTR. 03	2	6.4 V	.9 V	0 V
	1 & 3 COM	3	6.4 V	4.1 V	7.3 V
	VLV	4	5.0 V	4.7 V	
	DC/CCW	5	5.4 V	5.3 V	
	CLOCK(CW)	6	4.3 V	4.3 V	
	0 VDC	7	0 V	0 V	
	MODE SEL.	8	5.4 V	5.3 V	
	OUTPUTS OFF	9	0 V	5.2 V	
	VHV	10	53.4 V	53.3 V	
	2 & 4 COM	11	6.4 V	4.1 V	7.3 V
	MTR. 02	12	6.4 V	.9 V	0 V
	MTR. 04	13	6.5 V	4.3 V	0 V
X AXIS	MTR. 01	1	6.4 V	4.5 V	0 V
	MTR. 03	2	6.4 V	.9 V	0 V
	1 & 3 COM	3	6.4 V	4.1 V	7.3 V
	VLV	4	5.0 V	4.7 V	
	DC/CCW	5	5.4 V	5.3 V	
	CLOCK(CW)	6	4.3 V	4.3 V	
	0 VDC	7	0 V	0 V	
	MODE SEL.	8	5.4 V	5.3 V	
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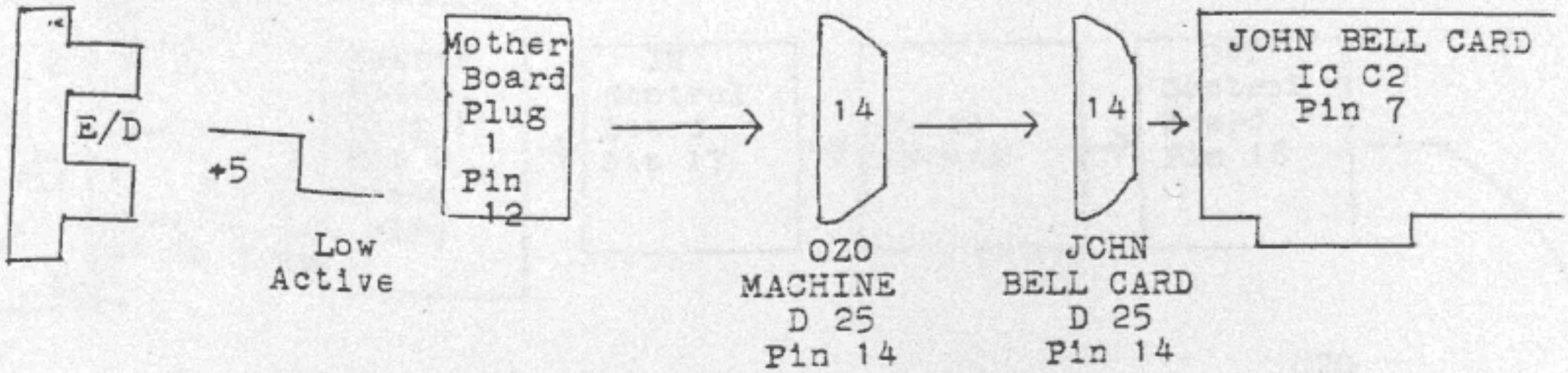
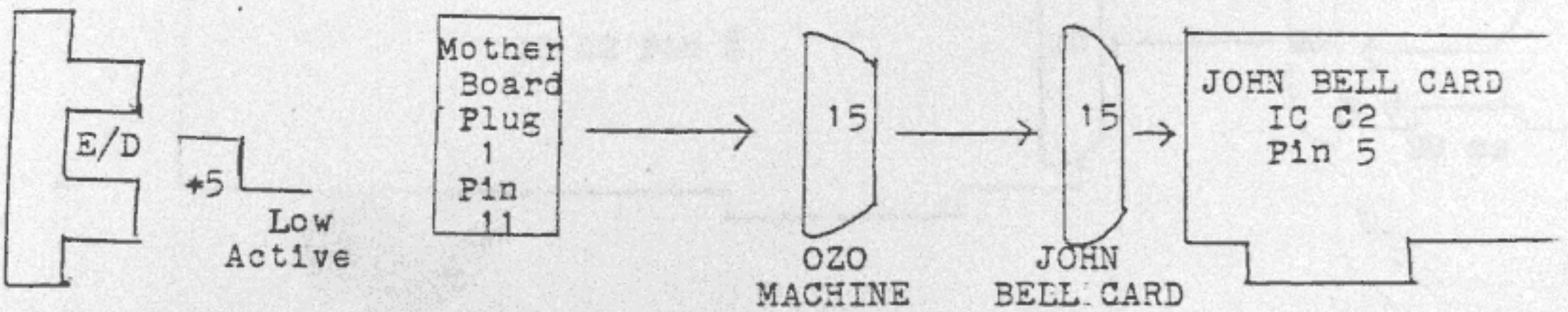
	VHV	10	53.4 V	53.3 V	
	2 & 4 COM	11	6.4 V	4.1 V	7.3 V
	MTR. 02	12	6.4 V	.9 V	0 V
	MTR. 04	13	6.5 V	4.3 V	0 V

FLAG TROUBLESHOOTING FLOW CHART

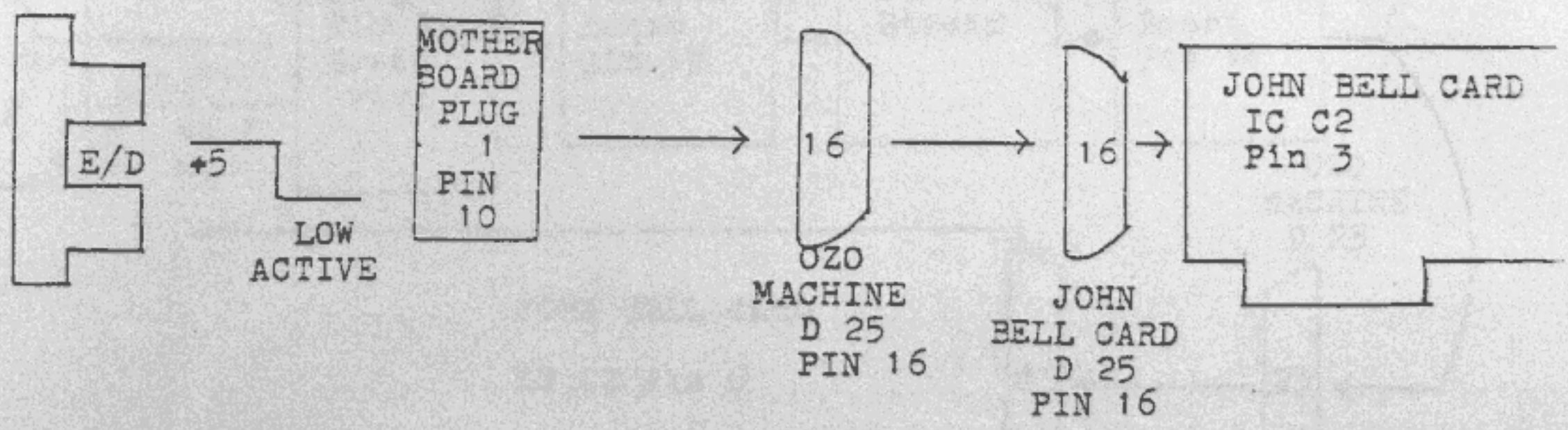
X FLAG



Y FLAG



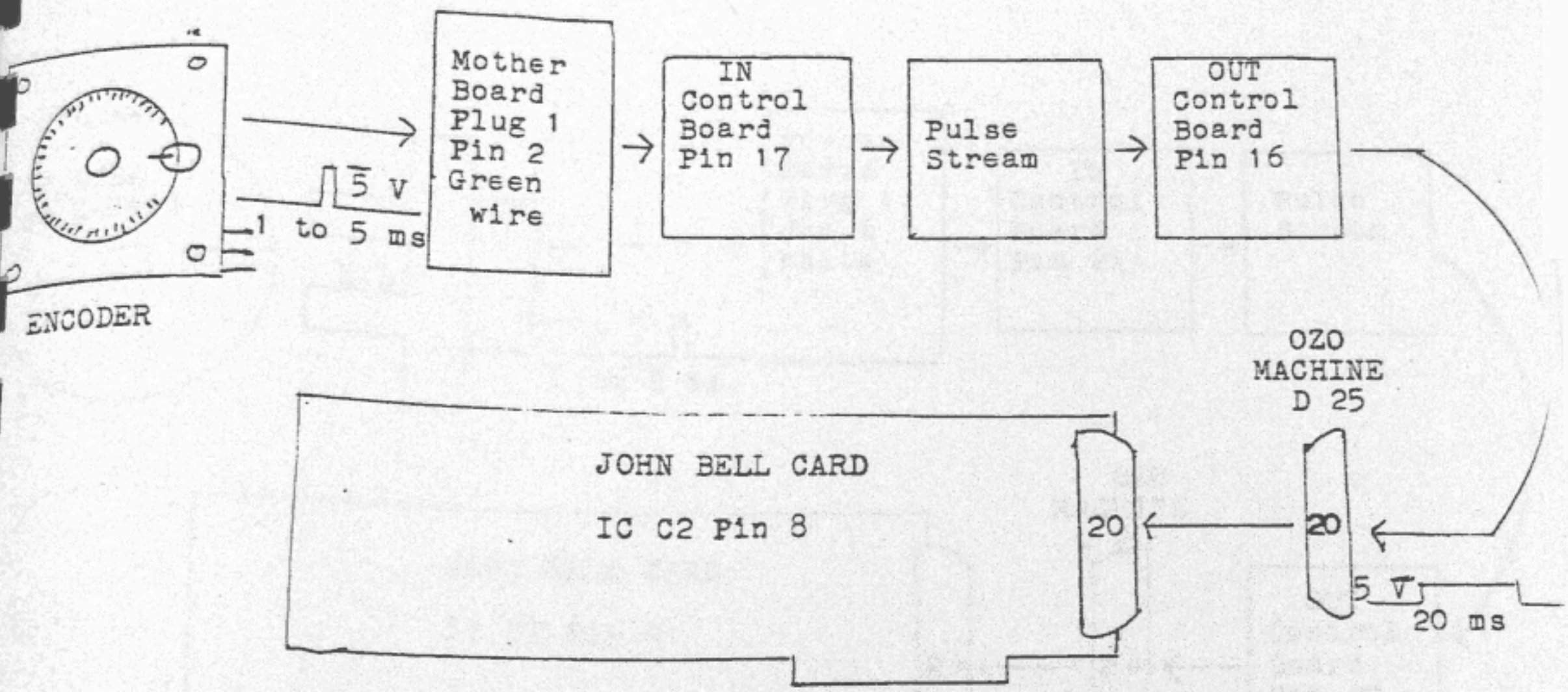
Z FLAG



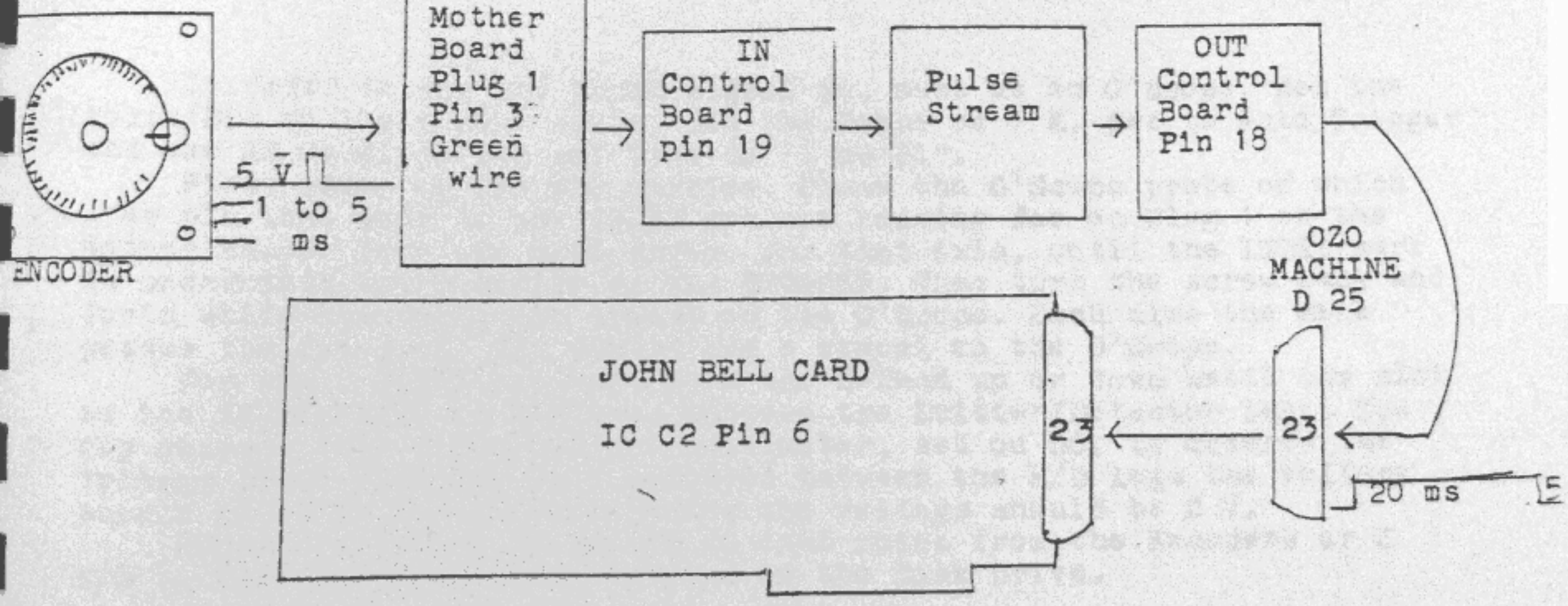
To check the FLAG signals, power up the OZO machine. Check to see that there is +5 VDC on the appropriate pins. Simply place a jumper card between the legs of the X and Y E/D's and check that the voltage drops to 0 on each pin. For the Z, lower the Z-Head all the way down. This moves the flag down between the E/D legs. Check to see that the voltage drops to zero on that pin.

INDEX TROUBLESHOOTING FLOW CHART

X INDEX

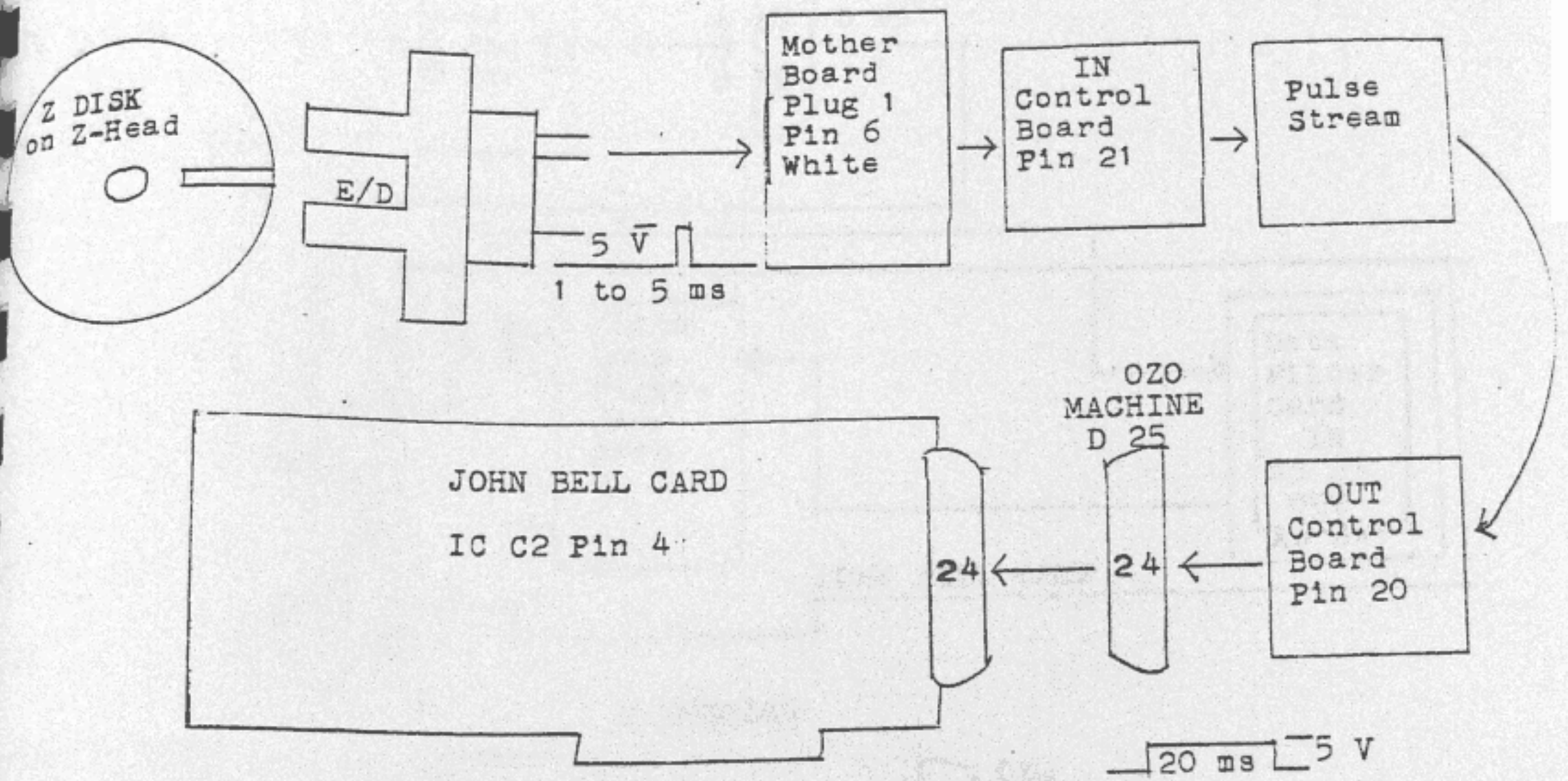


Y INDEX



INDEX TROUBLESHOOTING FLOW CHART

Z INDEX



In order to see the INDEX signal you must us an O'Scope. Set the Volts/Div on the 2 Volt scale. Set the Probe on 1 X, Set to Auto Trigger and use AC Coupling and set Time to 10 ms/Div.

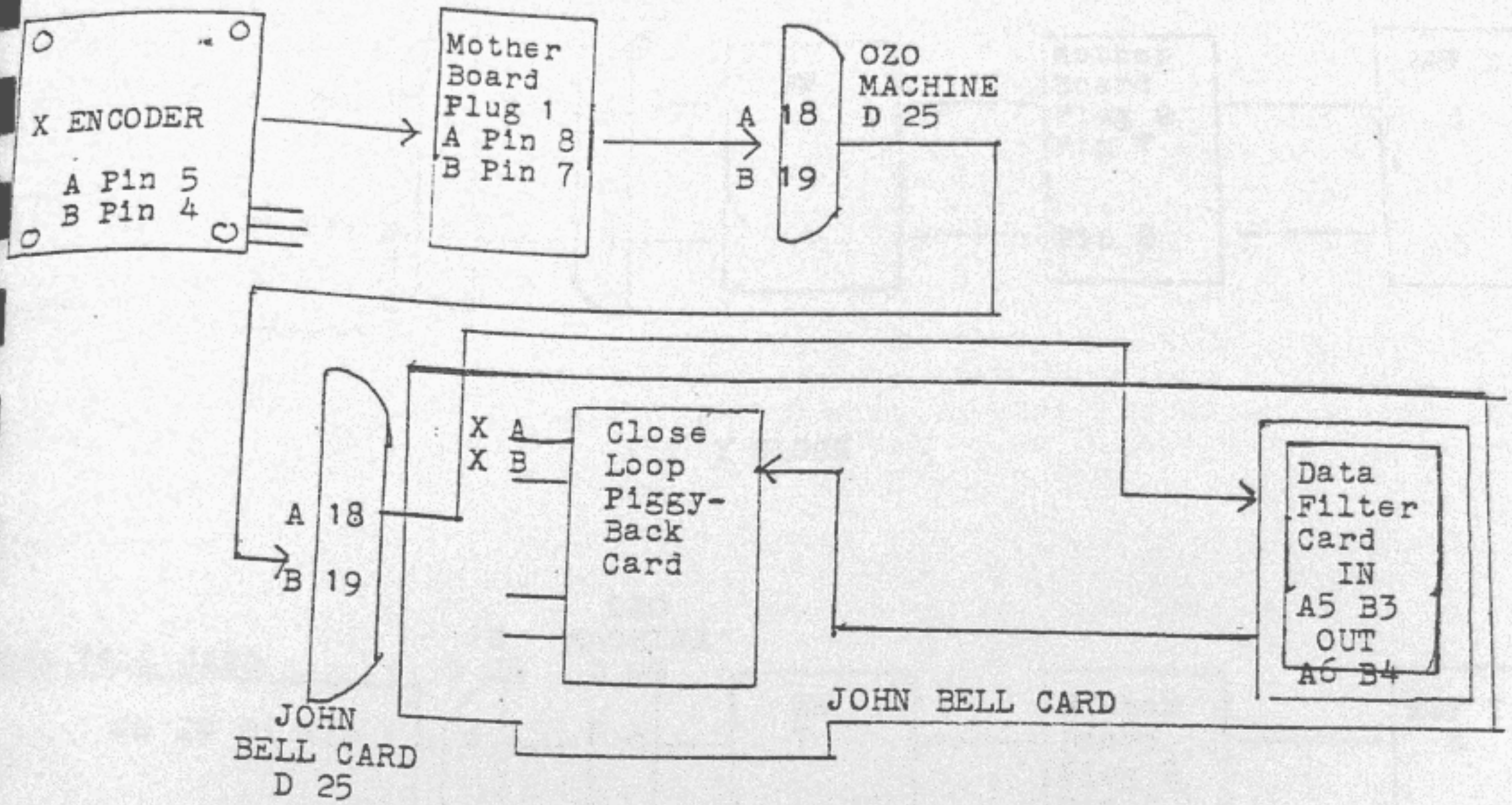
First power up the OZO machine. Place the O'Scope probe on which ever pin that goes to the INDEX you are testing for on Plug 1 on the Mother Board. Turn the Lead Screw, for that axis, until the INDEX mark is underneath the detector of the ENCODER. Then turn the screw back and forth while observing the signal on the O'Scope. Each time the mark passes the detector, you should see a signal on the O'Scope.

For the Z INDEX you must move the Z-Head up or down until the slot in the INDEX WHEEL is centered between the Emitter/Detector legs. You may measure this signal with a multimeter, set on DC, to observe the voltage rise. With the slot centered between the E/D legs the voltage should be +5 V. Any other location the voltage should be Ø V.

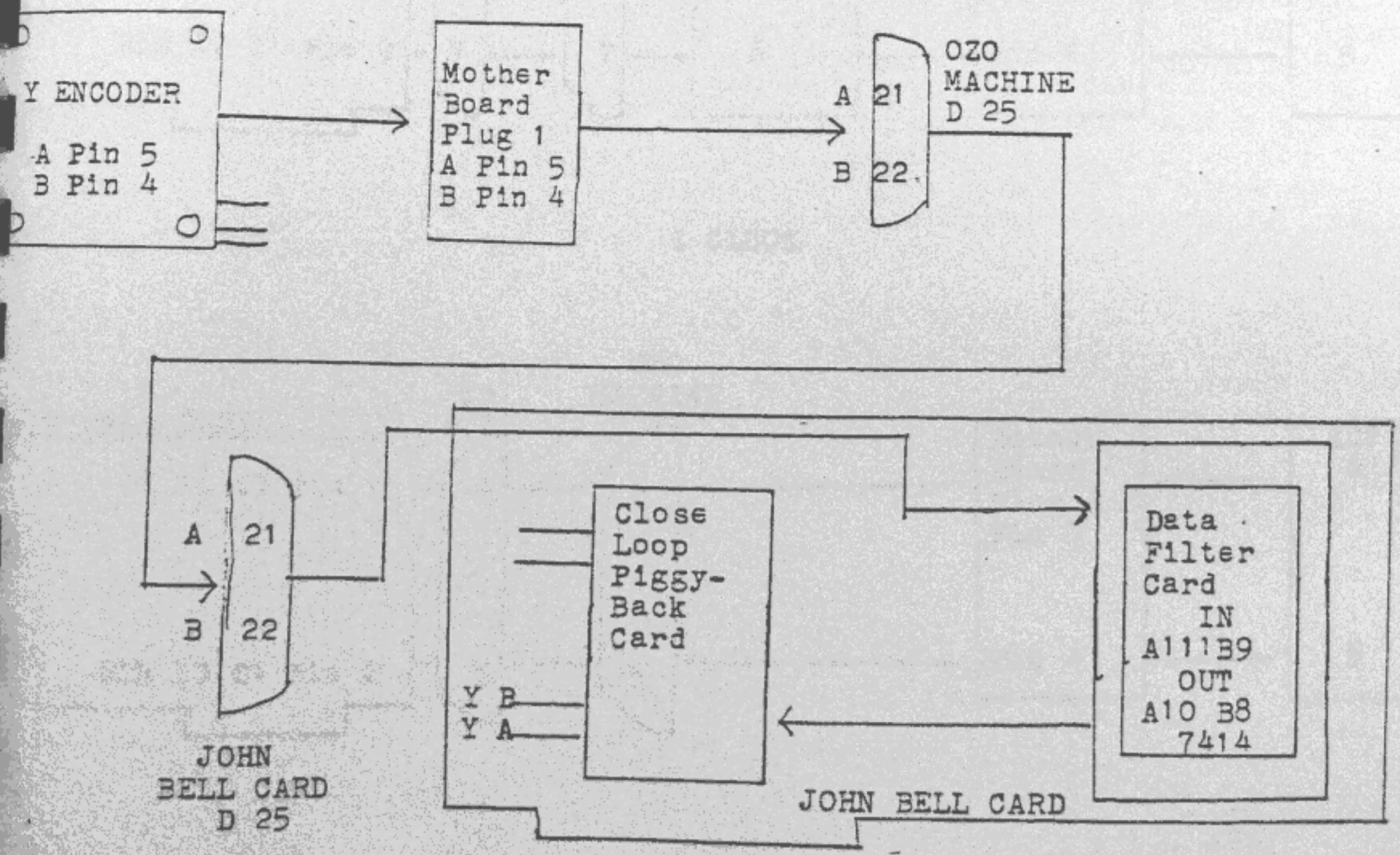
Repeat the above procedure at each point from the Encoders or Z E/D to the JOHN BELL CARD, located in the Disk Drive.

ENCODER CHANNEL A & B

X ENCODER

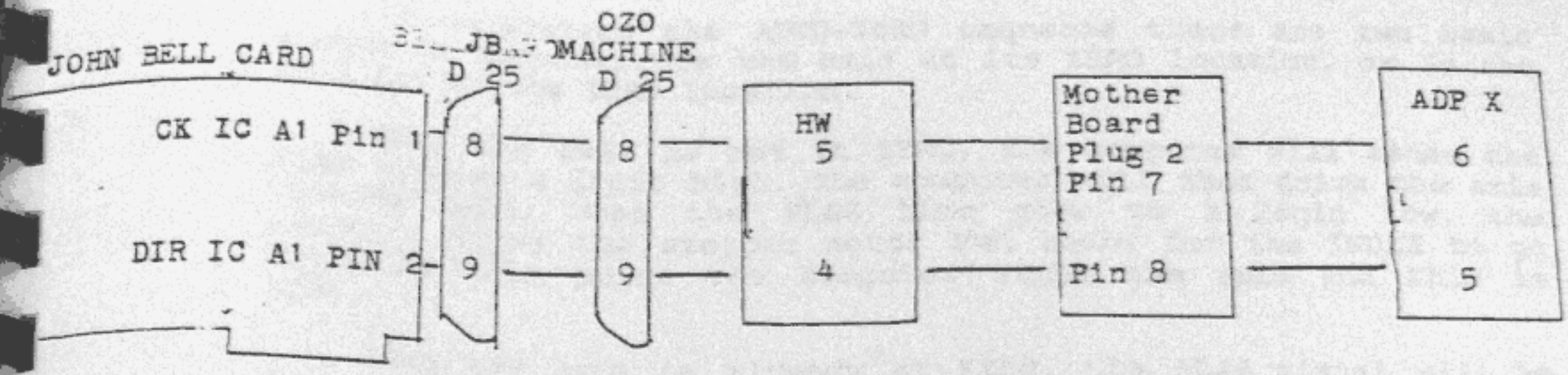


Y ENCODER

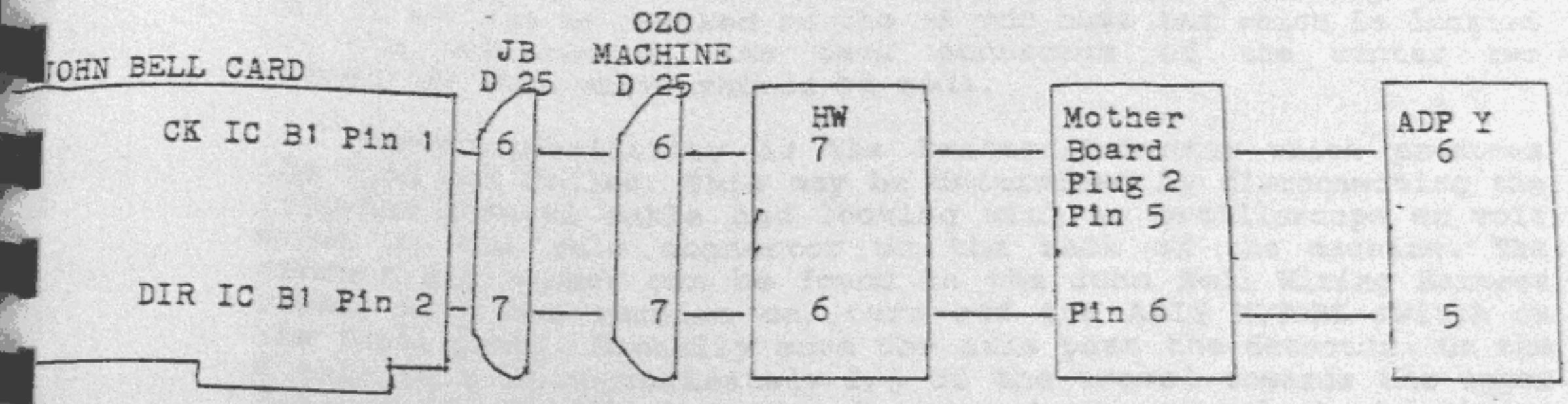


AXES CLOCK TROUBLESHOOTING GUIDE

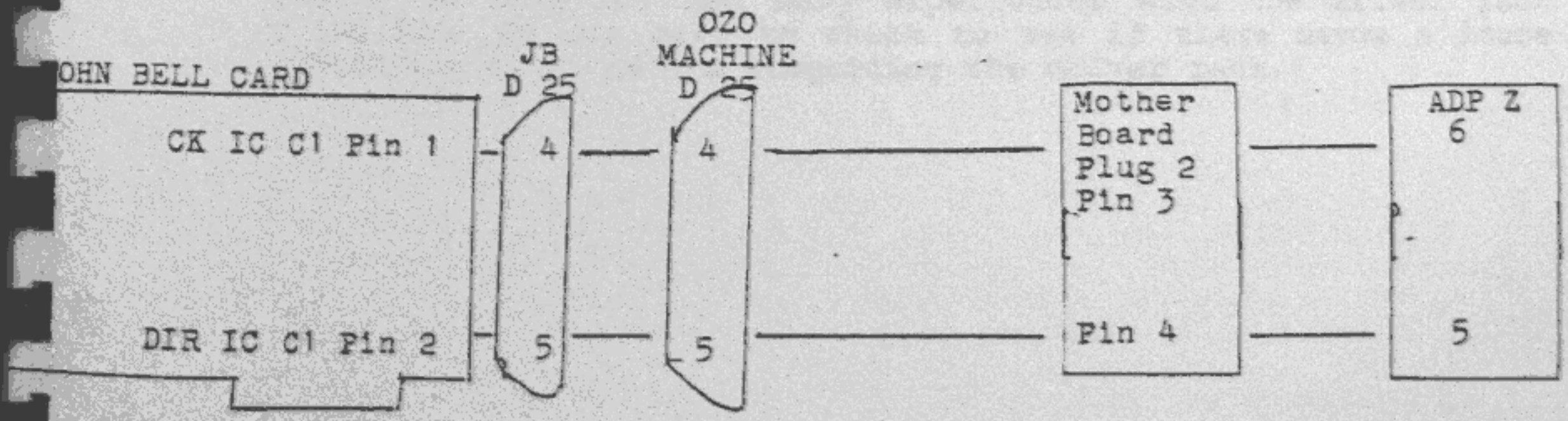
X CLOCK



Y CLOCK



Z CLOCK



OZO AUTO-ZERO SEQUENCE

To understand the AUTO-ZERO sequence there are two basic states to consider. Is the axis at its ZERO location, or is the axis not at its ZERO location.

When the axis is not at ZERO, the computer will sense the FLAG line at a logic high. The computer will then drive the axis towards ZERO. When the FLAG line goes to a logic low, the computer slows the stepper motor and looks for the INDEX to go high. At this point the computer stops the axis and this is ZERO.

When the axis is already at ZERO, the FLAG signal will be low. The computer will drive the axis away from ZERO until FLAG goes high. Then the computer will reverse the direction and drive the axis towards ZERO until INDEX goes high. At this point the computer will stop the axis and this is ZERO.

If this does not happen the following items need to be checked. First, make sure the machine is still producing +5 vdc. The +5 vdc can be checked at the +5 vdc buss bar which is located on the motherboard, the back connector of the center two connectors (the wires should be red).

Second possibility is the Emitter/Detector which produces the FLAG has failed. This may be determined by disconnecting the computer control cable and looking with an oscilloscope or volt meter at the male connector on the back of the machine. The correct pin number can be found on the John Bell Wiring Harness sheet. With the machine on, turn off the AXIS MOTORS switch on the front panel. Manually move the axis past the detector. On the Z axis this is approximately 2/3 of the travel towards the upper limit FLAG. As the detector is passed the signal should change from high to low. If the +5 vdc does not change there may be a loose connection on the Emitter/Detector or a failed Emitter/Detector.

The third possibility is the Anaheim driver pack is at fault. We have not had many experiences with the driver pack going bad. So its best to check to see if there maybe a loose connection first before suspecting the driver pack.

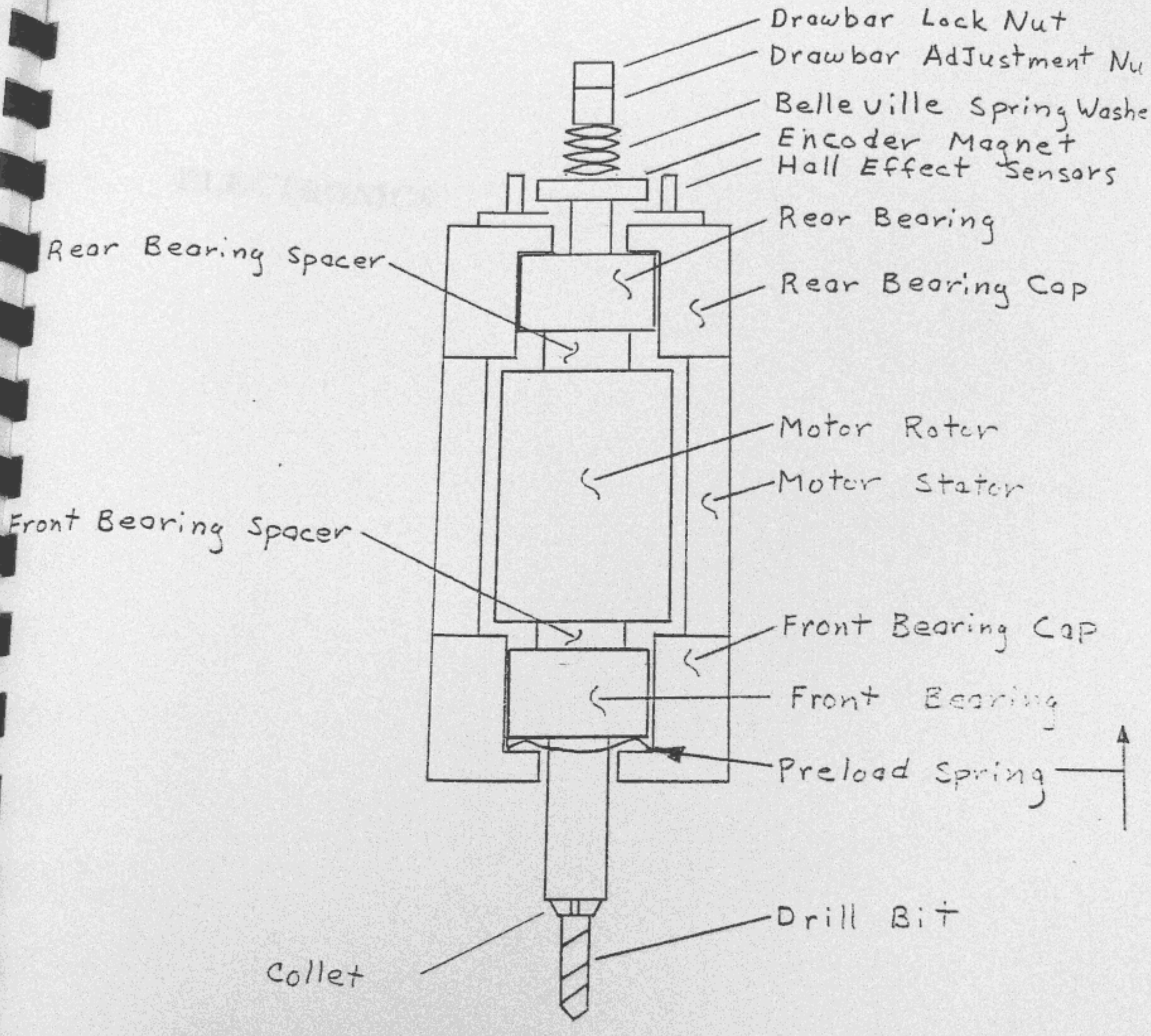
TESTING EMITTER DETECTORS ON Z-HEAD

QUICK TEST

A. Turn Power on.
B. Turn AXIS MOTOR Switch off. This allows you to move the Z-Head up or down by hand easily.
C. Place meter probe on Plug #1, pin #10 and the other probe to ground. With the Z-Head all the way up you should read +5 VDC. With the Z-Head all the way down you should read 0 VDC.
D. Next place the meter probe on Plug #1, pin #6 and the other probe to ground. Slowly move the Z-Head up or down until the Z-Disk slot is directly between the legs of the Emitter Detector. At this point you should read +5 VDC. At any other point you should read 0 VDC.
E. If all checks out, repeat these checks while metering the John Bell connector pins 16, for the Z-Flag, and 24, for the Z-Index. Results should be the same as in steps C and D.
F. If these checks are not correct, then you must check the Emitter Detectors themselfs. *See REMOVING THE Z-BOX and Z-HEAD*
   1. Check the violet wires for +5 VDC. These come in on pin #15, for the Index, and pin #10, for the Flag, on the Z-Head plug
   2. Next check the ground wires. The ground wire for both the Index and the Flag come in on Pin #14 on the Z-Head plug.
   3. Next, while metering the yellow output wires, pin #12 for Index and pin #9 for Flag, perform the same procedure as in steps C and D (Moving the Z-Head up and down)
   4. If there is proper voltage and a good ground but no outputs, replace the emitter detector.

REPLACING THE Z-HEAD EMITTER DETECTORS

Make sure that power is off and the machine is unplugged.
. Follow the procedure entitled "REMOVING THE Z-BOX".
. Next follow the procedure entitled "REMOVING THE Z-HEAD".
After removing the Z-Head from the machine, place the Z-Head on the work bench with the motors facing up.
. Of course by this time you have already determined which emitter detector you want to replace.
First cut the tie wrap from around the emitter detector that holds the plug and emitter detector together.
If the emitter detector you want to replace is for the FLAG: remove the two M3 cap screws holding it in place. The emitter detector can now be lifted out.
. If the emitter detector you want to replace is for the INDEX: with a flat bladed screwdriver remove the two M5 screws that holds the mounting bracket in place. Lift the bracket out carefully. After that remove the two M3 screws that hold the emitter detector to the bracket. Don't lose the two white spacers when you remove the two screws. Remove the emitter detector.
At this time the new emitter detector must be prepped. SEE EMITTER DETECTOR under Z-Head Assembly.
Once the emitter detector has been prepped, it can then be installed in place of the bad emitter detector.
After the Z-Head is back together, temperarilly hook up the Z-Harness to the Z-Head and perform the "TESTING EMITTER DETECTORS ON THE Z-HEAD" procedure. If it checks out properly, reattach the Z-Head and Z-Box to the machine.



Drill Motor Diagram

JOHNBELL I/O CARD

LOCATED INSIDE OF COMPUTER

DIRECTION A1-2 9
CLOCK A1-1 8
CHANNEL A CL- 18
CHANNEL B CL- 19
INDEX C2-8 20
FLAG C2-7 14

I/O CABLE

DB-25 MOTHER BRD

ANAHEIM DRIVER PACK

LOCATED INSIDE TOP ELECTRONICS COMPARTMENT

PHASE 1 1 — GREEN/WHITE
PHASE 3 2 — WHITE/GREEN/BLUE
COMM 1-3 3 — GREEN
COMM 2-4 11 — GREEN/YELLOW
PHASE 2 12 — WHITE/RED/BLUE
PHASE 4 13 — WHITE/RED
DIRECTION 5
CLOCK 6

GREEN/WHITE
GREEN
WHITE
BLACK
WHITE/RED
RED

STEPPER MOTOR

LOCATED AT REAR OF MACHINE MOUNTED TO BASE PLATE

WHITE
BLACK
GREEN INDEX

ENCODER

RED — P-9 4 + 5VDC

SHIELD (H.S.) — P-8 4

3 7 2 — P-1 MOTHER BOARD

21 — PULSE STRETCHER SPEED CONTROL CARD

PLUGS INTO MOTHER BOARD

MOTHER BOARD P-7

20

H.W. JUMPER BOARD

4 9
5 10

MOTHER BOARD P-2

8 VIOLET
7 RED

MOTHER BOARD P-9

+5VDC — 1 — VIOLET — 510 Ω

P-8 MOTHER BOARD — 1 — BROWN

FLAG

BOTTOM VIEW

+ E
D
- +

MOTHER BOARD P-1

12 — YELLOW — FLAG

X-AXIS CONTROL SYSTEM

JOHNBELL I/O CARD
LOCATED INSIDE OF COMPUTER

DIRECTION B1-2
CLOCK B1-1
CHANNEL A CL-
CHANNEL B CL-
INDEX C2-6
FLAG C2-5

15 23 22 21 6 7

I/O CABLE

DB-25 MOTHER BRD

ANAHEIM DRIVER PACK
LOCATED INSIDE TOP ELECTRONIC COMPARTMENT

PHASE 1	1	WHITE/GREEN
PHASE 3	2	WHITE/GREEN/BLUE
COMM 1-3	3	GREEN
COMM 2-4	11	GREEN/YELLOW
PHASE 2	12	WHITE/RED
PHASE 4	13	WHITE/RED/BLUE
DIRECTION	5	
CLOCK	6	

WHITE/GREEN
GREEN
WHITE
BLACK
RED
WHITE/RED

STEPPER MOTOR
LOCATED INSIDE LEFT ELECTRONICS COMPARTMENT

WHITE
BLACK
GREEN INDEX

ENCODER

RED — P-9 +5VDC
5

SHIELD (HS) — P-8
5

5 4 3
P-1 MOTHER BOARD

19
MOTHER BOARD P-7
18

PULSE STRETCHER SPEED CONTROL CARD
PLUGS INTO MOTHER BOARD

H.W. JUMPER BOARD
6 11
7 12

MOTHER BOARD P-2
6 VIOLET
5 RED

11
YELLOW
MOTHER BOARD P-1

FLAG

MOTHER BOARD P-9
+5VDC
2
VIOLET
510 Ω

P-8 MOTHER BOARD
2
BROWN

FLAG
E
D

BOTTOM VIEW
+ E
D
- +

Y-AXIS CONTROL SYSTEM

JOHNBELL I/O CARD
LOCATED INSIDE OF COMPUTER

DIRECTION C1-2 5
CLOCK C1-1 4
INDEX C2-4 24
FLAG C2-3 16

I/O CABLE

DB-25 MOTHER BOARD

ANAHEIM DRIVER PACK
LOCATED INSIDE TOP ELECTRONICS COMPARTMENT

PHASE 1 1
PHASE 3 2
COMM 1-3 3
COMM 2-4 11
PHASE 2 12
PHASE 4 13
DIRECTION 5
CLOCK 6

GREEN/WHITE
GREEN/WHITE/BLUE
GREEN
GREEN/YELLOW
RED/WHITE/BLUE
RED/WHITE

MALE FEMALE
6 PIN MOLEX CONNECTOR

WHITE/GREEN
BLACK
WHITE
GREEN
RED
WHITE/RED

3 STACK STEPPER MOTOR
Z-AXIS STEPPER MOTOR
INDEX WHEEL

510 Ω
BLUE
BROWN
YELLOW
INDEX

P-17 DB-15 J-17
MALE FEMALE

RED
BLACK
BLACK

MOTHER BOARD P-9 3 +5VDC
MOTHER BOARD P-8 3

MOTHER BOARD P-2
4 VIOLET
3 RED

P-1 MOTHER BOARD 6

MOTHER BOARD P-7
17
16

PULSE STRETCHER SPEED CONTROL BOARD
PLUGS INTO P-7 OF MOTHER BOARD

10 P-1 MOTHER BOARD

WHITE

J-17 FEMALE DB-15 P-17 MALE

MOTHER BOARD P-9 3 RED
MOTHER BOARD P-8 3 BLACK

10 VIOLET
9 YELLOW
14 BROWN

510 Ω

FLAG
E
D

BOTTOM VIEW
+ E
D
- +

STARTING WITH MACHINE #1136, #2060 (EXCEPT #1139)

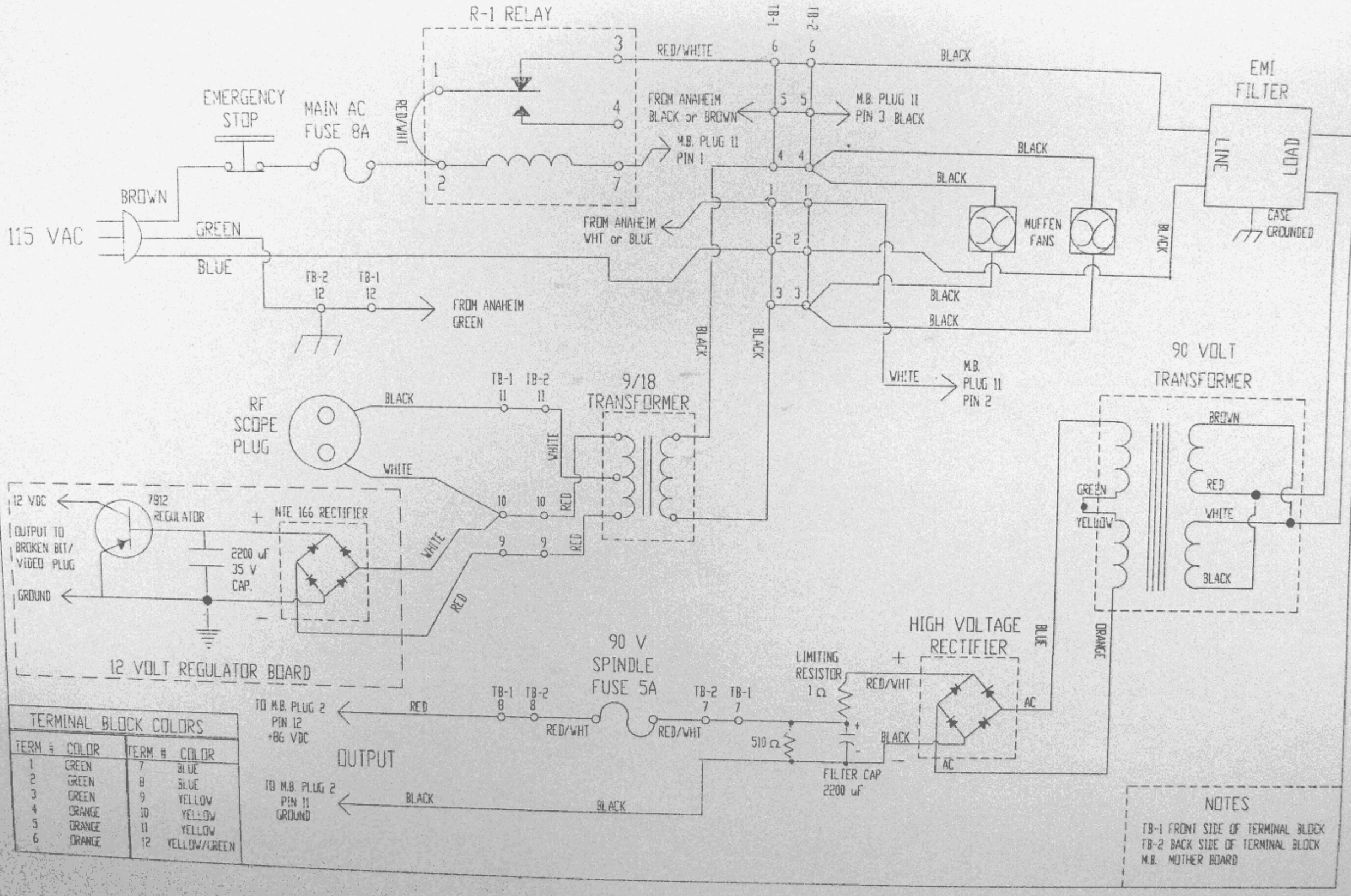
LEAD SCREW Z-AXIS CONTROL SYSTEM

6-11-92

STARTING WITH MACHINE # 1127
2060

11-4-92

POWER SUPPLY SCHEMATIC



TERMINAL BLOCK COLORS			
TERM #	COLOR	TERM #	COLOR
1	GREEN	7	BLUE
2	GREEN	8	BLUE
3	GREEN	9	YELLOW
4	ORANGE	10	YELLOW
5	ORANGE	11	YELLOW
6	ORANGE	12	YELLOW/GREEN

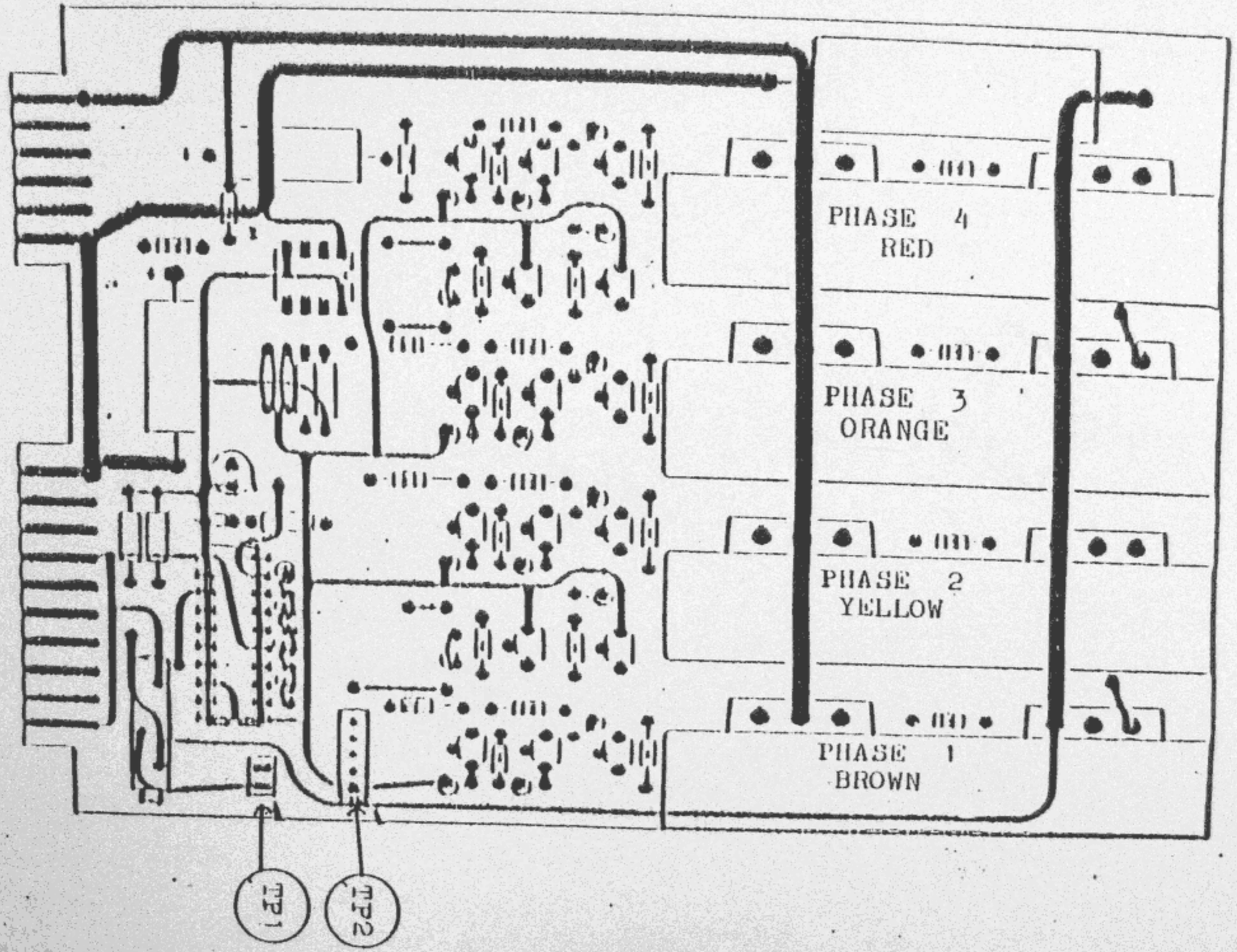
NOTES

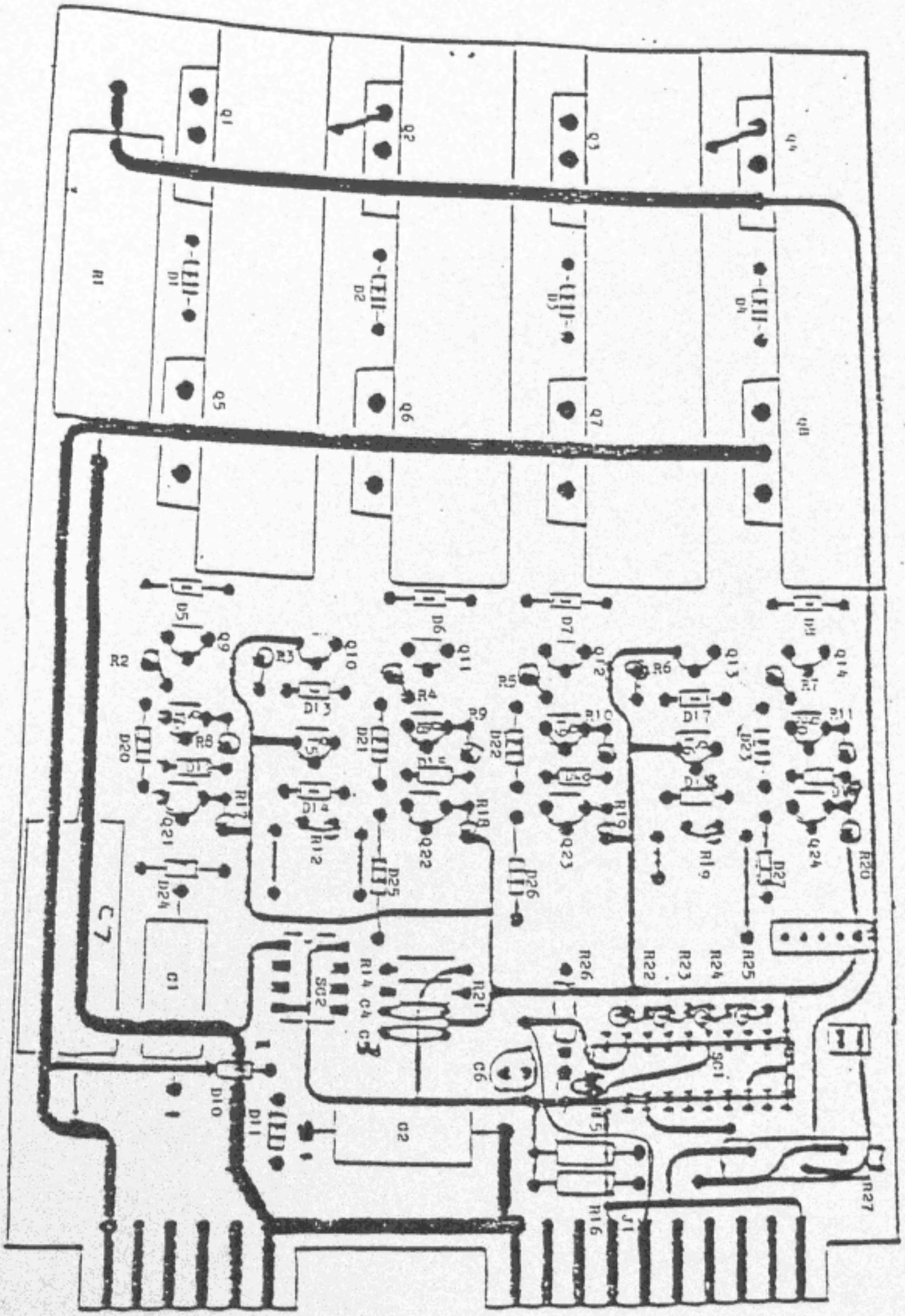
TB-1 FRONT SIDE OF TERMINAL BLOCK
TB-2 BACK SIDE OF TERMINAL BLOCK
M.B. MOTHER BOARD

DRIVER CARD PINOUTS

STATOR
1 + HV SUPPLY
2 BROWN
3 YELLOW
4 ORANGE
5 RED
6 - HV SUPPLY

HALL SENSORS
7 GROUND
8 BLACK
9 WHITE
10 + 15 VDC
11 BRAKE
12 CURRENT LINE
13 V IN
14 F/R
15 ENABLE
16 + 15 VDC





DRIVER BOARD
COMPONENT LAYOUT

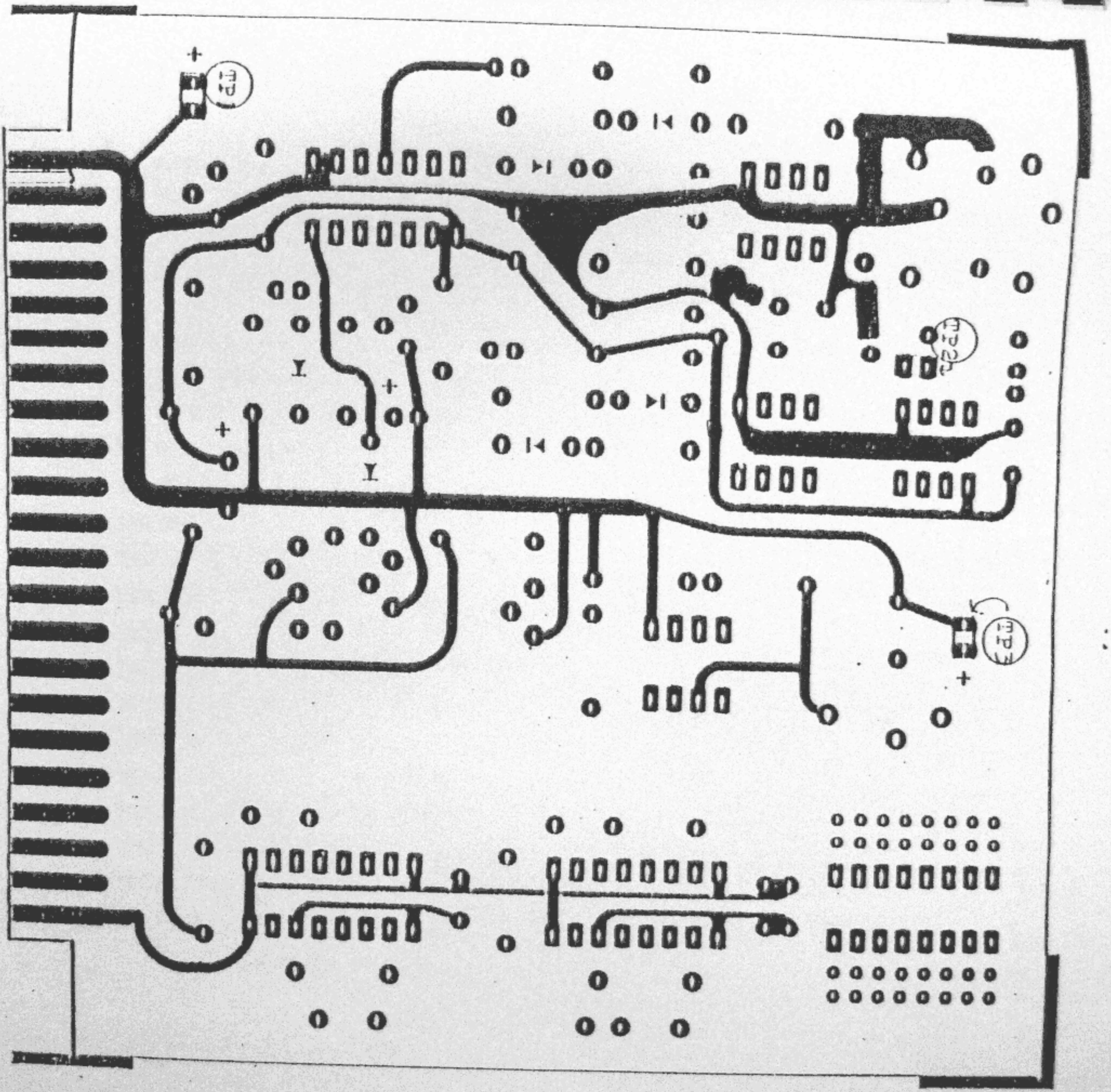
Troubleshooting the HV Driver Card

Problem	Cause	Solution
Excessive Current Drawn	1. Motor timing out of adjustment.	Re - time motor.
Over heating	2. Excessive load on motor.	Check bearings for binding, dull tools, etc
	3. Output Transistors damaged..	Test output transistors.
Motor does not turn on	1. Drill Motor Fuse blown.	Replace fuse.
	2. No signal, control card malfunction.	Enable pin 15 must be high, 15v. Vin (pin 13) is activated when it is pulled approximately below 12 v.
	3. Drive transistor blown.	Check to see if motor has a "dead spot" by rotating shaft. Test output transistors.
	4. Bias voltage for "high rail"not functioning	Check the voltage from the boot-strap power TP3. It should be ap-proximately 15v higher than the HV supply voltage. Replace 555 timer if this voltage is low.
	5. Trip Current out of adjustment.	Voltage across TP1 should be 5 volt under no load.
	6. Commutator Chip burned out.	Connect diode array across TP2 . When motor is turned on lights should flash in sequence as motor rotares.

Problem	Cause	Solution
Fuse Blows	1 . Commutation Circuit malfunction.	Test commutation at TP2 by removing drill motor fuse, installing diodes, running speed program. Turn the drill motor by hand and check if the lights flash in sequence one at a time. If not, check the hall sensor outputs and look for shorts or open circuits in the hall sensor circuit.
	2. Motor out of time.	Re - time motor.
	3. Output transistor burned out.	Replace transistor.

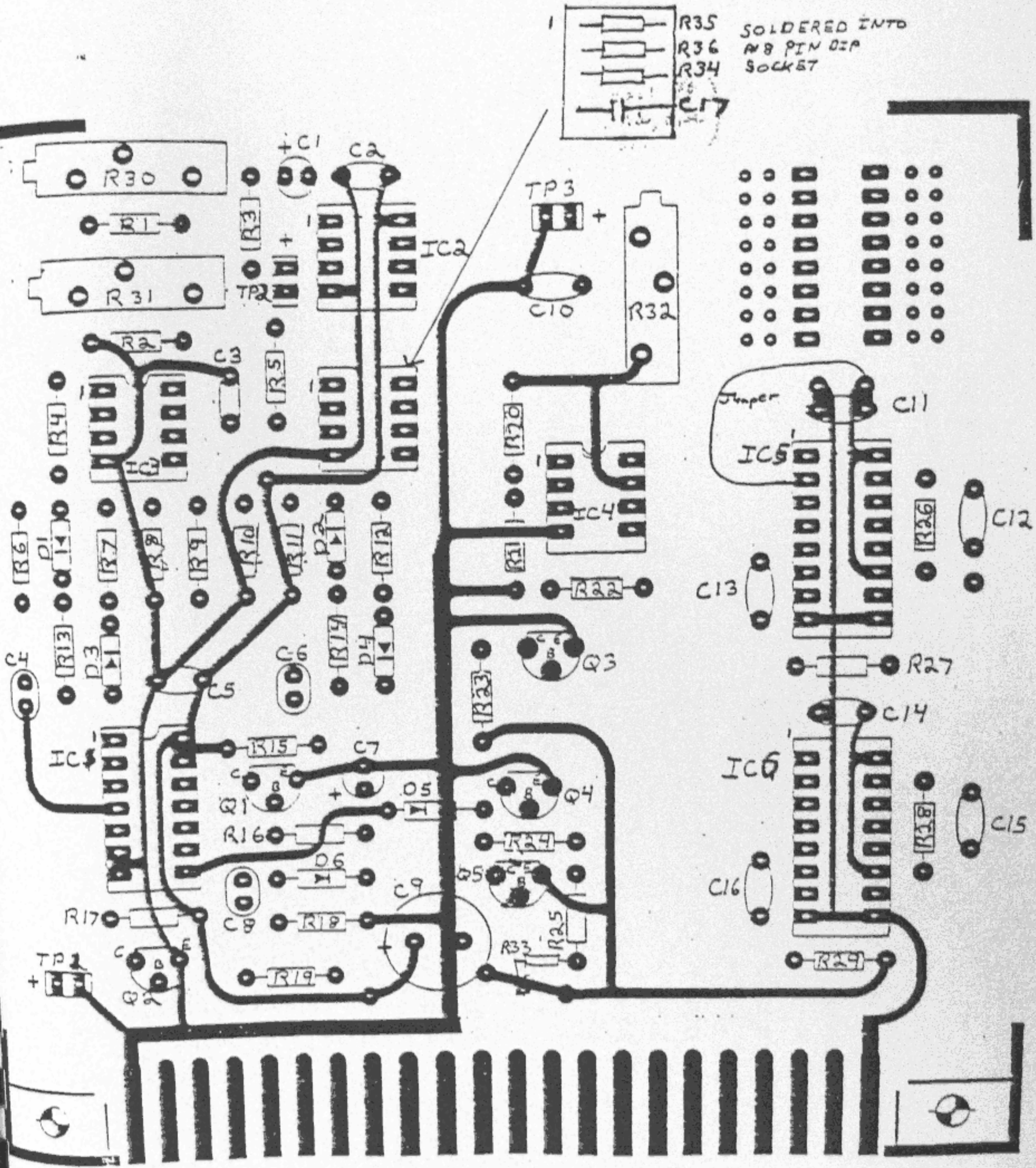
1 MOTOR GROUND
2 SENSOR A (WHT)
3 SENSOR B (BLK)

4 FREQUENCY IN
5 ENABLE OUT
6 V OUT
7
8 +15 V
9
10
11 SOLENOID OUT
12 SOLENOID IN
13 +5 V
14 OVERLOAD OUT
15 CURRENT SENSE
16 X OUT
17 X IN
18 Y OUT
19 Y IN
20 Z OUT
21 Z IN
22 LOGIC GROUND



CONTROL BOARD

COMPONENT LAYOUT



DRILL ENABLE CIRCUIT

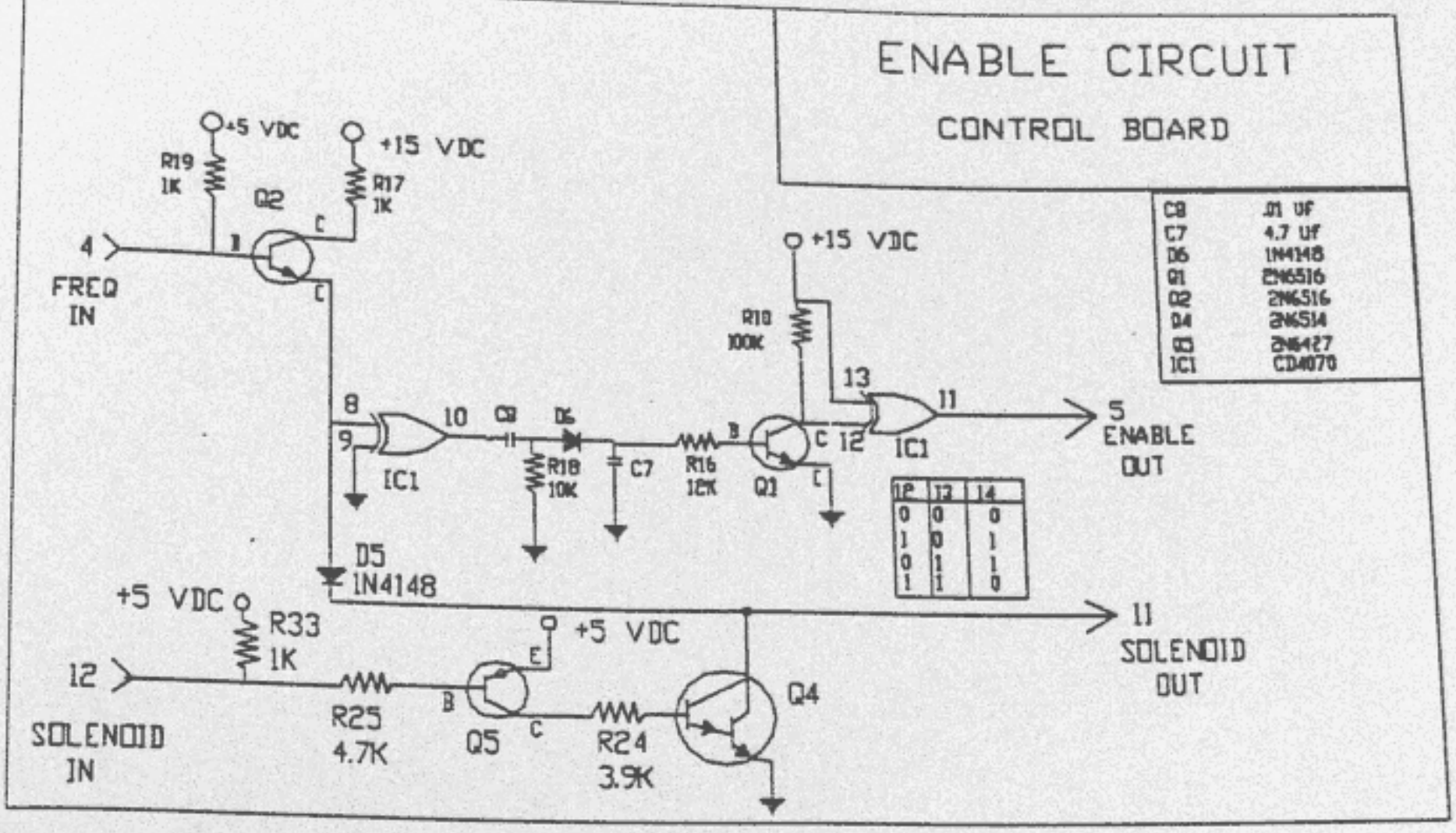


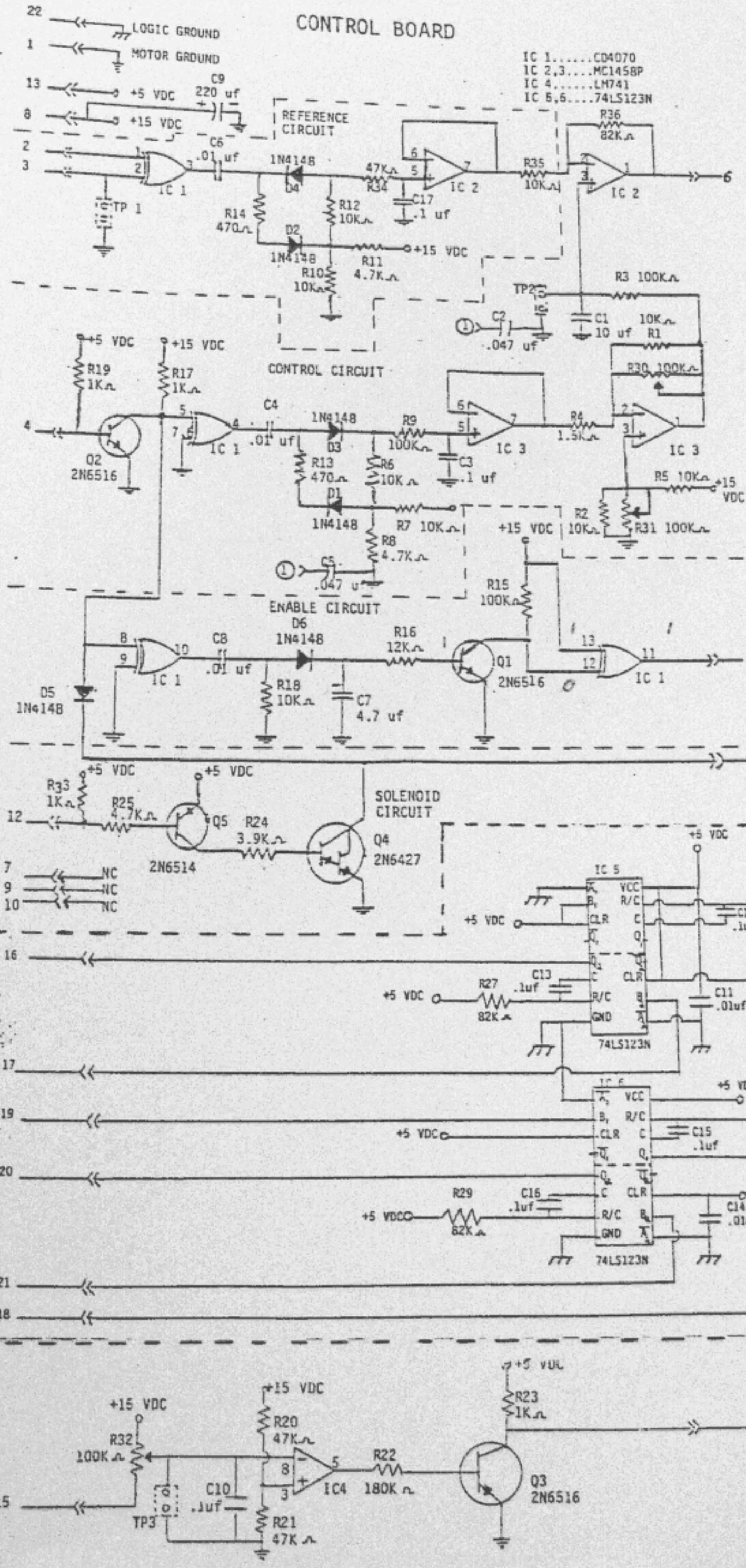
FIGURE 5

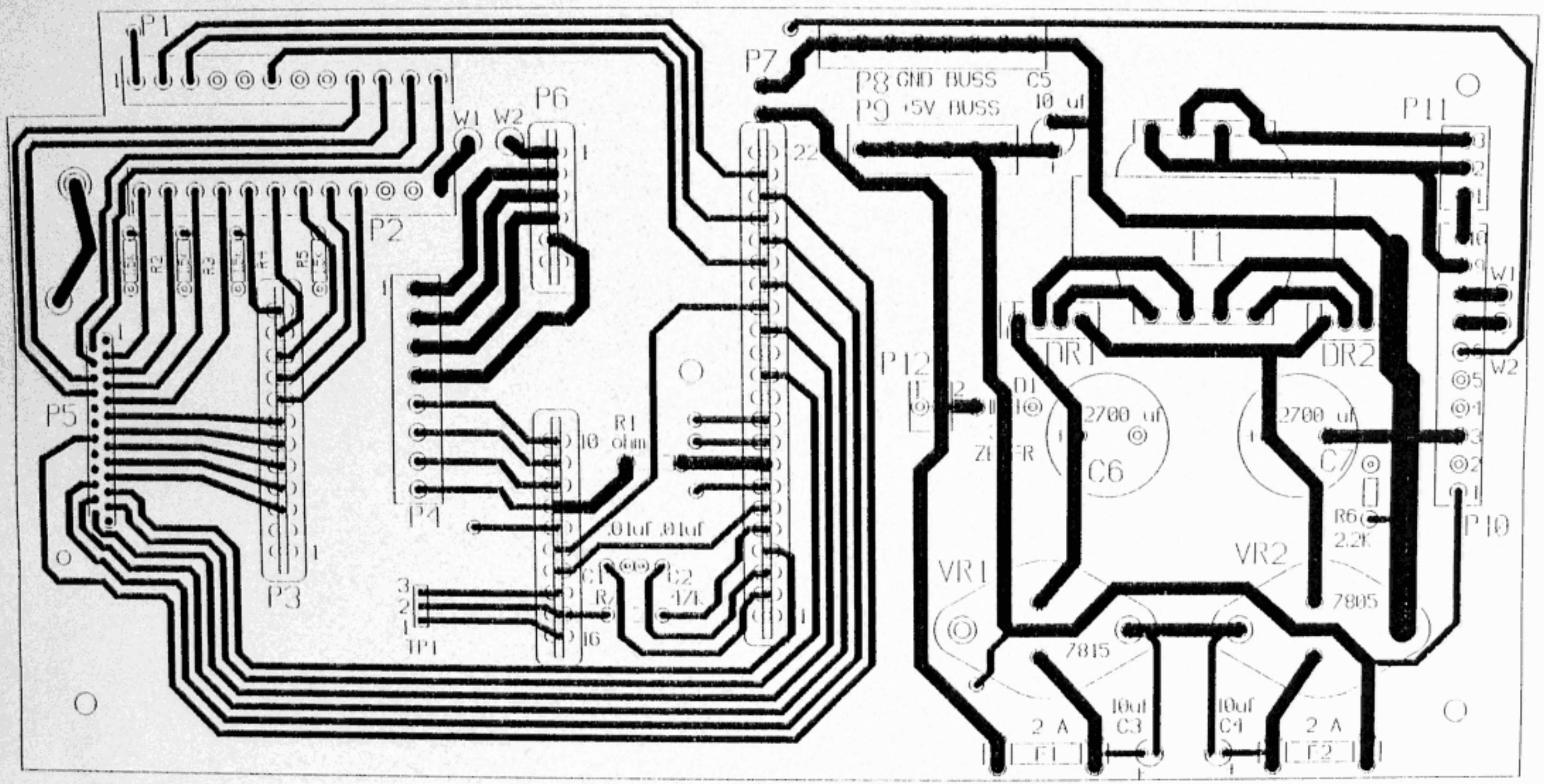
SWITCH POSITION	CONTROL BOARD PIN 12	CONTROL BOARD PIN 11	CONTROL BOARD PIN 5		SOLENOIDE
SWITCH ON	+5 VDC	+15 VDC	+15 VDC F-IN	0 VDC NO F	24 VDC
SWITCH OFF	0 VDC	.75 VDC	0 VDC F-IN	0 VDC NO F	14.3 VDC
	AIR TO SPINDLE	COLLET	LAMP		SOLENOIDE
SWITCH ON SWITCH OFF	CLAER LINE ORANGE LINE	CLOSED OPEN	ON OFF		DISABLED ENABLED
COLLET SWITCH	SWITCH ON — LAMP ON SWITCH OFF — LAMP OFF				

FIGURE 6

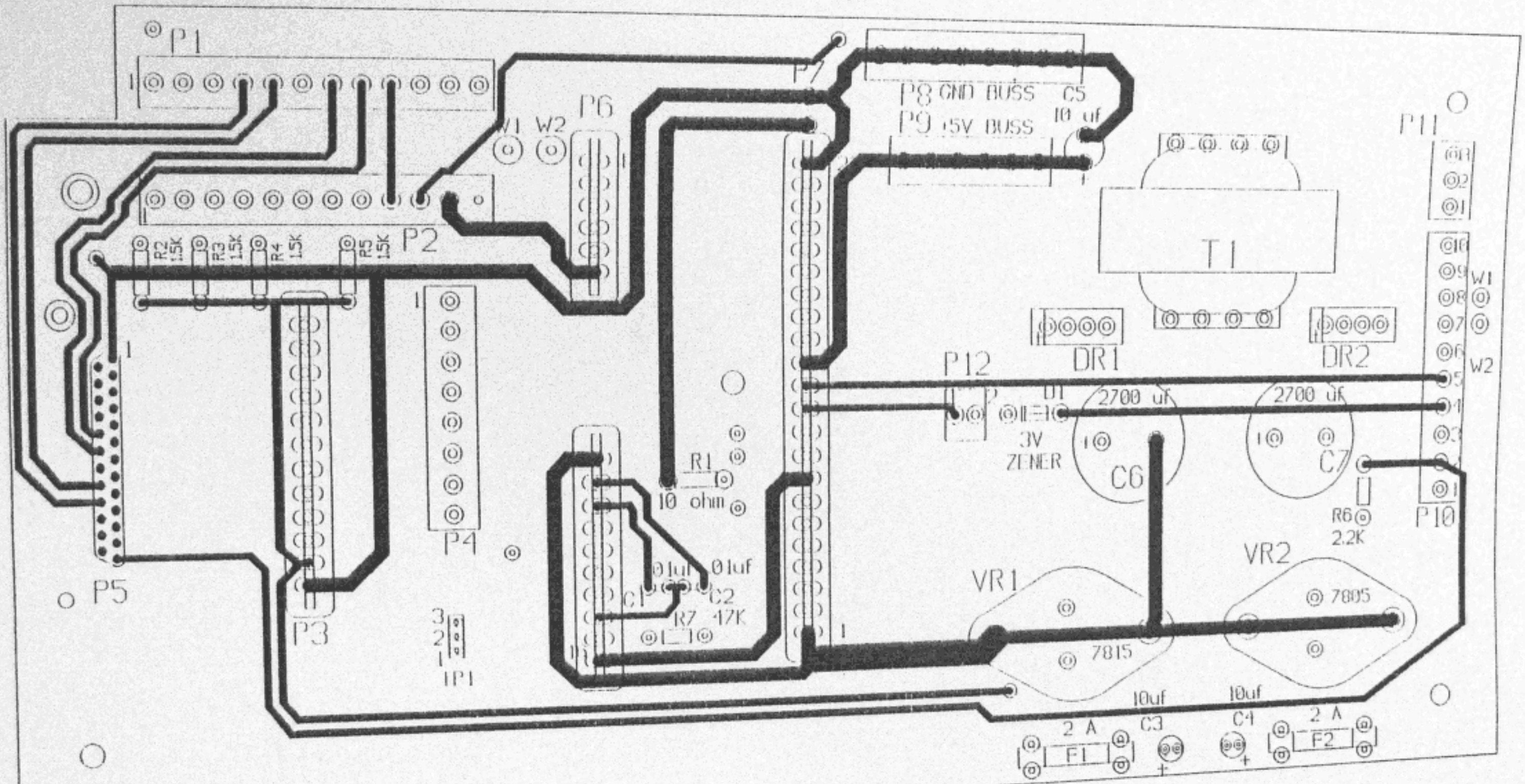
1 MOTOR GROUND
2 SENSOR A (WHITE)
3 SENSOR B (BLACK)
4 FREQUENCY IN
5 ENABLE OUT
6 V OUT
7
8 +15 VDC
9
10
11 SOLENOID OUT
12 SOLENOID IN
13 +5 VDC
14 OVERLOAD OUT
15 CURRENT SENSE
16 X OUT
17 X IN
18 Y OUT
19 Y IN
20 Z OUT
21 Z IN
22 LOGIC GROUND

CONTROL BOARD





Mother Board-18 Component Side



Mother Board-18 Solder Side

Mother Board-18

Plug Assignments

Key Locations

P1 Not Used

P2 Spindle Power In

P3 Jumper

P4 Drill Motor

P5 Frequency In

P6 Drill Driver Board

P7 Control Board

P8 GROUND Bus

P9 + 5V Bus

P10 Not Used

P11 AC Harness

P12 Not Used

P13 Test Point

JOHN BELL / DB CONNECTOR WIRING

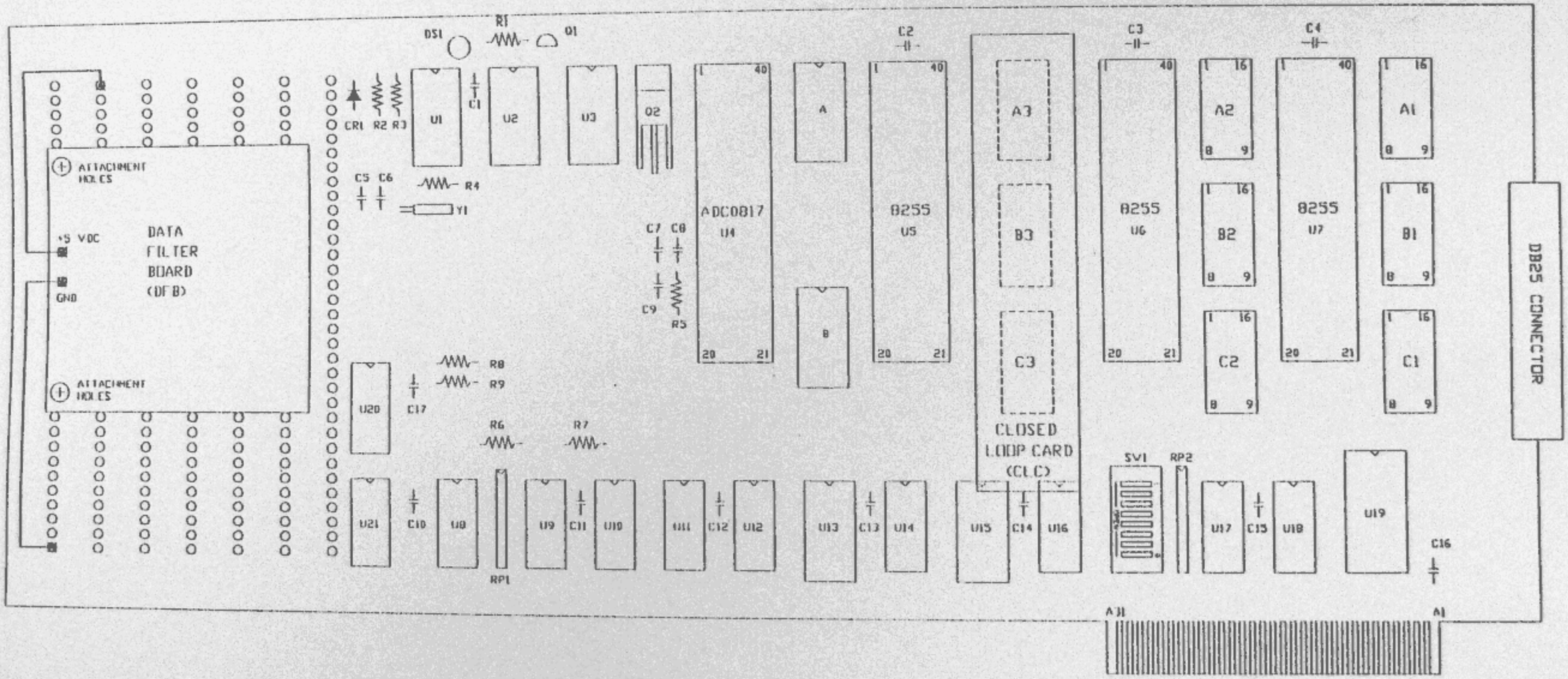
DB25 FEMALE	JOHN BELL PINOUTS	IN/OUT	SIGNAL NAME
1	A1-12	OUT	GROUND
2	A2-1	OUT	P CLK
3	A2-2	OUT	PP DIR
4	C1-1	OUT	Z CLK
5	C1-2	OUT	Z DIR
6	B1-1	OUT	Y CLK
7	B1-2	OUT	Y DIR
8	A1-1	OUT	X CLK
9	A1-2	OUT	X DIR
10	B2-1	OUT	HW ENABLE
11	DFB VIOLET (IC P12)	OUT	SPINDLE FREQ
12	B2-2**	OUT	SOLENOID
13	DFB GRAY (IC P1)	IN	MACHINE PAUSE IN
14	C2-7	IN	X FLAG
15	C2-5	IN	Y FLAG
16	C2-3	IN	Z FLAG
17	C2-1	IN	PP FLAG/FOOT SWITCH
18	DFB ORANGE (IC P5)	IN	XA
19	DFB YELLOW (IC P3)	IN	XB
20	C2-8	IN	X INDEX
21	DFB GREEN (IC P11)	IN	YA
22	DFB BLUE (IC P9)	IN	YB
23	C2-6	IN	Y INDEX
24	C2-4	IN	Z INDEX
25	N/C		

NOTES:

1. DB25 FEMALE CONNECTOR - PART NUMBER: 132-1007-000
2. 16 PIN IC PLUG CONNECTORS - PART NUMBER: 132-1006-000
3. ** A 1N4148 DIODE (PART NUMBER: 164-1001-000) IS INSTALLED IN LINE FROM DB25 P12 TO B2-2

JOHN BELL BOARD

COMPONENT LAYOUUT



7/94 LSH

FILE JOHNBELL.SKD

JOHN BELL INSTALLATION INSTRUCTIONS

1. REMOVE COMPUTER COVER
2. LOCATE AVAILABLE SLOT
3. INSERT JOHN BELL CARD
4. CONNECT GROUND STRAP TO RF PLATE
5. LOCATE SPEAKER PORT ON CPU MOTHER BOARD
   WHICH IS USUALLY A FOUR PIN CONNECTOR
6. DISCONNECT SPEAKER
7. DETERMINE WHICH PIN IS SIGNAL AND WHICH IS +5 VDC
8. PIN 1 OF THE 4x1 AMP CONNECTOR (SEE FIG. BELOW)
   CONNECTS TO THE SIGNAL PIN
   THE AMP CONNECTOR IS KEYED SO THE PIN NEXT TO
   THE SIGNAL PIN MUST BE CUT

7/94 LCH

GENERAL WIRING DIAGRAMS

ELECTRONIC SHELF and ANAHEIM DRIVER PACK

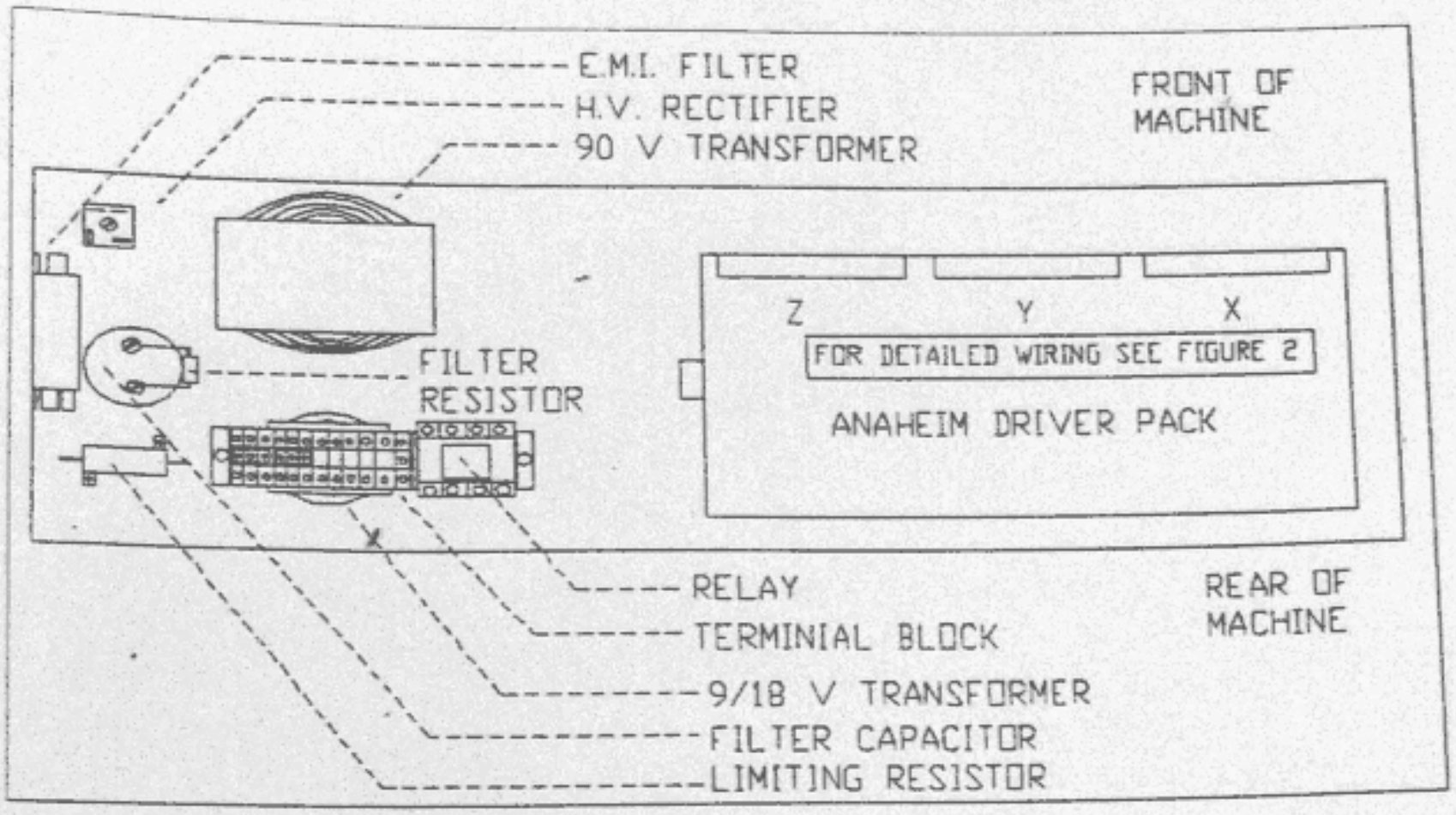


FIGURE 1

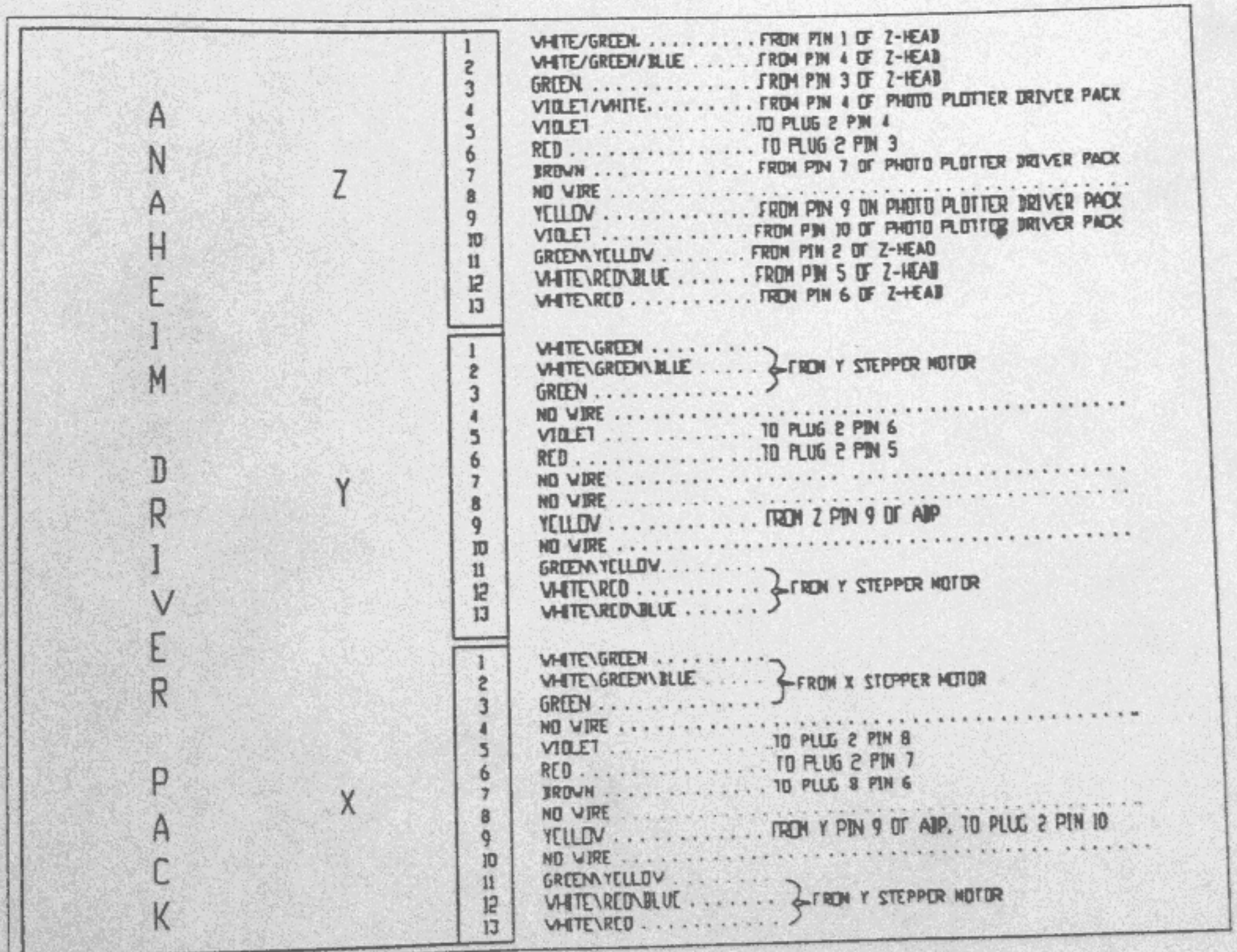


FIGURE 2

GENERAL WIRING DIAGRAMS

STARTING WITH MACHINE #1127

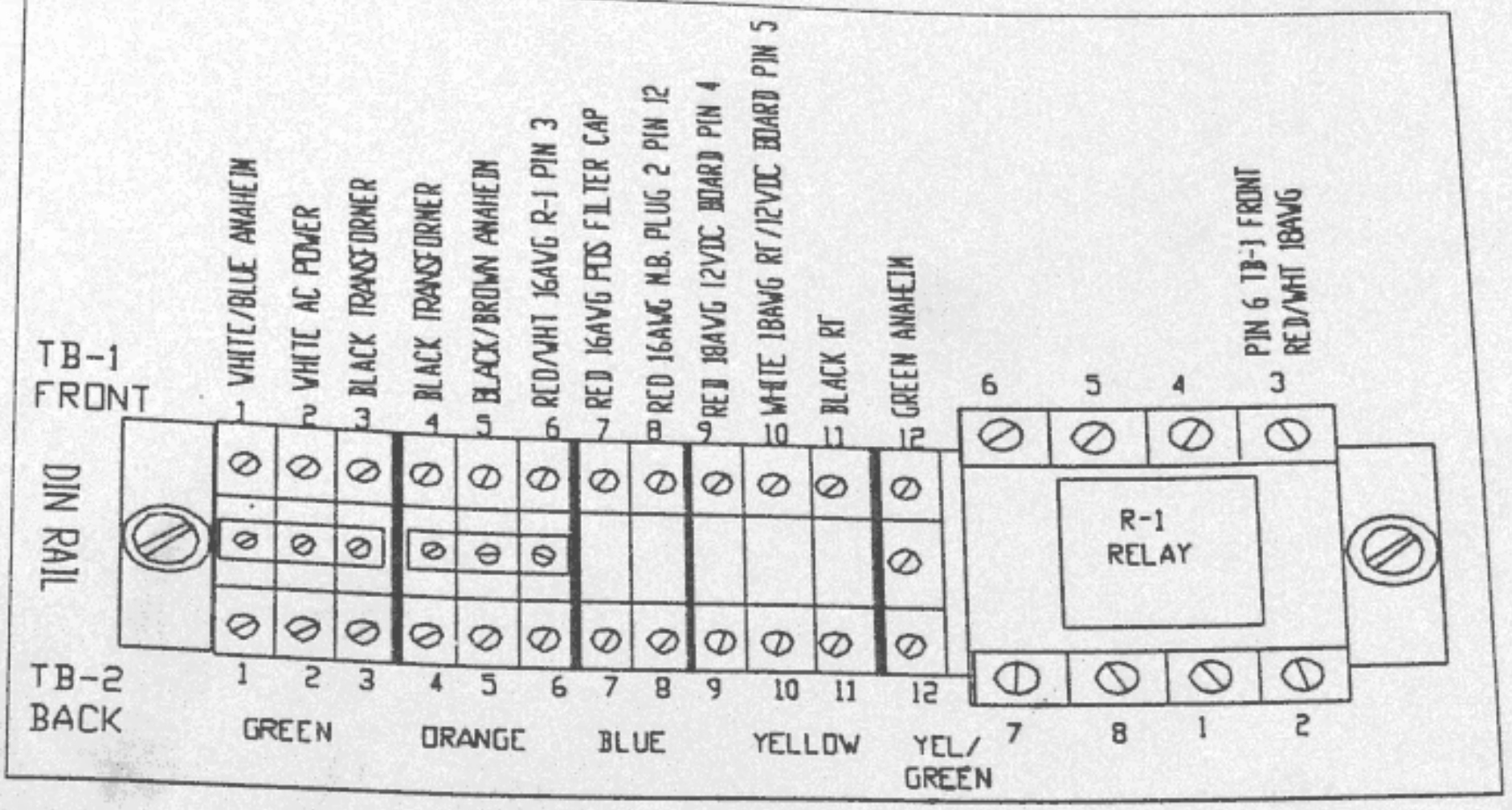


FIGURE 3

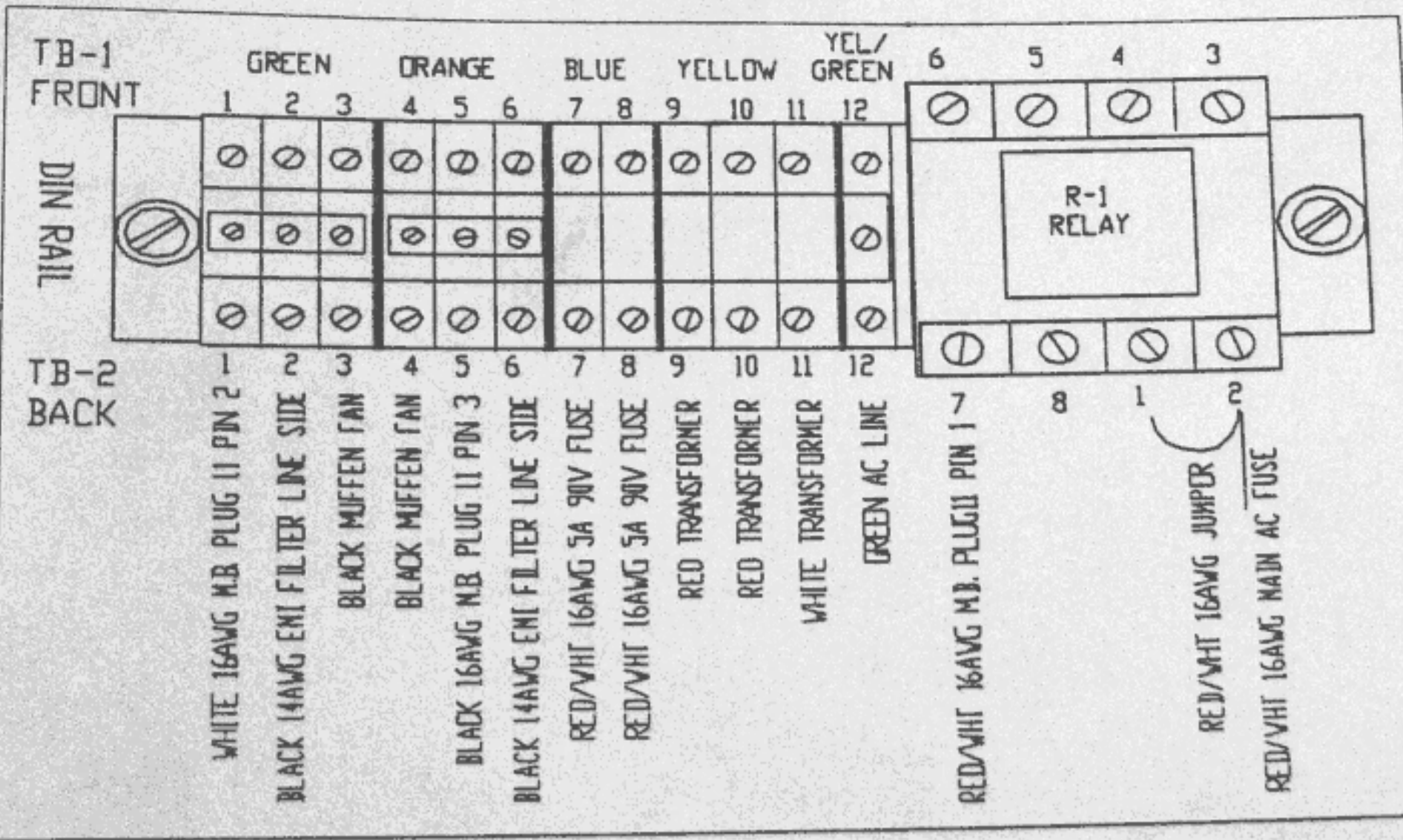


FIGURE 4

GENERAL WIRING DIAGRAMS

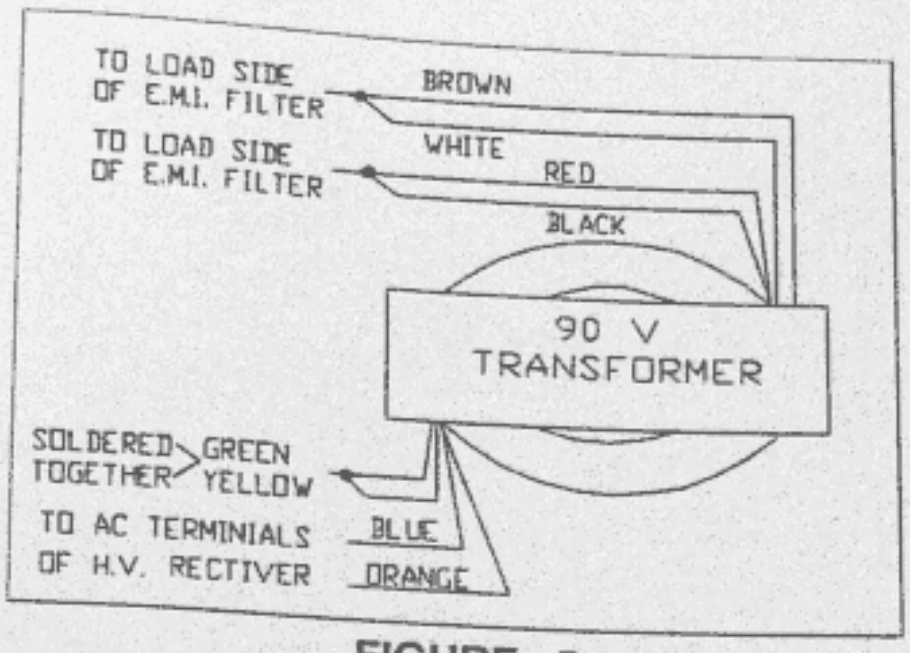


FIGURE 5

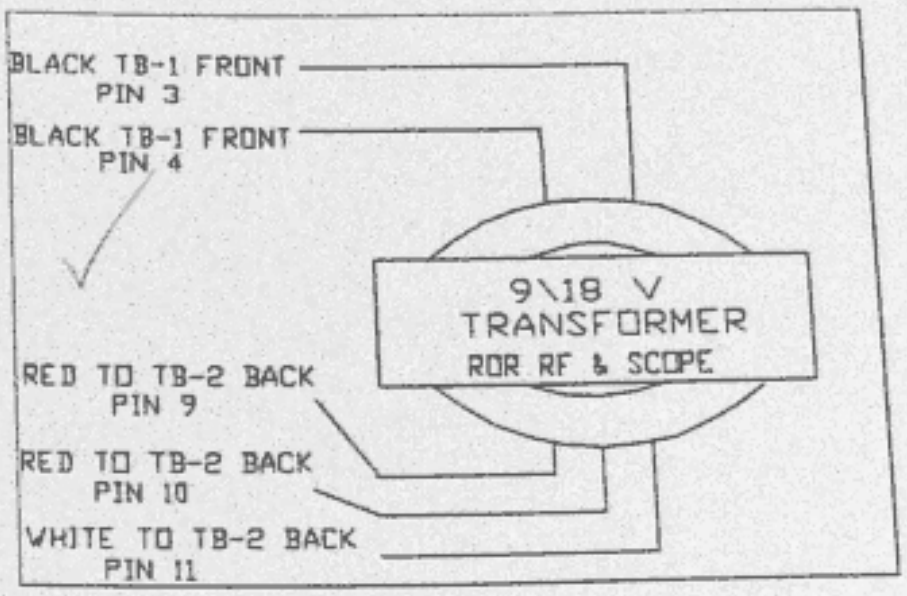


FIGURE 6

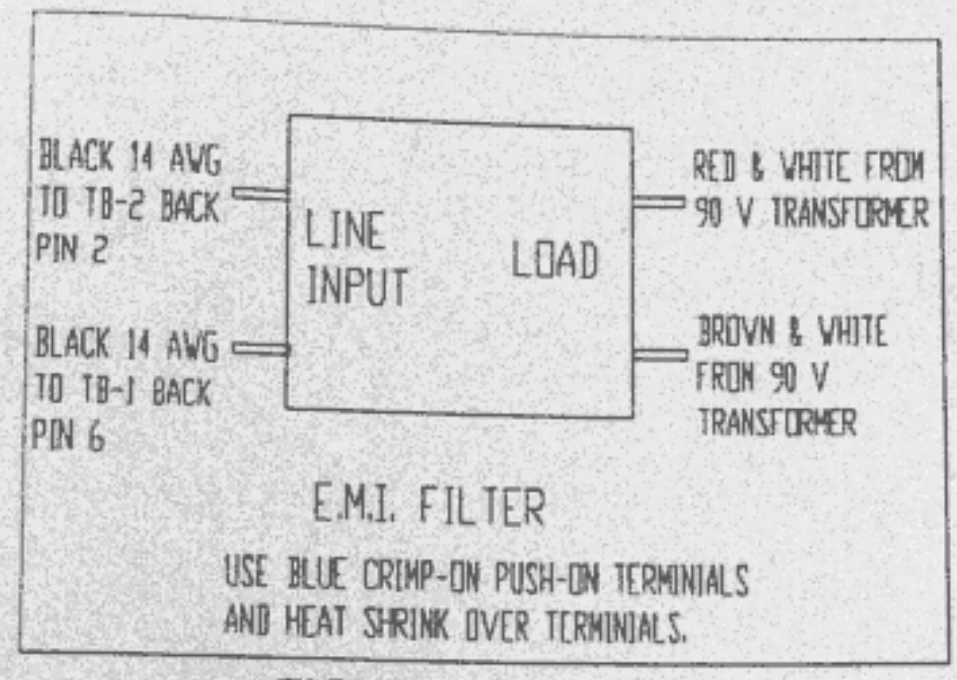


FIGURE 7

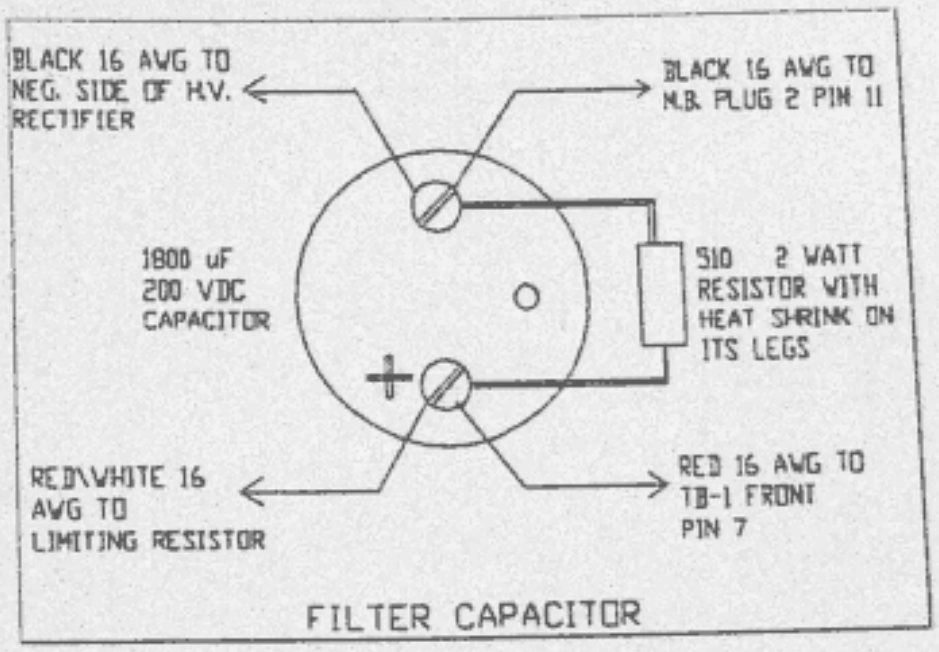


FIGURE 8

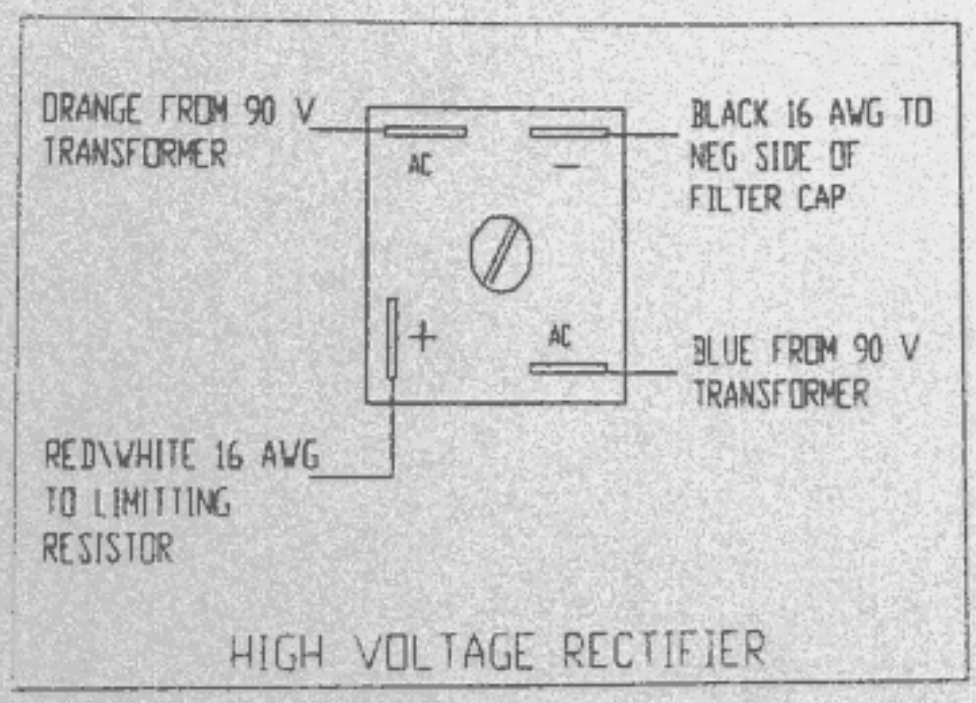


FIGURE 9

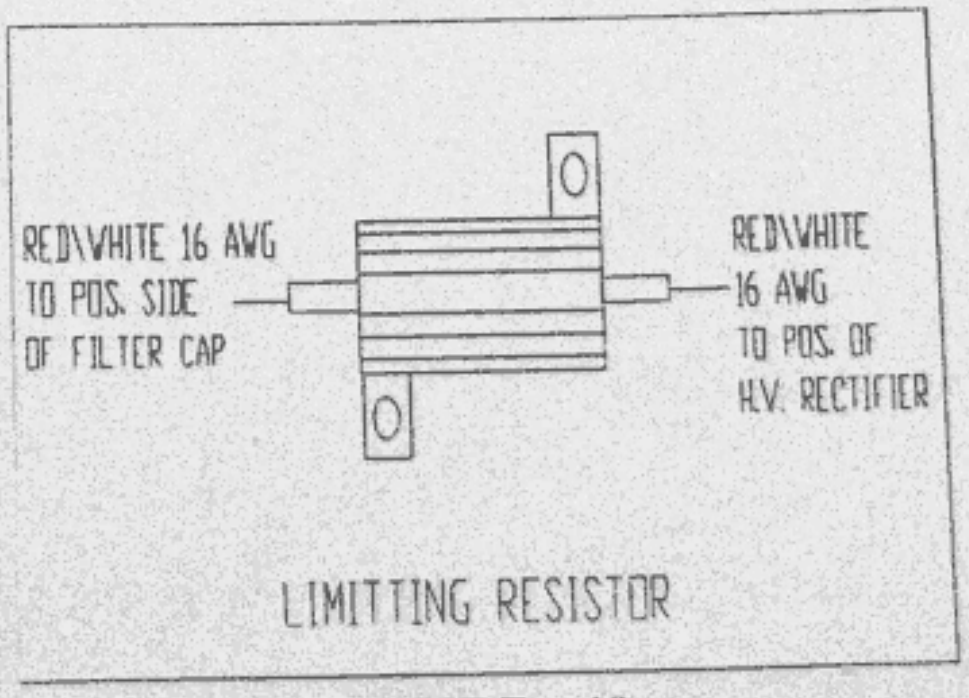


FIGURE 10

GENERAL WIRING DIAGRAMS

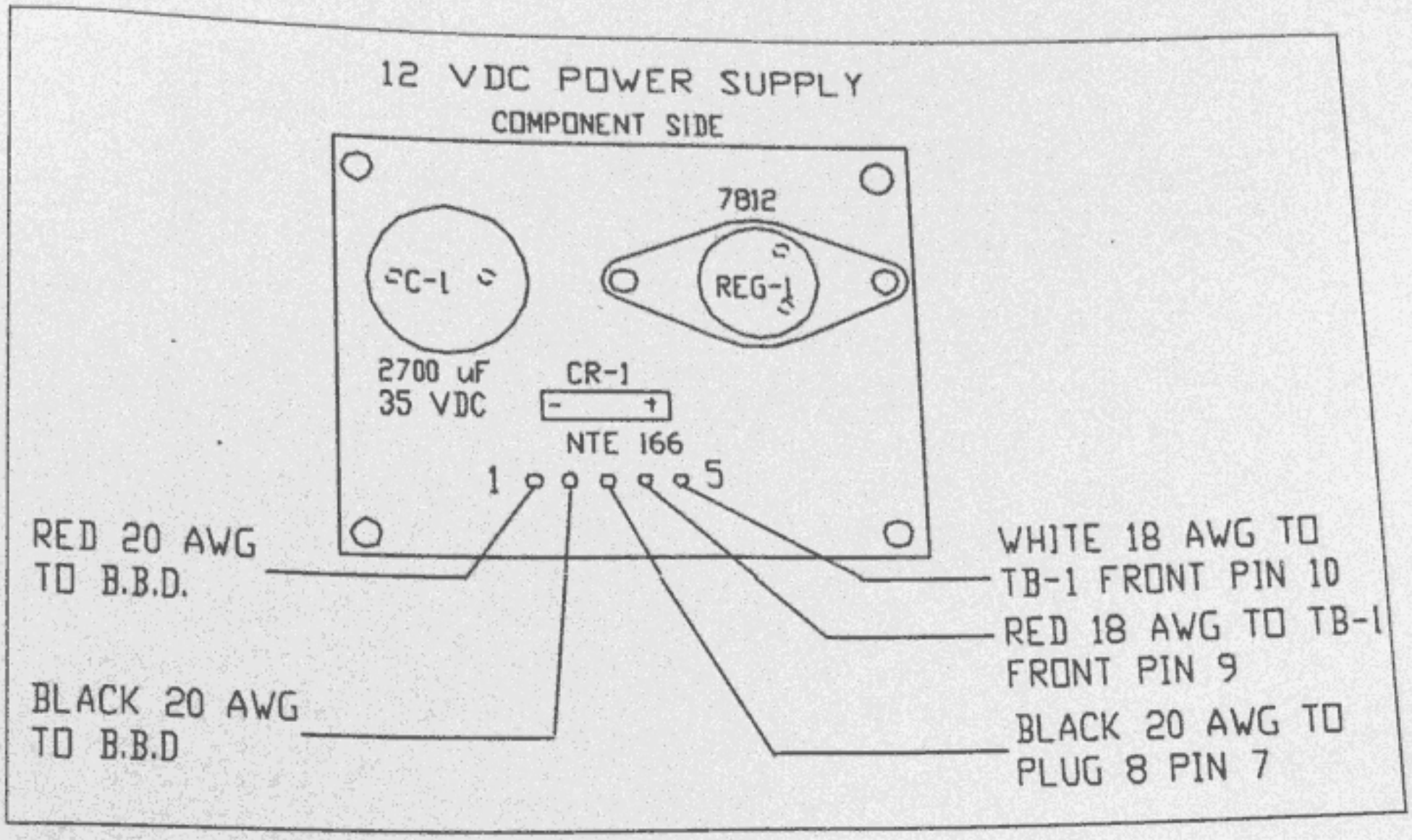


FIGURE 11

FIGURE 12

GENERAL WIRING DIAGRAMS

PLUG 1 REAR HARNESS

1 N\A
2 **FROM** X ENCODER *(4 CONDUCTOR SHIELDED CABLE)* 26 GAUGE GREEN
3 **FROM** Y ENCODER *(4 CONDUCTOR SHIELDED CABLE)* 26 GAUGE GREEN
4 **FROM** Y ENCODER *(4 CONDUCTOR SHIELDED CABLE)* 26 GAUGE BLACK
5 **FROM** Y ENCODER *(4 CONDUCTOR SHIELDED CABLE)* 26 GAUGE WHITE
6 **FROM** Z-DISK EMT\DET *(4 CONDUCTOR SHIELDED CABLE)* 26 GAUGE BLACK
7 **FROM** X ENCODER *(4 CONDUCTOR SHIELDED CABLE)* 26 GAUGE BLACK
8 **FROM** X ENCODER *(4 CONDUCTOR SHIELDED CABLE)* 26 GAUGE WHITE
9 **FROM** PHOTO PLOTTER EMT\DET PVC 26 GAUGE YELLOW
10 **FROM** Z FLAG EMT\DET *(3 CONDUCTOR SHIELDED CABLE)* 26 GAUGE WHITE
11 **FROM** Y FLAG EMT\DET PVC 26 GAUGE YELLOW
12 **FROM** X FLAG EMT\DET PVC 26 GAUGE YELLOW

PLUG 2 FRONT HARNESS

1 **FROM** PHOTO PLOTTER DRIVER PACK PIN 6 PVC 20 GAUGE RED
2 **FROM** PHOTO PLOTTER DRIVER PACK PIN 5 PVC 20 GAUGE VIOLET
3 **FROM** ANAHEIM DRIVER PACK Z-AXIS PIN 6 PVC 20 GAUGE RED
4 **FROM** ANAHEIM DRIVER PACK Z-AXIS PIN 5 PVC 20 GAUGE VIOLET
5 **FROM** ANAHEIM DRIVER PACK Y-AXIS PIN 6 PVC 20 GAUGE RED
6 **FROM** ANAHEIM DRIVER PACK Y-AXIS PIN 5 PVC 20 GAUGE VIOLET
7 **FROM** ANAHEIM DRIVER PACK X-AXIS PIN 6 PVC 20 GAUGE RED
8 **FROM** ANAHEIM DRIVER PACK X-AXIS PIN 5 PVC 20 GAUGE VIOLET
9 N\A
10 **FROM** X,Y,Z, & P.P.D.P. PINS 9 PVC 20 GAUGE YELLOW
11 **FROM** NEG SIDE OF FILTER CAPACITOR PVC 18 GAUGE BLACK
12 **FROM** TB-1 FRONT PIN 8 PVC 18 GAUGE RED

PLUG 4 DRILL MOTOR

1 **FROM** DRILL PLUG (FEMALE) PIN 1 PVC 20 GAUGE BROWN
2 **FROM** DRILL PLUG (FEMALE) PIN 4 PVC 20 GAUGE YELLOW
3 **FROM** DRILL PLUG (FEMALE) PIN 3 PVC 20 GAUGE ORANGE
4 **FROM** DRILL PLUG (FEMALE) PIN 2 PVC 20 GAUGE RED
5 **FROM** DRILL PLUG (FEMALE) PIN 8 *(3 CONDUCTOR SHIELDED CABLE)* 26 GAUGE SHIELD
6 **FROM** DRILL PLUG (FEMALE) PIN 6 *(3 CONDUCTOR SHIELDED CABLE)* 26 GAUGE BLACK
7 **FROM** DRILL PLUG (FEMALE) PIN 5 *(3 CONDUCTOR SHIELDED CABLE)* 26 GAUGE WHITE
8 **FROM** DRILL PLUG (FEMALE) PIN 7 *(3 CONDUCTOR SSHIELDED CABLE)* 26 GAUGE RED

PLUG 8 GROUND BUSS

1 **FROM** X-AXIS EMT\DET PLUG 20 PIN 2 PVC 26 GAUGE BROWN
2 **FROM** Y-AXIS EMT\DET PLUG 23 PIN 2 PVC 26 GAUGE BROWN
3 **FROM** Z ENCODER PLUG 17 PIN 14 *(4 CONDUCTOR SHIELDED CABLE)* SHIELD
4 **FROM** X ENCODER PLUG 19 PIN 1 *(4 CONDUCTOR SHIELDED CABLE)* SHIELD
5 **FROM** Y ENCODER PLUG 22 PIN 1 (*4 CONDUCTOR SHIELDED CABLE*) SHIELD
6 **FROM** ANAHEIM DRIVER PACK X-AXIS PIN 7 PVC 20 GAUGE BROWN
7 **FROM** PHOTOPLOTTER EMT\DET PLUG 15 PIN 9 PVC 20 GAUGE BROWN
8 **FROM** DRILL BODY GROUND PLUG 14 PIN 9 PVC 20 GAUGE BROWN

GENERAL WIRING DIAGRAMS

PLUG 9 + 5 VDC POWER BUSS

1 **FROM** X-AXIS EMT\DET PLUG 20 PINS 1 & 5 PVC 26 GAUGE YELLOW
2 **FROM** Y-AXIS EMT\DET PLUG 23 PINS 1 & 5 PVC 26 GAUGE VIOLET
3 **FROM** Z-AXIS EMT\DET PLUG 17 PIN 10 PVC 26 GAUGE RED
4 **FROM** X ENCODER PLUG 19 PIN 2 (*4 CONDUCTOR SHIELDED CABLE*) 26 GAUGE RED
5 **FROM** Y ENCODER PLUG 22 PIN 2 (*4 CONDUCTOR SHIELDED CABLE*) 26 GAUGE RED
6 **FROM** PHOTOPLOTTER EMT\DET PLUG 15 PIN 7 PVC 26 GAUGE VIOLET

PLUG10 FRONT PANEL

1 **FROM** FRONT PANEL MACHINE PAUSE SWITCH PVC 20 GAUGE WHITE
2 **FROM** FRONT PANEL MACHINE PAUSE SWITCH PVC 20 GAUGE WHITE
3 **FROM** FRONT PANEL GROUND PVC 20 GAUGE BLACK
4 **FROM** FRONT PANEL 15 VDC PVC 20 GAUGE RED
5 **FROM** FRONT PANEL COLLET SWITCH PVC 20 GAUGE WHITE
6 **FROM** FRONT PANEL AXIS MOTOR SWITCH PVC 20 GAUGE WHITE
7 **FROM** FRONT PANEL AMP METER PVC 18 GAUGE RED\WHITE
8 **FROM** FRONT PANEL AMP METER PVC 18 GAUGE RED\WHITE
9 **FROM** FRONT PANEL POWER SWITCH PVC 20 GAUGE WHITE
10 **FROM** FRONT PANEL POWER SWITCH PVC 20 GAUGE WHITE

PLUG 11 AC VOLTAGE HARNESS

1 **FROM** POWER SUPPLY BUSS RELAY PIN 7 PVC 16 GAUGE RED\WHITE
2 **FROM** POWER SUPPLY BUSS TB-2 (BACK) PIN 1 PVC 16 GAUGE WHITE
3 **FROM** POWER SUPPLY BUSS TB-2 (BACK) PIN 5 PVC 16 GAUGE BLACK

PLUG 12 SOLENOID

1 **FROM** SOLENOID PVC 20 GAUGE BLACK
2 **FROM** SOLENOID PVC 20 GAUGE WHITE (*OR BROWN*)

PLUG 5 DB-25 CONTROL CABLE PLUG

PLUG 7 CONTROL BOARD EDGE CONNECTOR

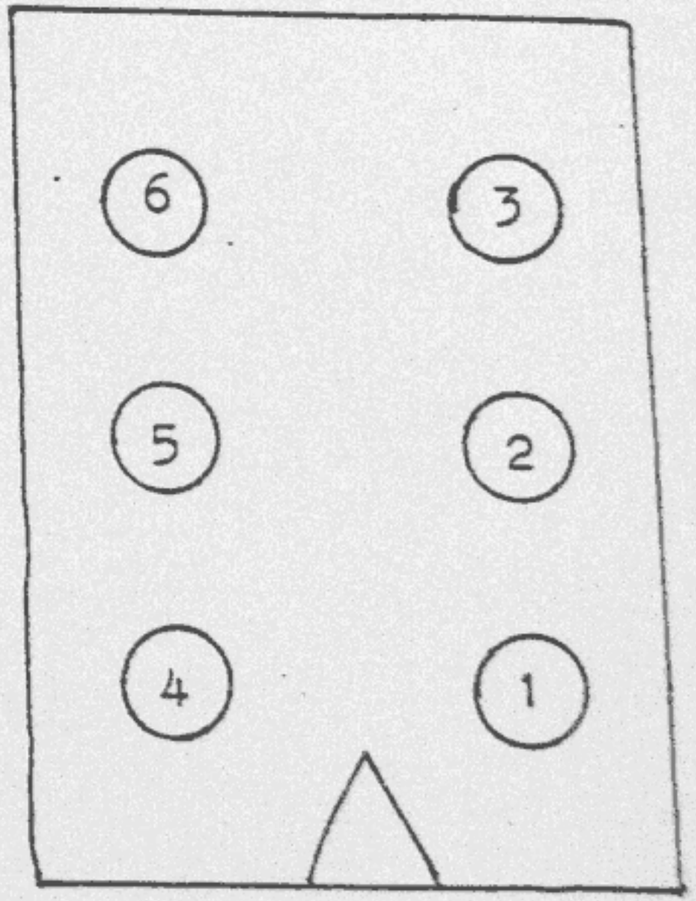
PLUG 6 DRIVER BOARD EDGE CONNECTOR

PLUG 13 TEST POINT

X & Y STEPPER MOTOR HARNESS

Z

PIN #	COLORS
1	WHITE & RED 20 GAUGE PVC
2	GREEN & YELLOW 20 GAUGE PVC
3	WHITE RED & BLUE 20 GAUGE PVC
4	WHITE GREEN & BLUE 20 GAUGE PVC
5	GREEN 20 GAUGE PVC
6	WHITE & GREEN 20 GAUGE PVC

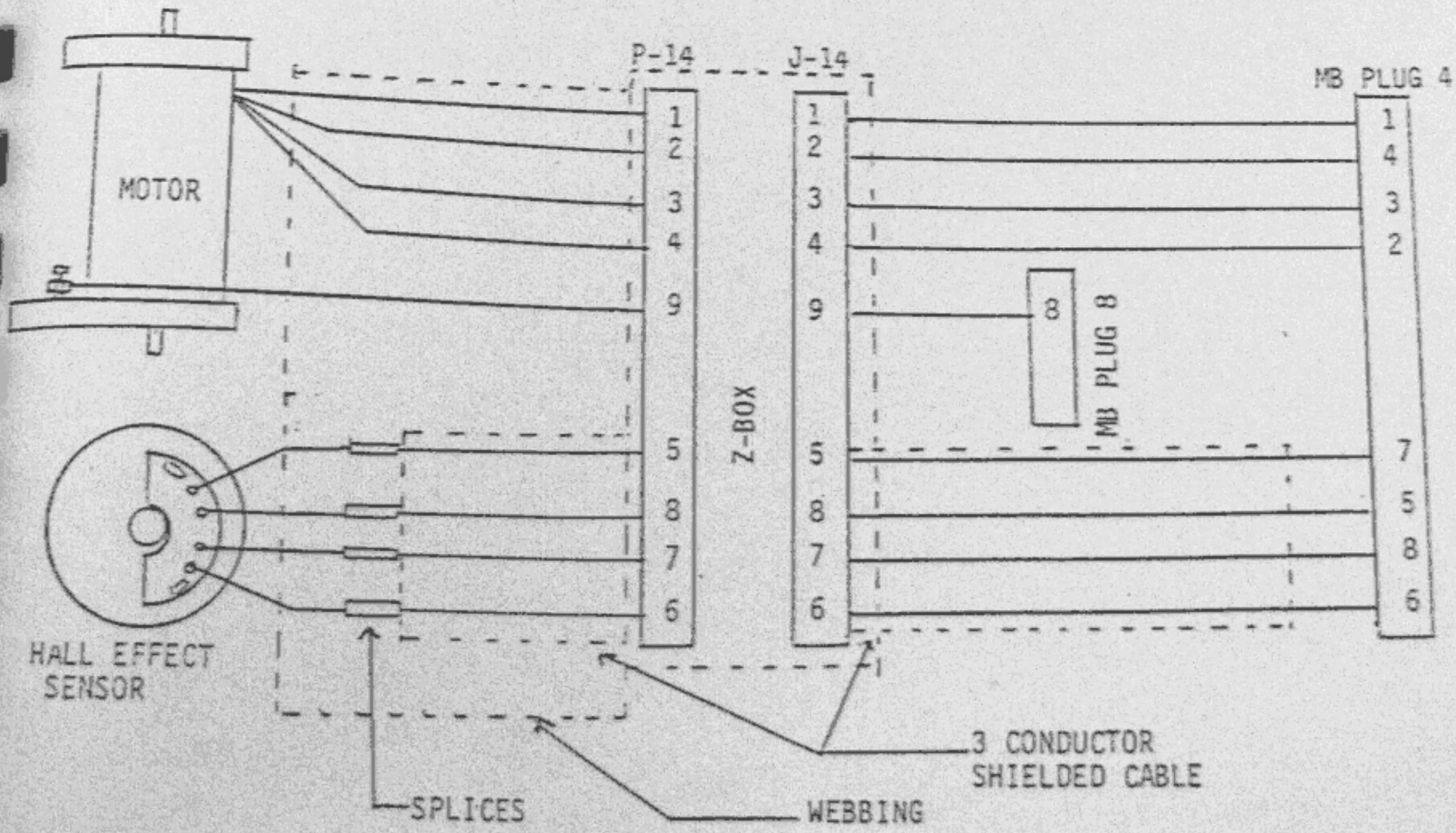


DRILL / ROUTER
J-14
(FROM Z-BOX TO MOTHER BOARD)

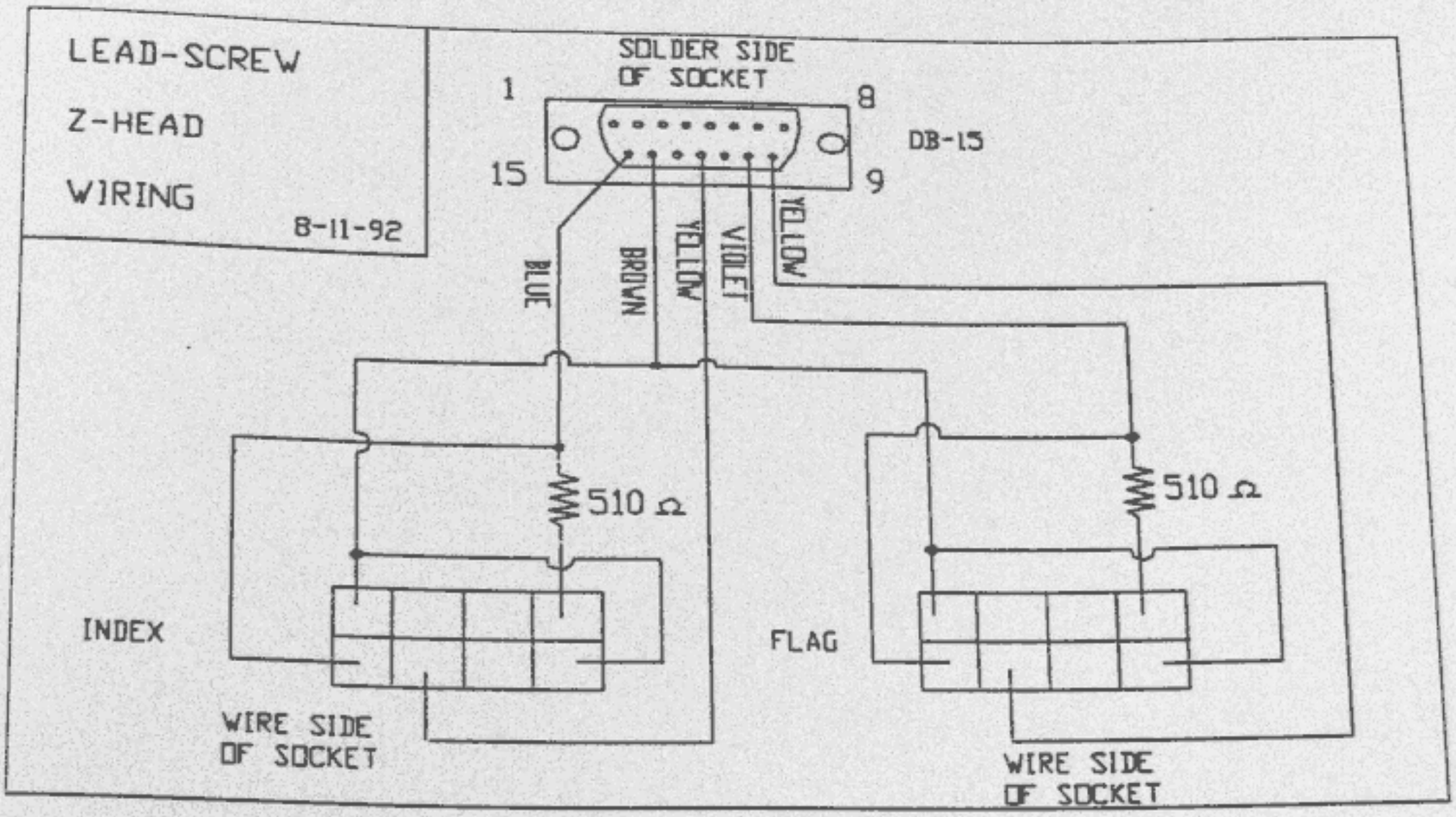
PIN #	COLOR	GAUGE	TYPE	LENGTH	DESTINATION
1	BROWN	22	TWISTED TEFLON	80"	MB PLUG 4, PIN #1
2	RED	22	TWISTED TEFLON	80"	MB PLUG 4, PIN #4
3	ORANGE	22	TWISTED TEFLON	80"	MB PLUG 4, PIN #3
4	YELLOW	22	TWISTED TEFLON	80"	MB PLUG 4, PIN #2
5	WHITE	24	3 CONDUCTOR SHIELDED	80"	MB PLUG 4, PIN #7
6	BLACK	24	3 CONDUCTOR SHIELDED	80"	MB PLUG 4, PIN #6
7	RED	24	3 CONDUCTOR SHIELDED	80"	MB PLUG 4, PIN #8
8	SHIELD	24	3 CONDUCTOR SHIELDED	80"	MB PLUG 4, PIN #5
9	BLACK	22	TWISTED TEFLON	80"	MB PLUG 8, PIN #8

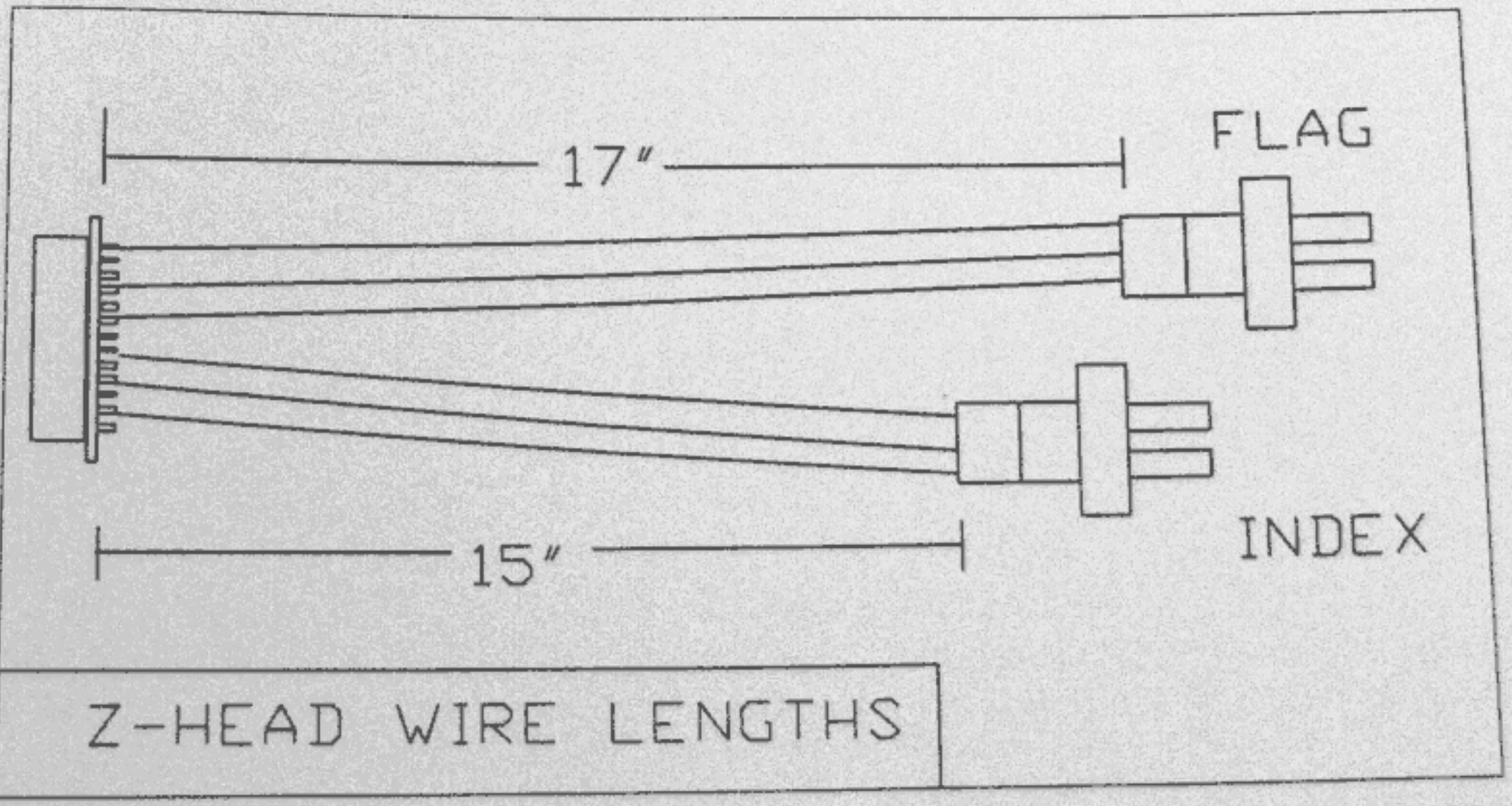
DRILL / ROUTER
P-14
(FROM DRILL/ROUTER TO Z-BOX)

PIN #	COLOR	TYPE	LENGTH	FROM	SIGNAL
1	BROWN	3 CONDUCTOR SHIELDED	17"	MOTOR	01
2	RED	3 CONDUCTOR SHIELDED	17"	MOTOR	02
3	ORANGE	3 CONDUCTOR SHIELDED	17"	MOTOR	03
4	YELLOW	3 CONDUCTOR SHIELDED	17"	MOTOR	04
5	WHITE	22 GAUGE PVC	17"	GRAY WIRE OF HALL EFFECT	SENSOR CH A
6	BLACK		17"	BLUE WIRE OF HALL EFFECT	SENSOR CH B
7	RED		17"	VIOLET WIRE OF HALL EFFECT	SENSOR +
8	SHIELD		17"	BLACK WIRE OF HALL EFFECT	SENSOR -
9	BROWN		17"	MOTOR END CAP	SYSTEM GROUND

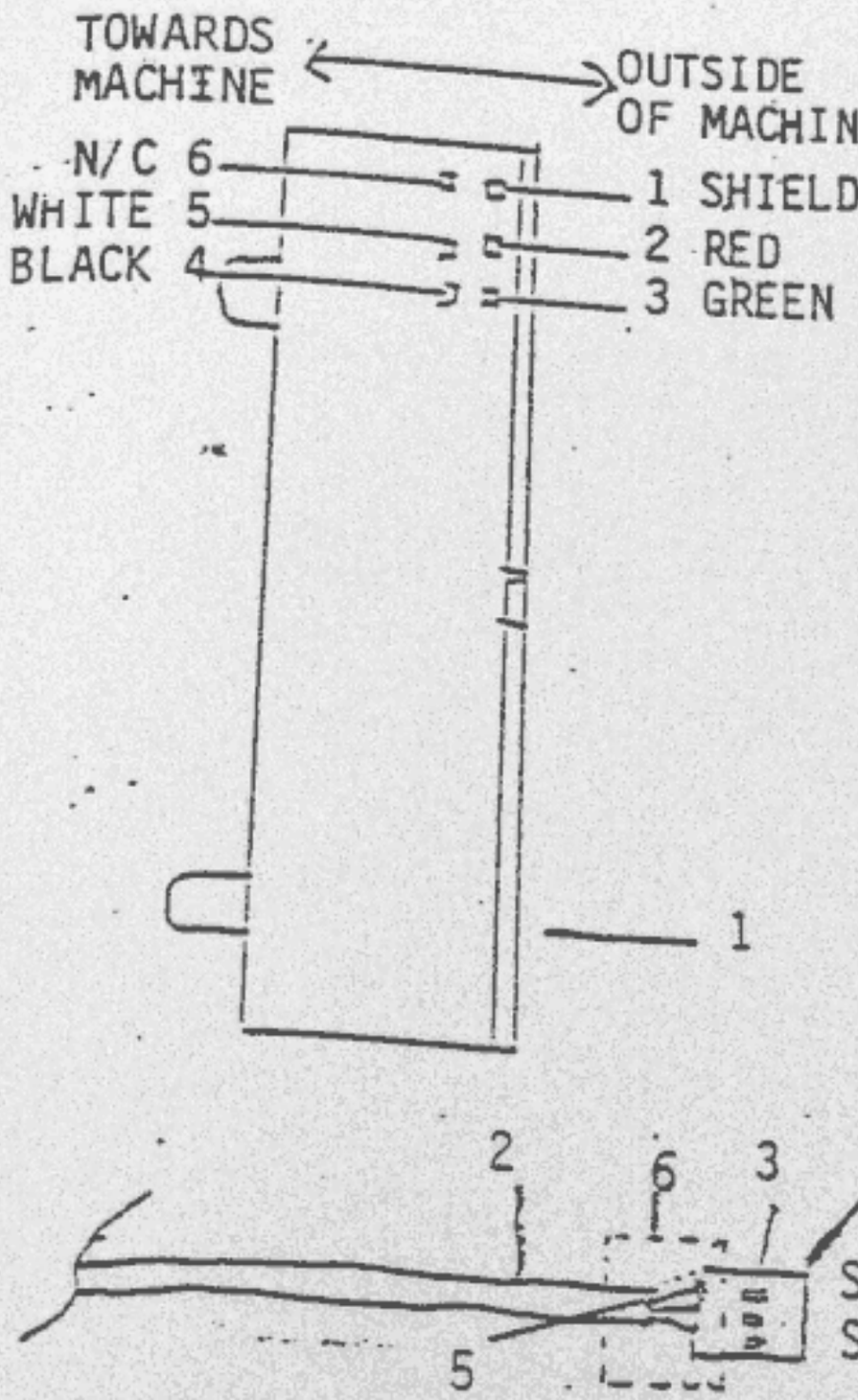


LEAD-SCREW Z-HEAD WIRING

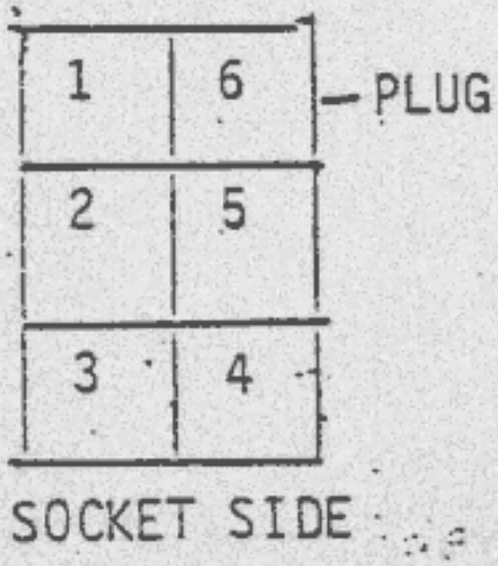


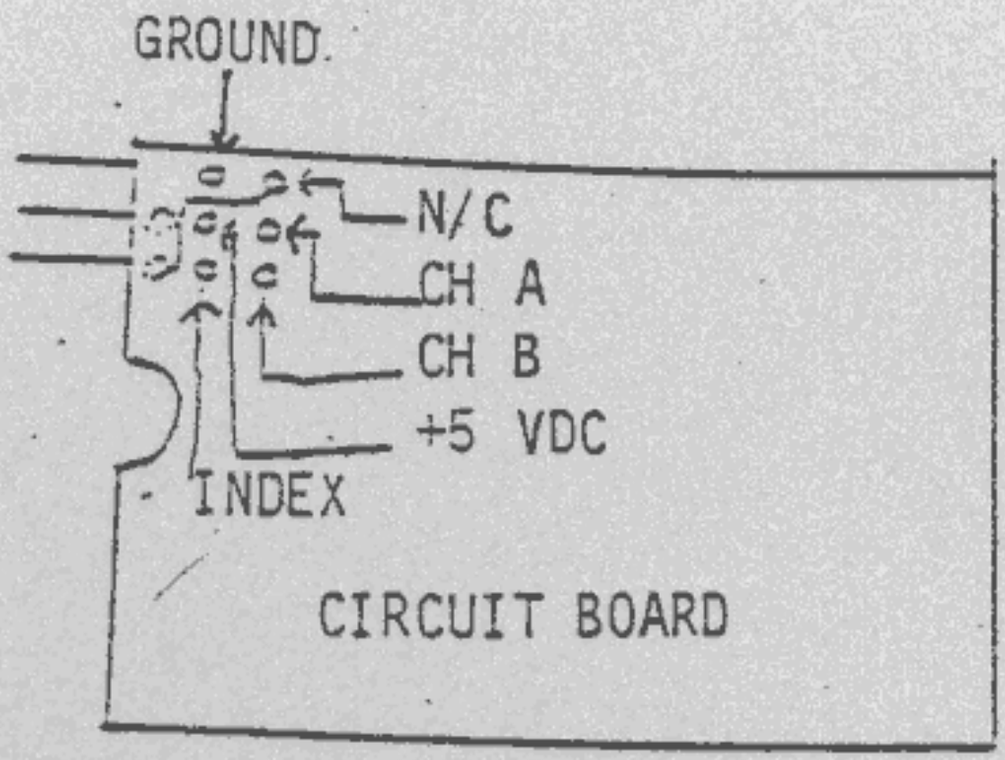


ROTARY ENCODER HARNESS
(730-1009-000)



PIN #	SIGNAL
1	GROUND, 0 VDC-HEATSHRINK
2	+5 VDC
3	INDEX
4	CHANNEL B
5	CHANNEL A
6	N/C





COMPONENT LAYOUT

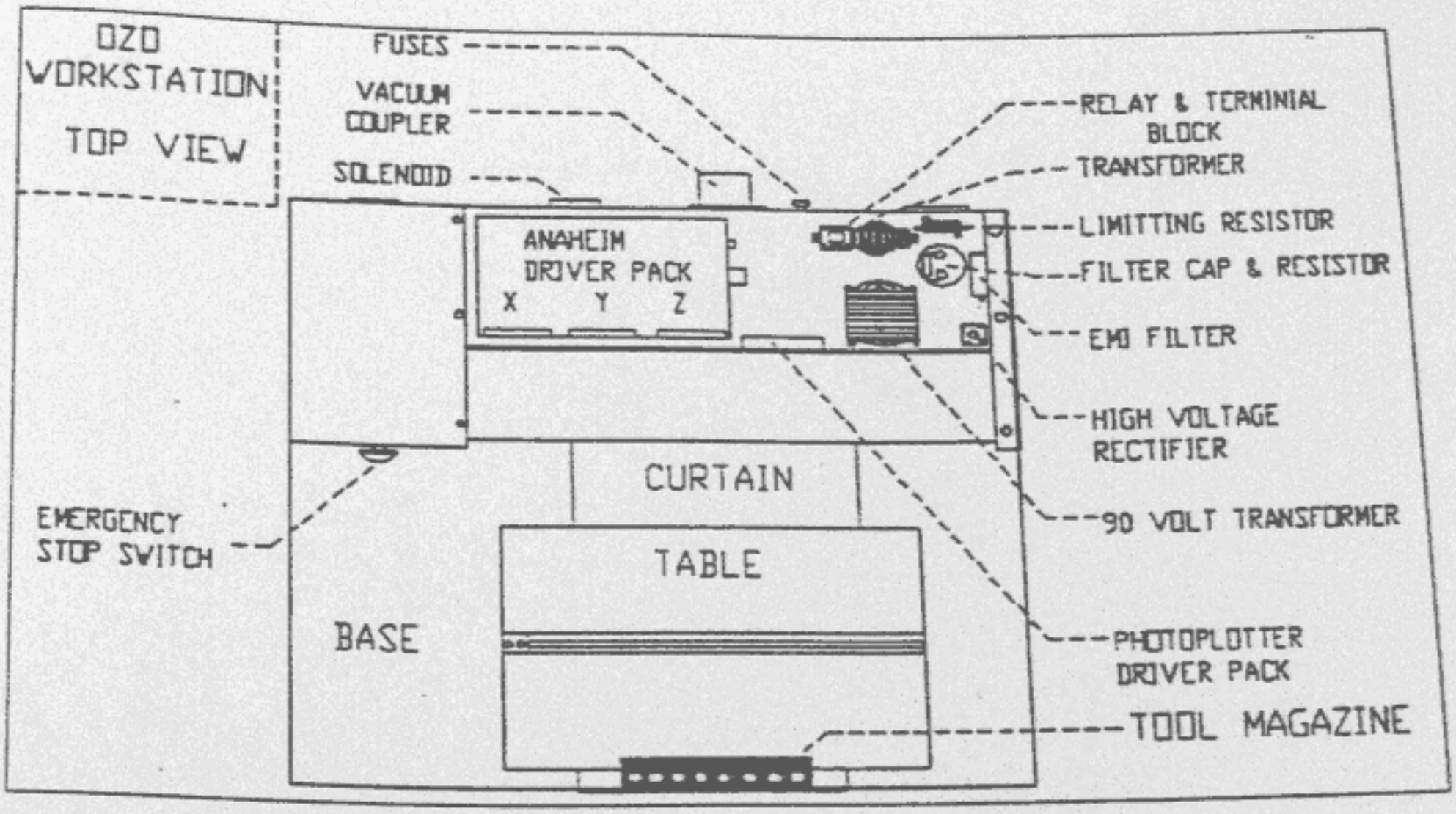


FIGURE 1

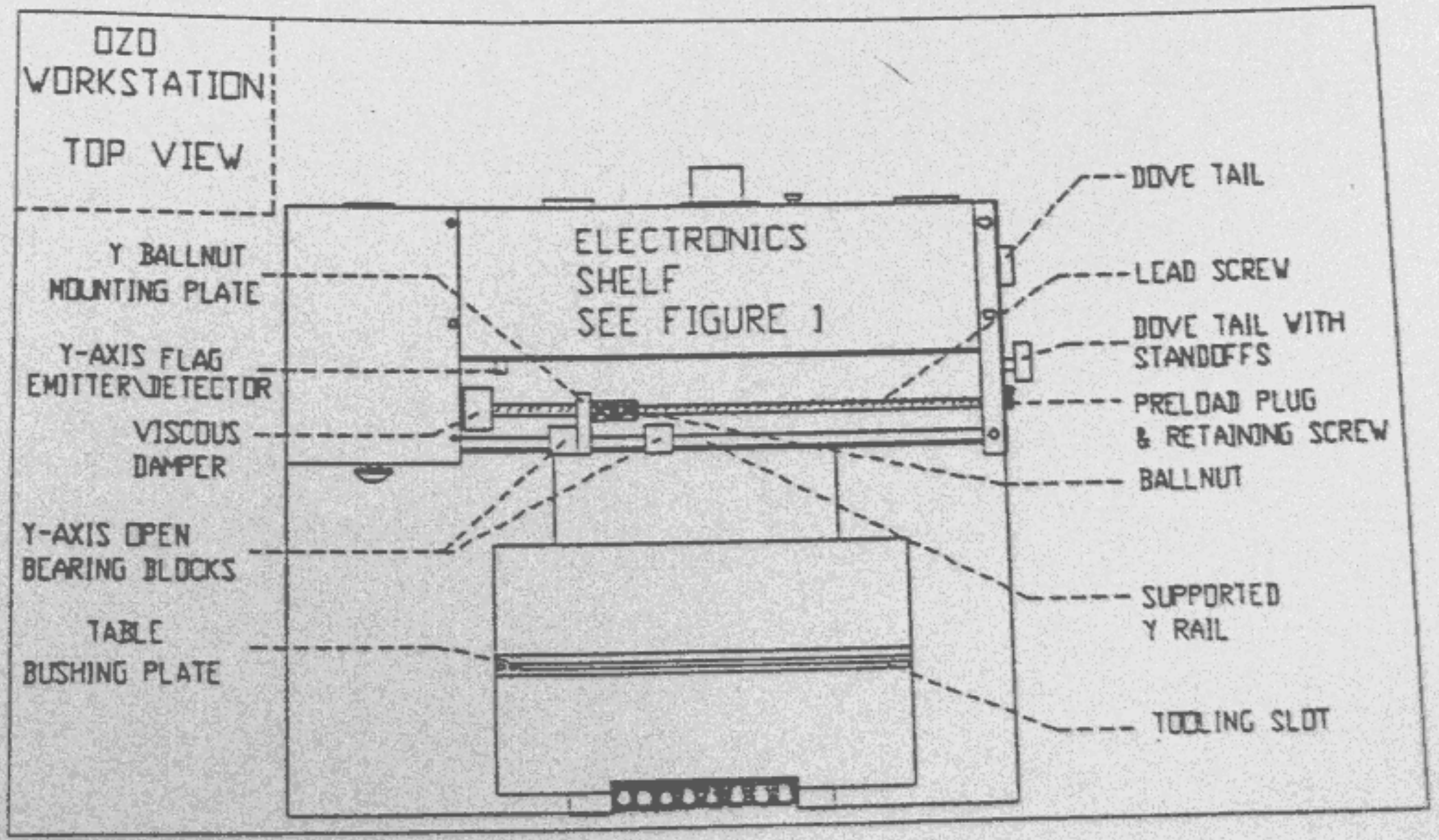


FIGURE 2

COMPONENT LAYOUT

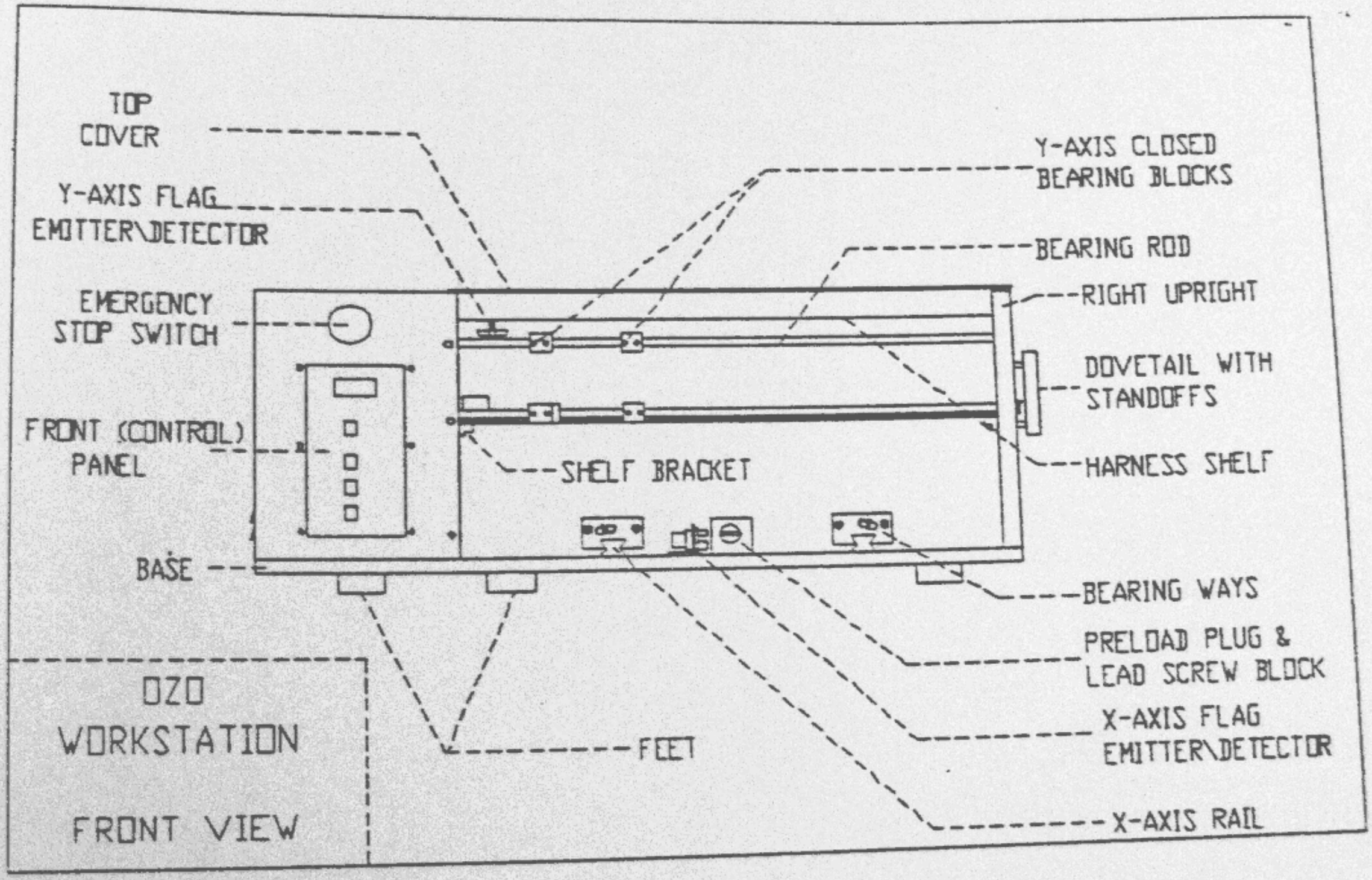


FIGURE 3

UPPER and LOWER BEARING ROD ASSEMBLY

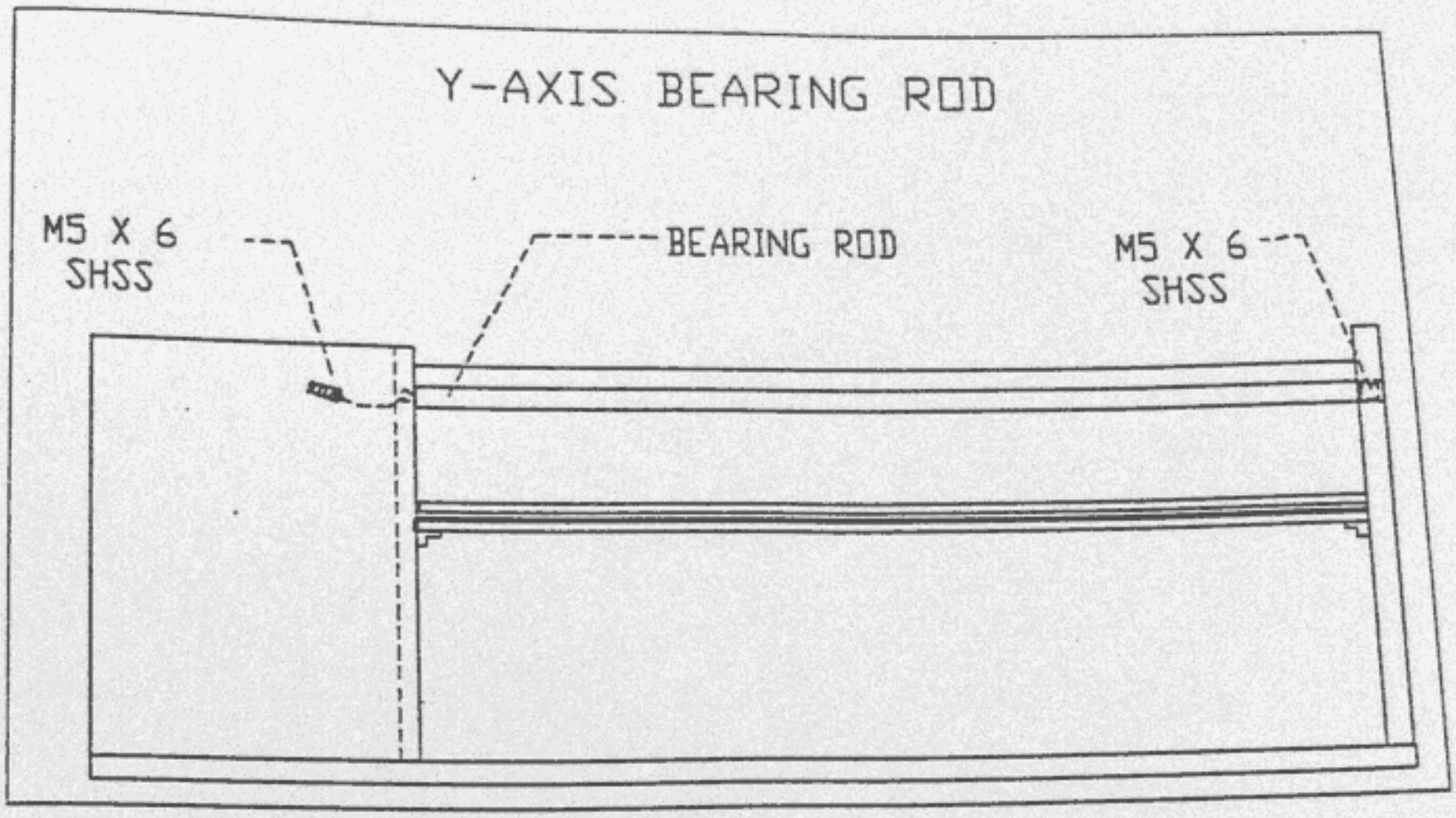


FIGURE 1

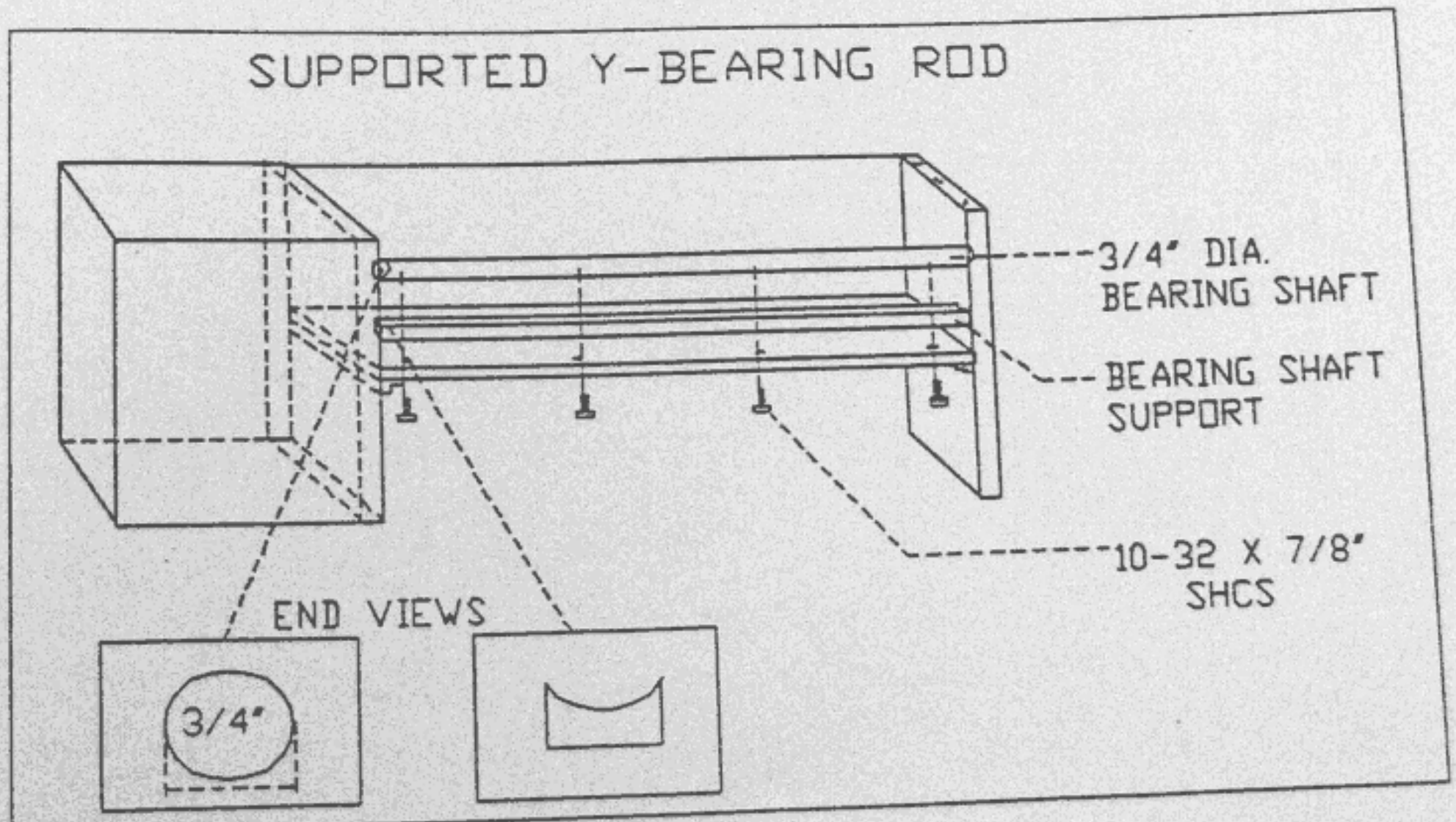


FIGURE 2

UPPER and LOWER BLOCK & BEARING ASSEMBLY

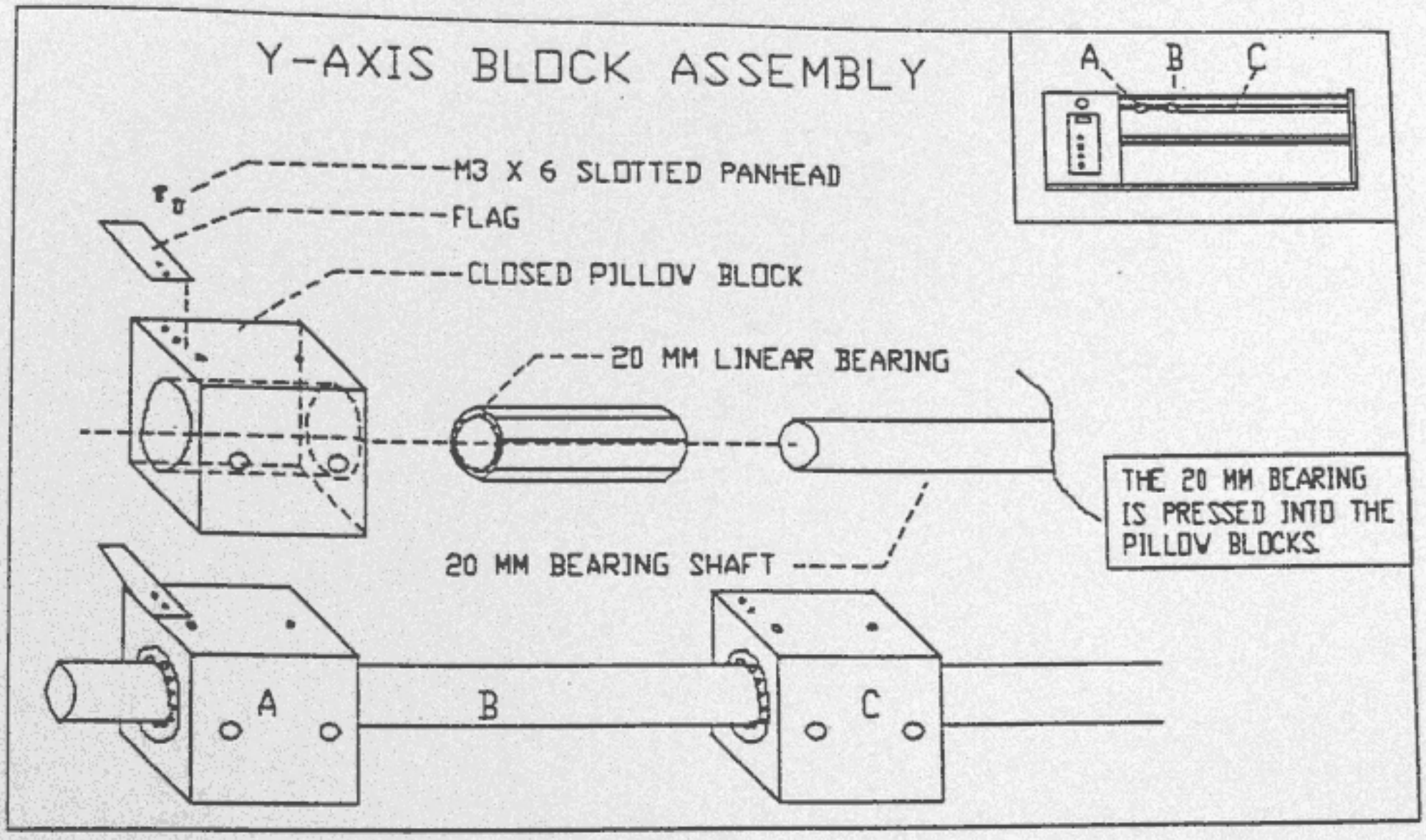


FIGURE 3

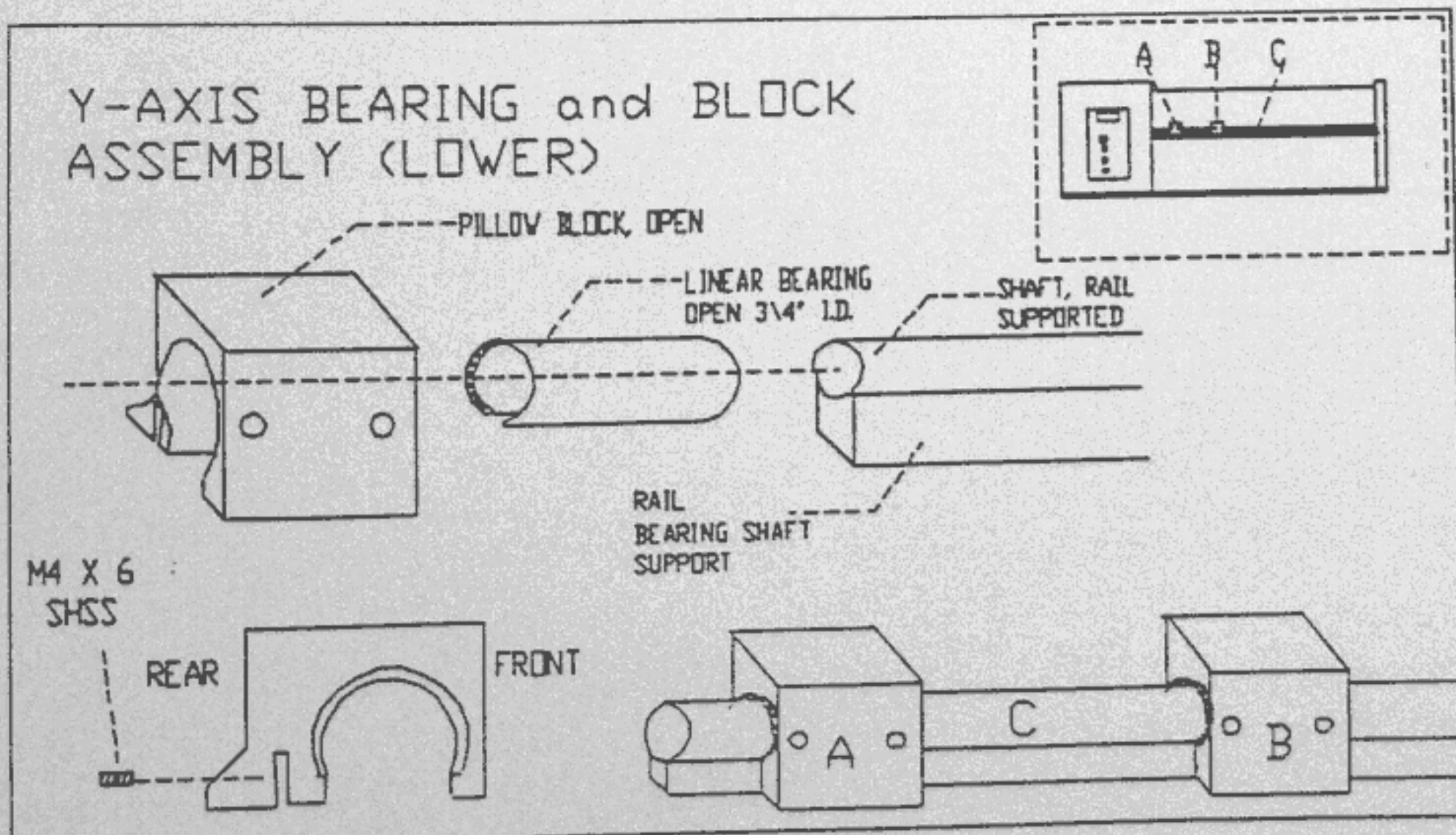
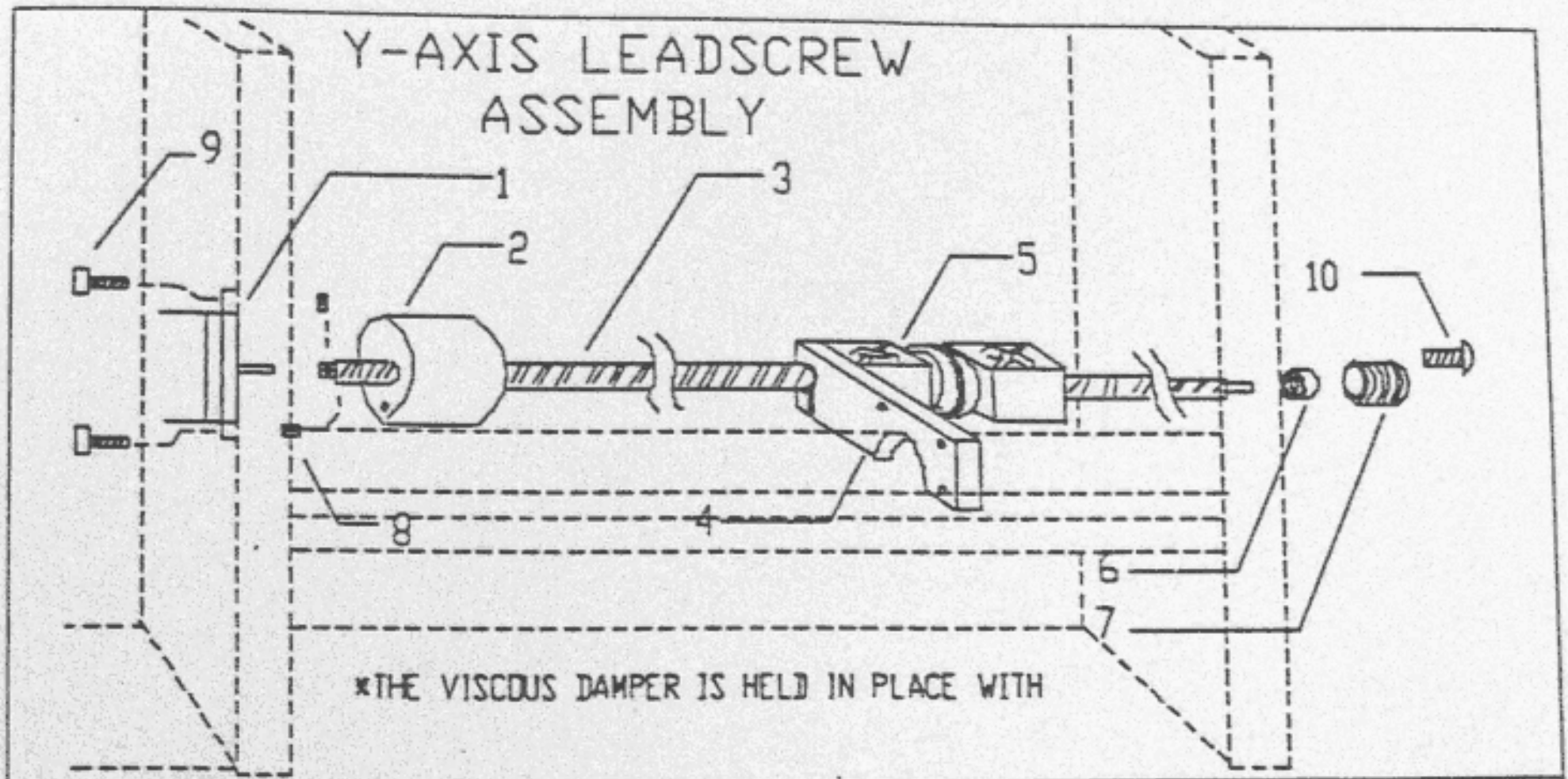


FIGURE 4

Y-AXIS LEADSCREW ASSEMBLY



1 Y-AXIS MOTOR	6 BEARING, 3\8" I.D., 7\8" O.D.
2 VISCOUS DAMPER ASSEMBLY	7 PRELOAD PLUG
3 LEAD SCREW	8 M4 X 4 SHSS
4 Y-BALLNUT MOUNTING PLATE	9 M5 X 16 SLOTTED CHEESEHEAD
5 BALLNUT	10M5 X 10 SLOTTED PANHEAD

FIGURE 5

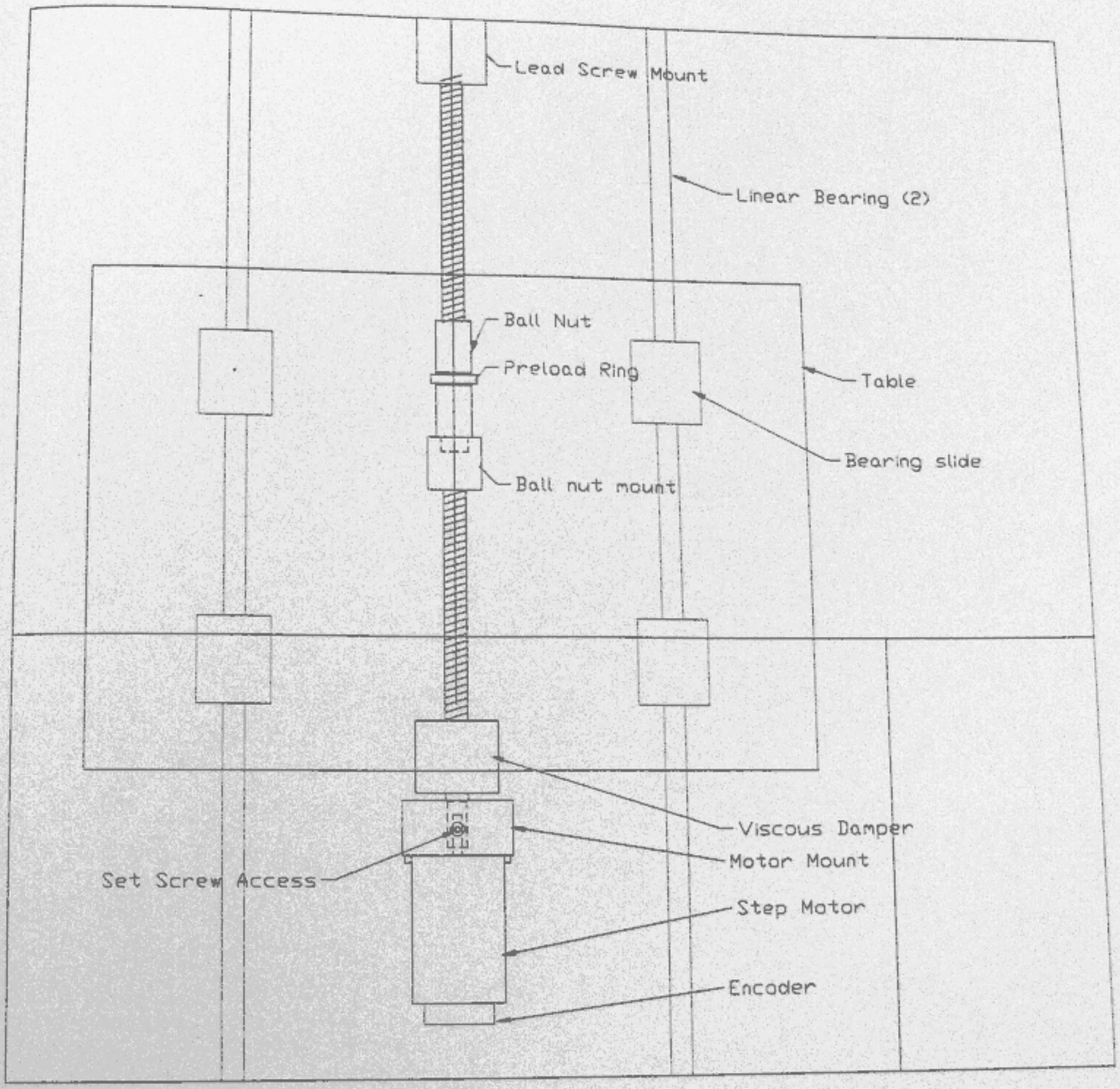
THE VISCOUS DAMPER CONSISTS OF THE FOLLOWING PARTS:
A HUD, THE HOUSING, A FLYWHEEL AND 2" OF COLD ROLLED STEEL.

THERE IS OIL INSIDE THE DAMPER.

THER IS A SCREW (NOT SHOWN) IS THE BACK OF THE BALLNUT MOUNTING PLATE.
IT IS A ~~M5~~ X 16 SHCS.

M4

X Axis Lead Screw Assembly



Note that there are two set screws mounted on the
lead screws at 90 degrees to each other.
There are also two flats on the motor shaft
also at 90 degrees that must match
during mounting

OZO WORKSTATION PNEUMATICS

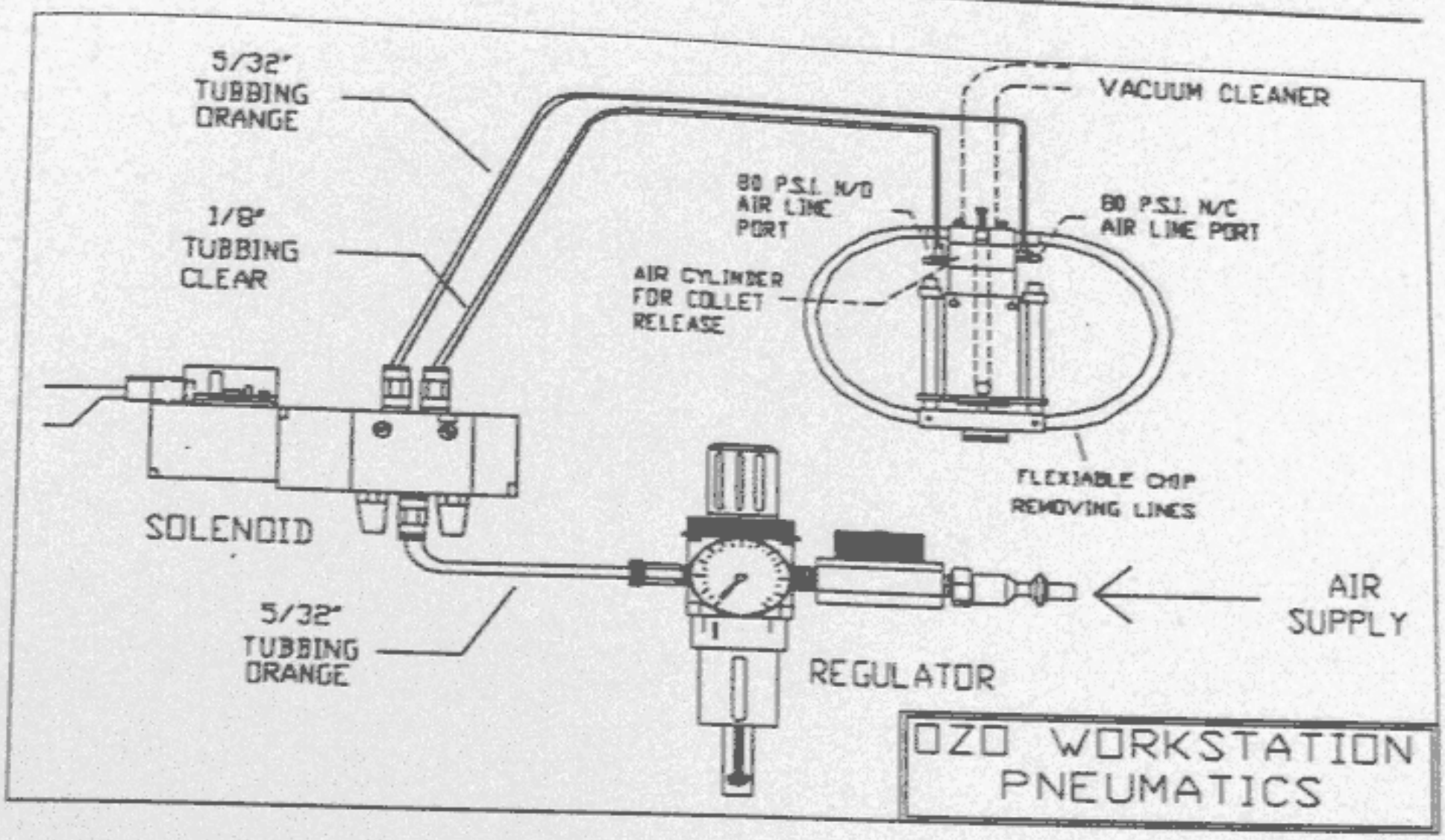


FIGURE 1

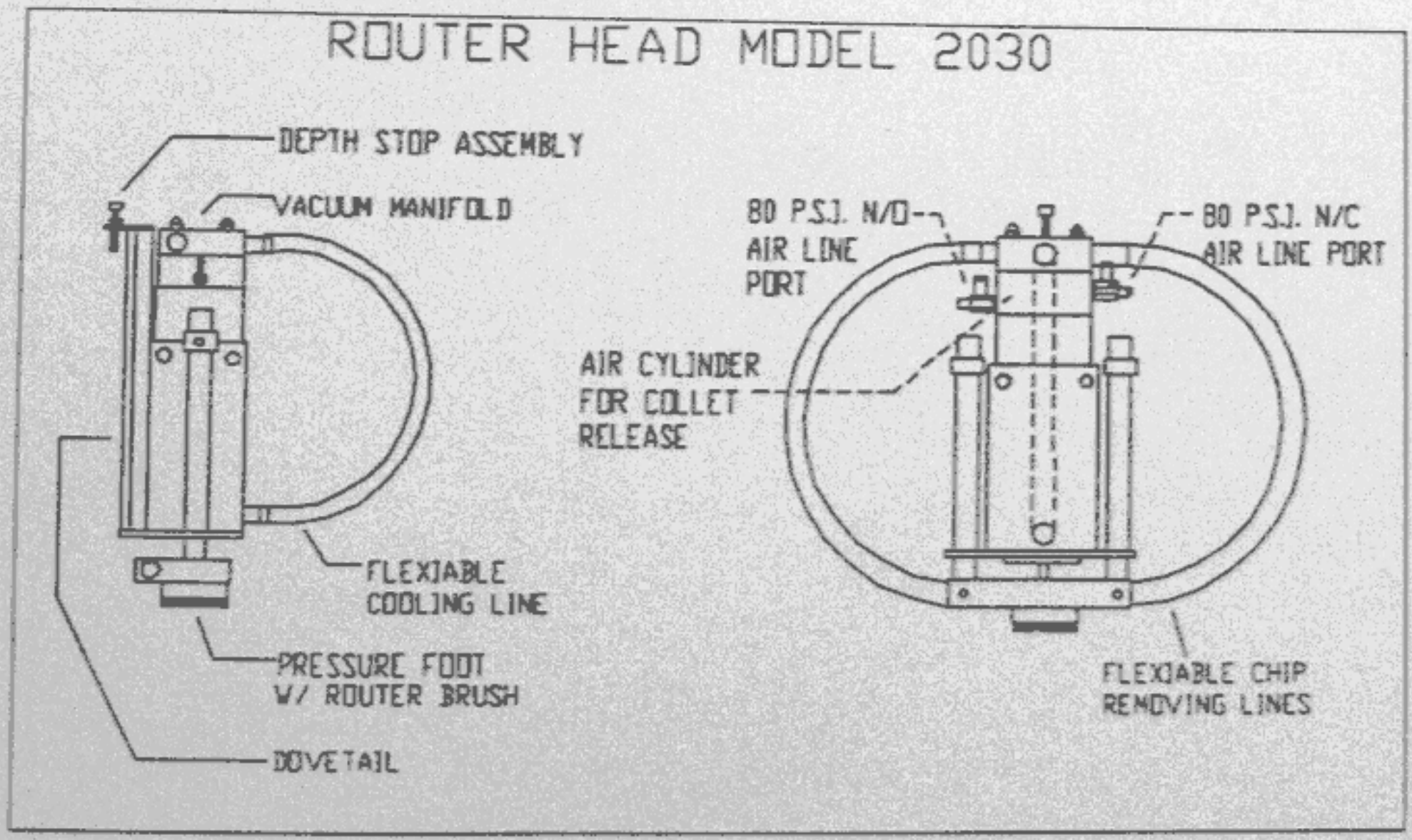


FIGURE 2

REGULATOR AND SOLENOID ASSEMBLIES

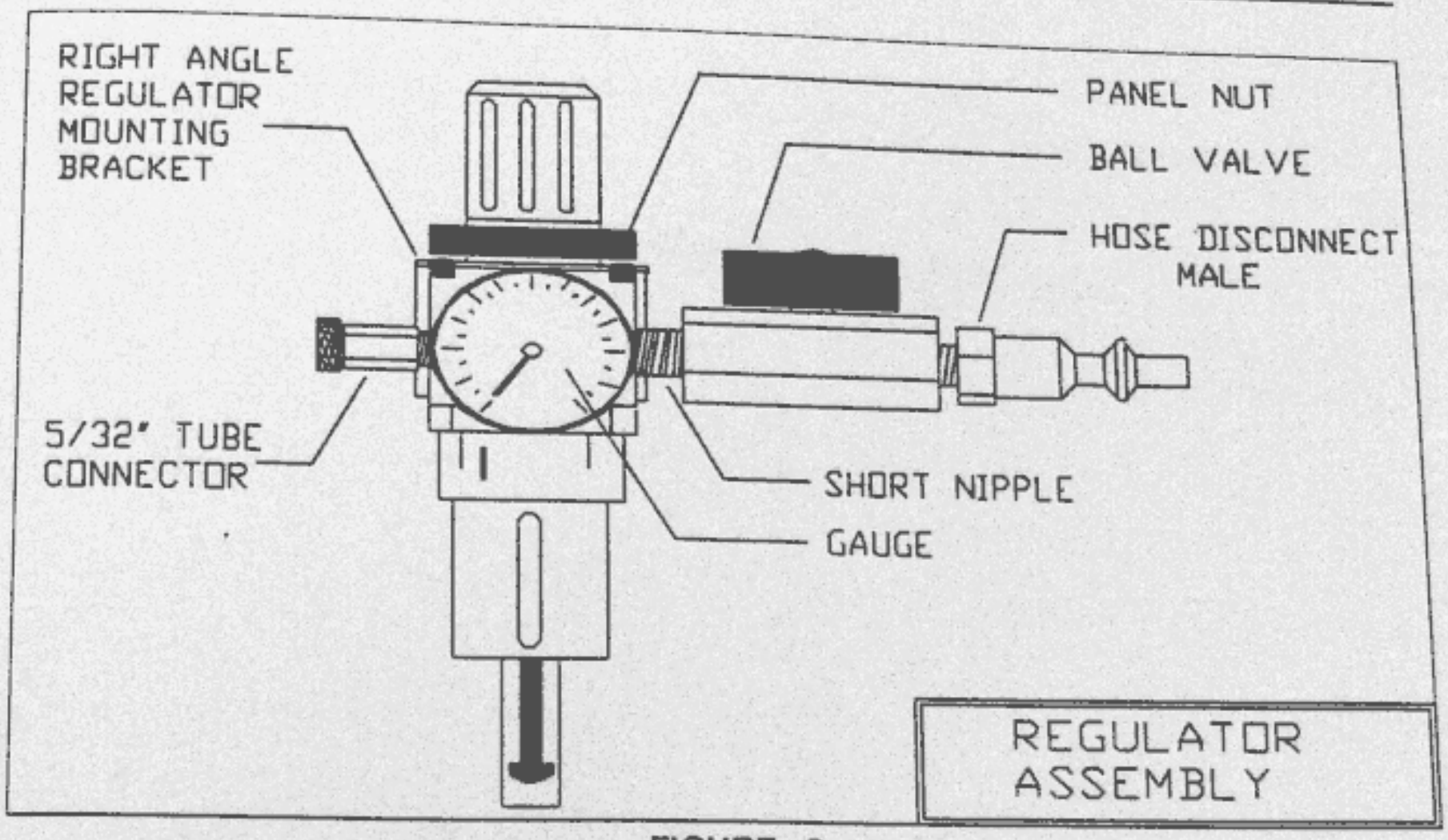


FIGURE 3

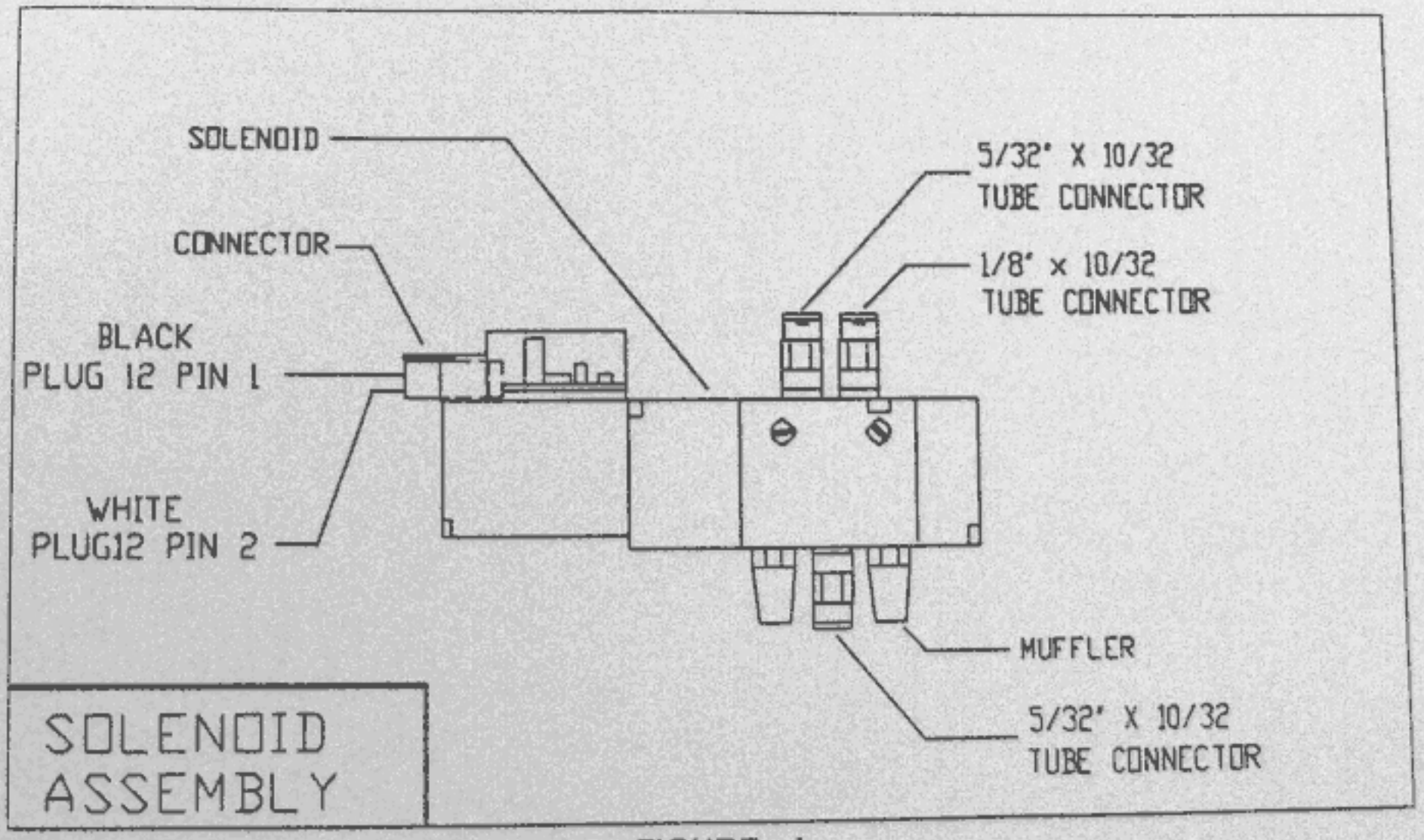
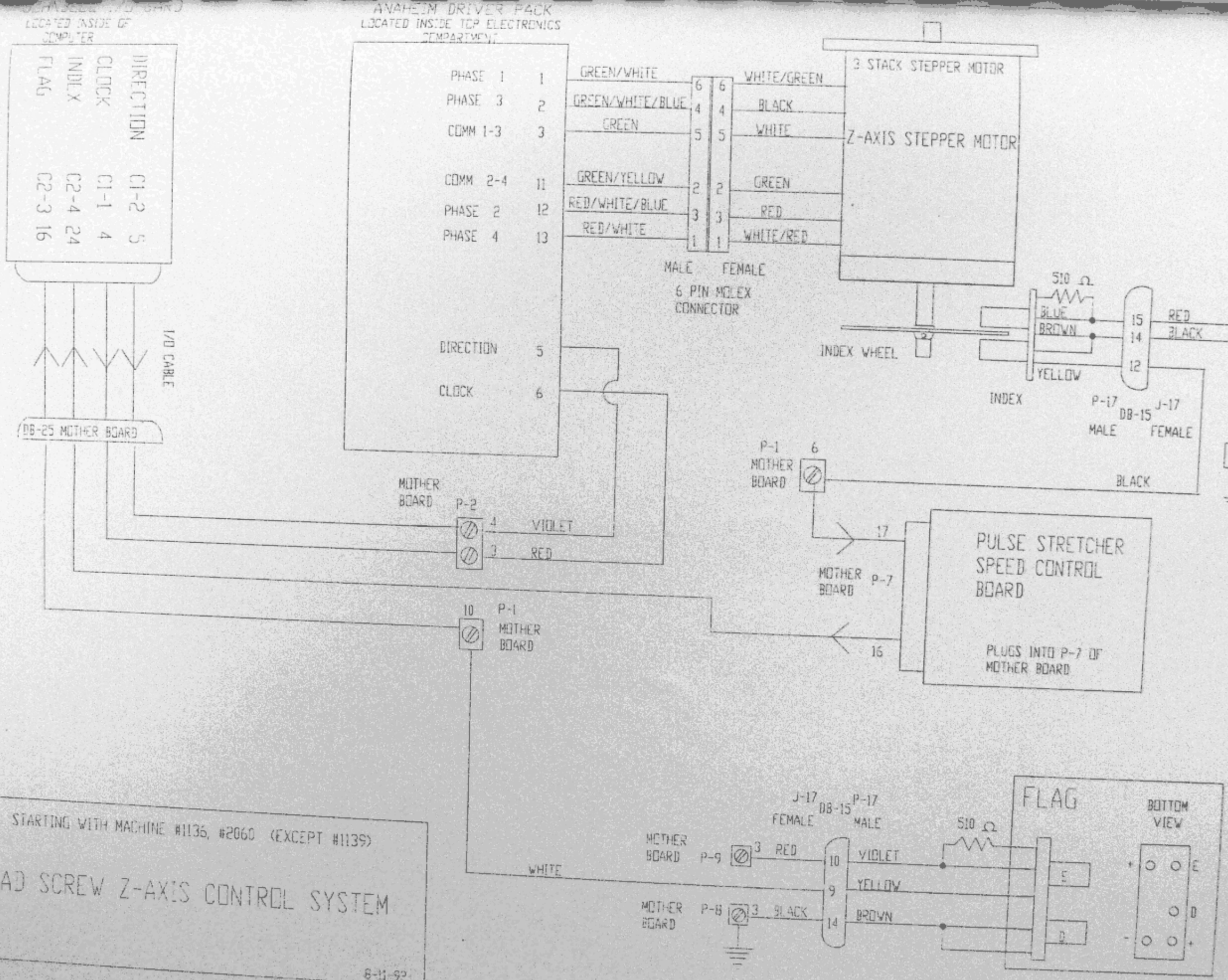


FIGURE 4

STARTING WITH MACHINE #1136, #2060 (EXCEPT #1139)

LEAD SCREW Z-AXIS CONTROL SYSTEM

8-11-92



Z-BOX ASSEMBLY

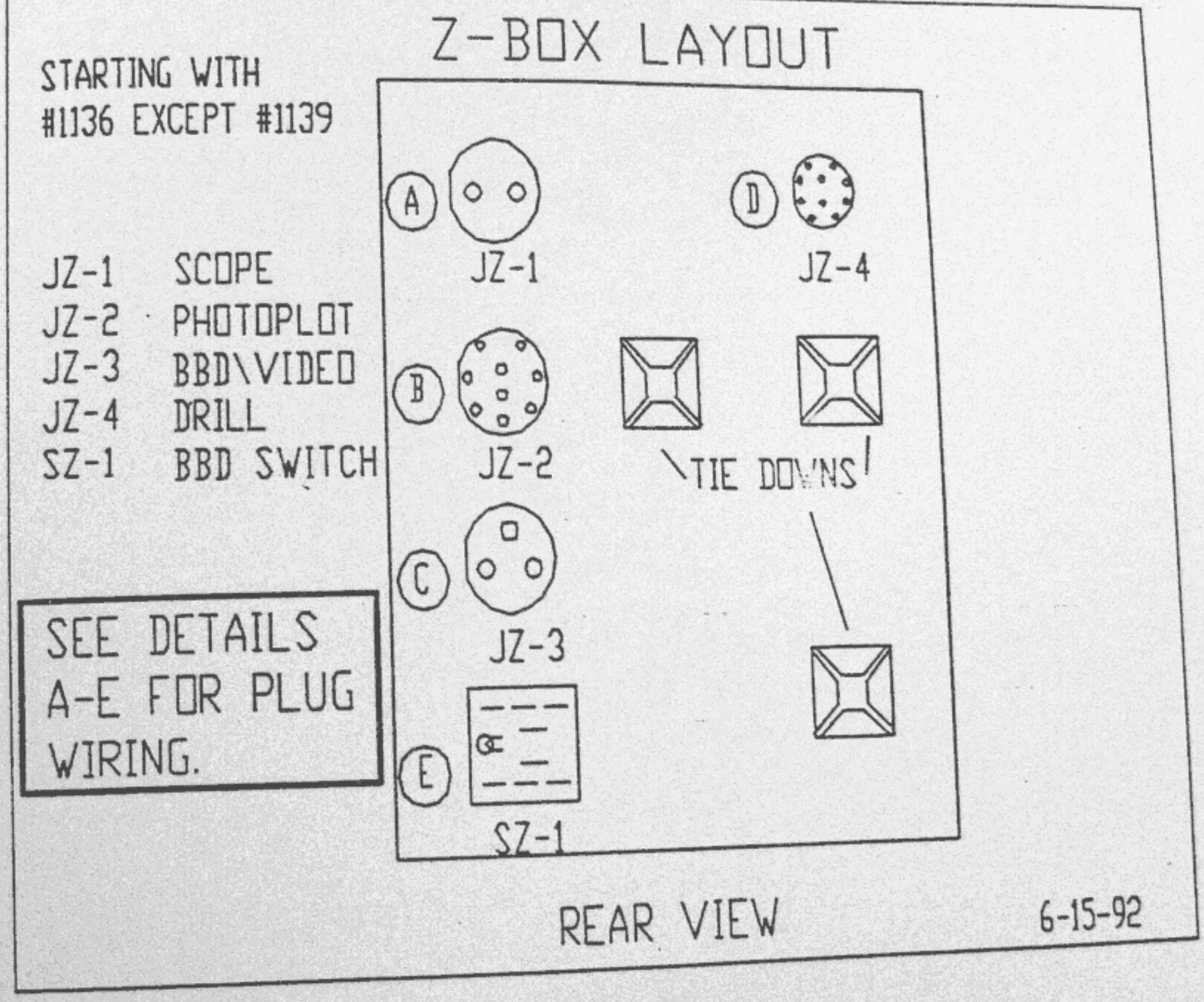


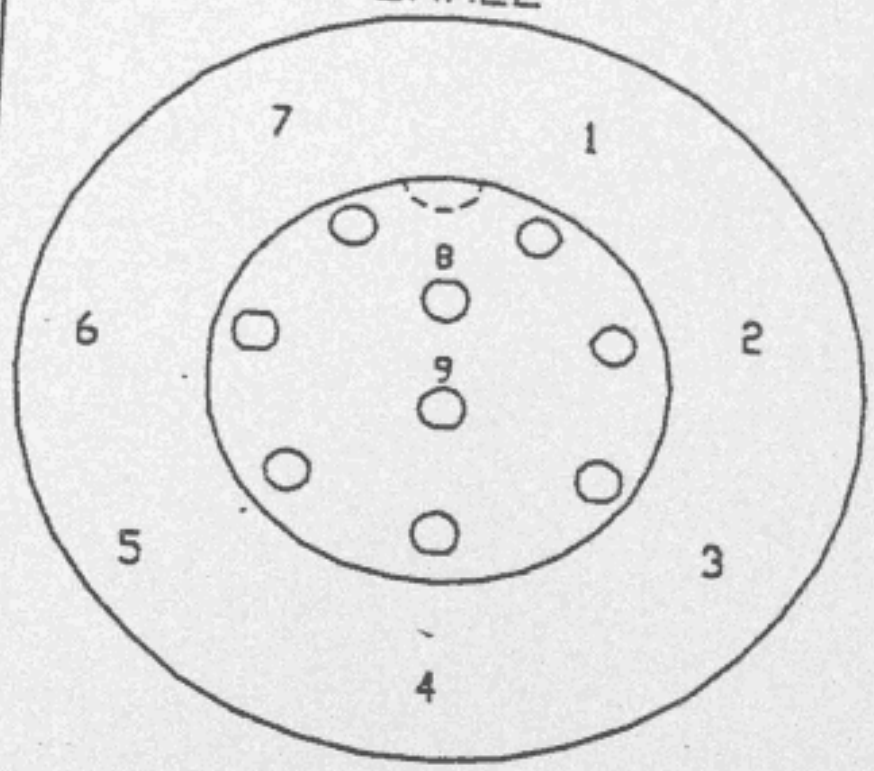
FIGURE 1

Z-BOX ASSEMBLY

DETAIL C

PHOTOPLOTTER JACK JZ-2

FEMALE



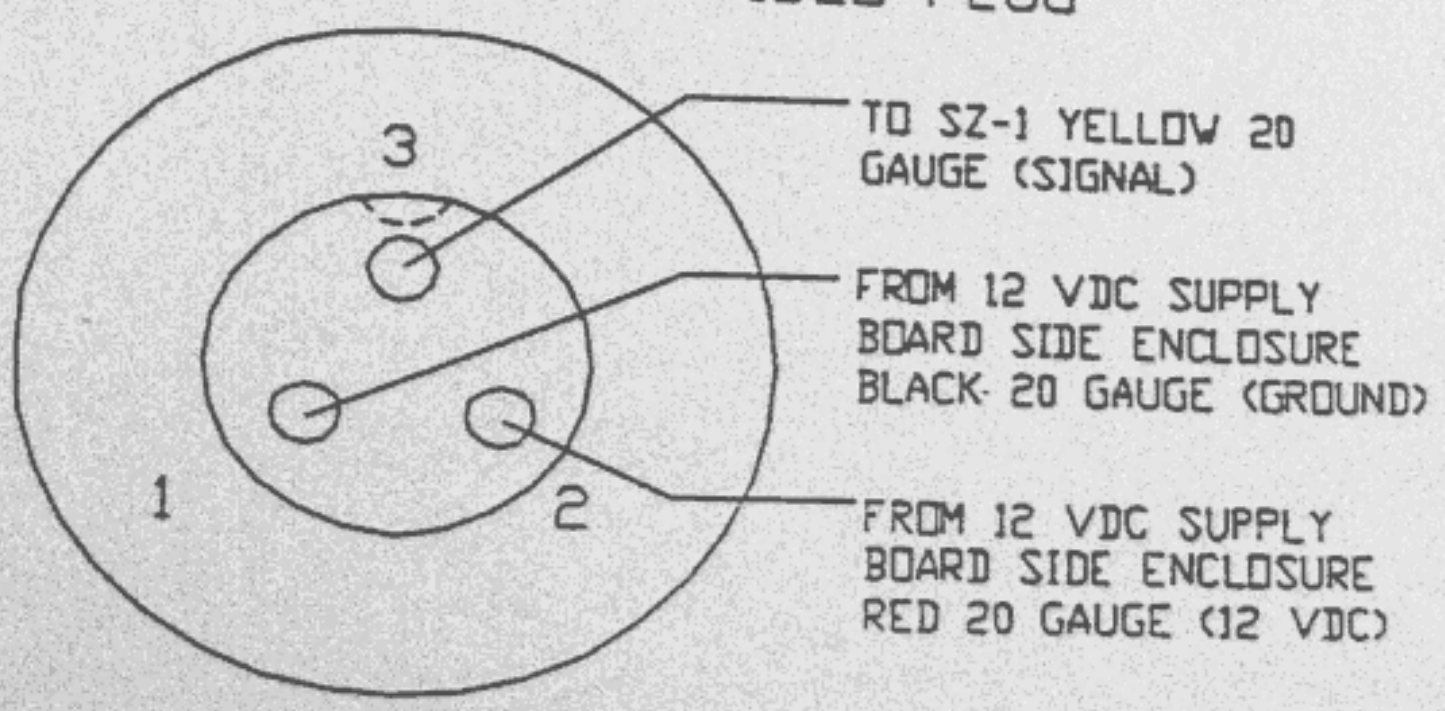
SOLDER SIDE

PIN #	COLOR	GAUGE	DESTINATION
PIN #1	WHIOTE\GREEN	20	P.P.D.P. PIN #1
PIN #2	WHOTE\GREEN\BLUE	20	P.P.D.P. PIN #2
PIN #3	GREEN	20	P.P.D.P. PIN #3
PIN #4	GREEN\YELLOW	20	P.P.D.P. PIN #11
PIN #5	WHITE\RED	20	P.P.D.P. PIN #12
PIN #6	WHITE\RED\BLUE	20	P.P.D.P. PIN #13
PIN #7	VIOLET	26	M.B. PLUG 9 PIN #6
PIN #8	YELLOW	26	M.B. PLUG 1 PIN #9
PIN #9	BROWN	26	M.B. PLUG 8 PIN #7

FIGURE 4

DETAIL D

JZ-3 BROKEN BIT \ VIDEO PLUG



SOLDER SIDE

FIGURE 5

TROUBLE SHOOTING GUIDE TO THE OZO SYSTEM

INTRODUCTION

The OZO System can be complex to trouble shoot, however the isolation of a problem can usually be handled with some basic testing. The system can be broken down to three areas, Mechanical, Electrical, and Electronic. The complexity occurs when an apparent mechanical problem is actually caused by a loose electrical connection. Usually a problem is obvious but the source needs diagnostic procedures to isolate. The scope of this section is to list the most common problems and guide the user through the diagnostic procedures. The problem areas are divided into Spindle Problems, Motion Problems and Positioning problems. If you are experiencing a problem that does not fit the ones described in this text contact the OZO service department for help.

SPINDLE PROBLEMS

The most frequent problems regarding the spindle are caused by either improper maintenance procedures or accidents resulting from incorrect setup of a drill or route file. In order to reduce the need to refer to this section it is highly recommended that the user become familiar with the Automatic Tool Change Spindle Maintenance. Proper spindle maintenance and utilization of the pre-operation check list have prevented many disasters.

PROBLEM

SPINDLE DOES NOT TURN ON

Check the drill motor fuse and replace if it is blown. If the fuse was blown the motor has been loaded beyond its capacity. The four main causes are;

1. Air lines reversed on the spindle.
2. Drill bit feed/speed too fast (normally a small bit will break first however larger bits will cause overcurrent.
3. The bit hitting a foreign object (table or tooling).
3. Overcurrent due to bearing seizure, motor timing error, blown power transistor or commutation circuit.

The most common cause of spindle failure is the sudden halting of the spindle rotor while under power. The resulting damage can include mechanical damage to the spindle, damage to the driver card electronics and damage to the current limiting resistor pack in the spindle power supply.

If the spindle is prevented from starting up by the pneumatic cylinder on top of the spindle, the most likely damage will be in the drive electronics. If the spindle rotor is suddenly halted by the pneumatic cylinder, the chance of mechanical damage to the spindle is almost certain. Spindle overload caused by the sideways contact of a tool bit can bend the spindle and cause damage to the electronics, however vertical tool impact generally will not damage the spindle.

To determine the source of the failure begin by checking the drill motor fuse. If it has been blown replace the fuse. Insert a tool in the collet and make sure the collet is closed. Run the diagnostic utility program SPEED.COM. Input 200hz for the first spindle test. If the spindle fails to rotate press RETURN immediately to turn off the drive frequency. If the spindle rotates smoothly note the spindle current. If the current is less than 2 amperes it is likely that no damage has occured to the drive electronics. Assuming the current is under 2 amperes repeat the test using 1000hz an an input. If the operating current remains under 2 amperes it is safe to assume no permanent damage has occured. In the event either frequency yields higher current the motor will require re-timing. Refer to the Automatic Tool Change Spindle Maintanence section for the proper timing procedure. If the spindle rotates unevenly the same diagnosis is likely.

In the event **the spindle failed to rotate** remove the drill motor fuse and unplug the machine. Remove the side cover of the machine. Replace the driver card, then replace the fuse and repeat the spindle tests.

Whenever a spindle has been overloaded it is good practice to test the collet adjustment and re-adjust it if necessary. In the event a **replacement card does not yield results** it will be necessary to remove the top cover and the cable shelf to expose the power supply. Begin by unplugging the machine and disconnecting the computer cable to the machine. The power resistor pack is near the cooling fan. If they have been damaged they will have expanded plastic sticking out of the ends of the housing. Carefully discharge the power capacitor before attempting to service the power supply. The recommended repair is to replace the entire resistor pack.

PROBLEM

SPINDLE SPEED FLUCTUATIONS

Some spindle speed fluctuation is normal. When the spindle has wide no load fluctuations a power transistor is weakening, a spindle postion sensor is weakening or there is an intermittant connection flaw. The most common cause is a connection flaw. If the spindle has been recently dissasembled the most likely source is on the sensor board assembly located on the top of the spindle. If the sensors are disturbed a solder connection may have been broken. Also a wire may have been pulled resulting in a broken solder connection. Check the sensor board assenbly for broken or suspect solder connections and resolder them.

If no flaw is found in the sensor assembly the next most likely location is in the cable going to the connector box on top of the Z-axis head. If a machine has been in service for a year or more a flex failure is possible. If the top enclosure has been bent it may be cutting the cable just behind the connector box. Improper methods of unplugging the spindle will cause damage to the spindle cable at the connector or entry point into the spindle housing. Visual and continuity tests are the best diagnostic tests. **If another spindle is available** it should be tested for speed fluctuations. This will narrow the area of suspicion. If another spindle fluctuates in speed the chances are fairly good the flaw is not in the spindle. Conversely, if the other spindle operates properly the suspicion falls on the spindle with the fluctuation.

PROBLEM

SPINDLE PICKS UP THE TOOL BUT WILL NOT RETURN IT

Manually open and close the collet using the front panel switch. If the collet is sticking check the air pressure and adjust and service the spindle collet. If the collet appears to operate smoothly one of two causes are possible. The bit may be encountering unusual vertical forces due to poor cutting conditions (point quality or speed/feed errors) or the tool pod location may have changed from its original programmed location causing the bit to bind in the collet. Examination of the tool and cutting parameters will reveal a problem in the cutting. If the spindle, the X or the Y axis encounter lateral resistance during operation it is possible that they have moved. It is necessary to re-calibrate the programming scope target and re-program the tool locations. These procedures are described in the maintenance and set up sections of the manual.

CLEANING THE COLLET

At the beginning of each day of operation it is necessary to remove, clean and lubricate the collet and mating spindle surface.

1. Begin by turning on the machine, making sure the air lines are properly connected and the air valve and regulator are on and properly set.

2. Unplug the electrical connector and lay the head on a soft rag.

3. Open the collet using the manual switch on the machine front panel.

4. Loosen the set screws securing the pressure foot and slide it off the bearing rods to expose the end of the spindle. Grasp the spindle shaft with two fingers and unscrew the collet with a collet tool.

5. Clean the collet in alcohol and let it dry. Clean the inside taper of the spindle with a swab soaked in alcohol.

6. Screw the collet into the spindle until it bottoms out and back it out 1/4 turn.

7. Place a drill blank in the collet and close it using the front panel switch. Open and close the collet several times and check for smooth operation. The collet should hold the bit tight enough to prevent a drill or router bit from forcing out during operation. **A simple test of tightness** is to try to pull a drill blank out of a closed collet. If it slips with little effort it will not hold during machine operation. The blank should be difficult if not impossible to remove in order to hold a router bit. The upward cutting action tends to pull the bit out if it is not tight enough.

ADJUSTING THE COLLET TENSION.

1. When the need for adjustment has been determined **begin** by removing the air lines from the compact air cylinder on the top of the head.

2. Next remove the bolts holding the air cylinder assembly and replace the solid tubular spacer with the collet adjusting spacer. Replace three of the air cylinder bolts to allow access through the spacer window.

3. **Release** the locking tension between the two adjusting nuts using the adjusting pins as spanner wrenches.

4. **Tighten** the lower nut until it is firm with a tool blank in the collet **Remove** the two pins and press the collet switch to open the collet. **Remove** the drill blank and close the collet.

5. **Tighten** the lower nut 1/4 to 1/2 turn and replace the drill blank. **Test the collet tension.** Repeat the adjustment until the collet is tight while opening enough to smoothly allow easy removal of a bit.

MOTOR TIMING

Motor timing is indicated when top speeds can not be achieved or excessive heat appears to be generated during operation. This can be more easily monitored on OZO models with a built in ammeter by noting excessive current during operation.

1. Install a drill blank in the collet.

2. Remove the four air cylinder bolts and the pressure foot. Remove the four 3mm socket screws holding the drills cylindrical body from its upright plate.

3. Carefully slide the tubular body over the drill motor taking special care to guide the motor cable through the opening in the top of the motor case. As the motor progresses through the case slide the plastic tube surrounding the sensors into the motor case.

4. When the motor is out of its case it allows access to the timing sensor disk.

a) Plug the motor in.

b) Run the utility program SPEED.COM. When it requests the input in Hz enter 200. The next prompts require the ENTER key to be pressed to start the motor and again to stop the motor. **Loosen** the two screws holding the timing disk in place only enough to rotate the disk, however hold the disk to prevent it from rotating. Press the ENTER key to start the motor rotating.

c) Adjust the disk to achieve the optimum speed. Press ENTER to stop the motor. Reset the program to run at 500 Hz. Repeat the procedure to achieve the optimum timing. To accurately time the motor note the current draw in both timing tests and **adjust** it to the **lowest possible current.**