TEST STATION

FOR ALL

VAX 750 AND 780

POWER SUPPLIES

ALAIN GERVAIS

DIGITAL EQUIPMENT OF CANADA LTD

SECOND ISSUE
MAY 14 1984

Table of contents

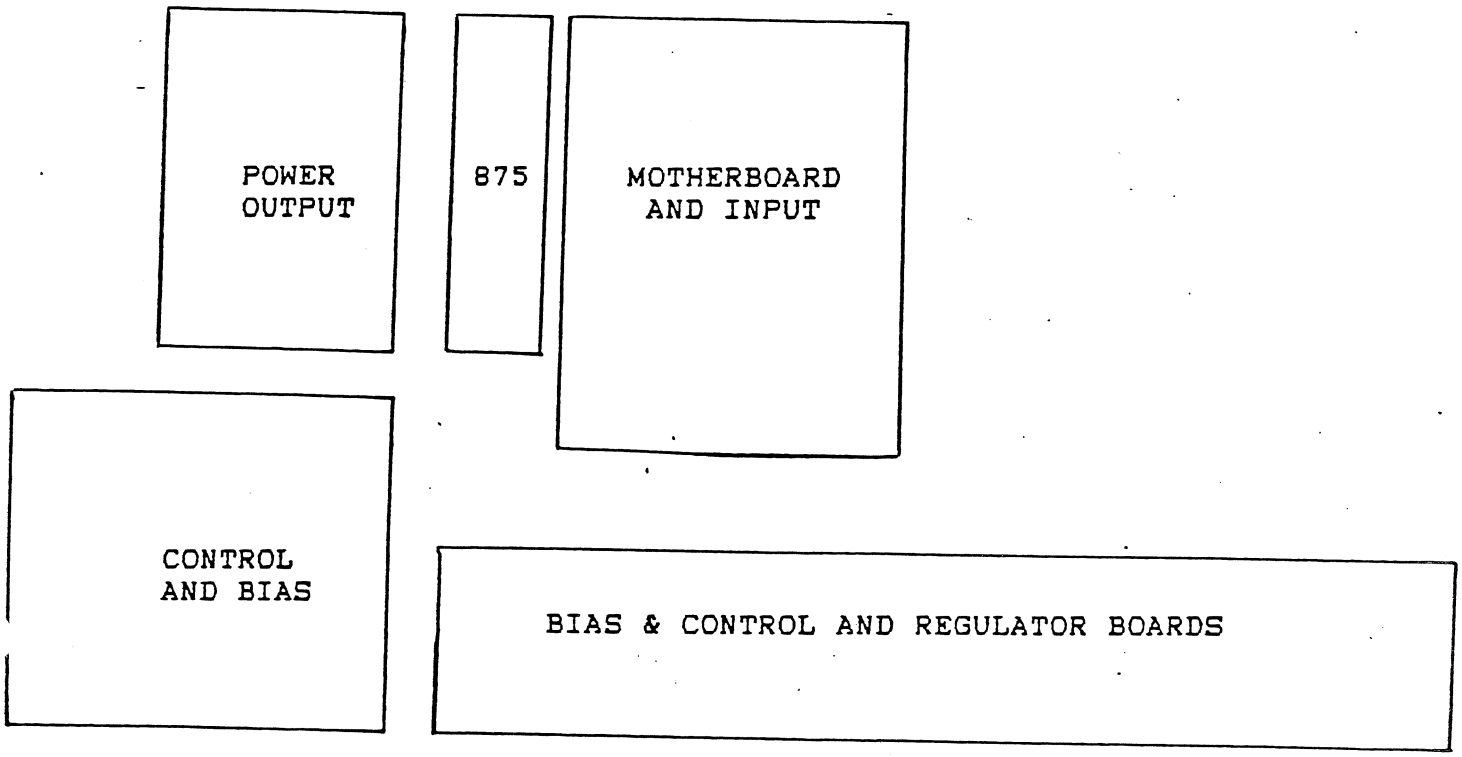
Introduction

This test station will allow a technician to debug each individual board from the three supplies it supports. Each power supply can be tested independantly with the help of a control box described later in this document.

If this station is built up to specification, it is very safe to work with; all high voltages and high currents are covered.

This is a test station only. If attemps are made to load the supply at more than minimum loads, there is a chance of burning wires and increasing the risk of injury.

Test station assembly



These are the units that can be placed in each box depending on witch supply is being tested.

Unit in test	Output panel	Motherboard & input	Control & bias	Bias & control (*) and reg. boards
H7100	70-13921	54-12550 70-18512	J5,6	*54-12554 54-12556 54-12560 54-13414
H7104-C	70-15857		J1,2,8,9	54-12556 *54-13396 54-13414
H7104-D	70-16151		J3,4,10	*54-13382 54-13417

Test station parts list

ITEM	PART NUMBER	DESCRIPTION	QYT	LOCATION
1	H7104-C	2.5 V SUPPLY	1	
2	H7104-D	5 V SUPPLY	1	
3	875-A (B)	11750 POWER CONTROLER 115 (230)	1	
4	12-09351-03	MATE & LOCK HOUSING, 1 X 3	1	
5	12-09378	MATE & LOCK PIN, MALE	2	
6	12-12168	MATE & LOCK HOUSING, 1 X 3	1	
7	12-12168-07	MATE & LOCK HOUSING, 3 X 3	1	
8	12-12170	MATE & LOCK PIN, FEMALE	12	
9	70-14249-0L	POWER CABLE, BLACK	4	
10	70-14530-0L	POWER CABLE, RED	4	
11	70-14957	MEMORY POWER SUPPLY (H7100)	1	
12	70-16153	AC DISTRIBUTION CABLE	1	
13	70-16513	SIGNAL CABLE	1	
14	70-16514	SIGNAL CABLE	1	
15	90-09730	TERMINAL RING, #10 STUD	10	
16		CONTROL BOX	1	
17		EXTERNAL BIAS (MOD. 70-14979)	1	
18		CONTROL CARD	1	
19		MODULE SUPPORT	1	
20		MOTHERBOARD COVERS	1	
21		TEST HARNESS FOR H7100	1	
22		TEST HARNESS FOR H7104-C	1	
23		TEST HARNESS FOR H7104-D	1	
24		36 CONNECTIONS RIBBON CABLE	A/R	

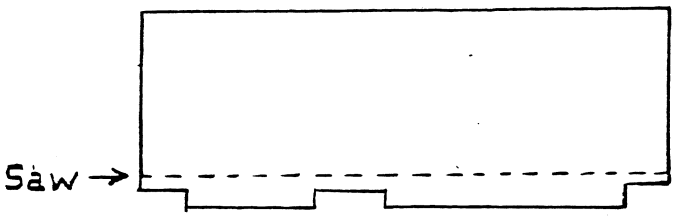
Wiring assembly

From the motherboard towards the power output

- cut 10 wires (18 AWG or larger) 300mm long
- on one end of each, crimp on a terminal ring (90-09730)
- on the other, crimp a female "mate & lock" pin (12-12170)
- install the terminal rings on the motherboard's J7
- house these pins in a female 9 pin connector (12-12168-07)
- pin 5 goes to pin 1 of a female 3 pin connector (12-12168)*

From the motherboard to the regulators

- saw male connector from 3 PC boards (from scrap H7100(4))
- isolate the fingers from each other, especialy pins 20 and 21 from pins 17, 18 and 19 of the bias control board

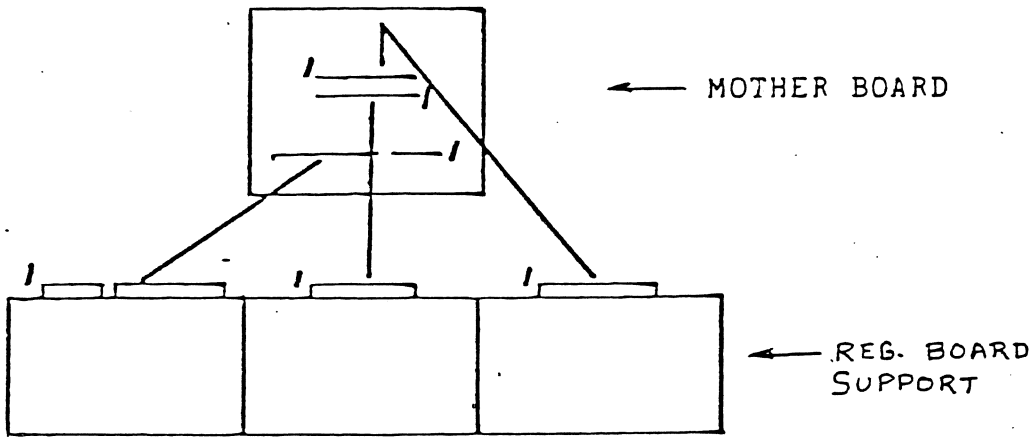


e.g.-edge card connector from 54-13382
- use ribbon cable, 2 X 600mm + 1 X 400mm, to unite the male connectors to the edge card connectors in the regulator support

*- solder two wires 300mm long from pin 21 and 23 of the male connector going to J2 of the motherboard to pins 3 and 2 respectively of the female 3 pin connector that also houses pin 5 from J7.

Assembly (top view)

Pin 1 identification of each ribbon cable

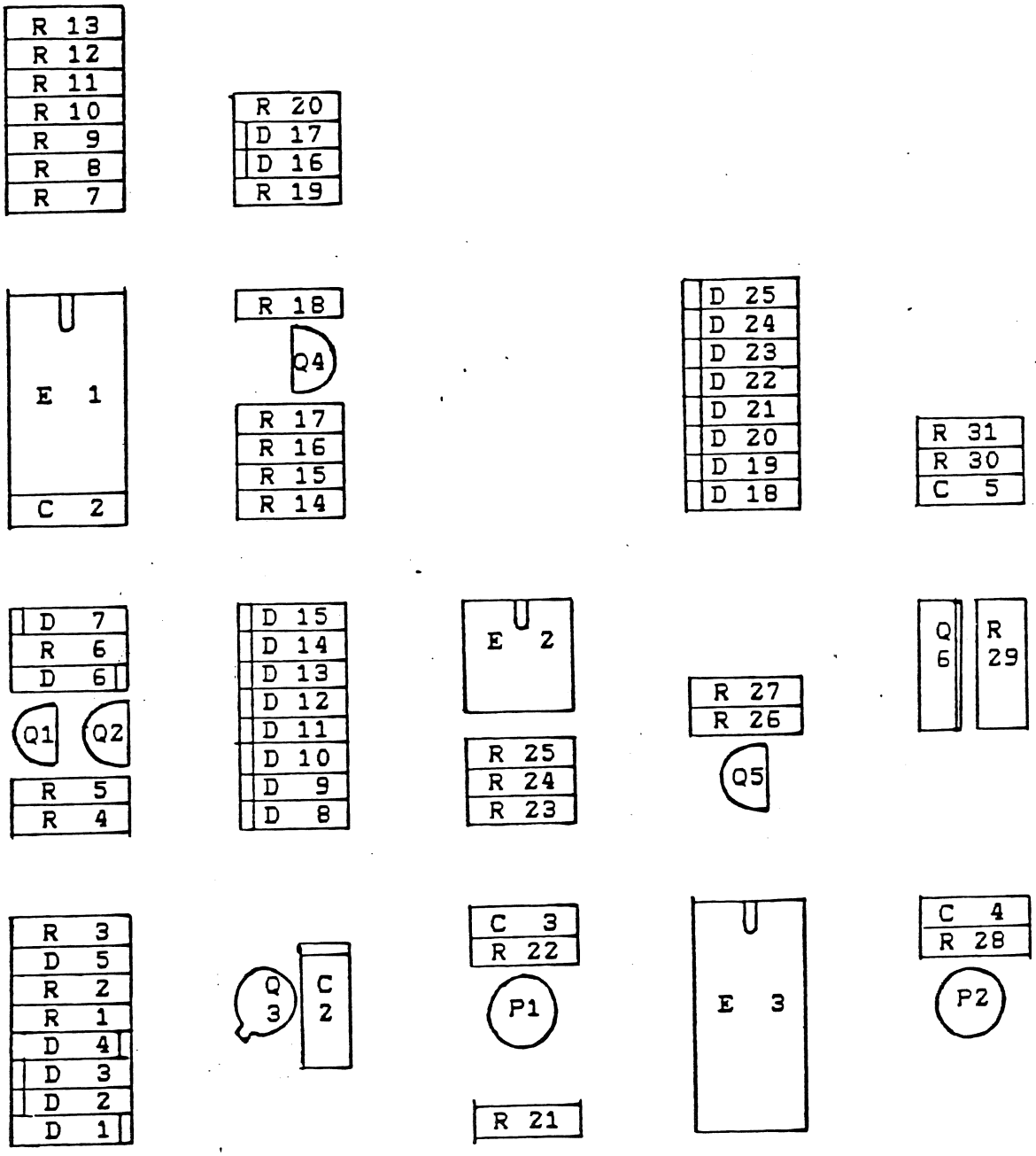


Control card

This card contains all the electronics necessary to control the H7104-C and the H7104-D. The H7100 and it's variants are stand alones, therefore control circuitry is not needed. But, a back up overvoltage protection circuit has been built on this board.

All the external circuitry needed is wire wrapped on a 50-09045 etch E (may vary). This allows for easy removal of the board from the control box.

Unit assembly



AA1

Circuits schematics

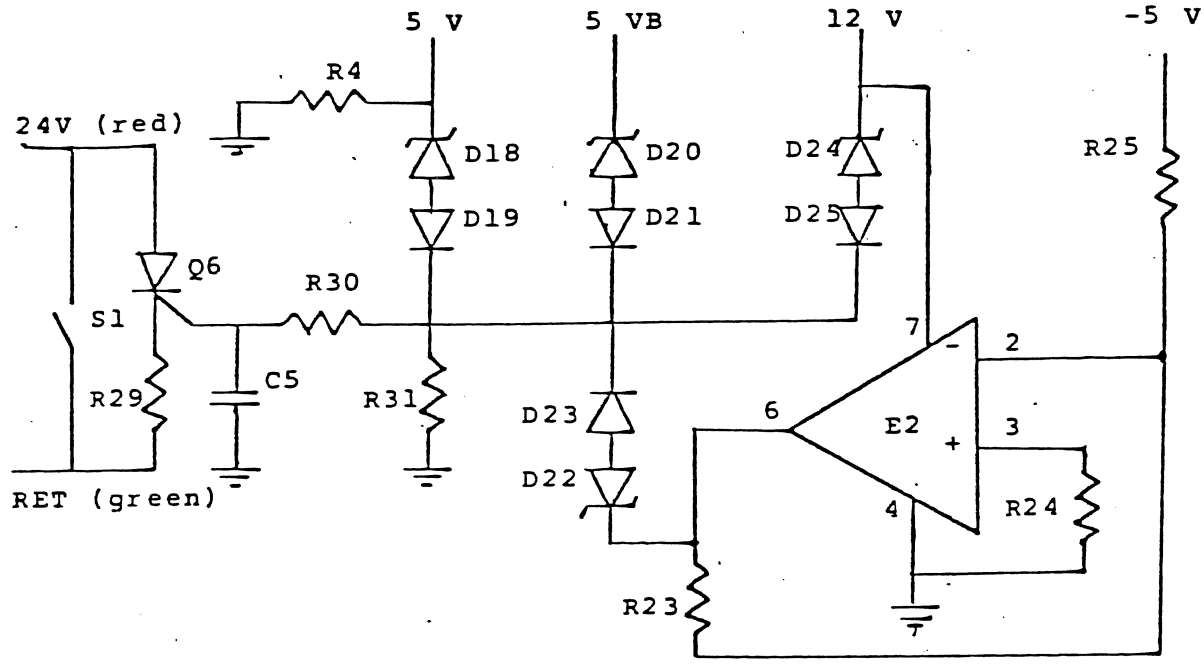
All the circuits needed on the control card are singled out to show their individual utility.

H7100 Overvoltage protection circuit

This power supply has an input power consumption of up to 1.4 kW. Therefore an overvoltage protection circuit is required in case it's internal counterpart fails.

There are four outputs to consider for this circuit; 5V power output, 5V secondary, 12V and -5V.

NOTE: Certain outputs will not be present without optional boards



-S1 is taken from the power output safety box/motherboard protection covers.

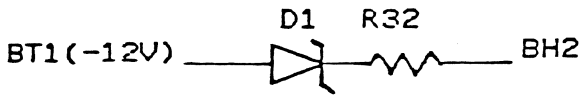
Connections from the block connector to the 6 pin mate & lock (J6) in the control box.

I/O		BLOCK CONNECTOR	CONN. PIN J6
-5 V	sense	AL1	1
12 V	sense	AL2	2
5 VB	sense	AK1	3
24 V @	controler	AJ2	4
24 V	return	AB2	5
	ground	AT2	6
5 V	sense	AK2	pin 3 of 3 pin mate & lock to the motherboard

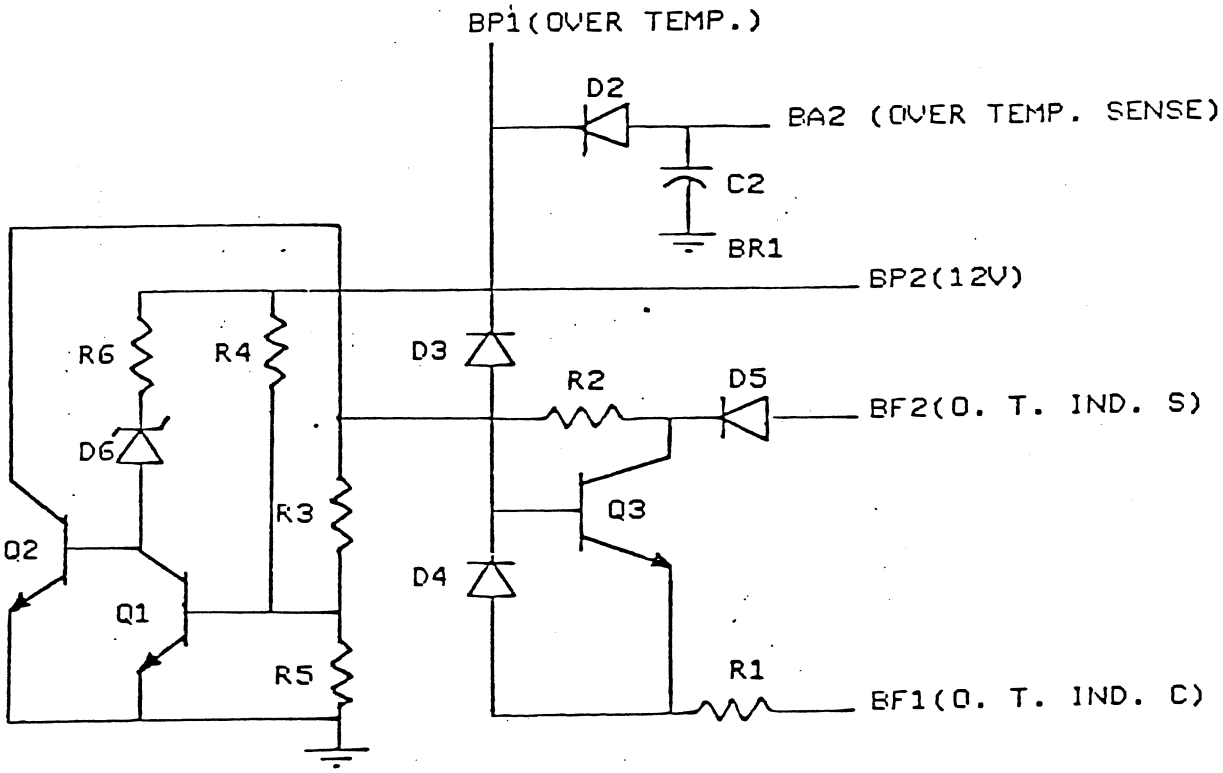
H7104-C simulator

These are the circuits needed to interface the H7104-D to the power controler (875-A or B).

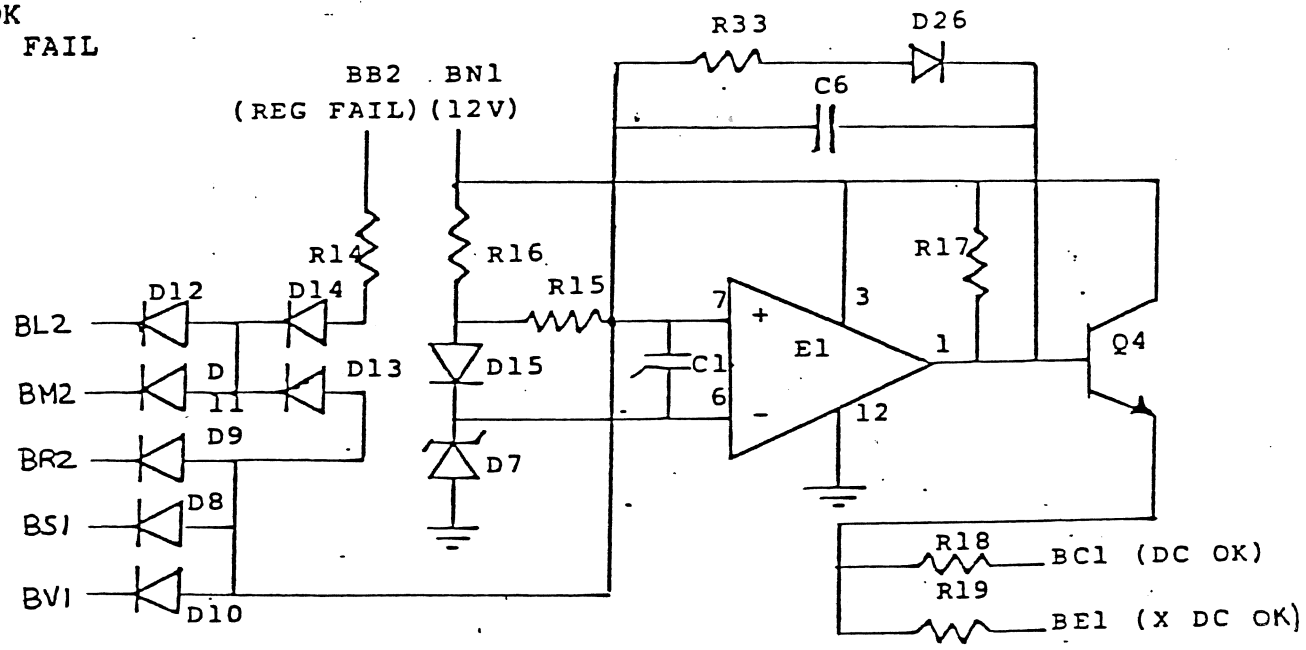
BATTERY ENABLE



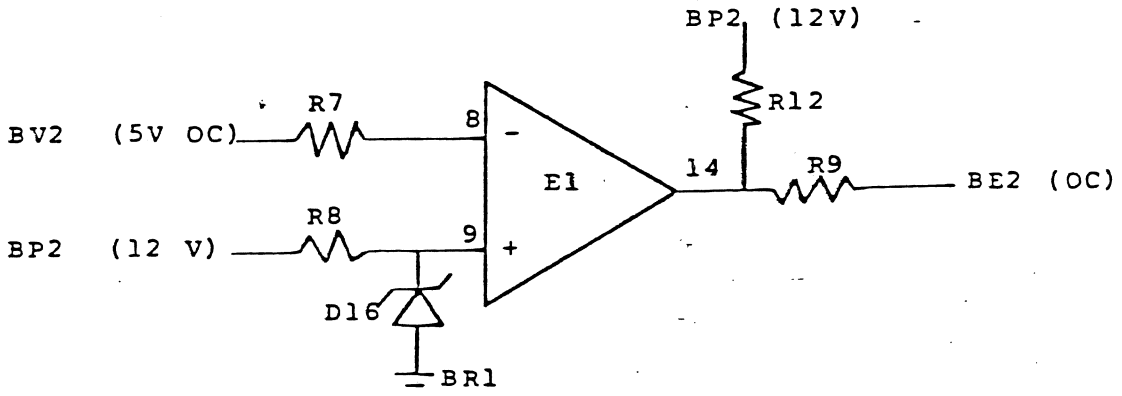
OVER TEMP. IND. C
OVER TEMP. IND. S
OVER TEMP. SENSE



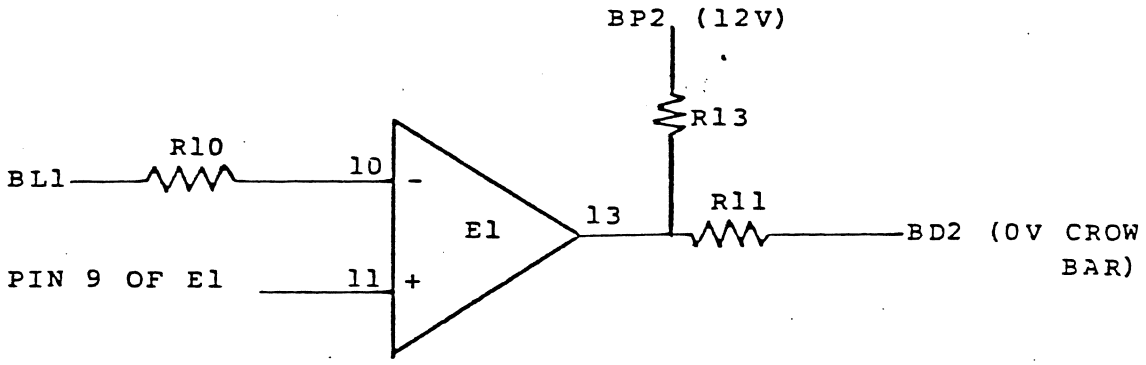
EXT. DC OK
DC OK
REG. FAIL



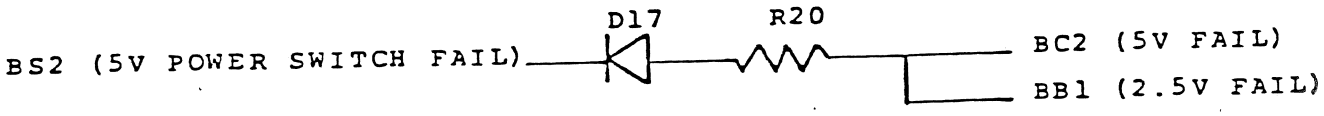
OVER CURRENT



0 V CROWBAR

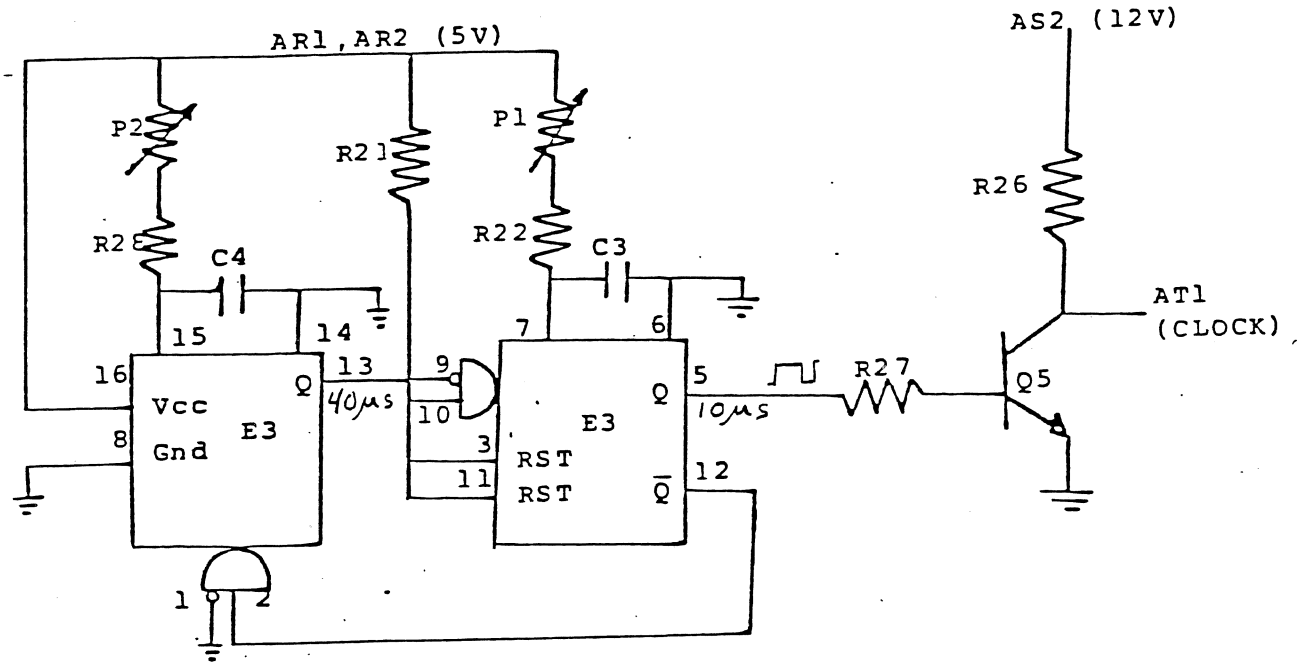


5 V FAIL
2.5 V FAIL



H7104-D simulator

CLOCK



Control card parts list

ITEM	PART NUMBER	DESCRIPTION	QTY	LOCATION
1	10-00024	470 MMFD 100 V 5% MICA	1	C6
2	10-00029	4700 MMFD 100 V 1% MICA	2	C3,4
3	10-00075	25 MFD 25 V AL/EL	1	C2
4	10-10274-01	.22 MFD 50 V CER	1	C5
5	10-10978-36	.1 MFD 50 V CER	1	C1
6	11-00102	1N754 A VZ = 6.8 V	1	D16
7	11-00122	1N748A VZ = 3.9 V	2	D1,6
8	11-01938	1N4370A VZ = 2.4 V	1	D7
9	11-05275	D67Z PIV = 60 V	9	D8-15,26
10	11-05796	1N4004 PIV = 400 V	9	D2-5,17, 19,21,23,25
11	11-09991-01	1N754 VZ = 6.8 V	3	D18,20,22
12	11-10854	1N5353A VZ = 16 V	1	D24
13	13-00172	10 2 W	1	R29
14	13-00229	100 .2 W	1	R30
15	13-00285	270 .5 W	1	R26
16	13-00309	390 .2 W	2	R14,20
17	13-00315	470 .5 W	1	R2
18	13-00316	470 .2 W	2	R5,16
19	13-00391	1.5 K .2 W	1	R6
20	13-00439	3.3 K .2 W	1	R3
21	13-00447	4.7 K .2 W	3	R21,23,25
22	13-01423	6.8 K .2 W	1	R4
23	13-01424	680 .2 W	1	R31
24	13-01425	300 .2 W	2	R18,19
25	13-02388	2.0 K .2 W	1	R17
26	13-02391	20 K .2 W	1	R28
27	13-02466	100 K .2 W	1	R33
28	13-03114	1.0 K .2 W	10	R7-13,15, 27,32
29	13-03177	2.4 K .2 W	1	R24
30	13-05890	4.7 .2 W	1	R1
31	13-09150-04	5.0 K .5 W POT	1	P2
32	13-09150-08	500 .5 W POT	1	P1
33	13-13592	4.87K .2 W	1	R22
34	15-05867	2N4441	1	Q6
35	15-10705	XA05	4	Q1,2,4,5
36	15-10959	2N3725	1	Q3
37	19-10282	LM301	1	E2
38	19-12108	LM339	1	E1
39	19-12837	74LS123	1	E3
40	50-09045	WIRE WRAP BOARD	1	

Construction

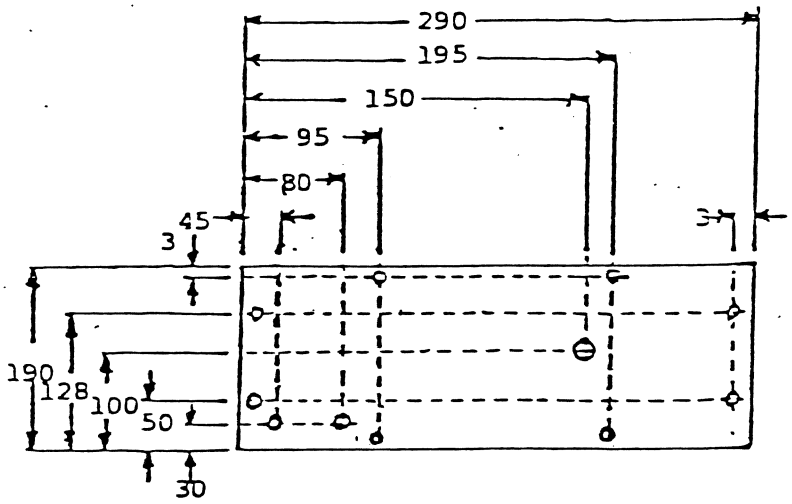
In this section you will find the construction specifications for the different boxes and mounting hardware for the test station.

For building material 1 1/2 square meters of plexiglass is needed. All holes are 7/64" in diameter unless otherwise specified.

All mesurements are in millimeters except drilled holes. This is due to DEC's use of the English mesurement system for their screws and accesories.

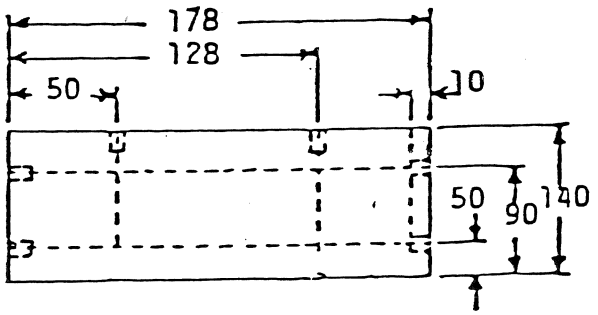
Safety box for the power output

Top

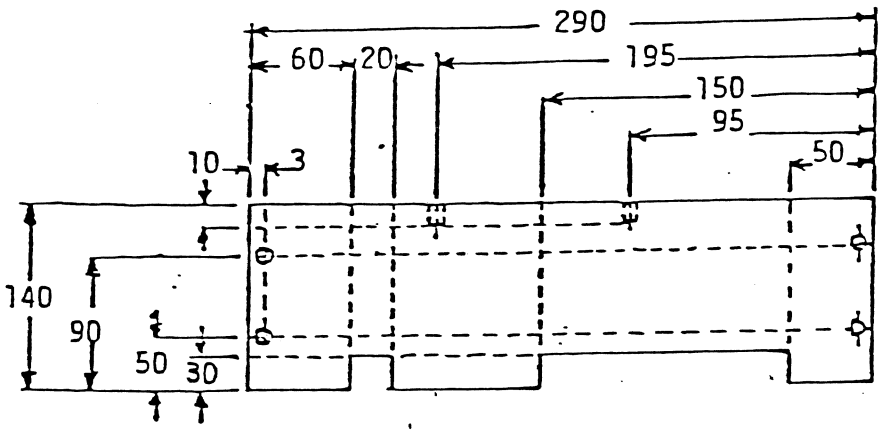


The three holes in the center of the box are 1/4" in diameter. These are used for minor heat dissipation and probing.

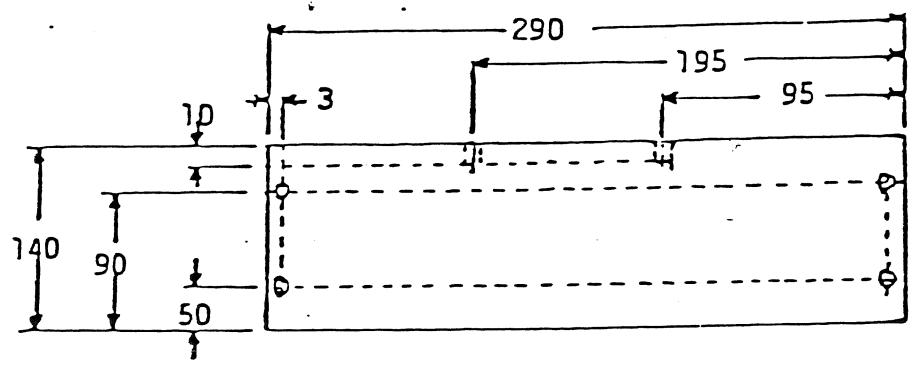
Back



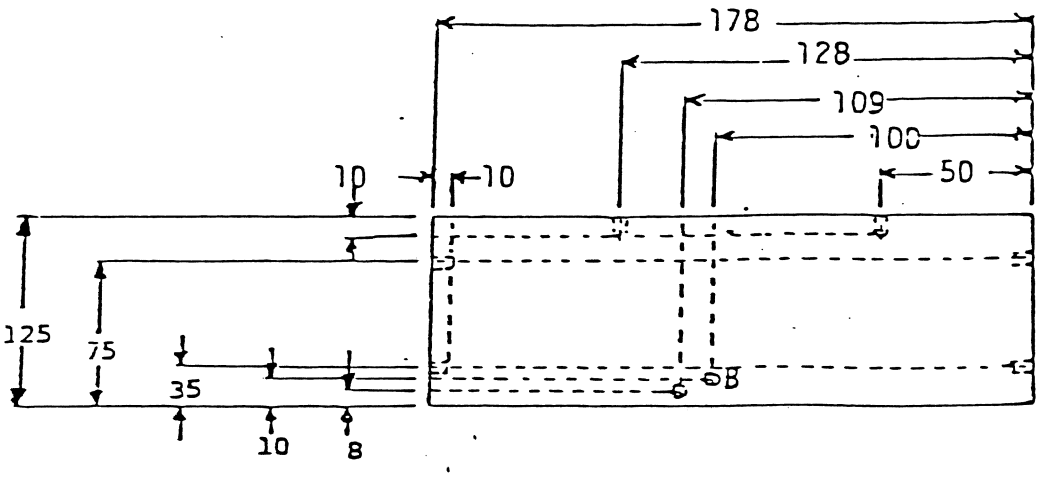
Right side



Left side

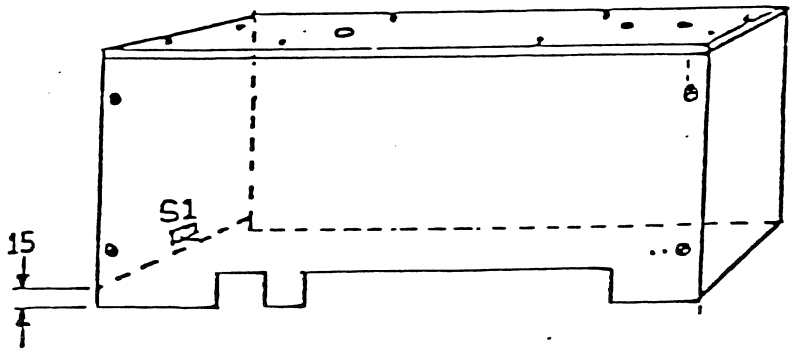


Front



The two holes at position B are used to fasten S1. These holes are 3/32" in diameter. S1 is wired in the normally closed position.

Assembly



S1 will open on contact with the O/P panel as it is laid on top. The switch is positioned inside the box as indicated.

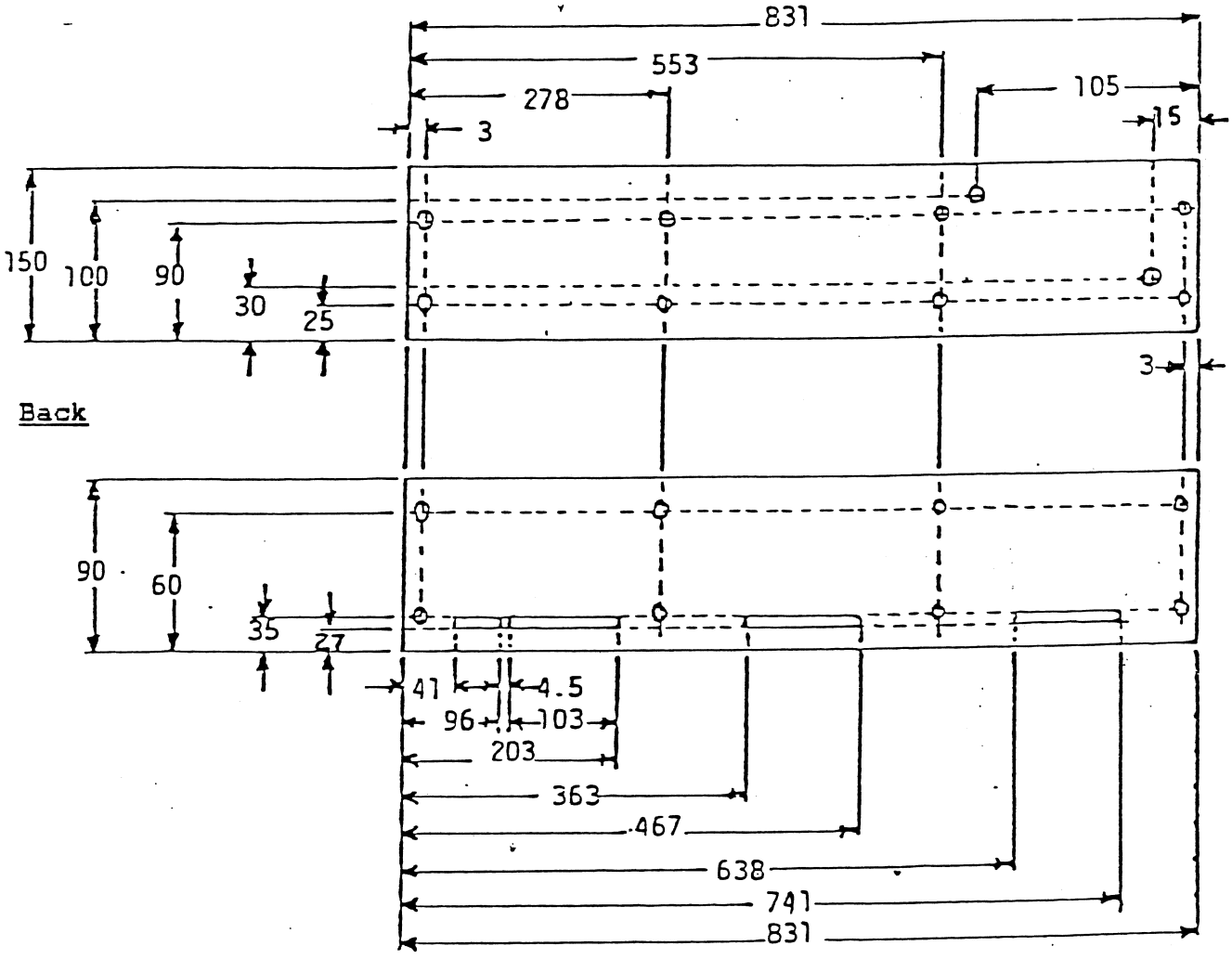
O/P safety box parts list

ITEM	PART NUMBER	DESCRIPTION	QTY	LOCATION
1	12-10340	MICRO SWITCH	1	S1
2	90-07793-01	SCREW, PHIL. 6/32	16	
3		6 X 300 X 750 mm PLEXIGLASS		

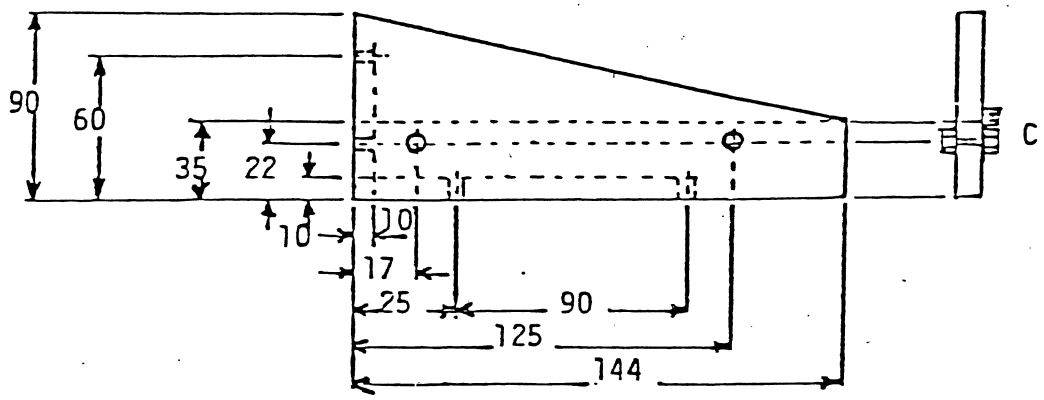
Module support

PRECISION IS NEEDED TO MAKE THIS ASSEMBLY

Bottom

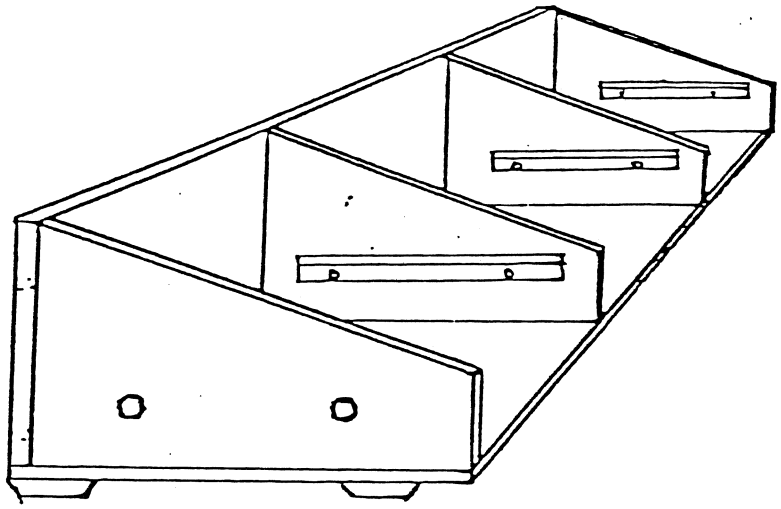


Sides(4 times this assembly)



Assembly

Use structural adhesive (items 9,10) to bond the edge card connectors (items 1,2) to the back of this assembly.

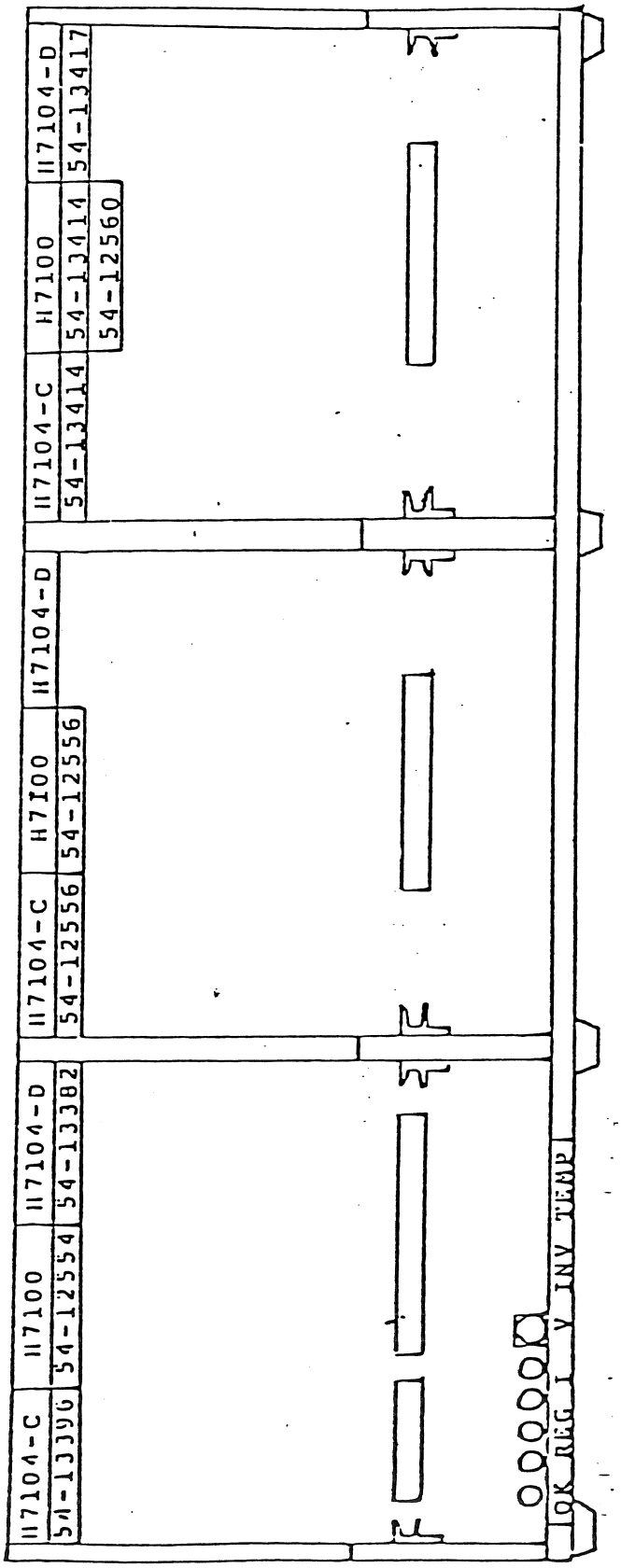


Module support parts list

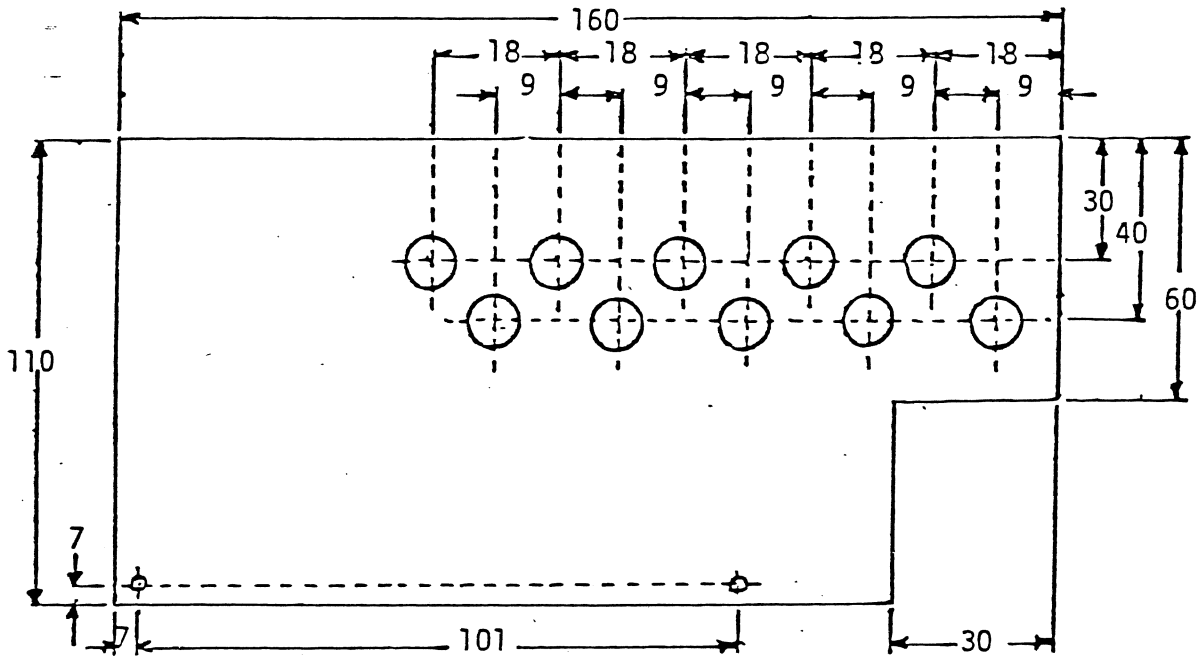
ITEM	PART NUMBER	DESCRIPTION	QTY	LOCATION
1	12-14257	12 PIN EDGE CARD CONNECTOR	1	
2	12-14257-02	24 PIN EDGE CARD CONNECTOR	3	
3	74-11673	CARD GUIDE	6	
4	90-06560	NUT, HEX 6/32	8	
5	90-06653	WASHER, FLAT STEEL .1	8	
6	90-07793-01	SCREW, PHIL. 6/32	24	
7	90-09624	RUBBER FEET .7	8	
8		6 X 300 X 1100 mm PLEXIGLASS		
9		LOCQUIC ACTIVATOR 707		
10		LOCTITE SPEED BONDER 324		

Labels

Labeling each section of the support is necessary so that the proper boards are placed in the right test station mode. (front view)

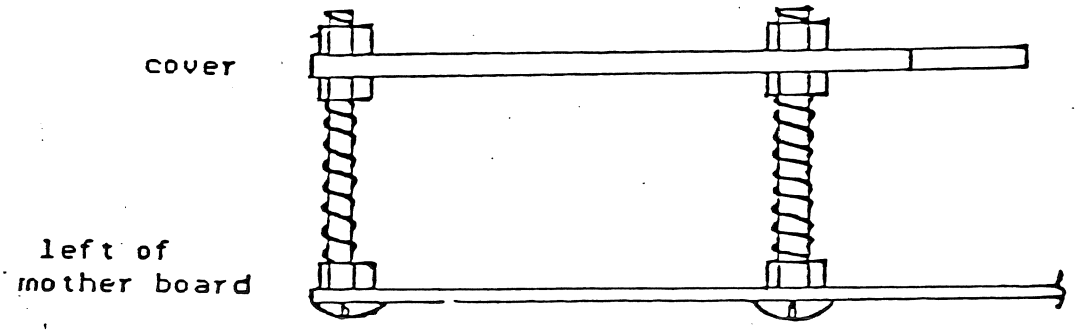


Motherboard high voltage covers



The ten larger holes are 3/8" in diameter.

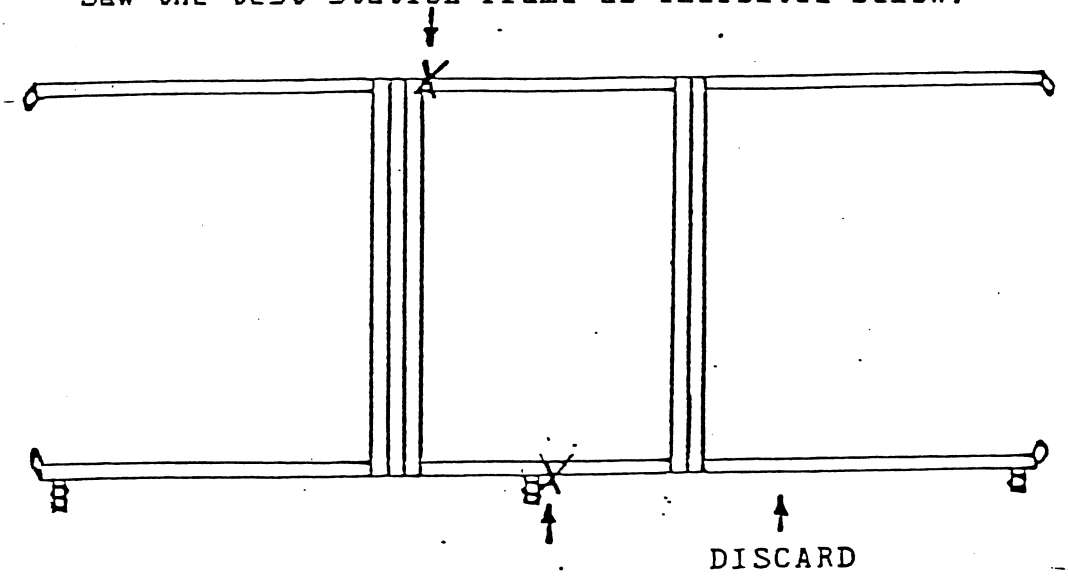
Assembly



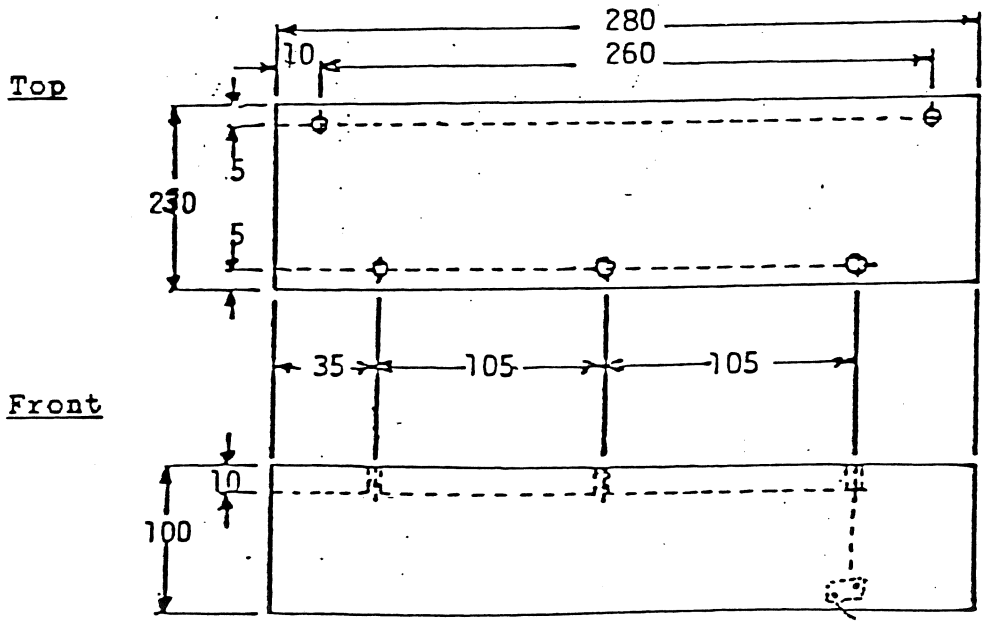
Two screws 90-08911-01 and six nuts 90-06560 are used to make this assembly. This permits easy access to the motherboard.

Probing frame for the motherboard

Saw the test station frame as indicated below.



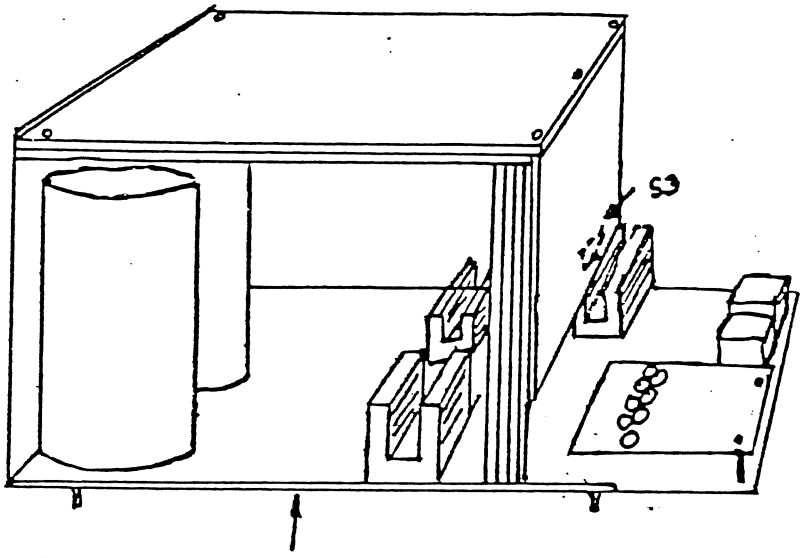
When probing a motherboard, remove it's frame and replace it with this one. This will allow for probing facility and a safer area to work around.



S3 is connected in the normally closed position and wired with two 400 mm long 18 AWG wires in parallel with S1 from the power output cover going to the power controller.

Assembly

S3 is depressed on heat sink; if cover his not installed properly the power controller will be turned off.

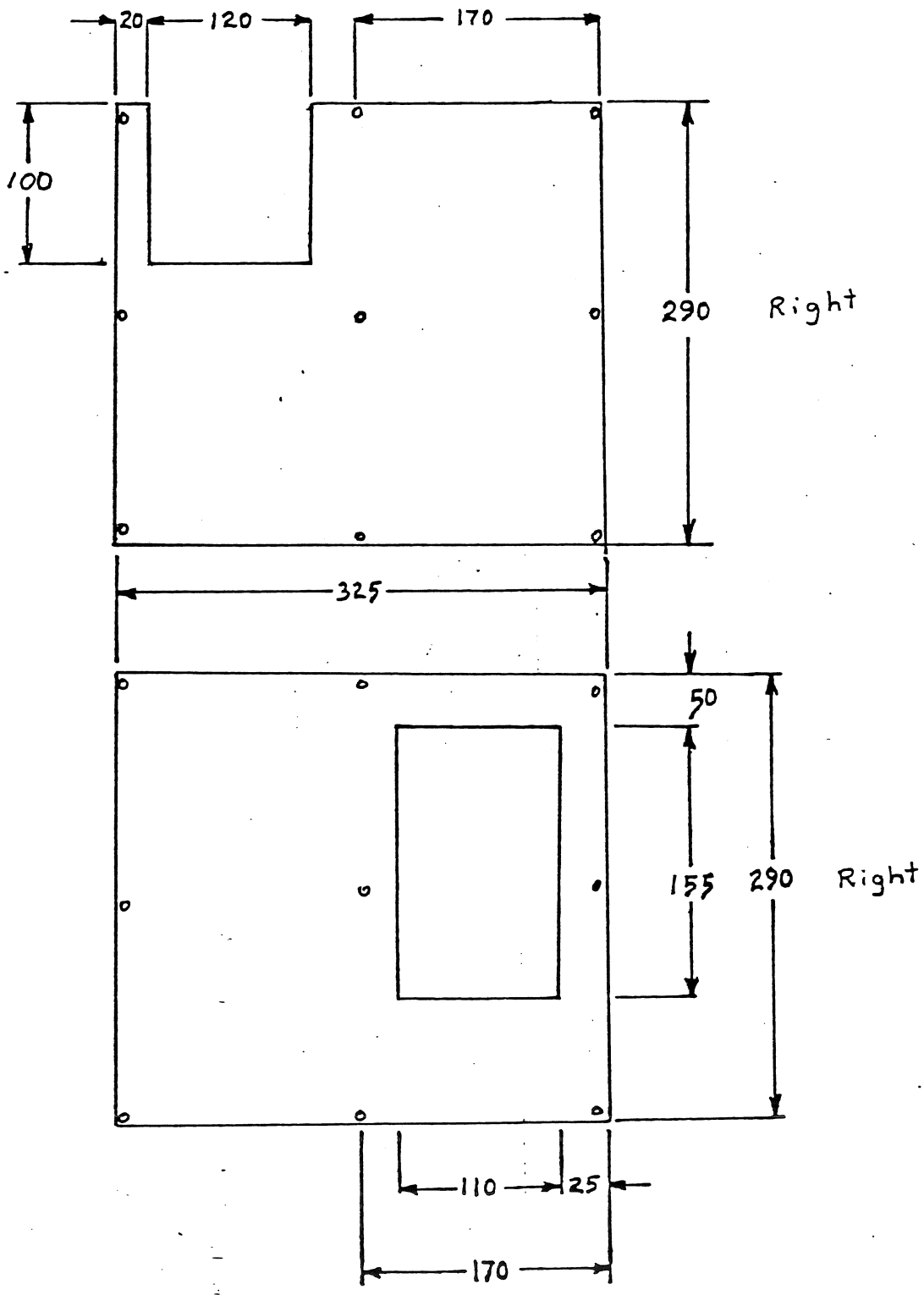


Motherboard covers parts list

ITEM	PART NUMBER	DESCRIPTION	QTY	LOCATION
1	12-10340	MICRO SWITCH	1	S1
2	90-06560	NUT, HEX 6/32	8	
3	90-07793-01	SCREW, PHIL. 6/32	5	
4	90-08911-01	SCREW, PHIL, 6/32	2	
5		6 X 320 X 390 mm PLEXIGLASS		

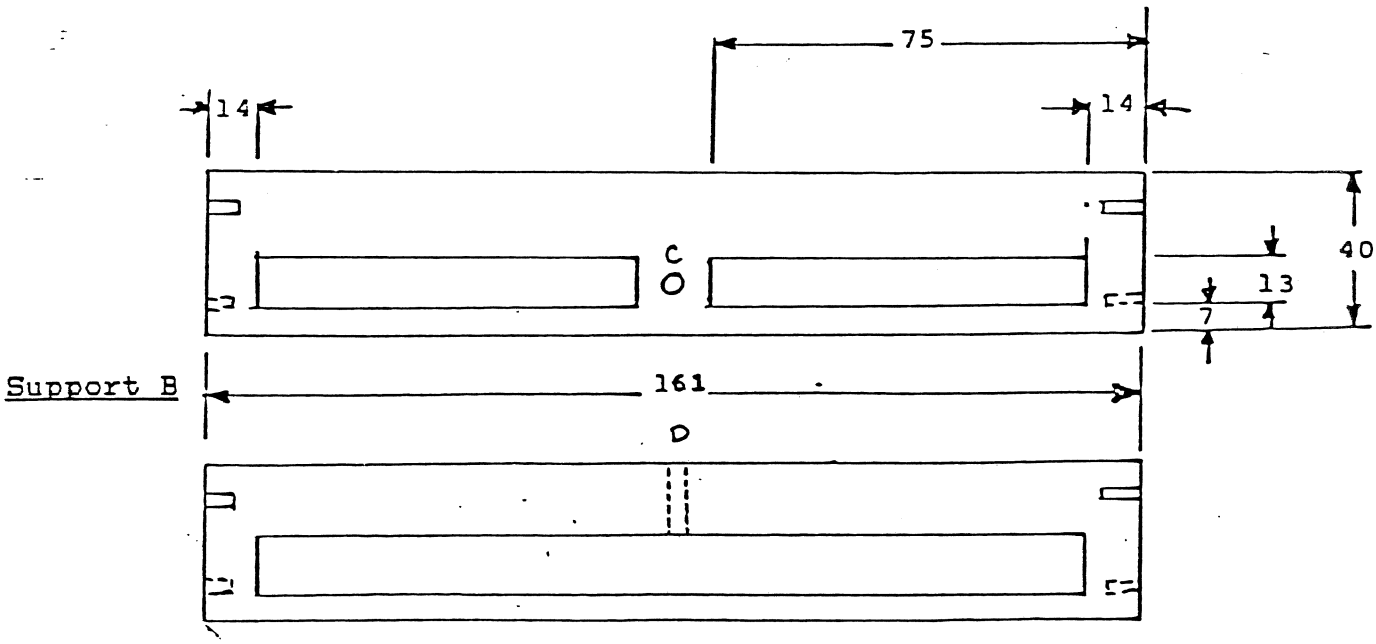
Control box

Top



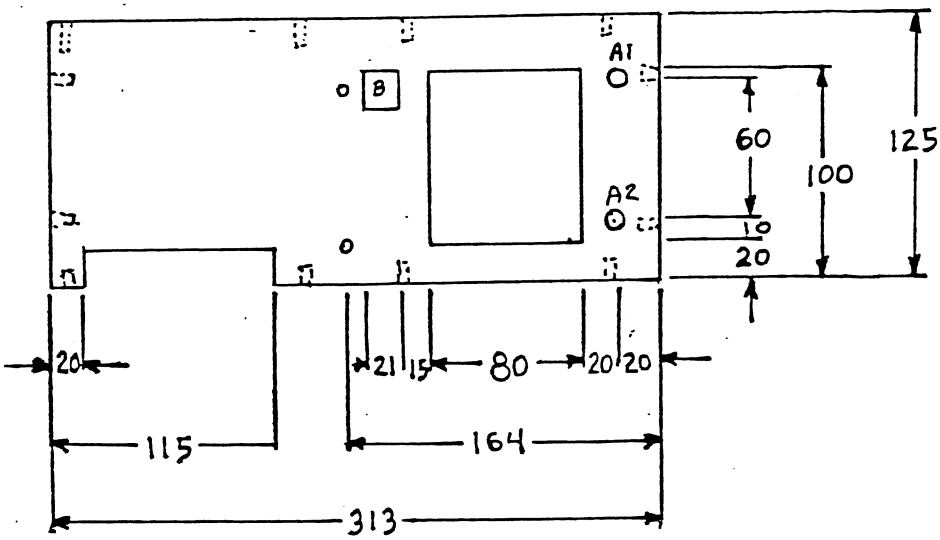
Bottom

Support A



Insert the screws at points C and D before assembling the top and rear.

Front

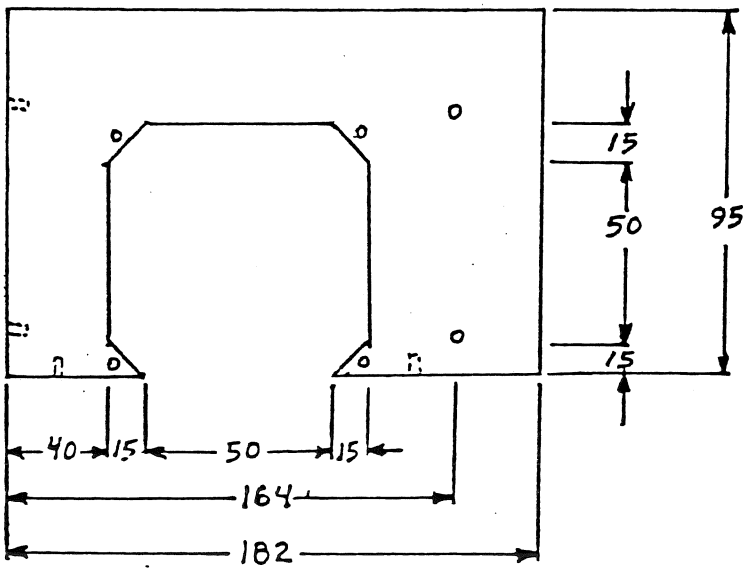


Right

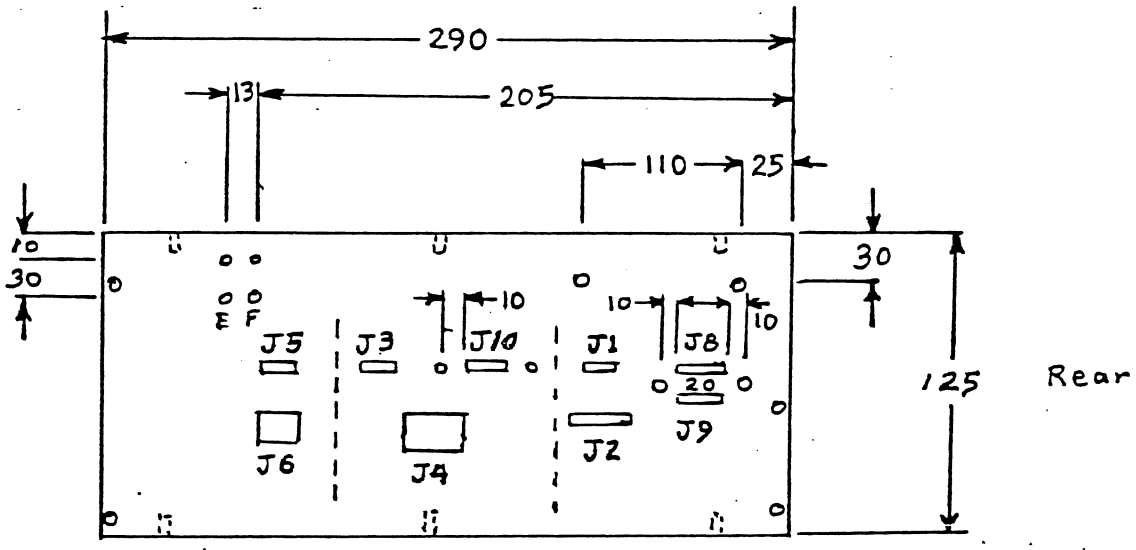
A : diameter = 13/32"; hole A1 is used for S1 and A2 is for the wires comming from S1.

B : 12-12168-07 for external DC supply;J7

Rear



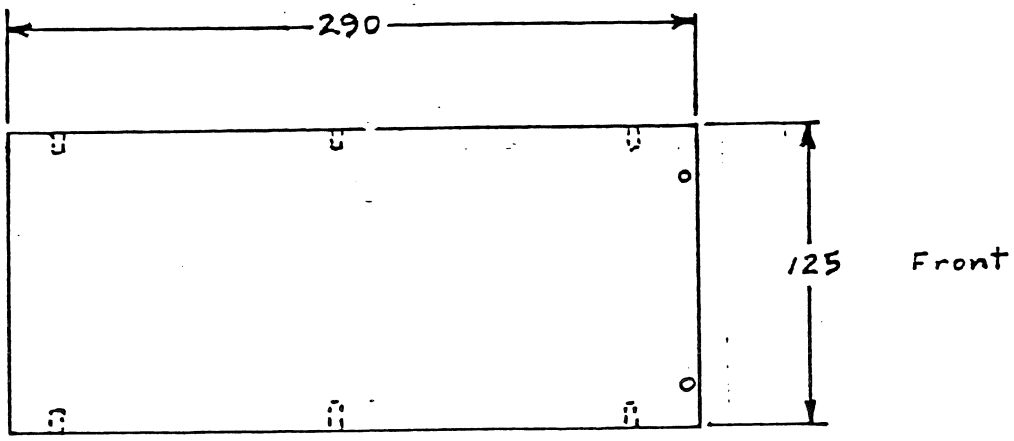
Right side



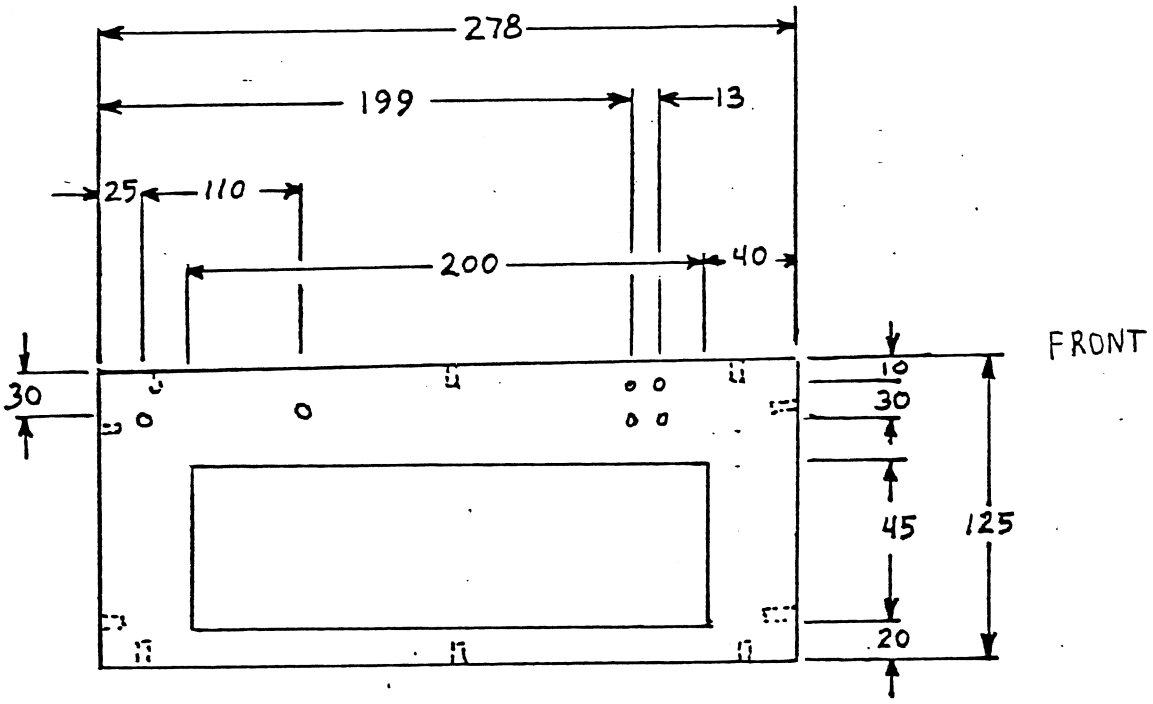
Connectors' hole mesurements;

J8-10 : 5 X 25
J1,3 : 8 X 15
J2 : 8 X 27
J4 :21 X 34
J5 : 8 X 21
J6 :15 X 21
E : Indicator for block connector Support A
F : Indicaror for block connector Support B

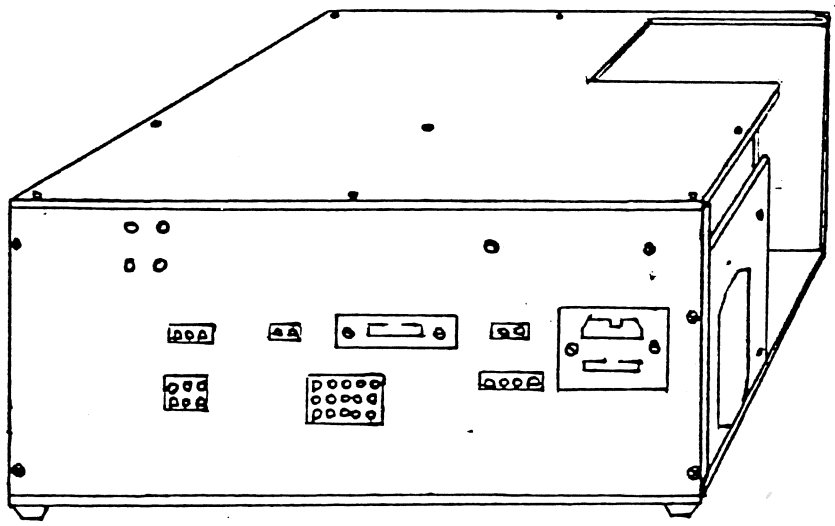
Left side



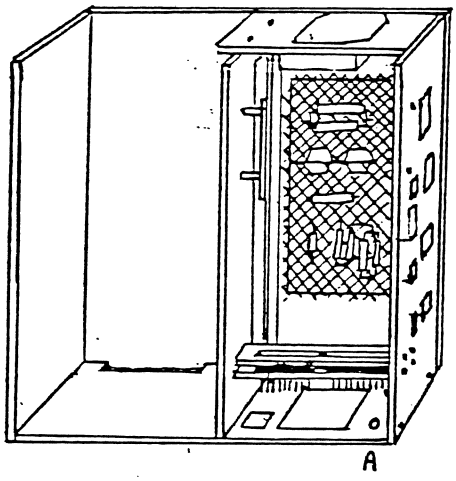
Middle



Assembly (viewed from the right)



Assembly cont. (viewed from the top without the top cover)

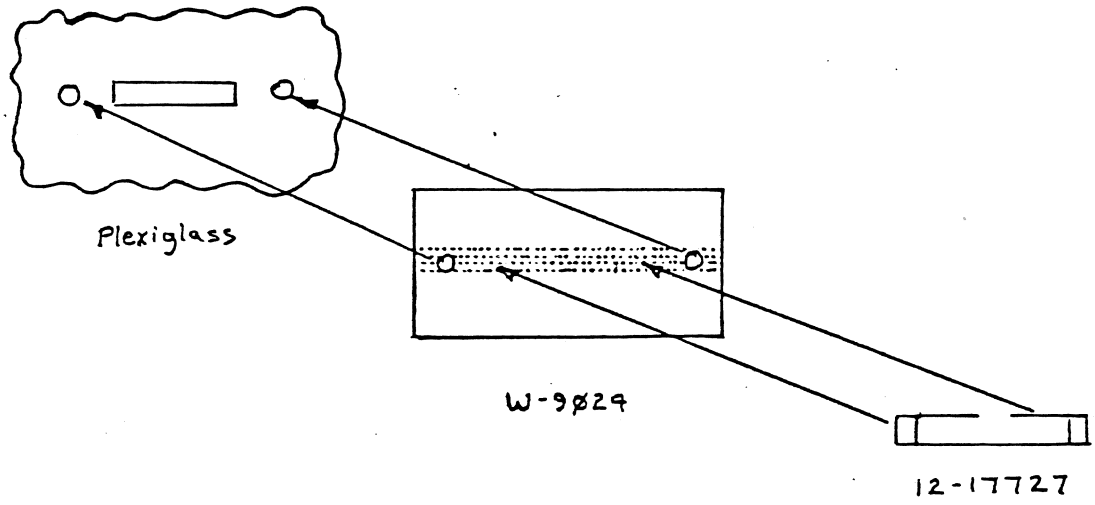


A toggle switch (12-11180-01) goes in hole "A". This replaces the +/-5% switch on the output panel since it will be unreachable during debuging. Crimp female pins and place them in pins 1 to 3 of a male connector (12-12167-04). Pins 4 to 9 of this connector come from pins 4 to 9 of the male connector of the output panel. As an intermediate, use a female connector (12-12168-07) with 200 mm long wires.

Ribbon cable connectors sub-assembly

To install these connectors unto the control box, use a prototyping board (W-09024). Cut one piece 40 X 65 and another 25 X 65 mm. Use 4 screws (90-07793-01) and 4 nuts (90-06560) to fasten these 2 boards.

Solder 30 AWG wire from the block connector of the control box to the proper pins of the cable connectors (see "Simulators" for wiring specifications).



Minimum loading sub-assembly

Switching power supply often need a minimum load for proper operation. These resistive loads are the recommended maximum values for each output. Clamp these loads to hard wire screen in the bottom of the box. When all the loads are securily fastened use insulating varnish to cover the bare leads or wire. **Be sure that none of the leads are in contact with the screen** (ground leads are acceptable but only if necessary).

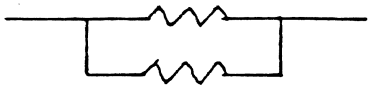
H7100

5 V: 0.2 Amps min. .'. R = 22 ohms @ 2w = 13-01546 (R1)

H7104-C

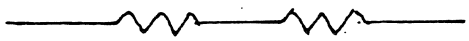
2.5 V: 8.5 Amps min. .'. R = 0.5 ohm @ 25w = 13-10180
Two resistors in parallel will load this output at 10 Amps

(R2,3)



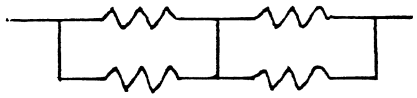
5 VB: 2.0 Amps min. .'. R = 2.0 ohm @ 25w = 13-00154 (R4)

12 VB: 1.0 Amp min. .'. R = 5.0 ohm @ 10w = 13-11842
Two of these resistors in series are needed.(R5,6)

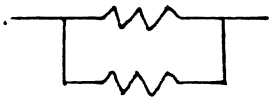


H7104-D

5 V: 10 Amps min. .'. R = 0.5 ohm @ 25w = 13-10180
Two sets of two resistors in parallel (the sets are placed in series) to load this output.(R7-10)



15 V: 0.2 Amp min. .'. R = 150 ohms @ 2w = 13-00257
Two resistors in parallel give the proper load to this output.(R11,12)



-15 V: 0.35 Amp min. .'. R = 30 ohms @ 10w = 13-05260 (R13)

Control box parts list

ITEM	PART NUMBER	DESCRIPTION	QTY	LOCATION
1	12-09941-06	RIBBON CABLE CONNECTOR	1	J8
2	12-10719-03	MINI BOXER FAN	1	
3	12-11180-01	TOGGLE SWITCH	1	S1
4	12-11425-02	BLOCK CONNECTOR	1	
5	12-12168	MATE & LOCK HOUSING, 3 X 1	1	J5
6	12-12168-01	MATE & LOCK HOUSING, 2 X 1	2	J1,3
7	12-12168-02	MATE & LOCK HOUSING, 4 X 1	1	J2
8	12-12168-05	MATE & LOCK HOUSING, 2 X 3	1	J6
9	12-12168-06	MATE & LOCK HOUSING, 5 X 3	1	J4
10	12-12168-07	MATE & LOCK HOUSING, 3 X 3	1	J7
11	12-17727	RIBBON CABLE CONNECTOR	2	J9,10
12	13-00154	2.0 25 W	1	R4
13	13-00257	150 2 W	2	R11,12
14	13-01546	22 2 W	1	R1
15	13-05260	30 10 W	1	R13
16	13-10180	.5 25 W	6	R2,3,7-10
17	13-11842	5 10 W	2	R5,6
18	74-11673	CARD GUIDE	2	
19	90-06027-01	SCREW, PHIL. 6/32	4	
20	90-06560	NUT, HEX 6/32	4	
21	90-06892	SPACER, THREADED 6/32	4	
22	90-09624	RUBBER FEET .7	4	
23		SCREEN 110 X 280 mm		
24		LOCQUIC ACTIVATOR 707		
25		LOCTITE SPEED BONDER 324		
26		6 X 625 X 775 mm PLEXIGLASS		
27	W-09024	PROTOTYPING WW BOARD	1	

WIRING TABLE

ITEM NO	DESCRIPTION AWG	COLOR	FROM	TO	SIGNAL	PART NUMBER
1	18	RED	J5-1	R1	+5 V	91-07360-22
2	18	BLACK	J5-3	R1	GND	91-07360-00
3	14	RED	J3-1	R2,3	+2.5 V	91-07370-22
4	14	BLACK	J3-2	R2,3	GND	91-07370-00
5	18	RED	J4-6	R4	+5 VB	91-07360-22
6	18	BLACK	J4-9	R4	GND	91-07360-00
7	18	ORANGE	J4-1	R5	+12 V	91-07360-33
8	18	BLACK	J4-3	R6	GND	91-07360-00
9	14	RED	J1-1	R7,8	+5 V	91-07370-22
10	14	BLACK	J1-2	R9,10	GND	91-07370-00
11	18	GREY	J2-1	R11,12	+15 V	91-07360-88
12	18	BLACK	J2-2	R11,12	GND	91-07360-00
13	18	BLACK	J2-3	R13	GND	91-07360-00
14	18	BLUE	J2-4	R13	-15 V	91-07370-66

Block Connector Wiring

Thirty AWG wire is used to wrap the block connector (12-11425-02) and soldered to the prototyping boards at the proper connector.

From	To		
Block Connector	Connector ID	Pin	AWG
BV1	from H7104-D	J9-01	30
BV2	''	2	
BU1	''	3	
BU2	''	4	
BT1	''	5	
BT2	''	6	
BS1	''	7	
BS2	''	9	
BR1	''	10	
BR2	''	11	
BP1	''	12	
BP2	''	13	
BN1	''	14	
BN2	''	15	
BM1	''	16	
BM2	''	17	
BL1	''	19	
BL2	''	J9-20	
BH2	to 875A	J8-01	
BF1	''	2	
BF2	''	3	
BE1	''	5	
BE2	''	7	
BD1	''	9	
BD2	''	10	
BC1	''	12	
BC2	''	13	
BB1	''	14	
BB2	''	15	
BA1	''	16	
BA2	''	J8-17	30

From Block Connector	To Connector ID	Pin	AWG
AV1	from H7104-C	J10-03	30
AV2	"	4	
AU1	"	5	
AU2	"	6	
AT1	"	8	
AT2	"	10	
AS1	"	13	
AS2	"	14	
AR1	"	15	
AR2	"	J10-16	30
AL1	from H7100	J6-01	18
AL2	"	2	
AK1	"	3	
AJ2	"	4	
AB2	"	5	
AT2	"	J6-06	18
*FAN RET.	external supply	J7-01	14
*FAN	"	3	
AV1	"	4	
AU1,2	"	5	
AV2	"	6	
AS1,2	"	7	
AT2	"	8	
AR1,2	"	J7-09	14

*These connections are made directly on the control box fan.

External biasing

The H7104-C needs an external bias usualy provided by the H7104-D. A modified version of the 70-14979 can be used for this task.

In case a problem should arise, the outputs of this external supply will be limited to the H7104-C's needs. The over current changes are as follows;

Remove R 37, R 44 and R45
Replace R 37 with a 0.03 ohm 2w resistor (13-10876-01)
Replace R 44 with a 0.02 ohm 2w resistor (13-10876)

The 5 V over current is now approximately 2.9 Amperes
The 12 V over current is now approximately 1.8 Amperes

It is best to give this output a minimum load. Therefore a 10 ohms 5w resistor (13-14171) is soldered to it's output.

Use harness 70-14978-03 to interface this supply with the control box. On one end of this cable there are two connectors. Cut both connectors from that end. Crimp the outputs into a 9 pin male connector (12-12167-04), P7 of the control box, as described below (pins 1 and 3 are provided by the optional fan output of the power supply).

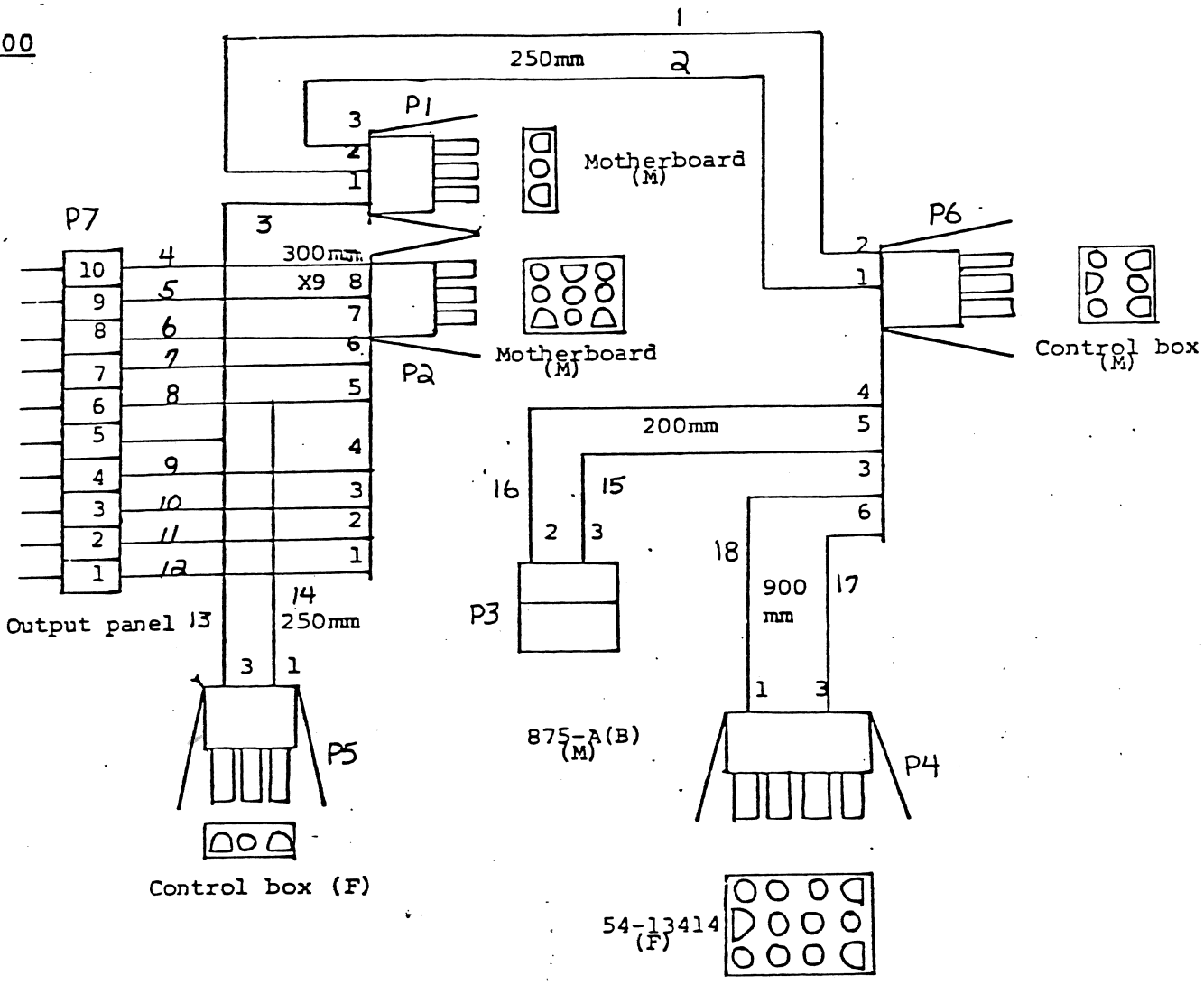
PIN	DESCRIPTION
P7-1	AC RETURN
P7-2	N/C
P7-3	115 VAC
P7-4	GND
P7-5	-12 V @ 1 A
P7-6	GND
P7-7	+12 V @ 1 A
P7-8	GND
P7-9	5 V @ 2 A

External bias parts list

ITEM	PART NUMBER	DESCRIPTION	QTY	LOCATION
1	12-12167-04	MATE & LOCK HOUSING, 3 X 3	1	
2	12-12169	MATE & LOCK PIN, MALE	9	
3	13-10876	.02 5.0 W 3 %	1	R1
4	13-10876-01	.03 5.0 W 3 %	1	R2
5	13-14171	10 5.0 W	1	R3
6	70-14978-03	DC POWER HARNESS	1	
7	70-14979	DC POWER SUPPLY	1	
8		LINE CORD	1	

Testing harnesses

H7100



The letters in parenthesis represent the type of pin used in each housing; (M) for the males, 12-12169, and (F) for the females 12-12170. Exception to this is the connectors (one on this page) going to the 875-A (B); the housings are 12-09351-03 and the male pins are 12-09378.

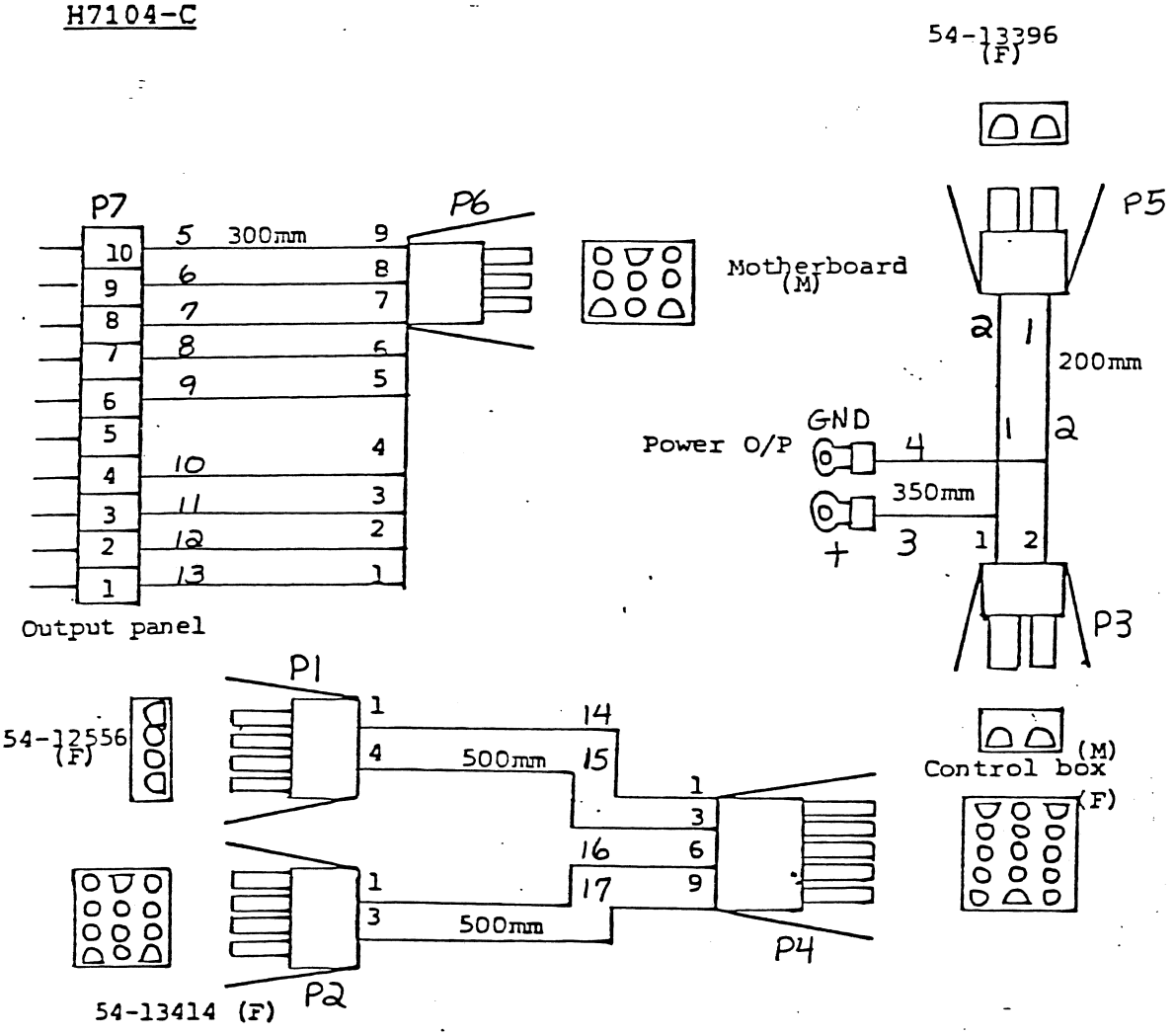
H7100 test harness parts list

ITEM	PART NUMBER	DESCRIPTION	QTY	LOCATION
1	12-09351-03	MATE & LOCK HOUSING, 1 X 3	1	P3
2	12-09378	MATE & LOCK PIN, MALE	2	
3	12-12167	MATE & LOCK HOUSING, 1 X 3	2	P1,5
4	12-12167-03	MATE & LOCK HOUSING, 3 X 4	1	P4
5	12-12167-04	MATE & LOCK HOUSING, 3 X 3	1	P2
6	12-12167-06	MATE & LOCK HOUSING, 2 X 3	1	P6
7	12-12169	MATE & LOCK PIN, MALE	18	
8	12-12170	MATE & LOCK PIN, FEMALE	4	
9	12-12484-04	10 POST TERMINAL	1	P7
10	90-07930	TERMINAL RING, #10 STUD	10	

WIRING TABLE

ITEM NO	DESCRIPTION AWG	COLOR	FROM	TO	SIGNAL	PART NUMBER
1	18	BROWN	P6-1	P1-3		91-07360-11
2	18	ORANGE	P6-2	P1-2		91-07360-33
3	14	BLACK	P7-5	P1-1		91-07370-00
4	14	GREEN	P7-10	P2-9		91-07370-55
5	14	GREEN	P7-9	P2-8		91-07370-55
6	14	GREEN	P7-8	P2-7		91-07370-55
7	14	GREEN	P7-7	P2-6		91-07370-55
8	14	GREEN	P7-6	P2-5		91-07370-55
9	14	GREEN	P7-4	P2-4		91-07370-55
10	14	GREEN	P7-3	P2-3		91-07370-55
11	14	GREEN	P7-2	P2-2		91-07370-55
12	14	GREEN	P7-1	P2-1		91-07370-55
13	18	BLACK	P7-5	P5-3		91-07360-00
14	18	RED	P7-6	P5-1		91-07360-22
15	18	BLACK	P6-5	P3-3		91-07360-00
16	18	GREY	P6-4	P3-2		91-07360-88
17	18	BLACK	P6-6	P4-3		91-07360-00
18	18	RED	P6-3	P4-1		91-07360-22

H7104-C



Plus; 70-16513 - from the control box to the 54-13396
70-16514 - from the 54-13396 to the 875-A (B)

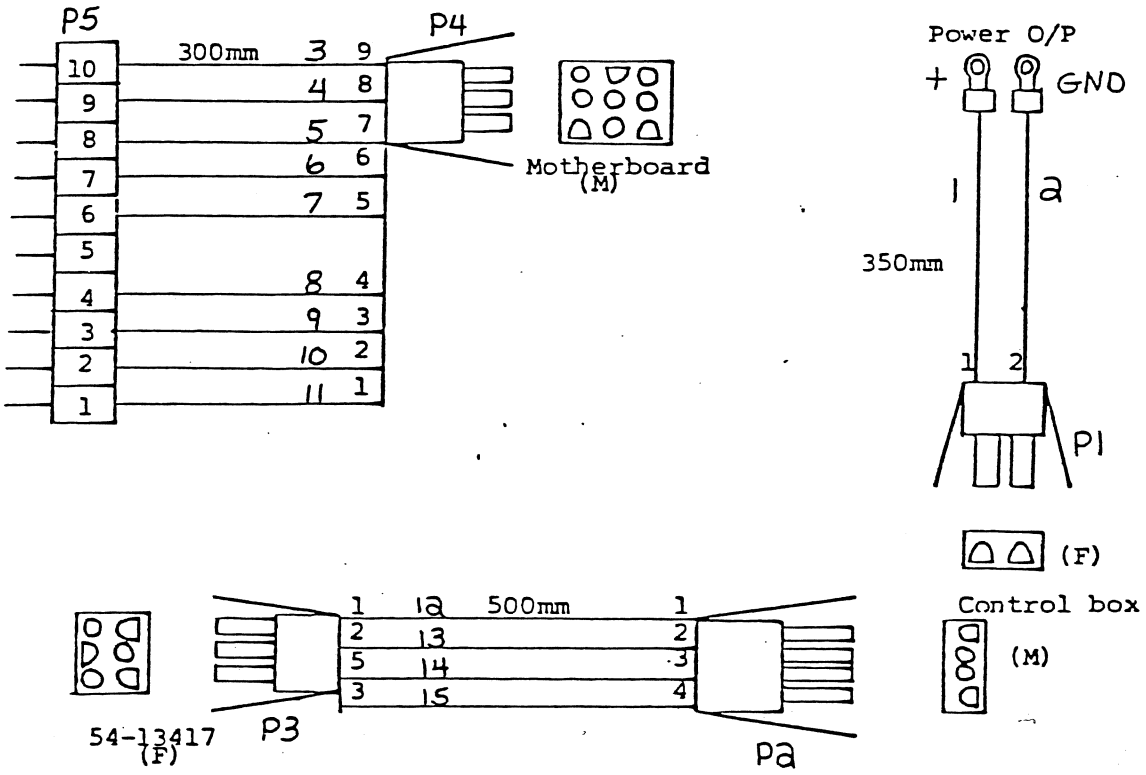
H7104-C test harness parts list

ITEM	PART NUMBER	DESCRIPTION	QTY	LOCATION
1	12-12167-01	MATE & LOCK HOUSING, 1 X 4	1	P1
2	12-12167-02	MATE & LOCK HOUSING, 1 X 2	2	P3,5
3	12-12167-03	MATE & LOCK HOUSING, 3 X 4	1	P2
4	12-12167-04	MATE & LOCK HOUSING, 3 X 3	1	P6
5	12-12167-05	MATE & LOCK HOUSING, 3 X 5	1	P4
6	12-12169	MATE & LOCK PIN, MALE	11	
7	12-12170	MATE & LOCK PIN, FEMALE	10	
8	12-12484-04	10 POST TERMINAL	1	P7
9	90-07930	TERMINAL RING, #10 STUD	12	

WIRING TABLE

ITEM NO	DESCRIPTION AWG	COLOR	FROM	TO	PART NUMBER
1	18	RED	P3-1	P5-2	91-07360-22
2	18	BLACK	P3-2	P5-1	91-07360-00
3	14	RED	P3-1	POWER O/P POS.	91-07370-22
4	14	BLACK	P3-2	POWER O/P GND	91-07370-00
5	14	GREEN	P7-10	P6-9	91-07370-55
6	14	GREEN	P7-9	P6-8	91-07370-55
7	14	GREEN	P7-8	P6-7	91-07370-55
8	14	GREEN	P7-7	P6-6	91-07370-55
9	14	GREEN	P7-6	P6-5	91-07370-55
10	14	GREEN	P7-4	P6-4	91-07370-55
11	14	GREEN	P7-3	P6-3	91-07370-55
12	14	GREEN	P7-2	P6-2	91-07370-55
13	14	GREEN	P7-1	P6-1	91-07370-55
14	18	ORANGE	P1-1	P4-1	91-07360-33
15	18	BLACK	P1-4	P4-3	91-07360-00
16	18	RED	P2-1	P4-6	91-07360-22
17	18	BLACK	P2-3	P4-9	91-07360-00

H7104-D



Plus; 70-16513 - from the control box to the 54-13382
70-16514 - from the control box to the 875-A (B)

H7104-D test harness parts list

ITEM	PART NUMBER	DESCRIPTION	QTY	LOCATION
1	12-12167-01	MATE & LOCK HOUSING, 1 X 4	1	P2
2	12-12167-02	MATE & LOCK HOUSING, 1 X 2	1	P1
3	12-12167-04	MATE & LOCK HOUSING, 3 X 3	1	P4
4	12-12167-06	MATE & LOCK HOUSING, 2 X 3	1	P3
5	12-12169	MATE & LOCK PIN, MALE	13	
6	12-12170	MATE & LOCK PIN, FEMALE	6	
7	12-12484-04	10 POST TERMINAL	1	P5
8	90-07930	TERMINAL RING, #10 STUD	12	

WIRING TABLE

ITEM NO	DESCRIPTION AWG	COLOR	FROM	TO	PART NUMBER
1	14	RED	POWER O/P POS.	P1-1	91-07370-22
2	14	BLACK	POWER O/P GND	P1-2	91-07370-00
3	14	GREEN	P5-10	P4-9	91-07370-55
4	14	GREEN	P5-9	P4-8	91-07370-55
5	14	GREEN	P5-8	P4-7	91-07370-55
6	14	GREEN	P5-7	P4-6	91-07370-55
7	14	GREEN	P5-6	P4-5	91-07370-55
8	14	GREEN	P5-4	P4-4	91-07370-55
9	14	GREEN	P5-3	P4-3	91-07370-55
10	14	GREEN	P5-2	P4-2	91-07370-55
11	14	GREEN	P5-1	P4-1	91-07370-55
12	18	GREY	P3-1	P2-1	91-07360-88
13	18	BLACK	P3-2	P2-2	91-07360-00
14	18	BLACK	P3-5	P2-3	91-07360-00
15	18	BLUE	P3-3	P2-4	91-07360-66

Testing assembly for the H7100

Output panel: Remove ground pin from the output panel. Use 4 screws (90-07793-01) and nuts (90-06560) to install spacers (90-06802) in the four corners to allow the panel to be flat on the work bench.

Status board: Remove the mounting for the LEDs and resolder each LED flat on the board facing outwards (be careful to keep the right polarity). Lay the over temperature mounting flat and use 24 AWG wire to remake the connection to the board. Then glue the over temperature mounting back to the board.

Screw the status board (54-12562), included in 70-14957, under the bias control board (54-12554) in the prepared holes.

Use existing cable (70-08612-1J) to connect the status board to the bias control board. Keep the cable intact and tied down.

NOTE: 54-12562 and 70-08612-1J are included in 70-14957.

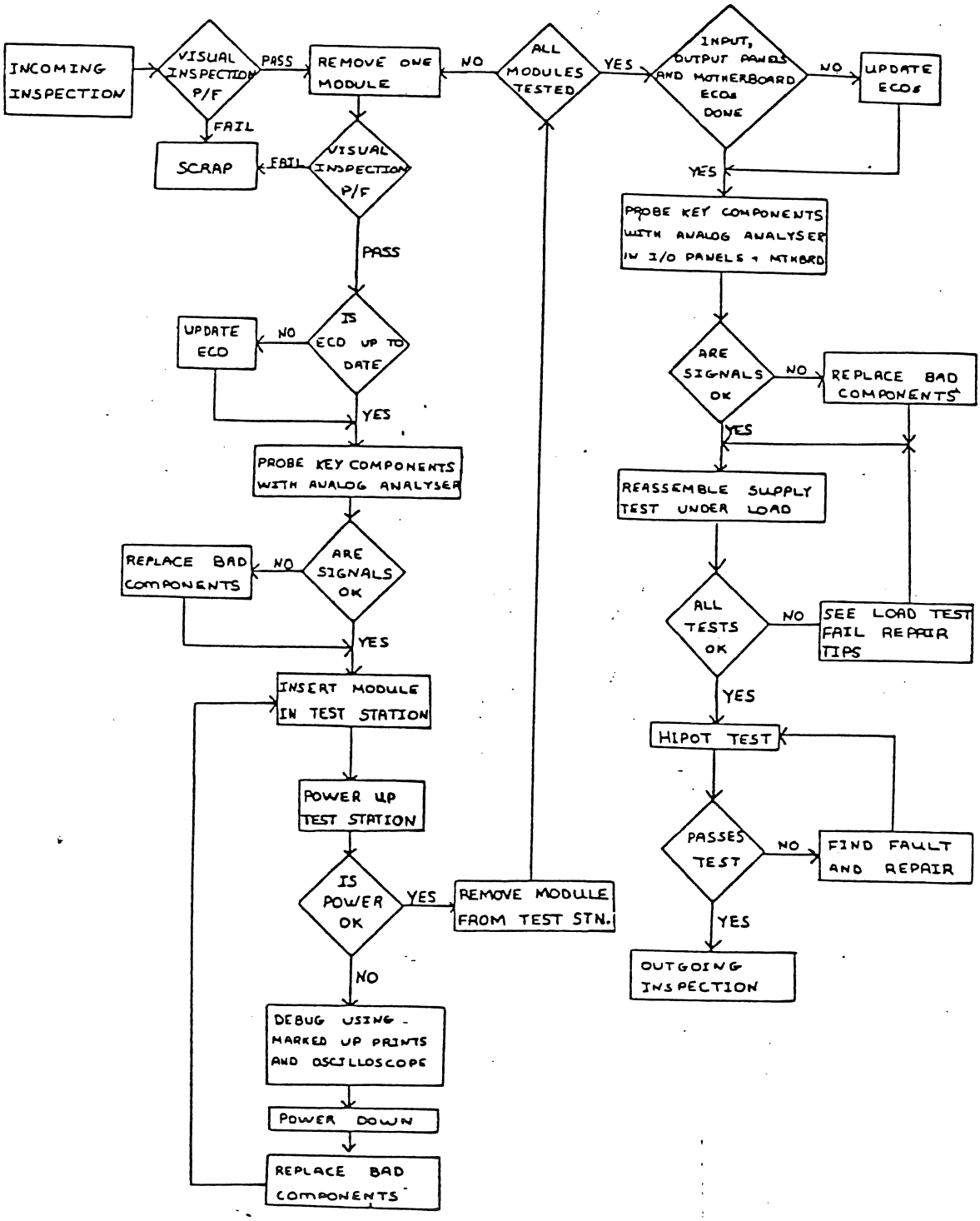
Equipement needed to repair H7100, H7104-C and H7104-D

1-H7100, H7104-C (D) Test station
2-Huntron tracker
3-Oscilloscope, Tektronix 453
4-Load boxes, ACDC electronics; 1 X EL 301
3 X EL 300
2 X EL 750
5-DC hipot tester
6-Digital multimeter

Documentation needed to repair H7100, H7104-C and H7104-D

1-Marked up Circuit Schematic prints
2-Unit Assemblies
3-Parts Lists
4-Engineering Change Orders
5-Engineering Specifications

Repair flow diagram



Engineering Change Orders

A specific series of engineering changes is done for each board or panel. All hilighted ECOs are to be done in the repair centers to meet upgrades.

Repair process

All modules

Any module that fits in the regulator support is debuged with the help of an oscilloscope, a digital multimeter, marked up circuit schematic prints and unit assembly.

Since there is only one known bad board in the test station, it's only a matter of tracking the bad component(s).

1- Before inserting the suspected board in the test station, use an ohmeter to check for short circuits at the 30 and +/-150 Volts raw DC inputs (when applicable) and the regulated output(s) (if applicable).

If a short is found, remove the components in parallel with the point of the short circuit one at a time. After taking one component out, look for a short on that component. If there is, replace it with a new one. Once all suspected components have passed, replace all known good and/or new components in the circuit. Insure that the short circuit is gone before proceding.

2- Insert module and power up test station.

3- With the voltmeter, look for the expected voltages on outputs or signals (Simulator's signals...)

4- The previous voltage mesurements should narrow down the problem to a specific area on the board.

5- Set the oscilloscope at 10 micro seconds per division. The volts per division setting will vary with the need.

Use the oscilloscope with the marked up circuit schematic prints to compare the expected AC and DC voltages with the actual mesurements.

6- Change the suspected bad component(s) and reverify the board in the test station.

Simulators: expected voltages

H7104-C Simulator

Connector from H7104-D		Block connector	Approximate voltages
1	5 V AC LOW	BV1	8 V
2	5 V OVERCURRENT	BV2	12 V
3	GND	BU1	0 V
4	GND	BU2	0 V
5	-12 VA	BT1	-12 V
6	-12 VA	BT2	-12 V
7	5 V DC LOW	BS1	8 V
8	CLK	---	---
9	5 V POWER SW. FAIL	BS2	12 V
10	GND	BR1	0 V
11	5 V DC OK	BR2	5 V
12	5 V OVER TEMP.	BP1	12 V
13	12 VA	BP2	12 V
14	12 VA	BN1	12 V
15	5 VA	BN2	5 V
16	5 VA	BM1	5 V
17	-15 V DC OK	BM2	5 V
18	N/C	---	---
19	5 V CROWBAR SENSE	BL1	12 V
20	15 V DC OK	BL2	5 V

Connector to the 875-A		Block connector	Approximate voltages
1	BATTERY ENABLE	BH2	-8 V
2	OVER TEMP. IND. C	BF1	10 V
3	OVER TEMP. IND. S	BF2	10 V
4	N/C	---	---
5	EXT. DC OK	BE1	6 V
6	N/C	---	---
7	OVER CURRENT	BE2	0 V
8	N/C	---	---
9	GND	BD1	0 V
10	0 V CROWBAR	BD2	0 V
11	N/C	---	---
12	DC OK	BC1	6 V
13	5 V FAIL	BC2	5 V
14	2.5 V FAIL	BB1	5 V
15	PLUG IN REG. FAIL	BB2	5 V
16	5 VA	BA1	5 V
17	OVER TEMP. SENSE	BA2	10 V
18	N/C	---	---
19	N/C	---	---
20	N/C	---	---

H7104-D simulator

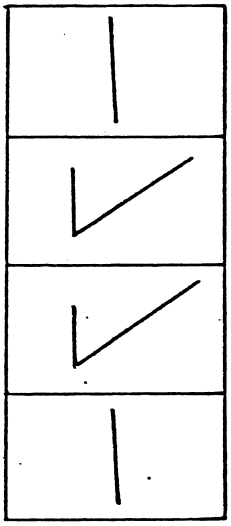
Connector from H7104-C		Block connector	Approximate voltages
1	5 V AC LOW	---	Z
2	5 V OVER CURRENT	---	Z
3	GND	AV1	0 V
4	GND	AV2	0 V
5	-12 VA @ 0.5 A	AU1	-12 V
6	-12 VA @ 0.5 A	AU2	-12 V
7	5 V DC LOW	---	Z
8	CLOCK	AT1	8 VAC
9	5 V POWER SW. FAIL	---	Z
10	GND	AT2	0 V
11	5 V DC OK	---	Z
12	5 V OVER TEMP.	---	Z
13	12 VA @ 0.5 A	AS1	12 V
14	12 VA @ 0.5 A	AS2	12 V
15	5 VA @ 1 A	AR1	5 V
16	5 VA @ 1 A	AR2	5 V
17	-15 V DC OK	---	Z
18	N/C	---	---
19	5 V CROWBAR SENSE	---	Z
20	15 V DC OK	---	Z

Star motherboard

The best method to trouble shoot this board is using the Huntron tracker (analog analyser). Certain signals are expected to show on the tracker from specific components.

These are the motherboard's most likely components to break down and the signals expected in circuit;

Q1-4	BASE-EMITTER	SHORT CIRCUIT
	COLLECTOR-EMITTER	DIODE-LOW SCALE
	BASE-COLLECTOR	DIODE-LOW SCALE
R7-10	1 OHM FUSES	SHORT-CIRCUIT



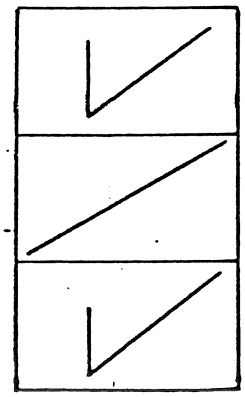
NOTE: If one (or more) transistor's base-collector or collector-emitter is shorted, all of the others will look this way. They are not necessarily all bad. By removing these transistors from the circuit, they can be examined individually.

Q1-4 (out of circuit)

B-E

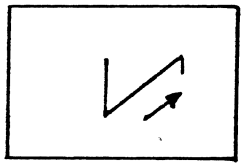
C-E

B-C



With an ohmeter verify that all the capacitors on the motherboard charge up.

All the diodes in the bridge rectifier should have this signal. Notice that the signal seems to change.



Input panel

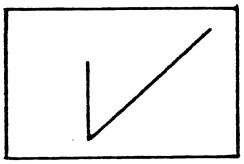
Verify fuse with ohmeter. If the fuse was blown, verify the motherboard for a problem.

Verify physical aspect of the relay. If it looks like it should operate but it doesn't, verify the bias and control board for the relay drive circuit.

Verify the inrush resistor with an ohmeter. If it doesn't meet specifications, change it.

Output panels

If physical aspects passes, remove the power diodes. These can only be verified out of circuit. Look for this signal on the Huntron tracker;



Loading procedure

Central Engineering strongly recommends testing of these supplies under full static load for 24 hours. Another possible way of loading, would be to use a combination of dynamic and static loads.

No matter what guidelines are followed the supply under load should always be monitored. Elapse time before failure and the fix are recorded for future reference.

All these supplies can be powered up under full static load. After doing all the static test, power down the supply under full load and then power it back up with full load.

AC and DC Low must be verified in all supplies except the H7104-D. Both signals are found on the output panel of each supply. DC Low is mesured between pins 1 and 2 of the POWER FAIL connector for the H7100A, 70-14956 and 70-14957 also between pins 2 and 3 of J2 for the H7104-C. AC Low is found on the same connectors but between pins 1 and 3 for the H7100A, 70-14956 and 70-14957 also between pins 1 and 2 of the H7104-C.

NOTE: AC and DC Low must be 4.8 Volts.

If the dynamic method is used, a minimum of 4 hours is needed;

FIRST hour: full static load with cabinet fan, overcurrent , ripple and AC and DC Low mesurements

SECOND hour: specified dynamic load without fan

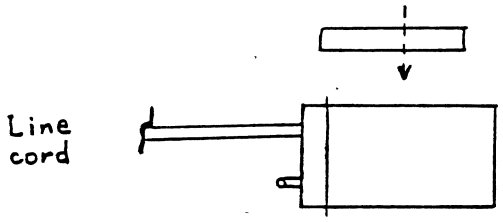
THIRD hour: specified dynamic load with fan

FOURTH hour: full static load without fan, overcurrent, ripple and AC and DC Low mesurements.

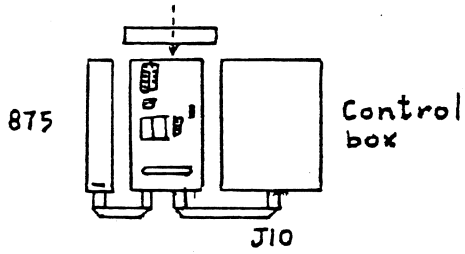
NOTE: use 12-04826 or simular fan for ventilation.

Loading assembly

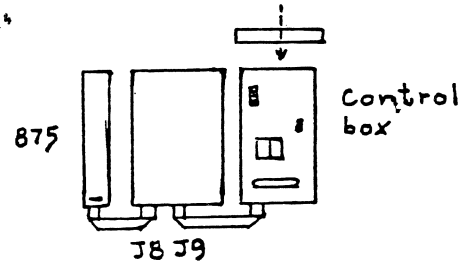
H7100



H7104-C



H7104-D



Static loading specification

Supply	Output +/- 5% (V)	Maximum load (A)	Power (W)	Maximum ripple (mV)	Over-current (A)	Over-voltage (V)
H7100A	5.1	100	500	100	120	6.8
70-14956						
H7100	5.1	75	375	100	120	6.8
H7101	-5.2	30	150	100	-36	-6.5
70-14957						
H7100	5.1	50	250	100	120	6.8
H7102	12	10	120	200	12	14.1
H7103	5B	20	100	100	24	6.3
	-5B	.2	1	100	---	---
H7104-C	2.5	85	212	50	105	3.3
	5B	10	50	100	24	6.8
	-5B	1.2	6	100	---	-6.8
	12B	10	120	200	12	15
H7104-D	5	135	675	100	155	6.8
	15	2	30	100	2.4	18
	-15	3.5	52	100	-4.6	-18

Dynamic loading specifications

Supply	Output (V)	Loading limits lower	upper
H7100A	5.1	80	100
70-14956	5.1	50	75
	-5.2	20	30
70-14957	5.1	30	50
H7104-C	2.5	55	85
H7104-D	5	100	135

All outputs not loaded dynamically must be under maximum static load.

Outgoing inspection

The technician has the charge of inforcing that all the electronics in the system meet quality standards. The repair engineer must then verify that the supply looks like new;

no - scratches
- dents
- excess labels
- missing pins or connectors
  (even when not in use)
- unconnected cabling
- missing hardware
- errors in packaging
  (when applicable)