

# APPENDIX C

## BL SERIES AC POWER SUPPLY EIA-232 SERIAL INTERFACE SPECIFICATIONS

### 1.0 INTRODUCTION

The RS232 interface option for the BL series AC Power Supplies allows two way communication with most computer systems. All programmable setup parameters may be queried or modified via the RS232 interface using command syntax described below.

### 1.1 EIA-232 INTERFACE UTILIZATION

The RS232 interface may be connected to modems, controllers, computers, or any other equipment capable of communicating with the RS232 protocol. It is assumed in the remainder of this document that the RS232 interface is connected to a "host" computer.

The interface is configured to communicate with the following format:

Duplex:	Full
Baud Rate:	9600
Bits:	8
Parity:	None
# Stop Bits	1

Other BAUD rates, however, are available by special order

### 1.2 EIA-232 CONNECTIONS

#### SIGNAL

	<u>AC SOURCE</u> (DB-9)	<u>HOST</u> (ANY)
GND	5 -----	GND
RXD	2 -----	TXD
TXD	3 -----	RXD

The RS232 interface does not currently support hardware handshaking.

Use of a good quality shielded cable is recommended. All cables should be secured with proper retaining hardware .

#### Important !

When using remote control, all control chassis front panel controls must be set fully counter-clock wise. The output switch and range switch (optional) must be set to the "off" position ( low for range switch). Failure to do so will prevent proper control.

### 1.3 EIA-232 SERIAL COMMUNICATION

The BL Series Power Supply incorporates an EIA-232 serial communications interface, which allows all function to be programmed and monitored remotely via a host computer.

The Power Supply receives ASCII encoded command strings via a EIA-232 interface according to MATE System Control Interface Standard No. 2806763 (IEEE-716 CIIL). The AC Power Supply supports all OPCODES, NOUNS, and MODIFIERS required by the stimulus module. They are as follows:

#### OPCODES

FNC, FTH, :CHO, SET, SRX, SRN, CLS, OPN, RST, CNF, IST, STA INX,

#### MODIFIERS

FREQ, VOLT, CURR, VLT0, VLT1

#### NOUN

ACS

The BL Series Power Supply can be used in point-to-point mode where a host Computer is connected irectly to One Power Supply.

#### NOTES:

1. Leading zeroes must be entered for commands.
2. Leading zeroes are blanked in response transmit.

#### EXAMPLES:

### 1.4 AC POWER SUPPLY SYNTAX

Setup Command:

FNC ACS :CHO SET VOLT <value>

[ SET FREQ <value>]  
[ SRX VOLT <value>]  
[ SRN VOLT <value>]  
[ SRX FREQ <value>]  
[ SRN FREQ <value>]  
[SET VLT(0,1)] <cr><lf><eos>

Table 1-1

#### CIIL SOFTWARE COMMANDS

(cr) =ASCII ' carriage return' code 0D Hex, ISO keyboard ^M  
(lf) =ASCII ' line feed ' code 0A Hex, ISO keyboard ^J  
(eos) =ASCII 'carriage return' code 1A Hex, ISO keyboard ^Z  
ASCII file transfer end-of string command

#### CIIL COMMANDS

#### EXPLANATION

<b>-ALL SET, SRX, SRN</b>	commands are part of the setup command above.
<b>SET VOLT &lt;value&gt;</b>	<p>Sets output voltage to given value, in volts rms. The following values are permitted:</p> <p><math>0 \leq \text{value} \leq 135</math>, or 270, dependent on range selected and type of unit.</p> <p>If set volt (value) not received, then use SRN VOLT (value), or SRX VOLT (value). If none of these 3 are sent then generate error message.</p>
<b>SET FREQ &lt;value&gt;</b>	<p>Optional. Sets frequency of output voltage to given value, in Hz. The following values are permitted: <math>45 \leq \text{value} \leq 500</math>. Default is 45 Hz only if SET FREQ, SRN FREQ, or SRX FREQ are not received. Otherwise the values shall be used in the order stated.</p>
<b>SRX VOLT &lt;value&gt;</b>	<p>Optional. Sets maximum limit for SET VOLT command. If SET VOLT value is greater than SRX VOLT value in a command string, an error message is generated and the setup command ignored. The following values are permitted:</p> <p><math>0 &lt; \text{value} \leq 135</math>, or 270, dependent on range selected and type of unit.</p> <p>If a value for SRX VOLT is not specified, the required maximum value for SET VOLT default to 135, or 270, dependant on range selected and type of unit.</p>
<b>SRN VOLT &lt;value&gt;</b>	<p>Optional. Sets minimum value limit for SET VOLT command. If SET VOLT value is less than SRN VOLT value in a command string, an error message is generated and a setup command ignored. The following values are permitted:</p> <p><math>0 &lt; \text{value} &lt; 135</math>, or 270, dependent on range selected and type of unit.</p> <p>The SET VOLT default is 0 for the minimum value if a value is not specified for SRN VOLT.</p>
<b>SRX FREQ &lt;value&gt;</b>	<p>Optional. Sets maximum limit for SET FREQ command. If the SET FREQ value in a command string is grater than the maximum limit, an error message is generated and the setup command ignored. Legal values are:</p> <p><math>45 &lt; \text{value} &lt; 500</math>.</p> <p>If a value for SRX FREQ is not specified, SRX FREQ defaults to 500.</p>
<b>SRN FREQ &lt;value&gt;</b>	<p>Optional. Assigns minimum value to SET FREQ command. If the SET FREQ value in a command string is less than the minimum limit, an error message is generated and the setup command ignored. Legal values are:</p> <p><math>45 \leq \text{value} &lt; 500</math>.</p> <p>If a value for SRN FREQ is not specified, SRN FREQ defaults to 45.</p>
<b>SET VLT0</b>	Set LO voltage range.
<b>SET VLT1</b>	Set HI voltage range.

**Notes**

Delay is necessary after issuing a setup command, due to the output voltage slew of 100v per 500ms.

On dual range Power Supplies, this command selects the LO or HI voltage range. Dual Ranges are 0-135 volts and 0-135/0-270 volt. If this command is omitted from the setup string the unit will default to the lowest available range. On single range units this command will be ignored.

**NOTES:**

1. The setup command specifies the voltage and frequency of the AC power Supply output. The AC Power Supply responds only to the last setup command entry. Its memory does not retain previously entered setup commands.
2. During EIA-232 remote operation, the unit's front panel VOLTS and FREQ must be fully CCW. If the controls are not set fully CCW, then the output voltage and frequency will be a sum of the programmed value and the value set with the front controls. Front Panel OUTPUT switch must be set to OFF position. Front Panel RANGE switch must be set to LO.

**CILL SOFTWARE COMMANDS**

**CILL COMMANDS**

**EXPLANATION**

**FETCH DATA COMMAND:**

FTH VOLT <cr><lf><eos>	The AC supply responds to this command by transmitting the RMS voltage (in volts) measured at its output, in decimal format as follows: <sp><digit><digit><digit><dp><digit><digit><cr><lf><eos>
FTH CURR <cr><lf><eos>	The AC Supply responds by transmitting the current (in amps) measured at its output, in decimal format, as follows:  <sp><digit><digit><dp><digit><cr><lf><eos>
FTH FREQ <cr><lf><eos>	The AC Supply response by transmitting the frequency (in hertz) measured at its output, in decimal format, as follows:  <sp><digit><digit><digit><cr><lf><eos>
CLS :CH0 <cr><lf><eos>	Closes output relay contacts. Connects AC Power Supply outputs to output terminal block. The setup command specifies the voltage and frequency. The setup-command must be entered before the CLS :CH0 command.
OPN :CH0 <cr><lf><eos>	Opens output relay contacts. Disconnects output of AC Power Supply from output connector. Ac Power Supply retains voltage and frequency assigned by setup command.
RST ACS:CH0	Resets AC Power Supply to quiescent. The output relay opens and error messages are erased.  Catastrophic error messages are cleared by reading the Power Supply's response, by use of the Status command.
CNF <cr><lf><eos>	Instructs AC Power Supply to perform internal confidence test. STA command transmits the message. The AC Power Supply responds with one of the following:  <u>Pass</u> <sp><cr><lf><eos>

**CILL SOFTWARE COMMANDS (cont)**

**CILL COMMANDS**

**EXPLANATION**

Fail

**F07ACSO(DEV): CONFIDENCE TEST FAILURE**  
<cr><lf><eos>

**IST <cr><lf><eos>**

Instructs AC Power Supply to perform internal self test. The STA command transmits the message. The AC Power Supply responds with one of the following:

Pass  
<sp><cr><lf><eos>

Fail  
**F07ACSO(DEV): BIT TEST FAILURE**  
(-PROM CHECKSUM FAULT|  
-RAM FAULT  
-AC SUPPLY HARD FAULT|  
<cr><lf><eos>

**STA <cr><lf><eos>**

Status. Prepares AC Power Supply for a response transmission. Clears error condition if one exists. The following response messages and conditions exclude confidence and internal self test.

**RESPONSE:**

Status OK  
<sp><cr><lf><eos>

Device error messages

**F07ACSO(DEV):BIT TEST FAILURE**  
<description consisting of up to 60 characters><cr><lf><eos>

TMA error messages All begin with:

**F07ACSO (MOD):**

This message is followed by one explanatory message from the following text:

**ILLEGAL NOUN**

AC Power Supply does not recognize illegal noun.

**ILLEGAL NOUN MODIFIER**

AC Power Supply does not recognize illegal noun modifier.

**ILLEGAL OPCODE**

AC Power Supply does not recognize illegal opcode.

**ILLEGAL VALUE**

Entered value lies outside upper and lower limits.

**NO SETUP**

Close command received but setup not programmed.

Example: **F07ACSO0(MOD): NO SETUP <cr><lf><eos>**

## 1.5 CATASTROPHIC ERRORS

A catastrophic failure is generated each time the AC Power Supply experiences a hardware failure. Errors are cleared whenever the AC Power Supply transmits a response, except in the case of a short circuit fault which may only be cleared by cycling power to the AC Supply.

### Catastrophic Error Messages

All begin with:

**F00ACS0(DEV):**

This message is followed by one explanatory message from the following text:

**OVERTEMP FAULT <cr><lf><eos>**

The heatsink temperature has exceeded its upper limit. The OVERTEMP LED on the front panel will light.

**CURRENT LIMIT FAULT <cr><lf><eos>**

**SHORT CIRCUIT FAULT: AC SUPPLY<cr><lf><eos>**

An output loading fault has occurred causing the supply to exceed 200% rated current output. The supply automatically shuts down and opens its output relay. The OVERLOAD LATCH LED on the front panel will light.

## EIA-232 SERIAL PROGRAMMING EXAMPLES

Examples of actual command strings transmissions and typical responses are outlined below.

All commands must be in upper case ASCII, lower case characters are ignored. All commands transmitted to the AC SUPPLY must terminate with a carriage return <cr> and a line feed <lf>, and <eos> as will all responses received from the AC SUPPLY.

1. EXAMPLE: Setup a single range AC Source to output 120 V @60 Hz, and close the output relay.

Transmit setup command:

FNC ACS :CHO SET VOLT 120 SET FREQ 60<cr><lf><eos>

Transmit status command to request status response:

STA <cr><lf><eos>

Talk address the AC Source to enable response:

<space><cr><lf><eos>

: Positive response indicating status is OK.

F07ACS00 (MOD) ILLEGAL VALUE <cr><lf>: Negative response indicating error condition.

(Typically a negative response would only occur if an error existed in the entry or reception of the command string, or the values entered were out of range of the AC Source).

Transmit output relay close command:

CLS :CHO <cr><lf><eos>

Transmit status command to request status response:

STA <cr><lf><eos>

Talk address the AC Source to enable response:

<space><cr><lf><eos>

: Positive response indicating status is OK.

F07ACS00 (MOD) NO SETUP <cr><lf> : Negative response indicating error condition.

(Negative response would only occur if invalid or no setup string had been transmitted prior to close command).

2. EXAMPLE: Setup a dual range AC Source to output 30 V on low range @400 Hz.

Transmit setup command:

FNC ACS :CHO SET VOLT 30 SET FREQ 400 SET VLTO <cr><lf><eos>

Transmit status command to request status response:

STA <cr><lf><eos>

Talk address the AC Source to enable response:

<space><cr><lf><eos>

: Positive response indicating status is OK.

## EIA-232 SERIAL PROGRAMMING EXAMPLES

**3. EXAMPLE:** Setup a dual range AC Source to output 115 V on high range @50 Hz, and read back what the actual voltage, current, and frequency being output is set at.

Transmit setup command:

```
FNC ACS :CHO SET VOLT 115 SET FREQ 50 SET VLT1 <cr><lf><eos>
```

Transmit status command to request status response:

```
STA <cr><lf><eos>
```

Talk address the AC Source to enable response:

```
<space><cr><lf><eos> : Positive response indicating status is OK.
```

Transmit output relay close command:

```
CLS :CHO <cr><lf><eos>
```

Transmit status command to request status response:

```
STA <cr><lf><eos>
```

Talk address the AC Source to enable response:

```
<space><cr><lf><eos> : Positive response indicating status is OK.
```

Transmit fetch volt command:

```
FTH VOLT <cr><lf><eos>
```

Talk address the AC Source to enable response:

```
115.0 <cr><lf><eos>
```

Transmit fetch current command:

```
FTH CURR <cr><lf><eos>
```

Talk address the AC Source to enable response:

```
5.2 <cr><lf><eos>
```

Transmit fetch frequency command:

```
FTH FREQ <cr><lf><eos>
```

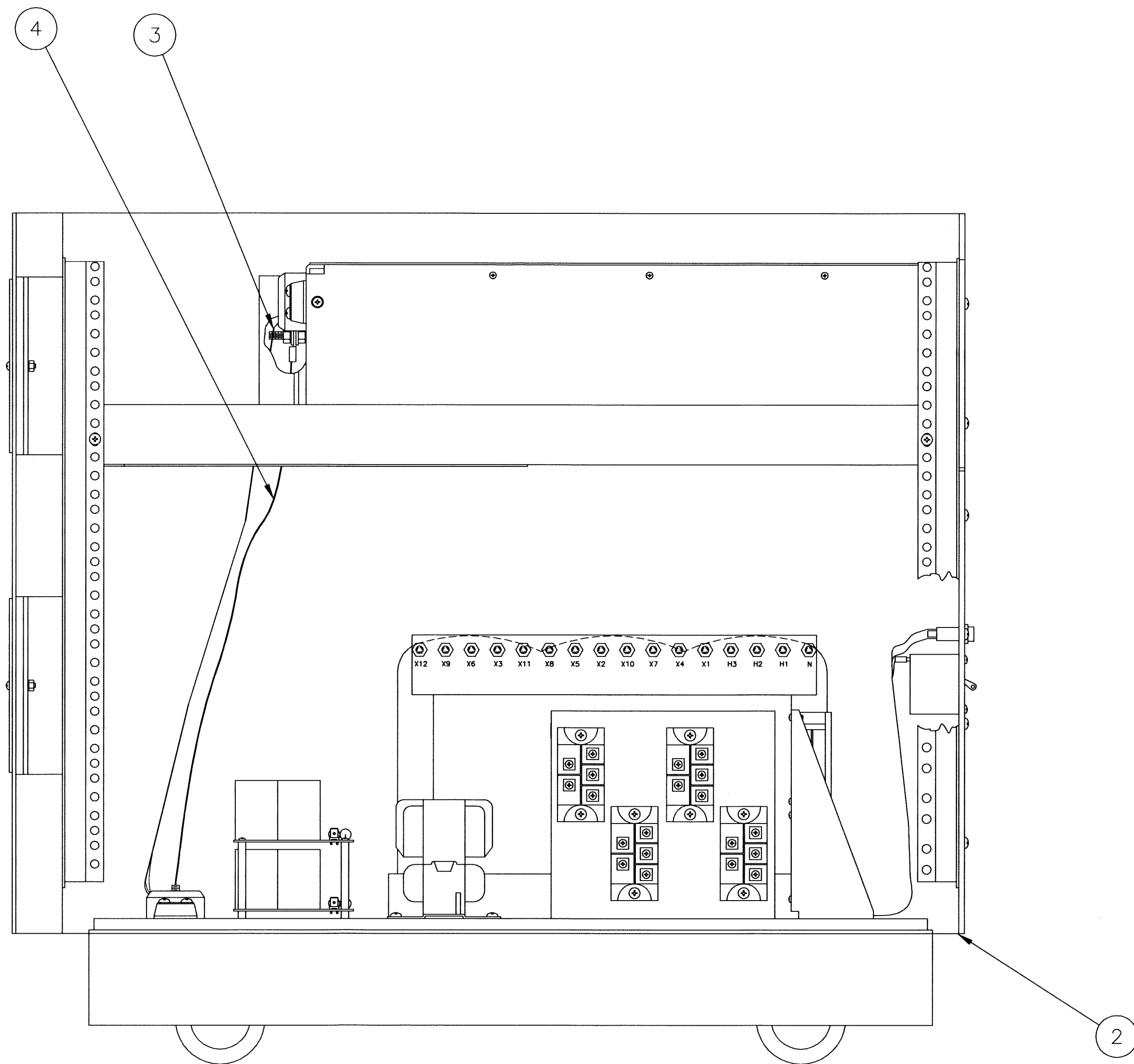
Talk address the AC Source to enable response:

```
50 <cr><lf><eos>
```

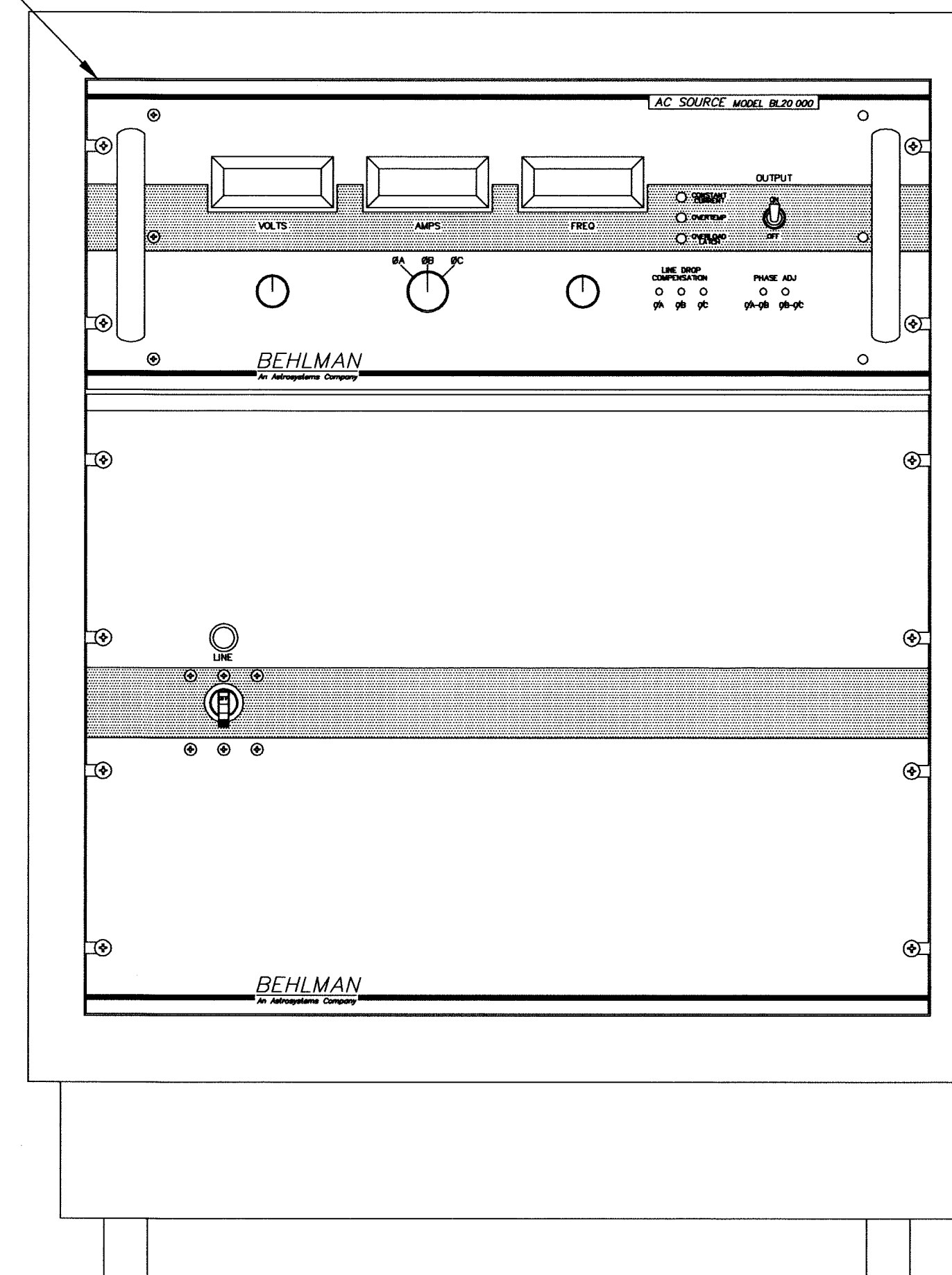


**SECTION 6**  
**DRAWINGS**

REV STATUS OF SHT	REVISIONS				
	ZONE	LTR	DESCRIPTION	DATE	APPROVED
REV SHT		A	DELETED ITEMS 5 AND 6, ADDED NOTE "HDW SUPPLIED WITH ITEM 2."		



NOTE:  
HDW SUPPLIED  
WITH ITEM 2.



SIDE OF CHASSIS REMOVED FOR CLARITY

SEE SEPARATE PARTS LIST

CONN NO.	FROM	TO	ITEM NO.	COLOR	COMMENTS
4	BASE PLATE GND STUD	CONTROL CHASSIS GND STUD	4	-	101-631-000
3	BASE PLATE LOW	CONTROL CHASSIS LOW	3	BLU	106-976-000
2	BASE PLATE GND	CONTROL CHASSIS GND	3	BRN	106-976-000
1	BASE PLATE HI	CONTROL CHASSIS HI	3	WHT	106-976-000

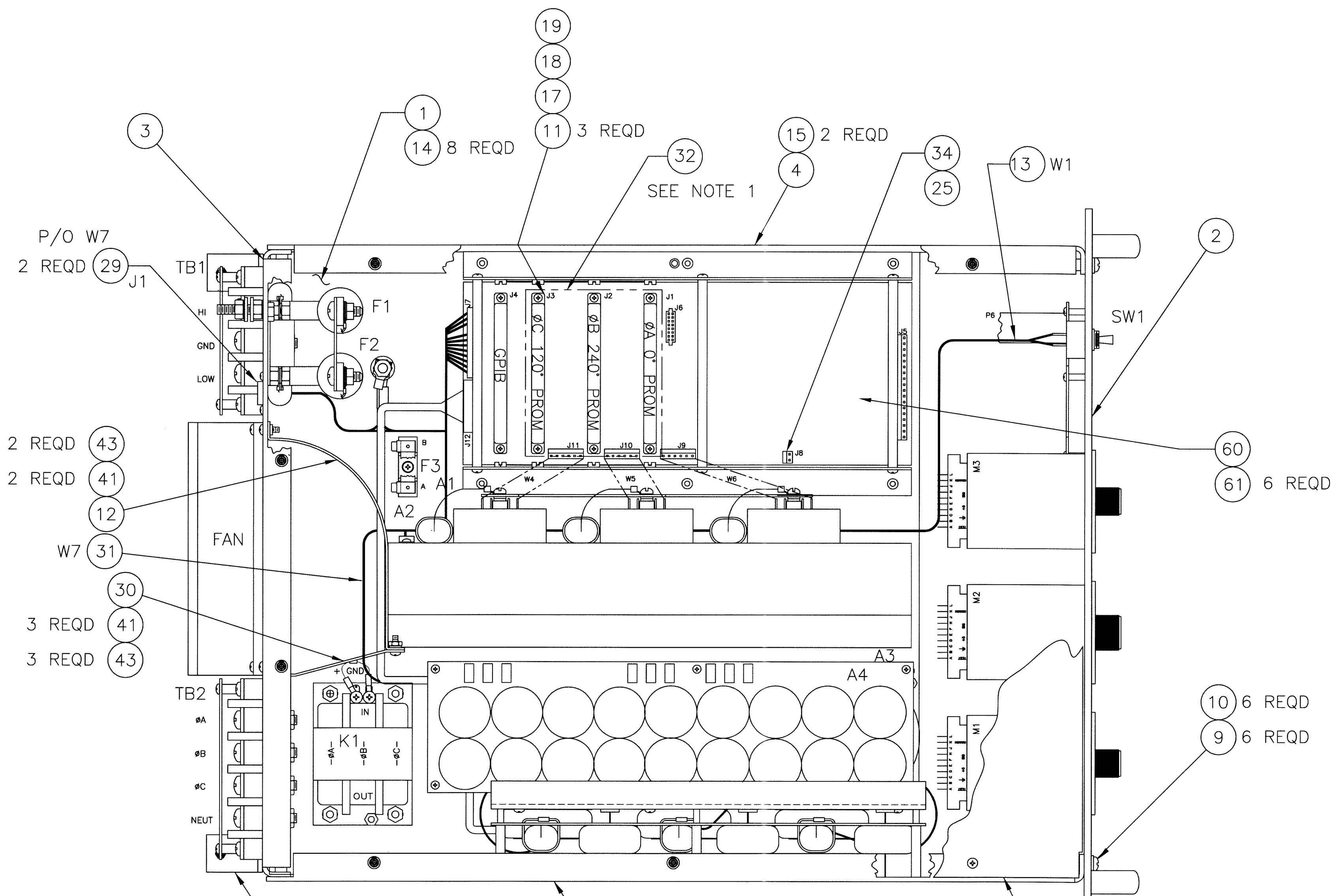
WIRE RUN SCHEDULE

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		CONTRACT		<b>BEHLMAN</b>													
		TOLERANCES: FRAC ± 3 PLACE DEC ± 2 PLACE DEC ±		DRAWN J. ALGERIO				DATE 93-4-20											
		ANGLES ±		DO NOT SCALE THIS DWG		TOP ASSY 20K SERIES													
		MATERIAL:		CHECKED															
		106-676-906		106-676-905		<table border="1" style="width: 100%;"> <tr> <td>SIZE</td> <td>CODE</td> <td>IDENT NO.</td> <td>REV</td> </tr> <tr> <td>D</td> <td></td> <td>53636</td> <td>A</td> </tr> <tr> <td colspan="2">SCALE 1/3</td> <td colspan="2">SHEET</td> </tr> </table>		SIZE	CODE	IDENT NO.	REV	D		53636	A	SCALE 1/3		SHEET	
SIZE	CODE	IDENT NO.	REV																
D		53636	A																
SCALE 1/3		SHEET																	
		106-676-904		106-676-903															
		106-676-902		106-676-901															
NEXT ASSY		USED ON		ENGR															
APPLICATION																			

106-676-9XX

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 BEHLMAN ELECTRONICS INC.  
 HAUPPAUGE, NEW YORK

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ADDED NOTE 1	93/12/20	D.M.
	B	ADDED CONN NO'S.	94/12/16	T.M.
	C	WIRE RUN SCHEDULE, ADDED CONN NO'S 16 AND 17		T.M.
	D	WIRE RUN SCHEDULE, CONN. NO.2 WAS F3-A	96/03/15	T.M.
	E	ADDED CAP BOARD ASSY PER ECO 96-019	96-06-05	T.M.
	F	REVISED WIRERUN PER ECO 98-018	98-02-20	T.M.
	G	REVISED PER ECO 98-108	99-03-04	T.M.
	H	REVISED PER ECO 01-007	01-01-26	T.M.
	J	REVISED PER ECO 09-045 (FM)	04-15-09	<i>[Signature]</i>



CONN NO.	FROM	LUG ITEM NO.	TO	LUG ITEM NO.	AWG	COLOR	COMMENTS
17	A3A1-E5	23	NEUT STUD	21	10	WHT	NEUT
16	A3A1-E3	23	NEUT STUD	21	10	WHT	NEUT
15	A3A1-E7	23	NEUT STUD	21	10	WHT	NEUT
14	F3-B	-	F1-A	-	22	RED	
13	K1 COIL GND	-	NEUT STD	-	22	BLK	NEUT
12	A3L6-OUT	-	K1-ØA	-	10	WHT	
11	A3L5-OUT	-	K1-ØB	-	10	WHT	
10	A3L4-OUT	-	K1-ØC	-	10	WHT	
9	K1-ØC OUT	21	TB2-ØC	21	10	BLK	ØC
8	K1-ØB OUT	21	TB2-ØB	21	10	BLK	ØB
7	K1-ØA OUT	21	TB2-ØA	21	10	BLK	ØA
6	NEUT STD	23	TB2-NEUT	21	8	WHT	
5	NEUT STD	21	A1J8-2	25	22	WHT	NEUT
4	F2-4	40	A2Q6-E2	39	8	ORN	-250V
3	TB1-GND	21	NEUT STUD	21	10	WHT	NEUT
2	F1-A	40	A2Q5-C1	39	8	RED	+250V
1	F3-A	20	A1J8-1	25	22	RED	+250V

WIRE RUN SCHEDULE

- 26 REF
- 27 REF
- 28 REF
- SEE NOTE 2
- 5
- 15 2 REQD
- 16 3 REQD
- 26 REF
- 27 REF
- 28 REF
- SEE NOTE 2
- 5
- 15 2 REQD
- 16 3 REQD

NOTES:  
 1. ADHERE ITEM 32 (1/8" THICK GRAY FOAM 4.50 X 3.60) TO UNDERSIDE OF TOP COVER, LINING UP WITH PHASE CARDS.  
 2. INSTALL ITEMS 26, 27 & 28 AFTER PLACING CONTROL CHASSIS INTO CABINET. APPLY BLUE LOCTITE. THIS IS TO BE DONE AT THE FINAL ASSEMBLY LEVEL. REFERENCE PL106-676-101.

**CONTROLLED DOCUMENT**

SEE SEPARATE PARTS LIST

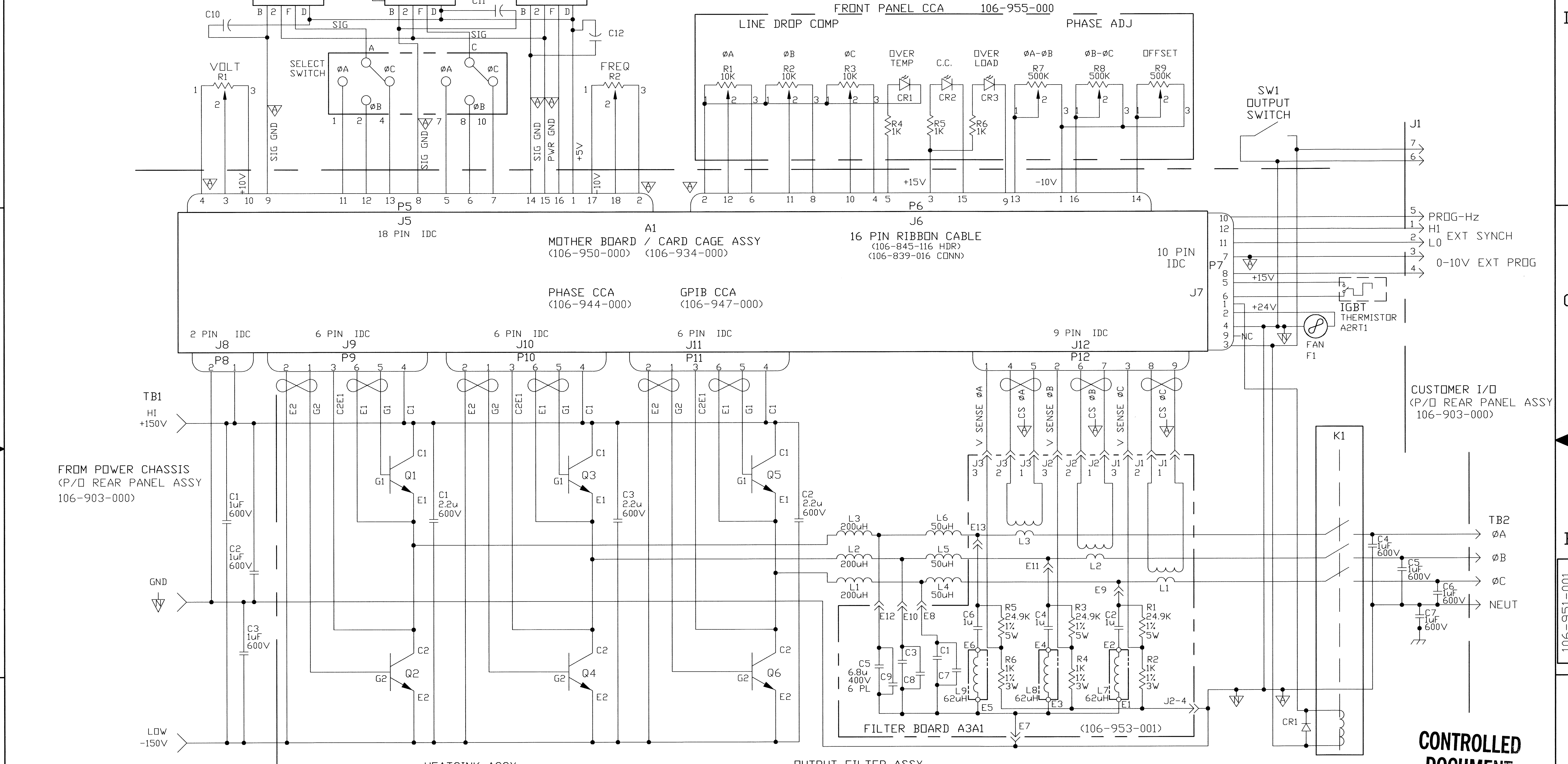
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		TOLERANCES: FRAC		THIS DRAWING SHALL ONLY BE CHANGED BY USE OF CAD		<b>BEHLMAN</b>			
3 PLACE DEC		±.005		DRAWN J.MORRELL				DATE 01-01-26	
2 PLACE DEC		±.01		DO NOT SCALE THIS DWG		CHECKED <i>[Signature]</i>		DATE 04-28-09	
ANGLES		± 1'		MATERIAL:		ENGR <i>[Signature]</i>		DATE 04-29-09	
106-676-9XX						QUALITY CONTROL		DATE	
NEXT ASSY USED ON						MANUFACTURING		DATE	
APPLICATION						SIZE		CODE IDENT NO.	
						D		53636	
						SCALE		1:2	
						CADFILE:		909-002J.DWG	
						SHEET		1 OF 1	

106-909-002

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REV STATUS OF SHT		REVISIONS						
REV	SHT	ZONE	LTR	DESCRIPTION	DATE	APPROVED	DRL #	INIT
B	1	XX	A	REVISED PER ECO 96-006	961025	<i>[Signature]</i>	12.719	PM
B	1		B	REVISED PER ECO 01-114	010801			



**CONTROLLED DOCUMENT**

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: FRAC 3 PLACE DEC ±.005 2 PLACE DEC ±.01 ANGLES ± 1°		THIS DRAWING SHALL ONLY BE CHANGED BY USE OF CAD		DATE 010801	
DO NOT SCALE THIS DWG		DRAWN GLESKOWITZ		DATE 8/15/01	
MATERIAL:		CHECKED <i>[Signature]</i>		DATE 8/15/01	
106-909-002 106-676-900		ENGR S. Boyle		DATE 8/15/01	
NEXT ASSY USED ON		QUALITY CONTROL		SIZE D	
APPLICATION		MANUFACTURING		CODE IDENT NO. 106-951-001	
				REV B	
				SCALE 1:1	
				CAD FILE: 951-001B.DWG	
				SHEET 1 OF 1	

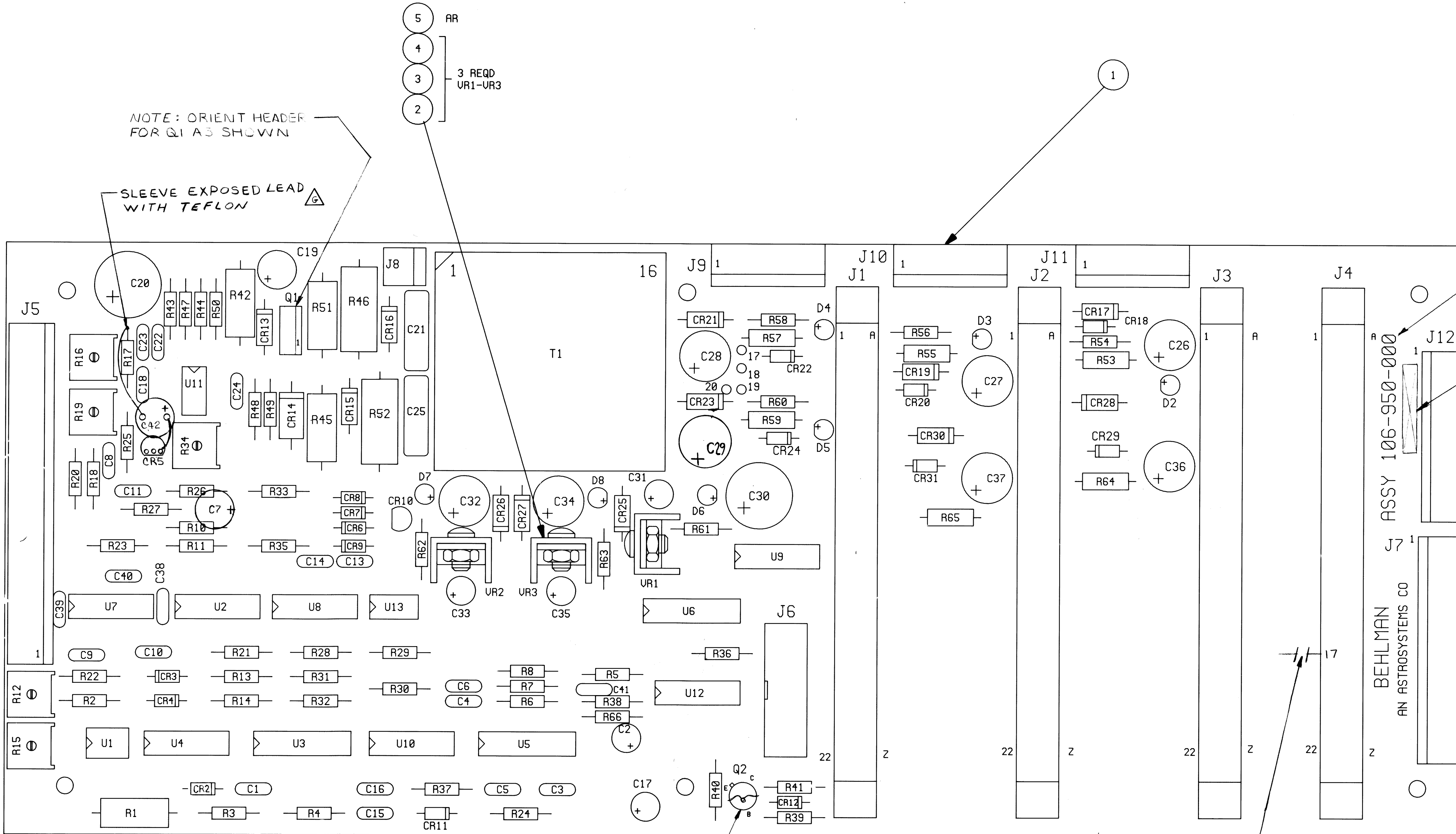
**BEHLMAN**  
 SCHEMATIC  
 BL20,000 CONTROL CHASSIS

106-951-001

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REV STATUS OF SHT		REVISIONS				
SHT	REV	ZONE	LTR	DESCRIPTION	DATE	APPROVED
		A		REVISED AND REDRAWN	1-29-93	[Signature]
		B		ADDED TABLE 1 AND SH 2.	95-8-10	[Signature]
		C		REVISED PER ECO 96-055	96-10-24	[Signature]
		D		REVISED PER ECO 97-038	97-08-12	SB
		E		REVISED PER ECO 98-075	98-06-22	[Signature]
		F		REVISED PER ECO'S 98-069 & 98-056	99-05-18	[Signature]
		G		REVISED PER ECO 99-127	99-06-15	[Signature]
		H		REVISED PER ECO 00-034	000316	[Signature]
		J		REVISED PER ECO 01-034	010517	[Signature]
		K		REVISED PER ECO 01-106 (GNL)	020124	[Signature]



- 5 AR
- 4
- 3 3 REQD UR1-UR3
- 2

SEE TABLE 1.

**CONTROLLED DOCUMENT**

- NOTE:
- DESIGNATIONS 17, 18, 19 AND 20 ARE FOR TRANSFORMER LEADS.
  - INSTALL ITEMS 2, 3, AND 4 ON UR1, UR2, AND UR3. SECURE NUT WITH ITEM 5.
  - APPLY SERIAL NUMBER WHERE SHOWN USING SERIALIZED LABEL OR .09 HIGH CHARACTER USING BLACK EPOXY BASED INK.
  - WORKMANSHIP TO BE IN ACCORDANCE WITH IPC-A-610, CLASS 2.
  - SOLDER IN ACCORDANCE WITH ANSI/J-STD-001, CLASS 2.

106-950-000	INSTALL COMPONENTS AS SHOWN ON SH 1 AND SH 2 MARKED *
106-950-100	INSTALL COMPONENTS AS SHOWN ON SH 1 AND SH 2. MARK APPROP DASH NO.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONS ± 3 PLACE DECIMALS ± 2 PLACE DECIMALS ± ANGLES ±		CONTRACT	
DO NOT SCALE THIS DRAWING		DRAWN J. BOTTIGLIERE DATE 1-29-93	
MATERIAL:		CHECKED [Signature] 2/17/93	
106-934-100		ENGR [Signature] 93/2/11	
106-934-000		NEXT ASSY USED ON	
APPLICATION		BEHLMAN	
		PRINTED WIRING ASSY	
		MOTHER BOARD	
		3 PHASE	
SIZE	CODE IDENT NO.	QTY	REV
D	53636	106-950-XXX	K
SCALE 2:1		SHEET 1 OF 2	

ATTENTION!  
 OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES  
 SEE SEPARATE PARTS LIST

106-950-XXX B

8

7

6

5

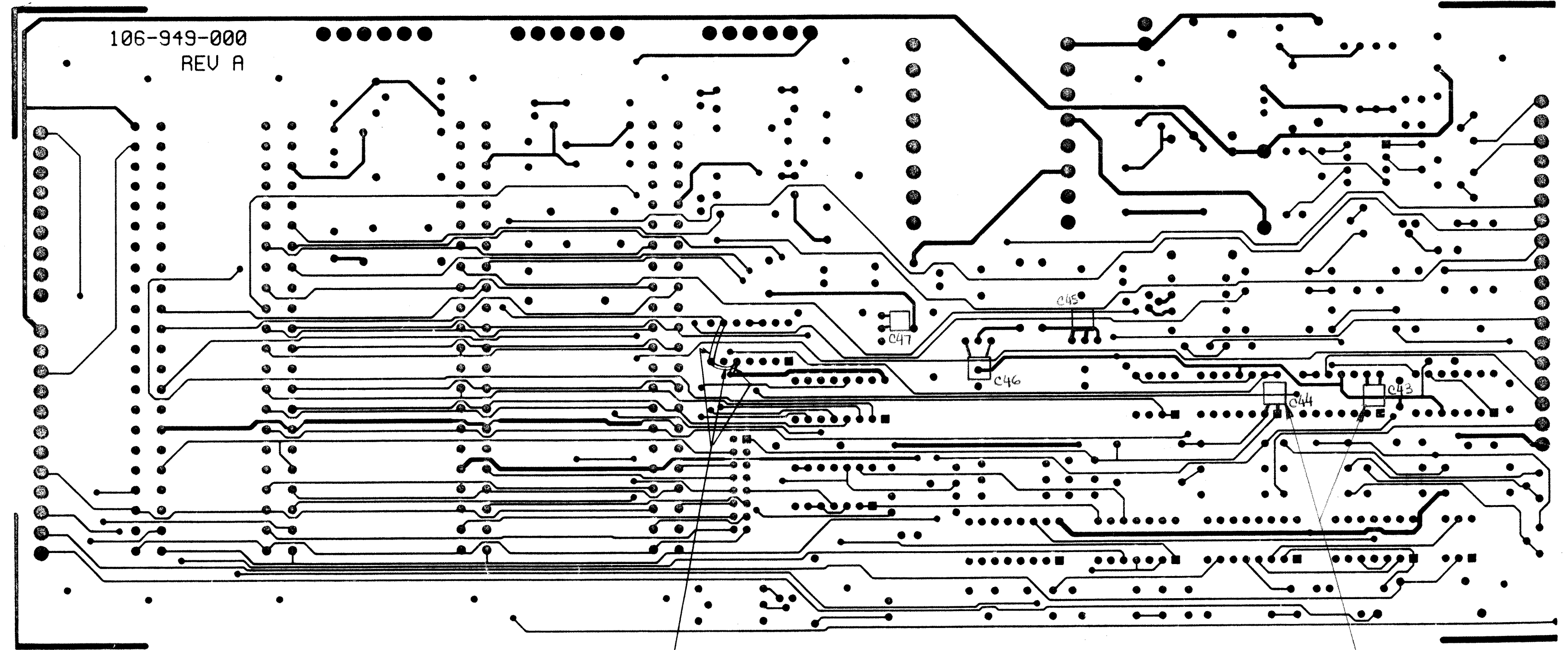
4

3

2

1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1 FOR REV HISTORY		



3 PL  
106-950-100  
ONLY

SCALE: NONE

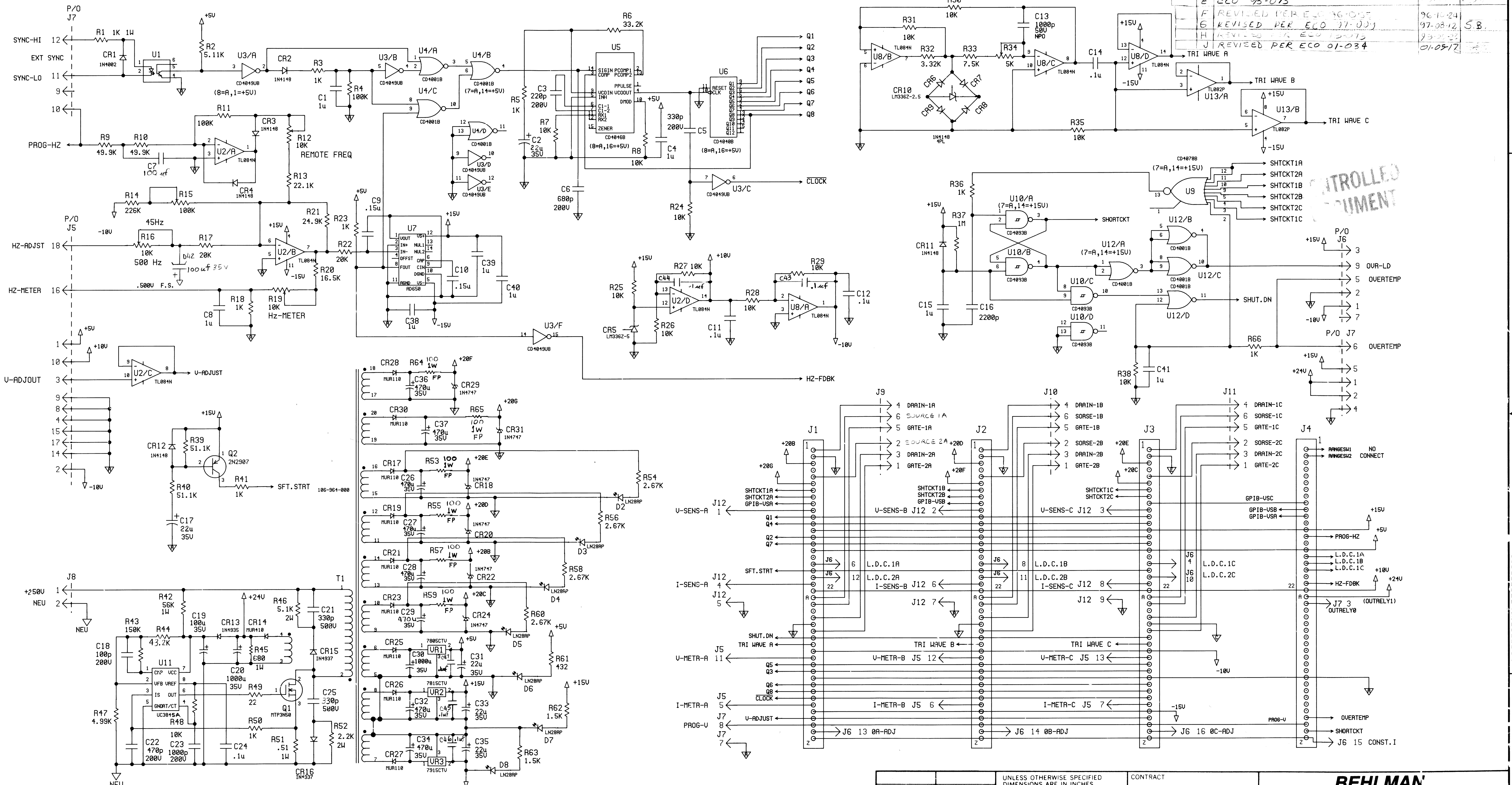
STAKE COMPONENTS C43 THRU C47  
TO BOTTOM OF BOARD, AS SHOWN,  
USING ITEM 93.

SIZE	CODE IDENT NO.	REV
D	53636 106-950-XXX	K
SCALE 1:1	SHEET 2 OF 2	

106-950-XXX B

A

REV STATUS OF SHT		REVISIONS			
ZONE	LTR	DESCRIPTION	DATE	APPROVED	
A		REVISED AND REDRAWN	1-29-93		
B		ECO 93-031	3/15/93		
C		R44 FROM 21.5 TO 43.2K R49 FROM 220 TO 22	1/31/93		
D		C25 FROM 600P TO 330P	9/3/93		
E		ECO 93-075			
F		REVISED PER ECO 93-057	9-6-93		
G		REVISED PER ECO 93-057	97-08-12	S.B.	
H		REVISED PER ECO 93-075	93-08-23		
J		REVISED PER ECO 01-034	01-09-17		



CONTROLLED  
EXPERIMENT

HIGHEST REF DES  
U13  
CR31  
R66  
C47  
D2-D8

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONS ± 3 PLACE DECIMALS ± ANGLES ± DO NOT SCALE THIS DRAWING		CONTRACT	
MATERIAL:		DRAWN: J. BOTTIGLIERE DATE: 1-29-93 CHECKED:	
106-950-000 BL10K NEXT ASSY US'D ON		ENGR: [Signature] DATE: 9/3/93	
APPLICATION		SCHEM DIAG MOTHER BOARD 3 PHASE	
SIZE: D	CODE IDENT NO: 53636	REV: J	106-948-000
SCALE:	SHEET 1 OF 1		

106-948-000

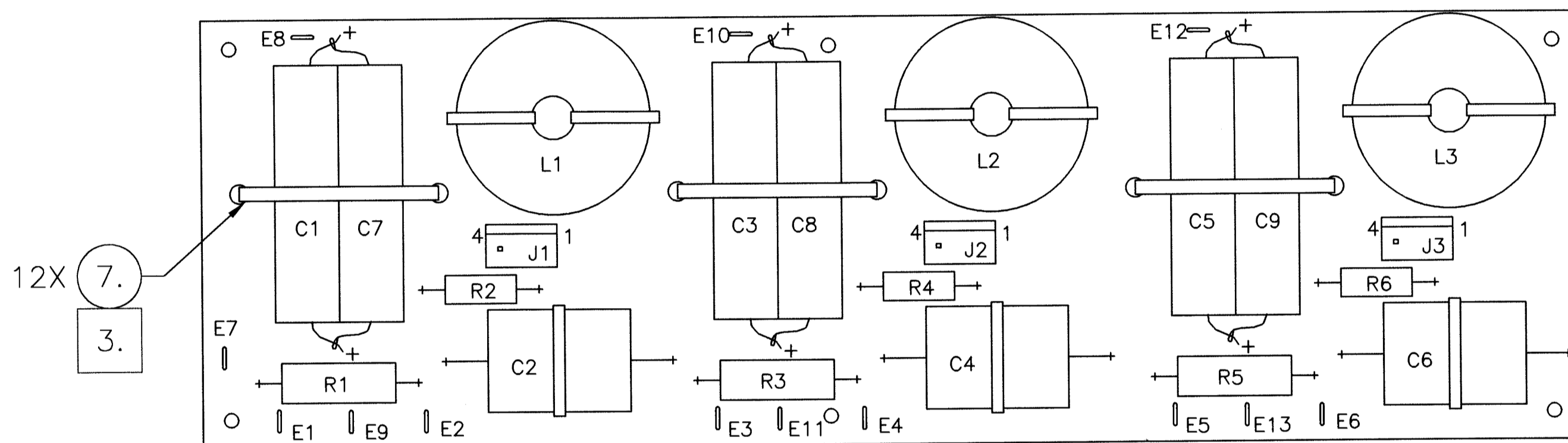
**PROPRIETARY**

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BEHLMAN ELECTRONICS INC.  
HAUPTPAUGE, NEW YORK

**REVISIONS**

ZONE	LTR	DESCRIPTION	DATE	APPROVED	DRL #	INIT
ALL	A	CHANGED CAP C1-C6	930610	<i>RLL</i>		
ALL	B	REVISED PER ECO 96-006	930610	<i>RLL</i>		
ALL	C	REVISED PER ECO 06-044 (AGB)	060310	<i>R. Young</i>	13117	pm



**CONTROLLED DOCUMENT**

**NOTES:**

- INTERPRET DRAWING I.A.W. MIL-STD-100
- WORKMANSHIP SHALL BE I.A.W. MIL-HDBK-454, GUIDELINE 9.
- PLACE TY-WRAP 'HEADS' ON SOLDER SIDE OF BOARD.

REF. SCHEMATIC 106-951-000  
SEE SEPARATE PARTS LIST

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	<b>THIS DRAWING SHALL ONLY BE CHANGED BY USE OF CAD</b>		<b>BEHLMAN</b>	
		TOLERANCES: FRAC 3 PLACE DEC ±.005 2 PLACE DEC ±.02 ANGLES ± 1°	DRAWN D. MORTENSEN DATE 92-07-28			
		DO NOT SCALE THIS DWG	CHECKED <i>R. Young</i> 3/16/01		SIZE C CODE IDENT NO. 106-953-XXX REV C	
		MATERIAL:	ENGR <i>S. Boyle</i> 3/17/06			
106-908-001	106-676-800					
NEXT ASSY	USED ON					
APPLICATION						

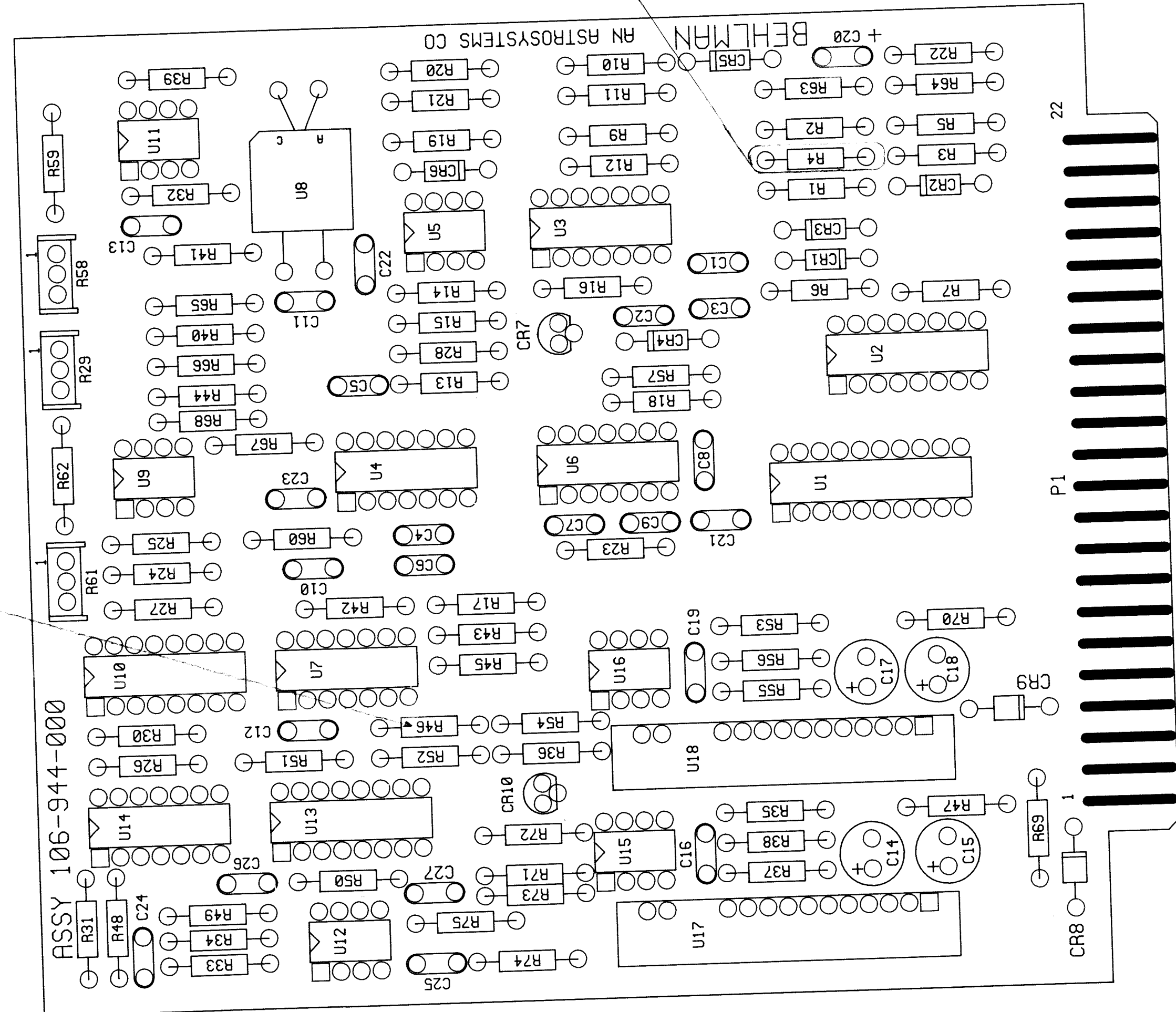
AutoCAD Genera see Document



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 BEHLMAN ELECTRONICS INC.  
 HAUPPAUGE, NEW YORK

REV STATUS OF SHT		REVISIONS				
SHT	REV	ZONE	LTR	DESCRIPTION	DATE	APPROVED
1	F		B	REVISED PER ECO 96-042	961024	
2	A		C	REVISED PER ECO 97-054	05-21-97	S. Boyle
3	-		D	REVISED PER ECO 98-032		S. Boyle
			E	REVISED PER ECO 98-034	980803	S. Boyle
			F	REVISED PER ECO 00-154	000323	S. Boyle
			G	REVISED PER ECO 00-190	001011	

SEE REWORK  
 VIEW A-A

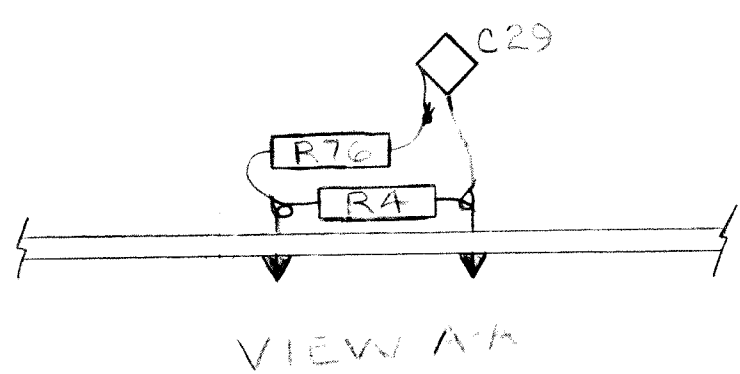


REWORK

\*SEE SAT MATRIX SCD (107-850-000)  
 FOR R20, R59, R56, R38 & R60 VALUES

MASK WHEN WAVE SOLDERING.  
 HOLES MUST BE FREE OF SOLDER!

SEE SEPARATE PARTS LIST



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONS ± 3 PLACE DECIMALS ± 2 PLACE DECIMALS ± ANGLES ±		CONTRACT		<b>BEHLMAN</b> An Astrosystems Company PRINTED WIRING ASSY PHASE CONTROL DRIVER 3 PHASE BL	
DO NOT SCALE THIS DRAWING		DRAWN J.M. CHECKED Boyle ENGR S. Boyle			
MATERIAL: BL20K 106-676-800 106-934-000 BL10K		DATE 10-11-00		SIZE C	CODE IDENT NO. 53636
NEXT ASSY USED ON		SCALE 2:1		106-944-XXX	REV G
APPLICATION		SHEET 1 OF 3			

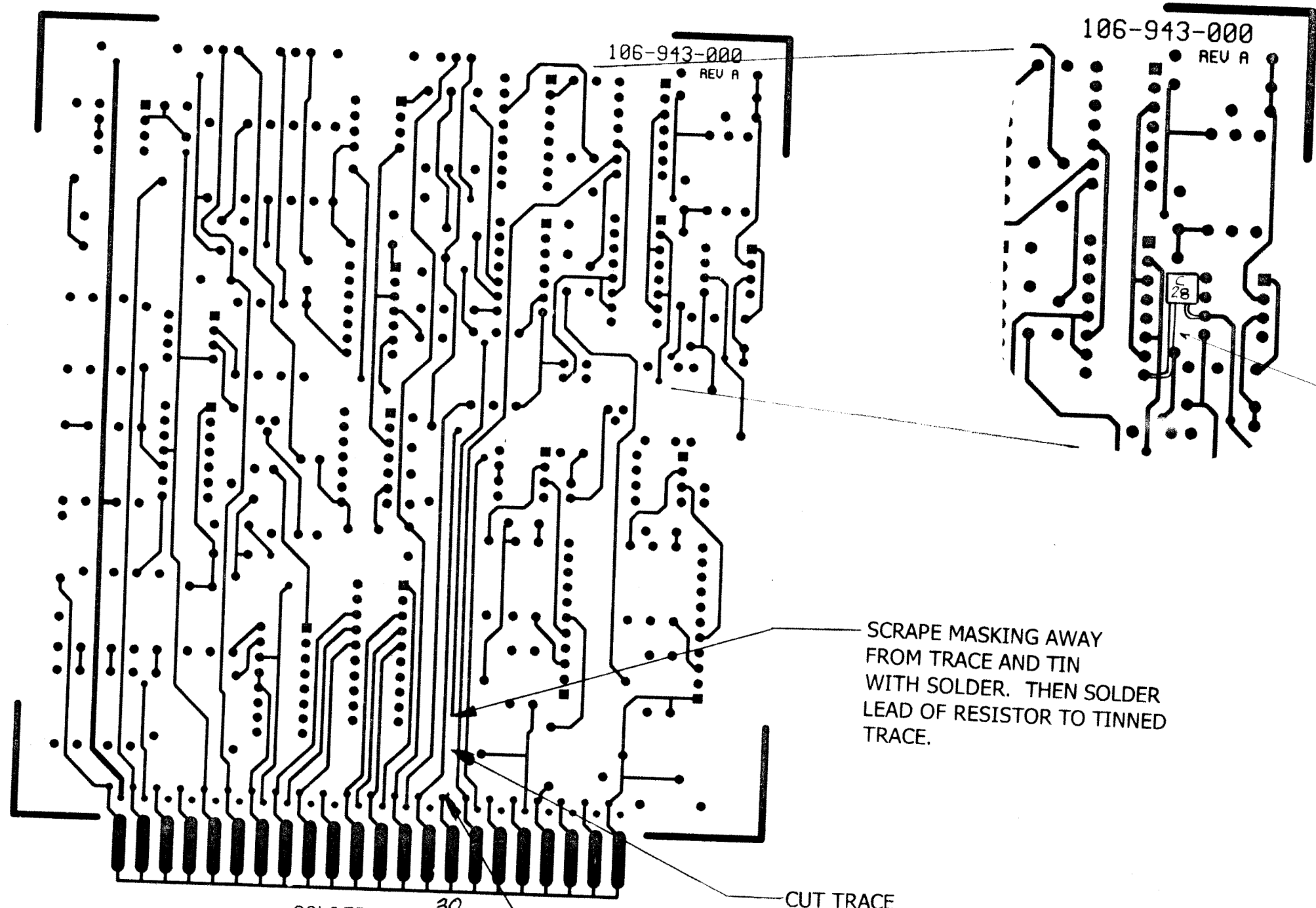
4

3

2

1

REV STATUS OF SHT		REVISIONS			
ZONE	LTR	DESCRIPTION	DATE	APPROVED	
		SEE SHEET 1 FOR REV HISTORY			



ADD C28 (106-481-331)  
AS SHOWN  
SLEEVE AS REQUIRED

SCRAPE MASKING AWAY  
FROM TRACE AND TIN  
WITH SOLDER. THEN SOLDER  
LEAD OF RESISTOR TO TINNED  
TRACE.

SOLDER SIDE  
000-342-001  
REV A U3A

ADD R77 TO HOLE OF JX-30  
(107-231-000, 100-193-002 OR 1100003-004).

CUT TRACE

106-944-XXX

SIZE	CODE IDENT NO.	REV
C	53636	A
SCALE	106-944-XXX	
SHEET		2 OF 3

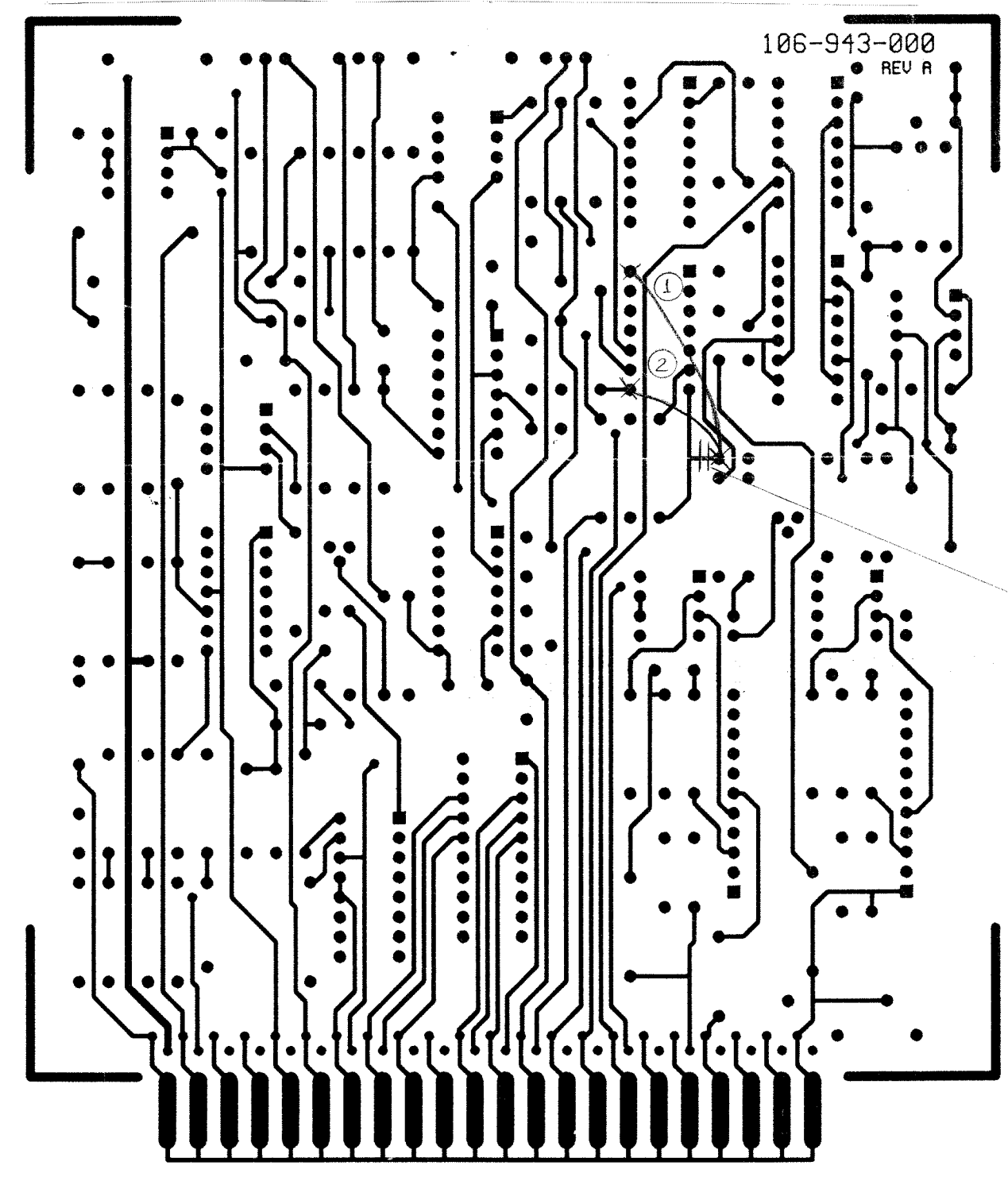
4

3

2

1

REV STATUS OF SHT		REVISIONS			
ZONE	LTR	DESCRIPTION	DATE	APPROVED	
SHT	REV	SEE SHEET 1 FOR REV HISTORY			



NOTE: THESE MODS FOR SINGLE PHASE 270 OUTPUT ONLY

ADD JUMPER #1 IN PHASE C BOARD ONLY

ADD JUMPER #2 TO PHASE A BOARD ONLY

CUT ONE PLACE FOR BOTH A & C PHASE BOARDS

SOLDER SIDE

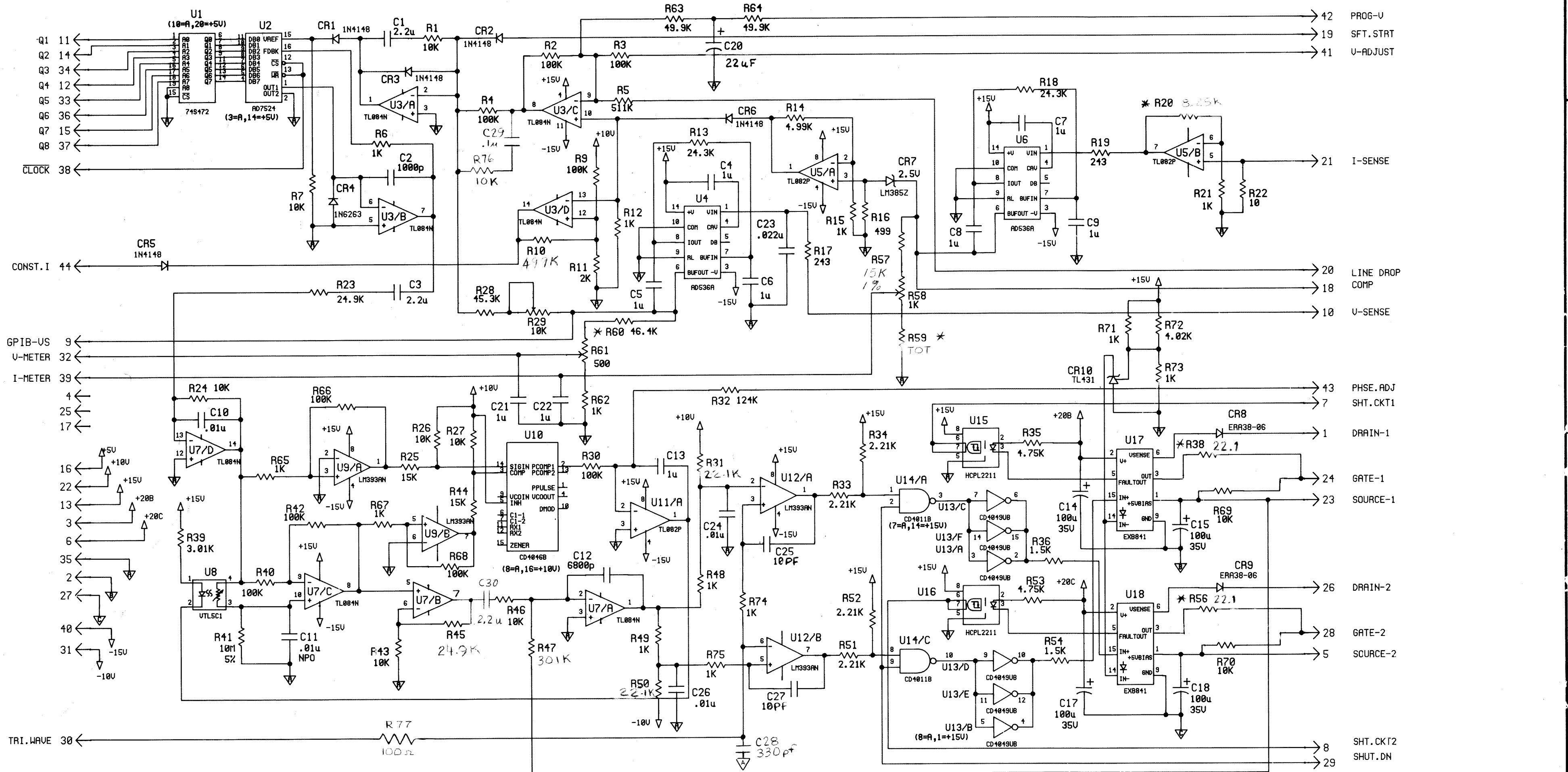
106-944-XXX

SIZE	CODE IDENT NO.	REV
C	53636	106-944-XXX
SCALE	SHEET 3 OF 3	

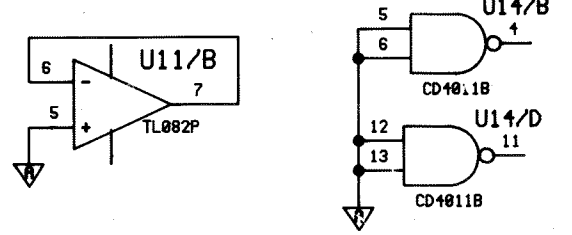
**PROPRIETARY**  
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 BEHLMAN ELECTRONICS INC.  
 HAUPPAUGE, NEW YORK

REV STATUS OF SHT		REVISIONS				
SHT	REV	ZONE	LTR	DESCRIPTION	DATE	APPROVED
			B	ECO 93-033	3/11/83	JTC
			C	R31, 50 FROM 33.2K C25, 27 FROM 100P		
			D	REVISED PER ECO 96-007	96-10-24	
			E	REVISED PER ECO 96-043	96-10-24	SB
			F	REVISED PER ECO 96-044	96-10-24	S.P. 10/24
			G	REVISED PER ECO 97-054	97-08-15	S. B. 8/15
			H	REVISED PER ECN 98-032	98-08-03	

ZONE	LTR	DESCRIPTION	DATE	APPD
	J	Revised Per ECO 98-034	980831	SB
	K	Revised Per ECO 00-190	10-20-00	CE



FROM	NOT USED
R7	R8, 37, 55
U18	
C30	C16, C19
CR10	



\*SEE SAT MATRIX SCD (107-850-000)  
 FOR R20, R59, R56, R38, & R60 VALUES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	
TOLERANCES: FRACTIONS ±	
3 PLACE DECIMALS ±	
2 PLACE DECIMALS ±	
ANGLES ±	
<b>DO NOT SCALE THIS DRAWING</b>	
MATERIAL:	
106-676-900	
106-944-000	BL1015
NEXT ASSY	USED ON
APPLICATION	

CONTRACT	
DRAWN	DATE
→ BOTTIGHERE	11-20-92
CHECKED	
Benn & John	10-20-00
ENGR	
J. Manning	11-24-92

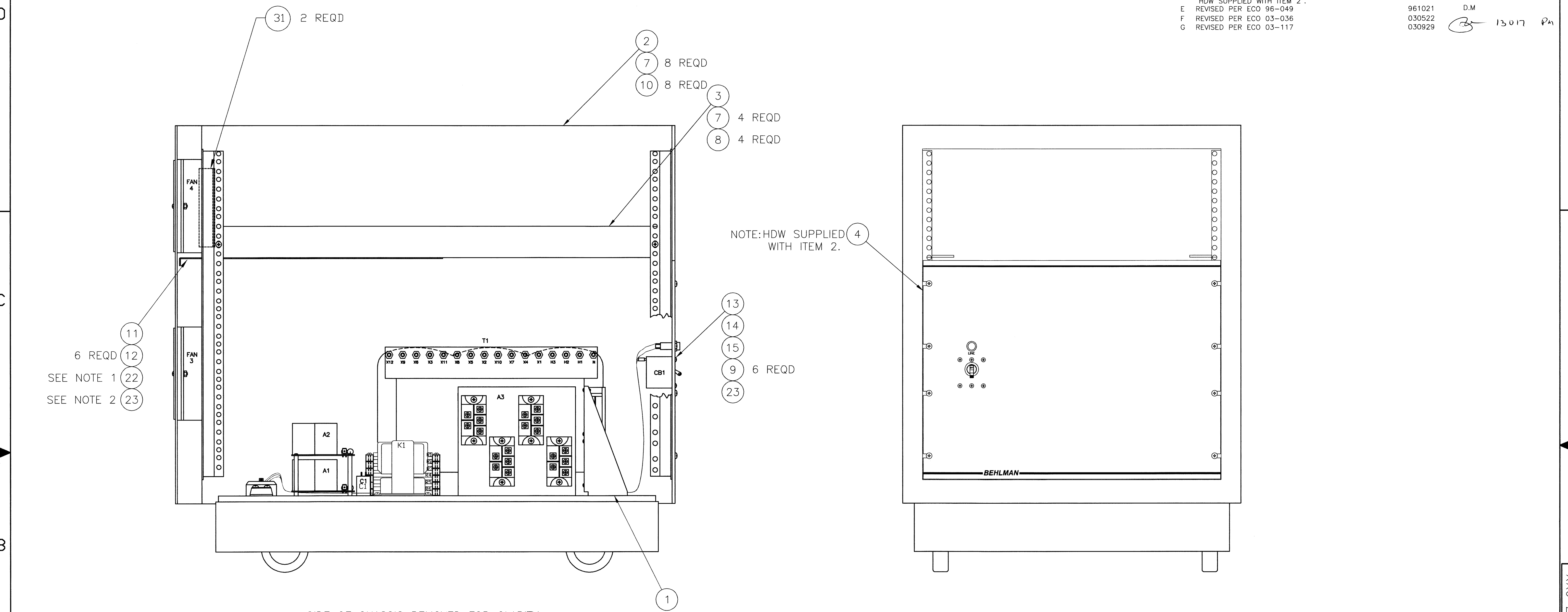
**BEHLMAN**  
 An Astrotech Company

SCHEM DIAG  
 PHASE CONTROL DRIVER  
 3 PHASE BL

SIZE	CODE IDENT NO.	REV
C	53636	1
SCALE	106-942-000	
SHEET		10/1

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 BEHLMAN ELECTRONICS INC.  
 HAUPPAUGE, NEW YORK

REV. STATUS OF SHT		REVISIONS				DATE	APPROVED	DRL #	INIT
REV	SHT	ZONE	LTR	DESCRIPTION					
-				RELEASED FOR PRODUCTION	930324				
A				ADDED 2 MORE CAP BOARDS					
B				REVISED WIRE RUN SCHEDULE.	95-7-27				
C				REVISED WIRE RUN SCHEDULE.					
D				DELETED ITEMS 5 AND 6, ADDED NOTE "HDW SUPPLIED WITH ITEM 2".					
E				REVISED PER ECO 96-049	961021			D.M	
F				REVISED PER ECO 03-036	030522				
G	1			REVISED PER ECO 03-117	030929			13017 P.M	



NOTE: HDW SUPPLIED WITH ITEM 2.

SIDE OF CHASSIS REMOVED FOR CLARITY

**CONTROLLED DOCUMENT**

SEE SEPARATE PARTS LIST

9	TB2-N	-	T1-N	-	8		SEE NOTE 4
8	CB1-0C (D)	19	K1-IN (C)	18	10	WHT	SEE NOTE 5
7	CB1-0B (D)	19	K1 IN (B)	18	10	WHT	SEE NOTE 5
6	CB1-0A (D)	19	K1 IN (A)	18	10	WHT	SEE NOTE 5
5	TB2-0C	17	CB1-0C (A)	19	10	WHT	SEE NOTE 5
4	TB2-0B	17	CB1-0B (A)	19	10	WHT	SEE NOTE 5
3	TB2-0A	17	CB1-0A (A)	19	10	WHT	SEE NOTE 5
2	T1-X3	18	INDICATOR LIGHT	21	20	WHT	
1	T1-X1	18	INDICATOR LIGHT	21	20	BLK	

CONN NO.	FROM	LUG ITEM NO.	TO	LUG ITEM NO.	AWG	COLOR	COMMENTS
WIRE RUN SCHEDULE							

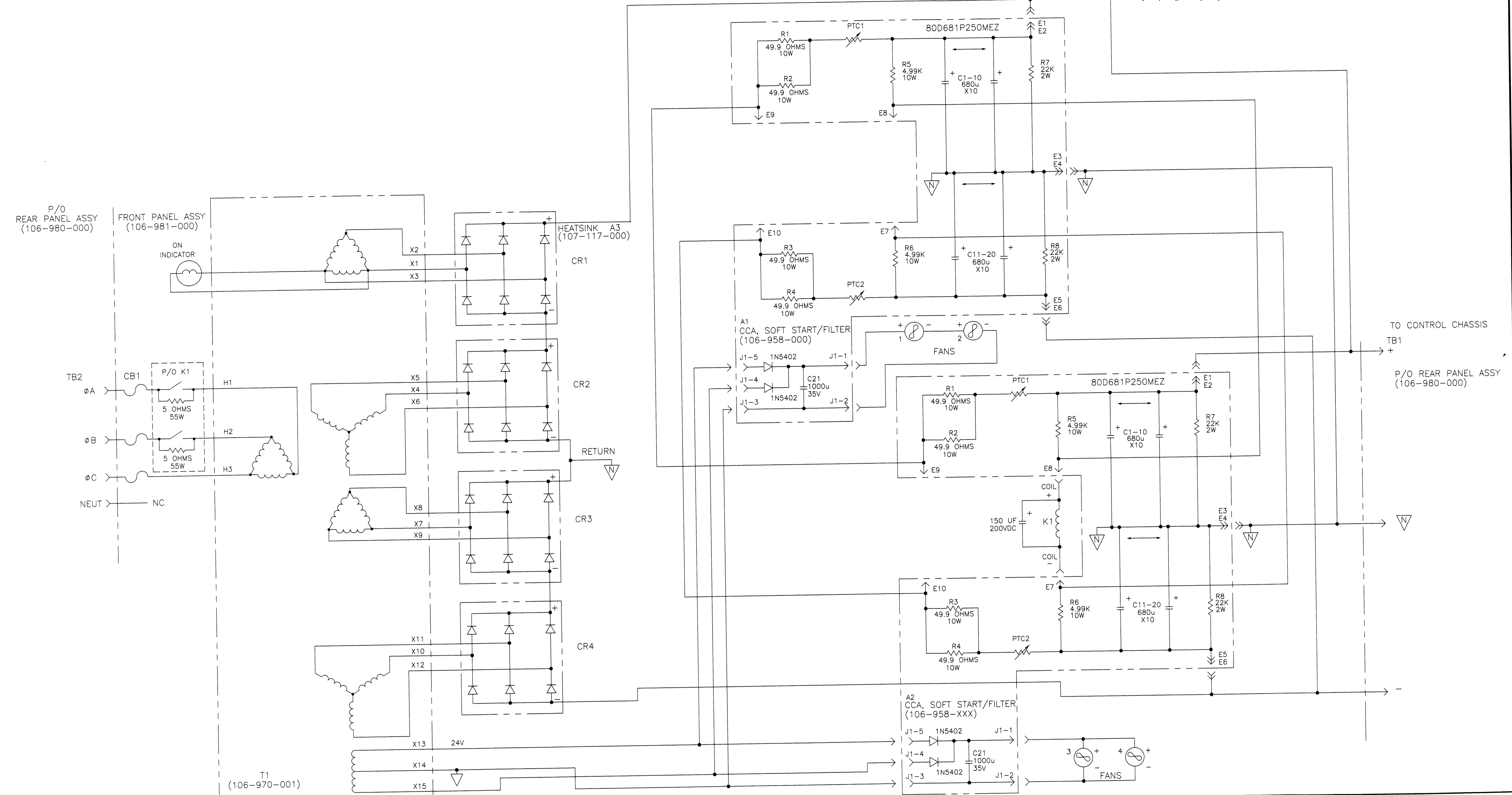
- NOTES:
- CENTER LABEL TOWARD REAR OF BAFFLE (SIDE CLOSEST TO REAR DOOR).
  - WRAP AROUND CUTOUTS FOR WIRES.
  - FOR DASH 007 SEE DRAWING 106-977-007.
  - FOR C1, C4 OPTION WIRE WILL BE 6 AWG.
  - FOR C1,C4 OPTION WIRES 3 THRU 8 WILL BE 8 AWG.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		<b>THIS DRAWING SHALL ONLY BE CHANGED BY USE OF CAD</b>		<b>BEHLMAN</b>	
TOLERANCES: FRAC 3 PLACE DEC ±.005 2 PLACE DEC ±.01 ANGLES ± 1°		DRAWN J.ALGERIO DATE 930323			
DO NOT SCALE THIS DWG		CHECKED RLA DATE 10/17/97		POWER CHASSIS ASSY, 20K	
MATERIAL:		ENGR RLA DATE 10/17/97			
106-676-906		QUALITY CONTROL DATE		SIZE D	
106-676-905		MANUFACTURING DATE		CODE IDENT NO. 106-977-0XX	
106-676-904				REV G	
106-676-903				SCALE 1:3 CAD FILE: 106-977-0XXG.DWG SHEET 1 OF 1	
106-676-902					
106-676-901					
NEXT ASSY USED ON					
APPLICATION					

106-977-0XX

AutocAD Extracted Document

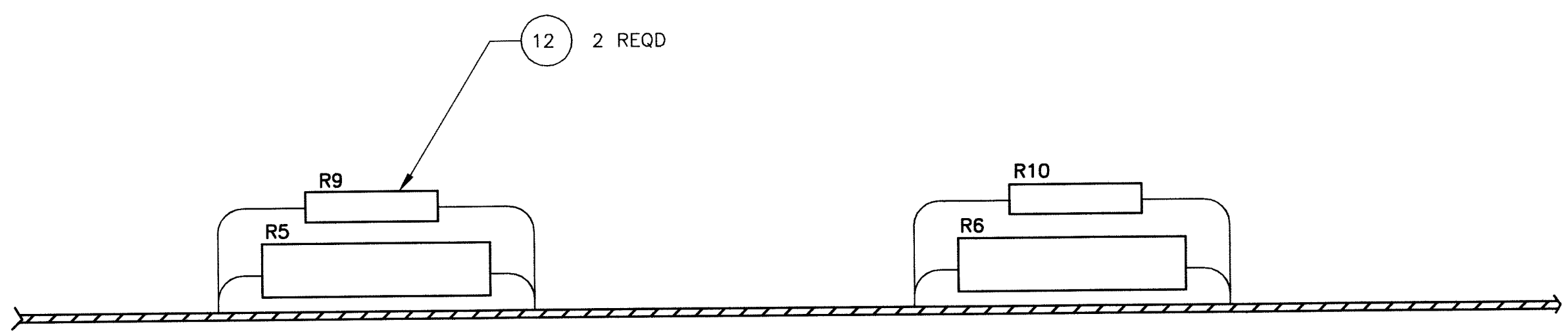
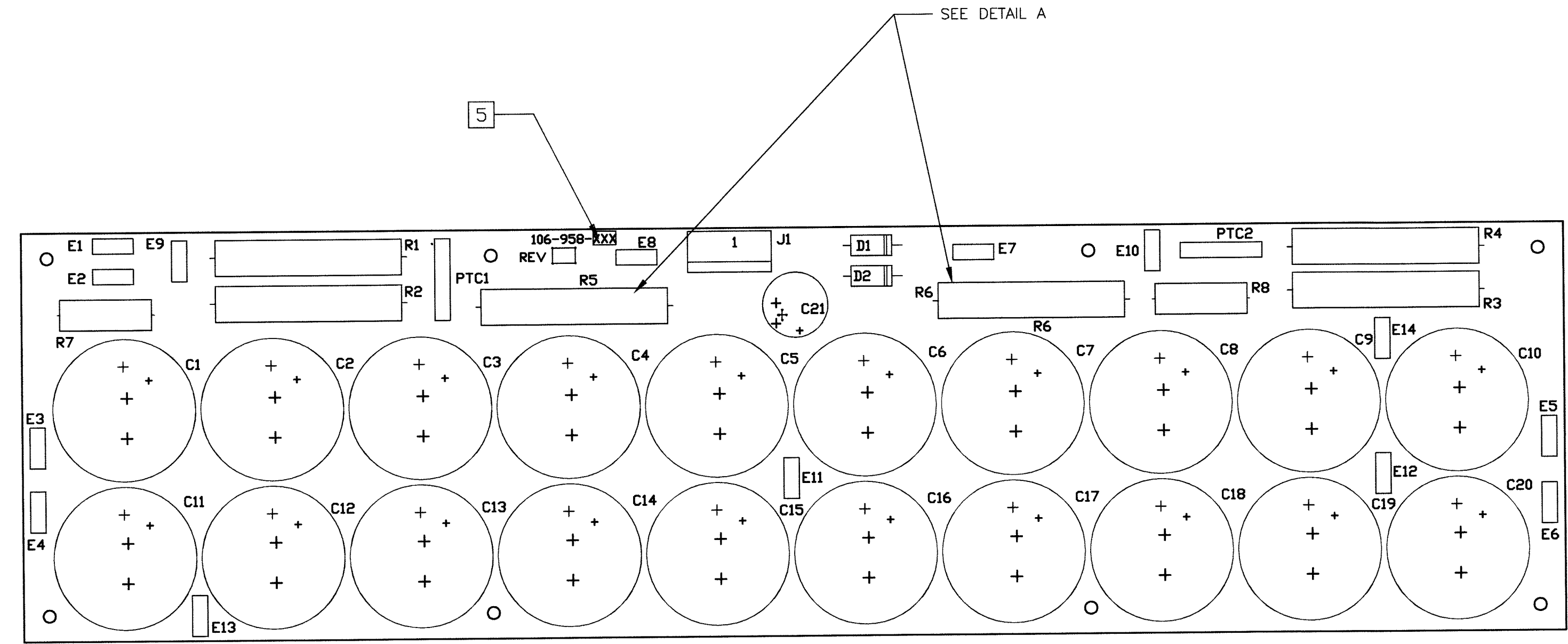
REV STATUS OF SHT	ZONE	LTR	REVISIONS		DATE	APPROVED
			DESCRIPTION			
SHT REV		A	ADDED (2) 5 OHM RESISTORS TO K1.			



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES - FRACTIONS ± 3 PLACE DECIMALS ± 2 PLACE DECIMALS ± ANGLES ±		CONTRACT		<b>BEHLMAN</b>	
DO NOT SCALE THIS DRAWING		DRAWN J. ALGERIO 92-07-07			
MATERIAL:		CHECKED D. MORTENSEN 4-13-93		SCHEMATIC BL20,000 POWER CHASSIS	
106-977-002 106-676-9XY		ENGR T. MURRY 4-13-93		SIZE CODE IDENT NO.	
NEXT ASSY USED ON				D 53636 106-956-001	
APPLICATION				SCALE SHEET	

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 BEHLMAN ELECTRONICS INC.  
 HALFPRAUGE, NEW YORK

REV STATUS OF SHT		ZONE	LTR	DESCRIPTION	DATE	APPROVED	DRL #	INIT
F	1			REWORKED TO ACCOMMODATE NEW R5,R6	93-08-20			
				CHANGED FROM -000 TO -XXX	01-01-15			
				ADDED DETAIL A	02-12-02	RA	12705	CR
				REVISED PER ECO 00-291	04-05-03			
				REVISED PER ECO 02-152				
				REVISED PER ECO 04-079				



DETAIL A  
 FOR -020 ONLY  
 PIGGY BACK R9 TO R5 & R10 TO R6 AS SHOWN.

**ATTENTION**  
 OBSERVE PRECAUTIONS  
 FOR HANDLING  
 ELECTROSTATIC  
 SENSITIVE DEVICES

**CONTROLLED  
 DOCUMENT**

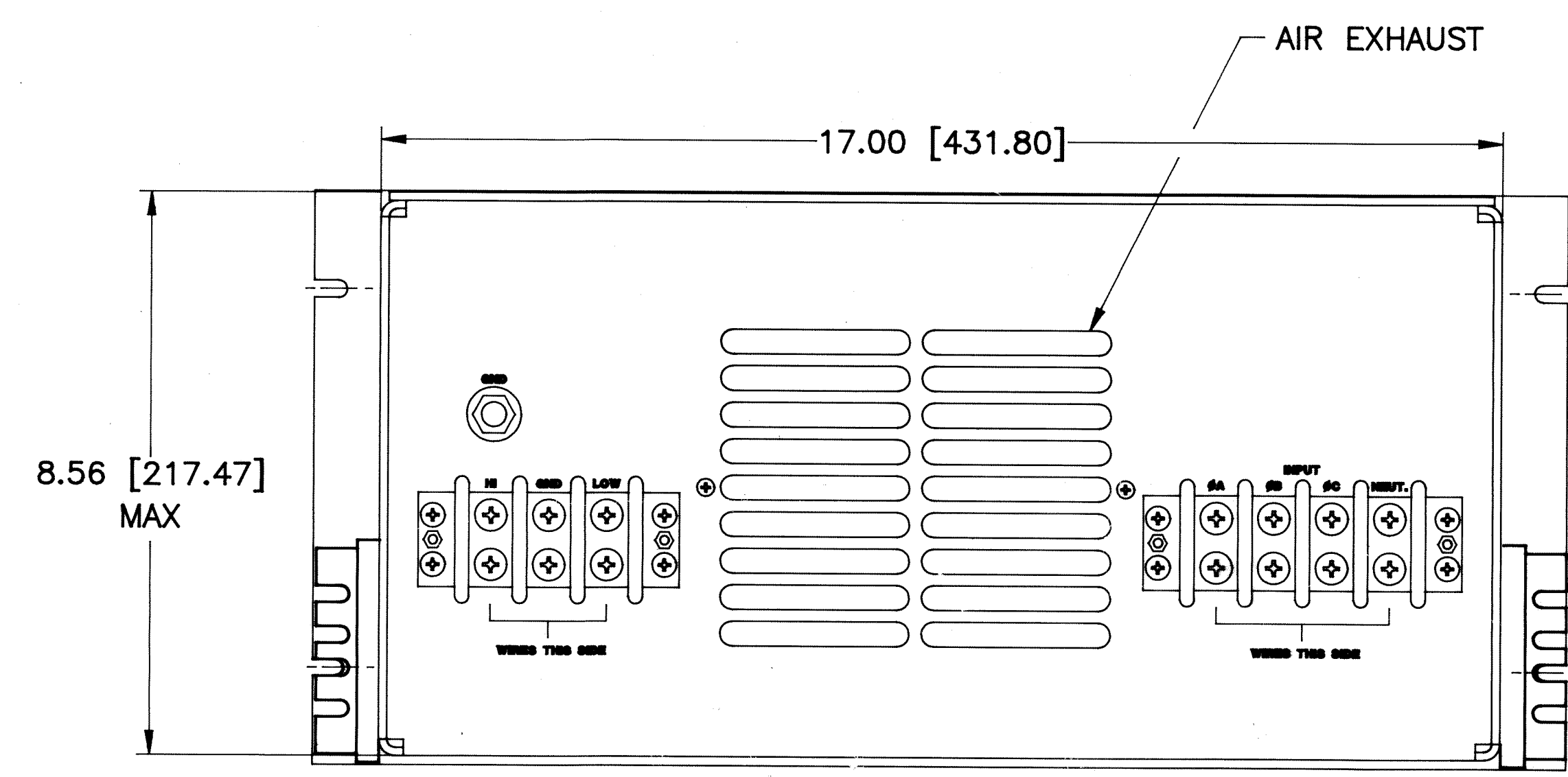
- NOTES:
- INTERPRET DRAWING IN ACCORDANCE WITH DOD-STD-100.
  - WORKMANSHIP TO BE IN ACCORDANCE WITH IPC-A-610, CLASS 2.
  - SOLDER IN ACCORDANCE WITH ANSI-J-STD-001A, CLASS 2.
  - THIS ASSEMBLY CONTAINS PARTS SENSITIVE TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD). USE ESD PRECAUTIONARY PROCEDURES WHEN ASSEMBLING OR HANDLING PER MIL-HDBK-263 & MIL-STD-1686, CLASS 1.
  - PRINT INDELIBLY & LEGIBLY 53636 106-958- (INSERT APPROPRIATE DASH NO). ADD LATEST REV LTR & SER. NO. XXX BY MEANS OF THERMAL TRANSFER ON ADHESIVE LABEL USING 7.0 POINT CHARACTERS IN BLACK INK. LOCATE WHERE SHOWN.
  - MAX LEAD PROTRUSION TO BE .06.
  - REFERENCE DOCUMENTS:  
 3.1 SCHEMATIC DIAGRAM: 106-956-000.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		<b>THIS DRAWING SHALL ONLY BE CHANGED BY USE OF CAD</b>		<b>BEHLMAN</b>	
TOLERANCES: FRAC		DRAWN J.ALGERIO DATE 92-07-21		PWA, SOFT START/FILTER	
3 PLACE DEC ±.005		CHECKED [Signature] DATE 4/16/94		REV F	
2 PLACE DEC ±.01		ENGR S.Boyle DATE 6-16-04		SIZE D	
ANGLES ± 1°		QUALITY CONTROL DATE		CODE IDENT NO. 106-958-XXX	
DO NOT SCALE THIS DWG		MANUFACTURING DATE		SCALE 1:1	
MATERIAL:		APPLICATION		CAD FILE:958-XXX.F.DWG	
106-983-000	106-977-000			SHEET 1 OF 1	
NEXT ASSY	USED ON				

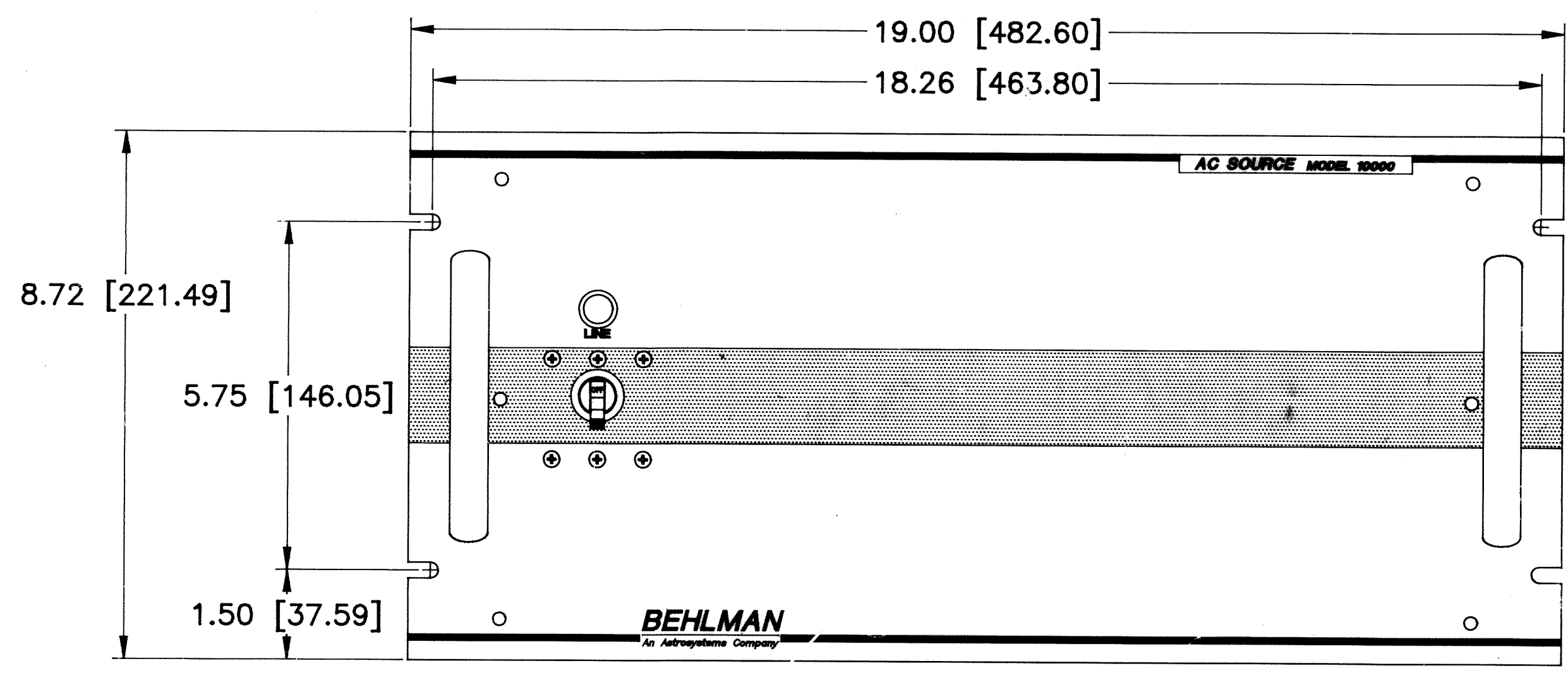
106-958-XXX

REV	STATUS	REVISIONS				
		ZONE	LTR	DESCRIPTION	DATE	APPROVED
SHT	REV					

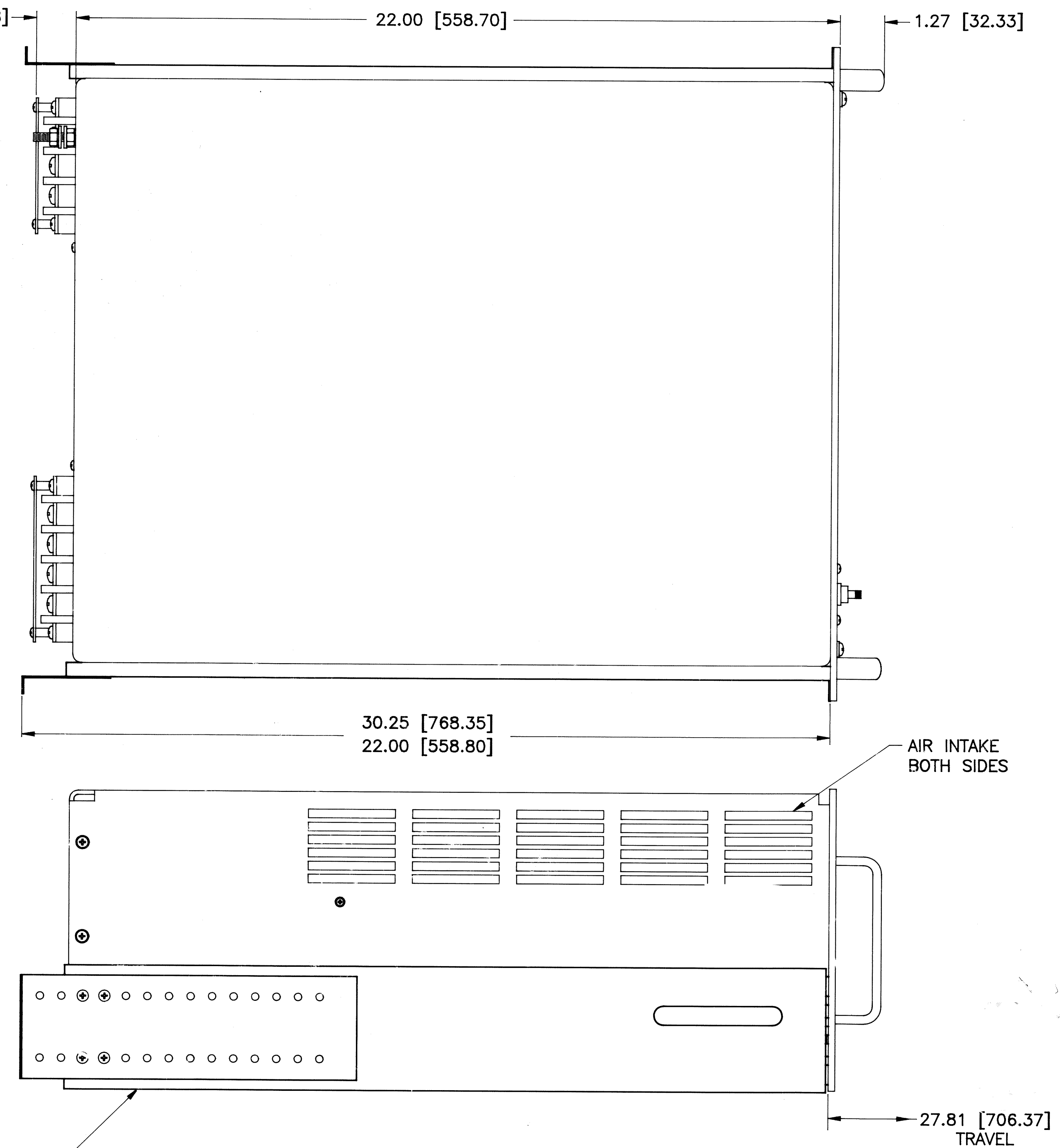
1.20 [30.48]      22.00 [558.70]      1.27 [32.33]



REAR VIEW  
TERMINAL BLOCK SAFETY COVERS REMOVED FROM VIEW FOR CLARITY



FRONT VIEW



SLIDES: 101-085-010

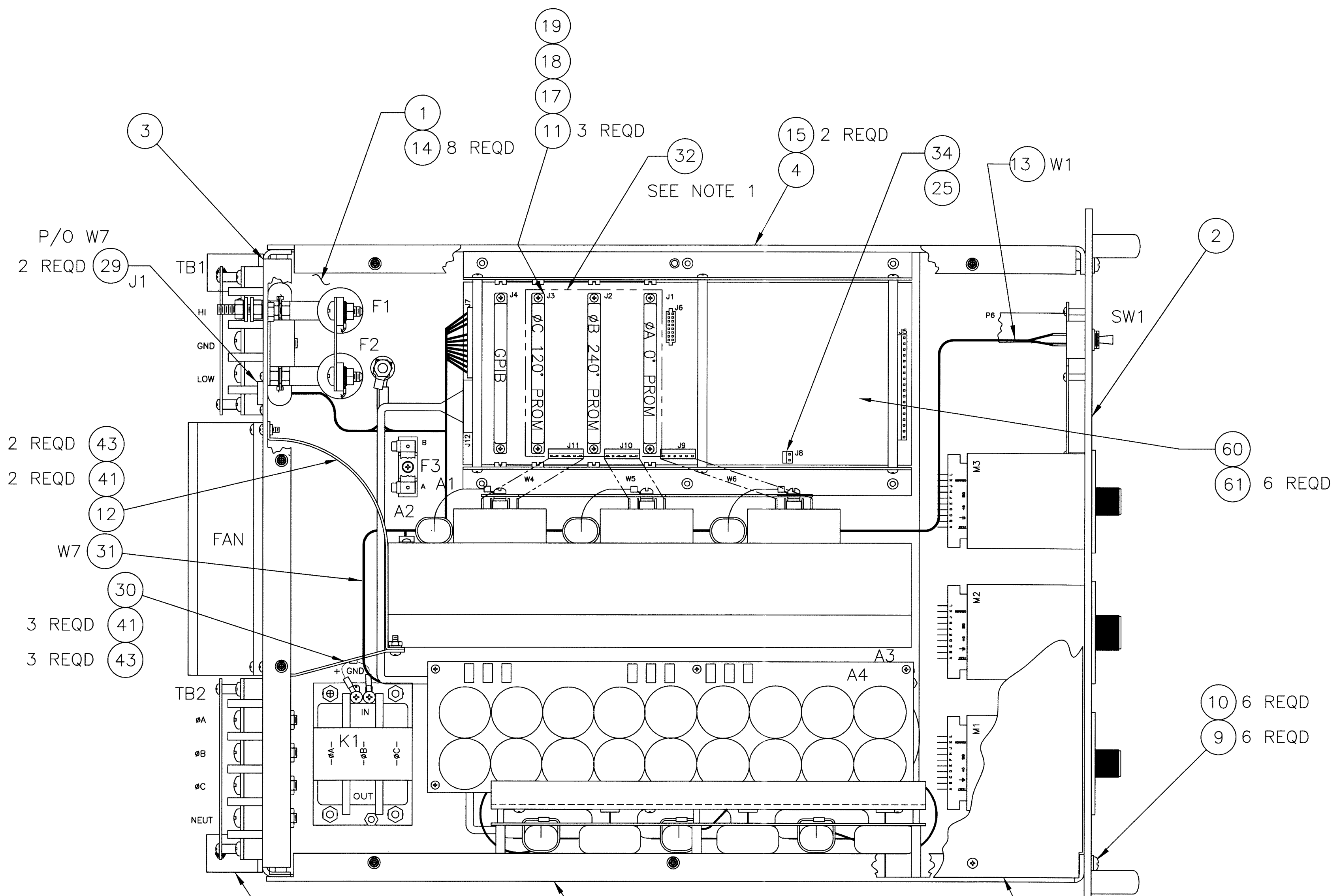
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONS ± 3 PLACE DECIMALS ± 2 PLACE DECIMALS ± ANGLES ±		CONTRACT		<b>BEHLMAN</b> An AstroSystems Company	
		DO NOT SCALE THIS DRAWING		DRAWN J. ALGERIO      92-07-24		OUTLINE DRAWING POWER CHASSIS	
		MATERIAL:		CHECKED D. MORTENSEN      93-1-26		SIZE    CODE IDENT NO.	
		NEXT ASSY    USED ON		ENGR A. ROMAY      93-1-20		D    53636      106-977-500	
		APPLICATION				SCALE    1/2      SHEET	

106-977-500



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 BEHLMAN ELECTRONICS INC.  
 HAUPPAUGE, NEW YORK

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ADDED NOTE 1	93/12/20	D.M.
	B	ADDED CONN NO'S.	94/12/16	T.M.
	C	WIRE RUN SCHEDULE, ADDED CONN NO'S 16 AND 17		T.M.
	D	WIRE RUN SCHEDULE, CONN. NO.2 WAS F3-A	96/03/15	T.M.
	E	ADDED CAP BOARD ASSY PER ECO 96-019	96-06-05	T.M.
	F	REVISED WIRERUN PER ECO 98-018	98-02-20	T.M.
	G	REVISED PER ECO 98-108	99-03-04	T.M.
	H	REVISED PER ECO 01-007	01-01-26	T.M.
	J	REVISED PER ECO 09-045 (FM)	04-15-09	<i>[Signature]</i>



CONN NO.	FROM	LUG ITEM NO.	TO	LUG ITEM NO.	AWG	COLOR	COMMENTS
17	A3A1-E5	23	NEUT STUD	21	10	WHT	NEUT
16	A3A1-E3	23	NEUT STUD	21	10	WHT	NEUT
15	A3A1-E7	23	NEUT STUD	21	10	WHT	NEUT
14	F3-B	-	F1-A	-	22	RED	
13	K1 COIL GND	-	NEUT STD	-	22	BLK	NEUT
12	A3L6-OUT	-	K1-ØA	-	10	WHT	
11	A3L5-OUT	-	K1-ØB	-	10	WHT	
10	A3L4-OUT	-	K1-ØC	-	10	WHT	
9	K1-ØC OUT	21	TB2-ØC	21	10	BLK	ØC
8	K1-ØB OUT	21	TB2-ØB	21	10	BLK	ØB
7	K1-ØA OUT	21	TB2-ØA	21	10	BLK	ØA
6	NEUT STD	23	TB2-NEUT	21	8	WHT	
5	NEUT STD	21	A1J8-2	25	22	WHT	NEUT
4	F2-4	40	A2Q6-E2	39	8	ORN	-250V
3	TB1-GND	21	NEUT STUD	21	10	WHT	NEUT
2	F1-A	40	A2Q5-C1	39	8	RED	+250V
1	F3-A	20	A1J8-1	25	22	RED	+250V

WIRE RUN SCHEDULE

- 26 REF
- 27 REF
- 28 REF
- SEE NOTE 2
- 5
- 15 2 REQD
- 16 3 REQD
- 6
- 8 8 REQD

**NOTES:**  
 1. ADHERE ITEM 32 (1/8" THICK GRAY FOAM 4.50 X 3.60) TO UNDERSIDE OF TOP COVER, LINING UP WITH PHASE CARDS.  
 2. INSTALL ITEMS 26, 27 & 28 AFTER PLACING CONTROL CHASSIS INTO CABINET. APPLY BLUE LOCTITE. THIS IS TO BE DONE AT THE FINAL ASSEMBLY LEVEL. REFERENCE PL106-676-101.

**CONTROLLED DOCUMENT**

SEE SEPARATE PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		<b>THIS DRAWING SHALL ONLY BE CHANGED BY USE OF CAD</b>		<b>BEHLMAN</b>	
TOLERANCES: FRAC 3 PLACE DEC ±.005 2 PLACE DEC ±.01 ANGLES ± 1'		DRAWN J.MORRELL DATE 01-01-26			
DO NOT SCALE THIS DWG		CHECKED <i>[Signature]</i> DATE 04-28-09		ASSY, CONTROL CHASSIS (BL20,000)	
MATERIAL:		ENGR <i>[Signature]</i> DATE 04-29-09			
106-676-9XX		QUALITY CONTROL DATE		SIZE <b>D</b>	CODE IDENT NO. <b>53636</b>
NEXT ASSY USED ON		MANUFACTURING DATE		106-909-002	REV <b>J</b>
APPLICATION		SCALE 1:2		CADFILE: 909-002J.DWG SHEET 1 OF 1	

106-909-002

AutoCAD Generated Document