COUNTERPOINT
SA-5000 DUAL CHANNEL
HYBRID PREAMPLIFIER

SERVICE MANUAL

COUNTERPOINT ELECTRONIC SYSTEMS, INCORPORATED
AUDIO COMPONENTS DIVISION
VISTA, CA 92083
USA

MANUAL REVISION: A
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APPLIES TO SERIAL NUMBERS STARTING: 15k01

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SECTION 1

GENERAL DESCRIPTION

Section 1 General Description

GENERAL DESCRIPTION

The SA-5000 is a stereo high-fidelity preamplifier. Its two main functions are Phono Equalizer/Amplifier and Control Amplifier.

Phono Equalizer/Amplifier ("phono stage"). This portion of the SA-5000 is intended for use with phono cartridges with outputs ranging from 0.05mV to 5mV. It is a buffered two-stage design with passive RIAA de-emphasis (EQ). Output level of this portion of the SA-5000 approximates "line" level.

The first stage of the phono section has two sets of phono inputs with different gain levels. Selection between the High Gain ("MC") and the Low Gain ("MM") inputs is determined by the setting of a pair of internal switches. In the high-gain mode, the stage is a FET/triode cascode. Low-gain mode sets the stage as a commmon-cathode triode amplifier. Shorting plugs are to be inserted into the unused set of phono inputs.

Output of the first stage is buffered by a FET video buffer operated in a constant-voltage environment. The buffer drives the RIAA network.

The second stage further amplifies the equalized signal. This stage uses a p-channel FET to drive the cathode of a triode. The FET is used as the source-follower and offers no voltage gain, but its low output impedance is a good match for the low impedance load of the triode's cathode. This mode of operation results in reduction of all forms of distortion by factors ranging from 10 to as much as 100 without feedback. In addition, high-frequency response is greatly improved due to the elimination of Miller effect.

Output of the second stage is also buffered by a FET video buffer. The buffer drives the balance and volume controls of the Control Amplifier portion of the SA-5000 when phono is selected.

Control Amplifier ("line stage"). This portion of the SA-5000 is intended for use with unbalanced line-level audio signals typical in a home stereo system. Its controls permit selection between various line-level audio sources, and control of listening parameters such as balance, volume and signal polarity. It also is a buffered single stage design whose intended purpose is to drive high-fidelity power amplifiers with unbalanced line-level signals.

The input port to the SA-5000's line stage is user-selectable with the LINE MODE control. When set to the NONINVERT position, the line stage is operated in a similar fashion to that of the second stage of the Phono Equalizer/Amplifier section in that signal is applied to the gate of a p-channel FET which drives the cathode of the

amplifying triode, while the tube grid is AC-coupled to ground. In the INVERT mode, the gate of the FET is AC coupled to ground, and signal is applied to the tube's grid. This configuration is the equivalent of the standard common-cathode amplifier, and offers polarity reversal of the signal.

Output of the line stage is also buffered by a FET video buffer. The buffer drives the BUFFERED OUTS of the SA-5000 and permits fairly long lines. The BUFFERED OUTS LEVEL control follows the buffers and offers -6 and -12dB of attenuation. In addition to the BUFFERED OUTS, the buffer circuit may be bypassed by using the DIRECT OUTS connectors, in which case, the signal is capacitor-coupled from the anode of the amplifying tube. The BUFFERED OUTS LEVEL control has no effect on the signal level of the direct signal.

For specific circuit descriptions, refer to the included schematics and circuit descriptions.

SECTION 2

SPECIFICATIONS

Section 2 Specifications

SPECIFICATIONS

Tube Complement

4-6DJ8, Audio Amplification. V1, V101, V2 & V102.
2-6DJ8, High-voltage Supply Pass Elements, V4 & V5.
1-12AX7, High-voltage Supply Error Amplifier, V3.
1-6CA4, Rectifier, V6.

Typical Electrical Specifications

All measurements performed with LINE MODE set to NONINVERT.

Gain. @ 1kHz.

MC Phono to Main Out: 84dB
MM Phono to Main Out: 52dB
Line Input to Main Out: 23dB

Frequency Response (per IHF).

Line Stage:
Buffered Outs: +0.0/-3.0dB: <2Hz to 300kHz.
+0.0/-0.1dB: <8Hz to 50kHz.
Direct Outs: +0.0/-3.0dB: <10Hz to 80kHz.
+0.0/-0.1dB: <20Hz to 10kHz.

Phono Stage (measured at Buffered Outs):
MC: +0.1/-3dB: <10Hz to >100kHz.
+0.1/-0.3dB: <10Hz to 80kHz.
MM: +0.1/-3dB: <10Hz to >100kHz.
+0.1/-0.3dB: <10Hz to 80kHz.

Distortion (per IHF).

Line Stage:
20 to 20kHz: <0.007% thd Max.

Phono Stage:
MC: 20 to 20kHz: 0.40% thd Max.
20 to 4kHz: <0.09% thd.
MM: 20 to 20kHz: 0.2% thd Max.
20 to 4kHz: <0.035% thd.

Signal to Noise.

Line Stage: 90dB (ref. 0.5V, EIA-weighted noise: 15uV, 10 to 500kHz),
MC Phono Stage: 80dB (ref. 0.5mV, EIA-weighted noise: 55uV, 10 to 500kHz),
MM Phono Stage: 76dB (ref. 5.0mV, EIA-weighted noise: 30uV, 10 to 500kHz).

Sensitivity (measured at Main Outs).

Line Stage: 37mV,
MC Phono Stage: 31uV,
MM Phono Stage: 1.3mV.

Section 2 Specifications

Input Impedance.
Line and Tape Inputs:
Selected: 15k ohms,
Unselected: 100 ohms,
MC Phono Input: 47k, internal provisions for lower resistances,
MM Phono Input: 47k.

Output Impedance.
Direct Outputs: 3500 ohms,
Buffered Outputs: 75 ohms,
Tape Outputs: 10 ohms.

Maximum Input Levels (1% thd, 1kHz).
Line Inputs: 12 Vrms,
MC Phono Input: 10mVrms (26dB headroom ref 0.5mV),
MM Phono Input: 400mV rms (38dB headroom ref 5.0mV).

Line Stage Maximum Output Level.
32V p-p @ 1% thd, 20-20kHz.

Polarity.
Phono Stage: inverting.
Line Stage: non-inverting.

Power Requirements.
88 to 133 Volts, 50 to 60Hz (Domestic version),
Standby: 55 Watts.
Operate: 80 Watts.

Replacement Fuse Value.
Mains: Use 2-1/2 Amp AGC 3AG-size Fast Blow type fuse,
High Voltage: Use 1 Amp 8AG-size Fast Blow type fuse.

Dimensions.
Front Panel: 19 inches (480 cm) wide, 4.46 inches (11.3 cm) tall.
Front-to-rear dimension: 12.68 inches (32.2 cm), including connectors.

Weight.
28 Lbs (12.7kg).

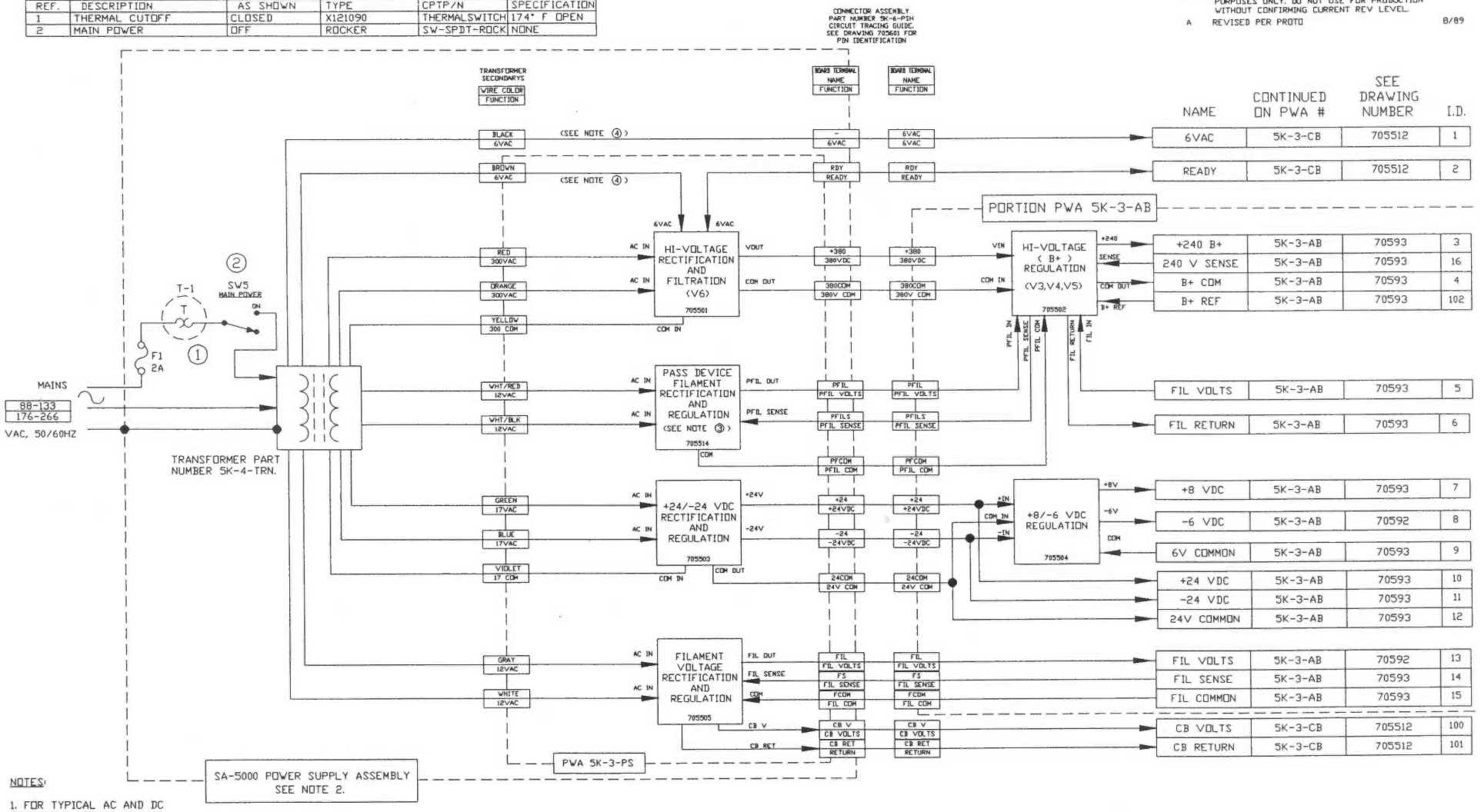
SECTION 3

BLOCK DIAGRAMS

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	2/20/89
A	REVISED PER PROTO	8/89

CONTROL FUNCTIONS

REF.	DESCRIPTION	AS SHOWN	TYPE	CPTP/N	SPECIFICATION
1	THERMAL CUTOFF	CLOSED	X121090	THERMALSWITCH	174° F OPEN
2	MAIN POWER	OFF	ROCKER	SW-SPDT-ROCK	NONE



NAME	CONTINUED ON PWA #	SEE DRAWING NUMBER	I.D.
6VAC	5K-3-CB	705512	1
READY	5K-3-CB	705512	2
+240 B+	5K-3-AB	70593	3
240 V SENSE	5K-3-AB	70593	16
B+ COM	5K-3-AB	70593	4
B+ REF	5K-3-AB	70593	102
FIL VOLTS	5K-3-AB	70593	5
FIL RETURN	5K-3-AB	70593	6
+8 VDC	5K-3-AB	70593	7
-6 VDC	5K-3-AB	70592	8
6V COMMON	5K-3-AB	70593	9
+24 VDC	5K-3-AB	70593	10
-24 VDC	5K-3-AB	70593	11
24V COMMON	5K-3-AB	70593	12
FIL VOLTS	5K-3-AB	70592	13
FIL SENSE	5K-3-AB	70593	14
FIL COMMON	5K-3-AB	70593	15
CB VOLTS	5K-3-CB	705512	100
CB RETURN	5K-3-CB	705512	101

NOTES:

1. FOR TYPICAL AC AND DC OPERATING VOLTAGES, SEE APPLICABLE DETAIL SCHEMATIC DRAWINGS.
2. CIRCUITRY SHOWN ENCLOSED IN DASHED LINE IS CONTAINED IN SA-5000 POWER SUPPLY ASSEMBLY.
3. CAUTION: THIS CIRCUIT FLOATED +210 VDC ABOVE GROUND.
4. CAUTION: THIS CIRCUIT FLOATED +380 VDC MINIMUM ABOVE GROUND.

OTHER APPLICABLE DRAWINGS

DRAWING TITLE	DESCRIPTION	CAD FILENAME	DRAWING NUMBER
CIRCUIT BOARD LAYOUT PWA 5K-3-PS	COMPONENT LAYOUT DIAGRAM POWER SUPPLY PCB	NONE	NONE
CIRCUIT BOARD LAYOUT PWA 5K-3-AB	COMPONENT LAYOUT DIAGRAM MAIN AUDIO PCB	NONE	NONE
TRANSFORMER PRIMARY WIRING DETAILS	NORMAL TRANSFORMER PRIMARY CONNECTION DETAILS	7057.DWG	7057
TRANSFORMER SECONDARY WIRING DETAILS	NORMAL TRANSFORMER SECONDARY CONNECTION DETAILS	7058.DWG	7058
MATERIALS, SA-5000 POWER SUPPLY	LIST OF FIELD-REPLACEABLE COMPONENTS	NONE	705301
POWER SUPPLY CONNECTOR	NORMAL POWER SUPPLY CONNECTOR ASSEMBLY DETAILS	5K-6-PSH	705601

APPLICABLE SCHEMATIC DETAIL DRAWINGS

DRAWING TITLE	CAD FILENAME	DRAWING NUMBER
HIGH VOLTAGE RECTIFICATION AND FILTRATION	HVRF.DWG	705501
HIGH VOLTAGE REGULATION,	HVR.DWG	705502
+24/-24 VDC RECTIFICATION AND REGULATION	24RF.DWG	705503
+8/-6 VDC REGULATION,	6REG.DWG	705504
FILAMENT VOLTAGE RECTIFICATION AND REGULATION	FILRF.DWG	705505
CONTROL BOARD PWA 5K-3-CB SCHEMATIC	5KUTIL.DWG	705512
PASS DEVICE FILAMENT RECIFICATION AND REGULATION	PFIL.DWG	705514

DRAWN J.M.E. REVISION A

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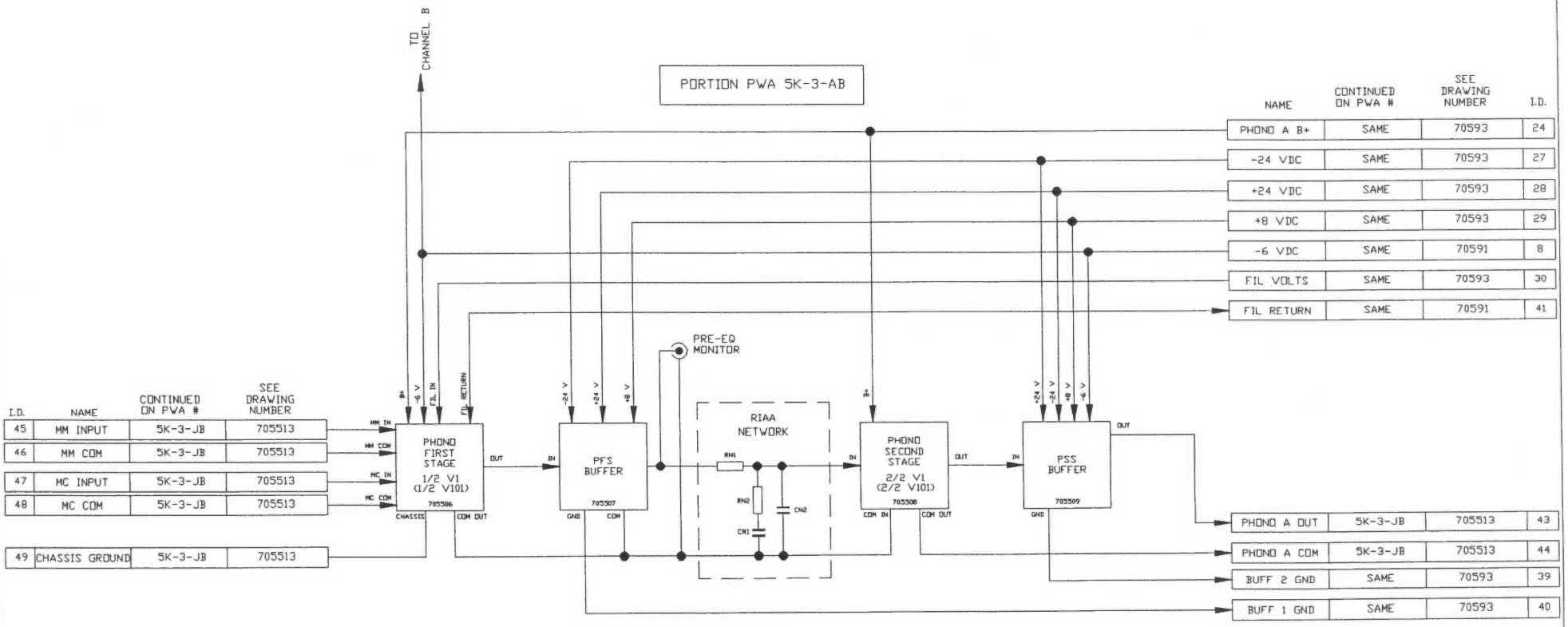
SA-5000 POWER SUPPLY BLOCK DIAGRAM

CAD FILE: 5KPSBLK DWG: 70591

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	5/1/89
A	REVISED PER PROTO	8/89



I.D.	NAME	CONTINUED ON PWA #	SEE DRAWING NUMBER
45	MM INPUT	5K-3-JB	705513
46	MM COM	5K-3-JB	705513
47	MC INPUT	5K-3-JB	705513
48	MC COM	5K-3-JB	705513
49	CHASSIS GROUND	5K-3-JB	705513

NAME	CONTINUED ON PWA #	SEE DRAWING NUMBER	I.D.
PHONO A B+	SAME	70593	24
-24 VDC	SAME	70593	27
+24 VDC	SAME	70593	28
+8 VDC	SAME	70593	29
-6 VDC	SAME	70591	8
FIL VOLTS	SAME	70593	30
FIL RETURN	SAME	70591	41
PHONO A OUT	5K-3-JB	705513	43
PHONO A COM	5K-3-JB	705513	44
BUFF 2 GND	SAME	70593	39
BUFF 1 GND	SAME	70593	40

OTHER APPLICABLE DRAWINGS

DRAWING TITLE	DESCRIPTION	CAD FILENAME	DRAWING NUMBER
MATERIALS, SA-5000 AUDIO BOARD	LIST OF FIELD-REPLACEABLE COMPONENTS	NONE	705302
CIRCUIT BOARD LAYOUT PWA 5K-3-AB	COMPONENT LAYOUT DIAGRAM	NONE	NONE

APPLICABLE SCHEMATIC DETAIL DRAWINGS

DRAWING TITLE	CAD FILENAME	DRAWING NUMBER
PHONO FIRST GAIN STAGE SCHEMATIC	PFS.DWG	705506
PHONO FIRST STAGE ('PFS') BUFFER SCHEMATIC	1_BUFF.DWG	705507
PHONO SECOND GAIN STAGE SCHEMATIC	PSS.DWG	705508
PHONO SECOND STAGE ('PSS') BUFFER SCHEMATIC	2_BUFF.DWG	705509

NOTES:
1. CHANNEL "A" (LEFT CHANNEL) SHOWN ONLY. COMPONENTS FOR CHANNEL "B" HAVE "100-" PREFIX.
2. FOR TYPICAL SIGNAL LEVELS AND DC OPERATING VOLTAGES, SEE APPLICABLE DETAIL SCHEMATIC DRAWINGS.

DRAWN J.M.E.

REVISION A

COUNTERPOINT

SA-5000 PHONO STAGE BLOCK DIAGRAM

CAD FILE: 5KPHONO

DWG: 70592

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	5/1/89
A	REVISED PER PROTO	8/89

I.D.	NAME	CONTINUED ON PWA #	SEE DRAWING NUMBER
24	PHONO B+	SAME	70592 (V1)
26	PHONO B+	SAME	70592 (V101)
27	-24 VDC	SAME	70592
28	+24 VDC	SAME	70592
29	+8 VDC	SAME	70592
30	FIL VOLTS	SAME	70592 (V1)
31	FIL VOLTS	SAME	70592 (V101)
32	SEL OUT	5K-3-JB	705513
33	SEL COM	5K-3-JB	705513
34	TA (TB) OUT	5K-3-CB	705512
35	TA (TB) COM	5K-3-CB	705512
36	-SIG IN	5K-3-CB	705512
37	+SIG IN	5K-3-CB	705512
38	SIG IN COM	5K-3-CB	705512
39	BUFF 2 GND	SAME	70592
40	BUFF 1 GND	SAME	70592
41	FIL RETURN	SAME	70592 (V1)
42	FIL RETURN	SAME	70592 (V101)

TO CHANNEL 'B'

PORTION PWA 5K-3-AB

Ilb
Ipb
Ipa
Ila
STAR B+

SEL MONITOR
(11)
CW
VR610
'LINE TRIM'
25K 10-T

C23
2/210 'E'
C22
0.1/425 'UK'
R35
100K

(16)
'BUFFERED OUTPUTS'
'ENABLE'
'DISABLE'
H1

LINE STAGE
V2 (V102)
705510

LS BUFFER
705511

B+ | +8 V | FIL IN | -24 V | +24 V | -IN | +IN | 9 OUT | 9 OUT | IN | COM IN | COM OUT | FIL RETURN | GND

STAR GROUND

NAME	CONTINUED ON PWA #	SEE DRAWING NUMBER	I.D.
240 V SENSE	SAME	70591	16
+240 B+	SAME	70591	3
-24 VDC	5K-3-CB	705512	17
-24 VDC	5K-3-PS	70591	11
+24 VDC	5K-3-PS	70591	10
+24	5K-3-CB	705512	18
+8 VDC	SAME	70591	7
FIL VOLTS	5K-3-PS	70591	13
FIL VOLTS	SAME	70591	5
DIR OUT	5K-3-JB	705513	20
DIR COM	5K-3-JB	705513	21
BUF OUT	5K-3-JB	705513	22
BUF COM	5K-3-JB	705513	23
B+ REF	SAME	70591	102
B+ COM	SAME	70591	4
24V COMMON	5K-3-PS	70591	12
6V COMMON	SAME	70591	9
FIL COMMON	5K-3-PS	70591	15
FIL SENSE	5K-3-PS	70591	14
CB COM	5K-3-CB	705512	25
FIL RETURN	SAME	70591	6

CONTROL FUNCTIONS

REF.	DESCRIPTION	AS SHOWN	TYPE	CPTP/N	SPECIFICATION
11	LINE TRIM		68WR25K	VR253	NONE
16	BUFFER ENABLE/DISABLE	ENABLED	HEADER/JUMPER	NONE	NONE

NOTES:
1. CHANNEL "A" (LEFT CHANNEL) SHOWN ONLY. COMPONENTS USED IN CHANNEL "B" HAVE "100-" PREFIX.
2. FOR TYPICAL SIGNAL LEVELS AND DC OPERATING VOLTAGES, SEE APPLICABLE DETAIL SCHEMATIC DRAWINGS.

APPLICABLE SCHEMATIC DETAIL DRAWINGS

DRAWING TITLE	CAD FILENAME	DRAWING NUMBER
LINE GAIN STAGE SCHEMATIC	LS.DWG	705510
LINE STAGE ('LS') BUFFER SCHEMATIC	3_BUFF.DWG	705511

OTHER APPLICABLE DRAWINGS

DRAWING TITLE	DESCRIPTION	CAD FILENAME	DRAWING NUMBER
SIGNALS, SA-5000 AUDIO SIGNAL PATH	NORMAL AUDIO SIGNAL LEVELS	7054.DWG	7054
MATERIALS, SA-5000 AUDIO BOARD	LIST OF FIELD-REPLACEABLE COMPONENTS	NONE	705302
CIRCUIT BOARD LAYOUT PWA 5K-3-AB	COMPONENT LAYOUT DIAGRAM	NONE	NONE

DRAWN	JME	REVISION	A
ON DATE	2/20/89	PRODUCT:	SA-5000

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LINE STAGE BLOCK DIAGRAM AND POWER SUPPLY ROUTING

CAD FILE: 5KLINE

DWG: 70593

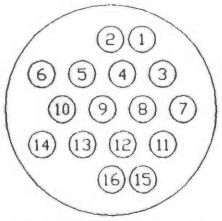
SECTION 4

SCHEMATICS

PARTS LIST FOR CABLE AND CONNECTOR ASSEMBLY

RECEPTACLE:	206036-1
PLUG:	206037-1
CABLE CLAMP:	206070-1
CONNECTOR PINS:	66182-1
CONNECTOR SOCKETS:	66183-1
CABLE:	OLYMPIC 2115

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	5/1/89
A	REVISED PER PROTO	8/89



POWER CONNECTOR VIEW OF END OF CABLE, PLUG FACING VIEWER

POWER SUPPLY BOARD TERMINAL NAME	POWER SUPPLY SOURCE ASSEMBLY	POWER SUPPLY FUNCTION	WIRE COLOR (BODY/STRIPE)	CONNECTOR PIN NUMBER	SEE NOTE	AUDIO CHASSIS FUNCTION	AUDIO CHASSIS DESTINATION ASSEMBLY	AUDIO CHASSIS BOARD TERMINAL NAME
NONE	5K-4-TRN	6VAC	BLACK	15	1	6VAC	5K-3-CB	6VAC
RDY	5K-3-PS	READY	BLACK/WHITE	16	1	READY	5K-3-CB	RDY
+380	5K-3-PS	380VDC	WHITE	1		380VDC	5K-3-AB	+380
380COM	5K-3-PS	380 COM	WHITE/BLACK	2		380 COM	5K-3-AB	380COM
+24	5K-3-PS	+24VDC	BLUE	11		+24VDC	5K-3-AB	+24
-24	5K-3-PS	-24VDC	BLUE/WHITE	13		-24VDC	5K-3-AB	-24
24COM	5K-3-PS	24V COM	BLUE/BLACK	12		24 COM	5K-3-AB	24COM
FIL	5K-3-PS	FIL VOLTS	GREEN	14		FIL VOLTS	5K-3-AB	FIL
FS	5K-3-PS	FIL SENSE	GREEN/WHITE	10		FIL SENSE	5K-3-AB	FS
FCOM	5K-3-PS	FIL COM	GREEN/BLACK	9		FIL COM	5K-3-AB	FCOM
PFIL	5K-3-PS	PFIL VOLTS	RED	6	2	PFIL VOLTS	5K-3-AB	PFIL
PFILS	5K-3-PS	PFIL SENSE	RED/WHITE	5	2	PFIL SENSE	5K-3-AB	PFILS
PFCOM	5K-3-PS	PFIL COM	RED/BLACK	4	2	PFIL COM	5K-3-AB	PFCOM
CB V	5K-3-PS	CB VOLTS	ORANGE	3		CB VOLTS	5K-3-CB	CB V
CB RET	5K-3-PS	CB RETURN	ORANGE/BLACK	7		CB RETURN	5K-3-CB	CB RET

NOTES: UNLESS OTHERWISE SPECIFIED

1. THESE CIRCUITS FLOATED +380 VDC MINIMUM ABOVE GROUND. REFER TO DRAWING 705501 "HIGH VOLTAGE RECTIFICATION AND FILTRATION" FOR FURTHER INFORMATION.
2. THESE CIRCUITS FLOATED +210 VDC ABOVE GROUND. REFER TO DRAWING 705502 "HIGH VOLTAGE REGULATOR" FOR FURTHER INFORMATION.

DRAWN	JME	REVISION	A
ON DATE	5/1/89	PRODUCT:	SA-5000

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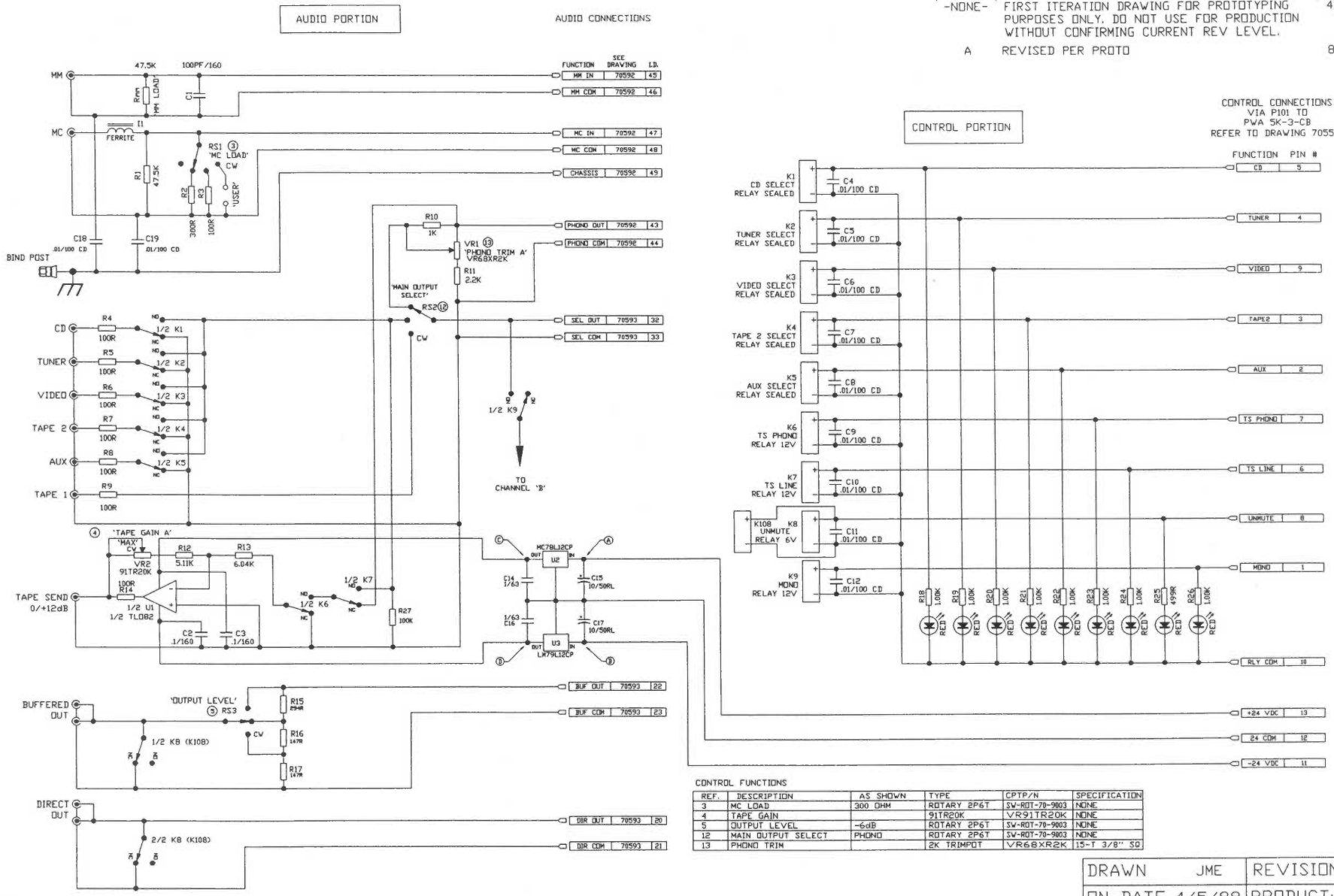
POWER SUPPLY HOSE PIN IDENTIFICATION AND FUNCTION

CAD FILE: 5K-6-PSH | DWG: 705601

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	4/5/89
A	REVISED PER PROTO	8/89



CONTROL FUNCTIONS

REF.	DESCRIPTION	AS SHOWN	TYPE	CPTP/N	SPECIFICATION
3	MC LOAD	300 OHM	ROTARY 2P6T	SW-ROT-70-9003	NONE
4	TAPE GAIN		91TR20K	VR91TR20K	NONE
5	OUTPUT LEVEL	-6dB	ROTARY 2P6T	SW-ROT-70-9003	NONE
12	MAIN OUTPUT SELECT	PHONO	ROTARY 2P6T	SW-ROT-70-9003	NONE
13	PHONO TRIM		2K TRIMPOT	VR68XR2K	15-T 3/8" SQ

NOTES:
1. CHANNEL "A" SHOWN ONLY. "B" CHANNEL COMPONENTS RECEIVE "100-" PREFIX REFERENCE DESIGNATOR.
2. REFERENCED VOLTAGES Ⓐ THROUGH Ⓓ REFER TO NORMAL DC OPERATING VOLTAGES AS SHOWN ON DRAWING NUMBER 705104 "DC OPERATING VOLTAGES, PWA 5K-3-JB AUDIO CIRCUIT."
3. FOR DESCRIPTION OF CIRCUIT, REFER TO DRAWING NUMBER 705205 "CIRCUIT DESCRIPTION, PWA 5K-3-JB."
4. FOR LIST OF FIELD-REPLACEABLE MATERIALS, REFER TO DRAWING 705304 "LIST OF MATERIALS, 5K-3-JB."

DRAWN JME	REVISION A
ON DATE 4/5/89	PRODUCT: SA-5000

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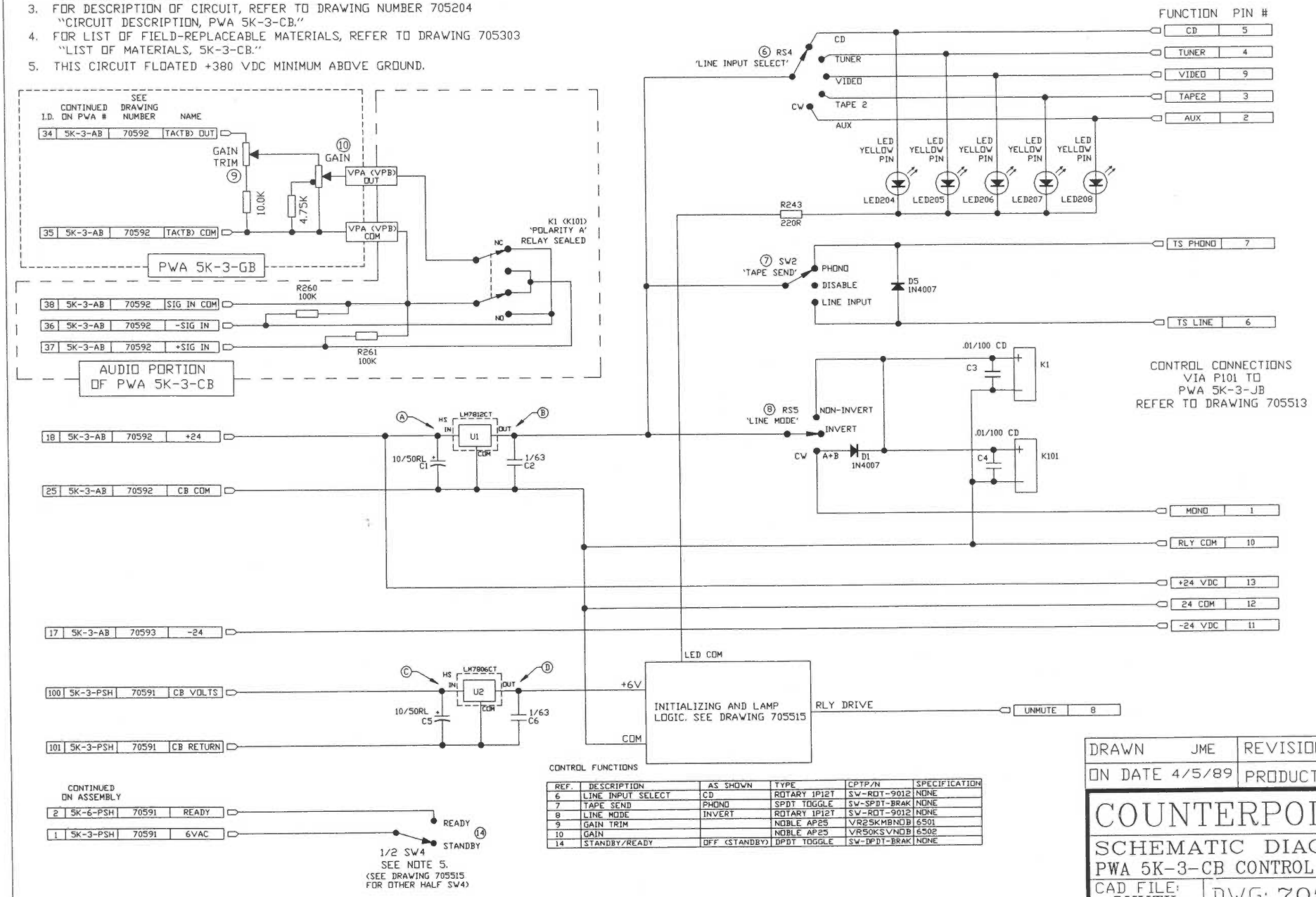
SCHEMATIC DIAGRAM PWA 5K-3-JB JACK BOARD

CAD FILE: 5KJACKS	DWG: 705513

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	5/2/89
A	REVISED PER PROTO	8/89

NOTES:
1. CHANNEL "A" AUDIO PATH IN AUDIO PORTION SHOWN ONLY. RELAY K101 REFERS TO "B" CHANNEL.
2. REFERENCED VOLTAGES Ⓐ THROUGH Ⓓ REFER TO NORMAL DC OPERATING VOLTAGES AS SHOWN ON DRAWING NUMBER 705105 "DC OPERATING VOLTAGES, PWA 5K-3-CB CONTROL BOARD CIRCUIT."
3. FOR DESCRIPTION OF CIRCUIT, REFER TO DRAWING NUMBER 705204 "CIRCUIT DESCRIPTION, PWA 5K-3-CB."
4. FOR LIST OF FIELD-REPLACEABLE MATERIALS, REFER TO DRAWING 705303 "LIST OF MATERIALS, 5K-3-CB."
5. THIS CIRCUIT FLOATED +380 VDC MINIMUM ABOVE GROUND.



CONTROL FUNCTIONS

REF.	DESCRIPTION	AS SHOWN	TYPE	CPTP/N	SPECIFICATION
6	LINE INPUT SELECT	CD	ROTARY 1P12T	SW-ROT-9012	NONE
7	TAPE SEND	PHONO	SPDT TOGGLE	SW-SPDT-BRAK	NONE
8	LINE MODE	INVERT	ROTARY 1P12T	SW-ROT-9012	NONE
9	GAIN TRIM		NOBLE AP25	VR25KMBNDB	6501
10	GAIN		NOBLE AP25	VR50KSVNDB	6502
14	STANDBY/READY	OFF (STANDBY)	DPDT TOGGLE	SW-DPDT-BRAK	NONE

DRAWN JME	REVISION A
ON DATE 4/5/89	PRODUCT: SA-5000

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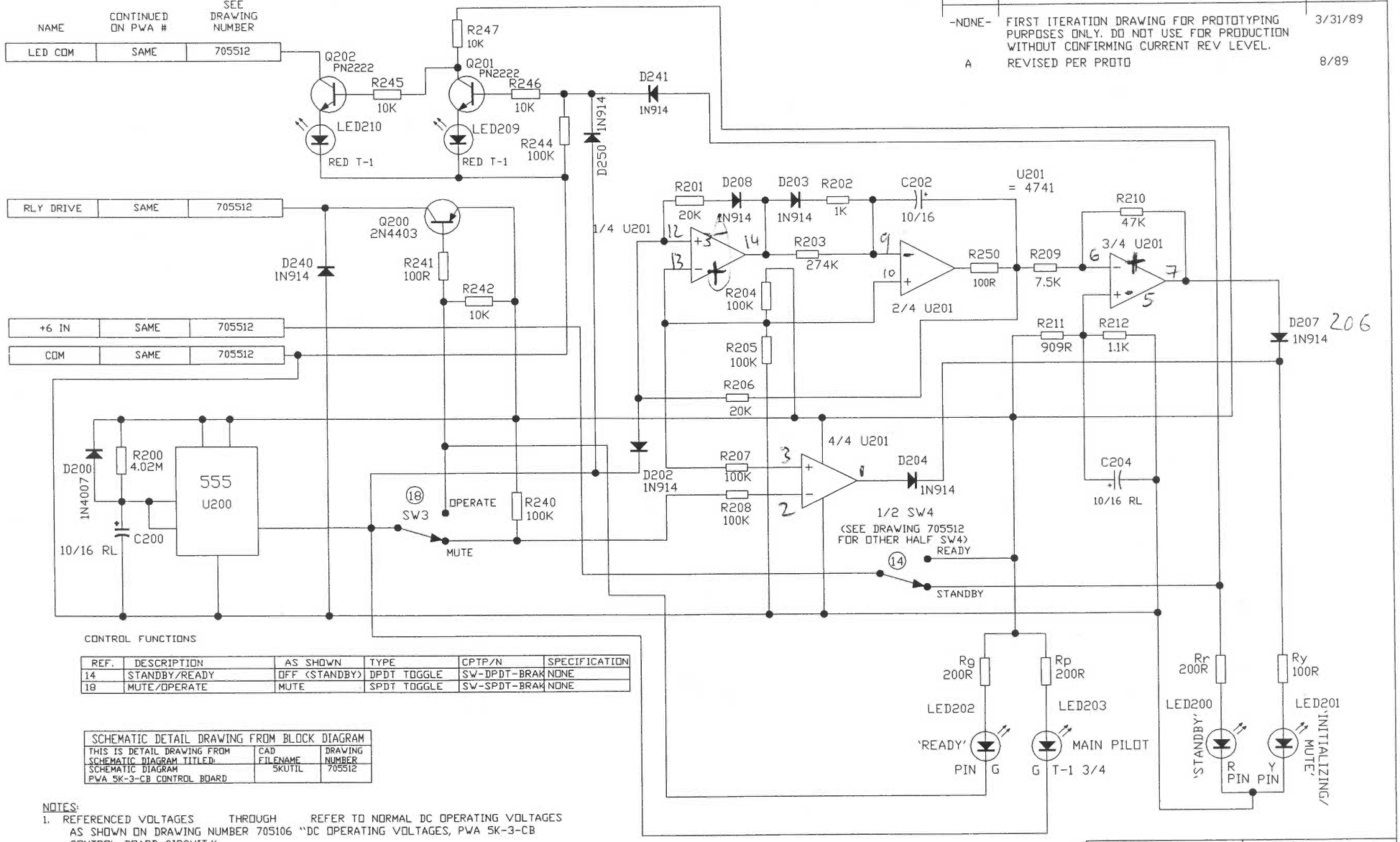
SCHEMATIC DIAGRAM
PWA 5K-3-CB CONTROL BOARD

CAD FILE: 5KUTIL

DWG: 705512

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	3/31/89
A	REVISED PER PROTO	8/89

NAME	CONTINUED ON PWA #	SEE DRAWING NUMBER
LED COM	SAME	705512
RLY DRIVE	SAME	705512
+6 IN	SAME	705512
COM	SAME	705512



CONTROL FUNCTIONS

REF.	DESCRIPTION	AS SHOWN	TYPE	CPTP/N	SPECIFICATION
14	STANDBY/READY	OFF (STANDBY)	DPDT TOGGLE	SW-DPDT-BRAK	NONE
18	MUTE/OPERATE	MUTE	SPDT TOGGLE	SW-SPDT-BRAK	NONE

SCHEMATIC DETAIL DRAWING FROM BLOCK DIAGRAM		
THIS IS DETAIL DRAWING FROM SCHEMATIC DIAGRAM TITLED:	CAD FILENAME	DRAWING NUMBER
SCHEMATIC DIAGRAM PWA 5K-3-CB CONTROL BOARD	SKUTIL	705512

NOTES:
1. REFERENCED VOLTAGES THROUGH REFER TO NORMAL DC OPERATING VOLTAGES AS SHOWN ON DRAWING NUMBER 705106 "DC OPERATING VOLTAGES, PWA 5K-3-CB CONTROL BOARD CIRCUIT."
2. FOR DESCRIPTION OF CIRCUIT, REFER TO DRAWING NUMBER 705204 "CIRCUIT DESCRIPTION, PWA 5K-3-CB."
3. FOR LIST OF FIELD-REPLACEABLE MATERIALS, REFER TO DRAWING 705303 "LIST OF MATERIALS, 5K-3-CB."

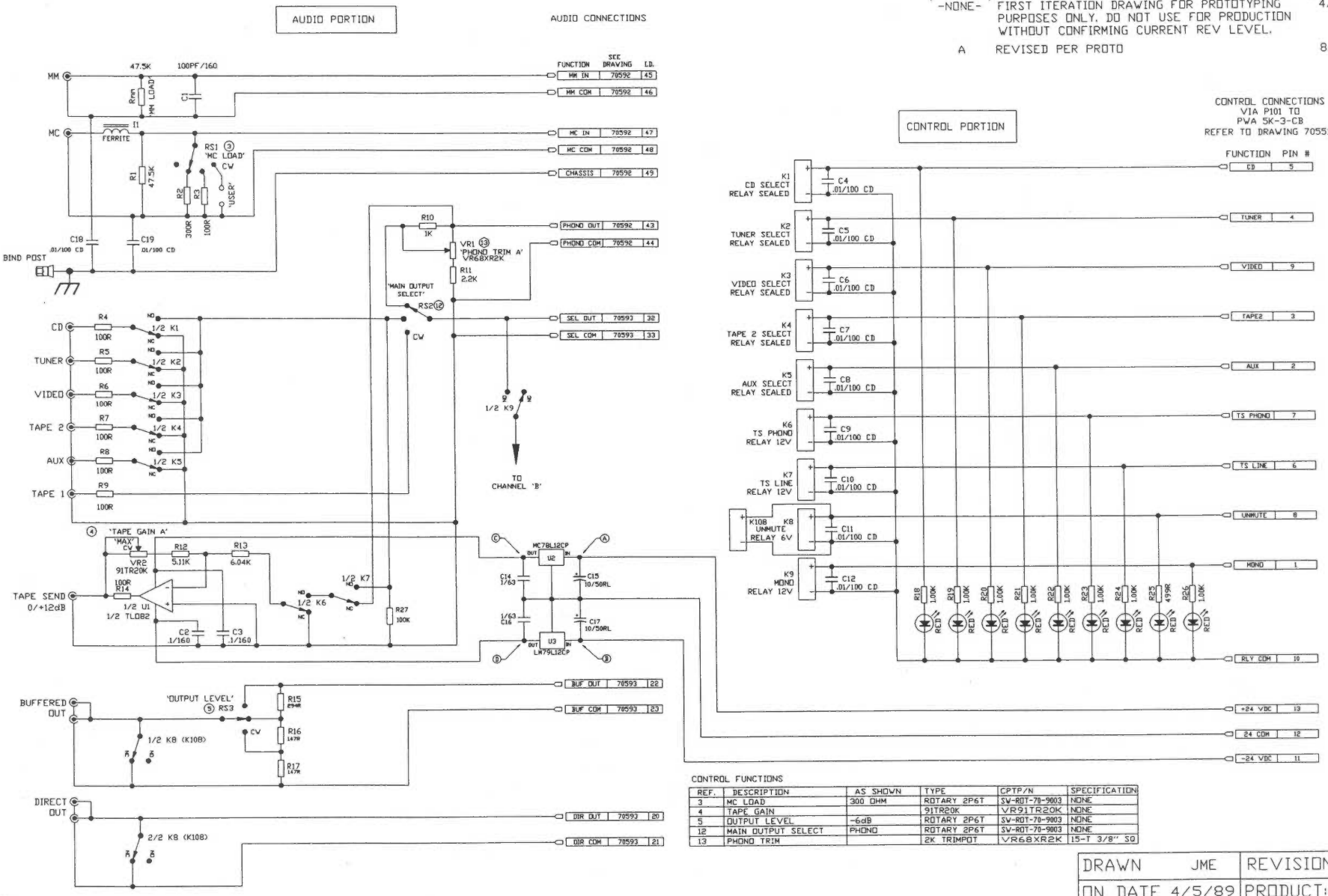
DRAWN	JME	REVISION	A
ON DATE	3/31/89	PRODUCT:	SA5000

COUNTERPOINT

SCHEMATIC DIAGRAM
INITIALIZING AND LAMP LOGIC

CAD FILE:	DWG:
UTIL	705515

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	4/5/89
A	REVISED PER PROTO	8/89



CONTROL FUNCTIONS

REF.	DESCRIPTION	AS SHOWN	TYPE	CPTP/N	SPECIFICATION
3	MC LOAD	300 OHM	ROTARY 2P6T	SW-ROT-70-9003	NONE
4	TAPE GAIN		91TR20K	VR91TR20K	NONE
5	OUTPUT LEVEL	-6dB	ROTARY 2P6T	SW-ROT-70-9003	NONE
12	MAIN OUTPUT SELECT	PHONO	ROTARY 2P6T	SW-ROT-70-9003	NONE
13	PHONO TRIM		2K TRIMPOT	VR68XR2K	15-T 3/8" SQ

NOTES:
1. CHANNEL "A" SHOWN ONLY. "B" CHANNEL COMPONENTS RECEIVE "100-" PREFIX REFERENCE DESIGNATOR.
2. REFERENCED VOLTAGES Ⓐ THROUGH Ⓓ REFER TO NORMAL DC OPERATING VOLTAGES AS SHOWN ON DRAWING NUMBER 705104 "DC OPERATING VOLTAGES, PWA 5K-3-JB AUDIO CIRCUIT."
3. FOR DESCRIPTION OF CIRCUIT, REFER TO DRAWING NUMBER 705205 "CIRCUIT DESCRIPTION, PWA 5K-3-JB."
4. FOR LIST OF FIELD-REPLACEABLE MATERIALS, REFER TO DRAWING 705302 "LIST OF MATERIALS, 5K-3-JB."

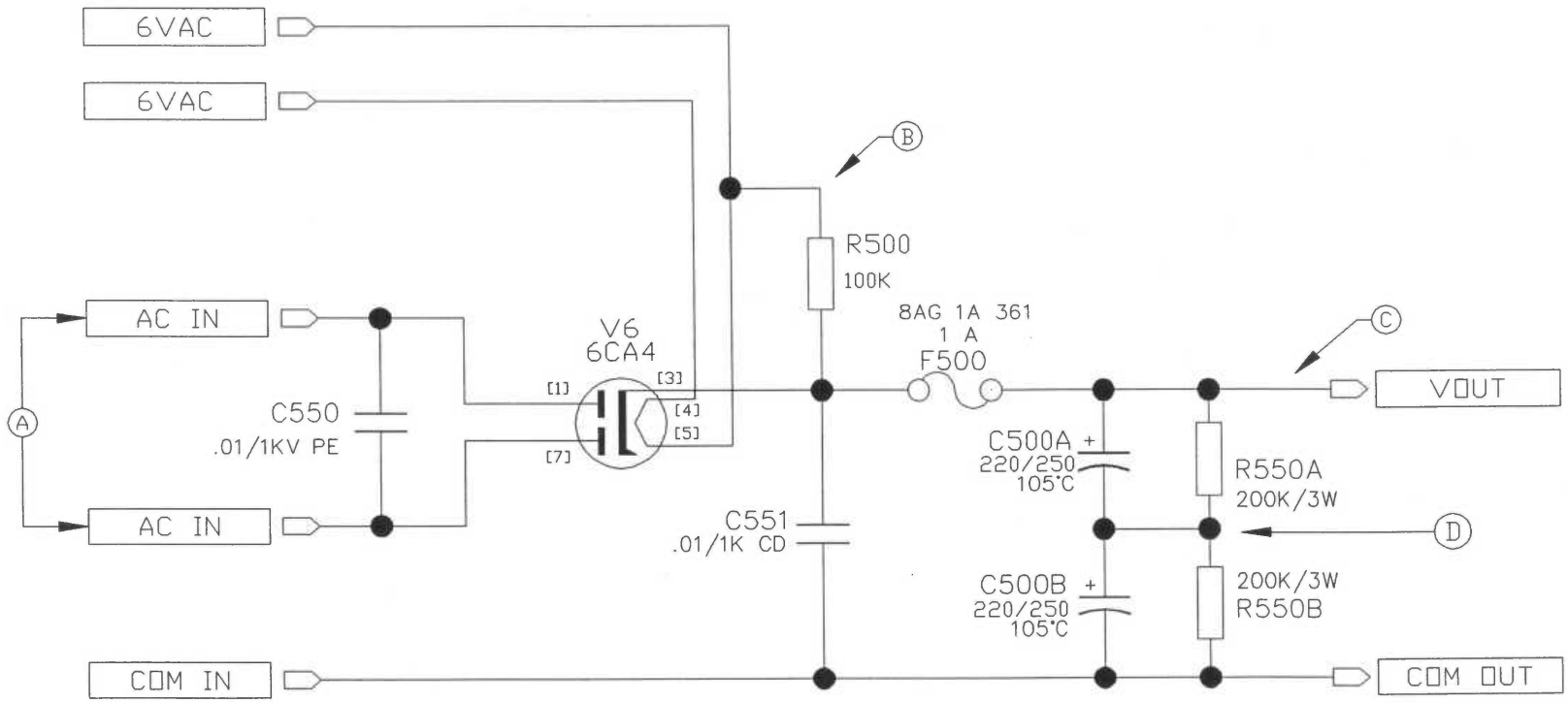
DRAWN JME	REVISION A
ON DATE 4/5/89	PRODUCT: SA-5000

COUNTERPOINT

SCHEMATIC DIAGRAM PWA 5K-3-JB JACK BOARD

CAD FILE: 5KJACKS | DWG: 705513

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	2/20/89
A	REVISED PER PROTO	8/89



SCHEMATIC DETAIL DRAWING FROM BLOCK DIAGRAM		
THIS IS DETAIL DRAWING FROM BLOCK DIAGRAM TITLED:	CAD FILENAME	DRAWING NUMBER
SA-5000 POWER SUPPLY BLOCK DIAGRAM	5KPSBLK	70591

NOTES:
1. REFERENCED VOLTAGES (A) THROUGH (D) REFER TO NORMAL OPERATING VOLTAGES AS SHOWN ON DRAWING NUMBER 705102 "OPERATING VOLTAGES, HIGH VOLTAGE SUPPLY."
2. FOR DESCRIPTION OF CIRCUIT, REFER TO DRAWING NUMBER 705202 "CIRCUIT DESCRIPTION, HIGH VOLTAGE SUPPLY."

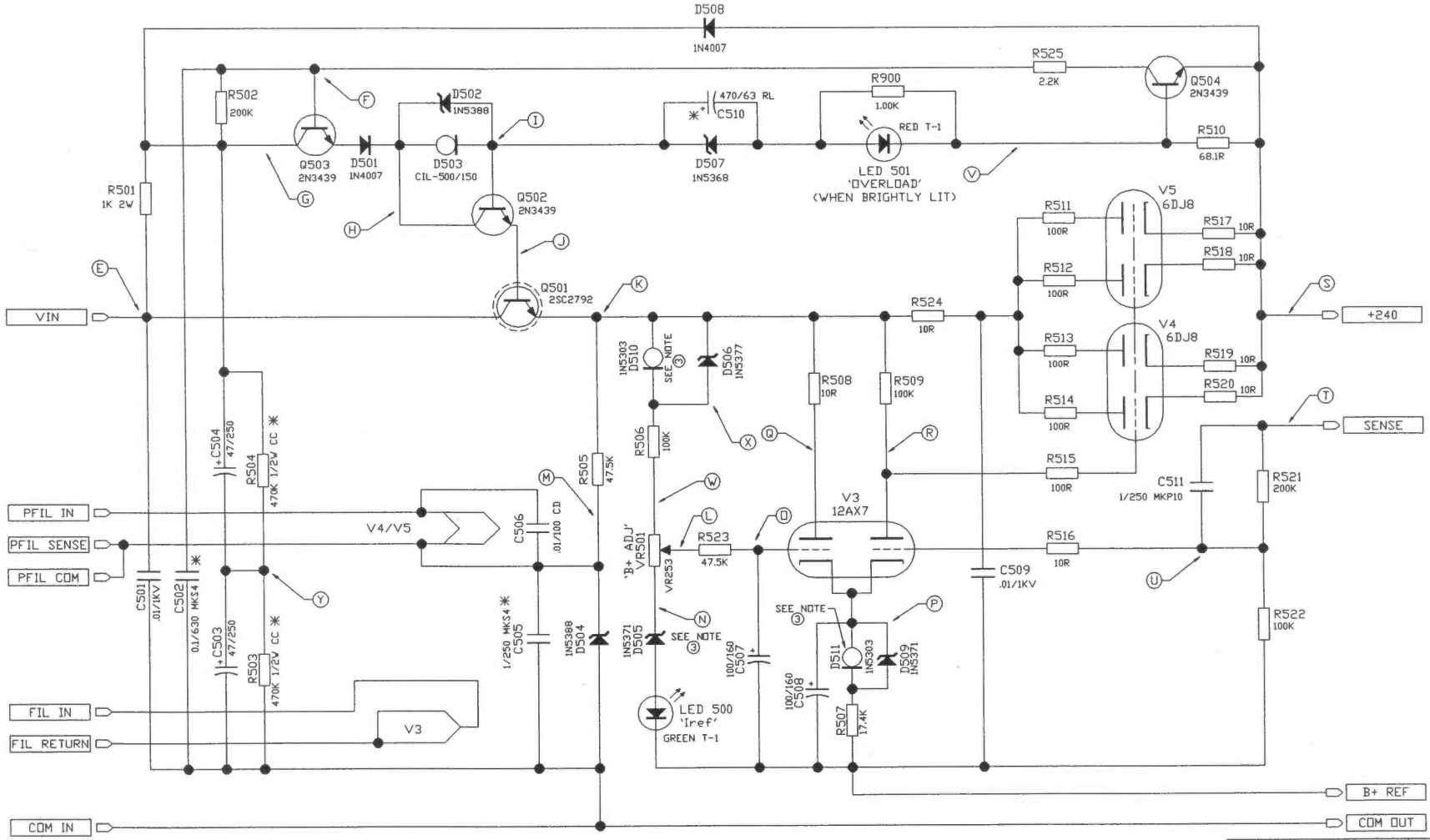
DRAWN JME	REVISION
ON DATE 2/20/89	PRODUCT: SA-5000

COUNTERPOINT

HIGH VOLTAGE RECTIFICATION AND FILTRATION

CAD FILE: HVRF	DWG: 705501

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	4/21/89
A	REVISED PER PROTO	8/89



SCHEMATIC DETAIL DRAWING FROM BLOCK DIAGRAM		
THIS IS DETAIL DRAWING FROM BLOCK DIAGRAM TITLED:	CAD FILENAME	DRAWING NUMBER
SA-5000 POWER SUPPLY BLOCK DIAGRAM	SKPSBLK	70591

NOTES:
1. REFERENCED VOLTAGES (E) THROUGH (Y) REFER TO NORMAL OPERATING VOLTAGES AS SHOWN ON DRAWING NUMBER 705102 "OPERATING VOLTAGES, HIGH VOLTAGE SUPPLY."
2. FOR DESCRIPTION OF CIRCUIT, REFER TO DRAWING NUMBER 705202 "CIRCUIT DESCRIPTION, HIGH VOLTAGE SUPPLY."
3. COMPONENTS MOUNTED ON BOARD UNDERSIDE TO REDUCE DC DRIFT DUE TO AIR CURRENTS.

DRAWN	JME	REVISION	A
ON DATE	5/1/89	PRODUCT:	SA-5000

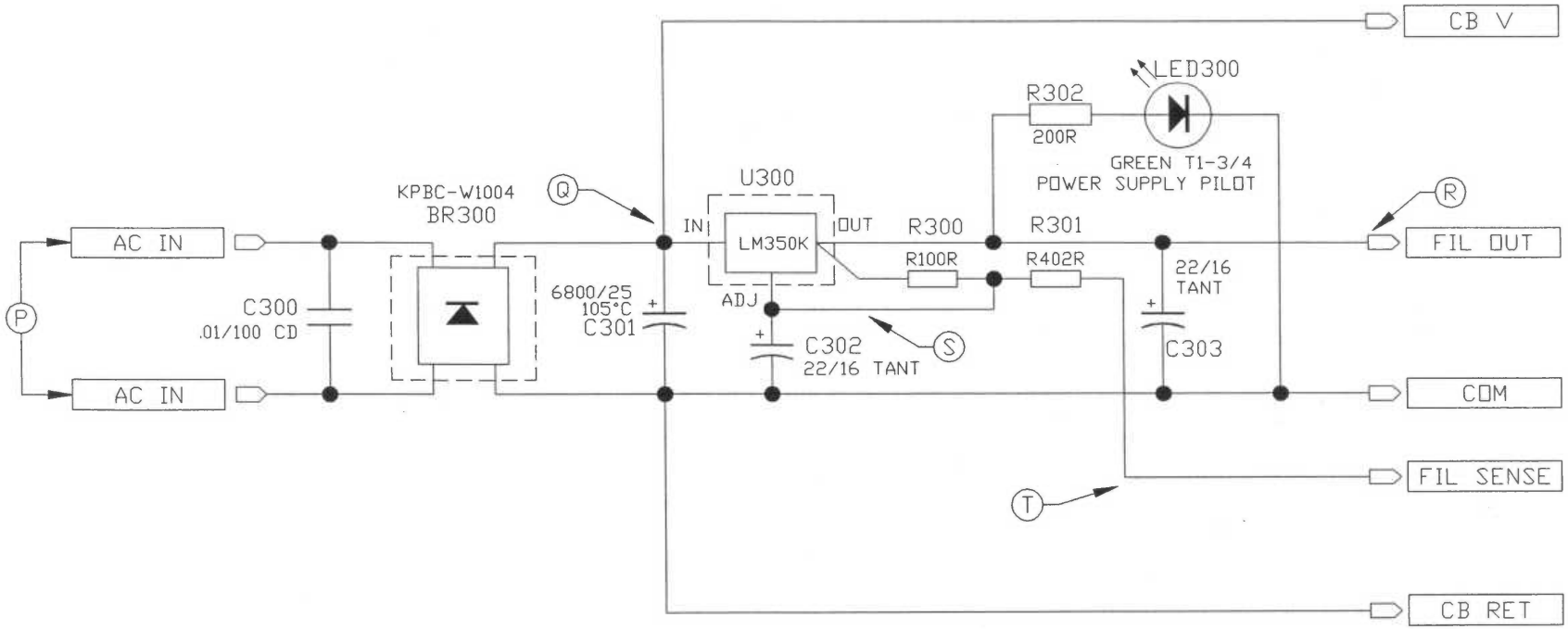
COUNTERPOINT

SCHEMATIC DIAGRAM
HIGH VOLTAGE REGULATION

CAD FILE: HVR

DWG: 705502

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	2/20/89
A	REVISED PER PROTO	8/89



SCHEMATIC DETAIL DRAWING FROM BLOCK DIAGRAM		
THIS IS DETAIL DRAWING FROM BLOCK DIAGRAM TITLED:	CAD FILENAME	DRAWING NUMBER
SA-5000 POWER SUPPLY BLOCK DIAGRAM	5KPSBLK	70591

NOTES:
1. REFERENCED VOLTAGES Ⓟ THROUGH Ⓣ REFER TO NORMAL OPERATING VOLTAGES AS SHOWN ON DRAWING NUMBER 705103 "OPERATING VOLTAGES, LOW VOLTAGE CIRCUITS."
2. FOR DESCRIPTION OF CIRCUIT, REFER TO DRAWING NUMBER 705203 "CIRCUIT DESCRIPTION, LOW VOLTAGE CIRCUITS."

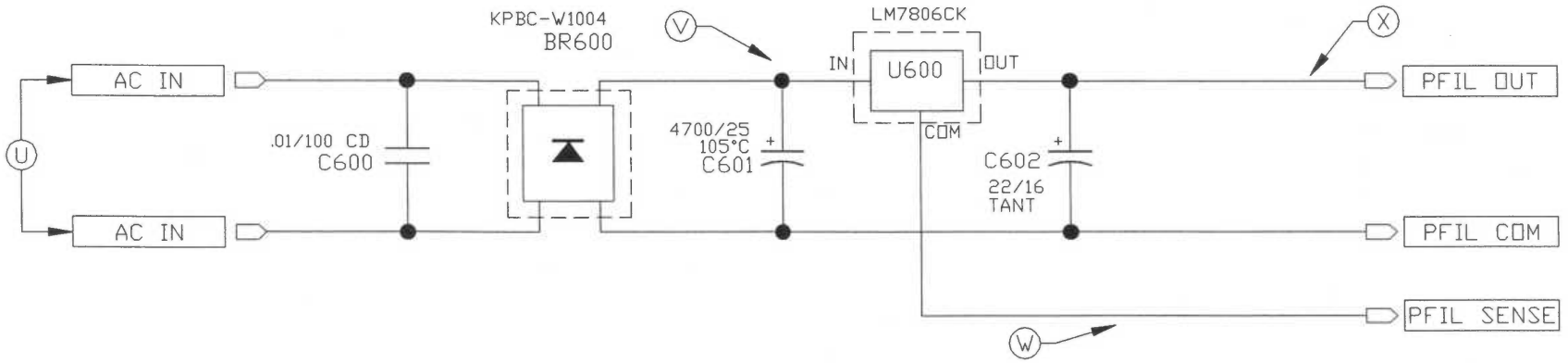
DRAWN JME	REVISION A
ON DATE 2/20/89	PRODUCT: SA-5000

COUNTERPOINT

FILAMENT VOLTAGE RECTIFICATION AND REGULATION

CAD FILE: FILRF | DWG: 705505

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	2/20/89
A	REVISED PER PROTO	8/89



SCHEMATIC DETAIL DRAWING FROM BLOCK DIAGRAM		
THIS IS DETAIL DRAWING FROM BLOCK DIAGRAM TITLED:	CAD FILENAME	DRAWING NUMBER
SA-5000 POWER SUPPLY BLOCK DIAGRAM	5KPSBLK	70591

NOTES:
1. REFERENCED VOLTAGES (U) THROUGH (X) REFER TO NORMAL OPERATING VOLTAGES AS SHOWN ON DRAWING NUMBER 705103 "OPERATING VOLTAGES, LOW VOLTAGE CIRCUITS."
2. FOR DESCRIPTION OF CIRCUIT, REFER TO DRAWING NUMBER 705203 "CIRCUIT DESCRIPTION, LOW VOLTAGE CIRCUITS."
3. CAUTION: THIS CIRCUIT FLOATED +240VDC ABOVE GROUND.

DRAWN JME	REVISION A
ON DATE 2/20/89	PRODUCT: SA-5000

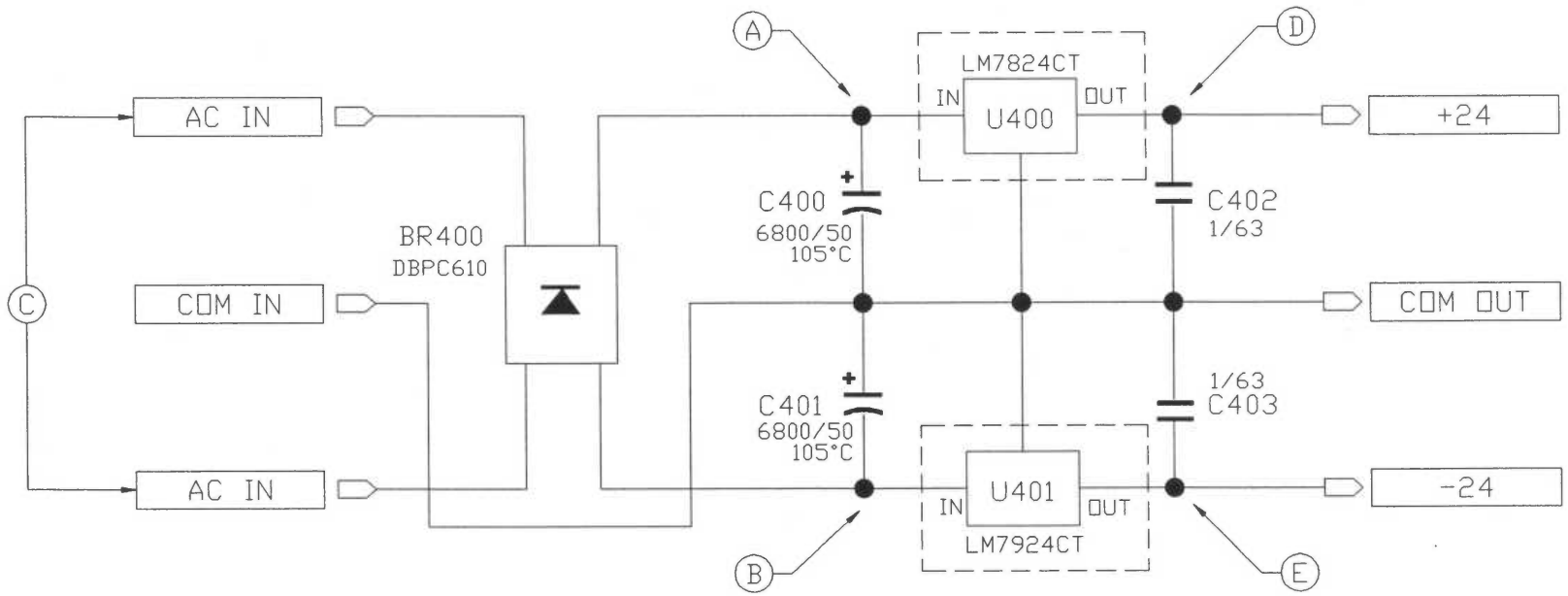
COUNTERPOINT

PASS DEVICE FILAMENT RECTIFICATION AND REGULATION

CAD FILE: PFIL

DWG: 705514

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	2/21/89
A	REVISED PER PROTO	8/89



SCHEMATIC DETAIL DRAWING FROM BLOCK DIAGRAM		
THIS IS DETAIL DRAWING FROM BLOCK DIAGRAM TITLED:	CAD FILENAME	DRAWING NUMBER
SA-5000 POWER SUPPLY BLOCK DIAGRAM	5KPSBLK	70591

NOTES:
1. REFERENCED VOLTAGES (A) THROUGH (E) REFER TO NORMAL OPERATING VOLTAGES AS SHOWN ON DRAWING NUMBER 705103 "OPERATING VOLTAGES, LOW VOLTAGE CIRCUITS."
2. FOR DESCRIPTION OF CIRCUIT, REFER TO DRAWING NUMBER 705203 "CIRCUIT DESCRIPTION, LOW VOLTAGE CIRCUITS."

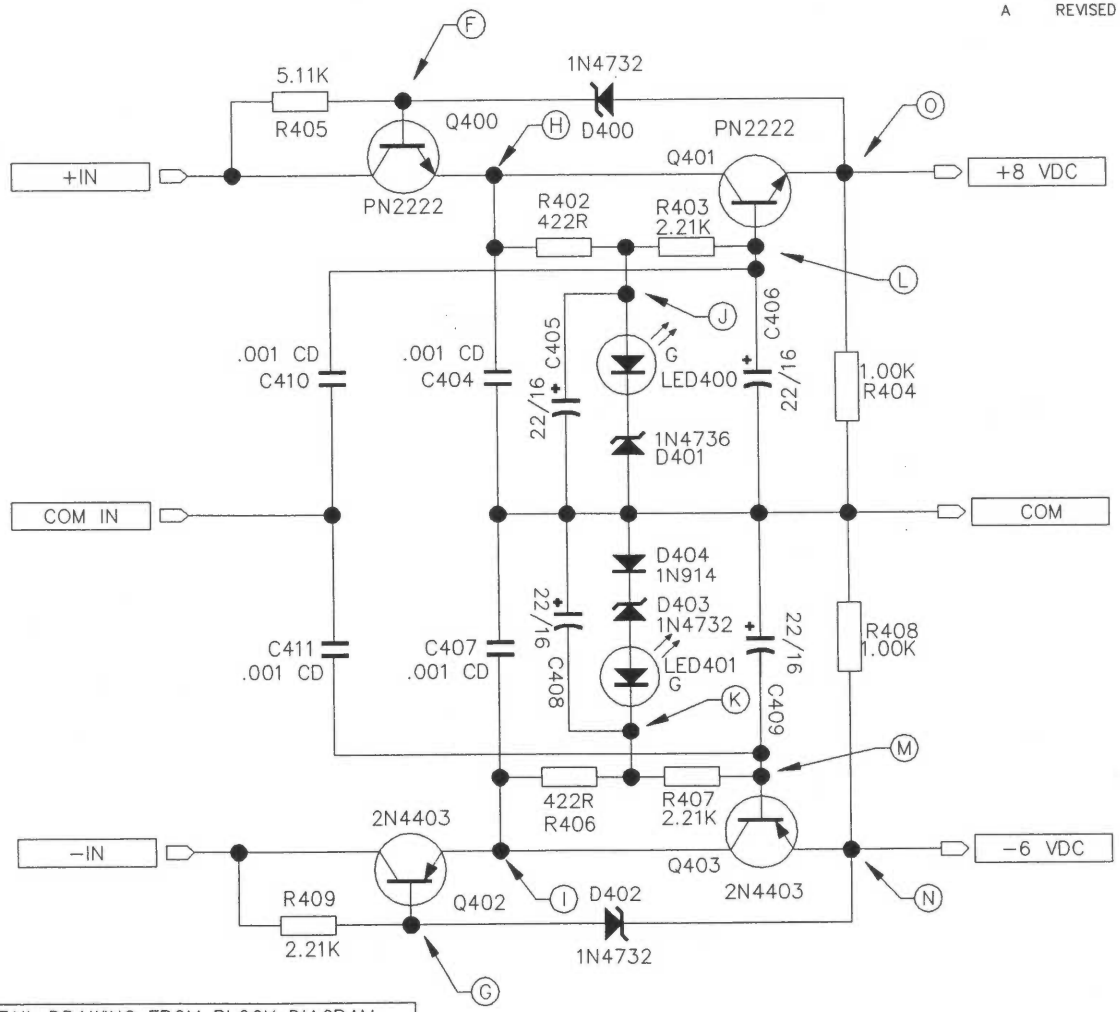
DRAWN JME	REVISION A
ON DATE 2/21/89	PRODUCT: SA-5000

COUNTERPOINT

+24/-24 VDC RECTIFICATION AND REGULATION

CAD FILE: 24RF	DWG: 705503

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	10/25/88
A	REVISED PER PROTO	8/89



SCHEMATIC DETAIL DRAWING FROM BLOCK DIAGRAM		
THIS IS DETAIL DRAWING FROM BLOCK DIAGRAM TITLED:	CAD FILENAME	DRAWING NUMBER
SA-5000 POWER SUPPLY BLOCK DIAGRAM	5KPSBLK1	70591

NOTES:
1. REFERENCED VOLTAGES (F) THROUGH (O) REFER TO NORMAL DC OPERATING VOLTAGES AS SHOWN ON DRAWING NUMBER 705103 "OPERATING VOLTAGES, LOW VOLTAGE CIRCUITS."
2. FOR DESCRIPTION OF CIRCUIT, REFER TO DRAWING NUMBER 705203 "CIRCUIT DESCRIPTION, LOW VOLTAGE CIRCUITS."

DRAWN JME	REVISION A
ON DATE 10/25/88	PRODUCT: SA-5000

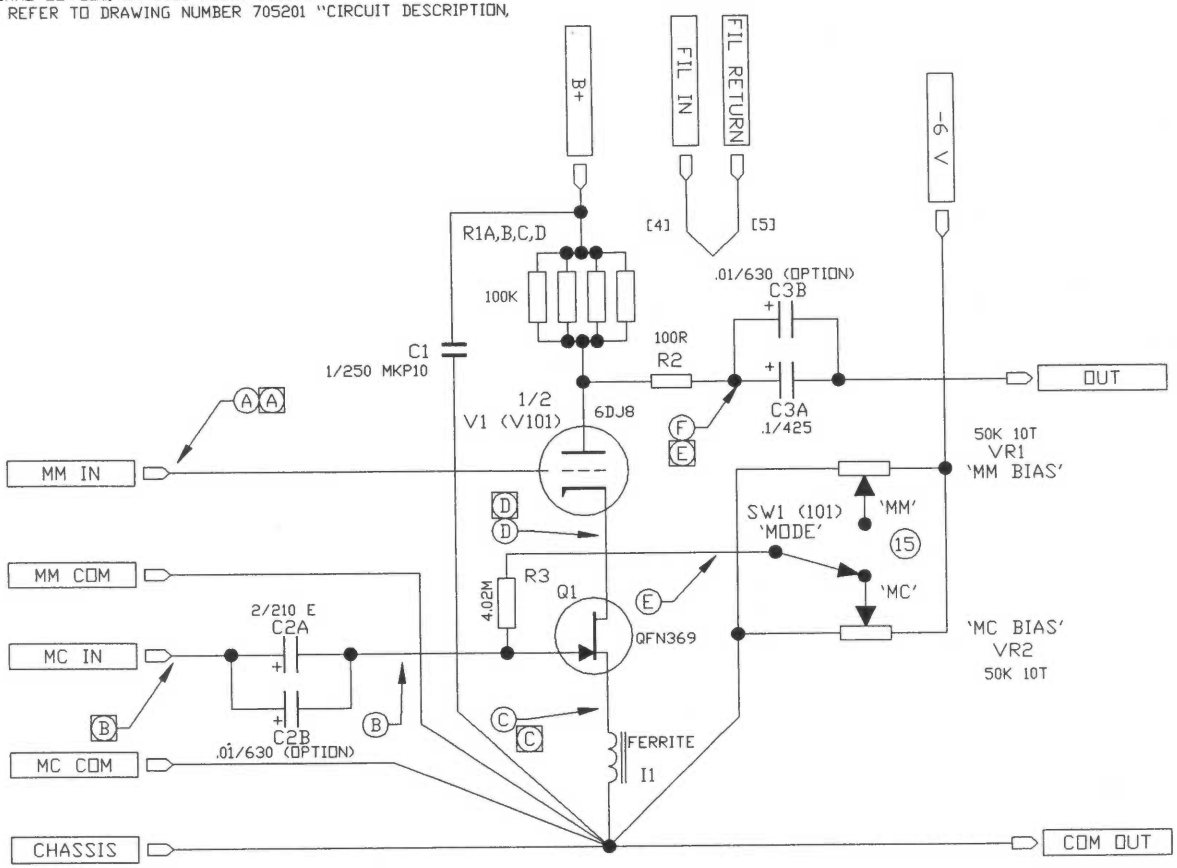
COUNTERPOINT

SCHEMATIC DIAGRAM +8/-6 VDC REGULATOR

CAD FILE: 6REG	DWG: 705504

NOTES:
1. CHANNEL "A" SHOWN ONLY. "B" CHANNEL COMPONENTS RECEIVE "100-" PREFIX REFERENCE DESIGNATOR.
2. REFERENCED VOLTAGES (A) THROUGH (F) REFER TO NORMAL DC OPERATING VOLTAGES AS SHOWN ON DRAWING NUMBER 705101 "DC OPERATING VOLTAGES, SA-5000 AUDIO CIRCUIT."
3. REFERENCED VOLTAGES [A] THROUGH [E] REFER TO NORMAL SIGNAL LEVELS AS SHOWN ON DRAWING NUMBER 705401 "SIGNAL LEVELS, SA-5000 AUDIO CIRCUIT."
4. FOR DESCRIPTION OF CIRCUIT, REFER TO DRAWING NUMBER 705201 "CIRCUIT DESCRIPTION, SA-5000 AUDIO."

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	2/20/89
A	REVISED PER PROTO	8/89



CONTROL FUNCTIONS

REF.	DESCRIPTION	AS SHOWN	TYPE	CPTP/N	SPECIFICATION
15	MC/MM BIAS	MC BIAS	SPDT TOGGLE	SW-SPDT-BRAK	NONE

SCHEMATIC DETAIL DRAWING FROM BLOCK DIAGRAM		
THIS IS DETAIL DRAWING FROM BLOCK DIAGRAM TITLED:	CAD FILENAME	DRAWING NUMBER
SA-5000 PHONO STAGE BLOCK DIAGRAM	5KPHONO	70592

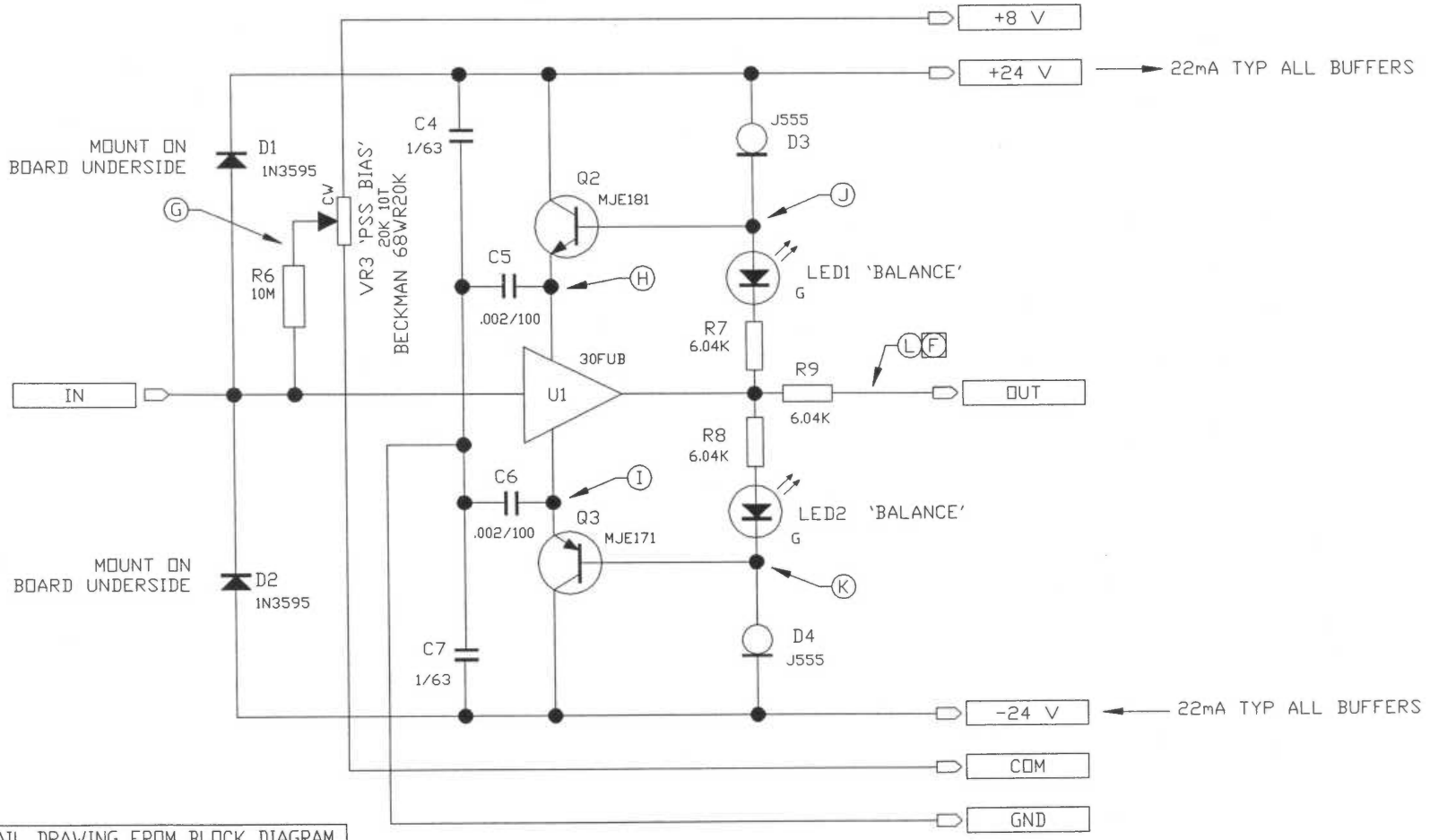
DRAWN JME	REVISION A
ON DATE 2/17/89	PRODUCT: SA-5000

COUNTERPOINT

PHONO FIRST GAIN STAGE DETAIL SCHEMATIC

CAD FILE: PFS	DWG: 705506

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	4/4/89
A	REVISED PER PROTO	8/89



SCHEMATIC DETAIL DRAWING FROM BLOCK DIAGRAM		
THIS IS DETAIL DRAWING FROM BLOCK DIAGRAM TITLED:	CAD FILENAME	DRAWING NUMBER
SA-5000 PHONO STAGE BLOCK DIAGRAM	5KPHONO	70592

NOTES:
1. CHANNEL "A" SHOWN ONLY. "B" CHANNEL COMPONENTS RECEIVE "100-" PREFIX REFERENCE DESIGNATOR.
2. REFERENCED VOLTAGES (G) THROUGH (L) REFER TO NORMAL DC OPERATING VOLTAGES AS SHOWN ON DRAWING NUMBER 705101 "DC OPERATING VOLTAGES, SA-5000 AUDIO CIRCUIT."
3. REFERENCED VOLTAGE [F] REFERS TO NORMAL SIGNAL LEVELS AS SHOWN ON DRAWING NUMBER 705401 "SIGNAL LEVELS, SA-5000 AUDIO CIRCUIT."
4. FOR DESCRIPTION OF CIRCUIT, REFER TO DRAWING NUMBER 705201 "CIRCUIT DESCRIPTION, SA-5000 AUDIO."

DRAWN JME	REVISION A
ON DATE 4/4/89	PRODUCT: SA-5000

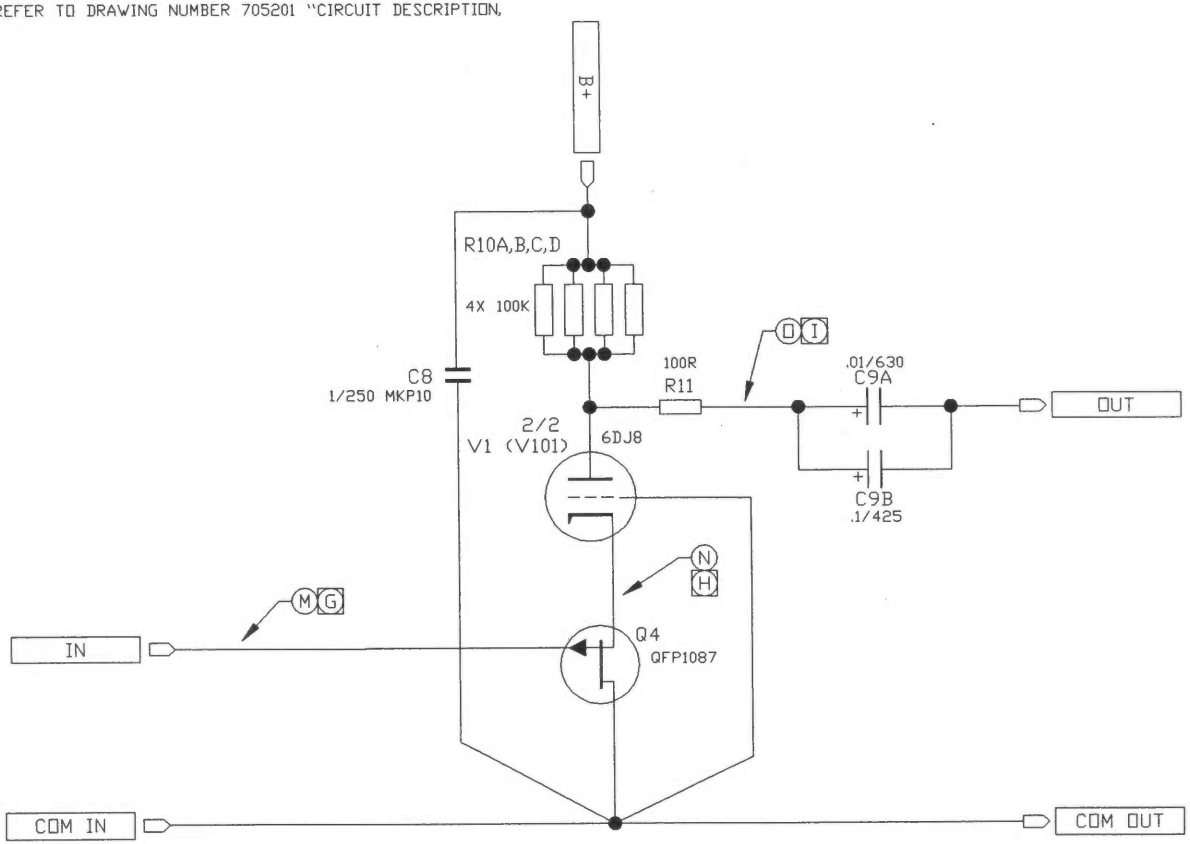
COUNTERPOINT

PHONO FIRST STAGE BUFFER DETAIL SCHEMATIC

CAD FILE: 1_BUFF	DWG: 705507

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	2/20/89
A	REVISED PER PROTO	8/89

NOTES:
1. CHANNEL "A" SHOWN ONLY. "B" CHANNEL COMPONENTS RECEIVE "100-" PREFIX REFERENCE DESIGNATOR.
2. REFERENCED VOLTAGES (M) THROUGH (D) REFER TO NORMAL DC OPERATING VOLTAGES AS SHOWN ON DRAWING NUMBER 705101 "DC OPERATING VOLTAGES, SA-5000 AUDIO CIRCUIT."
3. REFERENCED VOLTAGES [G] THROUGH [I] REFER TO NORMAL SIGNAL LEVELS AS SHOWN ON DRAWING NUMBER 705401 "SIGNAL LEVELS, SA-5000 AUDIO CIRCUIT."
4. FOR DESCRIPTION OF CIRCUIT, REFER TO DRAWING NUMBER 705201 "CIRCUIT DESCRIPTION, SA-5000 AUDIO."



SCHEMATIC DETAIL DRAWING FROM BLOCK DIAGRAM		
THIS IS DETAIL DRAWING FROM BLOCK DIAGRAM TITLED:	CAD FILENAME	DRAWING NUMBER
SA-5000 PHONO STAGE BLOCK DIAGRAM	5KPHONO	70592

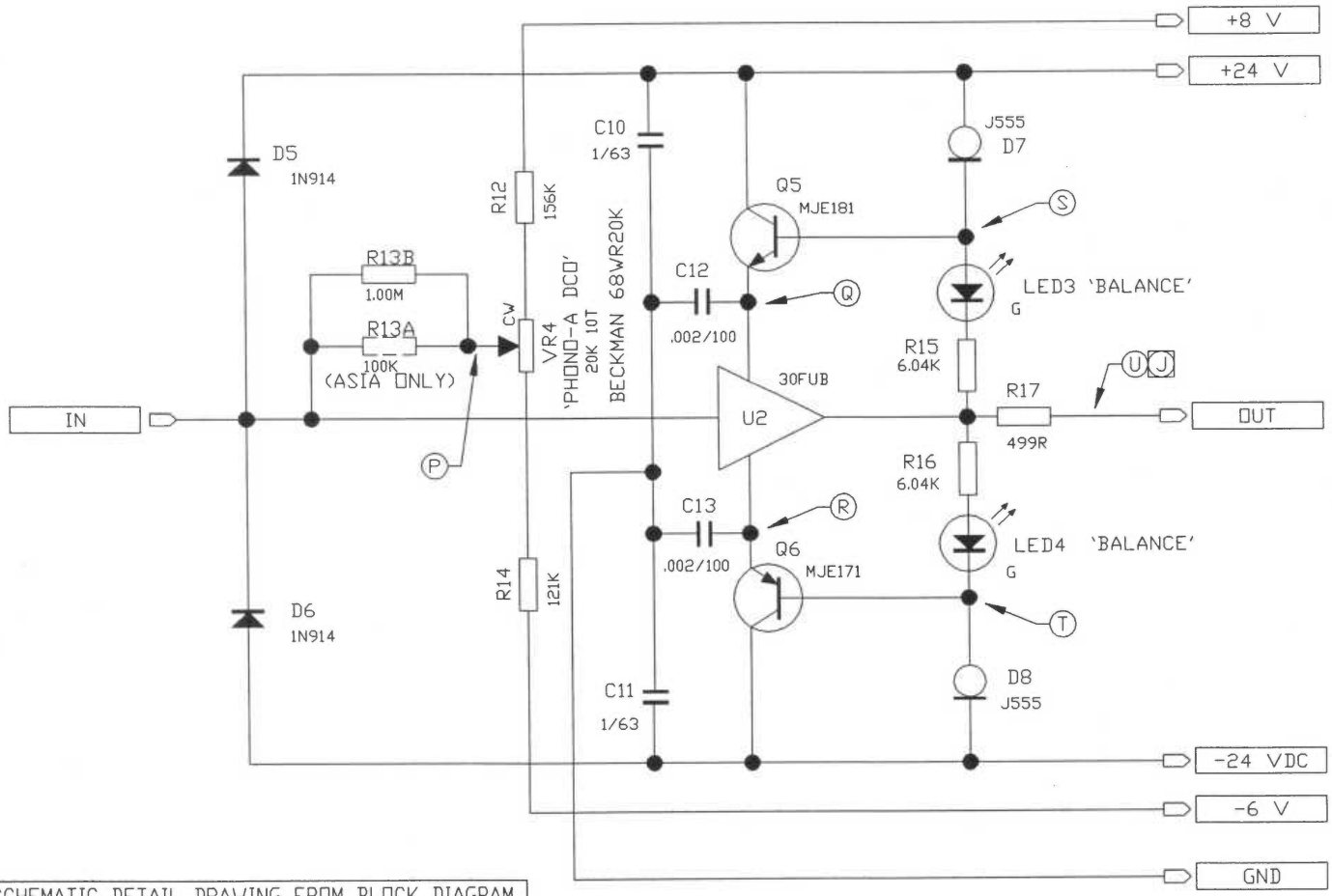
DRAWN JME	REVISION A
ON DATE 2/20/89	PRODUCT: SA-5000

COUNTERPOINT

PHONO SECOND GAIN STAGE DETAIL SCHEMATIC

CAD FILE: PSS	DWG: 705508

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	2/20/89
A	REVISED PER PROTO	8/89



SCHEMATIC DETAIL DRAWING FROM BLOCK DIAGRAM		
THIS IS DETAIL DRAWING FROM BLOCK DIAGRAM TITLED:	CAD FILENAME	DRAWING NUMBER
SA-5000 PHONO STAGE BLOCK DIAGRAM	5KPHONO	70592

BUF03 TO RECEIVE HEATSINK, AND TO HAVE ALL MARKINGS REMOVED.

NOTES:
1. CHANNEL "A" SHOWN ONLY. "B" CHANNEL COMPONENTS RECEIVE "100-" PREFIX REFERENCE DESIGNATOR.
2. REFERENCED VOLTAGES (P) THROUGH (U) REFER TO NORMAL DC OPERATING VOLTAGES AS SHOWN ON DRAWING NUMBER 705101 "DC OPERATING VOLTAGES, SA-5000 AUDIO CIRCUIT."
3. REFERENCED VOLTAGE [J] REFERS TO NORMAL SIGNAL LEVELS AS SHOWN ON DRAWING NUMBER 705401 "SIGNAL LEVELS, SA-5000 AUDIO CIRCUIT."
4. FOR DESCRIPTION OF CIRCUIT, REFER TO DRAWING NUMBER 705201 "CIRCUIT DESCRIPTION, SA-5000 AUDIO."

DRAWN JME	REVISION A
ON DATE 2/16/89	PRODUCT: SA-5000

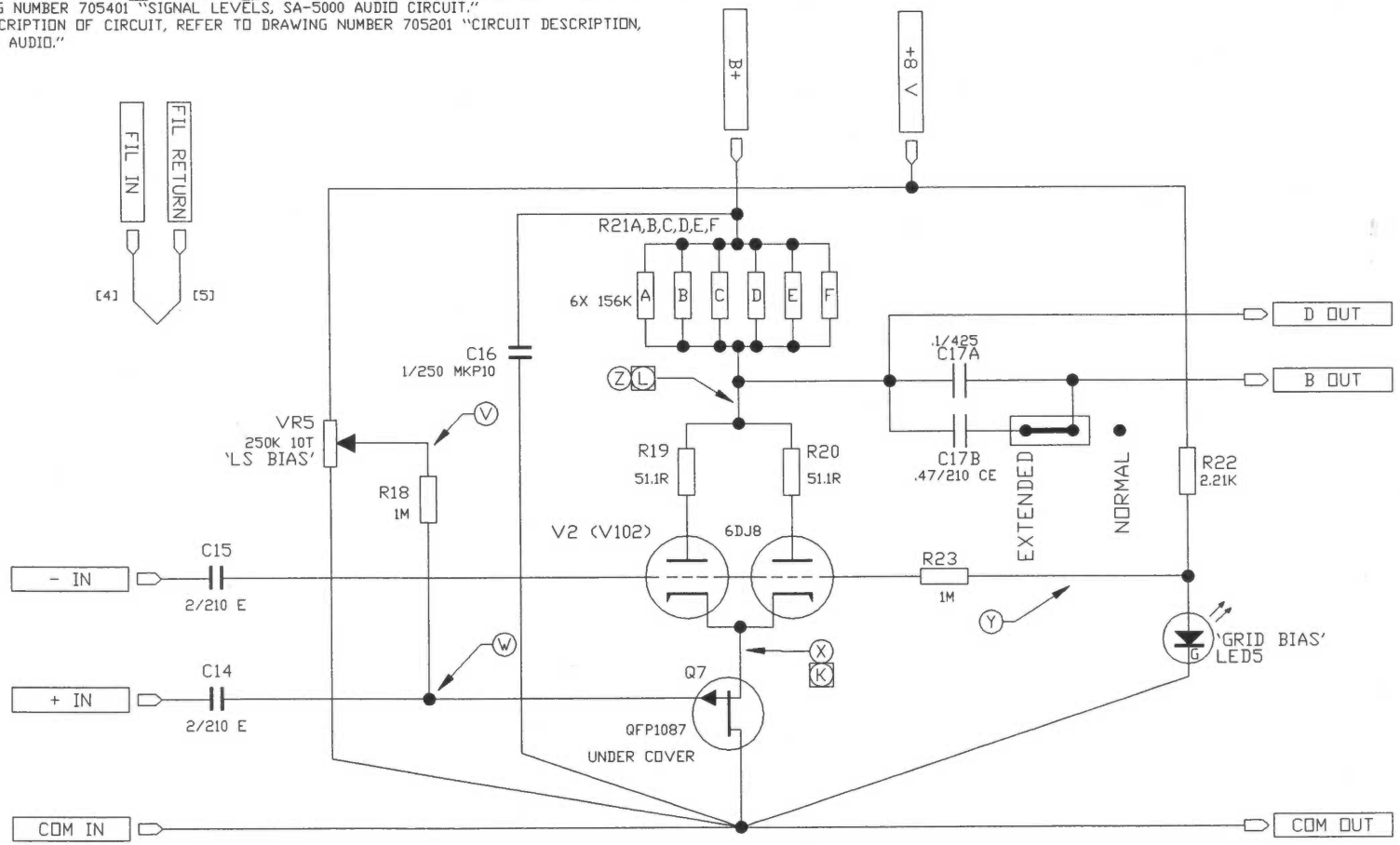
COUNTERPOINT

PHONO SECOND STAGE BUFFER DETAIL SCHEMATIC

CAD FILE: 2_BUFF	DWG: 705509

REV	DESCRIPTION	DATE
A	REVISED PER PROTO	8/89

NOTES:
1. CHANNEL "A" SHOWN ONLY. "B" CHANNEL COMPONENTS RECEIVE "100-" PREFIX REFERENCE DESIGNATOR.
2. REFERENCED VOLTAGES (V) THROUGH (Y) REFER TO NORMAL DC OPERATING VOLTAGES AS SHOWN ON DRAWING NUMBER 705101 "DC OPERATING VOLTAGES, SA-5000 AUDIO CIRCUIT."
3. REFERENCED VOLTAGES [K] THROUGH [L] REFER TO NORMAL SIGNAL LEVELS AS SHOWN ON DRAWING NUMBER 705401 "SIGNAL LEVELS, SA-5000 AUDIO CIRCUIT."
4. FOR DESCRIPTION OF CIRCUIT, REFER TO DRAWING NUMBER 705201 "CIRCUIT DESCRIPTION, SA-5000 AUDIO."



SCHEMATIC DETAIL DRAWING FROM BLOCK DIAGRAM		
THIS IS DETAIL DRAWING FROM BLOCK DIAGRAM TITLED:	CAD FILENAME	DRAWING NUMBER
SA-5000 LINE STAGE BLOCK DIAGRAM	5KLINE	70593

OUTPUT RESPONSE		
	U.S.	ASIA
R24A	N.A.	100K
EXTENDED	.11Hz	2.8Hz
NORMAL	.64hZ	16Hz

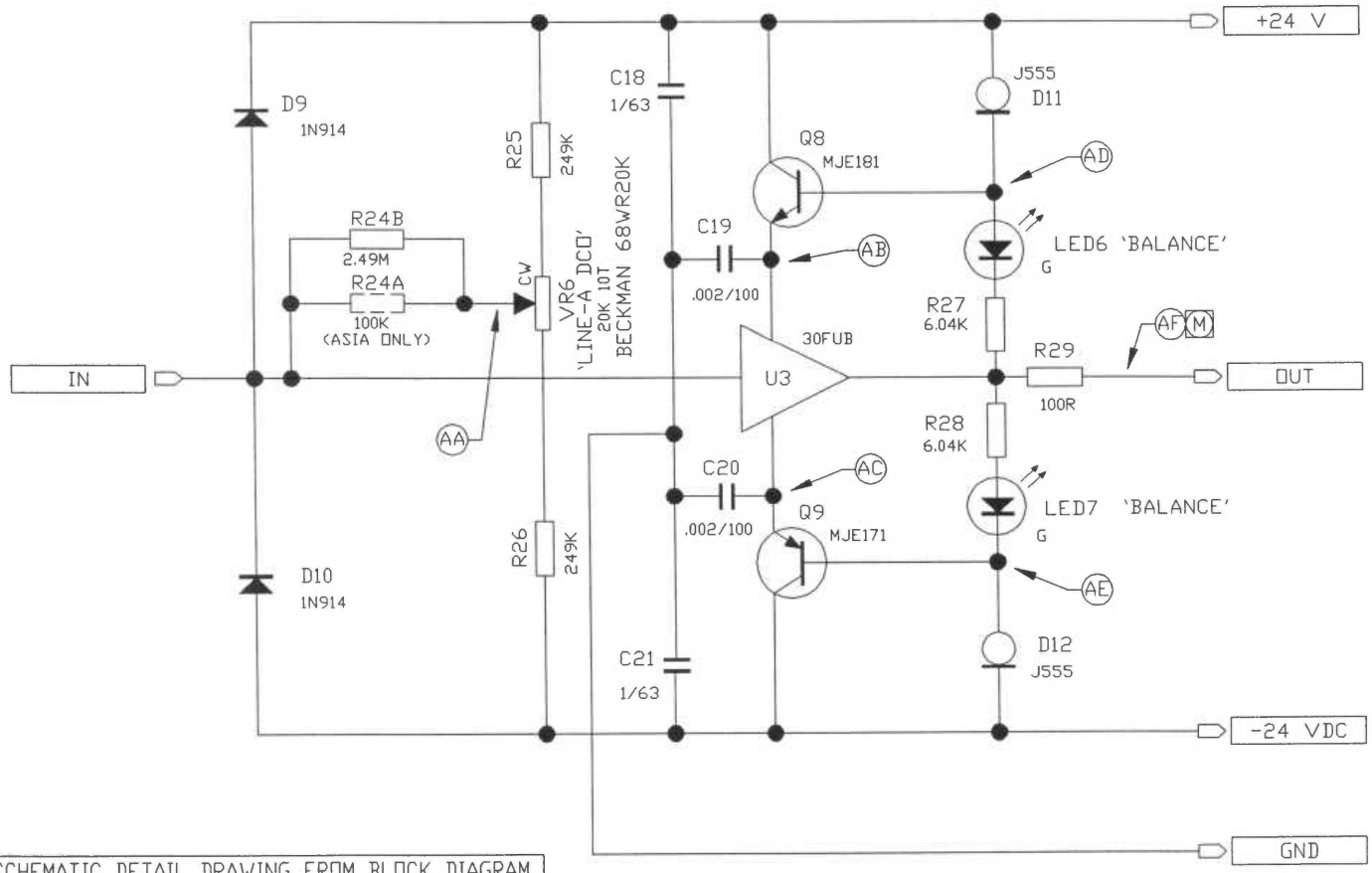
DRAWN JME	REVISION A
ON DATE 4/4/89	PRODUCT: SA-5000

COUNTERPOINT

LINE GAIN STAGE DETAIL SCHEMATIC

CAD FILE: LS	DWG: 705510

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	4/4/89
A	REVISED PER PROTO	8/89



SCHEMATIC DETAIL DRAWING FROM BLOCK DIAGRAM		
THIS IS DETAIL DRAWING FROM BLOCK DIAGRAM TITLED:	CAD FILENAME	DRAWING NUMBER
SA-5000 LINE STAGE BLOCK DIAGRAM	5KLINE	70593

BUF03 TO RECEIVE HEATSINK, AND TO HAVE ALL MARKINGS REMOVED.

NOTES:
1. CHANNEL "A" SHOWN ONLY. "B" CHANNEL COMPONENTS RECEIVE "100-" PREFIX REFERENCE DESIGNATOR.
2. REFERENCED VOLTAGES (AA) THROUGH (AF) REFER TO NORMAL DC OPERATING VOLTAGES AS SHOWN ON DRAWING NUMBER 705101 "DC OPERATING VOLTAGES, SA-5000 AUDIO CIRCUIT."
3. REFERENCED VOLTAGE [M] REFERS TO NORMAL SIGNAL LEVELS AS SHOWN ON DRAWING NUMBER 705401 "SIGNAL LEVELS, SA-5000 AUDIO CIRCUIT."
4. FOR DESCRIPTION OF CIRCUIT, REFER TO DRAWING NUMBER 705201 "CIRCUIT DESCRIPTION, SA-5000 AUDIO."

DRAWN JME	REVISION A
ON DATE 4/4/89	PRODUCT: SA-5000

COUNTERPOINT

LINE STAGE OUTPUT BUFFER DETAIL SCHEMATIC

CAD FILE: 3_BUFF	DWG: 705511

SECTION 5

OPERATING VOLTAGES AND SIGNAL LEVELS

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	9/26/89

MC MODE

REF	DRAWING	DC VOLTAGE	NOTES
A	705506	0	
B	705506	-100 to -250mV	SEE NOTE 2
C	705506	0	SEE NOTE 2
D	705506	2 to 3V	SEE NOTE 2
E	705506	-100 to -250mV	SEE NOTE 2
F	705506	90 to 100V	SEE NOTE 2

MM MODE

REF	DRAWING	DC VOLTAGE	NOTES
A	705506	0	
B	705506	0 to -70mV	SEE NOTE 2
C	705506	0	SEE NOTE 2
D	705506	200mV	SEE NOTE 2
E	705506	0 to -70mV	SEE NOTE 2
F	705506	40 to 50V	SEE NOTE 2

REF	DRAWING	DC VOLTAGE	NOTES
G	705507	4 to 5V	SEE NOTE 3
H	705507	15 to 20V	SEE NOTE 4
I	705507	-6 to -8V	SEE NOTE 5
J	705507	15 to 20V	SEE NOTE 4
K	705507	-6 to -8V	SEE NOTE 5
L	705507	4 to 5V	SEE NOTE 3
M	705508	4 to 5V	SEE NOTE 6
N	705508	3 to 4V	SEE NOTE 6
O	705508	100 to 115V	SEE NOTE 6
P	705509	-20 to +20mV	
Q	705509	11 to 14V	SEE NOTE 7
R	705509	-11 to -14V	SEE NOTE 8
S	705509	11 to 14V	SEE NOTE 7
T	705509	-11 to -14V	SEE NOTE 8
U	705509	0.000	SEE NOTE 9
V	705510	3 to 5V	SEE NOTE 10
W	705510	3 to 5V	SEE NOTE 10
X	705510	2 to 4V	SEE NOTE 10
Y	705510	+1.84V	
Z	705510	50 to 70V	SEE NOTE 10
AA	705511	-20 to +20mV	
AB	705511	11 to 14V	SEE NOTE 11
AC	705511	-11 to -14V	SEE NOTE 12
AD	705511	11 to 14V	SEE NOTE 11
AE	705511	-11 to -14V	SEE NOTE 12
AF	705511	0.000	SEE NOTE 13

NOTES:

1. ALL VOLTAGES WITH AC MAINS AT NOMINAL VOLTAGE, ALL TUBES INSTALLED AND SA-5000 IN "READY" MODE.
2. VOLTAGE IS A FUNCTION OF APPLICABLE BIAS POT (VR1, VR2), SET IN ACCORDANCE WITH FIRST PHONO STAGE BIASING INSTRUCTIONS IN OWNER'S MANUAL. VOLTAGE AT POINT "B" REQUIRES VERY HIGH IMPEDANCE (>100M OHM) VOLTMETER TO READ ACCURATELY.
3. VOLTAGE IS A FUNCTION OF PSS BIAS POT (VR3), SET IN ACCORDANCE WITH SECOND PHONO STAGE BIASING INSTRUCTIONS IN OWNER'S MANUAL.
4. VOLTAGE AT THESE POINTS WILL BE APPROXIMATELY 12 VOLTS GREATER THAN VOLTAGE AT POINT L.
5. VOLTAGE AT THESE POINTS WILL BE APPROXIMATELY 12 VOLTS LESS THAN VOLTAGE AT POINT L.
6. VOLTAGE IS A FUNCTION OF PSS BIAS POT (VR3), AND IS SET IN ACCORDANCE WITH PHONO SECOND STAGE BIASING INSTRUCTIONS IN OWNER'S MANUAL.
7. VOLTAGE AT THESE POINTS WILL BE APPROXIMATELY 12 VOLTS GREATER THAN VOLTAGE AT POINT U.
8. VOLTAGE AT THESE POINTS WILL BE APPROXIMATELY 12 VOLTS LESS THAN VOLTAGE AT POINT U.
9. USE VR4 TO ADJUST TO 0.000 VOLTS ±5mV.
10. VOLTAGE IS A FUNCTION ON LS BIAS POT (VR5), AND IS SET IN ACCORDANCE WITH LINE STAGE BIASING INSTRUCTIONS IN OWNER'S MANUAL. VOLTAGE AT POINT W REQUIRES HIGH INPUT IMPEDANCE (>100 MEG OHM) METER TO READ ACCURATELY.
11. VOLTAGE AT THESE POINTS WILL BE APPROXIMATELY 12 VOLTS GREATER THAN VOLTAGE AT POINT AF.
12. VOLTAGE AT THESE POINTS WILL BE APPROXIMATELY 12 VOLTS LESS THAN VOLTAGE AT POINT AF.
13. USE VR6 TO ADJUST TO 0.000 VOLTS ±5mV.

DRAWN JME	REVISION
ON DATE 9/26/89	PRODUCT: SA-5000

COUNTERPOINT

DC OPERATING VOLTAGES
SA-5000 AUDIO CIRCUIT

CAD FILE: 705101	DWG: 705101

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	5/1/89

REF.	DRAWING	VOLTAGE	RIPPLE	NOISE	NOTES
A	705501	630 VAC 1%			SEE NOTE 2
B	705501	400 V 1%			
C	705501	400 V 1%	850mV		
D	705501	200 V 1%	425Mv		
E	705502	400 V 1%	850mV		
F	705502	380 V 2%	2.8mV	90uV	
G	705502	396 V 1%	43mV	2mV	
H	705502	382 V 2%	2.9mV	90uV	
I	705502	291 V 2%	13uV	<4uV	
J	705502	290 V 2%	12uV	<4uV	
K	705502	290 V 2%	22uV	6.6uV	
L	705502	80 V 2%	2.1mV	1.9mV	
M	705502	210 V 5%	31mV	1.4mV	
N	705502	64 V 2%	1.3mV	1.1mV	
O	705502	80 V 2%	<4uV	<4uV	
P	705502	82 V 2%	<4uV	<4uV	
Q	705502	290 V 2%	22uV	6.6uV	
R	705502	240 V 2%	5uV	<4uV	
S	705502	240 V 1%	<4uV	<4uV	SEE NOTE 3
T	705502	240 V 1%	<4uV	<4uV	SEE NOTE 3
U	705502	80 V 2%	<4uV	<4uV	
V	705502	241 V 1%	<4uV	<4uV	
W	705502	97 V 2%	1mV	1mV	
X	705502	238 V 2%	700uV	630uV	
Y	705502	200 V 1%	21mV	1.1mV	

NOTES:

1. ALL VOLTAGES WITH AC MAINS AT NOMINAL VOLTAGE, ALL TUBES INSTALLED AND SA-5000 IN "READY" MODE.

   SHORTING PINS INSERTED INTO PHONO INPUTS, GAIN CONTROL SET TO FULLY CCW.

   MEASUREMENT CONDITIONS FOR RIPPLE AND NOISE:

   RIPPLE: 10 TO 20kHz, 18dB/OCTAVE BANDPASS, RMS.

   NOISE: 400Hz TO 20kHz, 18dB/OCTAVE BANDPASS, RMS.

2. AC VOLTAGE MEASURED BETWEEN POINTS SPECIFIED ON APPLICABLE SCHEMATIC.

3. REGULATED VOLTAGE ADJUSTED TO +240 VDC WITH VR501 "B+ ADJ" CONTROL.

DRAWN JME	REVISION
ON DATE 5/1/89	PRODUCT: SA-5000

COUNTERPOINT

OPERATING VOLTAGES, HIGH VOLTAGE SUPPLY

CAD FILE: 705102	DWG: 705102

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	9/26/89

REF.	DRAWING	VOLTAGE	RIPPLE	NOISE	NOTES
A	705503	35.0 VDC	280mV P-P	--	SEE NOTE 3
B	705503	35.0 VDC	180mV P-P	--	SEE NOTE 3
C	705503	54 VAC	--	--	SEE NOTE 2
D	705503	+24 VDC	200uV	145uV	SEE NOTE 5
E	705503	-24 VDC	240uV	200uV	SEE NOTE 5
F	705504	+12.1 VDC	9.5uV	4.2uV	SEE NOTE 7
G	705504	-11.0 VDC	8.6uV	4.1uV	SEE NOTE 7
H	705504	+11.5 VDC	9.3uV	4.3uV	SEE NOTE 7
I	705504	-10.4 VDC	8.6uV	4.6uV	SEE NOTE 7
J	705504	+8.5 VDC	7.3uV	3.5uV	SEE NOTE 7
K	705504	-7.2 VDC	6.8uV	2.7uV	SEE NOTE 7
L	705504	+8.4 VDC	7.8uV	2.7uV	SEE NOTE 7
M	705504	-7.1 VDC	7.3uV	2.6uV	SEE NOTE 7
N	705504	-6.5 VDC	7.3uV	3.0uV	SEE NOTE 7
O	705504	+7.7 VDC	7.9uV	2.9uV	SEE NOTE 7
P	705505	11.6 VAC	--	--	SEE NOTES 2,6
Q	705505	12.5 VDC	1560mV P-P	--	SEE NOTE 6
R	705505	6.2 VDC	85uV	36uV	SEE NOTE 6
S	705505	5.0 VDC	62uV	26uV	SEE NOTE 6
T	705505	0 V	0 V	0 V	SEE NOTE 6
U	705514	10.2 VAC	--	--	SEE NOTE 2
V	705514	11.3 VDC	830mV P-P	--	SEE NOTE 3,4
W	705514	0 V	850uV	400uV	SEE NOTE 4
X	705514	5.9 VDC	850uV	400uV	SEE NOTE 4

NOTES:

1. ALL VOLTAGES WITH 60-Hz AC MAINS AT NOMINAL VOLTAGE (110 OR 220 VAC, DEPENDING ON LOCAL MAINS), ALL TUBES INSTALLED AND SA-5000 IN "READY" MODE.

   MEASUREMENT CONDITIONS FOR RIPPLE AND NOISE:
   * RIPPLE: 10 TO 20kHz, 18dB/OCTAVE BANDPASS, RMS.
   * NOISE: 400Hz TO 20kHz, 18dB/OCTAVE BANDPASS, RMS.

2. AC VOLTAGE MEASURED BETWEEN POINTS SPECIFIED ON APPLICABLE SCHEMATIC.
3. PEAK-TO-PEAK VOLTAGES MEASURED WITH OSCILLOSCOPE.
4. CAUTION: THIS CIRCUIT FLOATED +200 VOLTS ABOVE GROUND. VOLTAGE MEASUREMENTS MADE USING TP-W AS REFERENCE, NOISE & RIPPLE MEASURED WITH RESPECT TO 'HGP' (HANDY GROUND POINT) ON MAIN AUDIO PCB.
5. VIOLET TRANSFORMER WIRE USED AS GROUND REFERENCE FOR NOISE & RIPPLE MEASUREMENTS.
6. USE TP-T FOR GROUND REFERENCE.
7. USE 'HGP' (HANDY GROUND POINT) ON MAIN AUDIO PCB FOR GROUND REFERENCE.

DRAWN JME	REVISION
ON DATE 9/26/89	PRODUCT: SA-5000

COUNTERPOINT

OPERATING VOLTAGES, LOW VOLTAGE CIRCUITS

CAD FILE: 705103	DWG: 705103

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	11/01/88

MC MODE

REF	DRAWING	SIGNAL VOLTAGE	dBR	NOTES
A	705506	0 V	--	
B	705506	500uV	0	
C	705506	0 V	--	
D	705506	23mV	+33	
E	705506	390mV	+58	
F	705507	426mV	+58	
G	705508	44mV	+39	
H	705508	39mV	+38	
I	705508	750mV	+63	
J	705509	690mV	+63	
K	705510	517mV	+60	
L	705510	10.4V	+86	
M	705511	9.1V	+85	

MM MODE

REF	DRAWING	SIGNAL VOLTAGE	dBR	NOTES
A	705506	5mV	0	
B	705506	0	--	
C	705506	0	--	
D	705506	140uV	-30	
E	705506	104mV	+26	
F	705507	96mV	+26	
G	705508	9.9mV	+6	
H	705508	8.7mV	+5	
I	705508	170mV	+31	
J	705509	155mV	+30	
K	705510	116mV	+27	
L	705510	2.3V	+53	
M	705511	2.0V	+52	

NOTES:

1. CAUTION: VOLTAGES AT SOME TEST POINTS MAY EXCEED MAXIMUM DC VOLTAGE RATINGS OF SOME AUDIO TEST EQUIPMENT. REFER TO DRAWING 705101 FOR TYPICAL DC VOLTAGES. IF IN DOUBT, CONTACT THE MANUFACTURER OF YOUR TEST EQUIPMENT.

2. TEST CONDITIONS:

   GENERAL.
   ALL VOLTAGES WITH AC MAINS AT NOMINAL VOLTAGE, ALL TUBES INSTALLED AND SA-5000 IN "READY" MODE.

   VOLUME CONTROL FULLY CLOCKWISE, BALANCE CONTROL CENTERED, PHONO SELECTED, UNIT UN-MUTED, NO RESISTORS IN "MC LOAD" JACKS, "SOURCE" SELECTED.

   SA-5000 BIASED IN ACCORDANCE WITH INSTRUCTIONS IN OWNER'S MANUAL.

   INPUT LEVELS.
   MC MODE: 0.5mV RMS, 1kHz SINE WAVE APPLIED TO PHONO JACKS, "MC MODE" SELECTED WITH INTERNAL SWITCH, SHORTING PINS INSERTED IN "MM" PHONO INPUTS.

   MM MODE: 5.0mV RMS, 1kHz SINE WAVE APPLIED TO PHONO JACKS, "MM MODE" SELECTED WITH INTERNAL SWITCH, SHORTING PINS INSERTED IN "MC" PHONO INPUTS.

   TEST POINT VOLTAGE.
   VALUE SHOWN IS RMS, dBR REFERENCED TO INPUT SIGNAL LEVEL.

3. SIGNAL LEVELS MAY VARY APPRECIABLY FROM THE VALUES SHOWN DUE TO VARIATIONS IN TUBES. BOTH CHANNELS SHOULD USE SAME BRAND OF TUBE (VISUALLY INSPECT INTERNAL CONSTRUCTION OF TUBE TO CONFIRM. DO NOT ASSUME SIMILARLY MARKED TUBES ARE FROM THE SAME MANUFACTURER.

4. SIGNAL LEVELS FROM TEST POINT "K" TO POINT "M" ARE VARIABLE AS A FUNCTION OF INTERNAL "PHONO TRIM" POTS VR1/VR101 (PWA 5K-3-JB) AND "LINE TRIM" POTS VR610/1610 (PWA 5K-3-AB), WHICH ARE USED TO ASSURE EQUAL SIGNAL LEVELS FROM THE TWO CHANNELS.

5. INPUT Z OF AUDIO VOLTMETER ASSUMED TO BE 100K OHMS.

DRAWN JME	REVISION
ON DATE 11/01/88	PRODUCT: SA-5000

COUNTERPOINT

SIGNAL LEVELS
SA-5000 AUDIO CIRCUIT

CAD FILE: 705401	DWG: 705401

SECTION 6

CIRCUIT DESCRIPTIONS

Description of Audio Circuit, SA-5000 Preamplifier

GENERAL

The SA-5000 has three stages of amplification and three stages of buffering per channel. This document will describe the Left channel (channel "A") only. All descriptions apply to channel B.

Refer to the individual Schematic Detail drawings for the following descriptions.

For List of Materials, refer to Drawing 705302.

POWER SUPPLIES

All DC supplies for the audio stages are described on Drawing 70591 "SA-5000 POWER SUPPLY BLOCK DIAGRAM" and its accompanying Schematic Detail drawings.

PHONO STAGE

The Phono Stage is composed of a stage of voltage amplification and its buffer, passive RIAA de-emphasis, and a second voltage amplifier with its buffer, as shown on Drawing 70592 "SA-5000 PHONO STAGE BLOCK DIAGRAM." The Phono Stages are physically located on the left side of the main audio circuit board, PWA 5K-3-AB, in the audio chassis.

Phono First Gain Stage Schematic, Drawing 705506.

The first gain stage of the Phono section is a dual-mode stage. With signal applied to the "MC" Phono inputs, and the "MC/MM" switch set to the "MC" mode, the stage is an N-channel JFET-input Cascode. VR2 ("MC BIAS") is adjusted to apply a small negative voltage to the Gate of JFET Q1 through resistor R3, biasing the stage for proper operation.

When in "MC" mode, a shorting pin inserted into the "MM" Phono inputs biases the Grid of tube V1 at zero volts.

In "MM" mode, the signal is applied to the Grid of V1, while the Gate of Q1 is biased to ground, causing Q1 to saturate and behave like a small value resistor in the Cathode circuit of V1. Excess noise caused by R3 is bypassed by a shorting pin inserted into the "MC" Phono input.

Phono First Stage Buffer Schematic, Drawing 705507.

Amplified signal at the Plate of V1 is applied to the input of buffer U1, a unity-gain JFET current amplifier. To increase linearity of U1, transistors Q2 and Q3 supply U1's + and - operating voltages, and are connected to "swing" U1's voltages with the output signal.

The bases of Q2 and Q3 are set a fixed voltage (approximately 12 VDC) above (or below) the output of U1 by the action of constant-current diodes D3 and D4 and resistors R7 and R8. LED1 and LED2 indicate flow of current, and therefore, proper operation.

Trimpot VR3 ("PSS BIAS") applies a DC Offset to the input of U1 through resistor R6. This DC voltage biases the Phono Second Gain Stage for proper operation.

RIAA De-emphasis Network, See Drawing 70592 "Phono Stage Block Diagram."

Resistors RN1, RN2 and capacitors CN1 and CN2 passively equalize the amplified and buffered first stage signal in accordance with the R.I.A.A. specification.

Phono Second Gain Stage, Drawing 705508.

The output of the RIAA network is applied to the Gate of JFET Q4, a P-channel device. The Source of Q4 is connected to the Cathode of the second half of tube V1. The signal at Q4's Source has no voltage gain, but is of sufficiently low impedance to properly drive V1's cathode.

DC operating bias for Q4 is supplied by the Phono First Stage Buffer. The Grid of tube V1 is tied to ground. Tube V1 acts as a common-grid, cathode-driven stage. Amplified signal from V1's Plate is applied to the Phono Second Stage Buffer.

Phono Second Stage Buffer, Drawing 705509.

Unity-gain current amplifier U2 is operated in the same fashion as the phono first stage buffer. Trimmer VR4 is used to adjust the output of U2 to 0.000 volts.

Phono Gain Trim

Schematic Diagram PWA 5K-3-JB Jack Board (Drawing 705513) shows Phono Trim trimpot VR1, used with resistors R10 and R11. The trimmer is used to properly match the gains of the two channels after biasing has been performed to the phono section, or tubes replaced.

LINE STAGE

The Line Stage is composed of a stage of voltage amplification and a buffer, as shown on Drawing 70593 "SA-5000 LINE STAGE BLOCK DIAGRAM and POWER SUPPLY ROUTING."

The Line Stages are physically located on the central portion of the main audio circuit board PWA 5K-3-AB in the audio chassis.

Line Gain Trim

Drawing 70593 "SA-5000 LINE STAGE BLOCK DIAGRAM and POWER SUPPLY ROUTING" Line Trim trimpot VR610. The trimmer is used to properly match the gains of the two channels after biasing has been performed to the line section, or tubes replaced.

Line Gain Stage, Drawing 705510.

The operation of this stage is identical with the Second Gain Stage with the following exceptions: (1), Polarity Relay-A K1 (Drawing 705512, "Schematic Diagram 5K-3-CB Control Board) is used to apply signal input to either the Gate of fet Q7, for non-inverting signal amplification; or to the Grid of tube V2 for inverting signal amplification; (2), the Grid of V2 is biased at +1.8 VDC by resistor R22 and LED5; (3), low-frequency response may be extended by placing capacitor C17B in parallel with C17A by setting the EXTENDED/NORMAL jumper to the 'EXTENDED' position. Refer to Drawing 705510 for cutoff points. Trim pot VR5 ("LS BIAS") supplies proper operating voltage to the Gate of JFET Q5 through resistor R18.

Line Stage Buffer, Drawing 705511.

Identical in operation to the Phono First and Second Stage Buffers.

DRAWN: JME	REVISION: A
ON DATE: 28 MARCH 1990	PRODUCT: SA-5000

COUNTERPOINT

CIRCUIT DESCRIPTION
SA-5000 AUDIO

EP FILE: 705201.EPD	DWG: 705201

Description of High-Voltage Supply, SA-5000 Preamplifier

GENERAL

The SA-5000 has a single high-voltage power supply as shown on Drawing 70591 "SA-5000 POWER SUPPLY BLOCK DIAGRAM." High voltage rectification is performed in the DC Power Supply, high-voltage regualtion is performed in the audio chassis. The high-voltage regulator is physically located on the right edge of the main audio circuit board PWA 5K-3-AB in the audio chassis.

The high-voltage supply is turned on by applying filament voltage to the rectifier tube. If DC Power Supply heatsink temperature exceeds approximately 75 degrees C, thermal switch T-1 opens, removing AC Mains voltage to the transformer tube. All capacitors in the DC Power Supply are rated for 105(D)C operation, for extended life.

Refer to the individual Schematic Detail drawings for the following descriptions.

For List of Materials, refer to Drawing 705301 and Drawing 705302.

TRANSFORMER

All AC for the SA-5000 power supplies is supplied by the transformer (CPTP/N 5K-4-TRN) located in the DC Power Supply. Refer to Drawing 7057 "TRANSFORMER PRIMARY WIRING DETAILS, SA-5000" for information on correct connections to the transformer primary for various AC Mains voltages.

HIGH VOLTAGE RECTIFICATION AND FILTRATION, Drawing 705501.

680 VAC (center-tapped) from the transformer is rectified by full-wave rectifier V6 as soon as 6VAC has been applied to its filaments. The rectified voltage is smoothed by series capacitor string C500A and C500B. Resistors R550A and R550B assure voltage-sharing by the capacitors. Resistor R500 "floats" the filaments up to the cathode voltage to prevent cathode-to-filament arcing inside V6.

HIGH VOLTAGE REGULATION , Drawing 705502.

Reference components D510 and D505 set regulator reference voltage at the Grid of V3, through R523 (Test Point 'O'). Capacitor C507 decouples noise from the reference circuit. 'B+ ADJ' trimmer VR501 is used to fine-tune the applied reference voltage. Zener diode D506 prevents voltages from exceeding the published breakdown limits of the constant-current diode.

V3 is operated as a cathode-coupled differential amplifier, using cathode-follower action to couple the reference voltage from the left side of the tube to the cathode of the right side of the tube, where is is compared with a sample of the regulator's output voltage (Test Point 'U') applied to the grid of the right side of the tube. Constant-current diode D511 assures a tight coupling between the cathodes of the two triode sections at low to DC-frequencies, while capacitor C508 further removes reference noise. Zener diode D509 prevents voltages from exceeding the published breakdown limits of the constant-current diode.

Differences between the reference voltage and the regulator's output voltage are amplified at Test Point 'P' and applied as corrections to the grids of paralleled Pass Elements V4 and V5. Cathode resistors operate through degenerative feedback to offer a degree of current-sharing among the four triode pass elements.

Transistors Q502 and Q501 are connected as a conventional Darlington pair. The voltage on Q502's Base controls the voltage of Q501's Emitter. Since this voltage follows the output of the regulator (through Zener diode D507), the voltage across V4 and V5 remains constant and small (approximately 47 VDC, set by D507).

The constant plate-to-cathode voltage across V4 and V5 permits the use of small, reliable 6DJ8 triodes for the pass elements with no risk of exceeding the plate dissipation ratings of the tubes. Additionally, since the voltage at the emitter of Q501 is constant, the current in the reference voltage string of D510 and D505 will be extremely constant, increasing line regulation.

A short condition at the output of the regulator will cause an increase in current through R510, causing Q504 to conduct, reducing the voltage at Q503's base. This action prevents damage to the constant-voltage network of D503 and D507. A current-limited condition will be indicated by a low output voltage from the supply, and the lighting of LED501 ("OVERLOAD"). Resistor R900 prevents LED501 from lighting while passing normal, non-fault current.

Filament voltage for the two pass tubes, V4 and V5, is supplied by the Pass Device Filament Rectification and Regulation circuity, shown on Drawing 705514. To prevent internal cathode-to-heater arcing, the filament supply is floated to +200VDC by R505 and D504.

NEVER OPERATE THE SA-5000'S HIGH VOLTAGE SUPPLY WITHOUT AUDIO TUBES V1, V101, V2 and V102!

Refer to Drawing 705102 for Normal Operating Voltages.

DRAWN: JME	REVISION: A
ON DATE: 28 MARCH 1990	PRODUCT: SA-5000
COUNTERPOINT	
CIRCUIT DESCRIPTION HIGH VOLTAGE SUPPLY	
EP FILE: 705202.EPD	DWG: 705202

Description of Low-Voltage Supplies, SA-5000 Preamplifier

GENERAL

The SA-5000 has four individual low-voltage power supplies as shown on Drawing 70591 "SA-5000 POWER SUPPLY BLOCK DIAGRAM." All low-voltage rectification and regulation circuitry, excepting the +8/-6 VDC regulation, is located in the DC Power Supply on circuit board PWA 5K-3-PS. The +8/-6 VDC regulation circuits are located on the rear right corner of the main audio circuit board, PWA 5K-3-AB, in the main chassis. The regulators are located on the rear right section of the circuit board in the audio chassis.

For description of the high-voltage supplies, refer to Drawing 705202 'Circuit Description, High Voltage Supply.'

All Low-voltage supplies operate as soon as the SA-5000 is connected to AC Mains.

Refer to the individual Schematic Detail drawings for the following descriptions.

For List of Materials, refer to Drawing 705301.

TRANSFORMER

All AC for the SA-5000 power supplies is supplied by the transformer (CPTP/N 5K-4-TRN) located at the rear of the DC Power Supply chassis. Refer to Drawing 7057 "TRANSFORMER PRIMARY WIRING DETAILS, SA-5000" for information on correct connections to the transformer primary for various AC Mains voltages.

HEAT SINK ASSEMBLY If DC Power Supply heatsink assembly temperature exceeds approximately 75 (D)C, thermal switch T-1 opens, removing AC Mains voltage to the transformer tube. All capacitors in the DC Power Supply are rated for 105(D)C operation, for extended life.

+24/-24 VDC RECTIFICATION AND REGULATION, Drawing 705503.

54 VAC from the transformer is rectified by full-wave bridge BR400 and smoothed by capacitors C400 and C401. Regulation is performed by U400 and U401, fixed + and - 24 volt regulators. U400 and U401 are mounted to the DC Power Supply's heat sink assembly.

Refer to Drawing 705103 for Normal Operating Voltages. When replacing U400 or U401, always be certain that the cases of these devices are insulated from the heat sink bracket.

+8/-6 VDC REGULATION, Drawing 705504.

This discussion will describe only the +8 VDC regulator. The operation of the -6 VDC regulator is identical.

Reference voltage components D401 and LED400 (point "J") establish Q401's Emitter voltage at approximately 8.6 VDC. Q400's Emitter voltage follows this voltage, raised by approximately 4.7 V by Zener diode D400. This configuration causes Q401's Vce to remain constant. Reference current for D401 and LED400 is set by R402 and remains constant due to the constant voltage at Emitter of Q400.

R405 supplies Zener current for D400 and Base current for Q400. R403 and C406 decouple Zener noise from the Base of Q401. C405 reduces Zener noise in the mid to high frequencies. C404 and C410 are required to prevent possible VHF parasitic oscillations due to phase shift in the loop formed by components Q401, D400 and Q400. R404 assures that the power supply pulls enough current to allow Zenering of D400.

Refer to Drawing 705103 for Normal Operating Voltages.

FILAMENT VOLTAGE RECIFICATION AND REGULATION, Drawing 705505.

11.6 VAC from the transformer is rectified by full-wave bridge BR300 and smoothed by capacitor C301. Regulation is performed by U300, an adjustable TO-3 regulator. Resistors R300 and R301 establish the correct output voltage. U300 is mounted to the DC Power Supply's heat sink assembly. Power for DC Power Supply pilot lamp, LED300, is derived from this circuit.

Refer to Drawing 705103 for Normal Operating Voltages. When replacing U300, always be certain that the case of this device is insulated from the heat sink bracket. The regulator is designed to shut off if its temperature exceeds a pre-set limit. Be certain that the heatsinks receive adequate ventilation.

PASS DEVICE FILAMENT VOLTAGE RECIFICATION AND REGULATION, Drawing 705514.

10.2 VAC from the transformer is rectified by full-wave bridge BR600 and smoothed by capacitor C301. Regulation is performed by U300, an three-terminal fixed voltage TO-3 6.0V regulator. U600 is mounted to the DC Power Supply's heat sink assembly.

During operation, when the High-voltage supply is active, this circuit is floated +200VDC above ground. Use caution when working on this circuit to avoid shorts to ground, especially through your body.

Refer to Drawing 705103 for Normal Operating Voltages. When replacing U600, always be certain that the case of this device is insulated from the heat sink bracket. The regulator is designed to shut off if its temperature exceeds a pre-set limit. Be certain that the heatsinks receive adequate ventilation.

DRAWN: JME	REVISION: A
ON DATE: 28 MARCH 1990	PRODUCT: SA-5000
COUNTERPOINT	
CIRCUIT DESCRIPTION LOW VOLTAGE SUPPLIES	
EP FILE: 705203.EPD	DWG: 705203

Description of Control Board Functions, SA-5000 Preamplifier

GENERAL

PWA 5K-3-CB, located at the front of the main audio chassis, includes the following circuits: Initializing and Lamp Logic functions, 12VDC Relay Power Supply, 6VDC Lamp Logic Power Supply, and front panel signal path control functions for (1) Volume and Balance, Line Input Select, Tape Send functions, Line Mode, and Ready/Standby control.

This document will only describe operation of the logic and power supply circuitry, as the signal path control functions are self-explainatory.

Refer to Schematic Detail Drawing 705512 for the following descriptions.

For List of Materials, refer to Drawing 705303.

Initializing and Lamp Logic functions, Drawing 705515

SA-5000 warmup initializing control functions are shown in Drawing 705515 (Schematic Diagram, Initializing and Lamp Logic), as a subsection of the Schematic Diagram of Printed Wiring Assembly, PWA 5K-3-CB, 705512.

All timer functions are performed by a timer (U200), and a quad OP-AMP (U201). U200 provides a delay from the moment the STANDBY/OPERATE switch is placed in the operate position, until approximately seventy seconds later. This insures that the tubes are warmed up, that everything is settled and that the control selections have been implemented before unmuting.

When in the STANDBY mode, red LED200 is lit on the front panel. During warm-up, yellow 'INITIALIZING/MUTE' LED201 blinks on the front panel. As soon as timer U200 times out, green 'READY' LED202 and main pilot LED203 light, unless the MUTE/STANDBY switch is in the 'Mute' position. In this case, the main pilot lamp remains lit, but yellow 'INITIALIZING/MUTE' LED 201 lights a steady yellow, while green 'READY' LED202 remains dark.

WARM-UP TIMER U200

U200 is a 555 timer configured as a monostable (one-shot) flip-flop. When the STANDBY/OPERATE (S/O) switch is in the STANDBY position, no power is provided to the timer and diode D200 insures that timing capacitor C200 is discharged. When the S/O switch is set to OPERATE, power (+6Vdc) is applied to U200 (along with U201 and Relay Common). The 555 trigger input is held low by C200 until it charges to approximately 4Vdc through resistor R200. The 555 output is positive from just after turn on until the rising trigger voltage reaches the reset point. It then switches to low where it remains until S/O is turned to STANDBY then to READY, intiating another warm-up cycle.

This low output state is logic function NOT ON -- an active low enable signal that tells other circuitry in the SA-5000 that the warm-up period has expired, including Mute Relay K1 which is pulled in (able to unmute) when NOT ON is active low.

INDICATOR LED AND U201

Quad Op-Amp U201, LED200 and the surrounding circuitry, perform service as Standby, Warm-up, Operate, and Muted/Unmuted indicator and driver.

When the S/O switch is in the STANDBY position, no power is available to run U201. LED200 is glowing red because the S/O switch provides power to red LED200 only. When S/O is set to OPERATE, the connection to the power is removed from LED200 red and connected to the other circuitry which then controls operation.

Sections one and two of U201 form an astable multivibrator with a cycle time around 1.5 sec (.66 hz). Section one is the comparator with R201 providing neccessary hysteresis, and R204-R205 providing 3Vdc reference to sections one, two and four. Section two is the integrator with two time constants. One, provided by R203 and C202, sets a long rising ramp at the output. The other made up of R202 and C202 and enabled by D203, provides a quick falling ramp at the output giving a saw tooth wave form.

Section three is an inverting amplifier which boosts the signal output of section two and drives yellow LED201. The output of this section is offset slightly below 3 Vdc by R211 and R212 for improved appearance of the blink quality.

During ''Initializing'' while the 555 timer output is high, diode D202 is reversed biased and has no effect on the circuit. This allows the Op-Amps to cycle continuously.

When U200 times out and NOT ON goes low, D202 couples this through to section one and forces its output low. This is inverted at the output of section two and again at section three such that section three's output is low.

U201 section four acts as a comparator. While U200's output is high, section four's output is low and because of D204 and D205, does nothing. When NOT ON goes low, the output of section four goes high and turns LED200 green on through D204. Thus the LED is green during unmuted operation. If, however, the SA-5000 is in a muted condition, the mute switch will connect the high output of section four through D204 to the yellow LED201.

12VDC Relay Power Supply, Drawing 705512

Three-pin regulator U1, located on the right upper edge of PWA 5K-3-CB supplies 12 VDC for use by all relays except for 6V UNMUTE relays K8 and K108. When replacing this device, be certain that it is electrically isolated from its heatsink.

6VDC Control Logic Power Supply, Drawing 705512

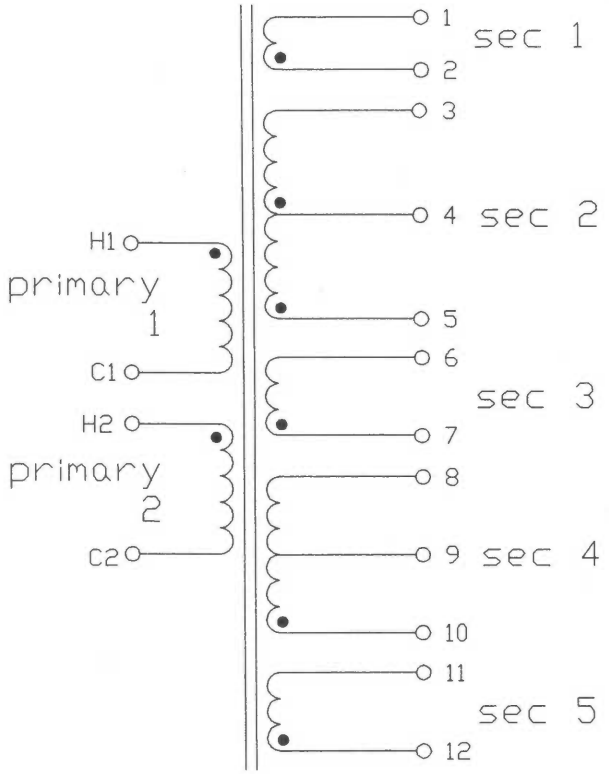
Three-pin regulator U2, located on the right upper edge of PWA 5K-3-CB supplies 6 VDC for use Initializing and Lamp Logic functions. When replacing this device, be certain that it is electrically isolated from its heatsink.

DRAWN: JME	REVISION: A
ON DATE: 28 MARCH 1990	PRODUCT: SA-5000
COUNTERPOINT	
CIRCUIT DESCRIPTION PWA 5K-3-CB	
EP FILE: 705204.EPD	DWG: 705204

SECTION 7

TRANSFORMER WIRING

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	4/89



GENERAL DESCRIPTION.

The SA-5000 has a single transformer (CPTP/N 5K-4-TRN) located in the SA-5000 power supply. This drawing describes Secondary wiring details and nominal Secondary voltages. For Primary wiring details, refer to Drawing 7057 "TRANSFORMER PRIMARY WIRING DETAILS."

SECONDARY SECTION. Transformer 5K-4-TRN has five Secondaries, terminated in wire leads. Details as follows (all voltages are with 110 Vac/60hz applied to domestic connection of primary. all voltages are r.m.s., DC resistance measured from coil start to finish, cold).

SECONDARY NUMBER	DC RESISTANCE	LOADED VAC	UNLOADED VAC	LEAD NUMBER	WIRE COLOR
1	0.21 OHMS	5.9	6.5	1 2	BLACK BROWN
2	407 OHMS	678 CT	688	3 4 5	RED YELLOW ORANGE
3	0.34 OHMS	10.2	10.6	6 7	WHITE/RED WHITE/BLACK
4	1.86 OHMS	54.1	54.1	8 9 10	GREEN VIOLET BLUE
5	0.39 OHMS	11.6	12.35	11 12	GRAY WHITE

DRAWN	JME	REVISION	
ON DATE	11/03/88	PRODUCT:	SA-5000

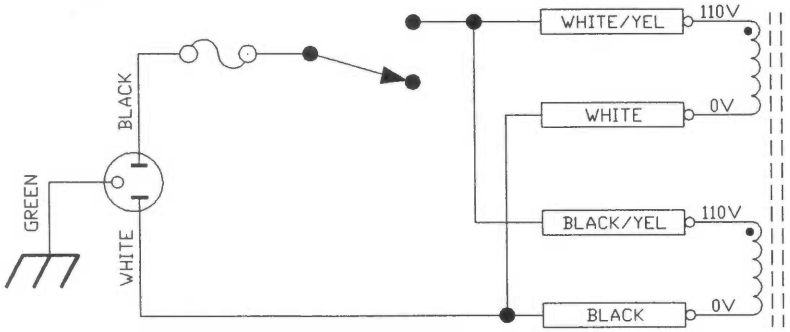
COUNTERPOINT

TRANSFORMER SECONDARY WIRING DETAILS

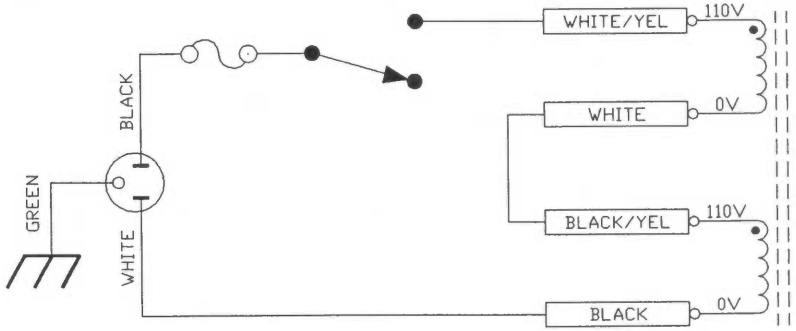
CAD FILE: 7058.DWG | DWG: 7058

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	9/12/89

NOMINAL DC RESISTANCE READINGS, PRIMARY CIRCUIT (MEASURED AT AC MAINS CONNECTOR)	
CONFIGURATION	DCR (COLD)
88-133 VAC	2.1 OHMS
176-266 VAC	8.4 OHMS



88 - 133 VAC



176 - 266 VAC

NOTES: UNLESS OTHERWISE SPECIFIED

1. DRAWING SHOWS PRIMARY CIRCUIT WIRING FOR SA-5000 TRANSFORMER. SA-5000 TRANSFORMER CPTP/N : 5K-4-TRN.

   TRANSFORMER IS HOUSED IN SEPARATE SUPPLY. DRAWING SHOWS TRANSFORMER PRIMARY LEADS, LEAD DESIGNATIONS, AC PLUG AND AC PLUGSET WIRE COLORS.

2. NOTE THAT AC PLUGSET GREEN ("EARTH" OR "GROUND") WIRE REQUIRES GOOD LOW RESISTANCE CONNECTION TO POWER SUPPLY CHASSIS.

3. TWO AC MAINS VOLTAGE WIRINGS SHOWN.

4. NOTE THAT DURING NORMAL OPERATION, AC MAINS ARE NOT SWITCHED: TRANSFORMER REMAINS CONNECTED TO AC MAINS AT ALL TIMES. ALL LOW-VOLTAGE CIRCUITS (FILAMENTS, ETC.) ARE ALWAYS IN POWER-ON CONDITION. SWITCHING SA-5000 TO "OPERATE" MODE SWITCHES ON HIGH VOLTAGE ONLY. REFER TO DRAWING #705202 "CIRCUIT DESCRIPTION, HIGH VOLTAGE SUPPLY" FOR HIGH VOLTAGE SWITCHING METHOD. SWITCH SHOWN IN SERIES WITH TRANSFORMER PRIMARIES IS LOCATED ON REAR OF POWER SUPPLY BOX AND IS RECOMMENDED FOR USE DURING VACATIONS OR IF POWER SUPPLY IS DISCONNECTED FROM AUDIO CHASSIS. USE "OPERATE" MODE SWITCH FOR EVERYDAY OPERATION.

DRAWN JME	REVISION
ON DATE 9/12/89	PRODUCT: SA-5000

COUNTERPOINT

TRANSFORMER PRIMARY WIRING DETAILS, SA-5000

CAD FILE: 7057	DWG: 7057

SECTION 8

INTERNAL ADJUSTMENTS

Section 8 Internal Adjustments

INTERNAL ADJUSTMENTS

Tube replacement. When replacing a tube in an SA-5000, be certain that you replace it with the exact RETMA type as indicated in Specifications section of this Service Manual.

Recommended Adjustments after Replacing Tubes. After replacing tubes in an SA-5000, the following procedures should be performed to assure operation within specification.

High-voltage Power Supply Tubes (V3, V4, and V5). If replacement of any of these tubes is required, the following measurements or adjustments should be made.
V4 or V5: These tubes are operated as paralleled cathode followers. Check to be certain that each triode half is operating properly by checking for reasonably good current-sharing by measuring the voltage drops across cathode resistors R517, R518, R519 and R520. An excessively high voltage across one resistor indicates that the triode section is passing more than its share of current and will fail prematurely. A low voltage across one resistor indicates a triode section not handling its fair share, increasing the loads on the other three sections. All values should be within 30% of each other.
V3: If this tube is replaced, it is suggested that the regulated voltage be checked and adjusted to be certain that it is within the nominal range. Measure the output voltage of the regulator at Test Point ''S'' (indicated on Schematic Detail Drawing number 705502 'SCHEMATIC DIAGRAM, HIGH VOLTAGE REGULATOR') to ground. Allow the SA-5000 30 minutes warmup time and use trimmer VR501 'B+ ADJ' to adjust the regulator's output voltage to 240 VDC $\pm$ 2 VDC.
Rectifier tube (V6). This tube is quite reliable. No special adjustments are neccessary if the tube is replaced.
Audio Tubes (V1, V2, and V3). If replacement of any of these audio tubes becomes neccessary, it is recommended that the bias adjustments in the SA-5000 be checked to confirm that the device is operating in accordance with its published gain and distortion specifications. However, new tubes should be used for at least a week to allow them to burn in and settle to their long-term characteristics. After burn in the following procedures should be performed:
V1 or V101: Bias the first and second phono stages for minimum THD, and match the gains of the two channels.
V2 or V102: Bias the line stage for minimum THD, and match the gains of the two channels.

Top Cover Removal. All of the Internal Adjustments described in this section require removing the top cover of the SA-5000. **Be aware that the voltages within can be LETHAL!** Any adjustments made with a screwdriver should be done with one that has an

insulated handle. Always unplug the SA-5000 from the AC wall outlet before removing or replacing the top cover. A screw falling onto the circuit board may cause substantial damage.

MC Cartridge Loading. The SA-5000's MC LOAD switch gives you some control over loading, and may be adjusted while listening for fast determination of acceptable loads. In addition to the three factory-installed values of 47K, 300 and 100 ohms, there is a fourth position to select user-installed resistors. Install custom load values into the USER-MC sockets located on the rear jack board, just above rotary switch RS1 ('MC LOAD'). You may insert any resistor with standard 0.025-inch (0.6mm) diameter leads
into these sockets. The sockets are about 0.10 inches (2.5mm) deep. Push the resistor leads straight into the sockets until they reach the bottom.

PLEASE DO NOT SOLDER THE RESISTORS INTO THE SOCKETS. The sockets' three internal gripping springs are tin-plated in order to form a good metal-to-metal contact with similar metals. Most resistor leads are tin-plated. Soldering the leads to the sockets will damage the sockets.

Changing the MM Input Loading Value. The resistance presented to the **"MM"** inputs as shipped from the factory is 47,000 ohms. The loading resistors ('Rmm-A' and 'Rmm-B') are located on the rear Jack board, beneath rotary switch RS1 ('MC LOAD'). Changing the factory value to another is very difficult, as it involves removing the rear board for access, and is not recommended.

Balancing the Phono Stage Channel-to-channel Gain. If either of the phono tubes (V1 or V101) are replaced, the gains of the right and left phono stages may require matching. Use trimmers PHONO TRIM-A and PHONO TRIM-B (VR1 and VR101) located on the rear vertical jack board, above and to the right of the phono input jacks to fine-tune the output levels of the two channels.

Adjusting Phono Stage D.C. Offset. If the customer experiences ''pops'' or ''thumps'' when he or she switches the MAIN OUTPUT SELECT knob from LINE INPUT to PHONO, it is possible that the D.C. offset of the phono stage needs adjusting. Use the following procedure to zero the DCO of the Phono stage.

< > Set the SA-5000 to the STANDBY mode.
< > Remove the top cover from the SA-5000.
< > Set the MAIN OUTPUT SELECT knob to PHONO.
< > Set your multimeter to the 2 Volts D.C. scale and connect it to the SEL MONITOR A jack, located near the front center of the main audio board. Any voltage shown is the DC offset of the channel A phono stage.

< > Use the PHONO A DCO trimmer (VR4) to reduce the indicated voltage to as close to 0.000 volts as possible.
< > Move your multimeter to the SEL MONITOR B jack, and repeat the process, using channel B's PHONO B DCO trimmer (VR104).
< > This completes the process. You may wish to leave the unit on for an hour or so and re-check both voltages in order to trim out any drifts caused by component heating.

NOTE: If the problem is not corrected by the above procedures, the problem may not be one of DC Offset, but rather excessive low-frequency noise generated by the preamplifier's phono stage. Turn on the preamp, install shorting plugs into all four phono input jacks, select PHONO as described above and use an oscilloscope to monitor the output of the phono stage at the SEL MONITOR jacks. Low frequency noise shows as a voltage slowly moving between + and - voltages, usually spending as much time + as -, whereas DC offset is unipolar and doesn't drift as much.

Biasing the Phono Stage. If phono stage tubes V1 or V101 have been replaced, it will be neccessary to check the phono stage bias. The following procedure will describe the process.

1. Set up the SA-5000:

< > Remove the top cover from the audio chassis.
< > Set the two internal phono MODE selector switches to the MC position.
< > Install shorting pins into the MM phono inputs on the rear of the SA-5000.
< > Locate both MM BIAS trimpots (VR1 and VR101) and set them fully CCW (counter-clockwise).
< > Locate both PHONO TRIM trimmers<197>marked PHONO TRIM-B and PHONO TRIM-A (VR1 and VR101)<197>on the rear vertical jack board, above and to the right of the phono input jacks. Set them fully CW (clockwise).
< > Connect the DC Power Supply to the SA-5000 and to an AC outlet and apply nominal AC Mains voltage.

2. Set the Front Panel Controls:

< > Set toggle switches: set TAPE SEND to DISABLE, and STATUS to READY.
< > Set the MAIN OUTPUT SELECT knob to the PHONO setting; set GAIN to counter-clockwise; set LINE MODE to NONINVERT.

3. Make Signal Connections:

< > Connect a 1kHz, 5mVrms low distortion sine-wave signal to the Channel A MC phono input on the rear of the SA-5000.

< > Connect a distortion analyzer to the Channel A PRE-RIAA MONITOR jack on the circuit board. The jack is located directly behind tube V101.

4. When the unit has warmed, you should read a signal of about 3.7 volts rms.
5. Locate MC BIAS Trimmer VR2, about halfway back on the left edge of the circuit board.
6. Use Trimmer VR2 to adjust the stage for lowest distortion. When adjusted properly, gain should be about 58dB and distortion should be less than 0.04%. Stage plate voltage measured on the right side of plate load resistor assembly R1 (A,B,C or D) will be in the 85 to 110 volts DC range.
7. Note the measured gain of the stage and write it down as 'Channel A MC gain.'
8. Return to Step 3 and repeat the procedure for the Channel B phono stage. This stage is laid out identically to the Channel A phono stage. Use trimmer VR102 to trim this stage.
9. Note the measured gain of this stage and write it down as 'Channel B MC gain.'
10. Set the two internal phono MODE selector switches to the MM position.
11. Use a 'Y' cord to connect the signal generator to both MM phono inputs.
12. Install shorting pins into both MC phono input jacks.
13. Set the signal generator to a signal level of 20mV rms, 1kHz.
14. Measure the signal gain at both PRE-RIAA MONITOR jacks. Signal gains should be around 25dB (360mVrms output).
15. Measured distortion should be less than 0.05%.
16. Turning an MM BIAS Trimmer (V1 or V101) clock-wise will reduce the gain of that channel. Use these controls to match the gain difference between the two channels to those noted earlier e.g., if your noted 'channel A MC gain' was 58.0dB, and 'channel B MC gain' was 57.5dB, you should adjust the trimmers to achieve a channel B MM gain 0.5dB lower than that measured on channel A.
17. Reset the two internal phono MODE selector switches to the MC position.
18. Insert shorting pins into all four phono input jacks.
19. Use a 100 to 1000uF electrolytic capacitor to AC couple the signal generator to the Channel A PRE-RIAA MONITOR jack. Connect the + side of the capacitor to the monitor jack.
20. Set the generator to 1Vrms, 1kHz and monitor the generator's distortion to be certain that it can satisfactorily drive the 6000 ohm load presented by the first stage's buffer amplifier.

21. Connect the distortion analyzer to the Channel A SEL MONITOR A jack on the main PCB.
22. Use PSS BIAS trimmer VR3 to adjust the stage's distortion to minimum.
23. When properly adjusted, the distortion should be less than 0.01%, and stage gain should be around +3.5dB (1.5Vrms indicated output). Stage plate voltage measured on the right side of plate load resistor assembly R8 (A,B,C or D) will be around 90 to 120 VDC.
24. Return to Step 19 and repeat this procedure on the B channel.
25. Set the generator to 1mV, 1kHz, and use a 'Y' cord to re-connect the signal generator to both MC phono inputs.
26. Monitoring the signal levels at the SEL MONITOR jacks, use PHONO TRIM-A and PHONO TRIM-B (VR1 and VR101) on the rear vertical jack board to match the two phono stage output levels.

This completes the phono section bias procedure.

Balancing the Line Stage Channel-to-channel Gain. If either of the line tubes (V2 or V102) are replaced, the gains of the right and left line stages may require matching. Use trimmers LINE TRIM-A and LINE TRIM-B (VR610 and VR1610) located 'front row center' of the main audio board to fine-tune the output levels of the two channels.

Adjusting Line Stage D.C. Offset. If the customer experiences ''pops'' or ''thumps'' when he or she toggles the MUTE/OPERATE switch back and forth, but ONLY when using the BUFFERED OUTs (and NOT the DIRECT OUTs), then it is possible that the D.C. offset of the line stage buffers needs adjusting. Use the following procedure to zero the DCO of the Phono stage.

< > Disconnect the DC Power Supply from the AC Mains and remove its cover.
< > Remove the rectifier tube, V6, from its socket in the Power Supply and set it aside.
< > Reconnect the Power Supply to the AC Mains and start the warm-up procedure by changing the STATUS switch to the UP position.
< > Set your multimeter to the 2 Volts D.C. scale and connect it to either of the Channel-A BUFFERED OUTPUT jacks on the rear of the preamp.
< > When the preamp unmutes, the indicated voltage is the DC offset of the channel A line stage buffer.
< > Use the LINE-A DCO trimmer (VR6) to reduce the indicated voltage to as close to 0.000 volts as possible.
< > Connect the multimeter to either Channel-B BUFFERED OUTPUT

jack and repeat the process using the LINE-B DCO trimmer (VR106).

< > This completes the process. You may wish to leave the unit on for an hour or so and re-check both voltages in order to trim out any drifts caused by component heating.

NOTE: If the problem exists in the DIRECT and the BUFFERED outputs, then the problem may be caused by excessive low-frequency noise coming from the signal source itself: if there is no problem with the front panel volume control fully off, then the problem originates in the selected input source (phono stage, CD player, etc.).

Biasing the Line Stage. If tubes V2 or V102 have been replaced, it may be neccessary to check the line stage bias. The following procedure will describe the process.

1. Set up the SA-5000:

< > Remove the top cover from the audio chassis.
< > Connect the DC Power Supply to the SA-5000, and to an AC outlet and apply nominal AC Mains voltage.

2. Set the Front Panel Controls:
< > Set toggle switches: set TAPE SEND to DISABLE, and STATUS to READY.
< > Set the MAIN OUTPUT SELECT knob to the LINE setting; set LINE INPUT SELECT to CD; set GAIN to fully clockwise; set LINE MODE to NONINVERT, both front panel TRIM controls to clockwise.

3. Make Signal Connections:

< > Connect a 1kHz, 200mVrms low distortion sine-wave signal to the Channel A CD input on the rear of the SA-5000.
< > Connect a distortion analyser to the channel A BUFFERED OUTPUT jack on the rear of the SA-5000.

4. When the unit has warmed, you should read a signal of about 2.6 volts rms.
5. Locate LS BIAS Trimmer VR5.
6. Use this Trimmer to adjust the stage for lowest distortion. When adjusted properly, gain should be about 22 to 23dB (2.6Vrms output level) and distortion should be less than 0.02%. Stage plate voltage measured on the left side of plate load resistor assembly R21 (A,B,C or D) will be around 50 to 60 VDC.
7. Return to Step 3 and repeat the procedure for the Channel B line stage. This stage is laid out identically to the

Channel A line stage. Use trimmer VR105 to trim this stage.

8. This completes the line stage bias procedure.

Disabling the Line Stage Buffers. If the system permits using the DIRECT OUTS (See ''Audio Outputs'' in the ''Back Panel'' section of the Owner's Manual), you may wish to totally disable the line stage's line-driver buffers. This disconnects the inputs of the buffers from the line tube and, by eliminating this final bit of non-essential loading, offers a wee bit better sound quality.

Located on the main audio circuit board, behind line tube V2, is Channel A's BUFFERED OUTPUT ENABLE/DISABLE jumper block. The jumper block for Channel B is behind line tube V102

The following procedure can be followed if you wish to disable the line stage buffers:

< > Disconnect the AC Mains cord from the DC Power Supply.
< > Remove the top cover of the SA-5000.
< > Move both jumper blocks from the ENABLED position to the DISABLED position.

Tape Send Level. Located on the rear vertical jack board, above and to the right of the BUFFERED OUT jacks, are two small finger-adjust TAPE GAIN trimmers marked TAPE GAIN A and TAPE GAIN B (VR2 and VR102). As shipped, the controls are set to ''unity gain,'' i.e., there is no amplification or attenuation of the signal. The range of these controls is approximately -6 to +12dB.

SECTION 9

CIRCUIT BOARD LAYOUTS

LIST OF MATERIALS

PAGE 1 OF 3

DRAWING NUMBER: 705301

PRODUCT: SA-5000

ASSEMBLY LEVEL: DC POWER SUPPLY

REFERENCE	PART VALUE	DESCRIPTION
	5K-4-TRN	TRANSFORMER
	5K-2-PSC	POWER SUPPLY CHASSIS
	5K-2-PST	POWER SUPPLY TOP COVER
	5K-2-PSF	POWER SUPPLY FRONT PANEL
	3K-2-HS	SA-3000 HEAT SINK
SW5	SW-SPDT-ROCK	MAINS ON/OFF
T-1	THERMAL SWITCH	X121090 174F OPEN
	FUSEHOLDER HTA	BUSSMAN
	SOCKET AC	
	LINECORD 9FT	
	PLUG-16	AMP 206037-1 16-PIN PLUG
	CONTACT-F-24	AMP 66183-1 SOCKETS FOR ABOVE
	CLAMP-16	AMP 206070-1 CABLE CLAMP FOR PLUG-16
	CABLE 15	OLYMPIC 2115 15-COND. CABLE
	5K-2-HSB	HEATSINK BRACKET
V6	SOCKET TUBE 9	

DISK FILE:	TITLE:	DRAWING NUMBER:	REV
5KPSLM1.DWG	LIST OF MATERIALS, SA-5000 POWER SUPPLY	705301	NONE

LIST OF MATERIALS

PAGE 2 OF 3

DRAWING NUMBER: 705301

PRODUCT: SA-5000

ASSEMBLY LEVEL: DC POWER SUPPLY

REFERENCE	PART VALUE	DESCRIPTION
V6	V6CA4	6CA4 FULL-WAVE RECTIFIER
C551	C.01/1KV CD	.01/1000V CD
C550	C.01/1KV PE RL	.01uF/1000V PE
C500A,500B	C220/250 SNAP HI-TEMP	220/250V SNAP-IN, 105C
C300,600	C.01/100CD	ON BIG BRIDGES ~ TO ~
C301	C6800/25 SNAP HI-TEMP	6800/25V SNAP IN 105C
C601	C4700/25 SNAP HI-TEMP	4700/25V SNAP-IN 105C
C302,303,602	C22/16 TANT	22/16V TANTALUM
C400,401	C6800/50 SNAP HI-TEMP	6800/50V SNAP-IN 105C
C402,403	C1/63	1/63V PP
R550A,550B	R300K 2W CC	
R500	R100K	
R300	R100R	
R301	R402R	
R302	R200R	
	FUSECLIP	
	FUSE 1A 8AG	8AG-SIZE, 1A FAST-BLOW
BR300,600	BIG BRIDGE	25A/600V

DISK FILE:	TITLE:	DRAWING NUMBER:	REV
5KPSLM2.DWG	MATERIALS, SA-5000 POWER SUPPLY	705301	NONE

LIST OF MATERIALS

PAGE 3 OF 3

DRAWING NUMBER: 705301

PRODUCT: SA-5000

ASSEMBLY LEVEL: DC POWER SUPPLY

REFERENCE	PART VALUE	DESCRIPTION
LED300	LED GREEN	
U300	LM350K	
U600	LM7806CK	
BR400	DBPC610	6A/1000V
U400	LM7824CT	
U401	LM7924CT	

DISK FILE:	TITLE:	DRAWING NUMBER:	REV
5KPSLM3.DWG	MATERIALS, SA-5000 POWER SUPPLY	705301	NONE

BILL OF MATERIALS REVISED: 3 29 90
PAGE 1 OF 1
PRODUCT: SA-5000
ASSEMBLY LEVEL: AUDIO CHASSIS 3 29 90
QTY USED/UNIT: 1

CPTPN/DESCRIPTION	QTY	MFGR/NOTES	REFDES	PRICE	EXT.
PWA 5K-3-JB	1	ASSEMBLED JACK BOARD			
PWA 5K-3-CB	1	ASSEMBLED CONTROL BOARD			
PWA 5K-3-AB	1	ASSEMBLED AUDIO BOARD			
5K-2-CHS	1	MAIN CHASSIS			
5K-2-BSC	1	AUDIO BOARD SUB-CHASSIS			
5K-2-FPL	1	FRONT DRESS PANEL			
5K-2-TOP	1	SA-9 AUDIO CHASSIS TOP COVER, SCREENED 5K			
9A-2-RL	2	RAILS			
9A-2-SPL	2	SIDE PANELS			
ISOLATORS	3	BARRY CONTROLS 7820-2			
KNOB, SMALL PINCH	4				
KNOB, BIG PINCH	2				
KNOB, BIG ROUND	2				
BINDPOST, BLACK	1				
COUPLER	3				
5K-2-SHAFT	3	11-INCH LONG SHAFT MATERIAL, 1/4-INCH O.D.			
SOCKET-16	1	AMP 206036-1 16-PIN RECEPTACLE			
CONTACT-M-24	16	AMP 66182-1 PINS FOR ABOVE			
1032 KEPNUT	4				
1032X5/8PPSZ	4				
440 KEPNUT	25				
440X1/2PPSB	29				
440X1/2SHSS	4				
440X1/4PPSB	22				
440X3/8BTH	3	AUDIO BOARD HOLDDOWN FOR SHIPPING			
440X3/8PPSB	6				
440X5/8FPSZ	7				
832 KEPNUT	11				
832X1FHPSS	3				
832X3/8FPSS	24				
BIGFEET	4				
COVER, FET	6				
GROMMET 2170	3				
SPACER 2201	15	SMITH 2201 440 X .25			
SPACER 9402B	15	440 X 3/16 HEX SPACER TO MOUNT 5K-3-JB			
WASHER #10 STAR	1				
WASHER 2514	4				

DISK FILE:	TITLE:	DRAWING NUMBER:	REV
5KAUDIO.DWG	BILL OF MATERIALS, SA-5000 AUDIO CHASSIS, DOMESTIC		A

LIST OF MATERIALS

PAGE 1 OF 6

DRAWING NUMBER: 705302

PRODUCT: SA-5000

ASSEMBLY LEVEL: PWA 5K-3-AB AUDIO BOARD

REFERENCE	PART VALUE	DESCRIPTION
V1,101,2,102,4,5	V6DJ8	
V3	V12AX7	
R501	R1K CPF2	
R502,521	R200K	
R503,504	R470K 1/2W CC	
R505,523	R47.5K	
R1ABCD,101ABCD,35, 135,RN1,RN101, R10ABCD,R110ABCD, 506,509,522	R100K	
R508,517,518,519,	R10.0R	
520,524,516,ILA ILB,IPA,IPB		
R507	R17.4K	
R2,102,11,111,29,129 511,512,513,514,515	R100R	
R22,122,403,407, 409,525	R2.21K	

DISK FILE:	TITLE:	DRAWING NUMBER:	REV
5KABLM1.DWG	MATERIALS, SA-5000 AUDIO BOARD	705302	NONE

LIST OF MATERIALS

PAGE 2 OF 6

DRAWING NUMBER: 705302

PRODUCT: SA-5000

ASSEMBLY LEVEL: PWA 5K-3-AB AUDIO BOARD

REFERENCE	PART VALUE	DESCRIPTION
R510	R68.1R	
R405	R5.11K	
R402,406	R422R	
R404,408,900	R1.00K	
R3,103	R4.02M	
R6,106	R10.0M	
R7,107,8,108,9,109 15,115,16,116,27,127 28,128	R6.04K	
R13B,113B,18,118 23,123	R1.00M	
R13A,113A	R100K	ASIA ONLY
R12,112,21A-F,121A-F	R154K	
R14,114	R121K	
R17,117	R499R	
R19,119,20,120	R51.1R	
R24B,124B	R2.49M	
R25,125,26,126	R274K	

DISK FILE:	TITLE:	DRAWING NUMBER:	REV
5KABLM2.DWG	MATERIALS, SA-5000 AUDIO BOARD	705302	NONE

LIST OF MATERIALS

DRAWING NUMBER: 705302
PRODUCT: SA-5000
ASSEMBLY LEVEL: PWA 5K-3-AB AUDIO BOARD

REFERENCE	PART VALUE	DESCRIPTION
RN2,102	R15.4K	
C501,509	C.01/1KV CD	.01/1000V CD
C502	C0.1/630 MKS4	0.1/630V PE
C503,504	C47/250	47UF/250V RADIAL LYTIC
C505	C1/250 MKS4	1/250V PE
C506	C.01/100 CD	.01/100V CD
C507,508	C100/160 RL	100UF/160V RADIAL LYTIC
C1,101,8,108,16, 116,511	C1/250 MKP10	1/250V PP
C510	C470/63 RL	470UF/63V RADIAL LYTIC
C404,407,410,411	C.001/100 CD	.001/100V CD
C405,406,408,409	C22/16	22/16V RADIAL LYTIC
C2A,102A,15,115 14,114,23,123	C2/210	2/210V PP
C3B,103B,9A,109A	C.01/630	.01/630V PP
C3A,103A,9B,109B 17A,117A,22,122	C.1/425	.1/425V PP

LIST OF MATERIALS

PAGE 4 OF 6
DRAWING NUMBER: 705302
PRODUCT: SA-5000
ASSEMBLY LEVEL: PWA 5K-3-AB AUDIO BOARD

REFERENCE	PART VALUE	DESCRIPTION	
C5,105,6,106,12,112 13,113,18,118,19,119 20,120	C.002/100 CD	.002/100V CD	
C4,104,7,107,10,110 11,111,18,118,21,121	C1/63	1/63V PP	
C17B,117B	C.47/210 CE	.47/210V PP	
CN1,101	C.0206/630 UK	.0206UF/630 1% PP	
CN2,102	C7000PF/630 UK	7000PF/630V 1% PP	
D501,508	D1N4007		
D502,503	D1N5388		
D507	D1N5368		
D506	D1N5377		
D505,509	D1N5371		
D510,511	D1N5303		
D400,402,403	D1N4732		
D401	D1N4736		
D1,101,2,102	D1N3595		

DISK FILE:	TITLE:	DRAWING NUMBER:	REV
5KABLM4.DWG	MATERIALS, SA-5000 AUDIO BOARD	705302	NONE

LIST OF MATERIALS

DRAWING NUMBER: 705302

PRODUCT: SA-5000

ASSEMBLY LEVEL: PWA 5K-3-AB AUDIO BOARD

REFERENCE	PART VALUE	DESCRIPTION
D5,105,6,106,9,109, 10,110	D1N485B OR D1N459A	
D503	DCIL-500/150	
LED500,400,401,1,101 2,102,3,103,4,104, 5,105,6,106,7,107	LED GREEN T-1	
LED501	LED RED T-1	
Q501	QMJH12005	
Q502,503,504	Q2N3439	
Q402,403	Q2N4403	
Q400,401	QPN2222	
Q1,101	Q2N4093	
D3,103,4,104,7,107, 8,108,11,111,12,112	QJ555	
Q2,102,5,105,8,108	QMJE182	
Q3,103,6,106,9,109	QMJE172	
Q4,104,7,107	QP1087	
U1,101,2,102,3,103	U03FUB	

LIST OF MATERIALS

DRAWING NUMBER: 705302
PRODUCT: SA-5000
ASSEMBLY LEVEL: PWA 5K-3-AB AUDIO BOARD

REFERENCE	PART VALUE	DESCRIPTION
SW1,101	SW-SPDT-BRAK	
I1,101	FERRITE BEAD	
VR501,610,1610	VR253	
VR1,101,2,102	VR68WR50K	
VR3,103,4,104,6,106	VR68WR20K	
VR5,105	VR254	

LIST OF MATERIALS

PAGE 1 OF 3

DRAWING NUMBER: 705303

PRODUCT: SA-5000

ASSEMBLY LEVEL: PWA 5K-3-CB CONTROL BOARD

REFERENCE	PART VALUE	DESCRIPTION
K1,101	RELAY SEALED	
RS4,RS5	SW-ROT-70-9003	
SW2	SW-SPDT-BRAK-3	TAPE SEND ON-OFF-ON
SW4	SW-DPDT-BRAK	
SW3	SW-SPDT-BRAK	
GAIN TRIM A, B	VR25KMBNOB	NOBLE 25K MONO BALANCE
GAIN	VR50KSVNOB	NOBLE 50K STEREO VOLUME
-NONE-	R10.0K	ON 5K-3-GB
-NONE-	R4.75K	ON 5K-3-GB
R243	R221R	
R200	R4.02M	
R240,207,208,204,205 244,260,261, 1260,1261	R100K	
R201,206	R20.0K	
Rg,p,r	R200R	
Ry,241,250	R100R	
R242,245,246,247	R10K	

DISK FILE:	TITLE:	DRAWING NUMBER:	REV
5KCBLM1.DWG	MATERIALS, SA-5000 CONTROL BOARD	705303	NONE

LIST OF MATERIALS

PAGE 2 OF 3

DRAWING NUMBER: 705303

PRODUCT: SA-5000

ASSEMBLY LEVEL: PWA 5K-3-CB CONTROL BOARD

REFERENCE	PART VALUE	DESCRIPTION
R202,211	R1.00K	
R212	R1.10K	
R210	R47.5K	
R209	R7.50K	
R203	R274K	
C202,204	C10/16 RL	10/16V RADIAL LYTIC
C200	C22/35 TANT	22/35V TANTALUM
C1,5	C10/50 RL	10/50V RADIAL LYTIC
C2,6	C1/63	1/63V PP
C3,4,210	C.01/100 CD	.01/100V CD
D202,203,204,208, 207,240,241,250	D1N914	
D1,5,200	D1N4007	
Q201,202	PN2222	
Q200	2N4403	
U200	LM555	
U201	MC4741	
U2	LM7806CT	

DISK FILE:	TITLE:	DRAWING NUMBER:	REV
5KCBLM2.DWG	MATERIALS, SA-5000 CONTROL BOARD	705303	NONE

LIST OF MATERIALS

DRAWING NUMBER: 705303
PRODUCT: SA-5000
ASSEMBLY LEVEL: PWA 5K-3-CB CONTROL BOARD

REFERENCE	PART VALUE	DESCRIPTION
LED200	LEDRED PIN	
LED202	LED GREEN PIN	
LED 203	LED GREEN	
LED201,204,205,206	LED YELLOW PIN	
207,208		
LED209,210	LED RED T-1	
U1	LM7812CT	

LIST OF MATERIALS

PAGE 1 OF 2

DRAWING NUMBER: 705304

PRODUCT: SA-5000

ASSEMBLY LEVEL: PWA 5K-3-JB JACK BOARD

REFERENCE	PART VALUE	DESCRIPTION		
K1,2,3,4,5	RELAY SEALED			
K6,7,9	RELAY 12V			
K8,108	RELAY 6V			
RS1,RS2,RS3	SW-ROT-70-9003			
VR2,102	VR91TR20K	TAPE GAIN		
VR1,101	VR68XR2K	PHONO TRIM		
Rmm,Rmm,R1,101	R47.5K			
R2,102	R301R			
R3,103,4,104,5,105 6,106,7,107,8,108 9,109,14,114	R100R			
	MICROJACK	USER MC LOADING		
R10,110,18,19,20,21 22,23,24,26	R1.00K			
R11,111	R2.21K			
R12,112	R3.01K			
R13,113	R6.04K			
R27,127	R100K			

DISK FILE:	TITLE:	DRAWING NUMBER:	REV
5KJBLM1.DWG	MATERIALS, SA-5000 JACK BOARD	705304	NONE

LIST OF MATERIALS

PAGE 2 OF 2

DRAWING NUMBER: 705304

PRODUCT: SA-5000

ASSEMBLY LEVEL: PWA 5K-3-JB JACK BOARD

REFERENCE	PART VALUE	DESCRIPTION
R15,115	R249R	
R16,116	R147R	
R17,117	R147R	
R25	R499R	
LED1-9	LEDRED T-1	
C1,101	C100PF/160V	MM LOAD
C18,118,19,119,4,5,6 7,8,9,10,11,12	C.01/100CD	
C2,3	C.1/160	
C14,16	C1/63	
C15,17	C10/50 RL	
U1	TL082	TAPE BUFFER
U2	MC78L12CP	+12 VR, TO-92 LOW POWER
U3	MC79L12CP	-12 VR, TO-92 LOW POWER
	SKT 8 PIN DIP	FOR U1
S101	SKT 16 PIN DIP	
	RIBBON-MM-16-36	16 COND RIBBON, 36-INCH MALE-MALE

DISK FILE:	TITLE:	DRAWING NUMBER:	REV
5KJBLM2.DWG	MATERIALS, SA-5000 JACK BOARD	705304	NONE

SECTION 10

PARTS LISTS

SECTION 11

REPAIR PROCEDURES

REPAIR PROCEDURES

General. All the components in the SA-5000 are of the highest quality and should have a long trouble-free life since they are operated well below their manufacturer's rating. The following procedure may facilitate locating the source of trouble if the SA-5000 does not function properly.

The likeliest source of failure are the solid-state components since they are inherently more fragile and susceptable to failure in the high-voltage/high temperature environment of the SA-5000.

Another common problem is a failure of an electron tube since these devices have a shorter life than the passive parts. Check first to see if all the tubes are inserted securely in the sockets. Check also to see if the tubes are located in the proper sockets, and that they are the correct RETMA type as specified in the Specifications Section of this manual.

Fuses. There are two fuses in the SA-5000: the AC Mains fuse is located on the rear apron of the DC Power Supply. For SA-5000 amplifiers operated at 100 to 240 VAC, the replacement value of this fuse is 2-1/2 Amp AGC 3AG-size Fast Blow type fuse.

The second fuse, located on the DC Power Supply circuit board is a 1 Amp 8AG-size Fast Blow type fuse. Use caution when handling this fuse: be certain that all high voltage has discharged.

Same Problem in Both Channels. If the SA-5000 suffers from a simultaneous type failure in both channels, check the following shared circuitry: Proper operation of Control Functions located on the front control board, failure of any of the five shared power supplies: 240 VDC B+ (used by all the audio tubes), +24/-24 VDC (used by all the buffers), +8/-6 VDC (used for bias functions), Audio Filament Voltage (used by all audio tube heaters and the Control Functions), and Pass Device Filament Voltage (used by V4 and V5 regulator pass device tubes).

Visual Inspection of Power Supply Operation. Visual inspection can be used to check operation of the tube filaments: with the exception of the 6CA4 rectifier tube, all tube heaters should light whenever the SA-5000 is connected to AC Mains. Changing the 'STATUS' switch to the up postition should cause the 6CA4 rectifier tube to light.

Operation of the +8 and -6VDC can be visually verified by observing whether LED's 400 and 401 are lit. A lighted lamp indicates proper operation.

Correct operation of the + and - 24VDC supplies is implied whenever LEDs 400 and 401 are lit, since the +8 and -6VDC supplies derive their operating voltages from the 24VDC supplies.

Operation of control board +6 and +12 VDC regulators may be

determined by the presence of one or more lit relay indicator LED's located above signal-switching relays on the rear Jack board.

Check DC Operating Voltages. Section 5 of this manual gives nominal DC Operating voltages of selected Test Points in the circuits in the SA-5000. Careful use of the Schematic Diagrams (Section 4) and Circuit Board Layouts (Section 9) permit troubleshooting all the SA-5000's circuitry. If a test point's voltage differs significantly from the correct voltage, all of the components wiring and voltage and resistance readings to ground associated with that circuitry and the circuitry preceding the test point should be made.

Always refer to the Notes section of the specific DC Operating Voltage drawings for specific information on measurement techniques.

Please note that Plate and Cathode voltages in the audio circuit are dependent upon adjustable bias settings and should be used as a rough guide only due to the variations in different brands of electron tubes.

Check AC Signal Levels. Section 5 of this manual gives nominal AC Signal Levels of selected Test Points in the circuits in the SA-5000. Signal tracing techniques can be used to localize a problem in the audio circuit. If a test point's signal level differs significantly from the correct voltage, all of the components wiring and voltage and resistance readings to ground associated with that circuitry and the circuitry preceding the test point should be made.

Always refer to the Notes section of the specific AC Signal Level drawings for specific information on signal amplitudes, injection and measurement points.

Totally Dead SA-5000. A cartridge fuse, located on the rear apron of the DC Power Supply, is used in the primary circuit of the power transformer to protect the power supply components from short circuits. The rating of this fuse was selected for proper protection of the SA-5000 and should be replaced with the same type and rating.

If a failure is detected the following procedure is recommended before replacing the fuse.

(a) Check for proper connection of power transformer Primarys for your AC Mains voltage. Refer to Transformer Wiring (Section 7) of this manual for more information. All of the leads from the Primarys are connected within the Transformer box and may be easily inspected.

(b) Check for failed power transformer: Section 7 gives information on transformer Primary and Secondary characteristics and connections. If the transformer still

draws too much current with all secondaries disconnected, the transformer has failed and must be replaced.

(c) If the transformer has not failed, re-connect the secondaries one at a time until the problem occurs. Use trouble-shooting techniques to determine the failed components responsible for the excess current.

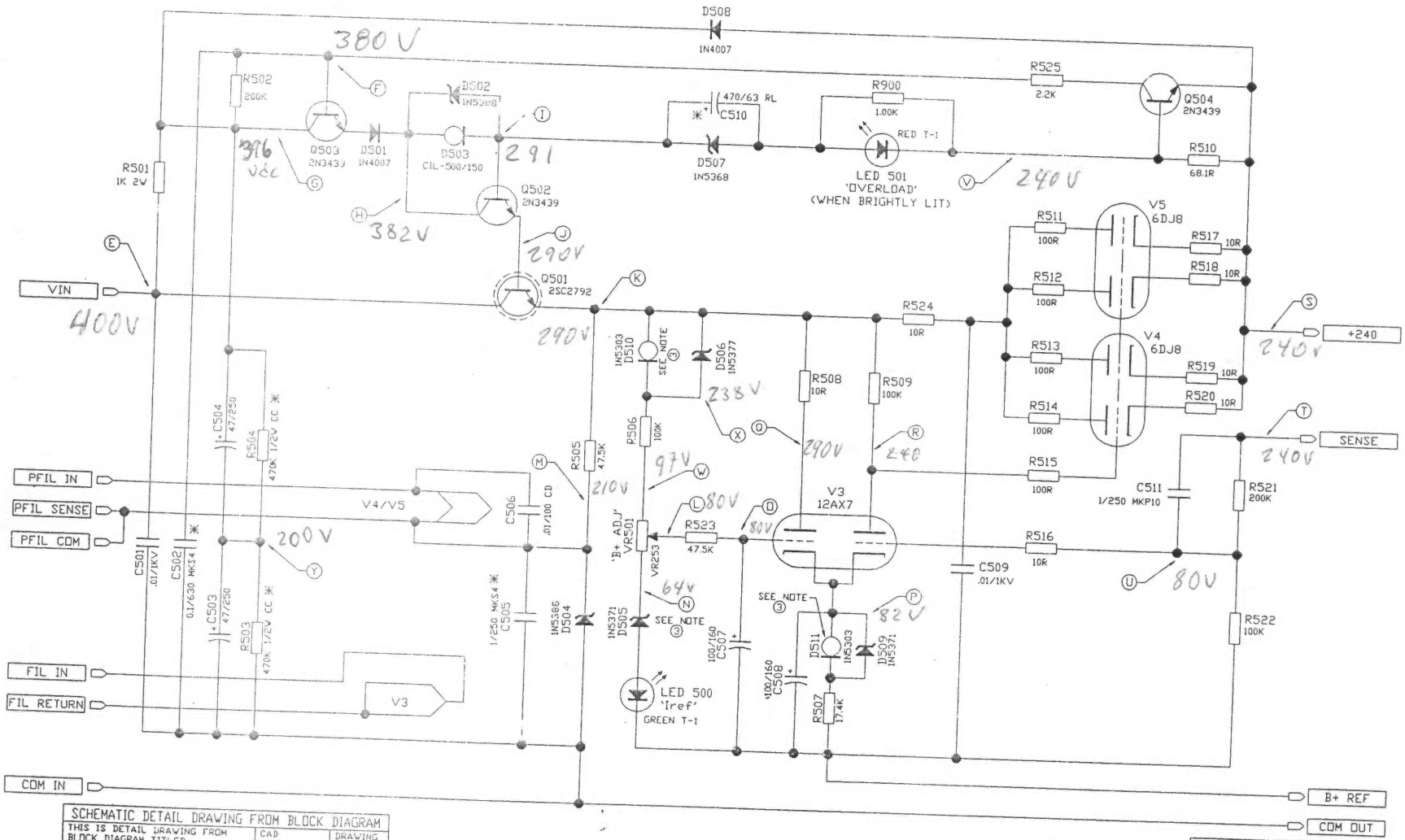
SECTION 12

SERVICE BULLETINS

SECTION 13

REVISION NOTES

REV	DESCRIPTION	DATE
-NONE-	FIRST ITERATION DRAWING FOR PROTOTYPING PURPOSES ONLY. DO NOT USE FOR PRODUCTION WITHOUT CONFIRMING CURRENT REV LEVEL.	4/21/89
A	REVISED PER PROTO	8/89



SCHEMATIC DETAIL DRAWING FROM BLOCK DIAGRAM		
THIS IS DETAIL DRAWING FROM BLOCK DIAGRAM TITLED: SA-5000 POWER SUPPLY BLOCK DIAGRAM	CAD FILENAME: SKPSBLK	DRAWING NUMBER: 70591

NOTES:
1. REFERENCED VOLTAGES (E) THROUGH (Y) REFER TO NORMAL OPERATING VOLTAGES AS SHOWN ON DRAWING NUMBER 705102 "OPERATING VOLTAGES, HIGH VOLTAGE SUPPLY."
2. FOR DESCRIPTION OF CIRCUIT, REFER TO DRAWING NUMBER 705202 "CIRCUIT DESCRIPTION, HIGH VOLTAGE SUPPLY."
3. COMPONENTS MOUNTED ON BOARD UNDERSIDE TO REDUCE DC DRIFT DUE TO AIR CURRENTS.

DRAWN	JME	REVISION	A
ON DATE	5/1/89	PRODUCT:	SA-5000

COUNTERPOINT

SCHEMATIC DIAGRAM
HIGH VOLTAGE REGULATION

CAD FILE: HVR	DWG: 705502