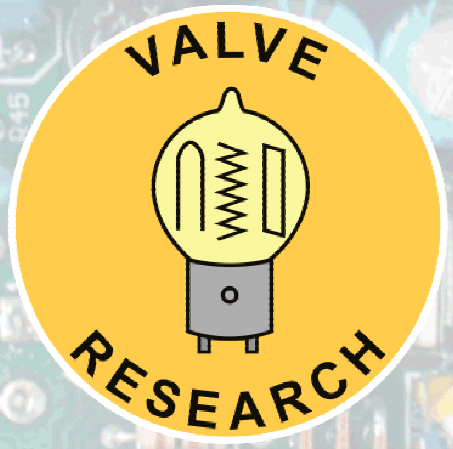
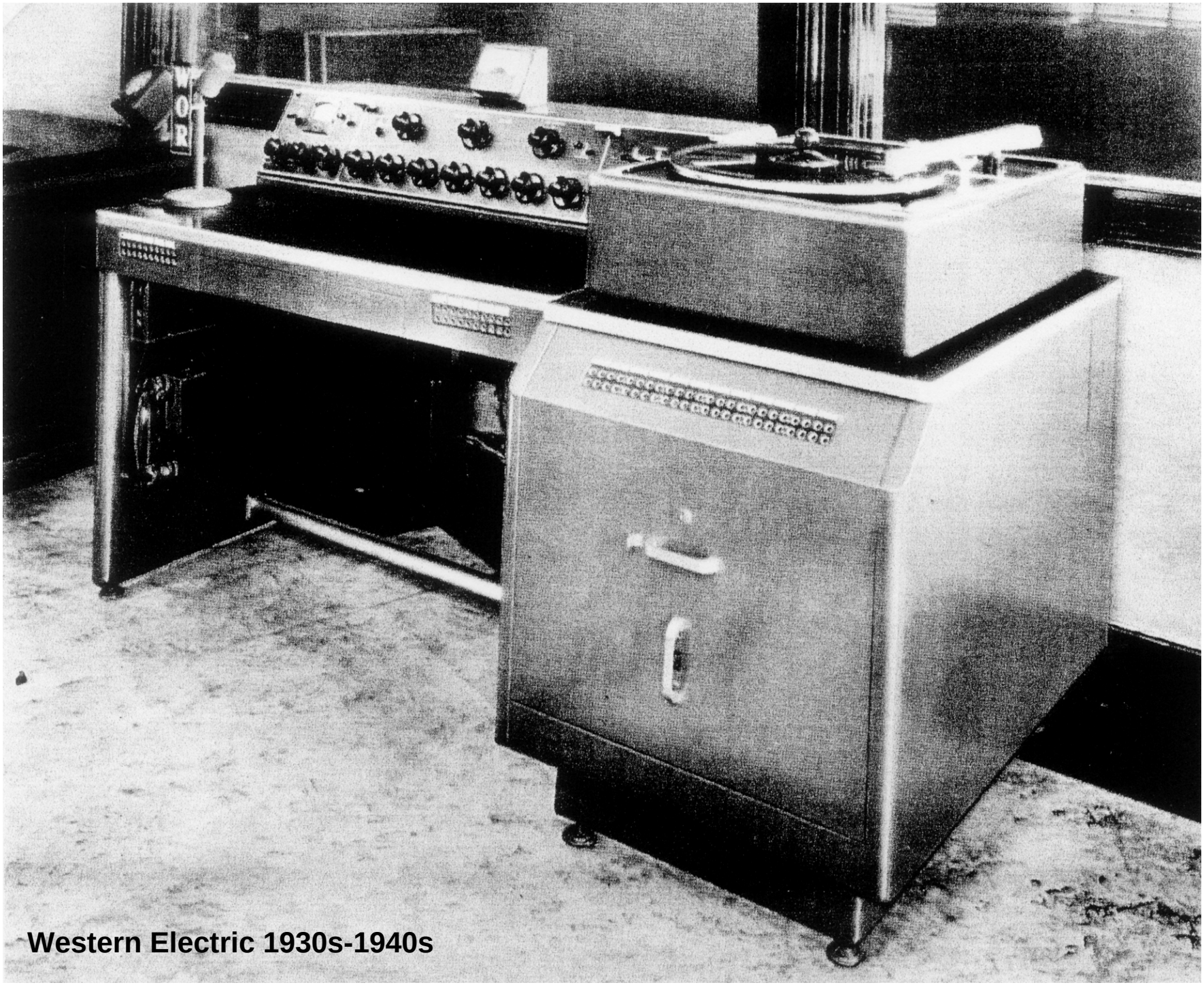
Microphone Amplifier History and Design

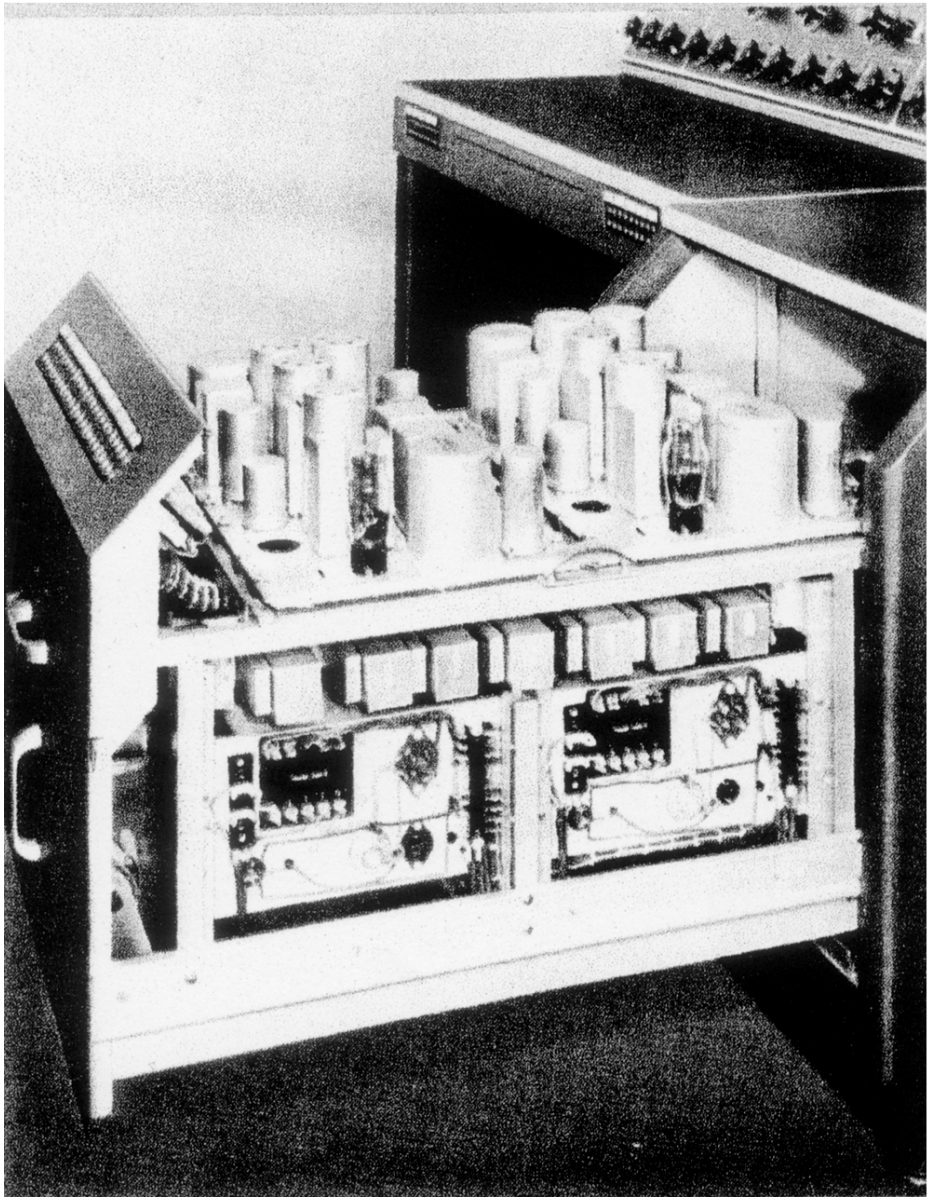
Audio Engineering Society
Adelaide Section. August 15 2006

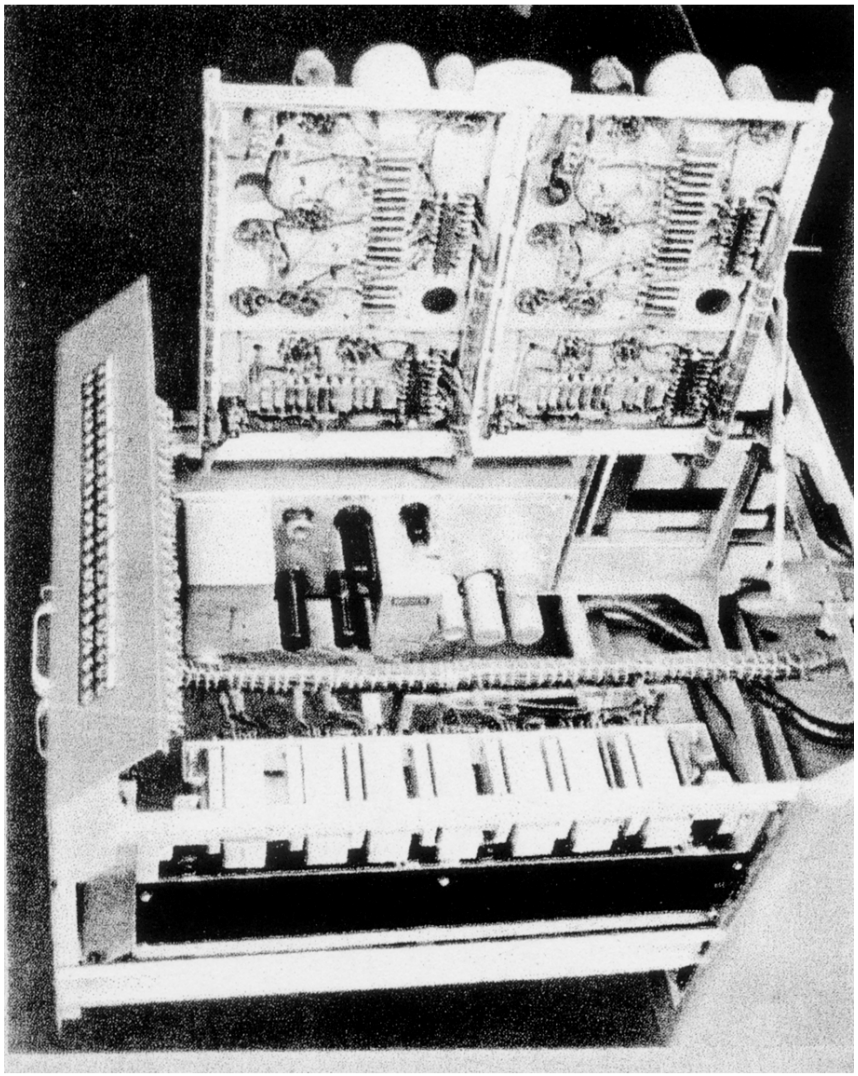


Graeme J Cohen

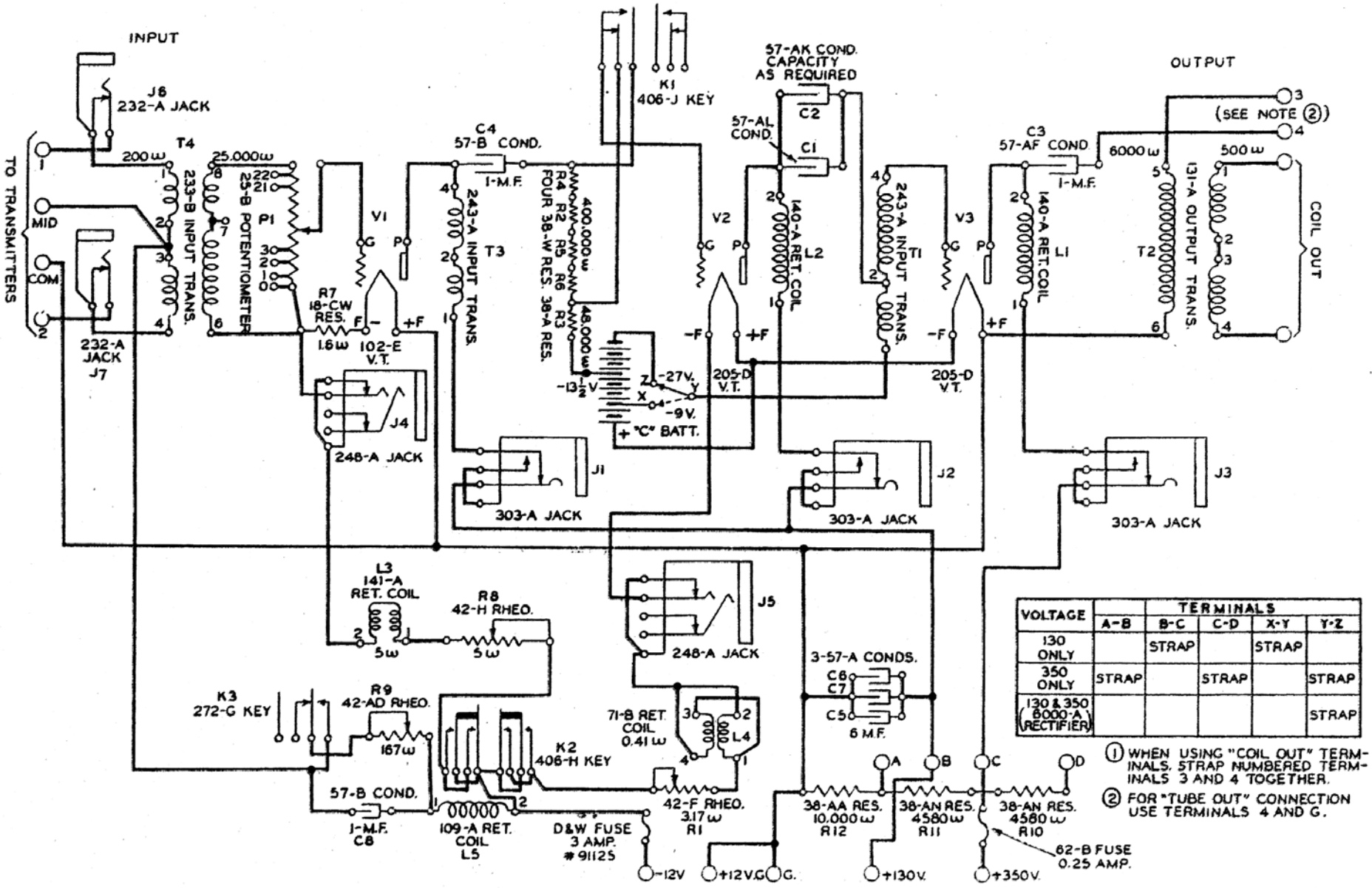


Western Electric 1930s-1940s



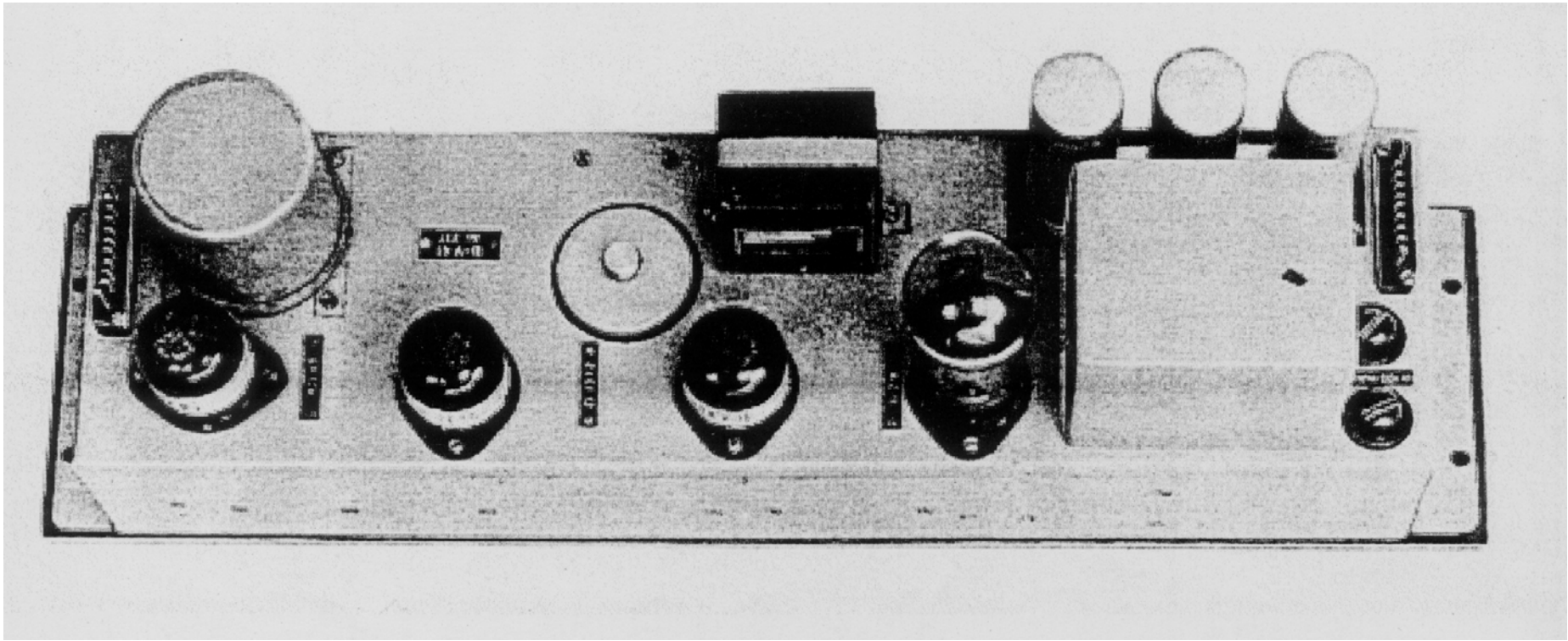


Western Electric 1930s-1940s



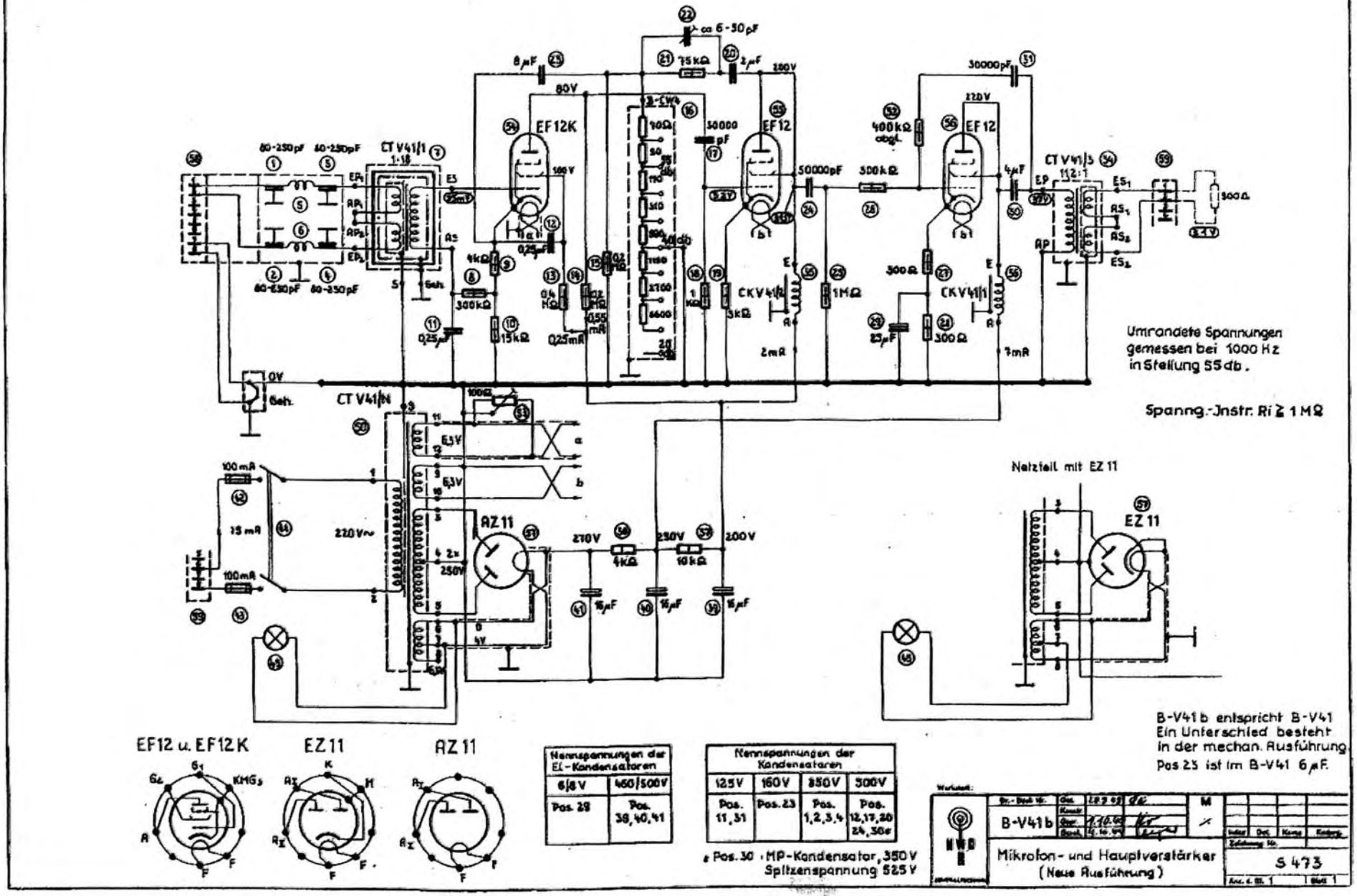
Schematic of No. 8-C Amplifier

Western Electric 1920s



German Broadcasting 1940s

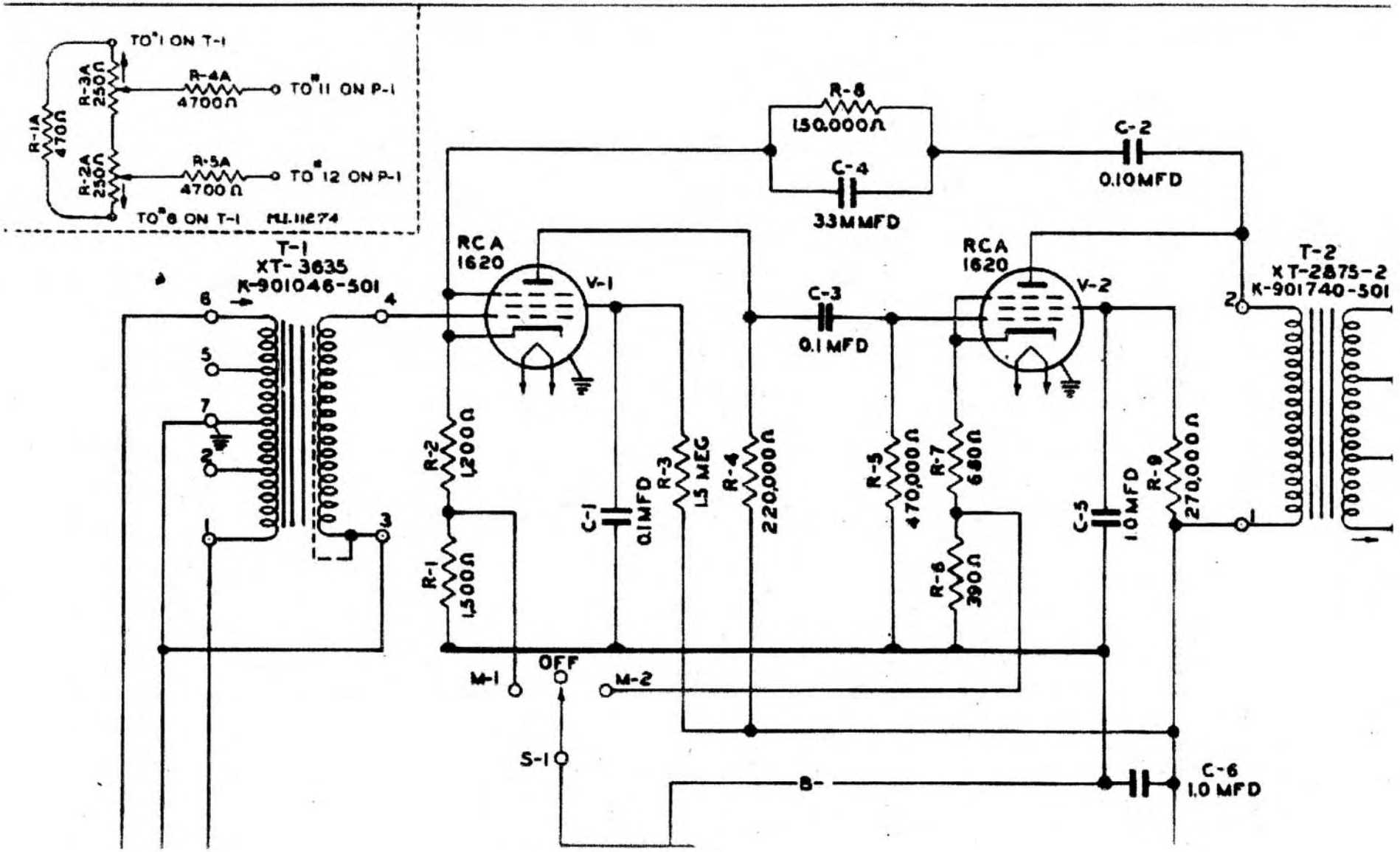
German Broadcasting 1940s



Nennspannungen der El.-Kondensatoren	
6/8 V	460/500 V
Pos. 23	Pos. 38, 40, 41

Nennspannungen der Kondensatoren			
125 V	160 V	350 V	500 V
Pos. 11, 31	Pos. 23	Pos. 1, 2, 3, 4	Pos. 12, 17, 20 24, 30*

* Pos. 30 : MP-Kondensator, 350 V Spitzenspannung 525 V



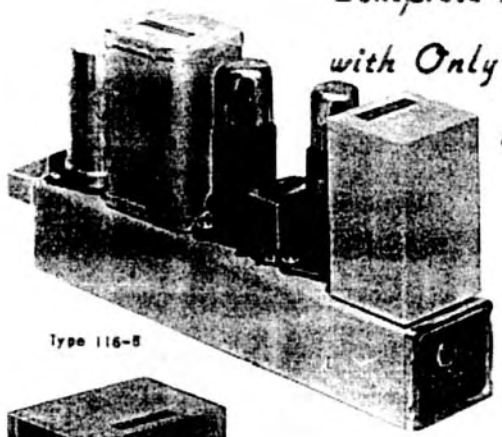
RCA BA-1A from 1945

PLUG-IN AMPLIFIERS

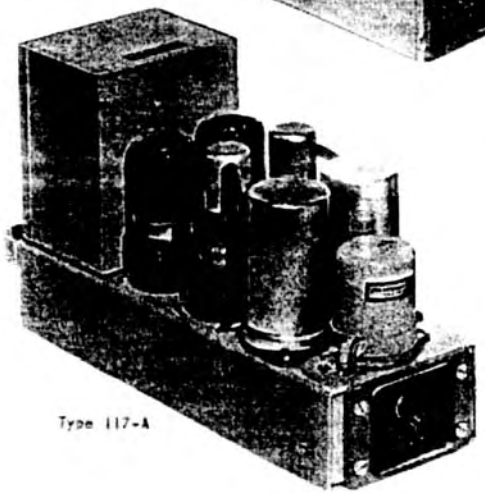
BY Langevin

TYPE 116-B . . . TYPE 117-A

Complete Plug-In Audio Facilities with Only 2 Types of Amplifiers 2 Types of Vacuum Tubes



Type 116-B



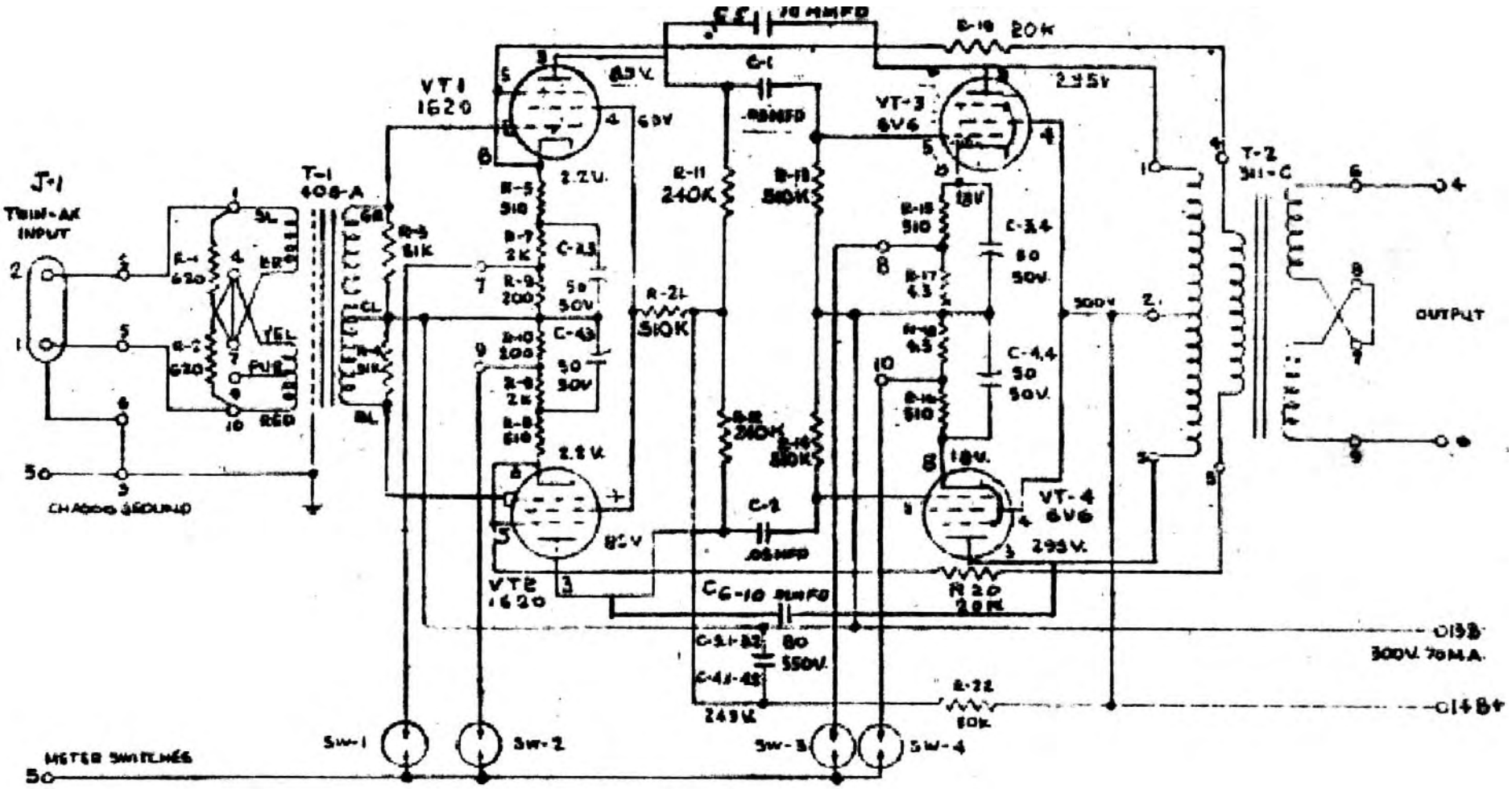
Type 117-A

- STUDIOS STAY IN SERVICE
- LOWER OPERATING COST
- LOWER MAINTENANCE COST
- LOWER INVENTORIES
- RACK SPACE-SAVERS
- AMPLIFIERS EXCEED FCC QUALITY REQUIREMENTS FOR FM
- AMPLIFIERS PROVIDE HIGH OVERLOAD SAFETY FACTOR

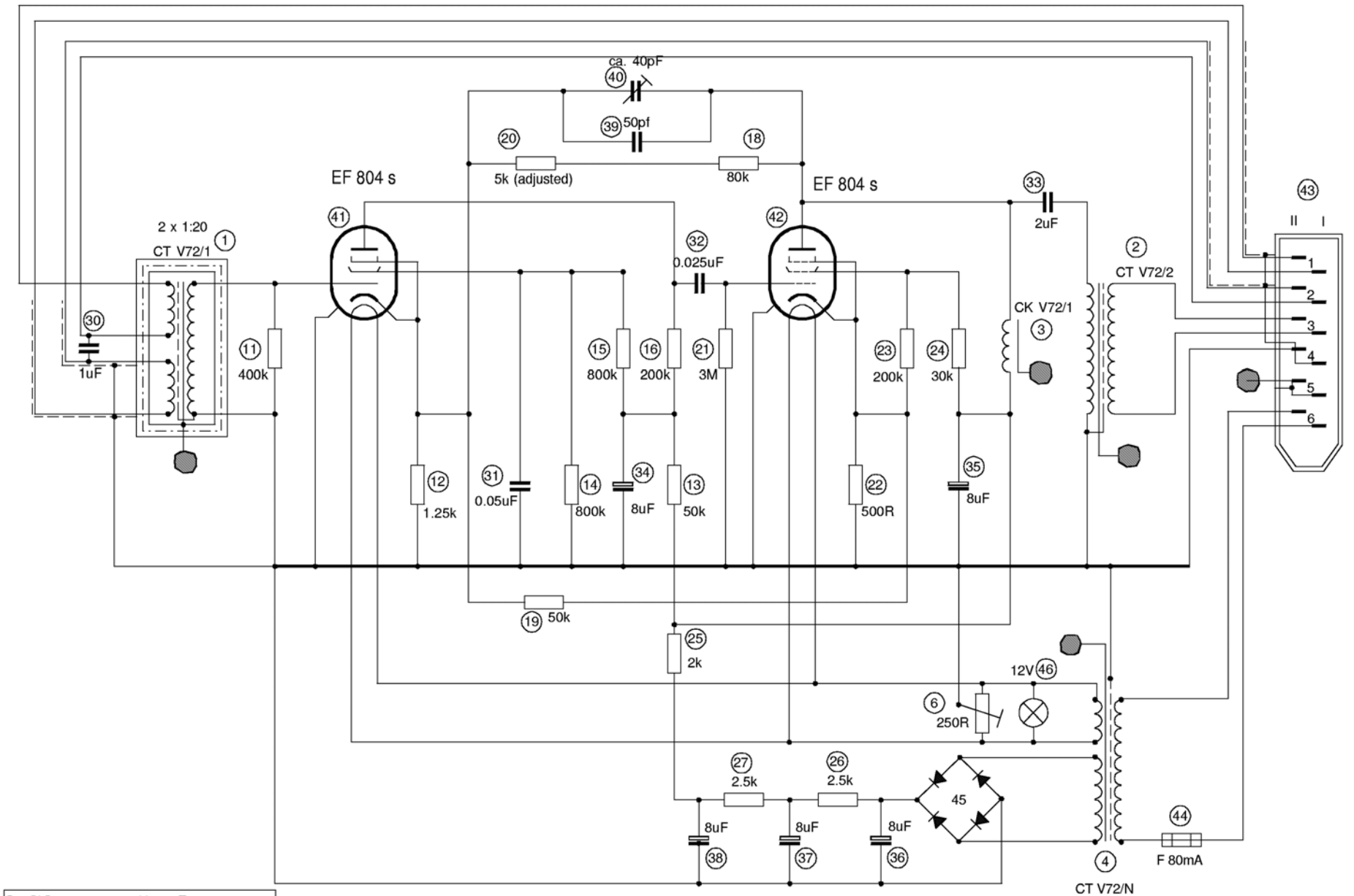
MAXSON INSTRUMENT CORP. • LONG ISLAND CITY, N.Y.

Langevin

1940s - 1950s



Langevin 1947



from Serial No. 1001

Position	Volt	Type
39	500V	Keramik
30	3V~	Papierkond.
31;32	250V	Papierkond.
33	250V	MP-Kond.
34;35;36;37;38	450V	Elkos

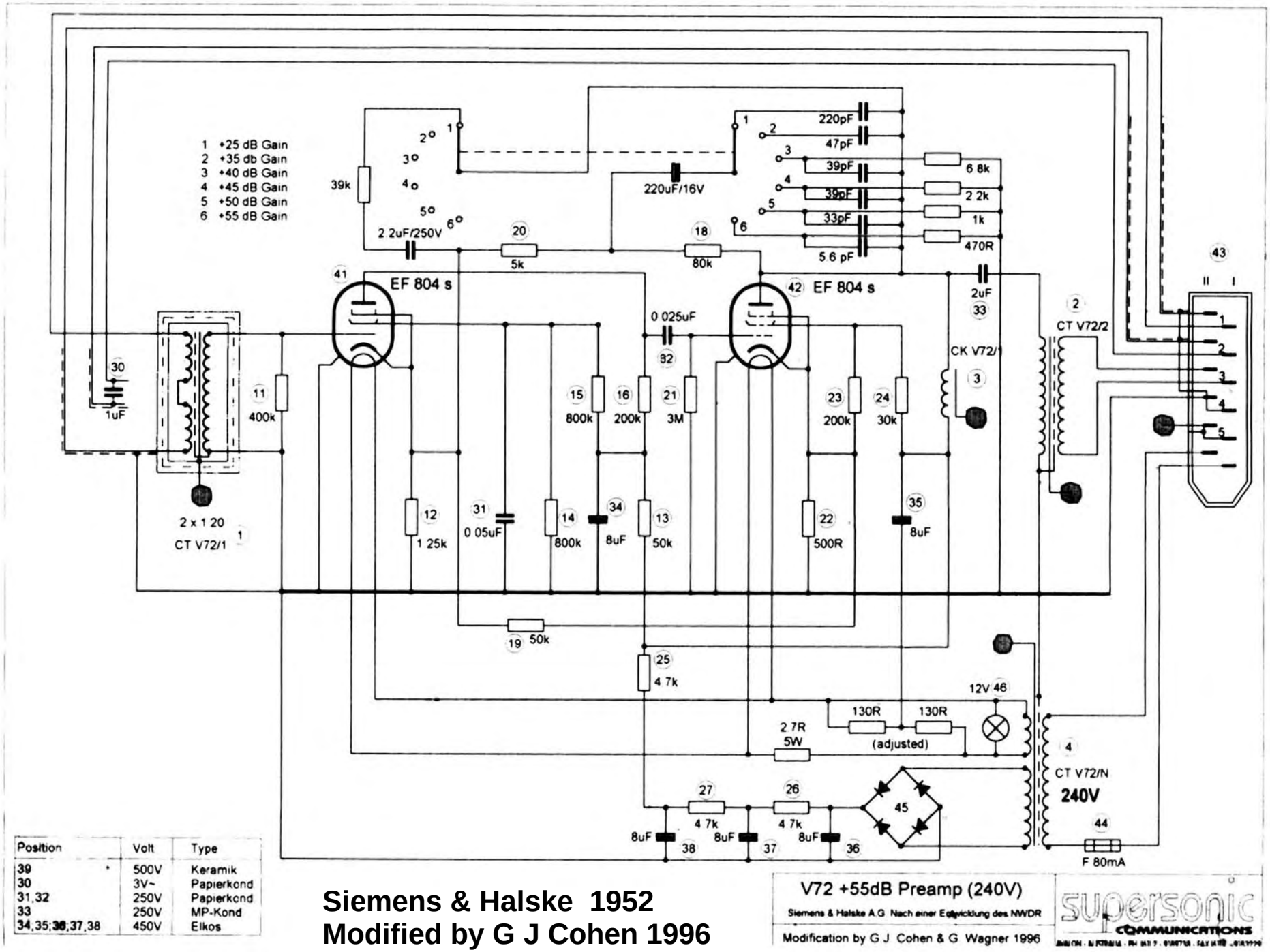
Siemens & Halske 1952

Studioverstaerker V72

Siemens & Halske A.G.
Nach einer Entwicklung des NWDR

Date of original diagram: 30.8.52

redrawn by:
supersonic COMMUNICATIONS



Position	Volt	Type
39	500V	Keramik
30	3V~	Papierkond
31,32	250V	Papierkond
33	250V	MP-Kond
34,35,36,37,38	450V	Elkos

Siemens & Halske 1952
Modified by G J Cohen 1996

V72 +55dB Preamp (240V)

Siemens & Halske A.G. Nach einer Entwicklung des NWDR

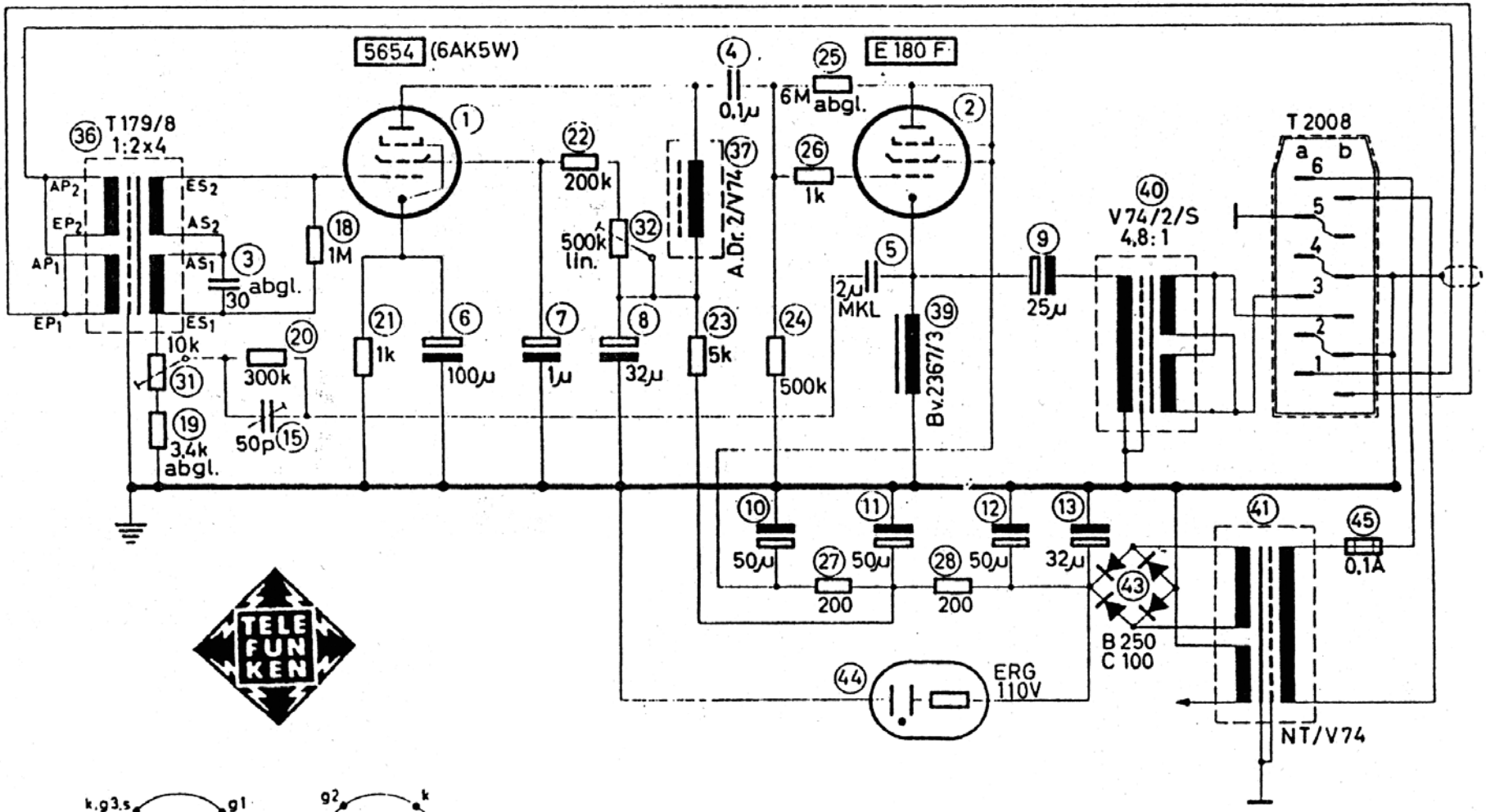
Modification by G J Cohen & G Wagner 1996

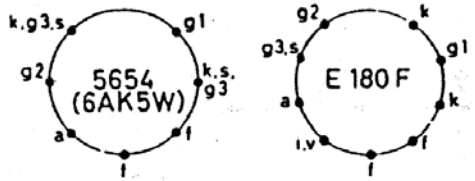
supersonic COMMUNICATIONS

März 1962

Studio Verstärker V 72 a

A IV, 60-1





Blockierungsstellung 1 (wie V 72)

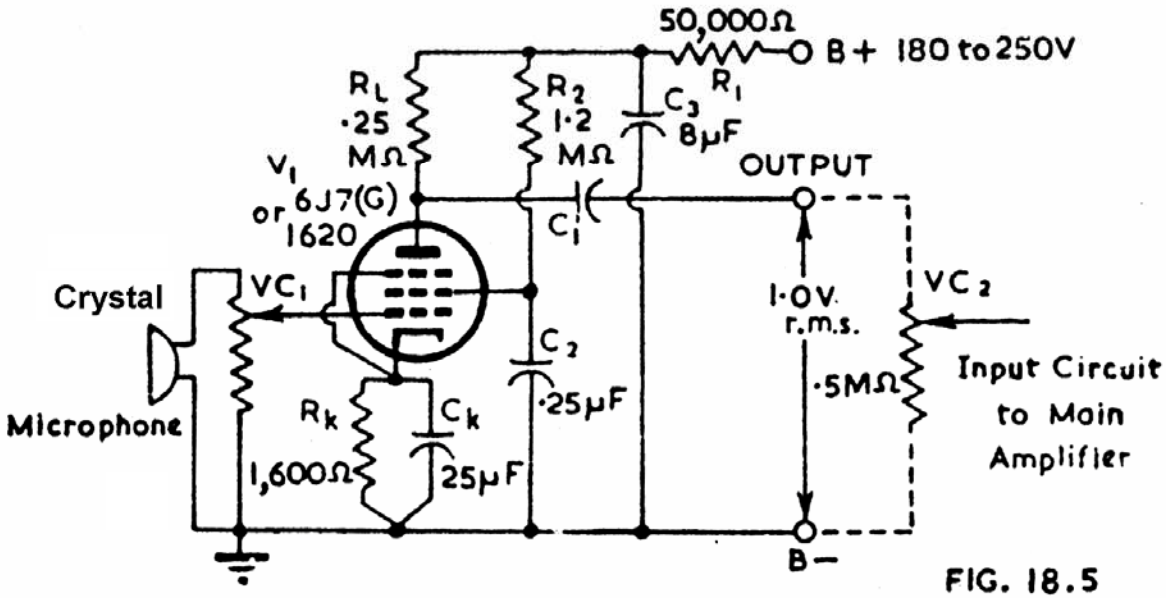


FIG. 18.5

Fig. 18.5. Single stage pentode pre-amplifier for use with diaphragm-type crystal microphone.

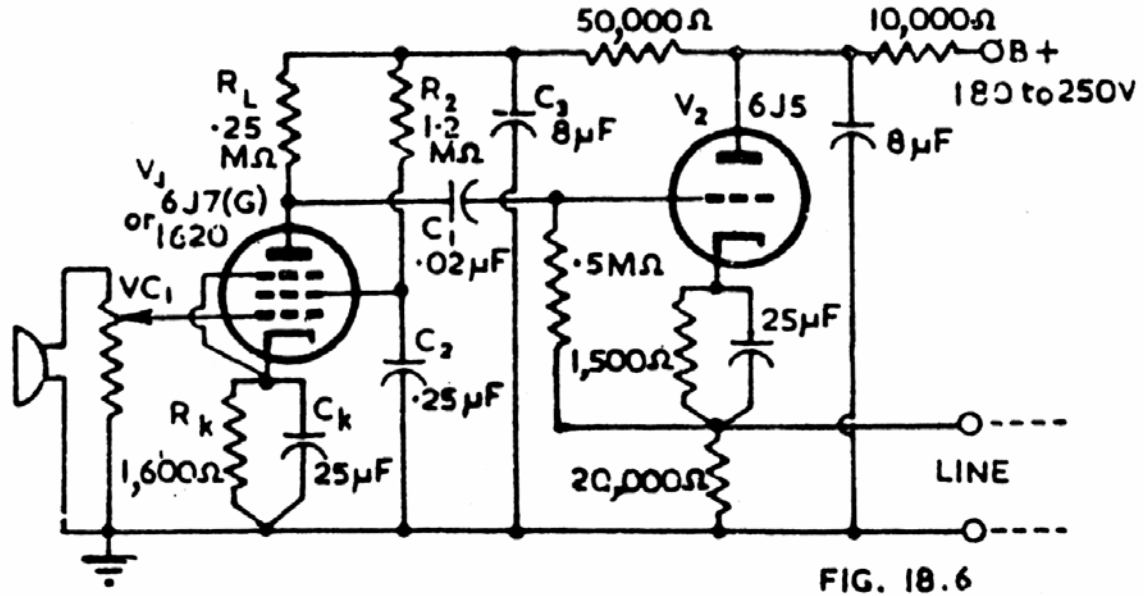


FIG. 18.6

Fig. 18.6. Single stage pentode pre-amplifier followed by cathode follower, for use with diaphragm-type crystal microphone.

Radiotron Designer's handbook 4th ed. P789

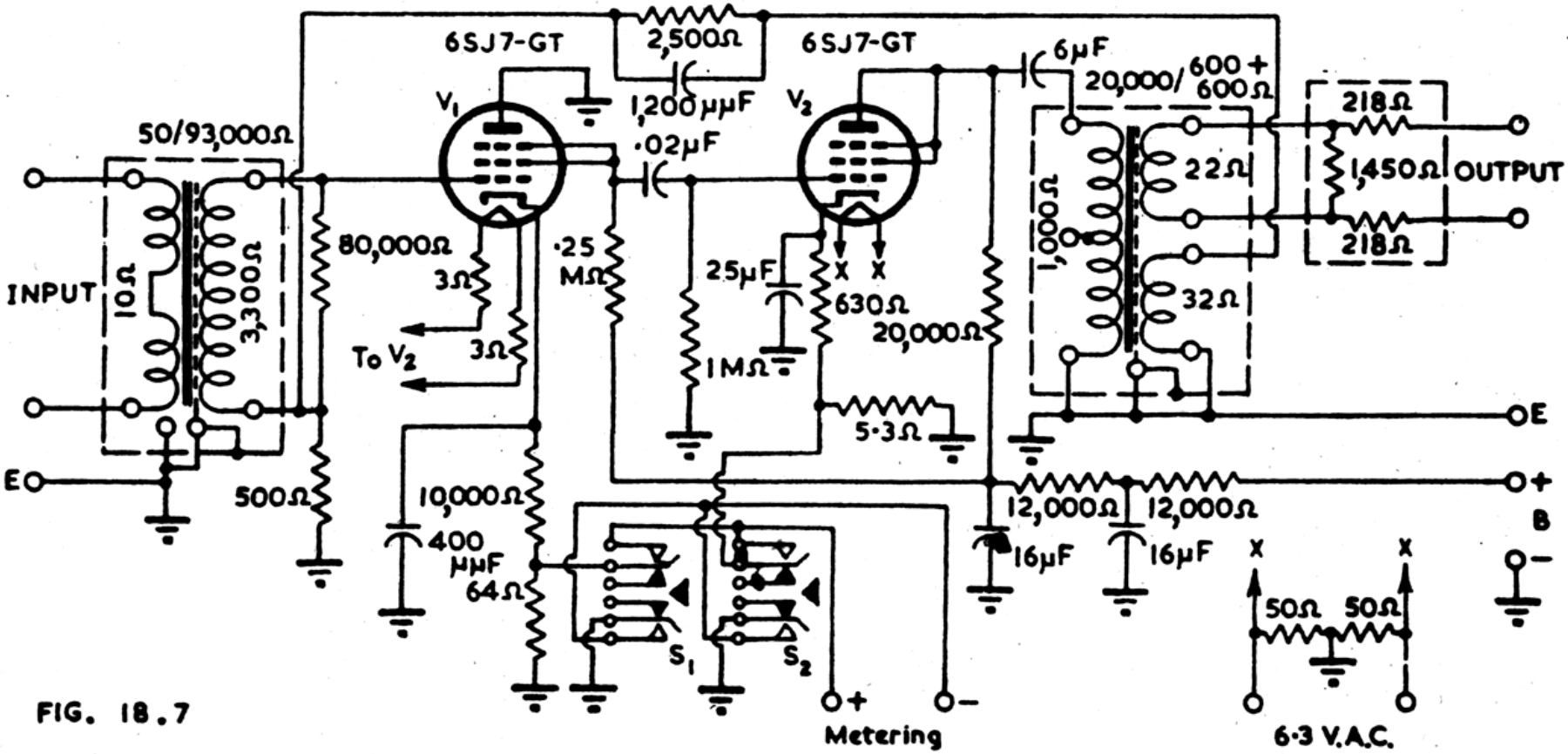


Fig. 18.7. Two stage broadcast station microphone pre-amplifier with gain of 29 db.

Radiotron Designer's handbook 4th ed. P790

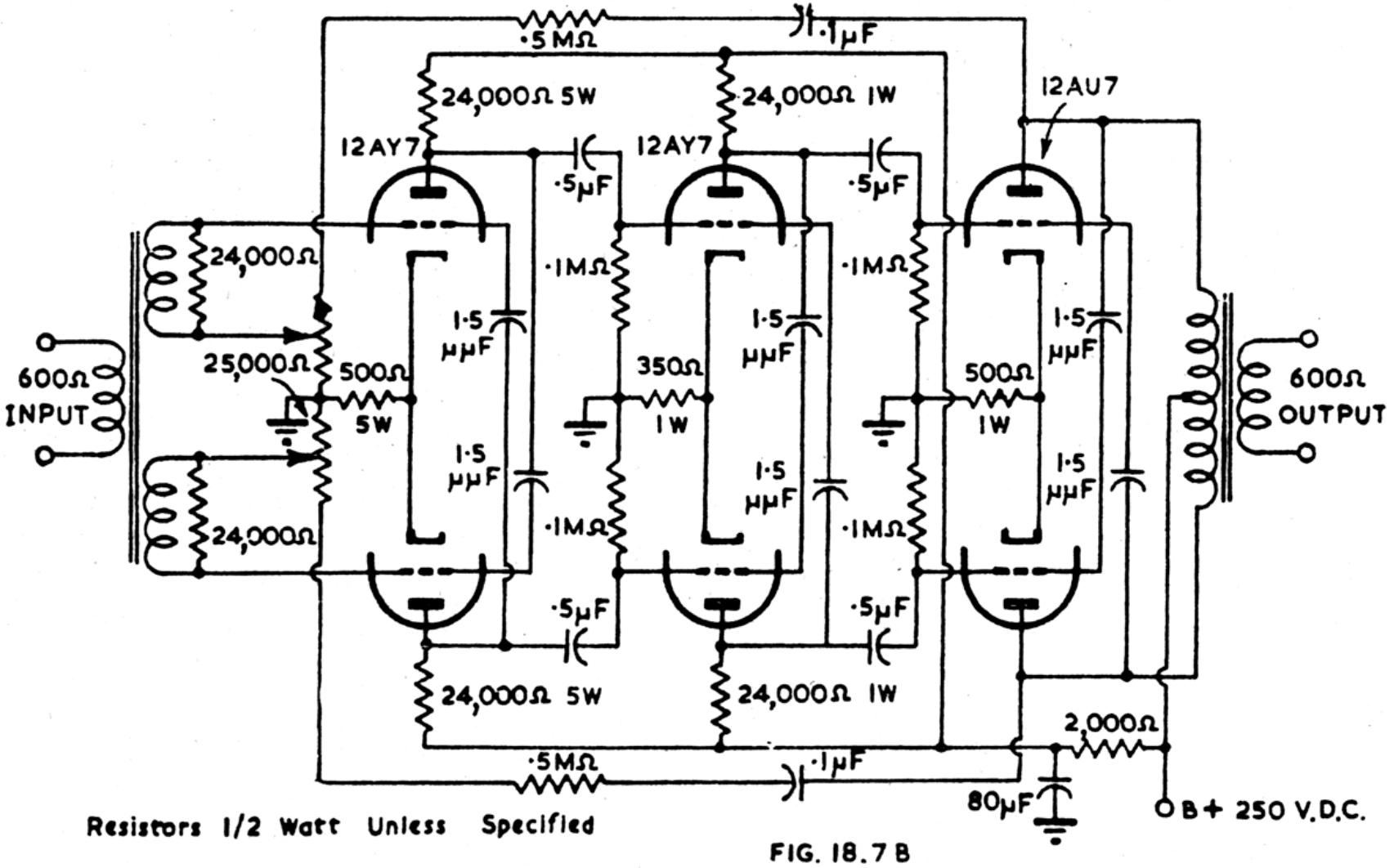
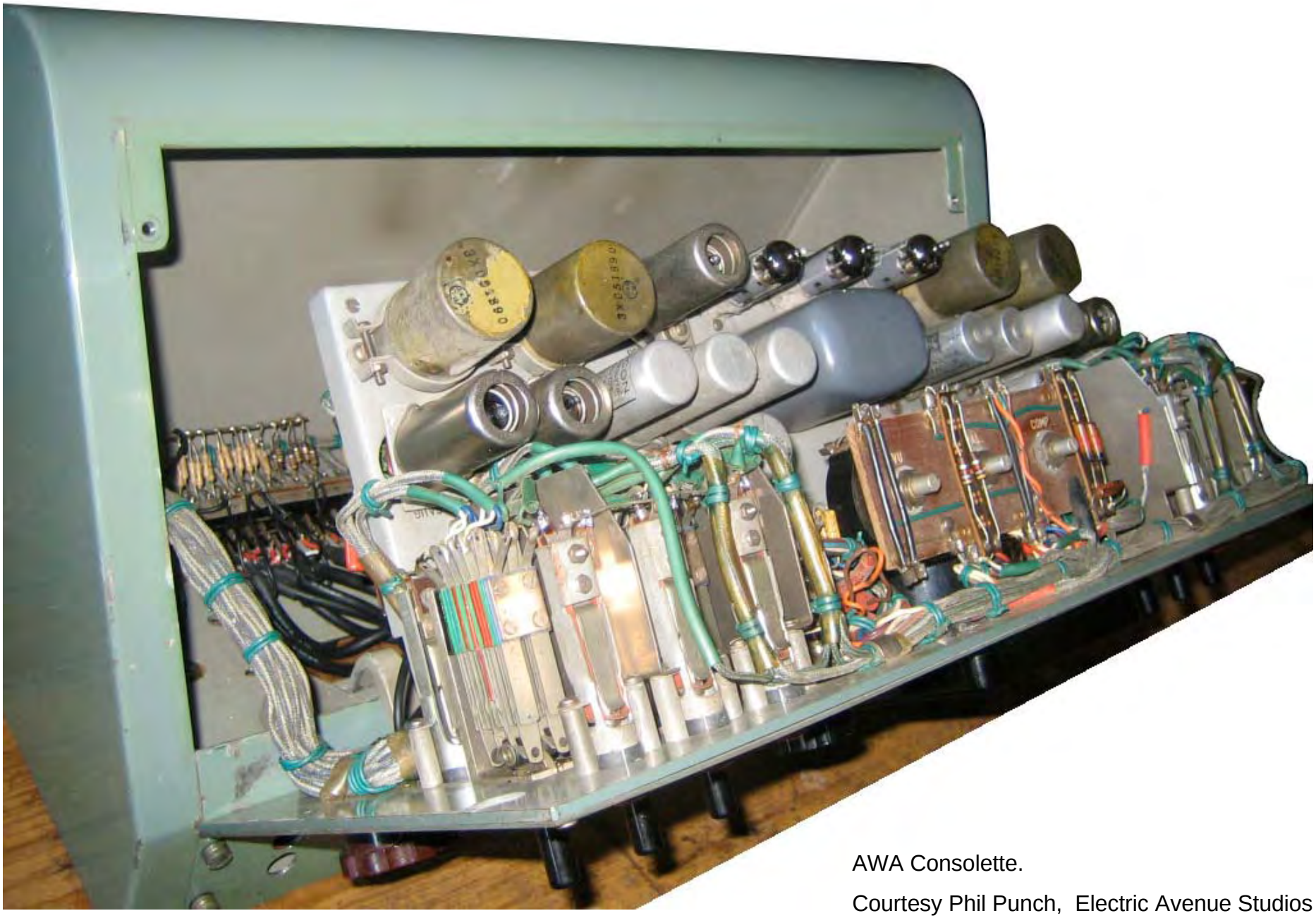


FIG. 18.7 B

Fig. 18.7B. *Three-stage balanced cross-neutralized pre-amplifier using two* 12*AY*7 *valves and* 12*AU*7 (*Ref. B*17).

AWA Consolette.

Courtesy Phil Punch, Electric Avenue Studios



AWA Consolette.

Courtesy Phil Punch, Electric Avenue Studios

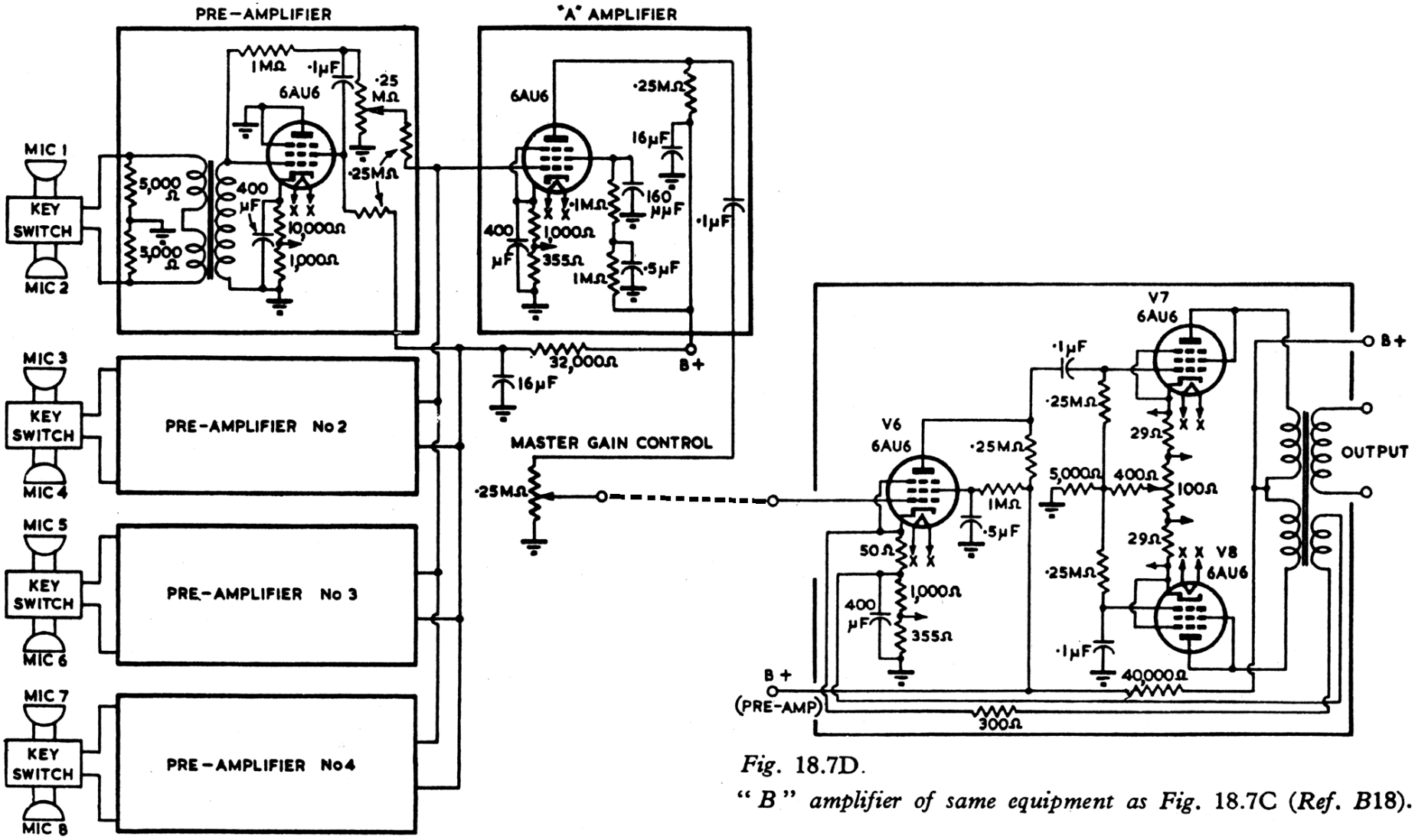
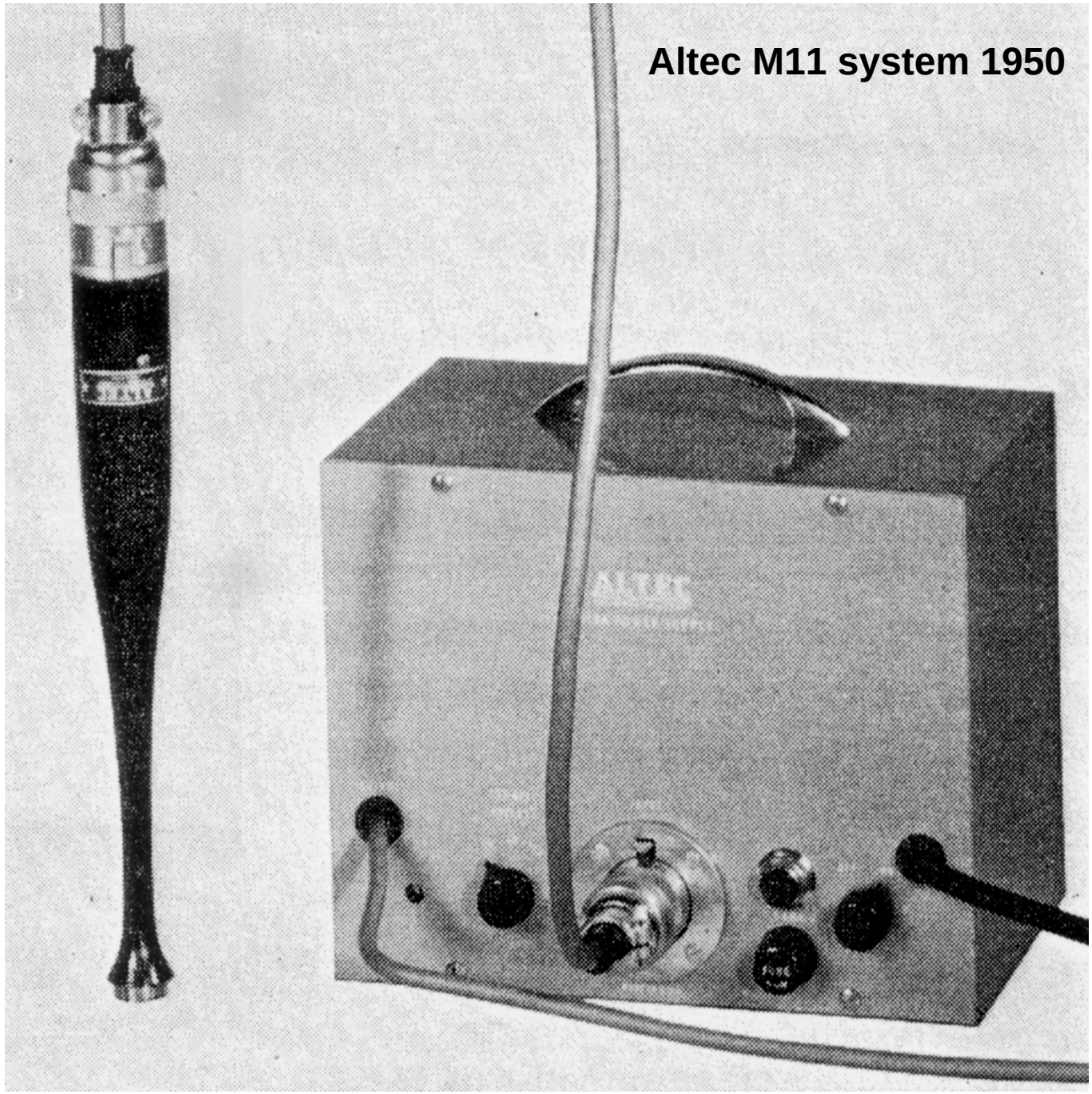


Fig. 18.7D.
"B" amplifier of same equipment as Fig. 18.7C (*Ref. B*18).

Fig. 18.7C. *Essential amplifying and attenuating circuits of pre-amplifiers and "A" amplifier of single unit equipment for studio use* (*Ref. B*18). *See also Fig.* 18.7D.

Radiotron Designer's handbook 4th ed. P792-793


Altec M11 system 1950

Altec M11 system 1950

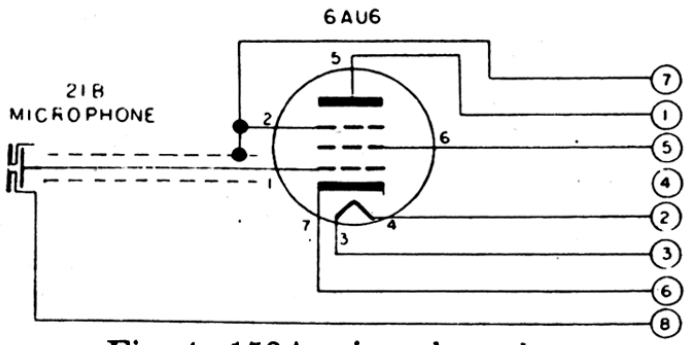


Fig. 4. 150A microphone base.

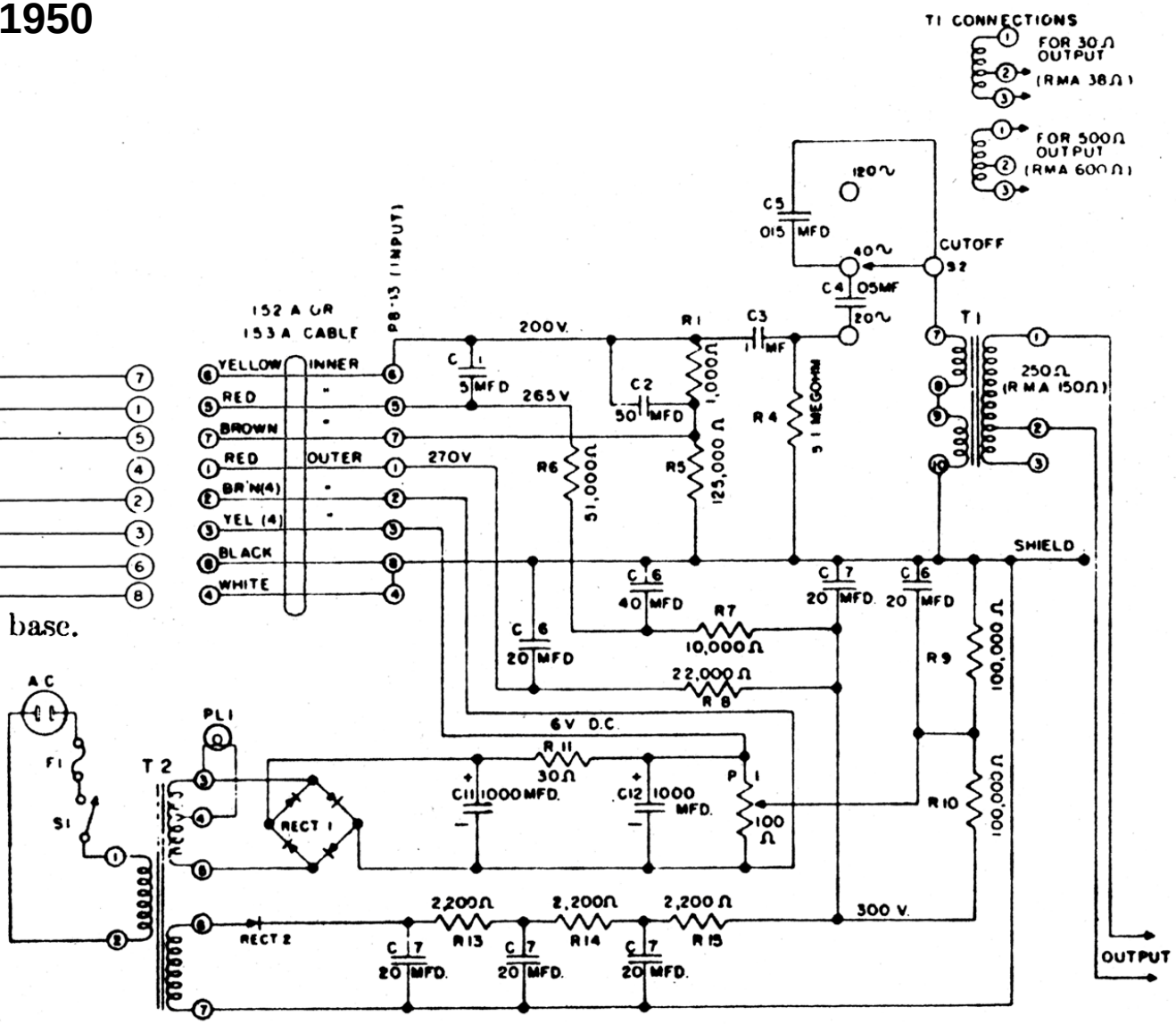
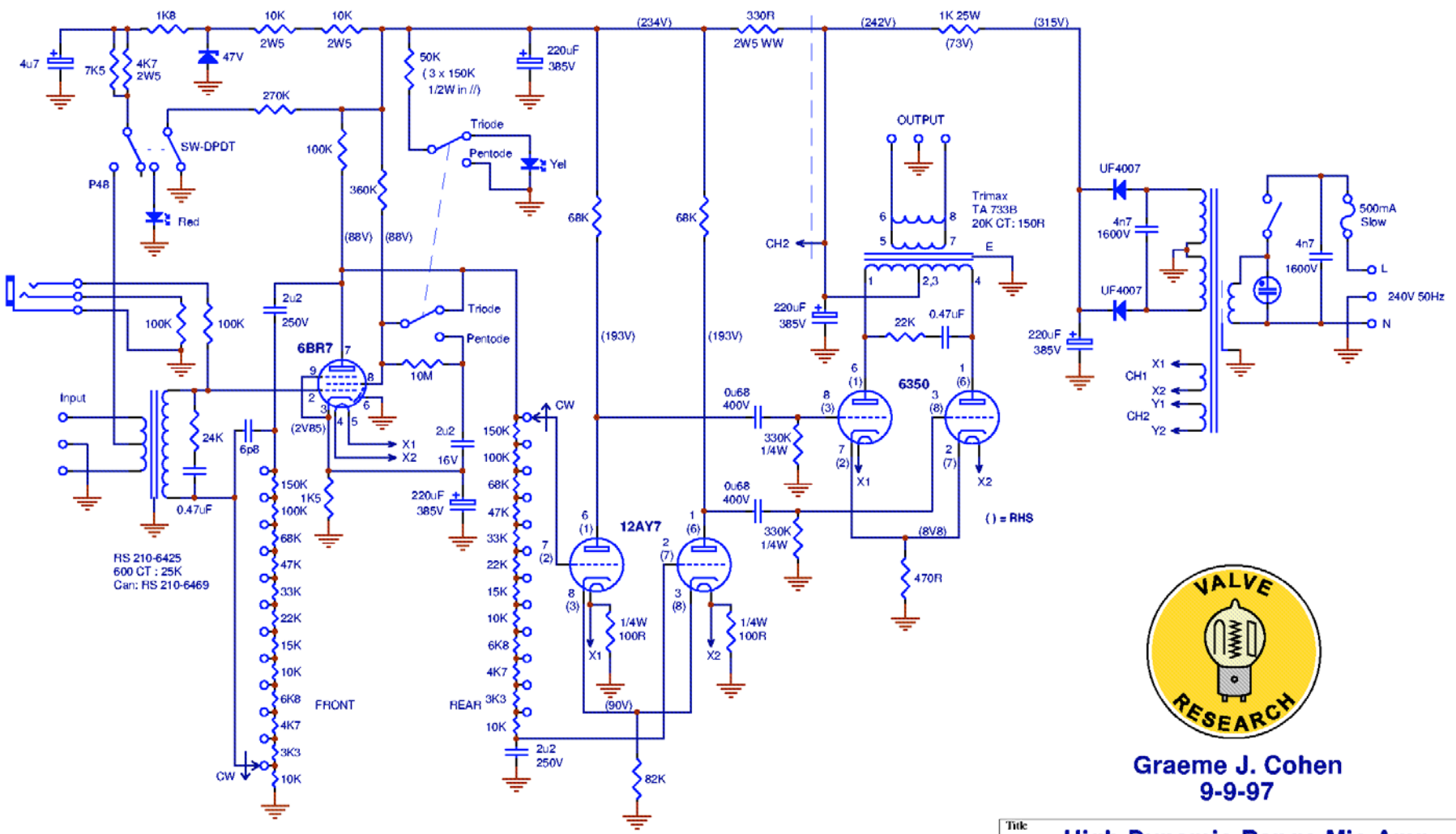


Fig. 6. P-518 power supply.


1K8
10K 2W5
10K 2W5
(234V)
330R 2W5 WW
(242V)
1K 25W
(73V)
(315V)
4u7
7K5
4K7 2W5
47V
50K (3 x 150K 1/2W in //)
220uF 385V
270K
SW-DPDT
P48
Red
100K
360K
(88V)
(88V)
Triode
Pentode
Yel
68K
68K
(193V)
(193V)
OUTPUT
CH2
Trimax TA 733B 20K CT: 150R
E
UF4007
4n7 1600V
UF4007
500mA Slow
L
240V 50Hz
N
4n7 1600V
220uF 385V
22K
0.47uF
220uF 385V
X1
CH1
X2
Y1
CH2
Y2
100K
100K
2u2 250V
6BR7
Triode
Pentode
10M
Input
24K
6p8
(2V85)
X1
X2
2u2 16V
220uF 385V
0u68 400V
330K 1/4W
6350
0u68 400V
330K 1/4W
( ) = RHS
(8V8)
470R
CW
150K
100K
68K
47K
33K
22K
15K
10K
6K8
4K7
3K3
10K
12AY7
1/4W 100R
1/4W 100R
(90V)
82K
150K
1K5
100K
68K
47K
33K
22K
15K
10K
6K8
4K7
3K3
10K
FRONT
REAR
CW
2u2 250V
0.47uF
HS 210-6425
600 CT : 25K
Can: HS 210-6469
VALVE RESEARCH
Graeme J. Cohen
9-9-97
Title
High Dynamic Range Mic Amp
Size
A4
Number
Revision
1.0
Date:
2-Aug-2006
Sheet 1 of
1
File:
HDRMA10.SCH
Drawn By:
I. DuHIEU

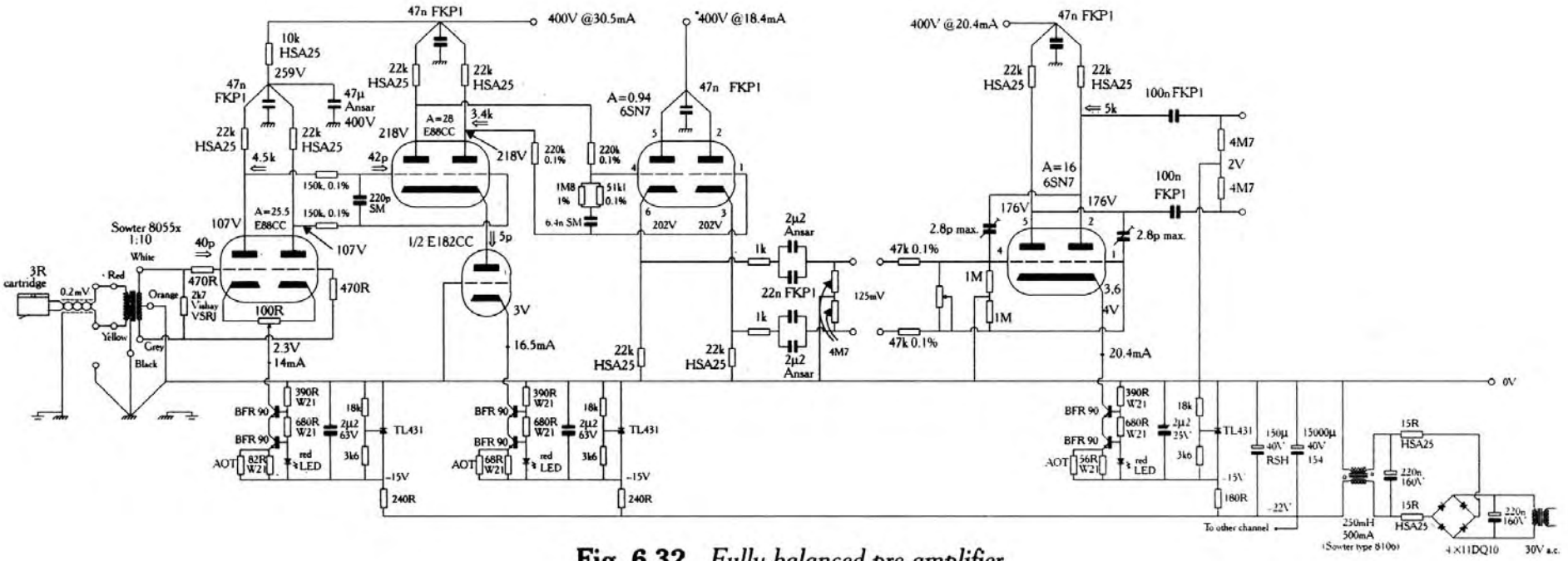
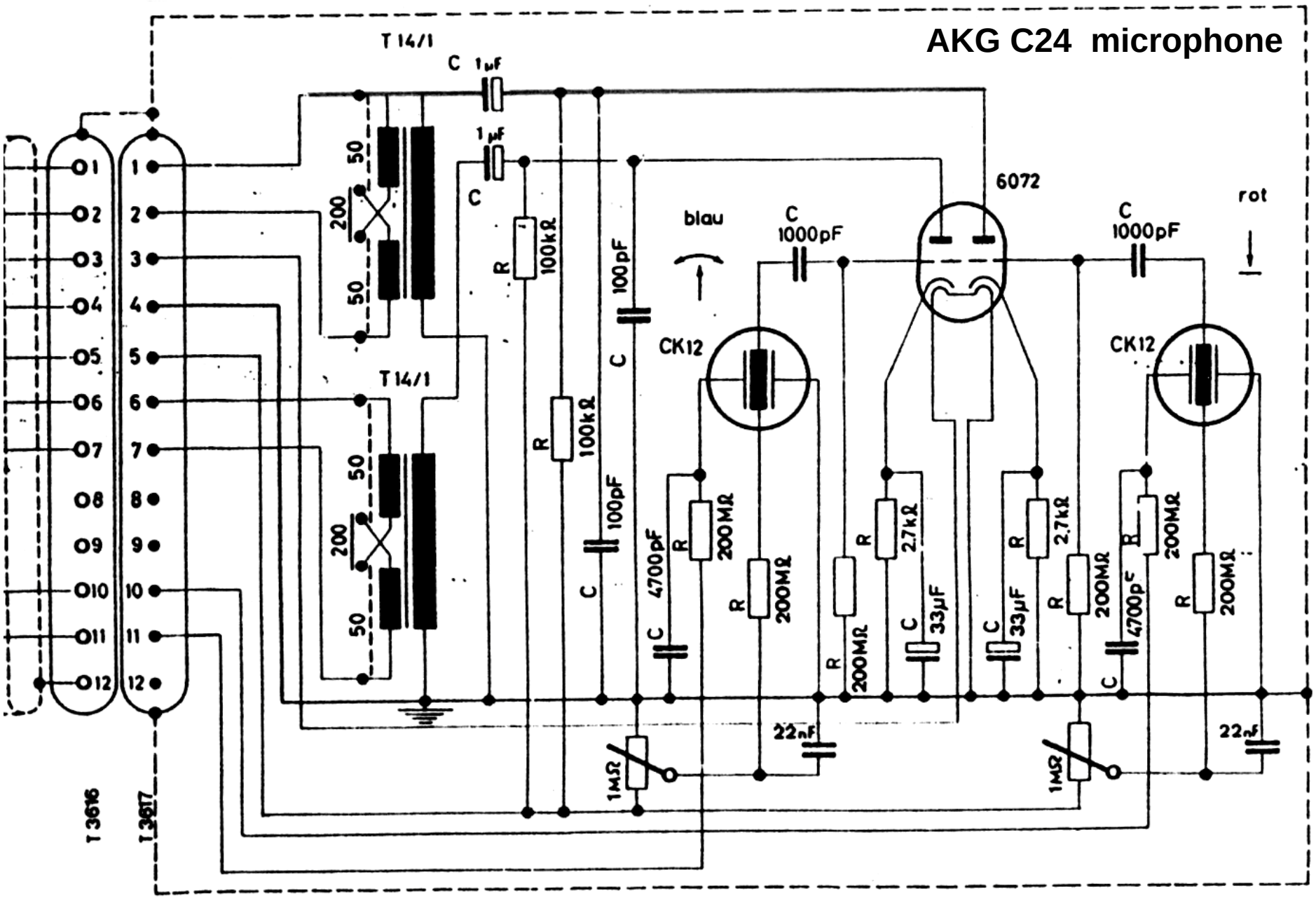


Fig. 6.32 *Fully-balanced pre-amplifier*

Morgan Jones 1995

AKG C24 microphone



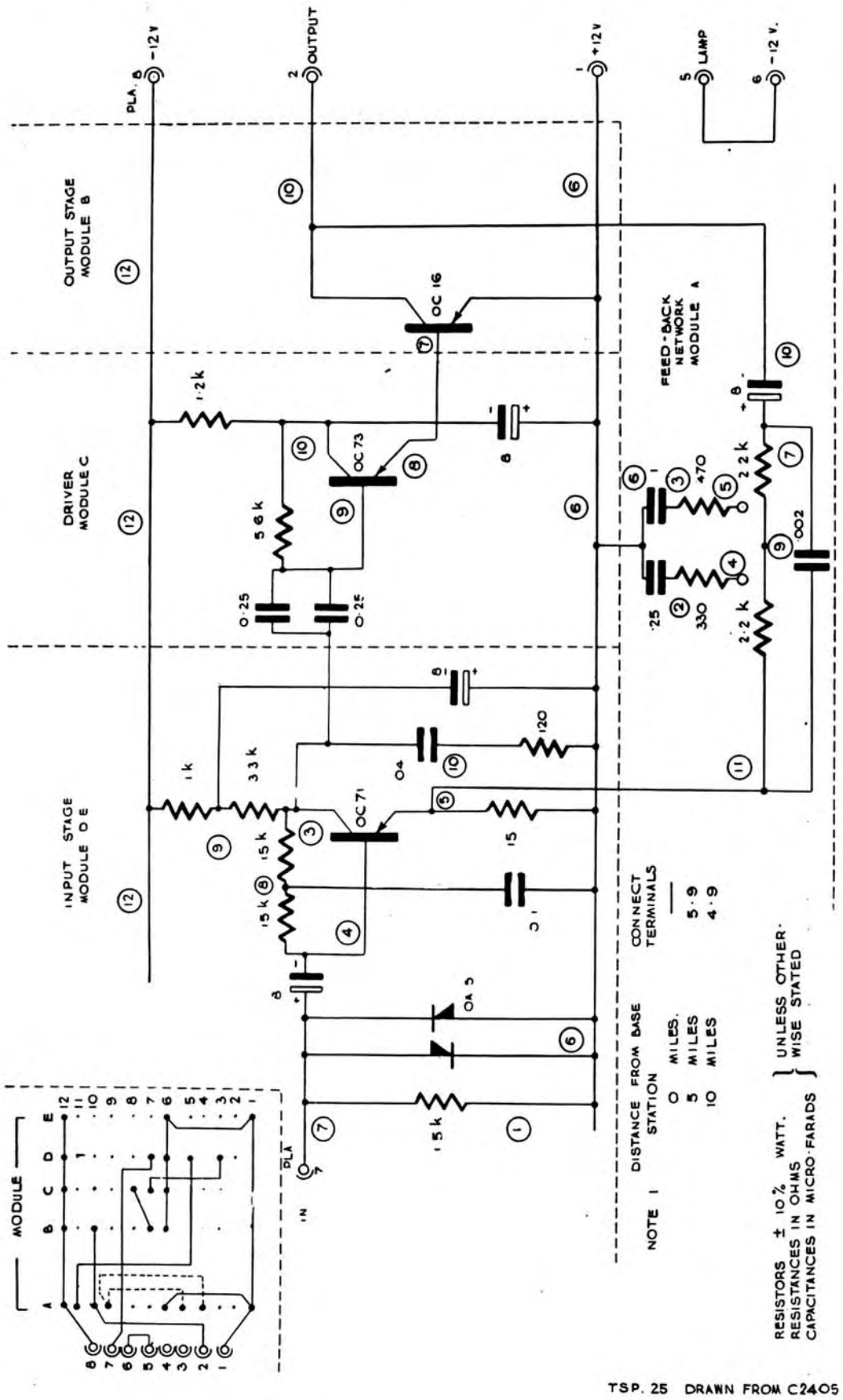
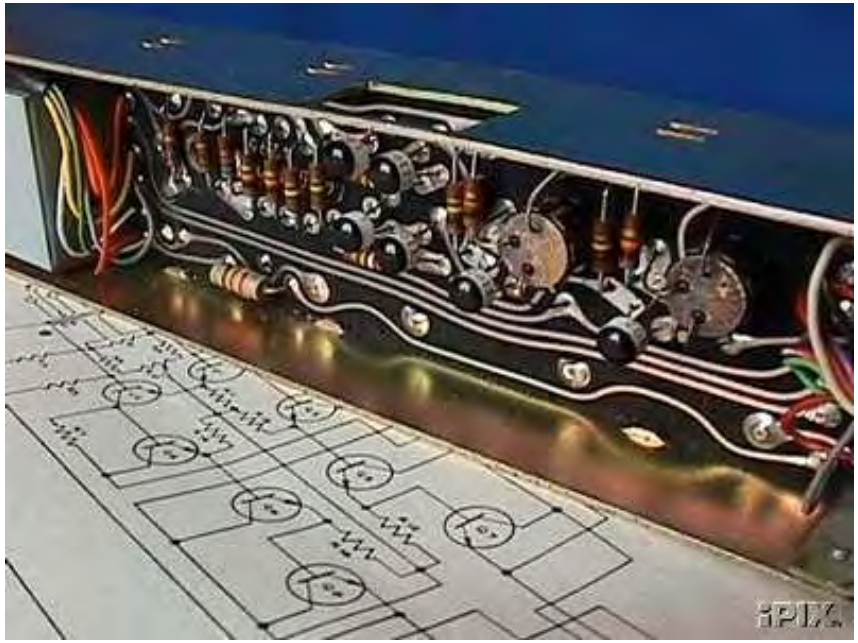
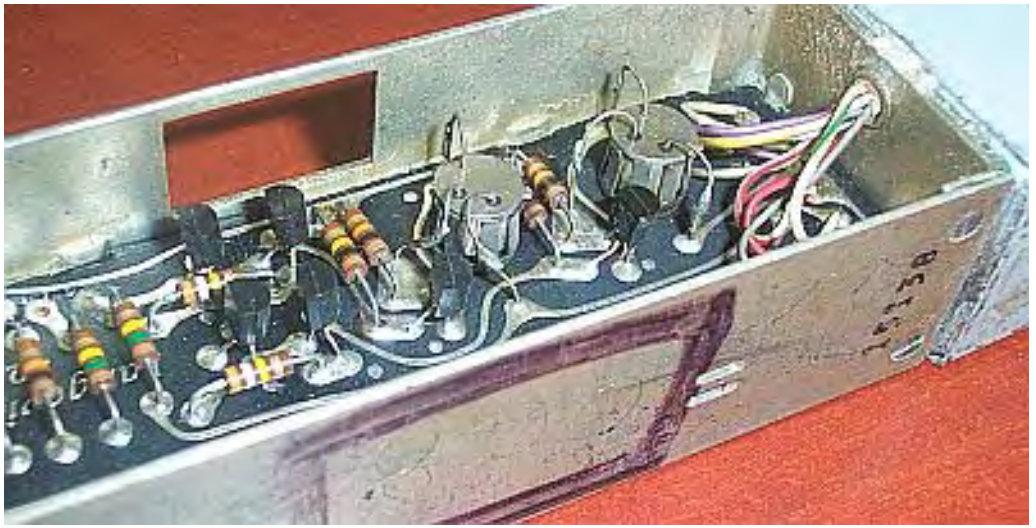


Figure 33.—Circuit diagram of intercommunication amplifier plug-in unit.

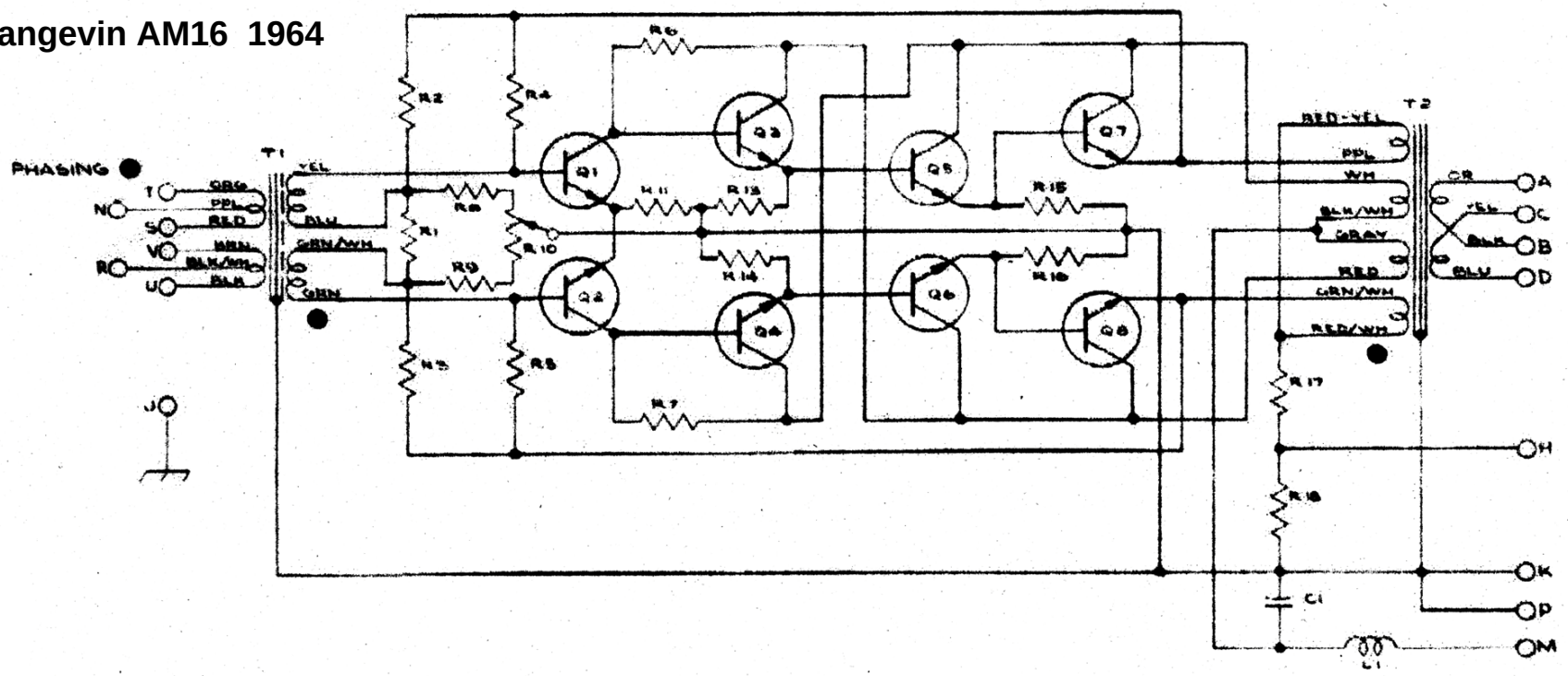




Langevin AM16 1961

John Hall is credited with this design, and he subsequently left Langevin and went to Altec where his name can be found on the similar PP 9470A/9475A amps of 1964.

Langevin AM16 1964



architects' and engineers' specifications

The amplifier shall be Langevin AM16. It shall be plug-in. It shall have magnetically and electrostatically shielded input and output transformers. Input impedances shall be 50, 150 and 600 ohms. Output impedances shall be 150 and 600 ohms. All strapping for impedance and "high-low-power" shall be on the tray or cabinet which receives the amplifier, and not on the amplifier proper. Noise level shall not exceed an equivalent input of -127 dbm, unweighted. Gain at 1 Kc shall be 45 ± 0.5 db. When strapped for high power, harmonic generation at +24 dbm shall not exceed 0.75% from 30 cps to 20 Kc. When on low power, supply current demand shall be reduced, and harmonic generation at +18 dbm shall not exceed 0.5% from 30 cps to 20 Kc. Response at approx. +14 dbm shall be uniform ±0.5 db from 20 cps to 20 Kc. Amplifier shall employ only silicon transistors, and no electron tubes. It shall not contain any electrolytic capacitors, nor any part with known shelf or service life. Size shall be approx. 1 3/4" high, 1 1/4" wide, and 10 1/2" long not including plug pins. Plug pins shall be gold-plated. Color scheme shall be gray and iridited cadmium plate.

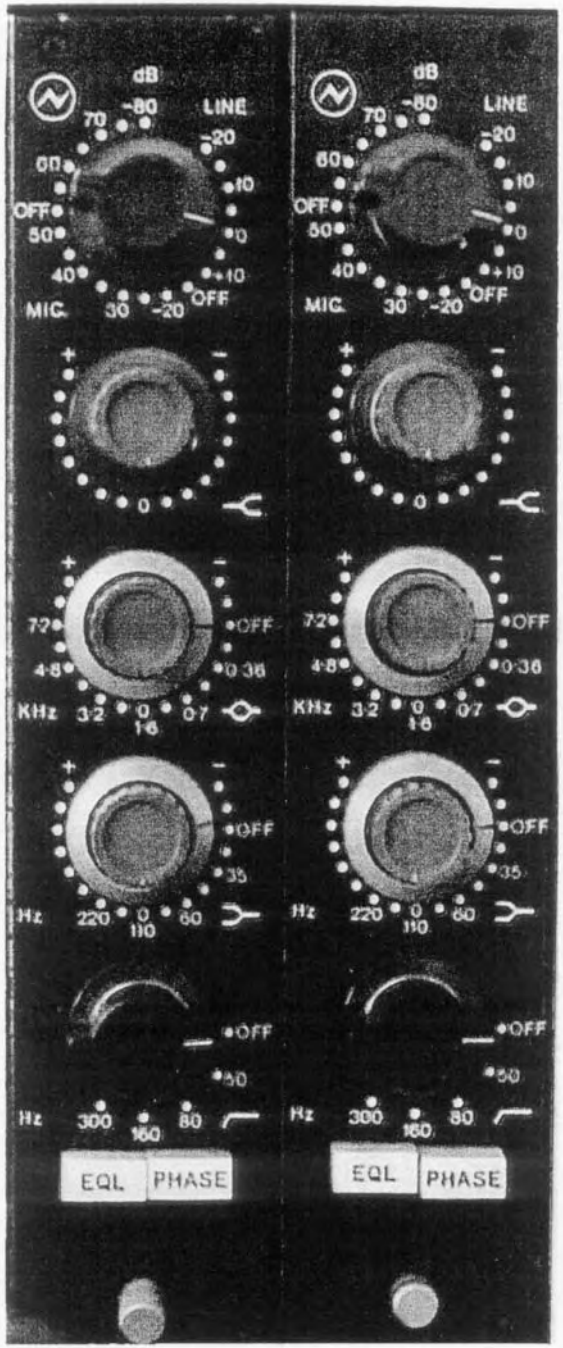
AM16 AMPLIFIER

Neve

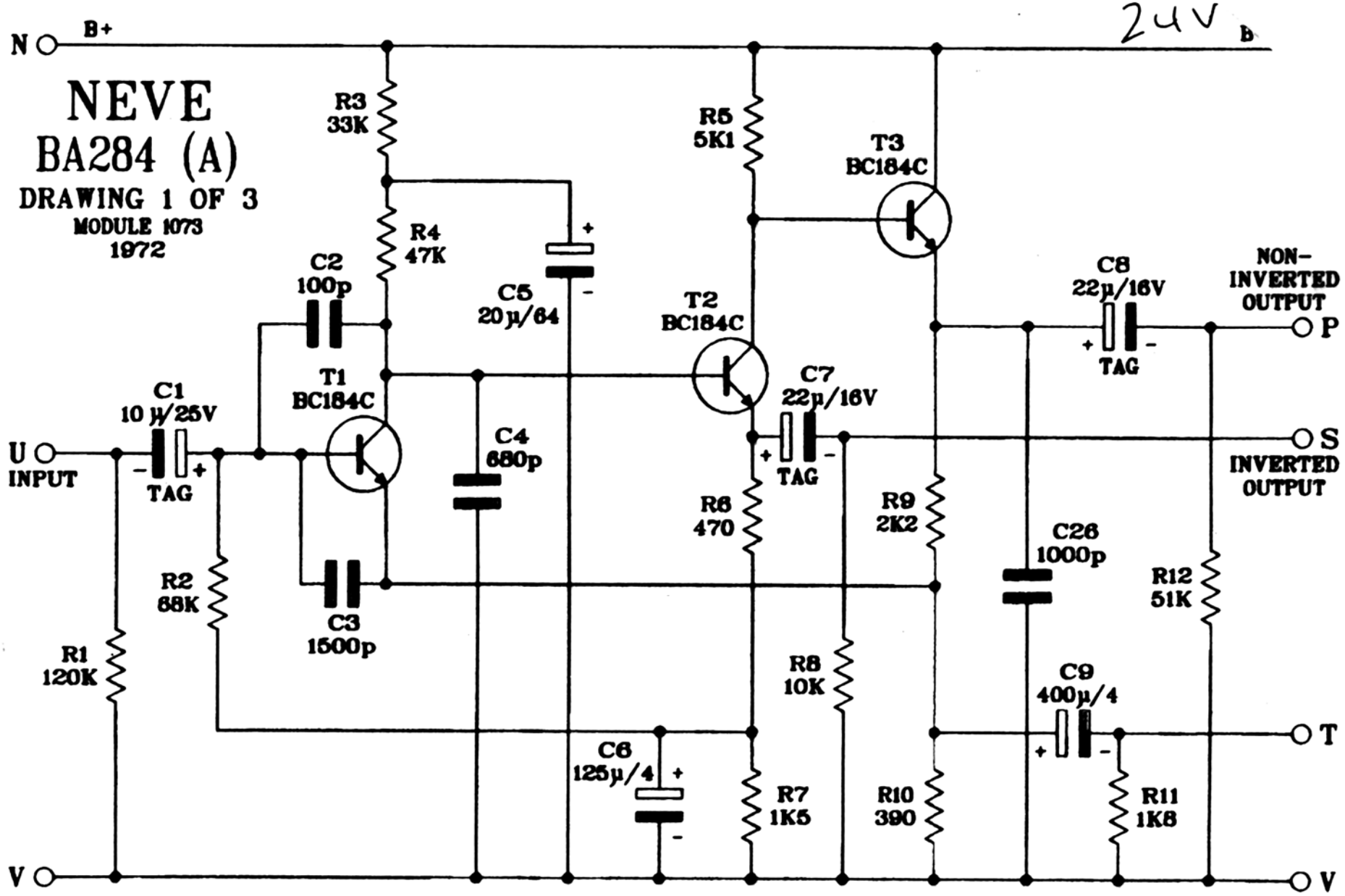
1073
Channel
Amplifier
&
1272
Microphone
Preamplifier

Manual
And
Schematics

Including:
*Detailed descriptions and schematics for all circuits.
*Modifications and parts sources.
*Transformer information.



1972


N
B+
24V
NEVE
BA284 (A)
DRAWING 1 OF 3
MODULE 1073
1972
R3
33K
R4
47K
C2
100p
C5
20µ/64
T1
BC184C
C1
10µ/25V
TAG
U
INPUT
C4
680p
R2
68K
C3
1500p
R1
120K
V
R5
5K1
T3
BC184C
T2
BC184C
C7
22µ/16V
TAG
R6
470
R9
2K2
C8
22µ/16V
TAG
NON-
INVERTED
OUTPUT
P
S
INVERTED
OUTPUT
C26
1000p
R12
51K
R8
10K
C9
400µ/4
T
C6
125µ/4
R7
1K5
R10
390
R11
1K8
V

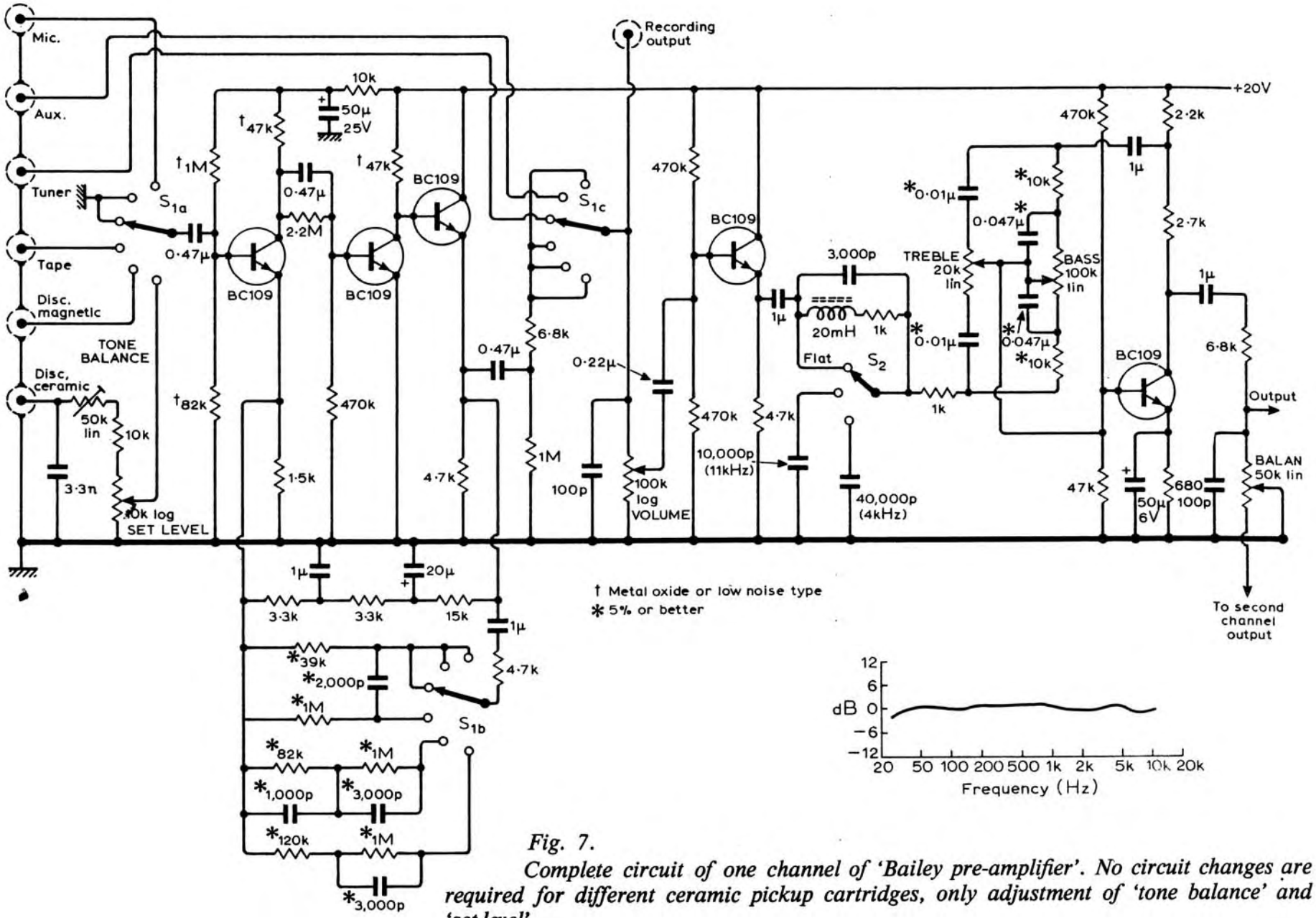
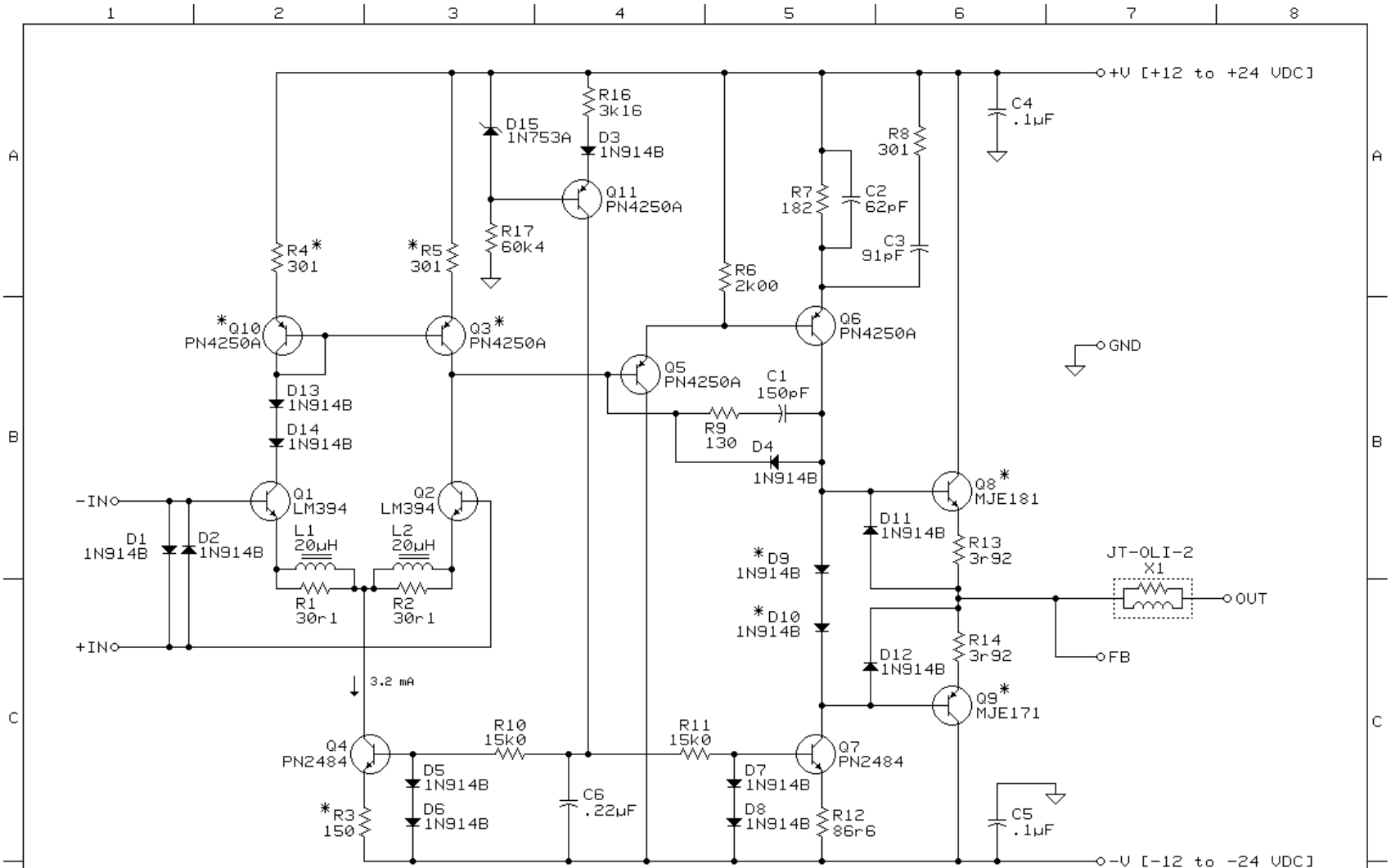


Fig. 7.

Complete circuit of one channel of 'Bailey pre-amplifier'. No circuit changes are required for different ceramic pickup cartridges, only adjustment of 'tone balance' and 'set level'.

Bailey. Wireless World



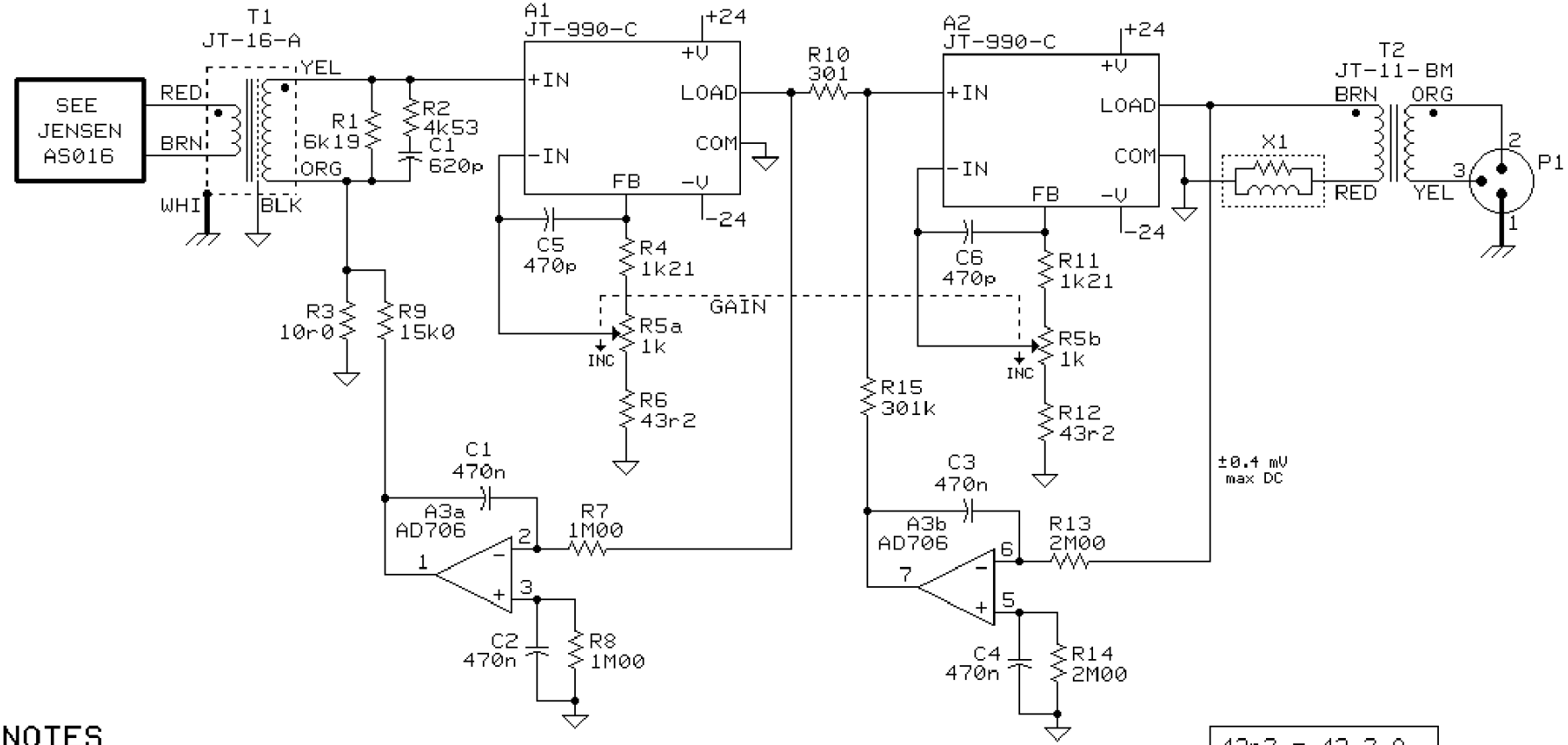
* INDICATES A PART SELECTED AT TEST, NOMINAL VALUE SHOWN

jensen
JENSEN TRANSFORMERS, INC.
10735 BURBANK BLVD.
N. HOLLYWOOD, CALIFORNIA 91601

JT-990-C SCHEMATIC DIAGRAM

ENGINEER: DEJ/SAH		REVISION: C
A	SHEET 01 OF 01	JT99-001
	DATE: 02/04/88	

FAMOUS JENSEN TWIN-SERVO® 990 MIC PREAMP BASIC CIRCUIT



NOTES

THIS IS NOT A PROJECT FOR ELECTRONIC BEGINNERS ...

THE 990, LIKE ALL HIGH GAIN-BANDWIDTH AMPLIFIERS, CAN OSCILLATE IF CAREFUL ATTENTION IS NOT PAID TO LAYOUT AND GROUNDING. USE OF POWER & GROUND PLANES AND GOOD HIGH FREQUENCY CONSTRUCTION TECHNIQUES IS HIGHLY RECOMMENDED.

R5 IS A REVERSE LOG TAPER CONDUCTIVE PLASTIC DUAL POT

X1 IS AN OUTPUT LOAD ISOLATOR, JENSEN JT-OLI-2 OR EQUIVALENT.

ALL RESISTORS ARE ±1% 1/4w METAL FILM TYPES, ROEDERSTEIN MK2-1 OR EQUIVALENT

ALL CAPACITORS ARE POLYPROPYLENE, POLYSTYRENE, OR NP0/C0G CERAMIC TYPES

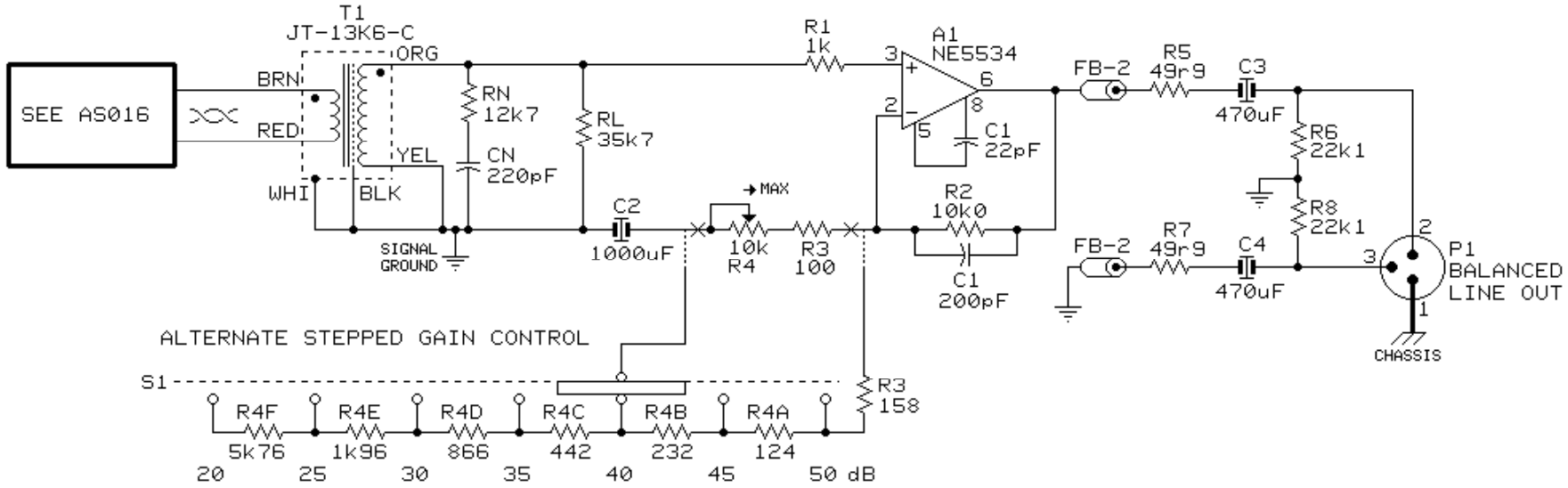
43r2 = 43.2 Ω
4k53 = 4.53 kΩ
2M00 = 2.00 MΩ

jensen | AS083 | 03/05/97

7135 HAYVENHURST AVE.
VAN NUYS, CALIFORNIA 91406
(818) 374-5857

JT-13K6-C IN SIMPLE ONE IC STAGE MIC PREAMP

GAIN VARIABLE FROM 20 dB TO 53 dB



NOTES

ELECTROLYTIC CAPACITORS ARE PANASONIC BI-POLAR TYPES.

ALL RESISTORS ARE ±1% 1/4w METAL FILM TYPES, ROEDERSTEIN MK2-1 OR EQUIVALENT

ALL RESISTORS IN OHMS (12k7 = 12.7k, 49r9 = 49.9)

POTENTIOMETER R4 IS REVERSE LOG TAPER CONDUCTIVE PLASTIC TYPE

RN, CN, AND RL ARE SPECIFIED ON TRANSFORMER DATA SHEET

MOUNT R1 AS CLOSE AS POSSIBLE TO A1 TO PREVENT POSSIBLE SPURIOUS OSCILLATIONS

USE OF GOLD PLATED CONTACTS IN XLR CONNECTORS IS HIGHLY RECOMMENDED

TIGHTLY TWIST LEADS AS SHOWN ><> IN PATH FROM J1 TO T1 TO MINIMIZE ELECTROMAGNETIC PICKUP

USE GOOD HIGH FREQUENCY CONSTRUCTION TECHNIQUES AND ADEQUATE POWER SUPPLY BYPASSING AT IC PINS. GROUND PLANE CONSTRUCTION IS HIGHLY RECOMMENDED

S1, IF USED, IS HIGH QUALITY SHORTING TYPE SWITCH

jensen

AS017

09/13/95

7135 HAYVENHURST AVE.
VAN NUYS, CALIFORNIA 91406
(818) 374-5857

Graeme J Cohen. Sept 1984

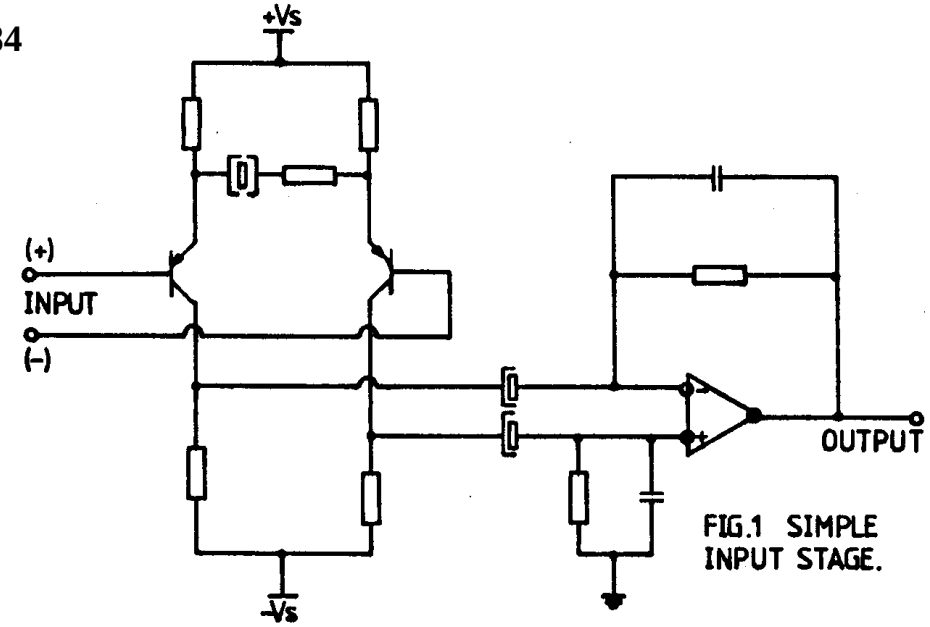


FIG.1 SIMPLE INPUT STAGE.

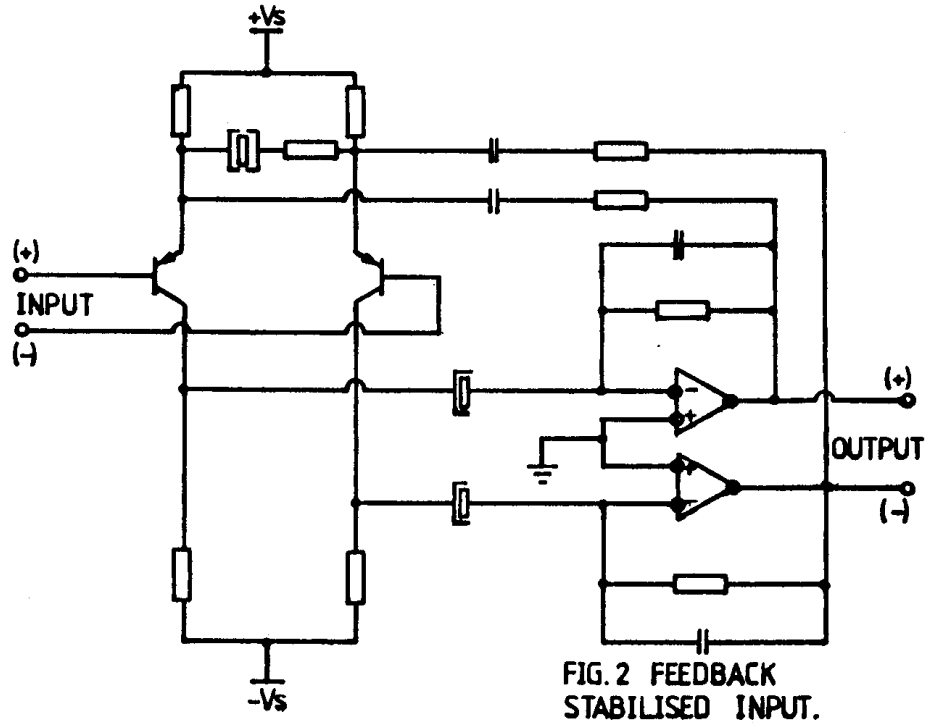


FIG. 2 FEEDBACK STABILISED INPUT.

Graeme J Cohen. Sept 1984

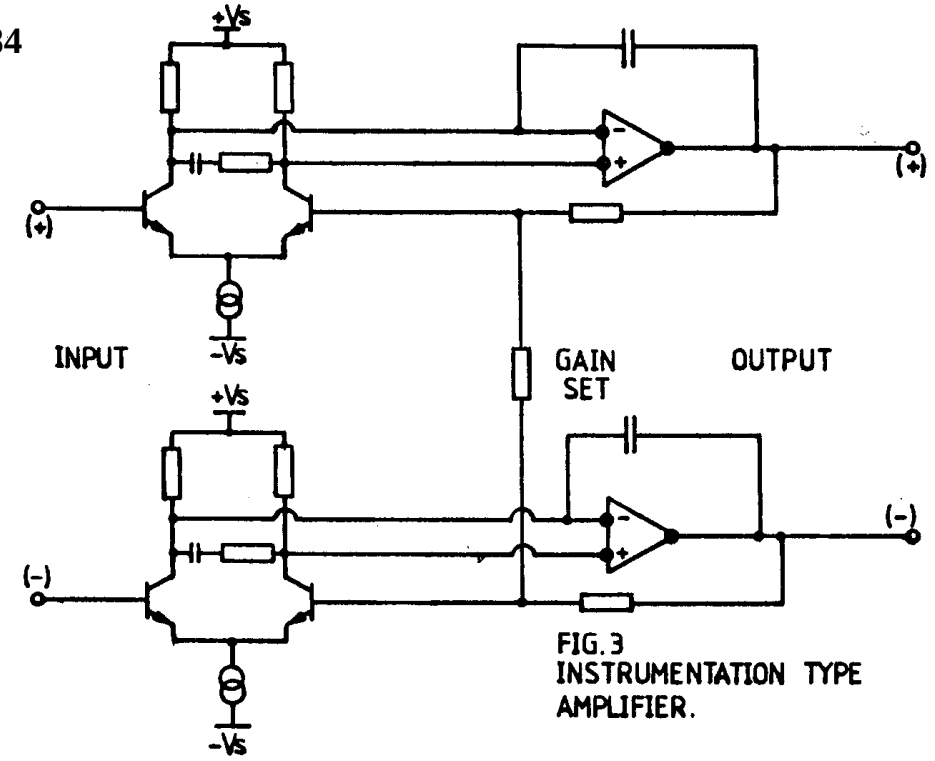


FIG. 3
INSTRUMENTATION TYPE
AMPLIFIER.

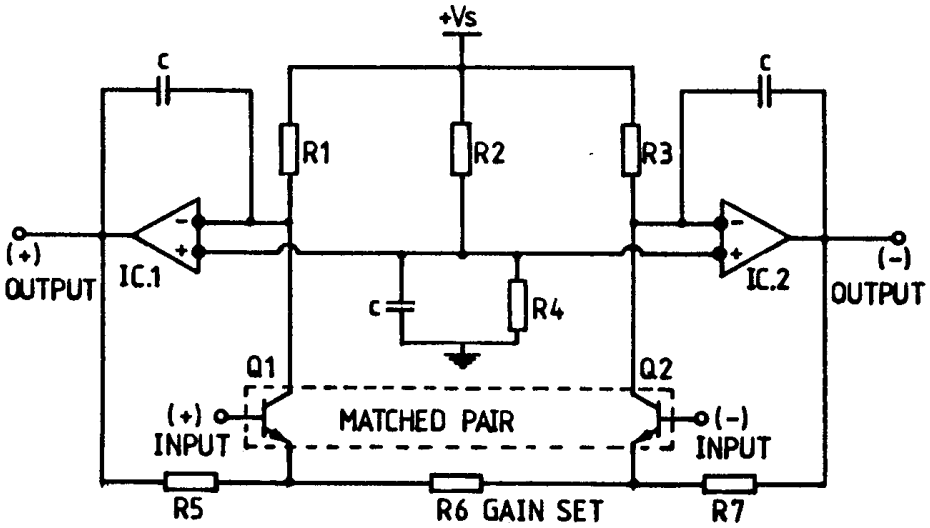
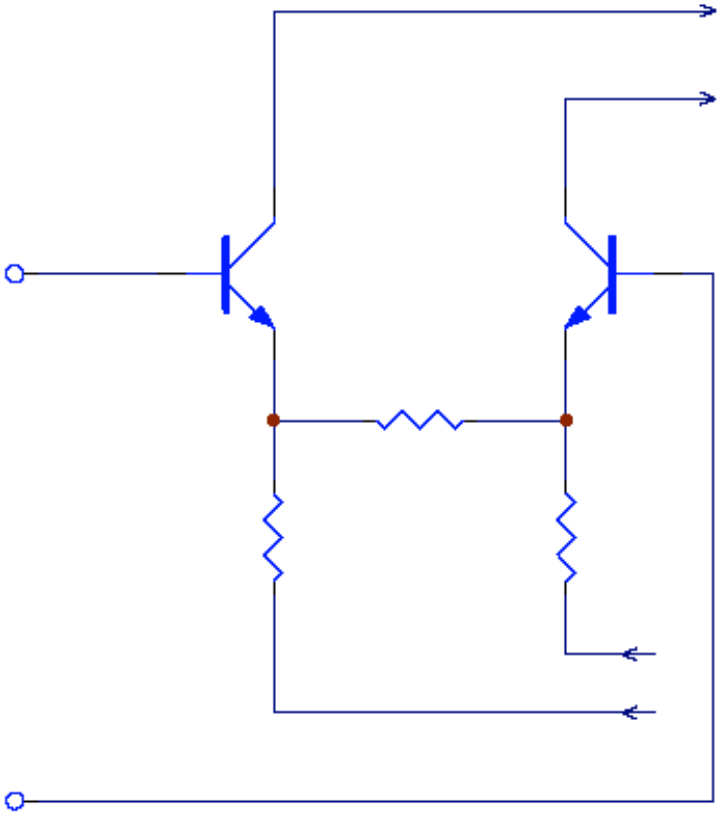
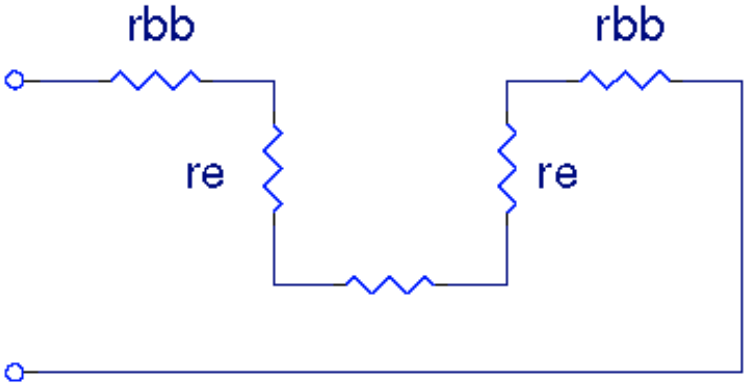


FIG. 4 NEW INPUT STAGE.

Graeme J Cohen.

Hybrid Input Concept





Graeme J Cohen. Sept 1984 Double Balanced Microphone amplifier

AES preprint 2106

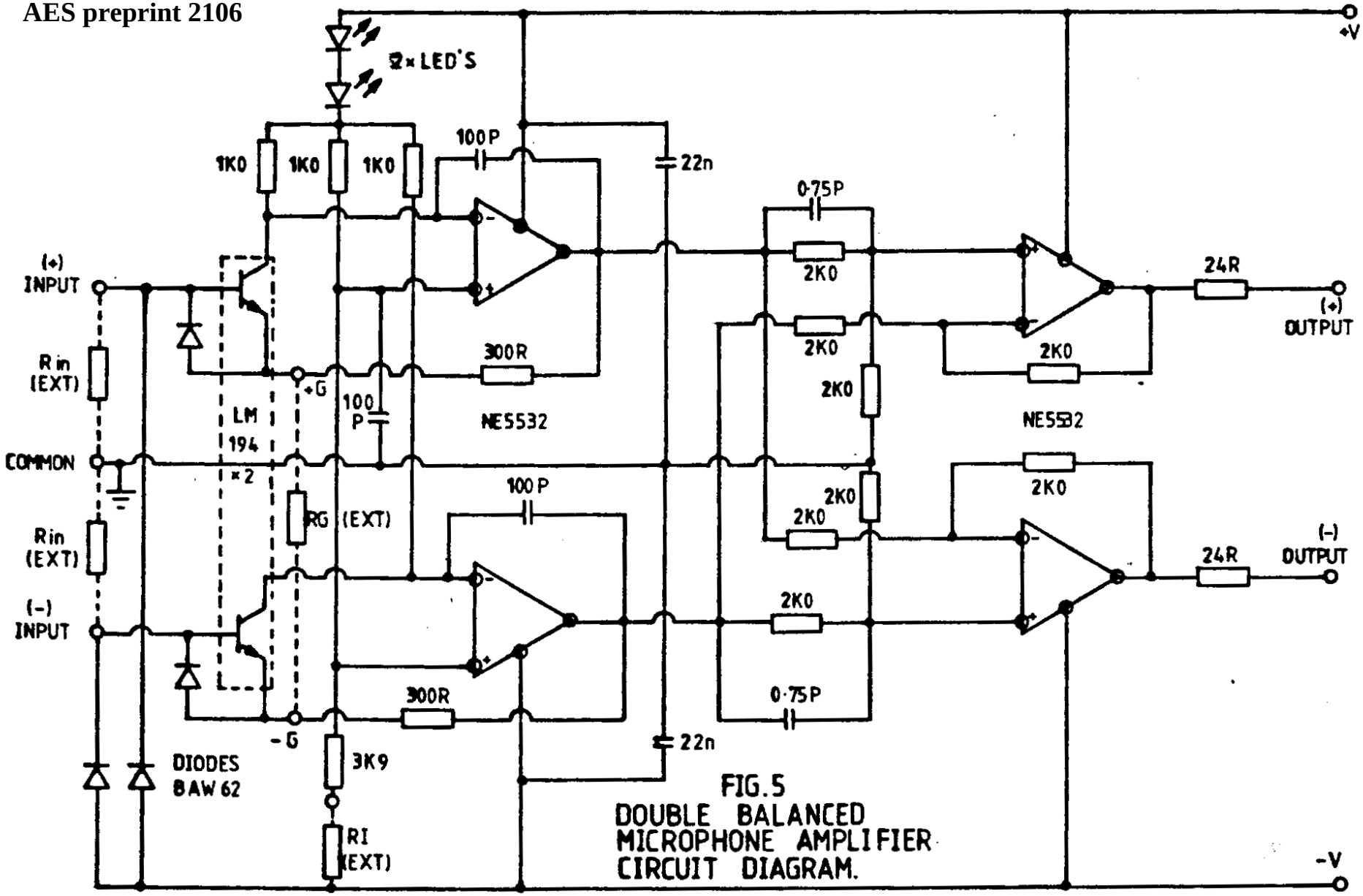


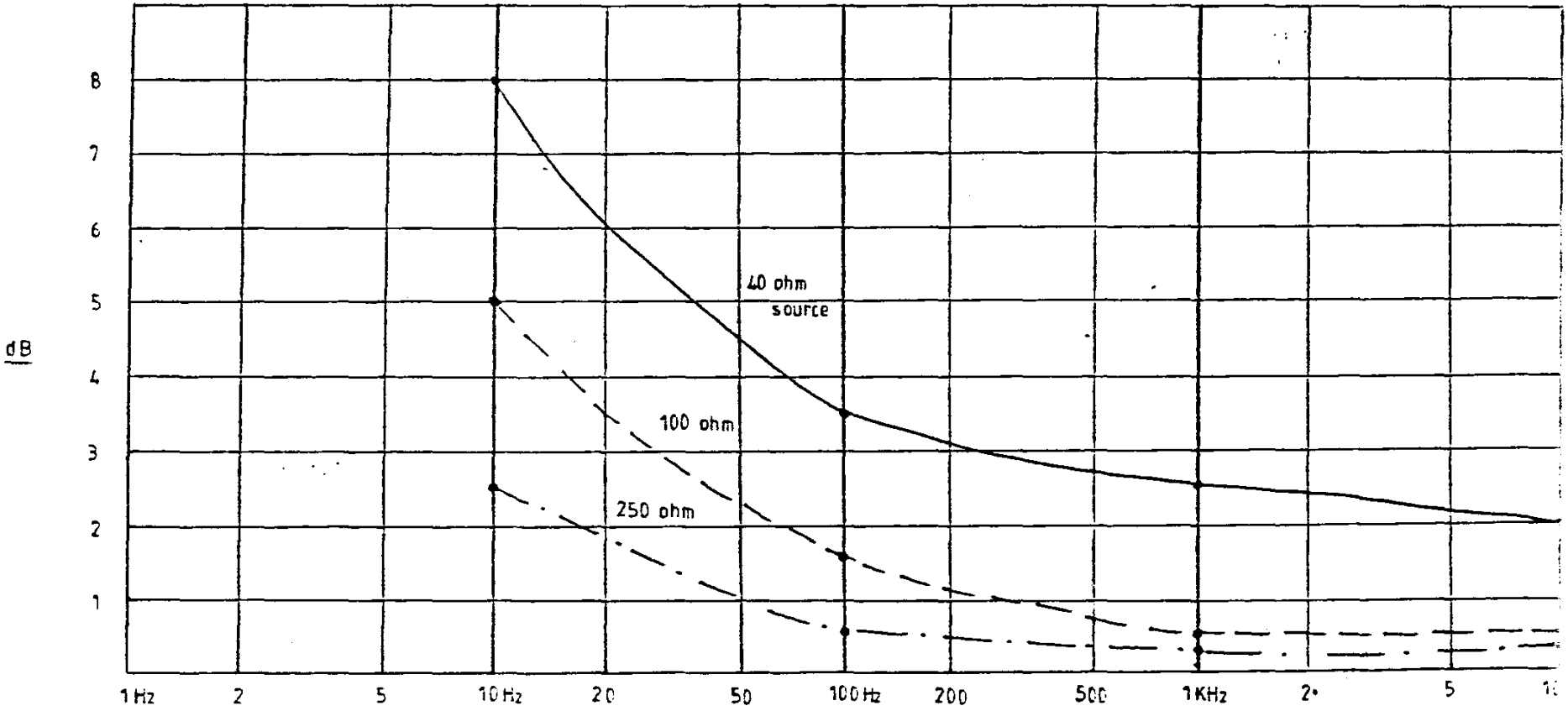
FIG.5
DOUBLE BALANCED MICROPHONE AMPLIFIER CIRCUIT DIAGRAM.

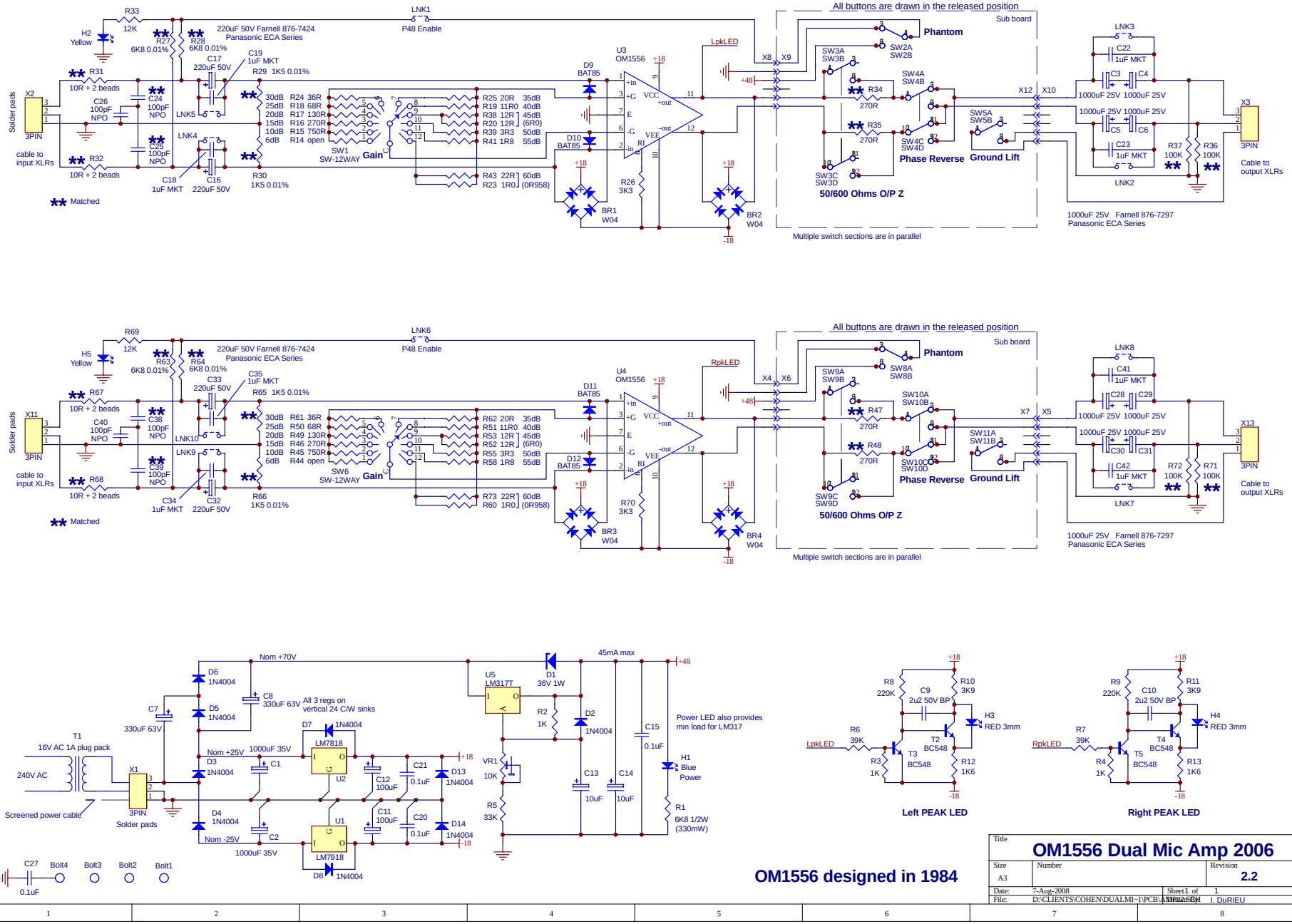
Graeme J Cohen. Sept 1984 Double Balanced Microphone amplifier

AES preprint 2106

OM 1556

TYPICAL NOISE FIGURE FOR
4mA INPUT STAGE CURRENT




All buttons are drawn in the released position
Sub board
Phantom
Phase Reverse
Ground Lift
50/600 Ohms O/P Z
Multiple switch sections are in parallel
220uF 50V Farnell 876-7424
Panasonic ECA Series
1000uF 25V Farnell 876-7297
Panasonic ECA Series
Solder pads
cable to input XLRs
Cable to output XLRs
Matched
Gain
Left PEAK LED
Right PEAK LED
Power LED also provides min load for LM317
All 3 regs on vertical 24 C/W sinks
Screened power cable
Solder pads
240V AC
16V AC 1A plug pack
45mA max
Nom +70V
Nom +25V
Nom -25V
Blue Power
OM1556 designed in 1984
Title
OM1556 Dual Mic Amp 2006
Size
A3
Number
Revision
2.2
Date:
7-Aug-2008
Sheet 1 of 1
File:
D:\CLIENTS\COHEN\DUALMI~1\PCB\AMP2006.SCH
I. DuRIEU

PMI

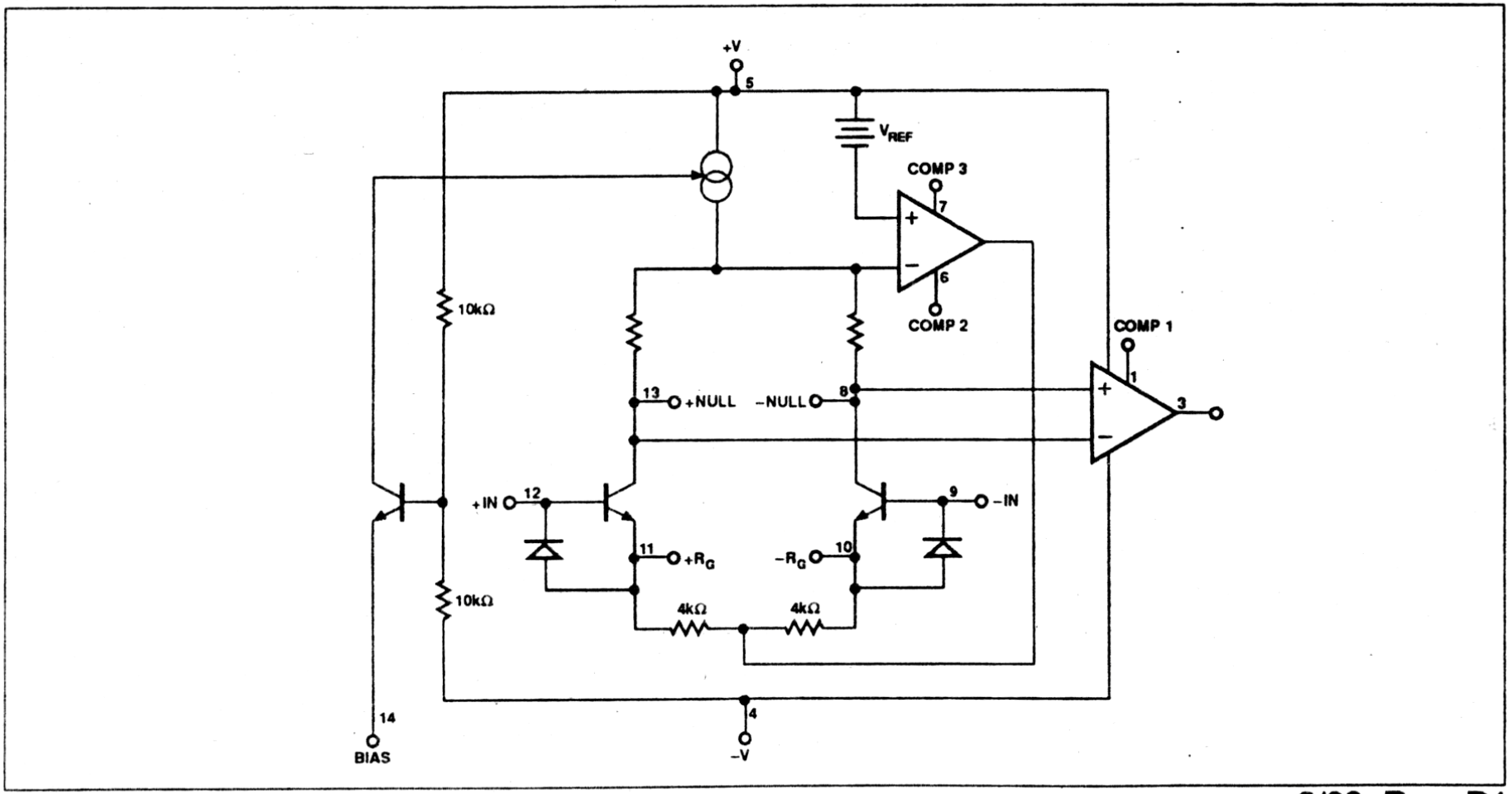
Audio Silicon Specialists™

SSM-2015

LOW NOISE MICROPHONE PREAMPLIFIER

Precision Monolithics Inc.

BLOCK DIAGRAM



2/90, Rev. B1

PMI

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AN-115

BALANCED LOW NOISE MICROPHONE PREAMPLIFIER DESIGN

Precision Monolithics Inc.

APPLICATION NOTE 115

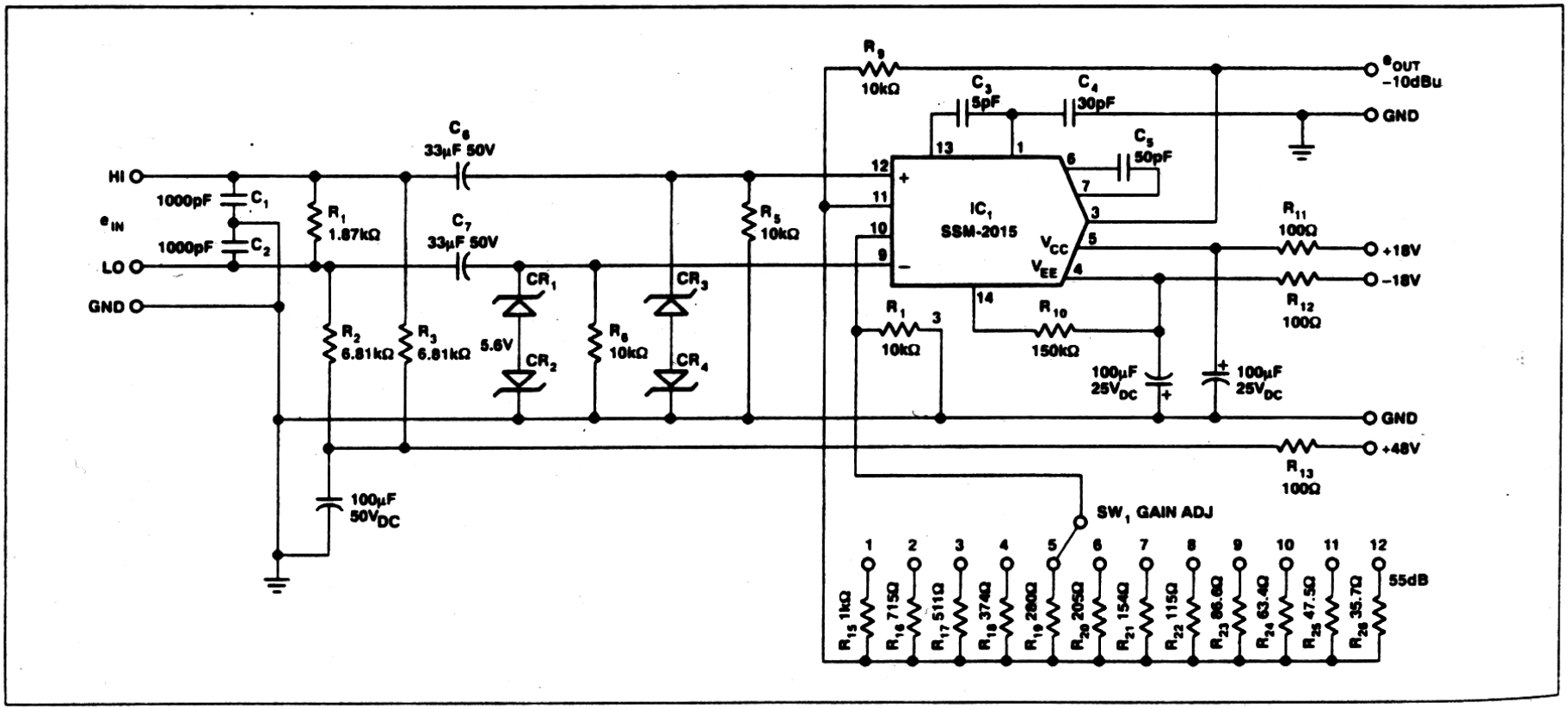


FIGURE 1

1990

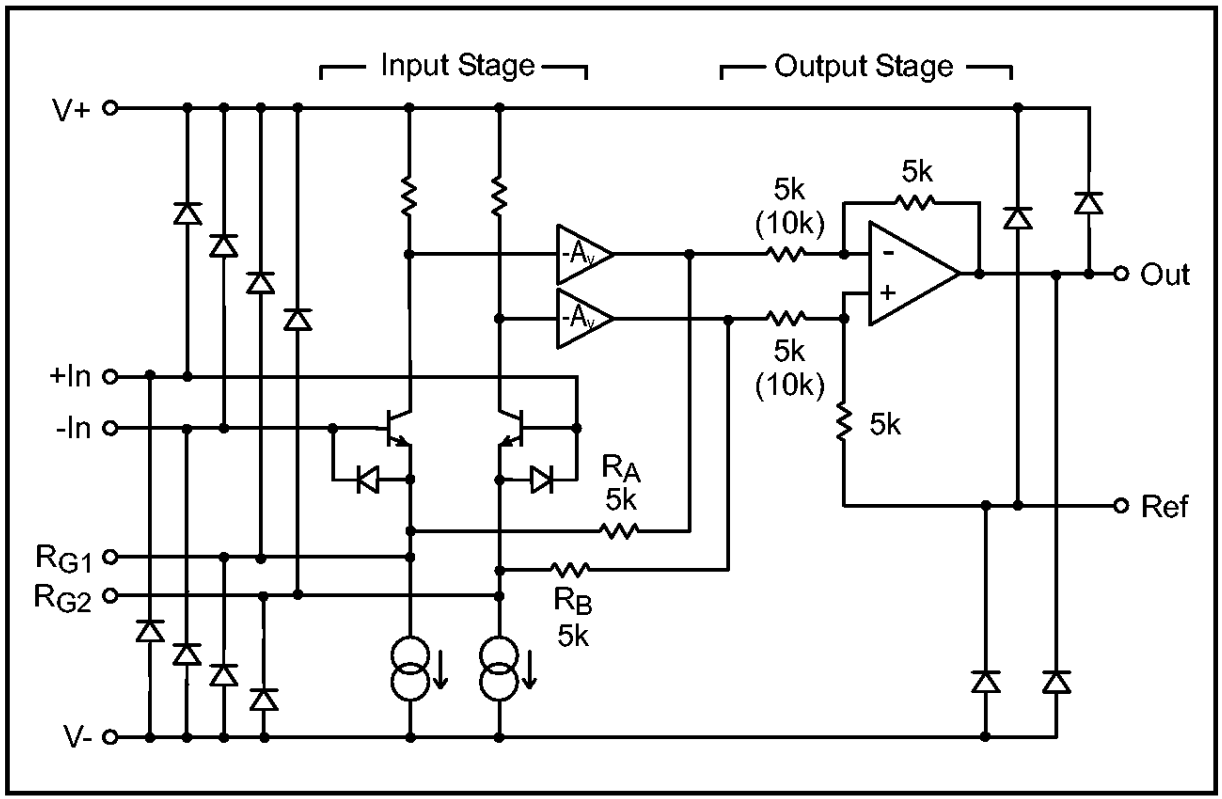


Figure 1. THAT 1510 / 1512 Equivalent Circuit Diagram
(THAT 1512 values shown in parentheses)

Graeme J Cohen. Sept 1996

Split Cascode Amplifier

AES preprint 4296

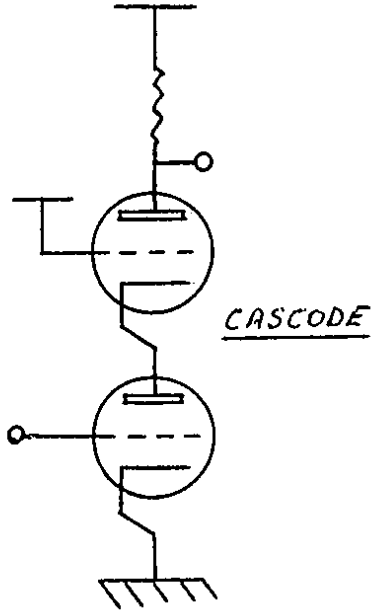


FIG 1

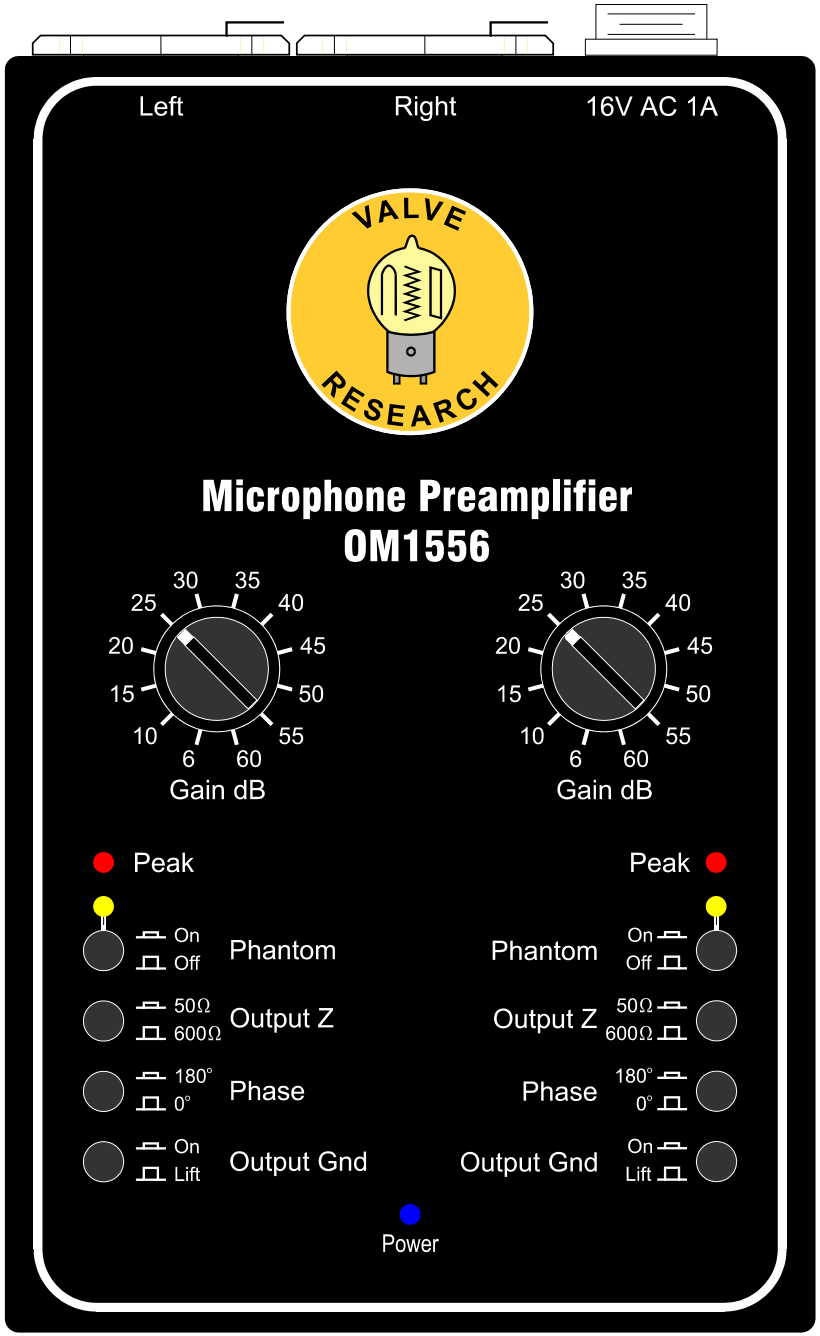
FIG 2
SPLIT CASCODE

FIG 3
TERMINATION

TECHNICAL PAPERS (AUDIO)

- Double Balanced Microphone Amplifier
  Presented at the 1984 Australian Regional Convention of the Audio Engineering Society (AES), Melbourne, Australia. Preprint 2106.
- A Music Amplifier - A New Approach
  Presented at the 1988 2nd Australian Regional Convention of the AES, Melbourne, Australia. Preprint 2677.
- A Pulse Test Method for Amplifiers
  Presented at the 1991 3rd Australian Regional Convention of the AES, Melbourne, Australia. Preprint 3087.
- A Balanced Analogue Optical Coupler
  Presented at the 1991 3rd Australian Regional Convention of the AES, Melbourne, Australia. Preprint 3089.
- Linear Output Stages
  Presented at the 1993 4th Australian Regional Convention of the AES, Melbourne, Australia. Preprint 3674. Also published in: Glass Audio, Vol. 7, No. 6, 1995.
- Transmission Line Audio Transformers
  Presented at the 1993 4th Australian Regional Convention of the AES, Melbourne, Australia. Preprint 3692. Also published in: Glass Audio, Vol. 7, No. 5, 1995.
- Beam Control Amplifier
  Presented at the 1995 5th Australian Regional Convention of the AES, Sydney, Australia. Preprint 4026.
- Dual Single Ended Amplifier
  Presented at the 1995 5th Australian Regional Convention of the AES, Sydney, Australia. Preprint 4028. Also published in: Glass Audio, Vol. 8, No. 3, 1996.
- Split Cascade Microphone Amplifier
  Presented at the 1996 6th Australian Regional Convention of the AES, Melbourne, Australia. Preprint 4296.

Dual OM1556 2006
OM1556 designed in 1984



Dual OM1556 2006
OM1556 designed in 1984