

# FILM-TECH

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**THESE MANUALS ARE DESIGNED TO FACILITATE THE  
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SERVICE ENGINEERS.**

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## INTRODUCTION

This manual has been prepared especially for the Bell & Howell Service Stations. It is assumed that the repair man performing repairs has a thorough knowledge of sound amplifiers and the operation of all Filmosounds. If the repair man is not familiar with Filmosound operation, reference should be made to the Instruction Book and Manual of Operation which accompanies each machine.



Missing pages:

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H9: amplifier # 13817 for 156-V

H20: amplifier # 05311 for 185

H21: amplifier # 05973 for 185

H22: amplifier # 05973 new for 185

K1: information about amplifier # 07001 for 202 (page 1)

K2: information about amplifier # 07001 for 202 (page 2)

K5: monitor mixer # 25996

L1-B: projector electrical diagram for 285

L3: amplifier # 07138-J for late 285 projectors



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## SECTION A

GENERAL INFORMATIONAMPLIFIERS.

Amplifier circuits are all conventional or adaptations of conventional tube circuits. An oscillating vacuum tube supplies energy for the exciter lamp. Frequencies range from 22KC to 100KC, depending on the model. Volume is usually controlled at two places: first, by varying the voltage on the oscillator tube causing a change of oscillation intensity, and second, by varying the voltage to the photocell. On older models this is accomplished by one control which is placed in the cathode circuit of the oscillator tube. A lead from the cathode side of this control connects to one side of the photocell and the voltage drop is used to neutralize the voltage on the opposite side of the photocell when the control is in the minimum position. Therefore, if the two voltages are not equal the volume will not shut off completely. Another method is used on the later Design 138, Model R and Design 156, Model A and D amplifiers. This consists of a dual control, one section of which varies the voltage on the photocell, and the other changes the degree of feedback in the oscillator tube.

EXCITER LAMP VOLTAGE.

Exciter lamp voltage or current cannot be measured with any meter other than a vacuum tube voltmeter or a radio frequency ammeter. Many modern testing units are not vacuum tube voltmeters on the A.C. scales.

SPEAKERS.

Speakers have specially designed cones whose frequency characteristics blend in with those of the associated amplifier; therefore, do not have damaged cones replaced by any company other than Bell & Howell.



PARTS.

Parts should always be ordered by the "A" number and description. If the number is unknown give the projector serial number and a brief description of the part.

TUBES.

Tubes used must be very low in microphonic qualities, otherwise vibration of the running motor will be reproduced in the speaker.

MODEL DESIGNATION.

On all old model Filmosounds the model designation appears on the projector name plate. On late model Filmosounds the amplifier part number appears on an individual plate attached to the amplifier. Be sure to give the serial number of the projector and, when possible, the part number of the amplifier in correspondence concerning an amplifier.

On models manufactured since 1943 the design number and model designation appear on the name plates of projector and speaker case.



RESISTOR COLOR CODE.

The following resistor color code is given as means of determining the resistance values of the resistors.

<u>Color</u>	(A) <u>Body</u>	(B) <u>Tip</u>	(C) <u>Dot</u>
Black-----	0-----	0-----	---
Brown-----	1-----	1-----	0---
Red-----	2-----	2-----	00---
Orange-----	3-----	3-----	000---
Yellow-----	4-----	4-----	0000---
Green-----	5-----	5-----	00000---
Blue-----	6-----	6-----	000000---
Violet-----	7-----	7-----	
Grey-----	8-----	8-----	
White-----	9-----	9-----	

EXAMPLE:

\_\_\_\_\_ Red Body (A)  
 \_\_\_\_\_ Green Tip (B)  
 \_\_\_\_\_ Yellow Dot (C)

The resistance value of this resistor would be:

Red Body,    Green Tip,    Yellow Dot  
 ---2-----5-----0000---

which is 250,000 ohms.

Later resistors are marked with 3 consecutive bands. A fourth band is used for tolerance percentage. A gold band indicates a 5% tolerance and a silver band indicates a 10% tolerance. Absence of a fourth band indicates a 20% tolerance. The bands are read 1 - 2 - 3 toward the percentage band.



SECTION B

FILMOSOUND MONITOR SPEAKER

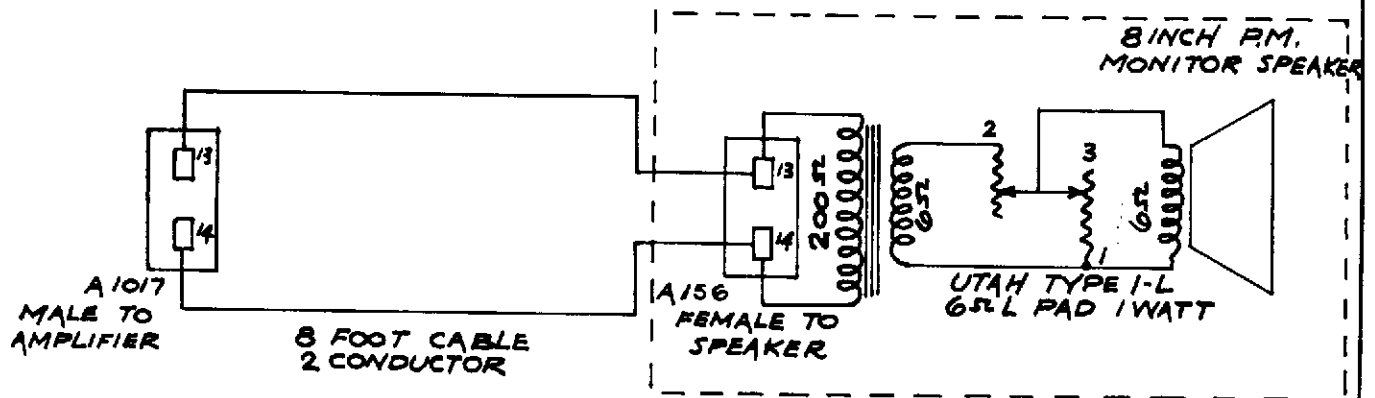
The Filmosound monitor speaker is supplied with a monitor volume control. Permanently attached to this box is a short cord which should be plugged into the amplifier receptacle to which the speaker cable is ordinarily connected.

Connect the speaker cable to the receptacle provided in the monitor speaker case.

The volume of the monitor speaker will always be proportional to the volume of the stage speaker, and experimentation will quickly indicate the correct position of the monitor volume control to provide the proper volume of sound in the projection booth when the stage speaker is delivering the desired output in the auditorium.

Do not connect or disconnect the monitor speaker until the Filmosound amplifier has been turned off.

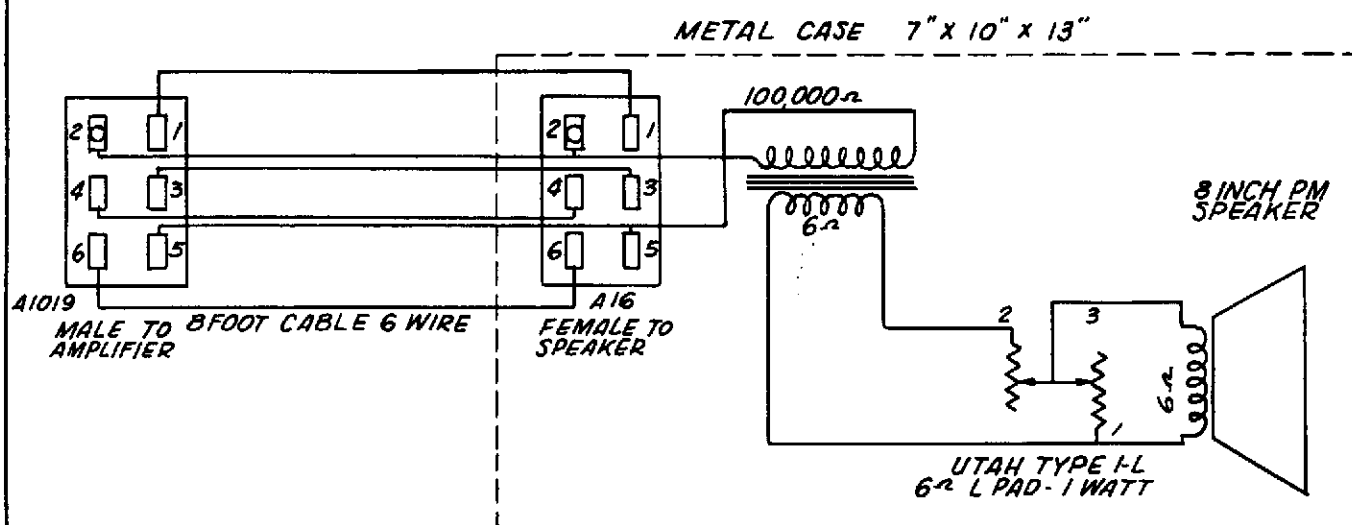




MODELS 130G, 6B, E, EB, -140A, E, G, H, AB, EB, GB, HB,  
142B, BB, C, CB, 120J-K

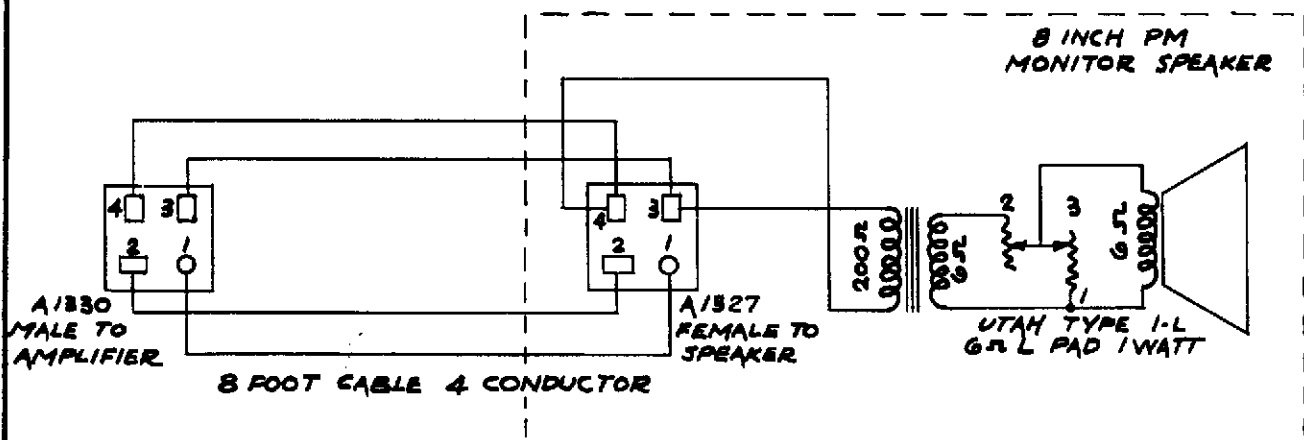
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MONITOR SPEAKER	
DATE	
9-8-45	





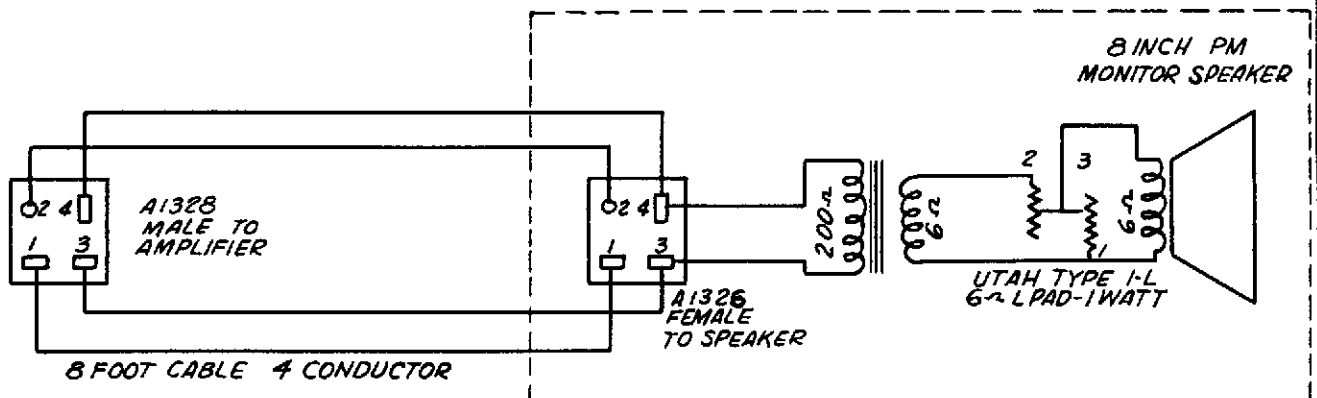
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MONITOR SPEAKER MODELS 138Q70Z	
	DATE





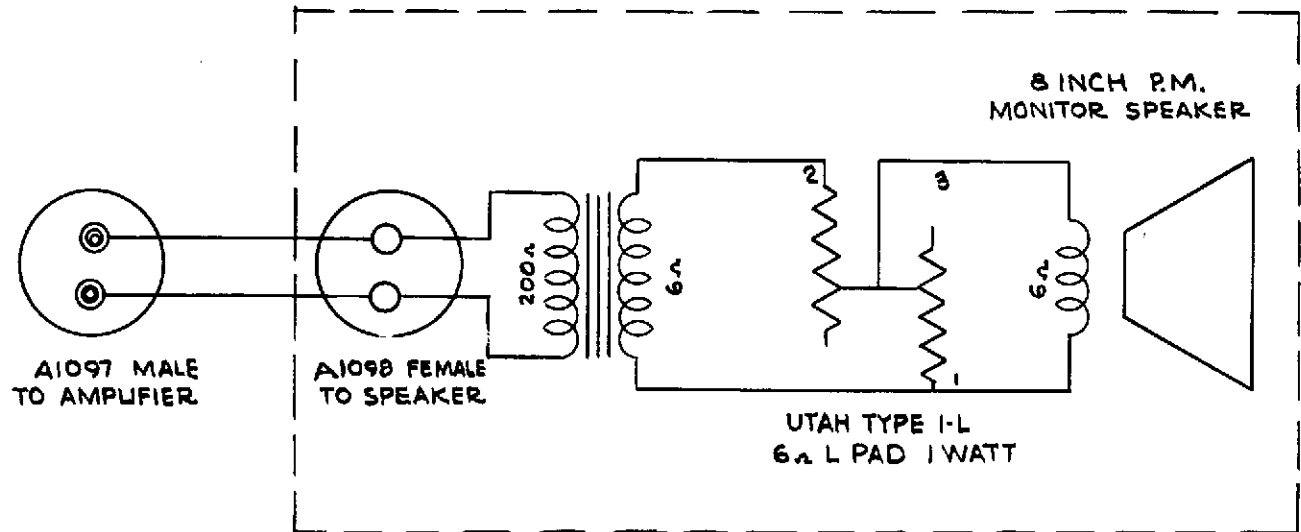
SERVICE DATA	
MONITOR SPEAKER	
MODELS 142 D & DB	
	DATE 9-8-45





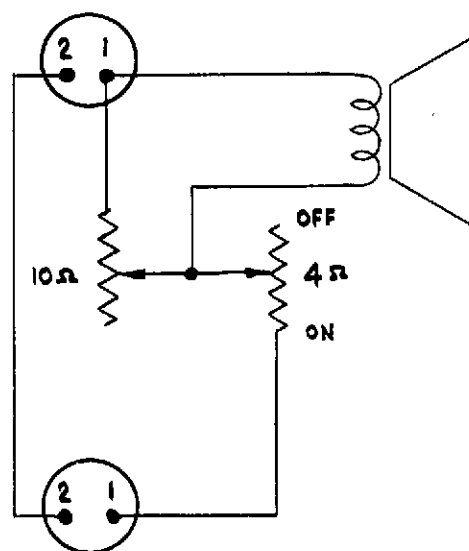
SERVICE DATA	
MONITOR SPEAKER	
MONITOR SPEAKER MODELS 156ABC, & 156V	
	DATE





SERVICE DATA	
WIRING DIAGRAM	
MONITOR SPEAKER	
MODELS 156 G,H	MODELS 179 A,B
DATE: 1-5-46	

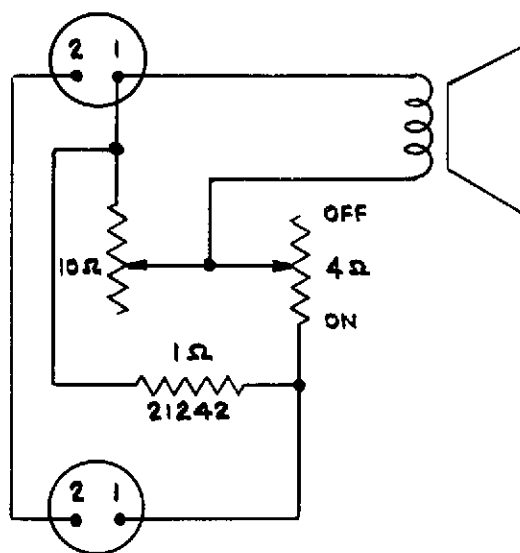




PART 21241

MONITOR SPEAKER FOR USE ON SYSTEMS  
UP TO 15 WATTS OUTPUT





PART 05400

MONITOR SPEAKER FOR USE ON SYSTEMS  
FROM 16 WATTS TO 50 WATTS OUTPUT

**SERVICE DATA**

**MONITOR SPEAKER WIRING DIAGRAMS**

FOR USE WITH PARTS 05400  
AND 21241

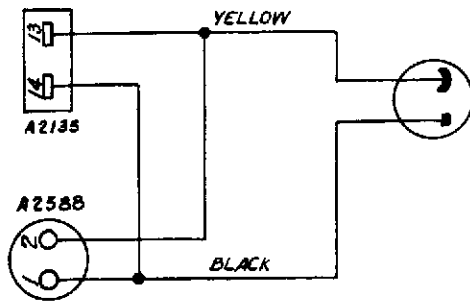
4-19-51







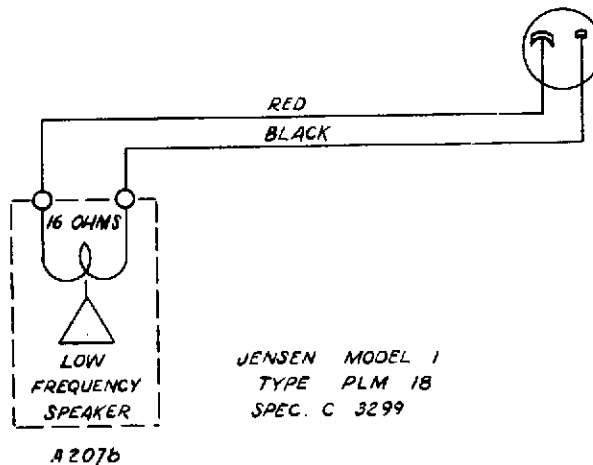
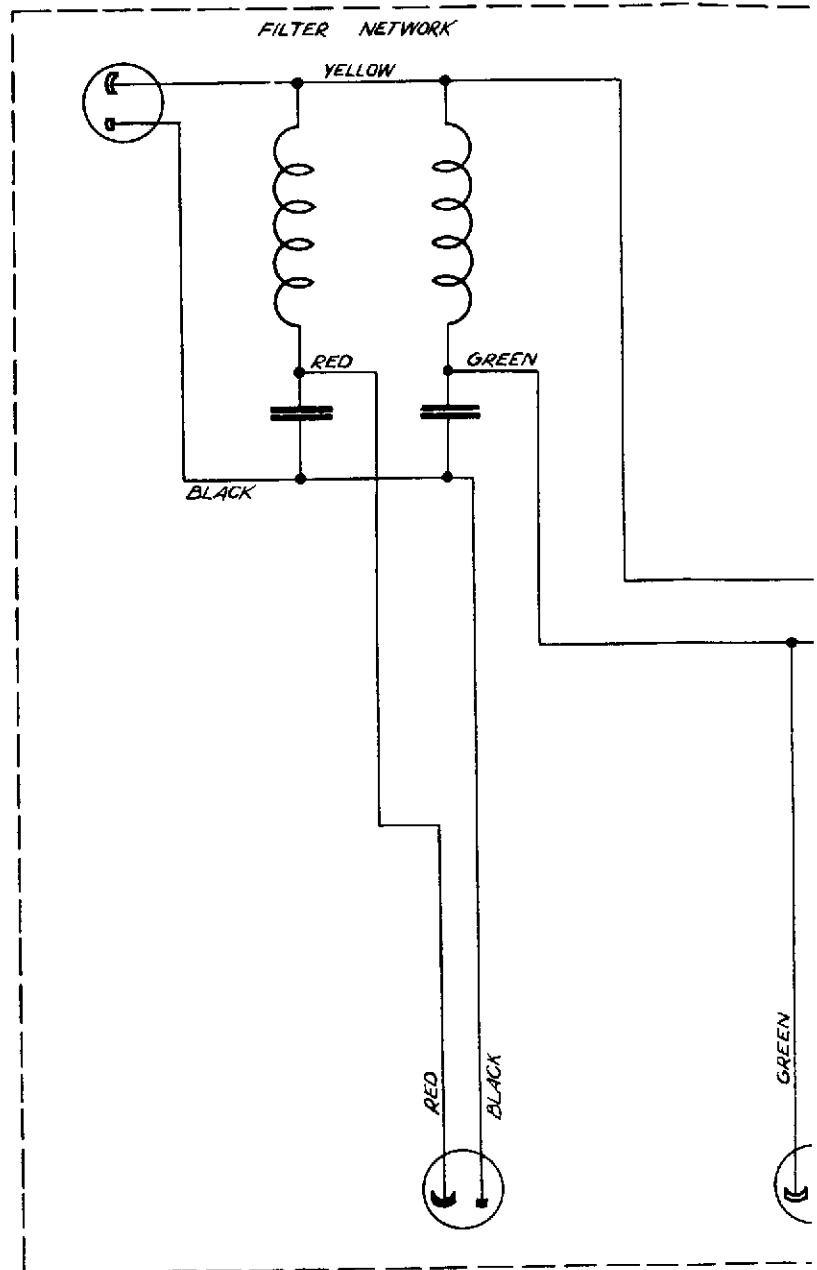
Read all notes before starting work. Do not scale drawings.  
 Work to dimensions. All dimensions are given in inches.  
 Unless otherwise specified, standard 90 degree corners. 90°/45°  
 Unless otherwise specified, fractional dimensions are  $\frac{1}{16}$   
 Unless otherwise specified, angles are 90°.  
 Substitutions must be approved by the Engineering Dept.



TO 16 OHM  
 OUTPUT OF  
 AMPLIFIER

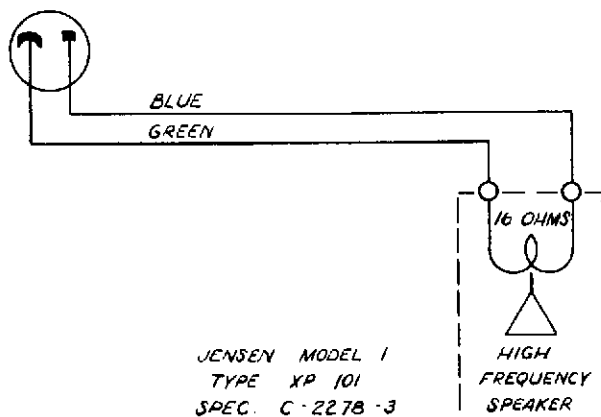
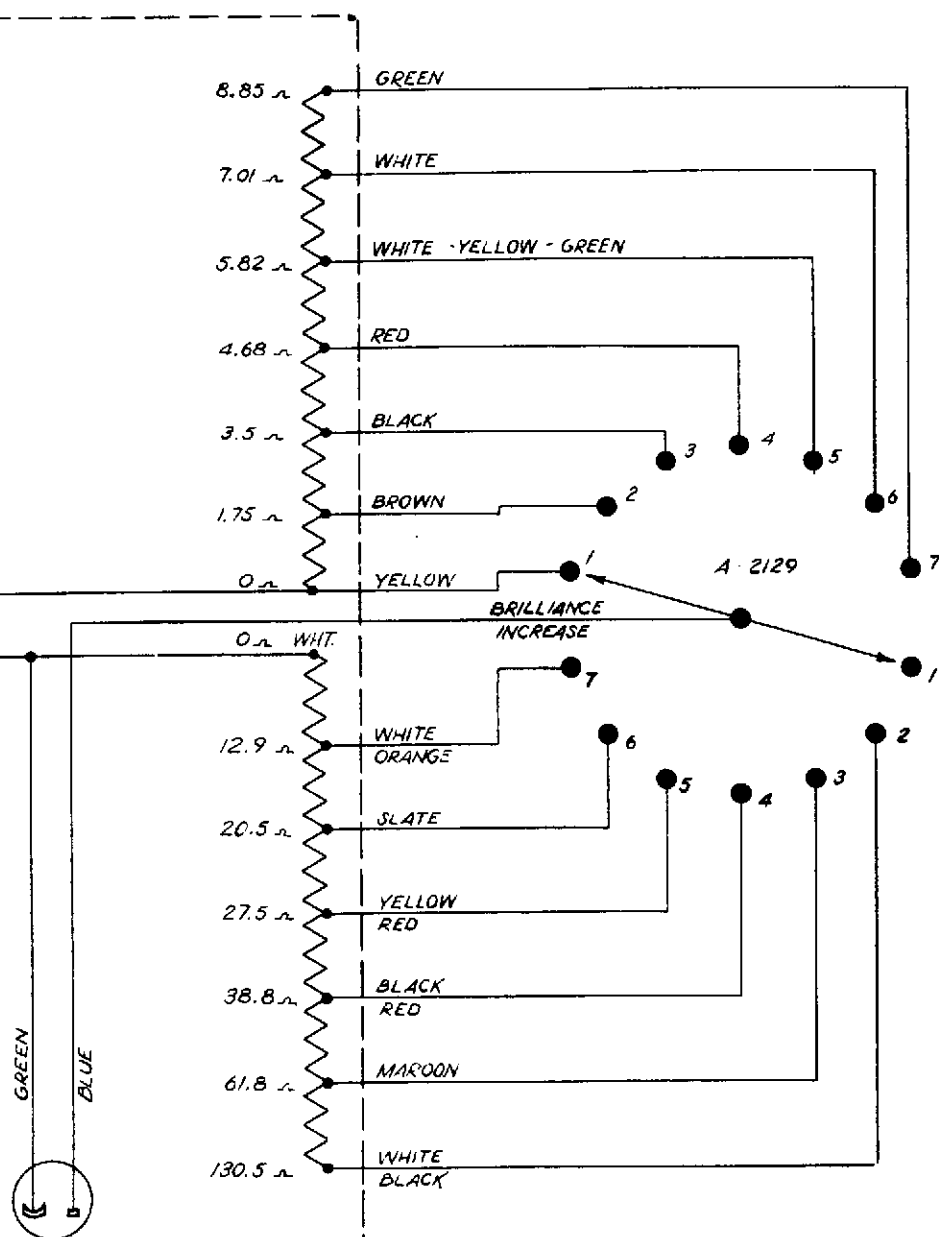
CABLE COMPLETE A0 294

JENSEN MODEL  
 TYPE AB-1  
 SPEC. C-2409  
 A2076



JENSEN MODEL 1  
 TYPE PLM 18  
 SPEC. C 3299





A2077

AS 121

SERVICE DATA			
ORCHESTRICON WIRING DIAGRAM			
DESIGN 150 B			
CHECKED R.A.P.	APP. <i>L.L.</i>	APP.	6-23-47



A550

REVISED 4-16-43 PER C.O. 181

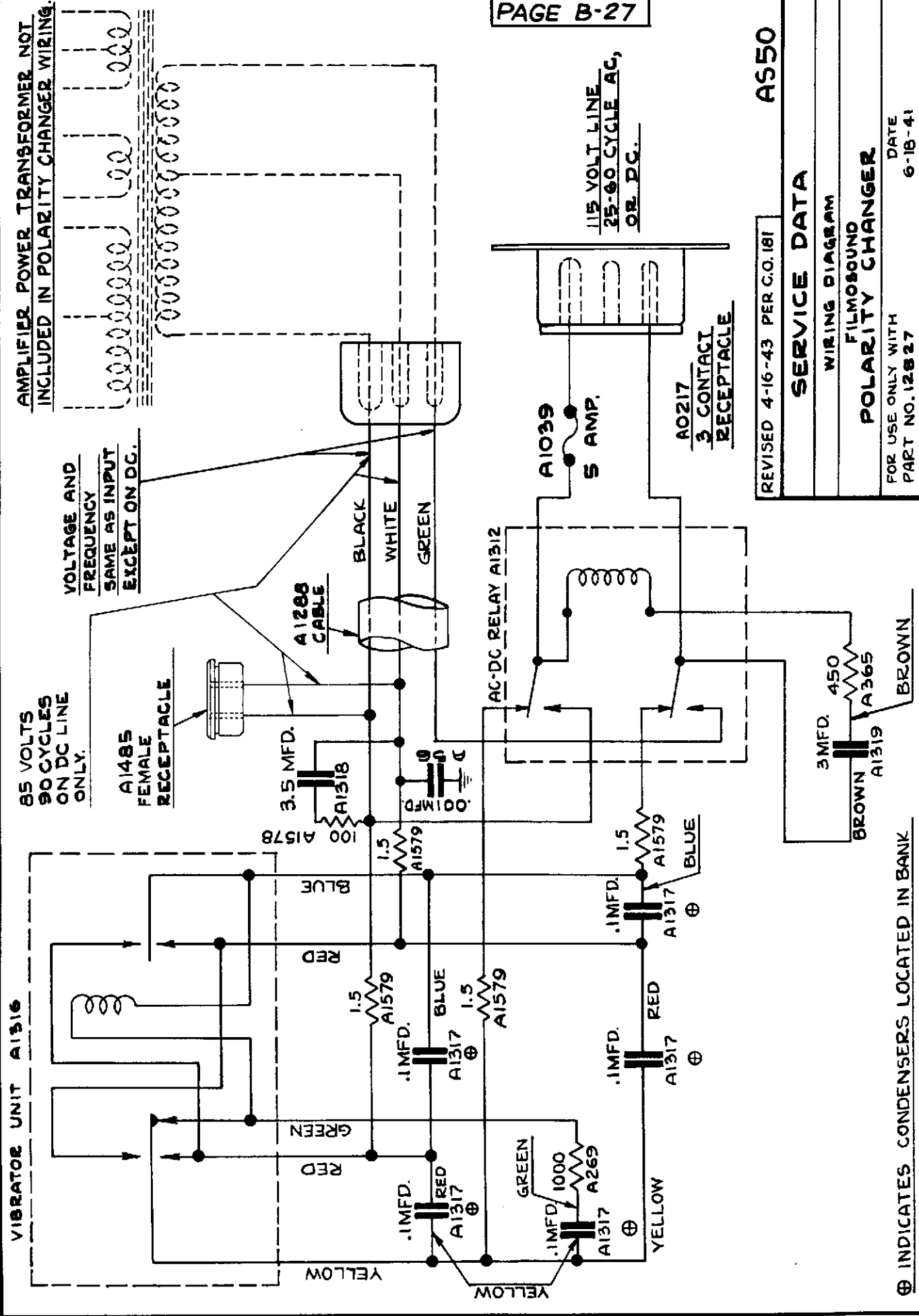
SERVICE DATA

WIRING DIAGRAM

FILMOSOUND  
POLARITY CHANGER

FOR USE ONLY WITH  
PART NO. 12827  
DATE  
6-18-41

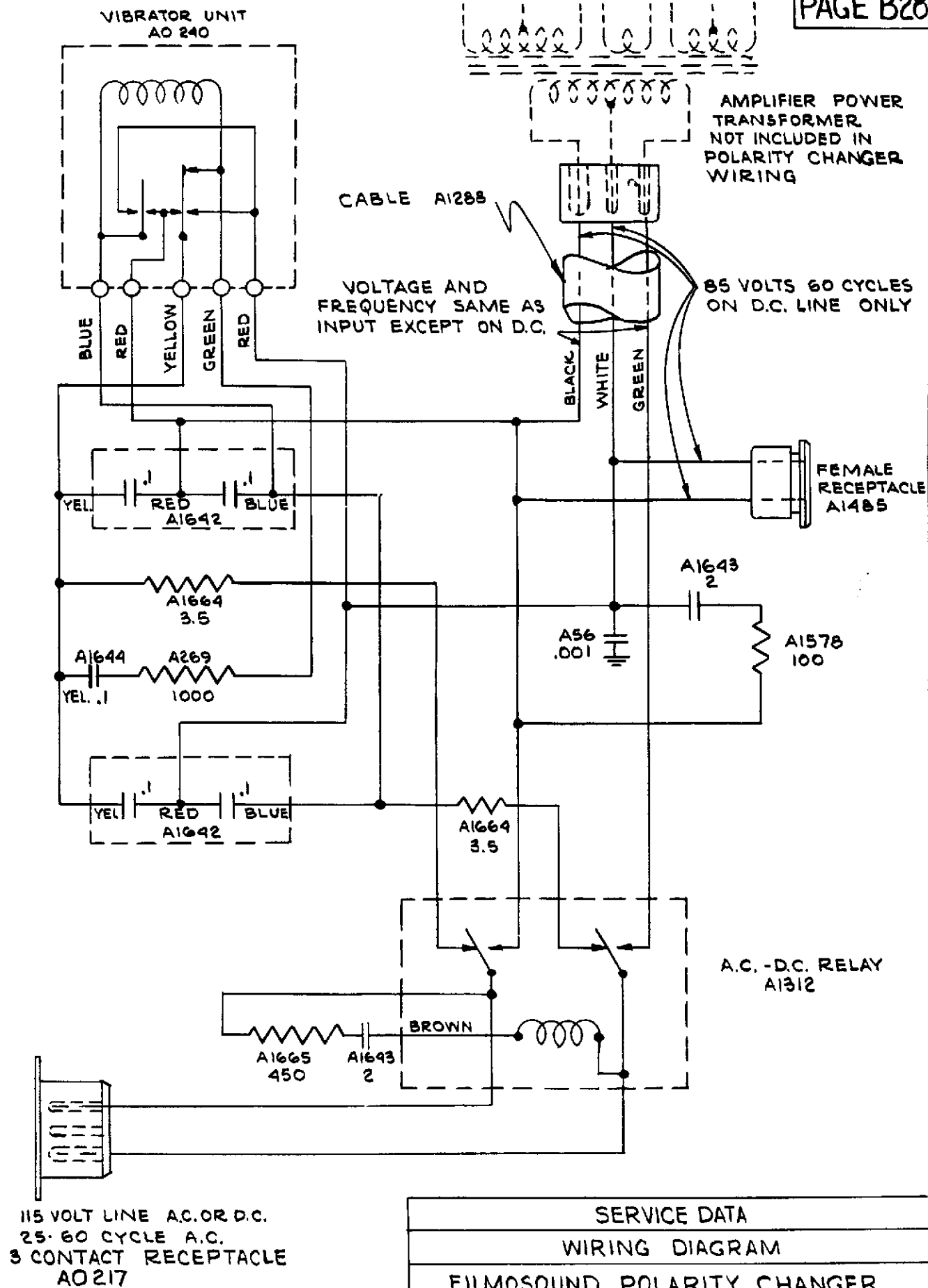
⊕ INDICATES CONDENSERS LOCATED IN BANK



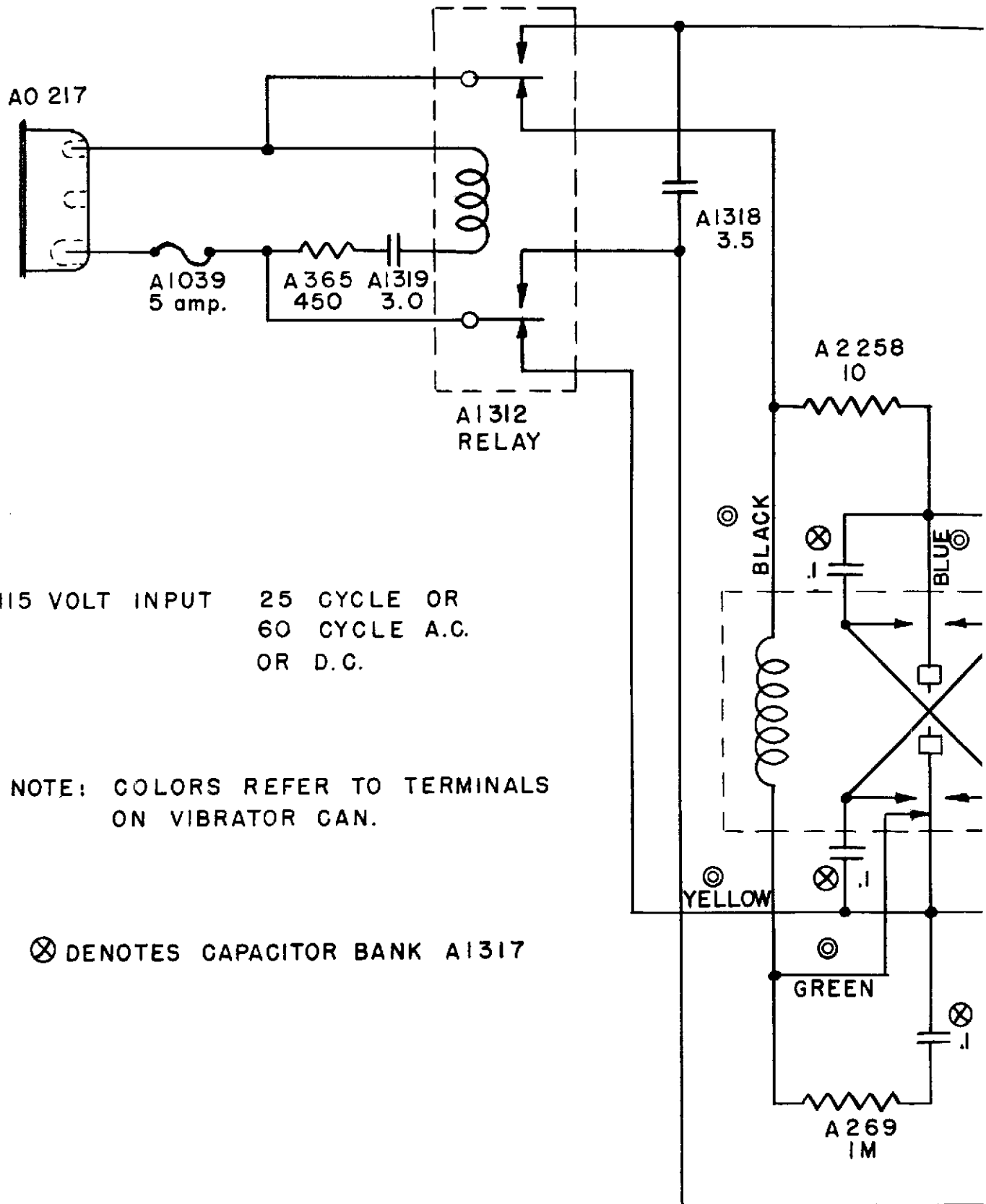
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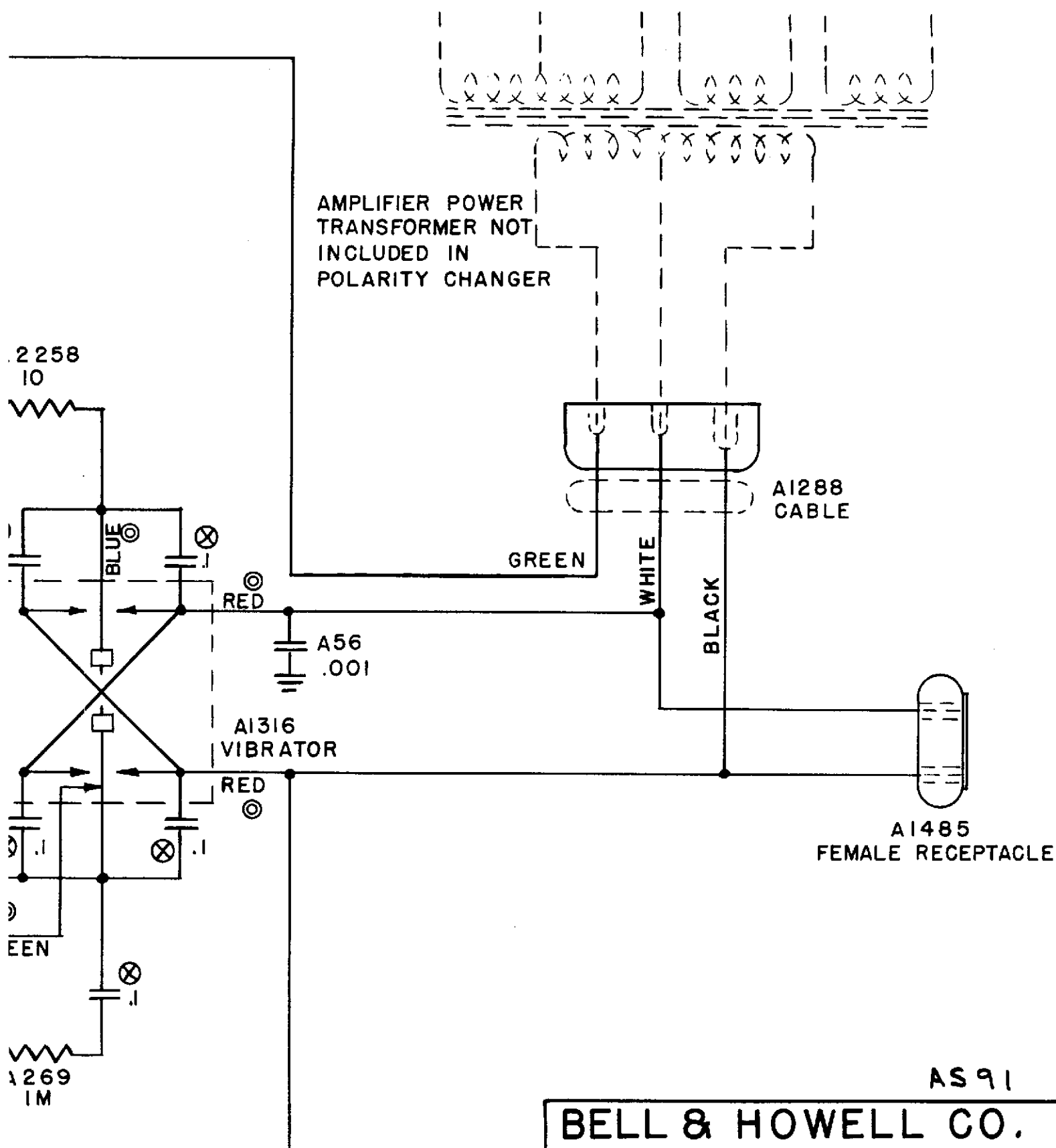






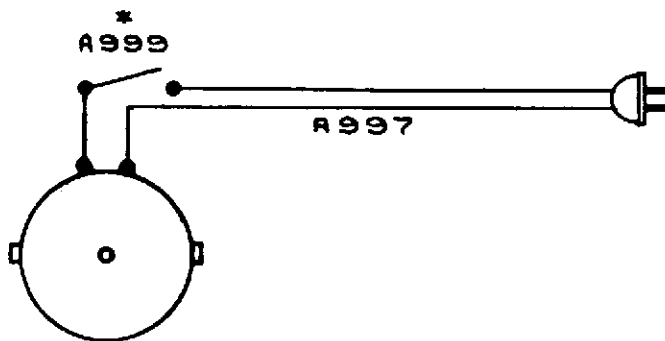
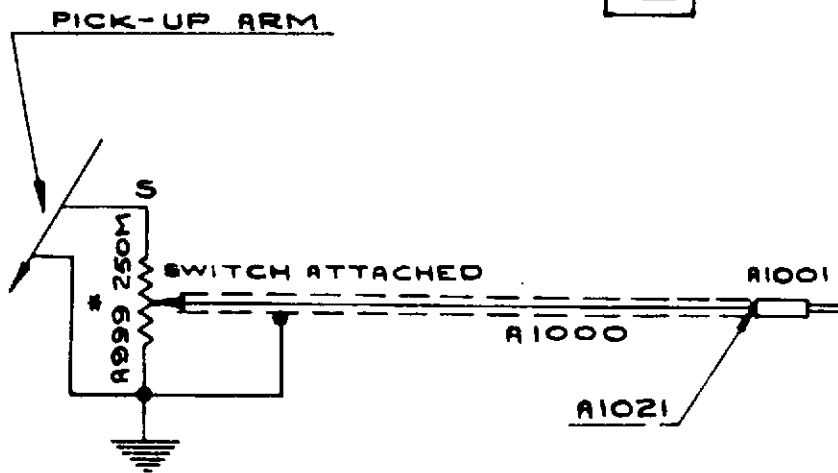






PART 12827 REVISED



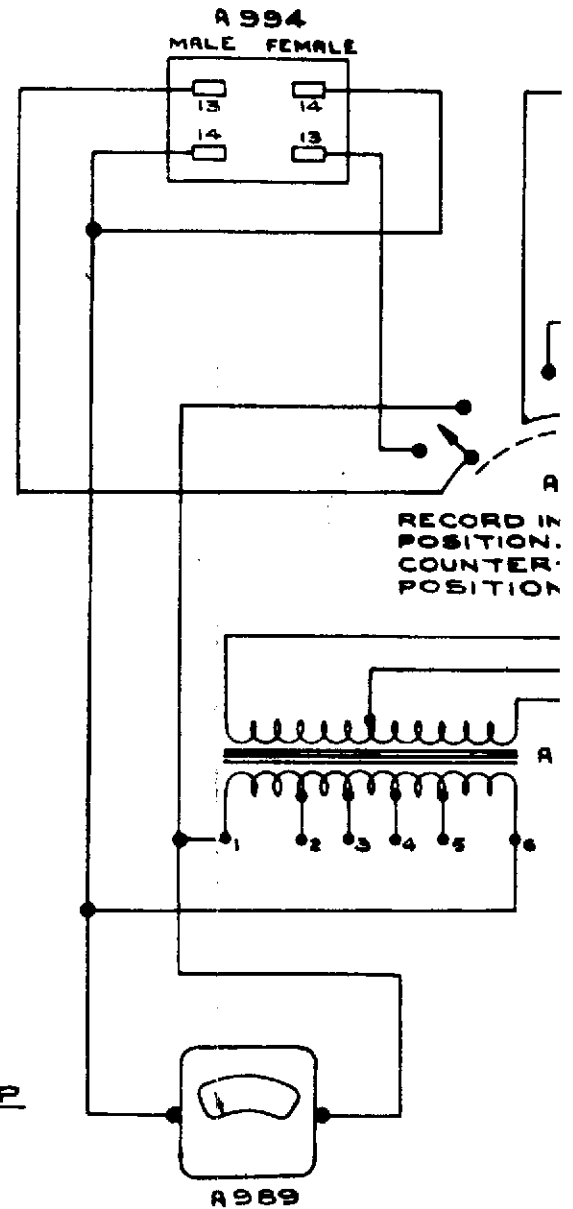


MOTOR  
115 VOLTS, 60 CYCLES  
0.65 AMPERES  
75 WATTS  
80 R.P.M.

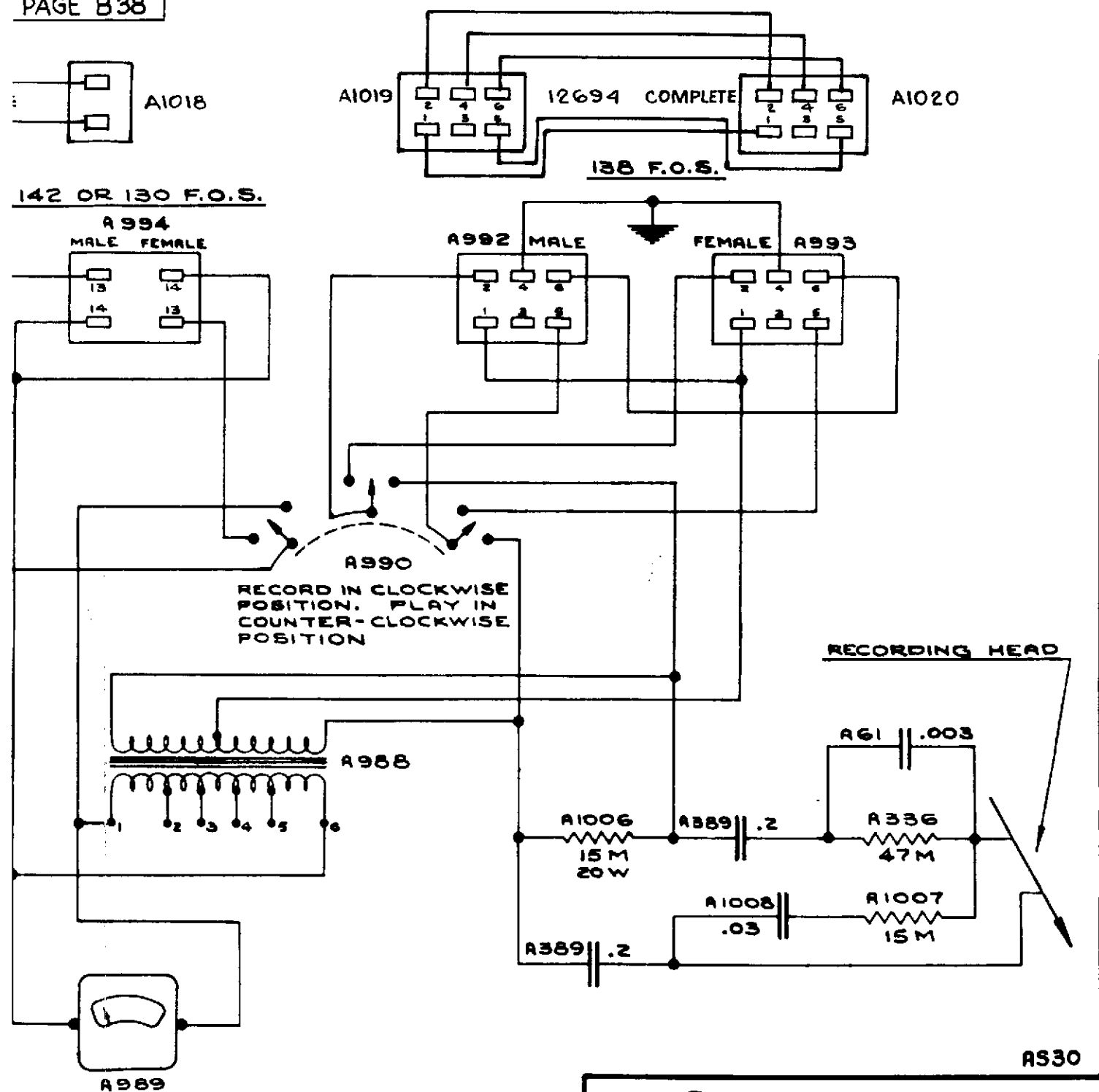
NOTE :-

S INDICATES TERMINAL AT CLOCKWISE STOP  
\* INDICATES UNITS ON SAME SHAFT

142 OR 130 F.O.S.







## SERVICE DATA

### WIRING DIAGRAM

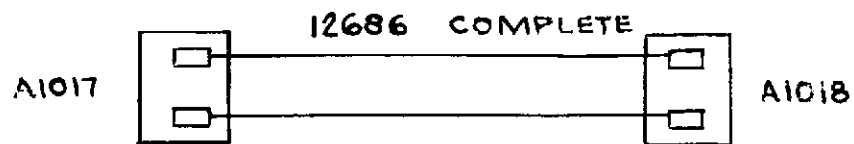
### DISC RECORDER

FOR COMMERCIAL, ACADEMY, UTILITY, MASTER, & AUDITORIUM FILMSOUNDS

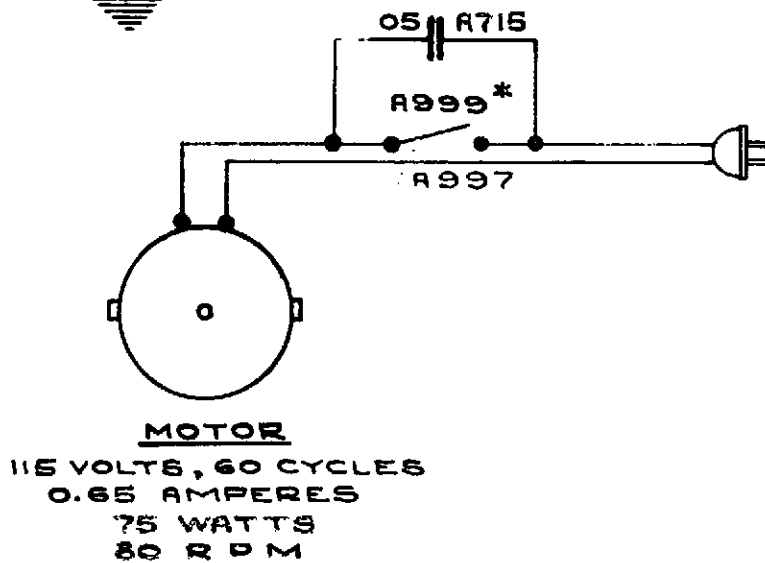
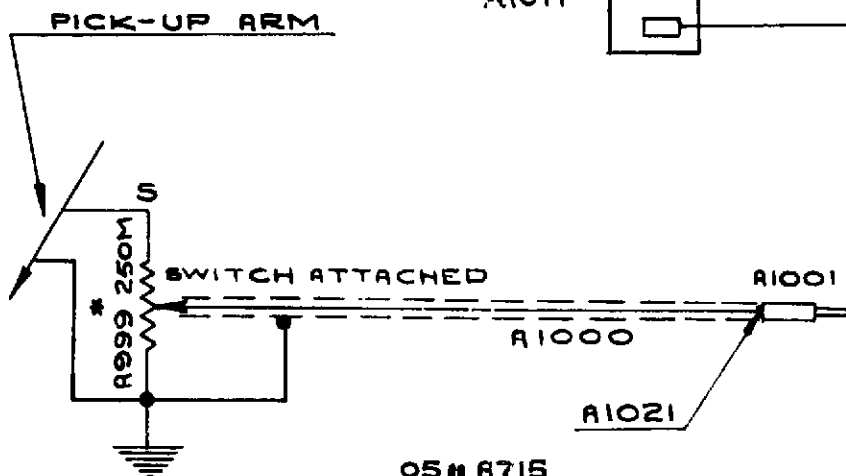
FOR USE ONLY WITH DISC RECORDERS  
PART No's 12625 & 12728

DATE  
10-9-40

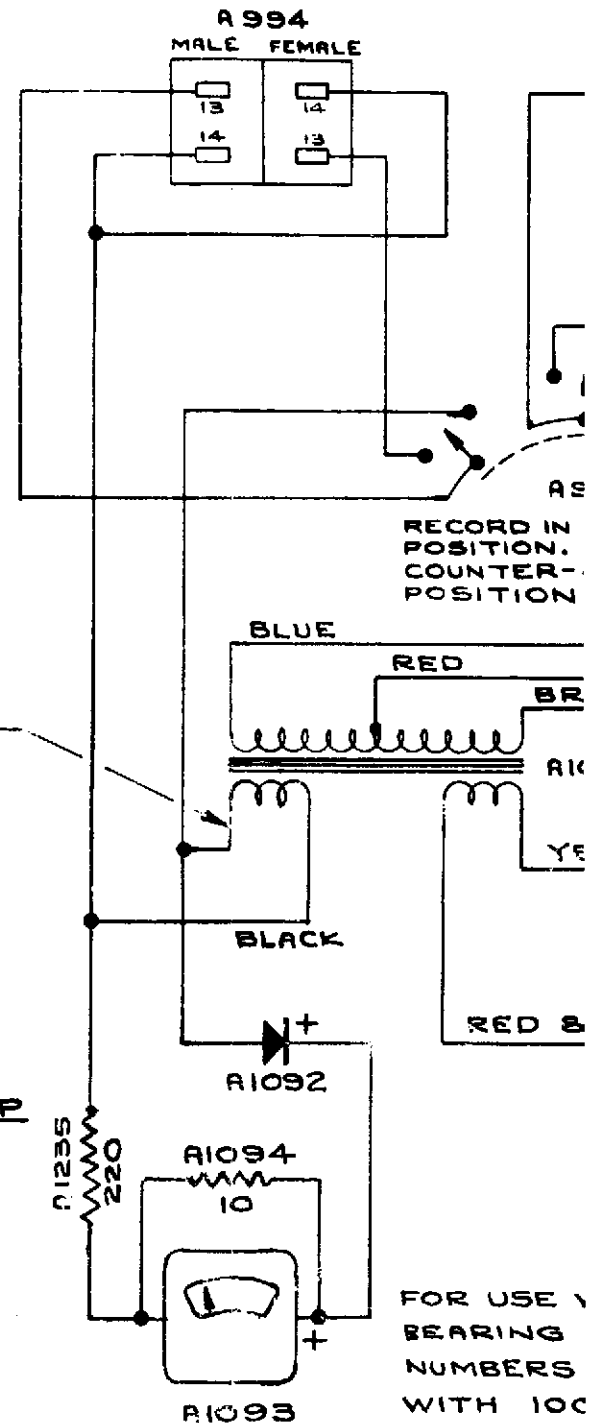




142 OR 130 F.O.S.



GREEN

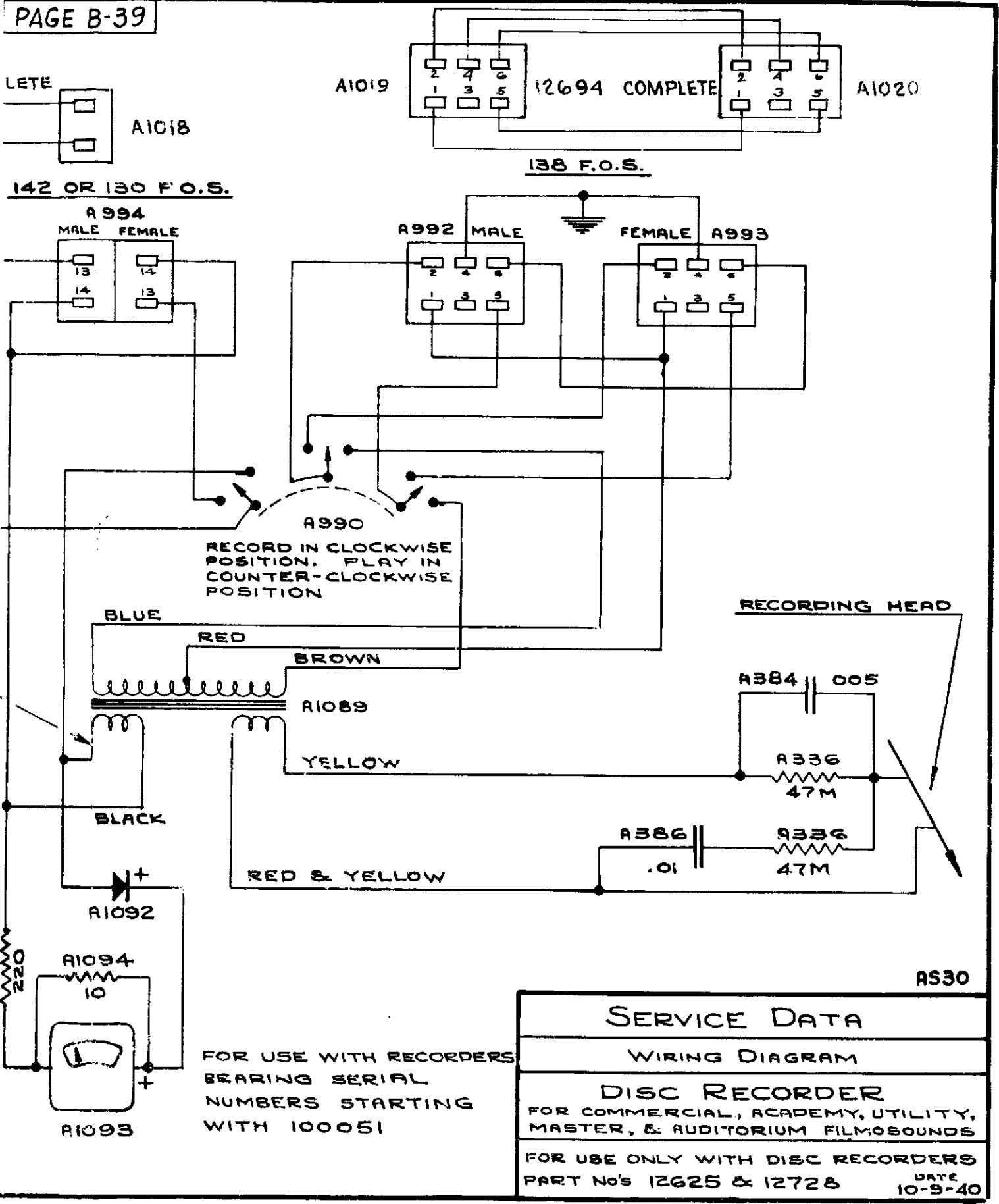


NOTE :-

S INDICATES TERMINAL AT CLOCKWISE STOP

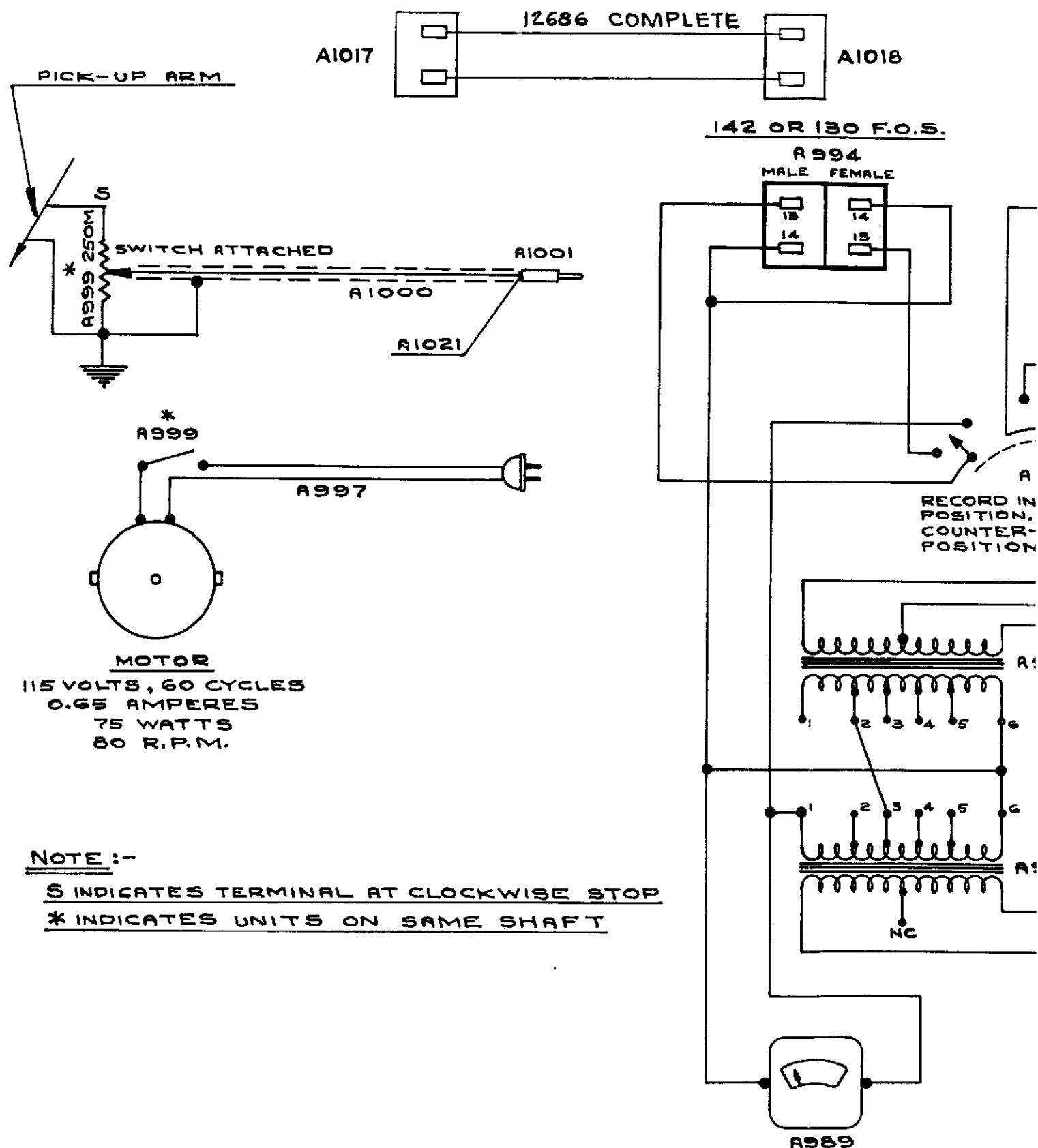
\* INDICATES UNITS ON SAME SHAFT





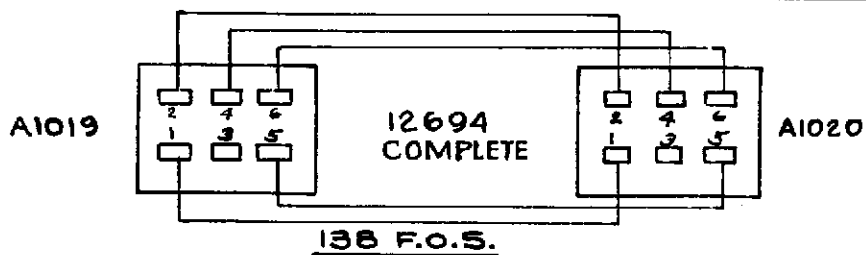
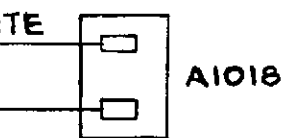
FOR USE WITH RECORDERS  
BEARING SERIAL  
NUMBERS STARTING  
WITH 100051



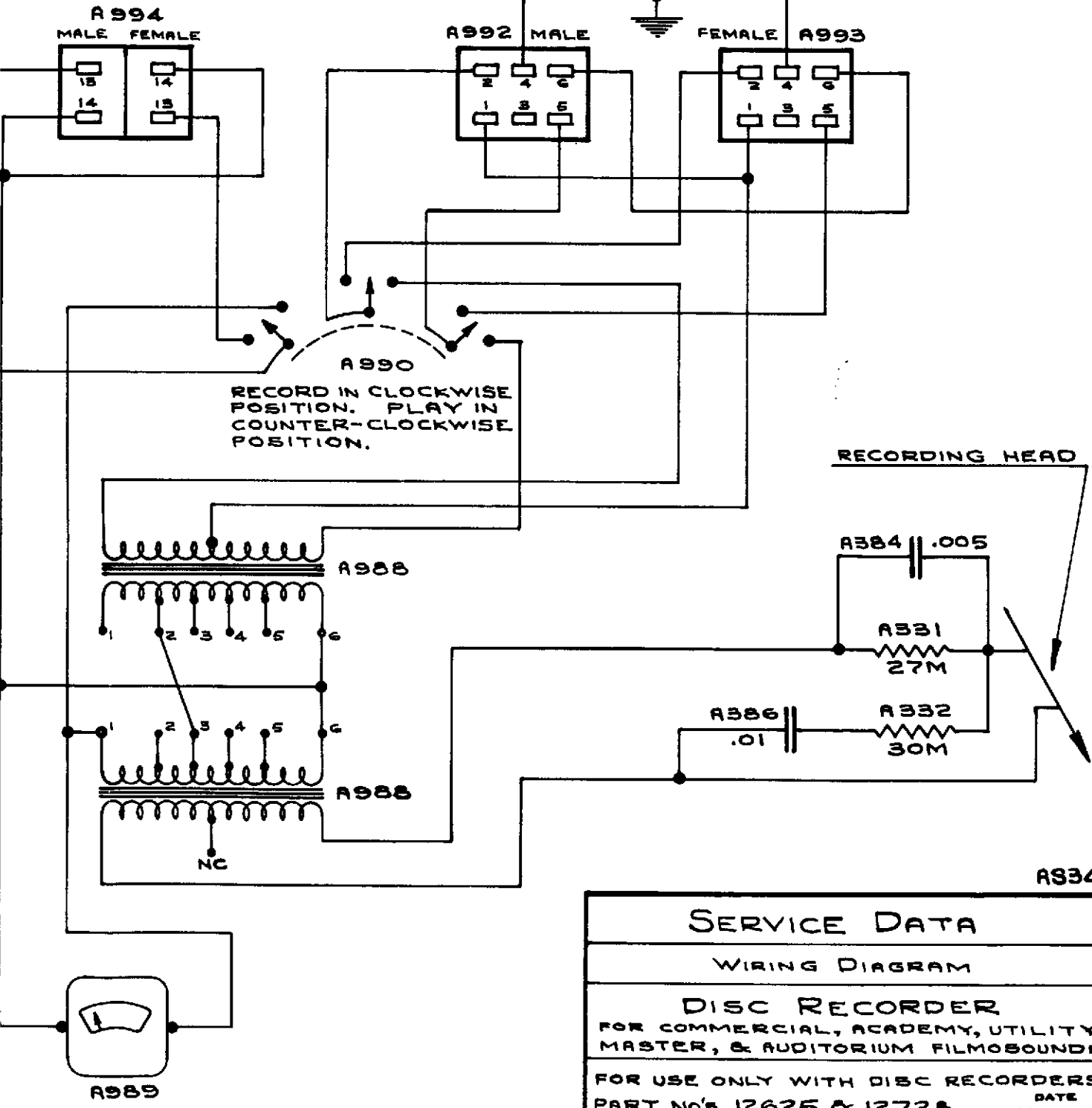




E B-40

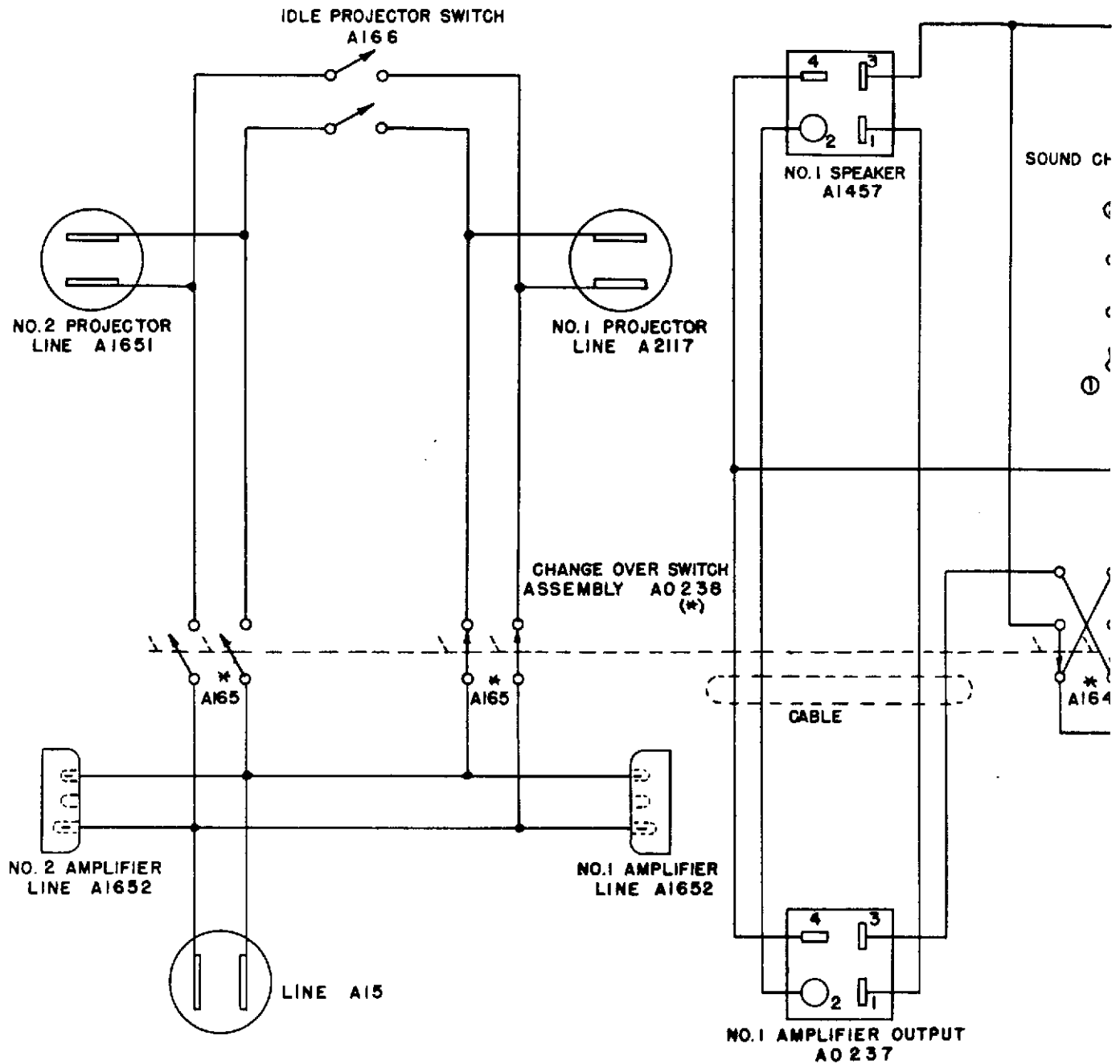


142 OR 130 F.O.S.



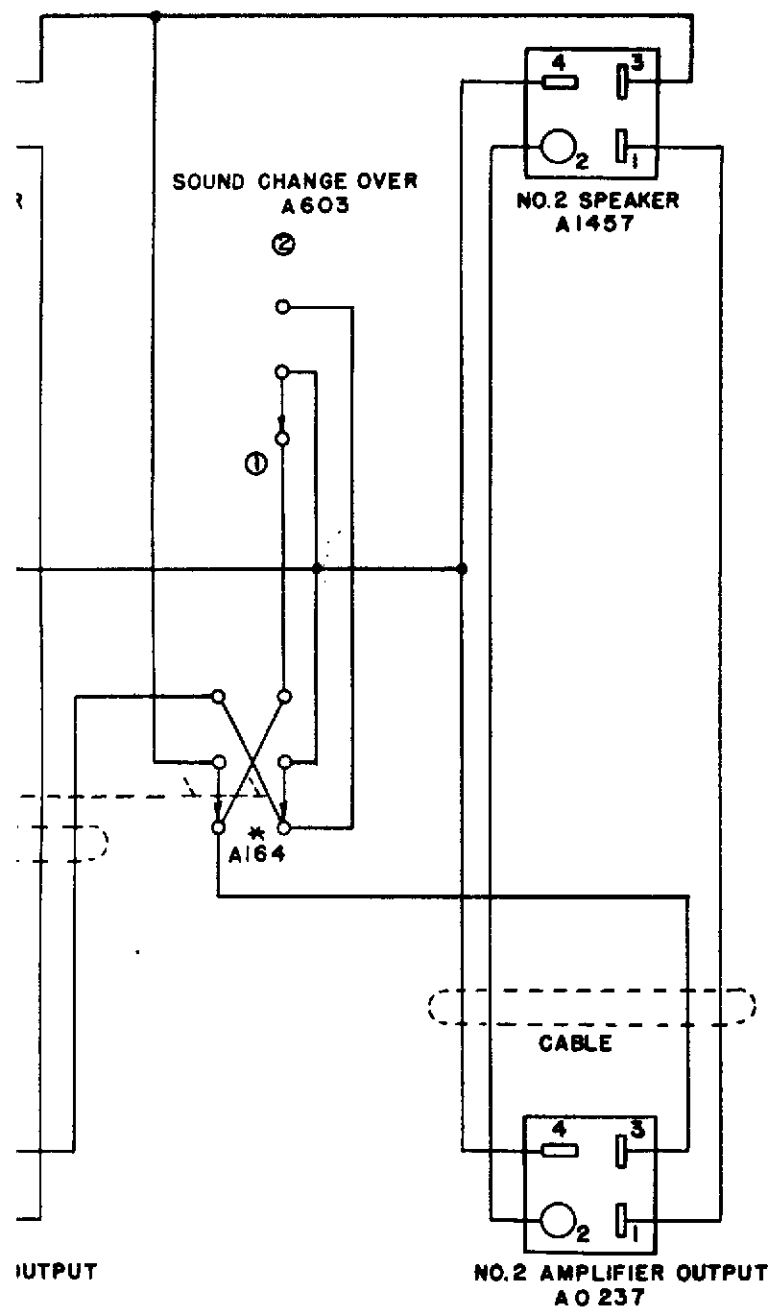
SERVICE DATA	
WIRING DIAGRAM	
DISC RECORDER	
FOR COMMERCIAL, ACADEMY, UTILITY, MASTER, & AUDITORIUM FILMSOUNDS	
FOR USE ONLY WITH DISC RECORDERS	
PART No's 12625 & 12728	DATE 11-8-40





SWITCHES SHOWN IN PROJECTOR NO.1 POSITION





AS102

BELL & HOWELL CO.  
CHANGE OVER BOX

DES. 156 A-D, V

DATE 5-13-46

SERVICE  
DATA

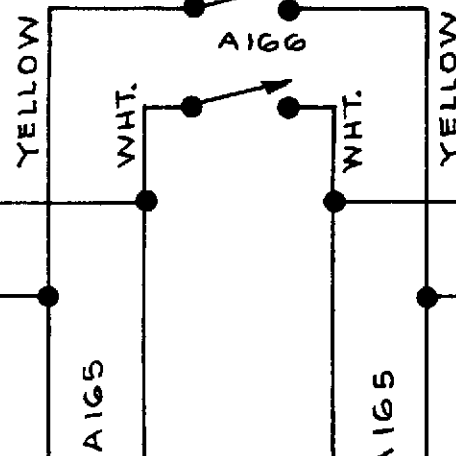
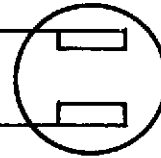
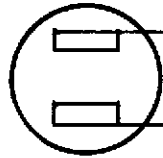
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APVD *[Signature]*



# IDLE PROJECTOR SWITCH

#2  
PROJECTOR  
LINE  
A1651

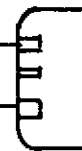
#1  
PROJECTOR  
LINE  
A2117



PICTURE  
CHANGE OVER  
SWITCH  
AO 238

#2  
AMPLIFIER  
LINE  
A1652

#1  
AMPLIFIER  
LINE  
A1652



LINE  
A15

WHITE  
YELLOW

SWITCHES SHOW  
PROJECTOR #1 POS



CTOR  
E  
117

IFIER  
E  
052

WITCHES SHOWN IN  
JECTOR #1 POSITION

#1  
AMPLIFIER  
OUTPUT  
AO 273

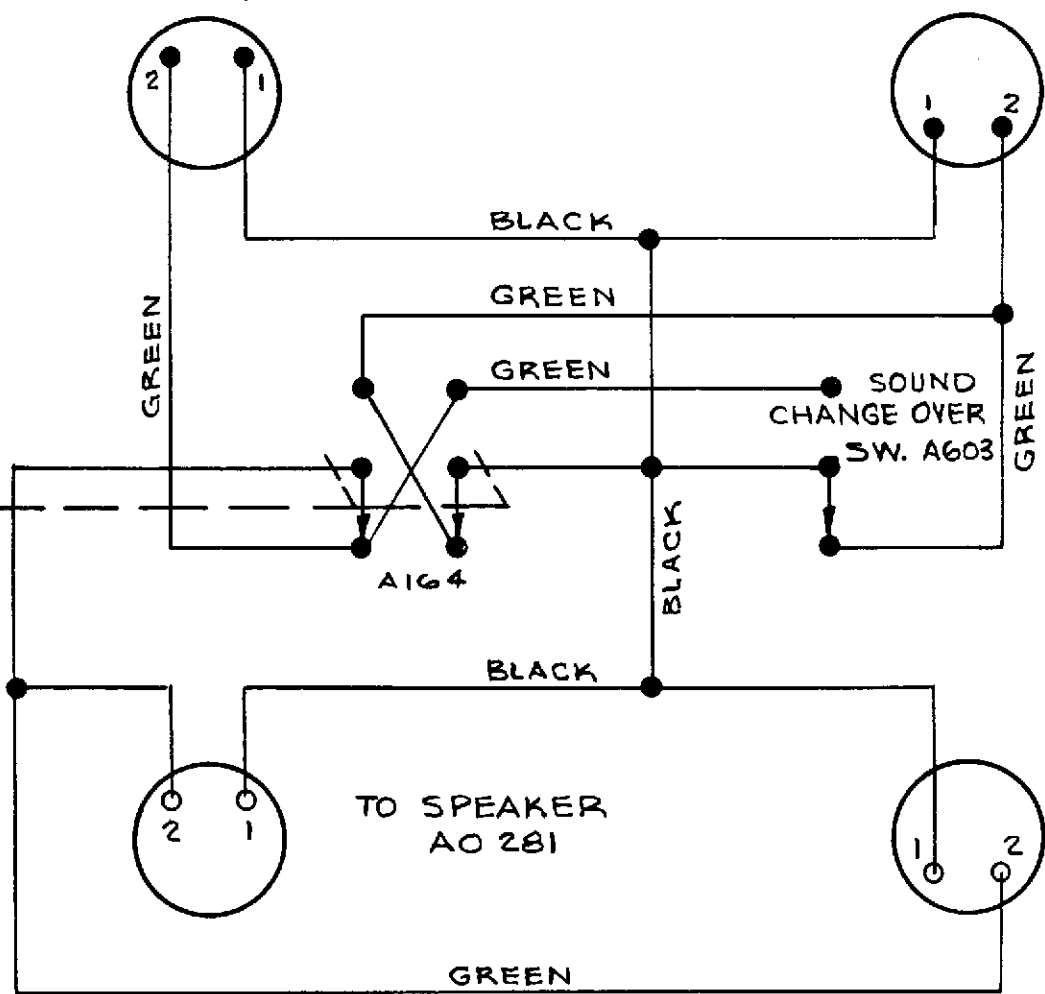
#2  
AMPLIFIER  
OUTPUT  
AO-273

PICTURE  
CHANGE OVER  
SWITCH  
AO 238

SOUND  
CHANGE OVER  
SW. A603

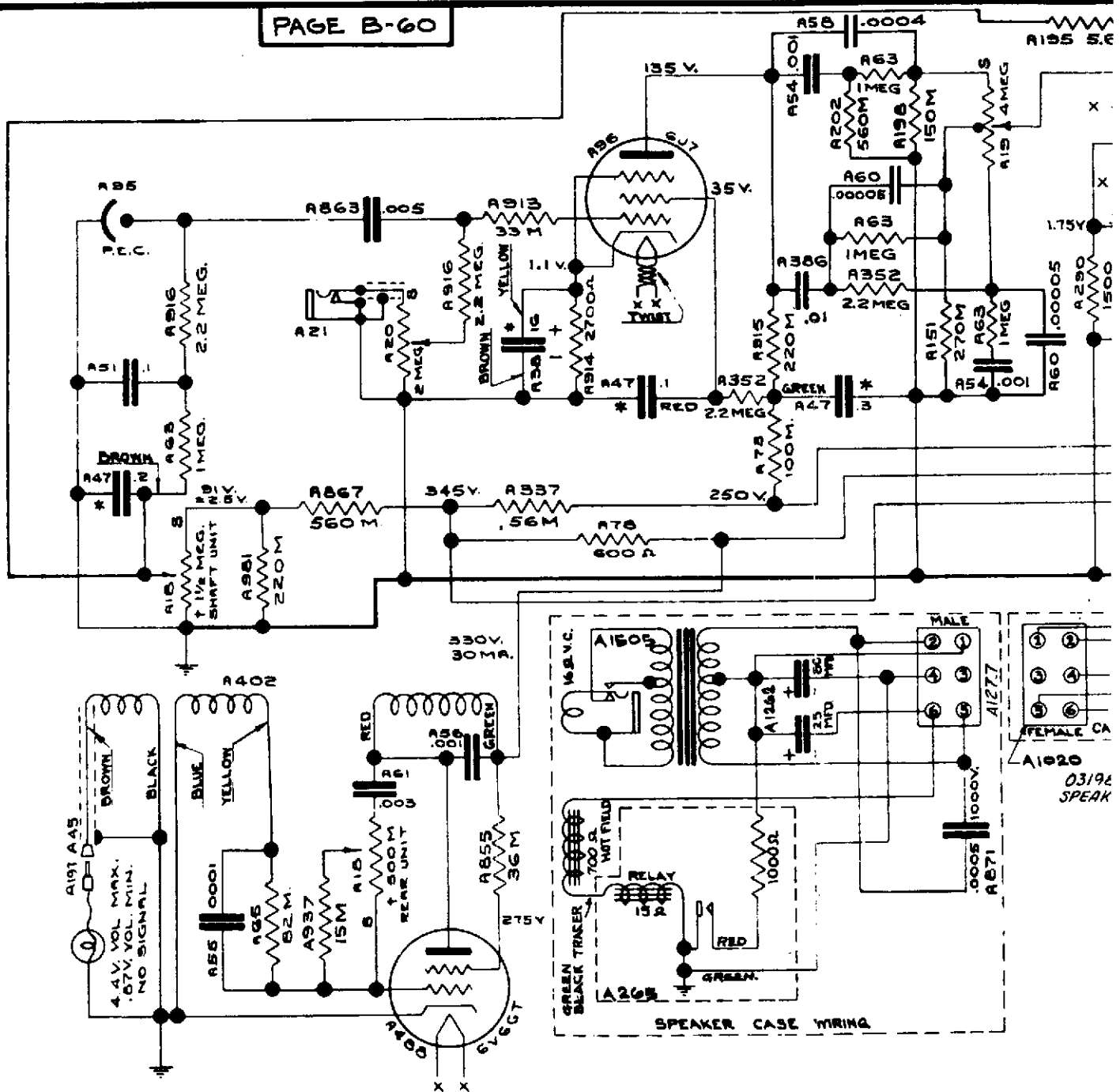
TO SPEAKER  
AO 281

TO SPEAKER  
AO 281



SERVICE DATA	
CHANGE-OVER BOX	
BELL & HOWELL CO, CHICAGO	
PART: 13987	APVD. F.C.H.





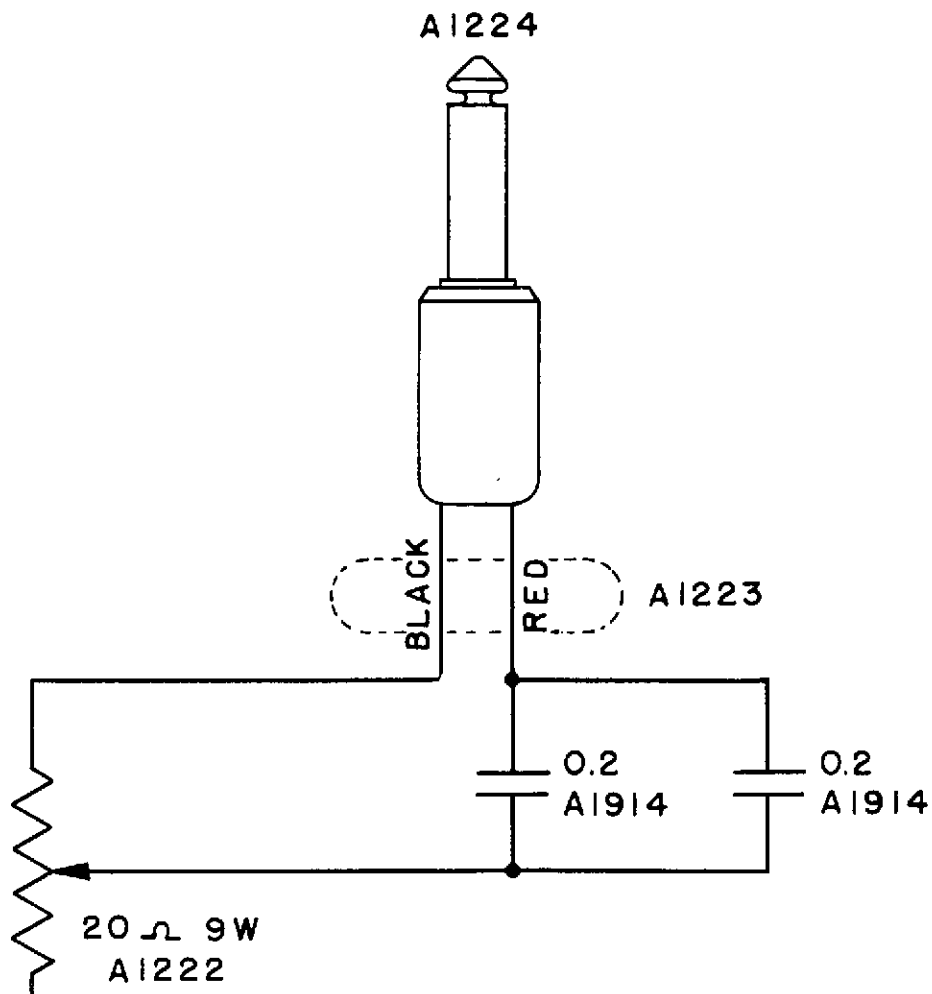
\* S INDICATES TERMINAL, AT CLOCKWISE STOP. ALL VOLTAGES MEASURED WITH EXCITER LAMP FULL ON AND NO SIGNAL AT 115 V. LINE. ALL VOLTAGES MEASURED TO GROUND  
 \* F & D DENOTE CAPACITORS LOCATED IN BANK  
 T INDICATED CONTROLS ON SAME SHAFT

WIRING COLOR CODE	
WHITE - GROUND	BROWN - SCREEN
YELLOW - CATHODE	BLUE - PLATE
RED - B+	BLACK - HEATER
GREEN - GRID	









AS 103

SERVICE DATA	
REMOTE VOLUME CONTROL	
B & H #12828	
	5-1-46

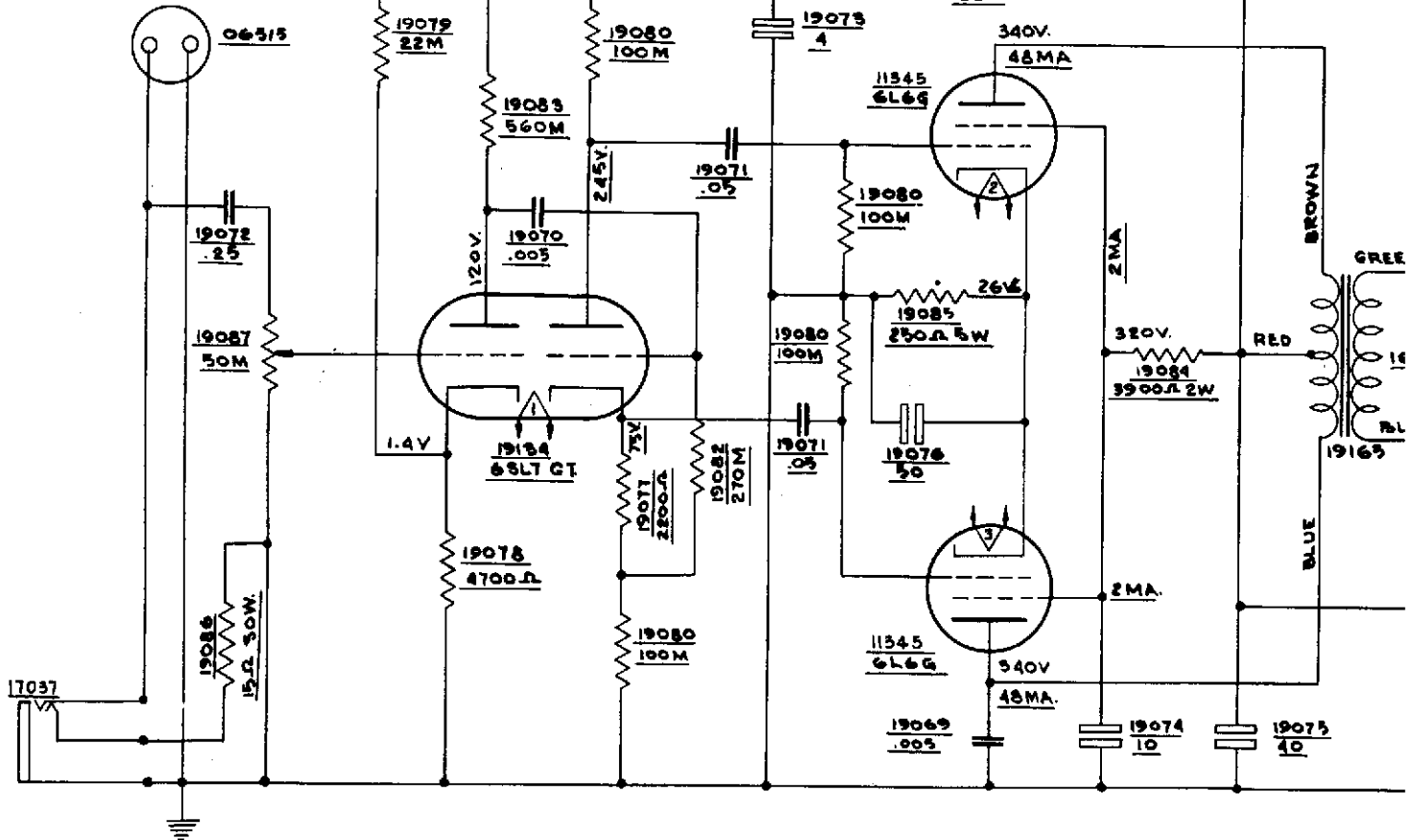


12824  
F.O.S. SPEAKER  
CABLE

TO FQS. AMPLIFIER

NOTE:

NOT SUPPLIED WITH  
POWER SPEAKER

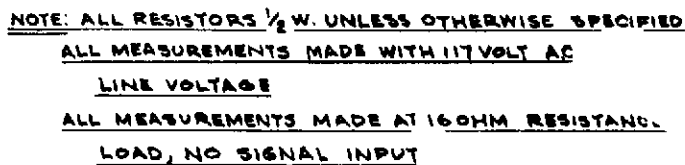


21705  
CABLE

TO ADDITIONAL POWER  
SPEAKERS OR  
F.O.S. STANDARD SPEAKER

NOTE: ALL RESISTORS  $\frac{1}{2}$  W. UNLESS OTHERWISE SPECIFIED  
ALL MEASUREMENTS MADE WITH  
LINE VOLTAGE  
ALL MEASUREMENTS MADE AT 16  
LOAD, NO SIGNAL INPUT





BELL & HOWELL CO. CHICAGO U.S.A.

25 WATT 60 CYCLE POWER SPEAKER

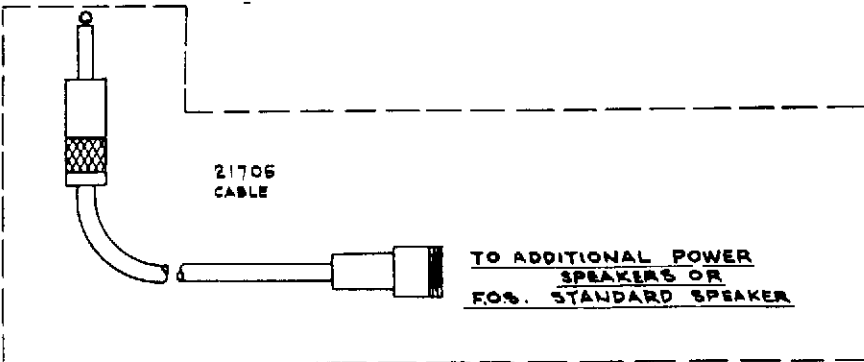
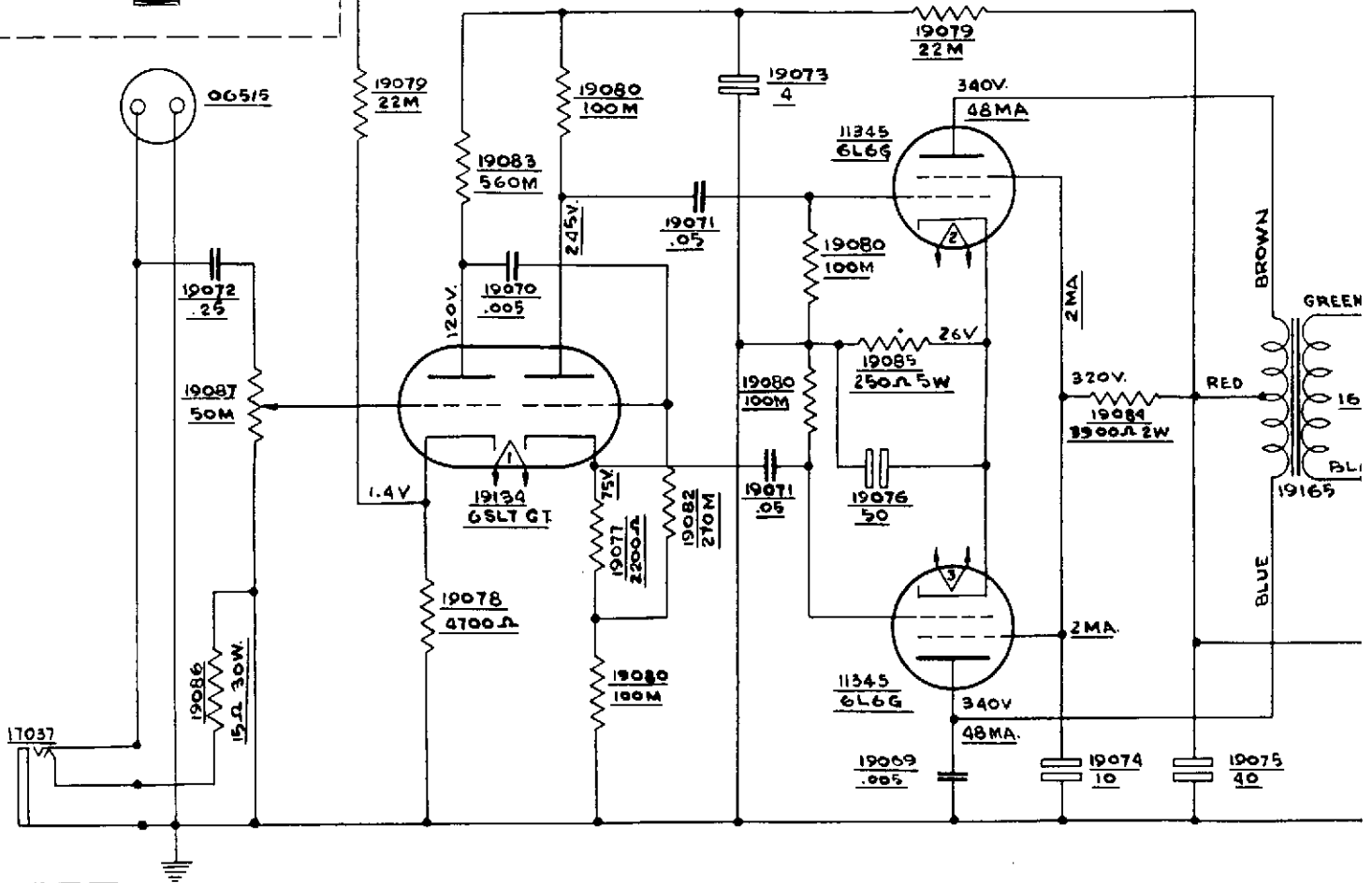
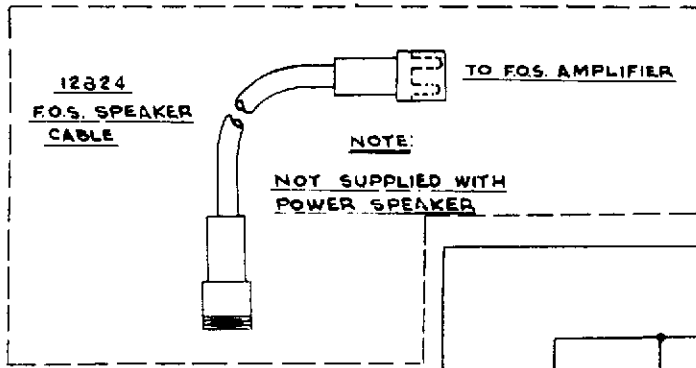
SCHEMATIC  
FOR USE WITH 06528 & 06517 AMPLIFIERS ONLY

DATE 1-12-48

**SERVICE DATA**

DRAWN BY: M.  
REVISED BY: E.





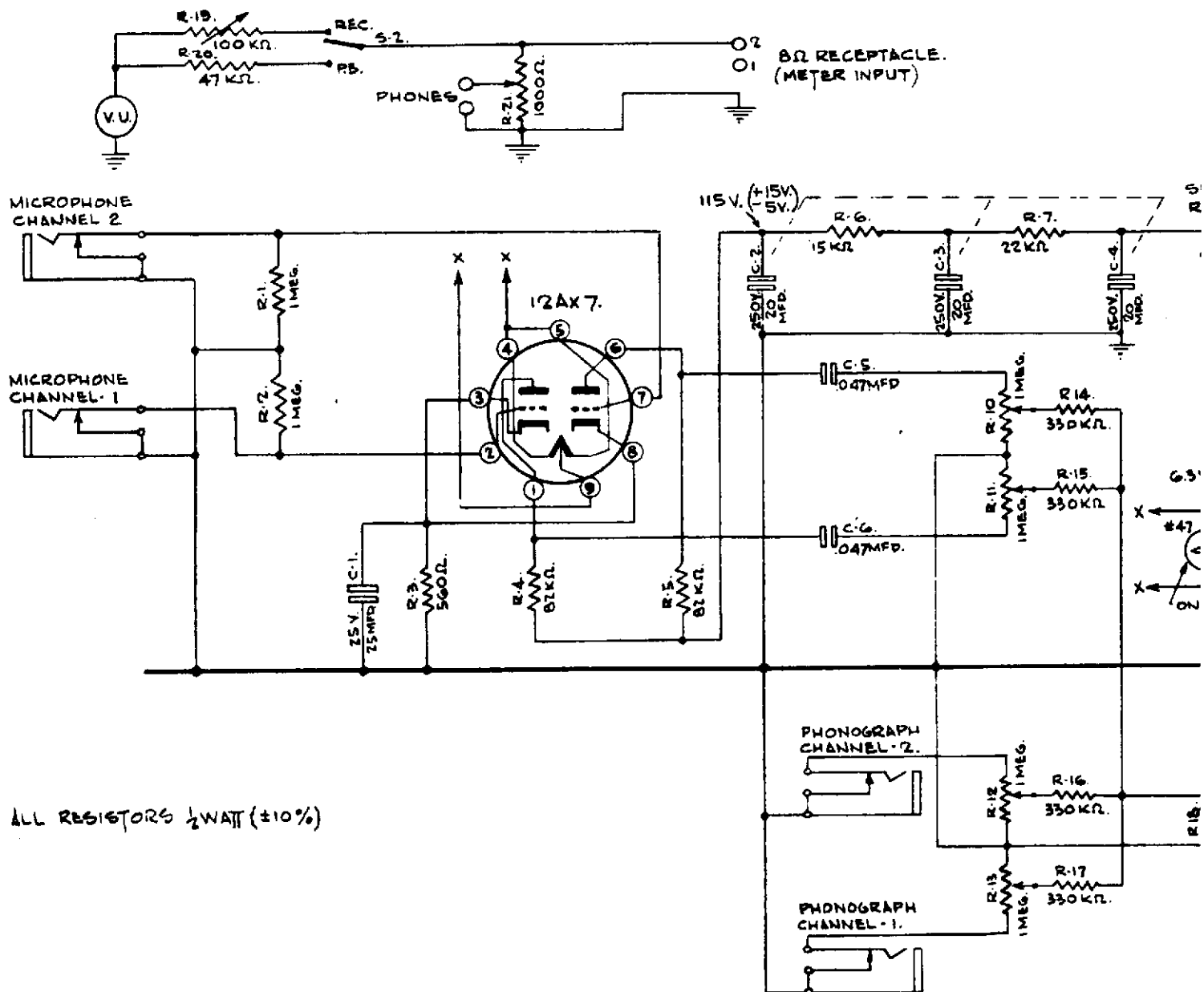




REVISÉ 6-20-51

DRAWN BY  
APPROVED

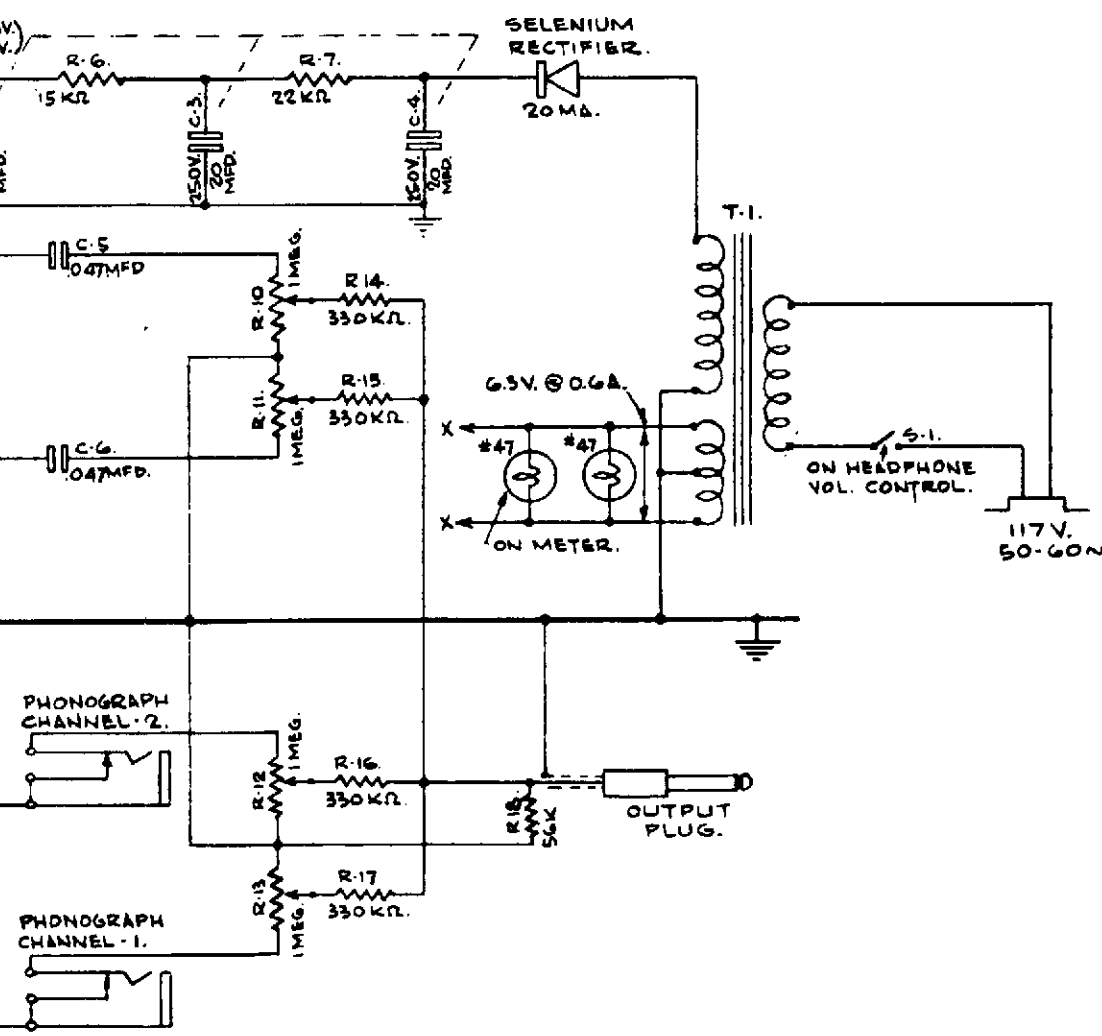






B-80

8Ω RECEPTACLE.  
(METER INPUT)



SERVICE DATA	
WIRING DIAGRAM	
MONITOR MIXER	
DESIGN 202	MODELS - ALL
FOR USE ONLY WITH	DATE 11-30-55
PART NO. 25996	



## SECTION C

DESIGN 120, Models A, B, C, DGENERAL INFORMATION.

The amplifier uses 2A3 tubes in the output. Filmosounds with serial numbers up to 161595 and from 162157 to 165485 inclusive are of this type. These amplifiers contain a microphone transformer with a 200-ohm primary and use a double-button carbon microphone with a Western Electric No. 110 or a Kellogg No. 191 plug. The voltage for the microphone is obtained from the 45 oscillator tube. The tone control and microphone volume control are mounted on the same shaft. The tone control is disconnected when the plug is inserted.

FILM VOLUME.

Film volume is controlled by changing the voltage on the oscillator tube. This in turn controls the voltage on the exciter lamp and the bucking voltage supplied to the phototube. As this bucking voltage is decreased, the positive voltage on the anode remaining constant, the effective voltage on the phototube is increased and the volume is higher. The 45 tube oscillates at a frequency of approximately 25,000 cycles.

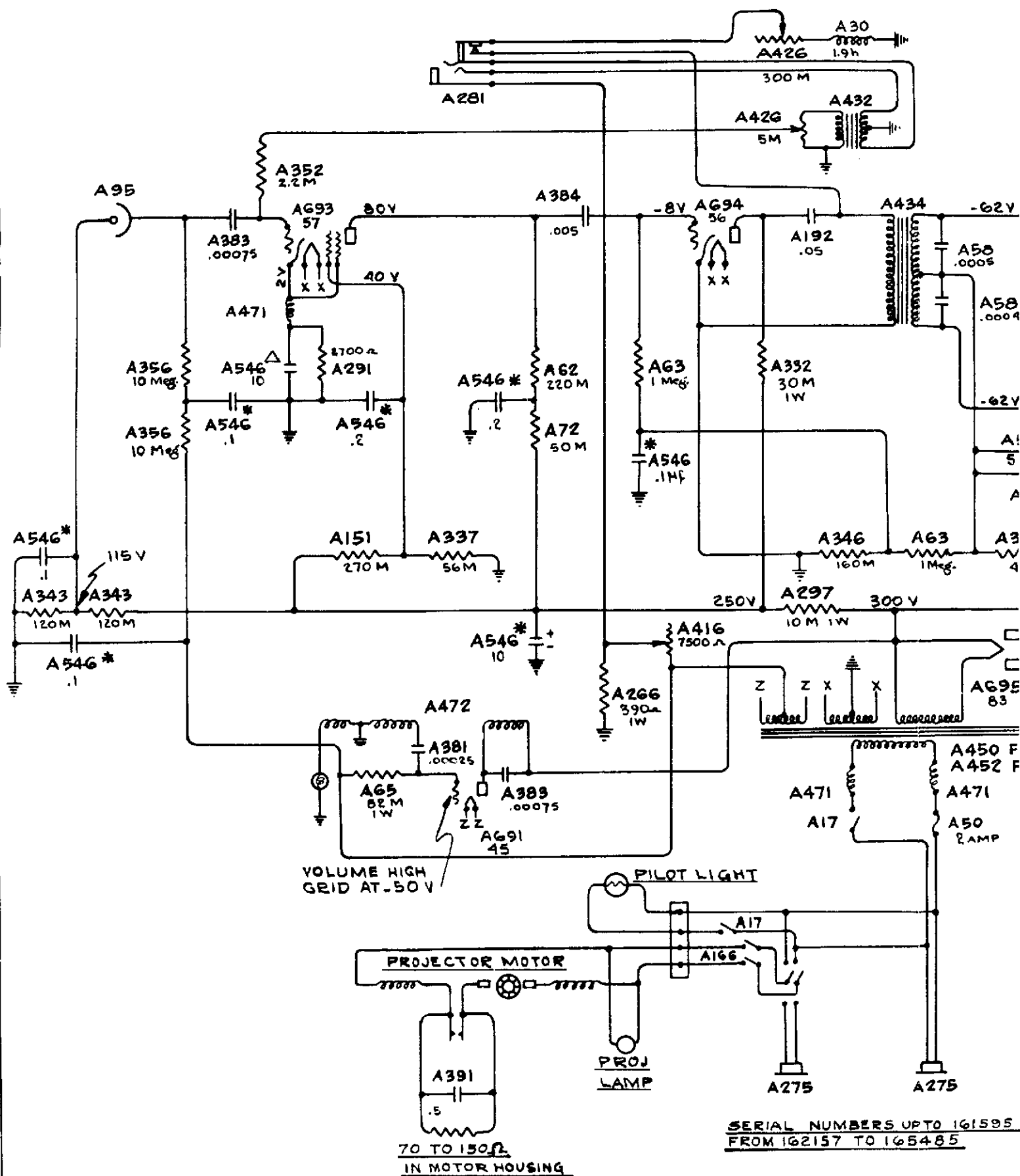
SPEAKER.

Note that the speaker field is connected in the "B" negative lead. The voltage divider across the field provides the negative voltage for the bias on the 56 and 2A3 tubes. The 991 neon lamp, A709, acting through the 40,000-ohm resistor, maintains a constant bias voltage on

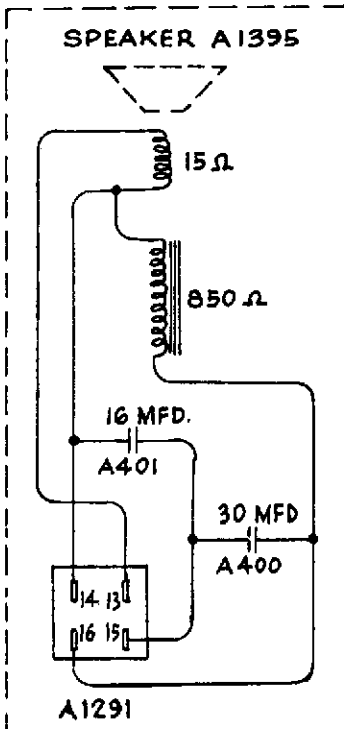
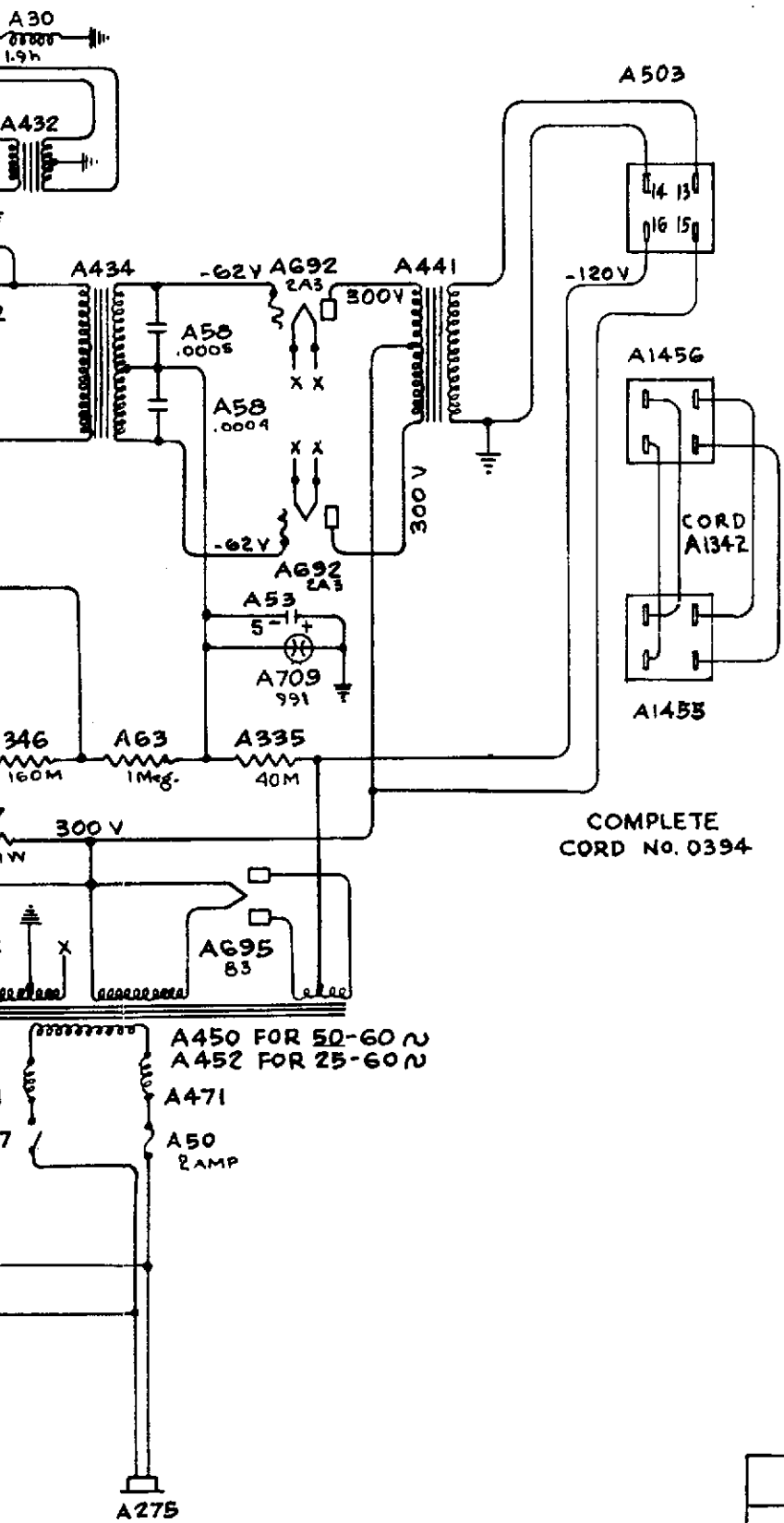


the 2A3 tubes. The 4 mfd condenser, A53, prevents flickering of the neon lamp and reduces hum. The voice coil impedance required is 15 ohms, and the plate load impedance is 10,000 ohms. The power output of each of these models is 10 watts.









NOTE -  
IN SOME MODELS THE CONDENSERS  
IN THE CONDENSER BANK ARE  
AS FOLLOWS:

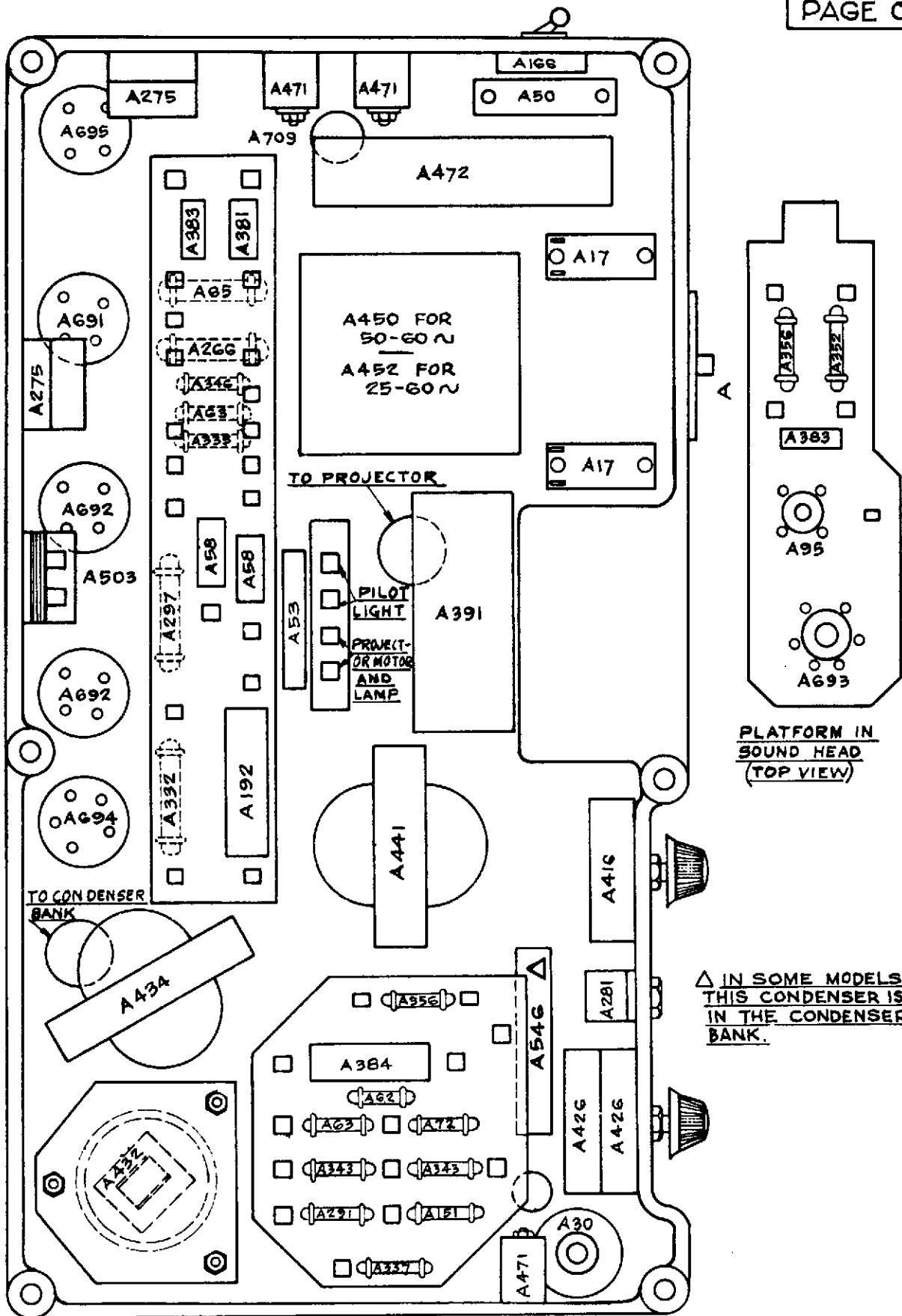
- |               |      |             |
|---------------|------|-------------|
| BLACK         | A546 | RED         |
|               | A546 | BLUE        |
|               | A546 | GREEN       |
|               | A546 | GREEN       |
|               | A546 | GREEN       |
| WHITE & GREEN | A546 | BROWN       |
| BLACK & WHITE | A546 | RED & WHITE |
- IN SOME MODELS THE CONDENSERS IN  
THE BANK ARE AS FOLLOWS:
- |                |      |             |
|----------------|------|-------------|
| BLACK          | A546 | RED         |
|                | A546 | BLUE        |
|                | A546 | GREEN       |
|                | A546 | GREEN       |
|                | A546 | GREEN       |
| BLACK & YELLOW | A546 | GREEN       |
|                | A546 | MAROON      |
| BLACK & RED    | A546 | YELLOW      |
|                | A546 | RED & BLACK |
- IN OTHER MODELS THE SECOND COLOR  
CODE IS USED, BUT CONDENSER MARKED  
△ IS LOCATED OUTSIDE THE BANK.
- \* CONDENSERS WITH THIS MARK  
ARE NORMALLY LOCATED IN THE BANK.  
SEE THE ABOVE CLASSIFICATION.

MBERS UPTO 161595 &  
7 TO 165485

SUPERSEDES MODEL 120

BELL & HOWELL CO. CHICAGO, U.S.A.		
FILMOSOUND		
DESIGN 120 MODELS ABC & D		
DATE 5-13-36	SERVICE DATA	DRAWN <i>WPK</i>
REV. 10-16-45		APVD.





### SERVICE DATA

BOTTOM VIEW OF AMPLIFIER

FILMSOUND

DESIGN 120

MODELS ABC & D

FOR USE ONLY WITH  
PART NO. 01849

DATE 5-13-36  
REV. 10-16-45

SUPERSEDES MODEL 120



DESIGN 120, SPECIAL ERPI MODEL

GENERAL INFORMATION.

This projector has a standard Design 120 mechanism but has only a pre-amplifier which terminates in a low impedance line. The final amplifier was manufactured by Western Electric. It is located in the speaker and uses Western Electric special parts and tubes. Due to the special design of the final amplifiers, we have never serviced them and recommend that you do not attempt their repair.

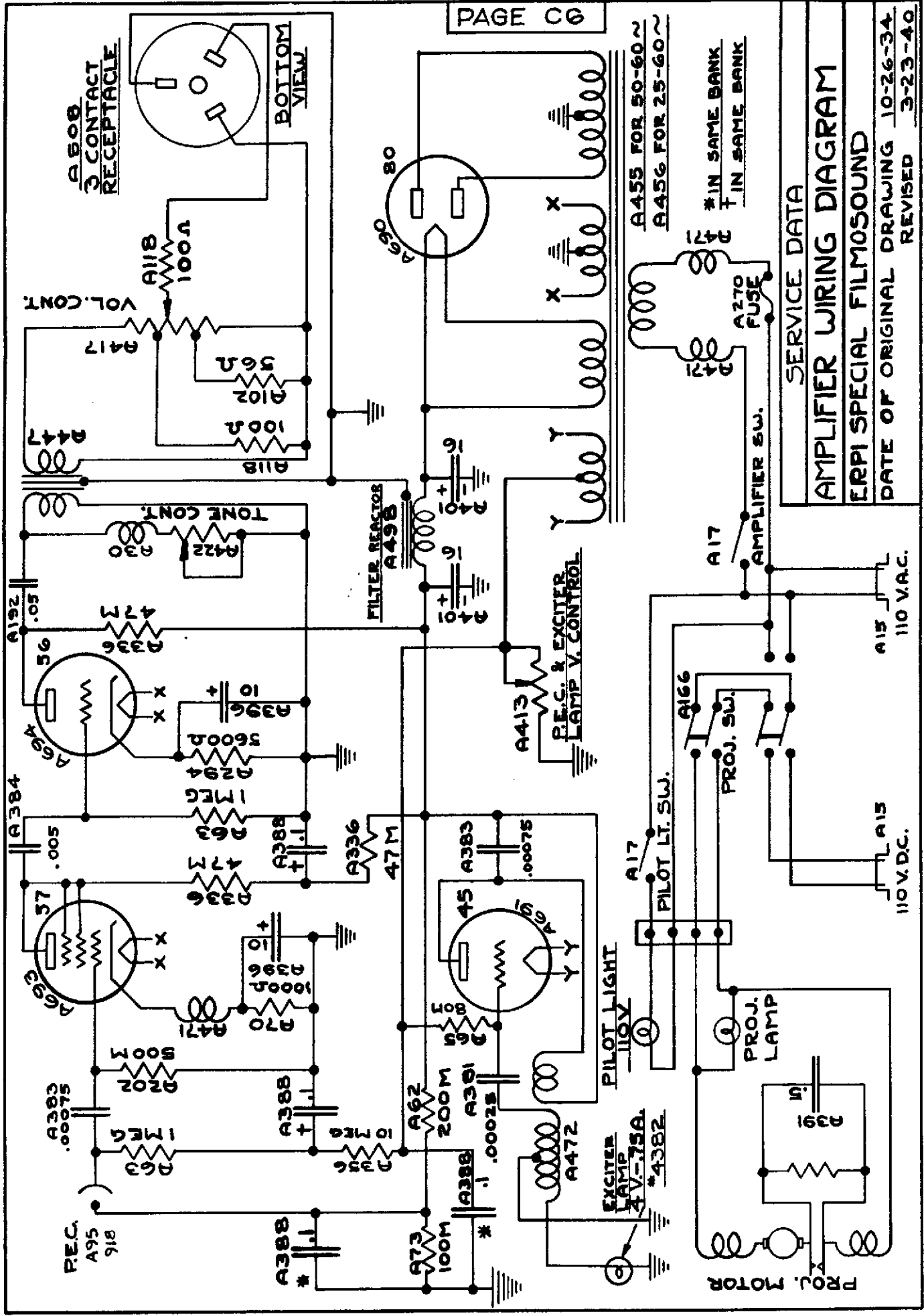
VOLUME REGULATION.

Complaints of poor volume regulation can be corrected by changing the original output circuit to the one shown on the schematic diagram, page C-6. Parts are obtainable from Bell & Howell Company.

TESTING.

For testing, the output may be connected into the microphone input of a standard Filmsound of almost any model. The upper and lower right terminals of the output receptacle when connected together will form the sleeve connection to the microphone plug, and the lower left terminal, the tip connection. Headphones may also be used but the output will be extremely low.





SERVICE DATA

AMPLIFIER WIRING DIAGRAM

ERPI SPECIAL FILMOSOUND

DATE OF ORIGINAL DRAWING 10-26-34

REVISED 3-23-40

A455 FOR 50-60~  
A456 FOR 25-60~

\*IN SAME BANK  
† IN SAME BANK

PROJ. MOTOR

PROJ. LAMP

PROJ. SW.

PILOT LT. SW.

EXCITER LAMP

EXCITER LAMP

EXCITER LAMP

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EXCITER LAMP



DESIGN 120, MODELS B, D

(with hum balancer and adjustment on phototube voltage)

- - - - -

GENERAL INFORMATION.

This amplifier uses 2A3 tubes in the output. Filmosounds with serial numbers from 161963 to 161965, 161967 to 161991, 161993 to 161999, 162010 to 162054, 165486 to 165493, and 171468 to 171479 are of this type. These Filmosounds can be distinguished by the hum balancing control mounted on top of the amplifier casting between the amplifier and pilot light switches, and the phototube voltage control on top of the casting above the volume control.

There is no microphone transformer in this amplifier. A 5,000-ohm input is used, and voltage is supplied on the ring contact of the jack. A double-button carbon microphone with an external transformer is used. A Western Electric No. 110 or Kellogg No. 191 plug should be used.

FILM VOLUME.

Film volume is controlled by varying the voltage on the exciter lamp with a variable series resistor. Thus, the oscillator is not changed. The voltage on the phototube is adjusted by control A425. Thus, the phototube is not controlled by the volume control and will pick up any light reaching it, producing a hum in the speaker. Turning the volume control down will not eliminate this hum. It is important that the phototube in these Filmosounds be shielded from 60-cycle light if this hum is to be avoided.

The hum balancer adjusts the bias on the 2A3 tubes, and, in this way, compensates for unmatched tubes having different plate currents.



The bias voltage for the 2A3 tubes is obtained from the oscillator, by the drop in resistor A333. As in the other amplifier using 2A3 tubes, the 991 neon lamp regulates the bias voltage by acting through resistor A332. However, in this amplifier, if the 991 neon lamp does not function the bias becomes so high that the tubes will not operate. Sometimes the oscillator will not start if the amplifier is turned on with the volume control advanced. Under these conditions the 2A3 tubes have no bias and the fuse will blow. This point should be watched.

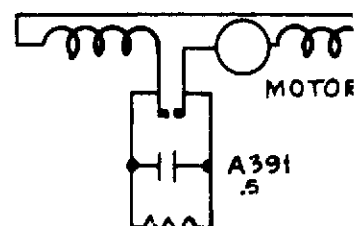
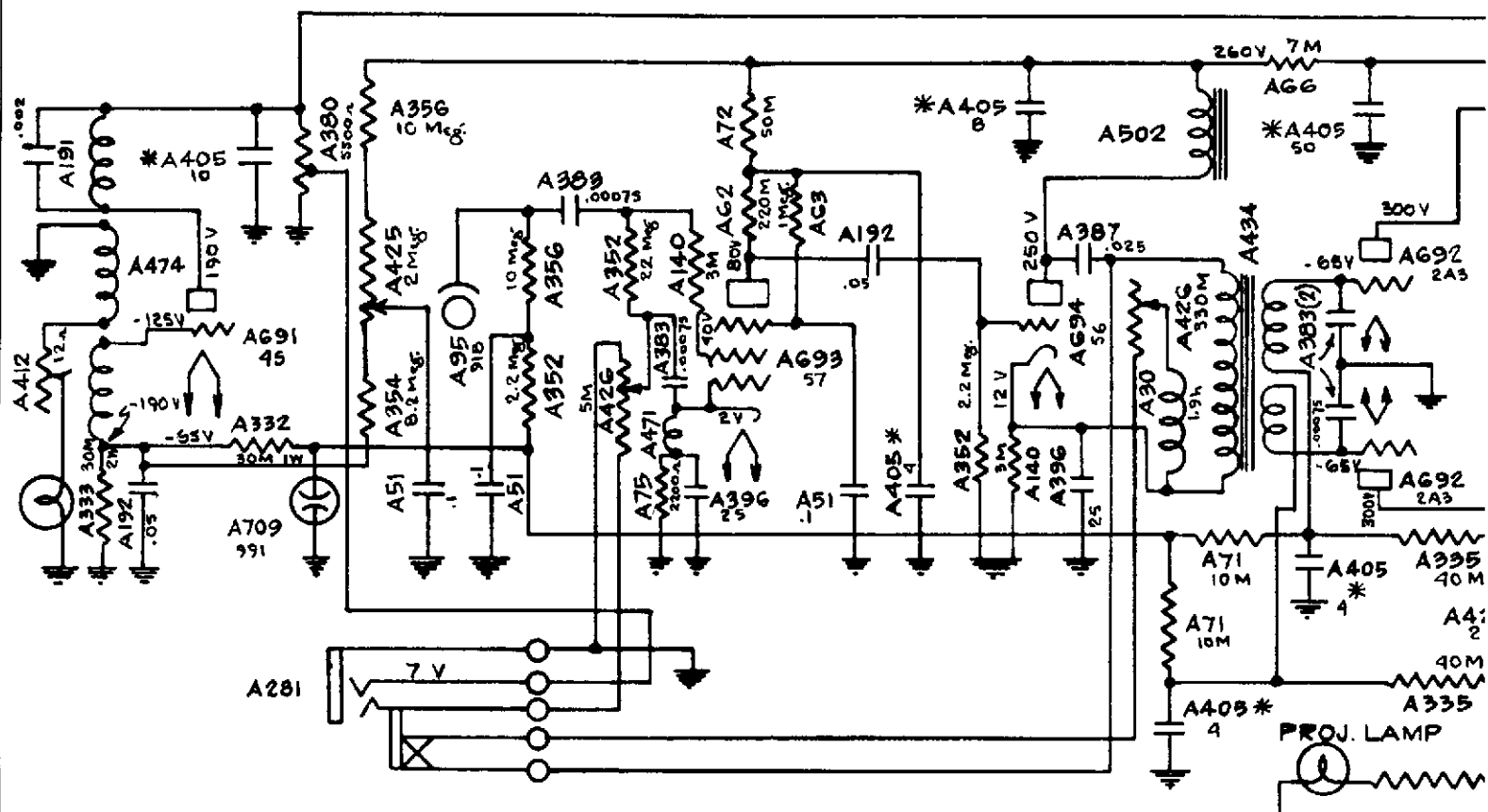
SPEAKER.

Note that the speaker field and resistor A380 are connected across the "B" supply. The current through this circuit, plus the plate current of the oscillator tube, furnishes the field excitation. Filtering is accomplished by condensers as no filter choke is used.

WARNING

Do not press on resistor A330 when handling this amplifier. It will last indefinitely if not disturbed but will not withstand any flexing.





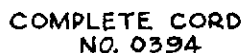
SERIAL NUMBERS

161963 TO 161965  
161967 TO 161991  
161993 TO 161999  
162010 TO 162054  
165486 TO 165493  
171468 TO 171479

NOTE

\* MOUNTED IN CONDENSER BANK.





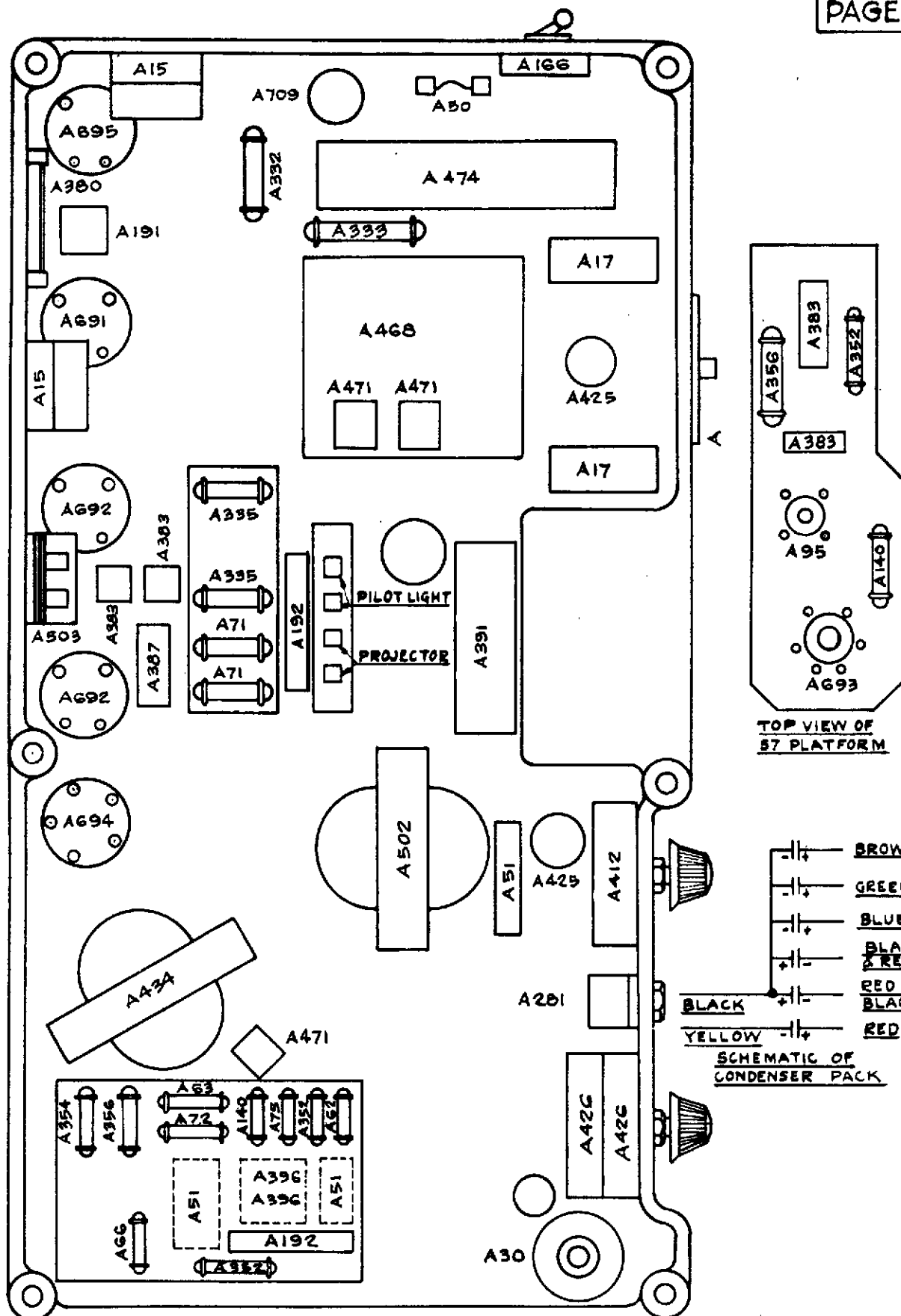
**OUTSIDE VIEW**

**SUPERSEDES MODELA**

FOR USE ONLY WITH  
PART NO. 92564

DATE 5-21-36  
REV 10-17-45





### SERVICE DATA

**BOTTOM VIEW OF AMPLIFIER**

**FILMOSOUND**

DESIGN 120 MODELS B & D

WITH HUM BALANCER

**SUPERSEDES MODEL A**

FOR USE ONLY WITH  
PART NO. 02564

DATE 5-23-56  
REV. 10-17-45



DESIGN 120 - MODELS E, F, G, H

GENERAL INFORMATION.

In this type of amplifier, 6B5 output tubes are used. All of the tubes are of the 6-volt series. The 991 neon lamp is not used, as the 6B5 tubes are self-biased. This Filmosound uses a diaphragm-type crystal microphone with a Yaxley No. 75A plug. The cell-type crystal microphone may also be used, but the output is not as great. The sleeve of the plug is the ground terminal.

FILM VOLUME.

Film volume is controlled by varying the voltage on both the phototube and the exciter lamp.

SPEAKER.

A 12-inch speaker is used, with its 6,350-ohm field connected directly across the B supply. A tap on the field provides reduced voltage for the oscillator. The speaker voice coil has an impedance of 18 ohms.

CAUTION

Do not leave the lead to the exciter lamp close to the microphone volume control when working on this amplifier, as this may cause feed back. Keep the lead straight and pulled back toward the power transformer.

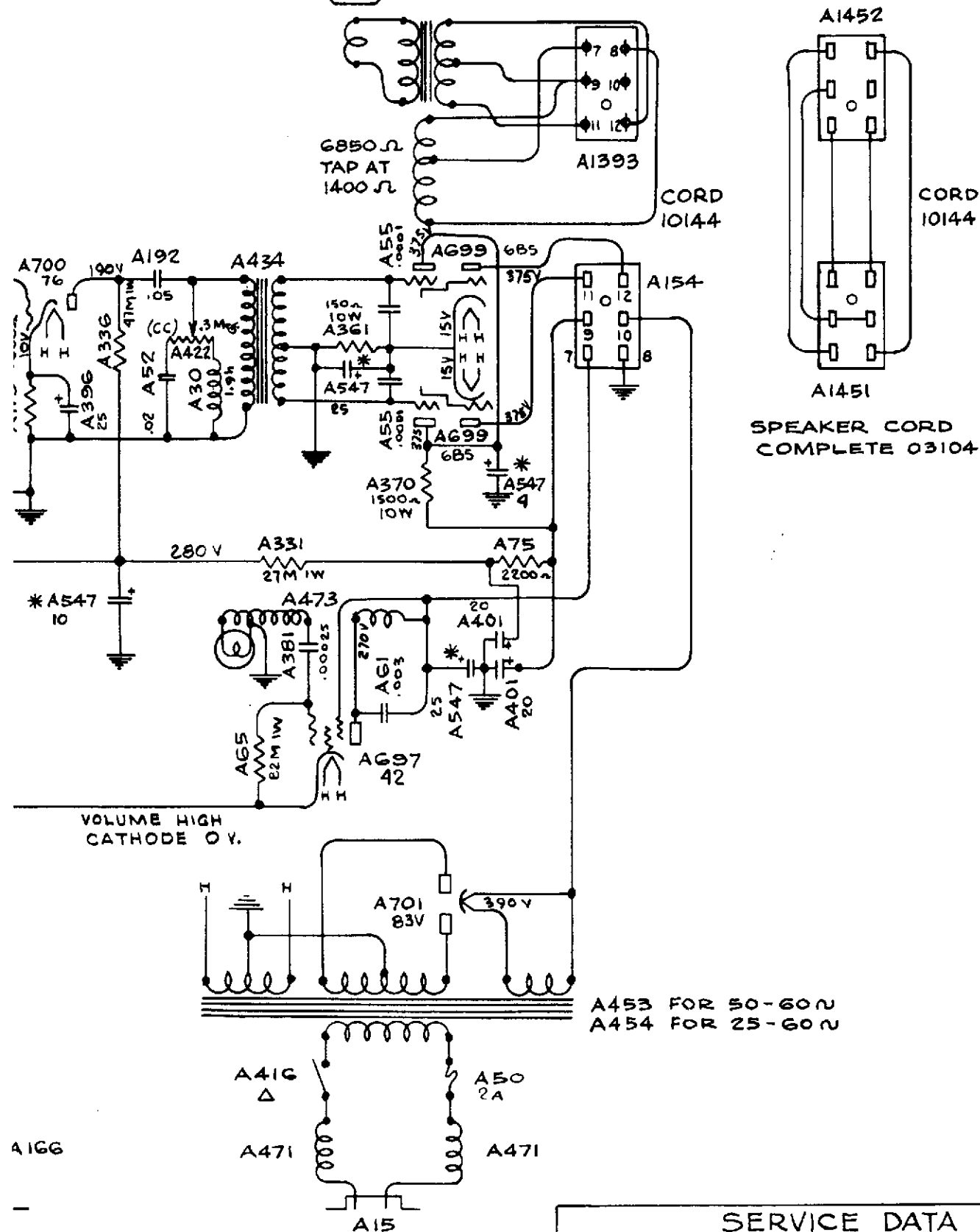






SPEAKER  
A1396

NOTE - TERMINALS 9&10  
STRAPPED IN SPEAKER CABLE



### SERVICE DATA

## WIRING DIAGRAM

FILMSOUND

DESIGN 120

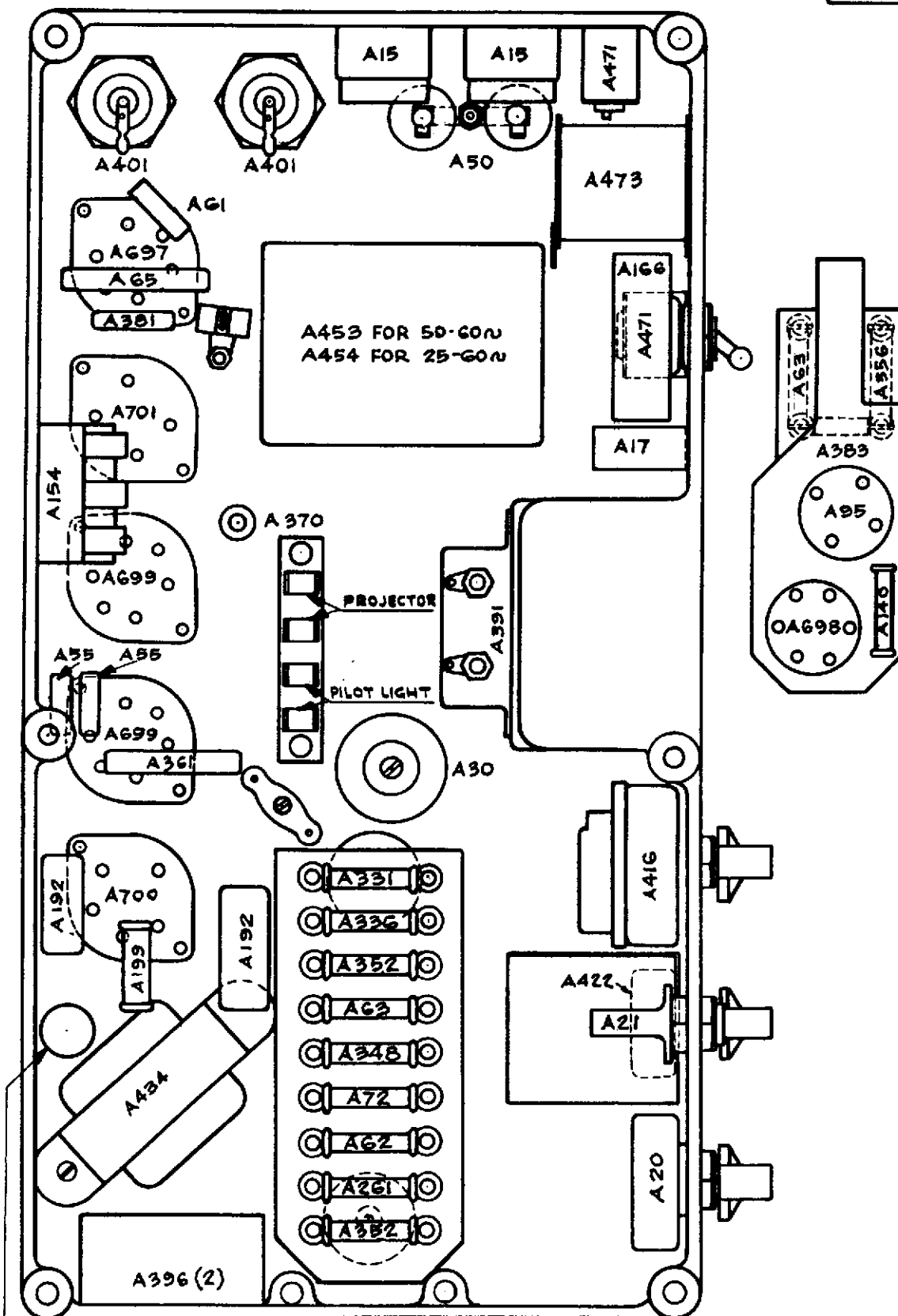
MODELS E & F

SUPERSEDES MOD. EFF  
-20-36

FOR USE ONLY WITH  
PART NO. 02668

DATE 5-22-36  
REV. 10-18-45





CONDENSER BANK

# SERVICE DATA

## BOTTOM VIEW OF AMPLIFIER

### FILMOSOUND

DESIGN 120

MODELS E&F

FOR USE ONLY WITH

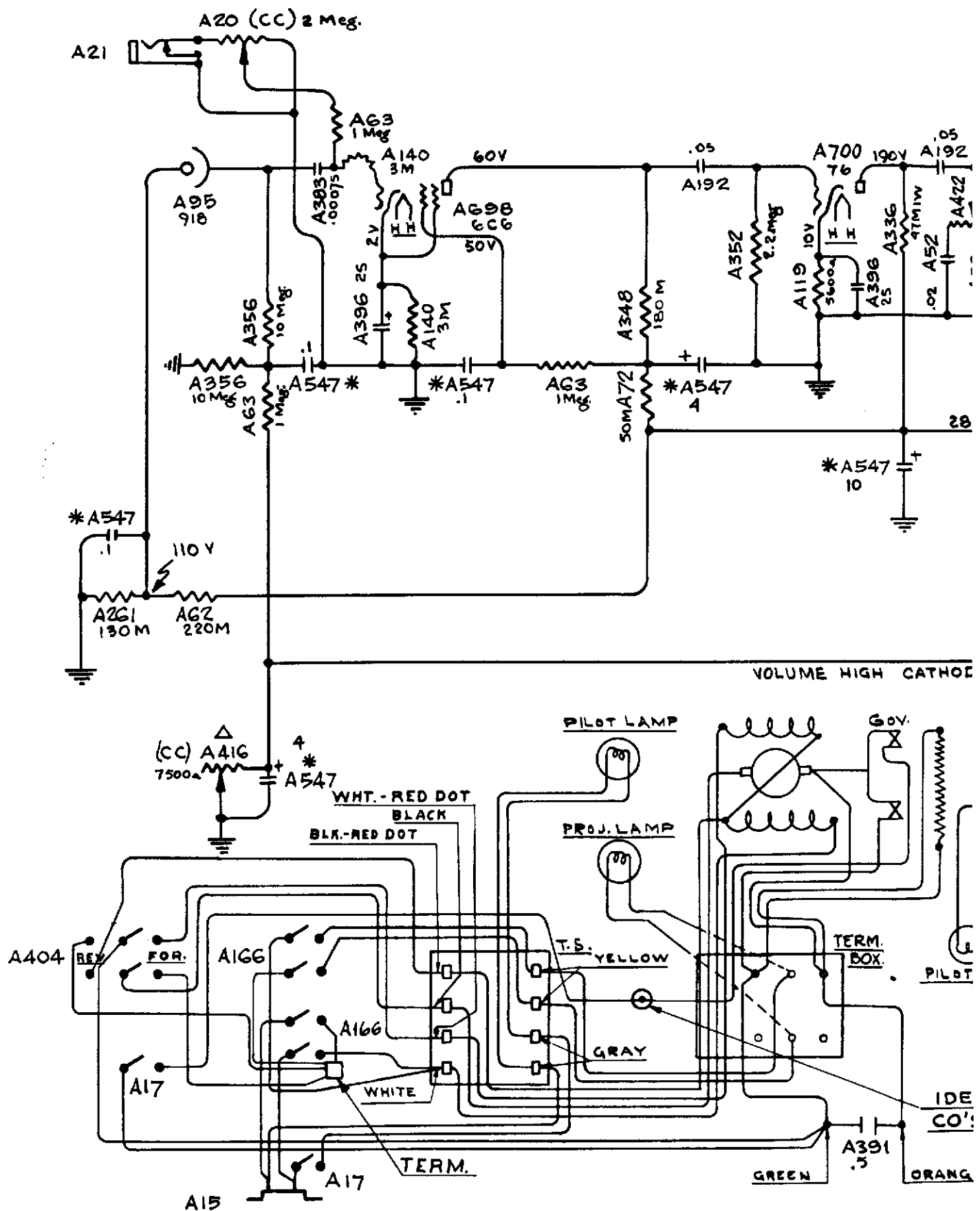
DATE 1-21-36

PART NO. 02668

REV. 10-19-45

SUPERSEDES MOD. ABCED

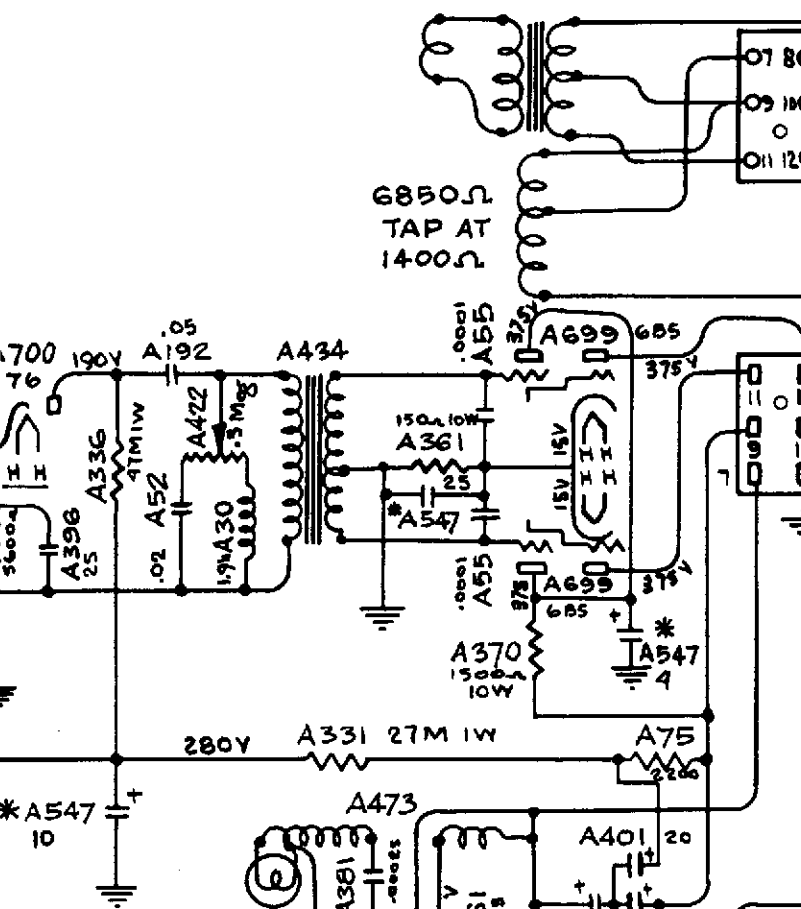






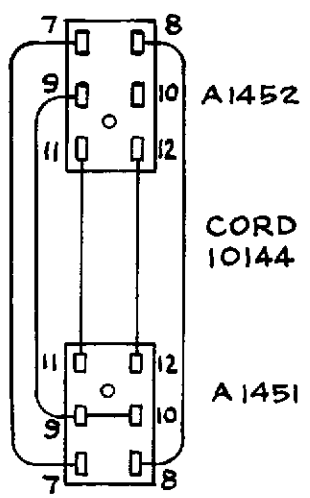
SPEAKER  
A1396

NOTE - TERMINALS 9 & 10  
STRAPPED IN SPEAKER CABLE



A1399

CORD  
10144



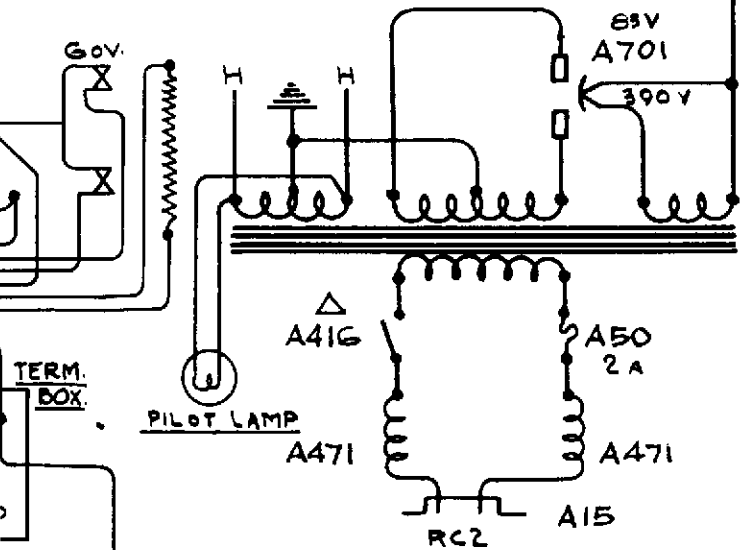
SPEAKER CORD  
COMPLETE 03104

NOTE :-

Δ COMBINED IN SAME UNIT

\* MOUNTED IN CONDENSER BANK

HIGH CATHODE 0 V.



A453 FOR 50-60 ~  
A454 FOR 25-60 ~

IDEAL COMMUTATOR DRESSER  
CO'S TERMINAL #71

ORANGE

SUPERSEDES MODEL 88F

### SERVICE DATA

WIRING DIAGRAM

FILMOSOUND

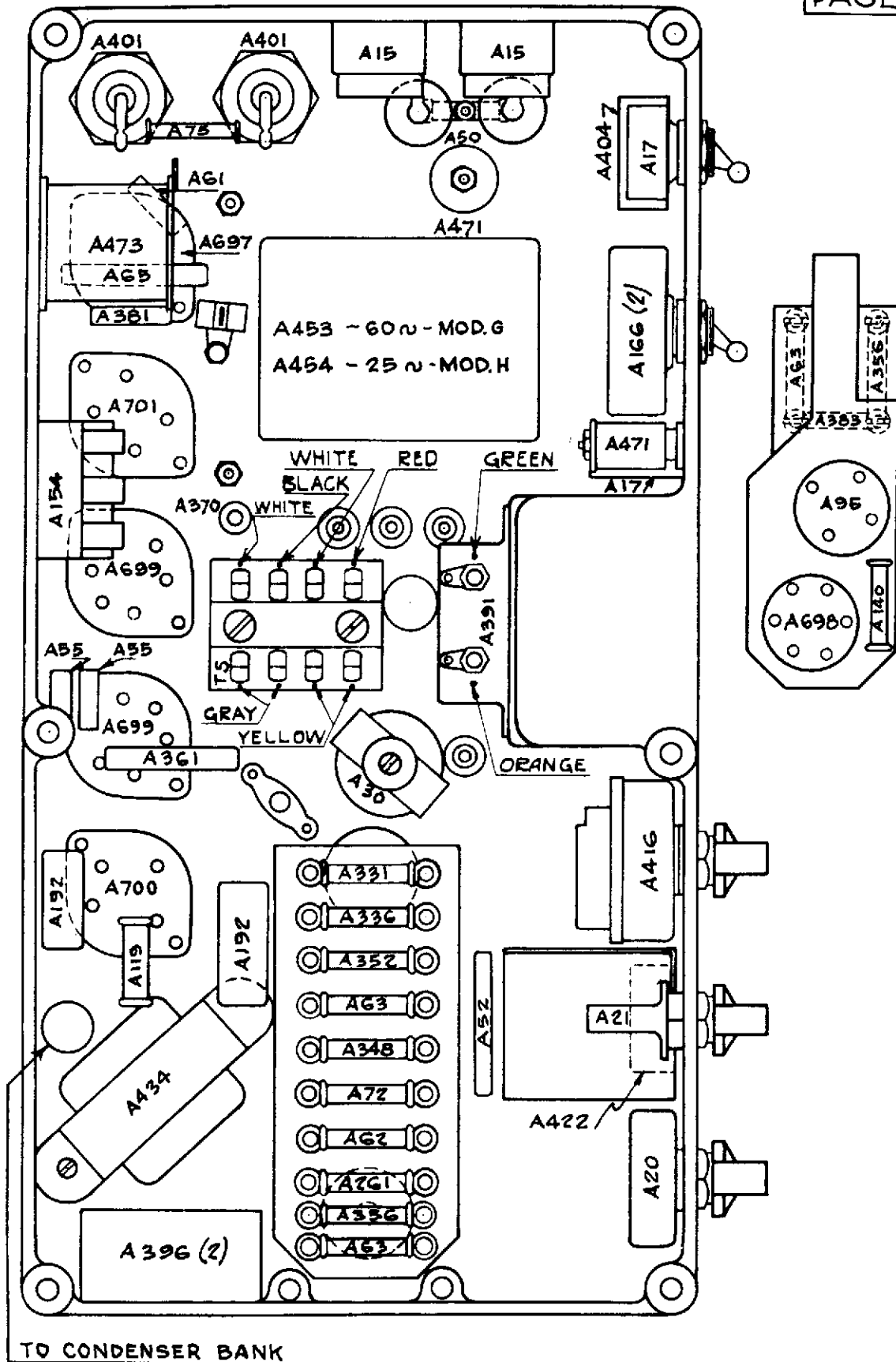
DESIGN 120

MODELS G & H

FOR USE ONLY WITH  
PART NO. 02791

DATE 3-26-37  
REV. 10-19-45





TO CONDENSER BANK

## SERVICE DATA

BOTTOM VIEW OF AMPLIFIER

FILMOSOUND

DESIGN 120

MODELS G&amp;H

SUPESEDES MOD. E &amp; F

FOR USE ONLY WITH  
PART NO. 02791DATE 3-29-37  
REV. 10-22-45



DESIGN 120 - Model J (60-CYCLE), K (25-CYCLE)

GENERAL INFORMATION.

In this amplifier, two 6L6 tubes are used in the output. The amplifier uses a crystal microphone with a Mallory type 75A plug, No. A1378. These amplifiers were made in two series of which very few of the first (page C-17) will be encountered. The second series is readily distinguished by the switch located on the microphone control. This switch must be in the "off" position for the amplifier to operate with film. A close examination of the circuit (page C-19) will show that the input circuits to the second tube are transferred. Also note that the oscillator tube was changed from a pentode to a triode connected pentode.

A three-ampere fuse is used.

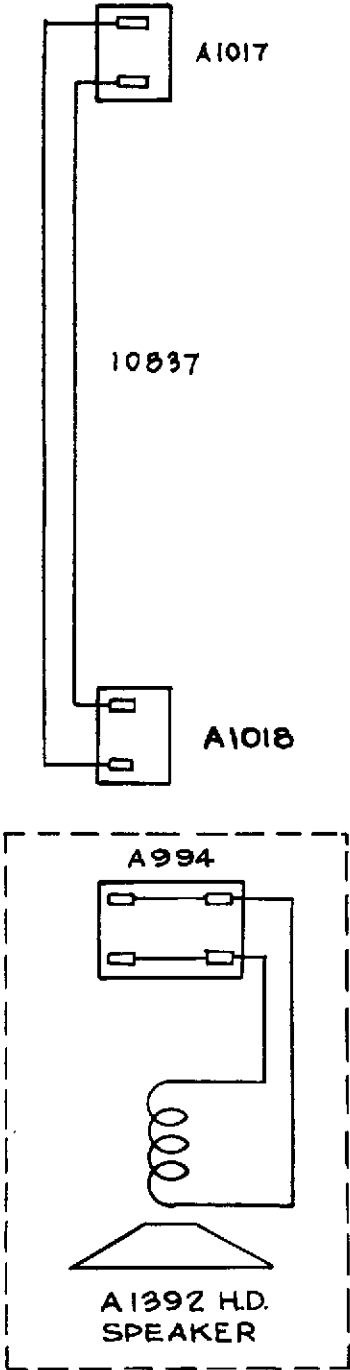
The power output is 25 watts.







COMPLETE CORD  
02937

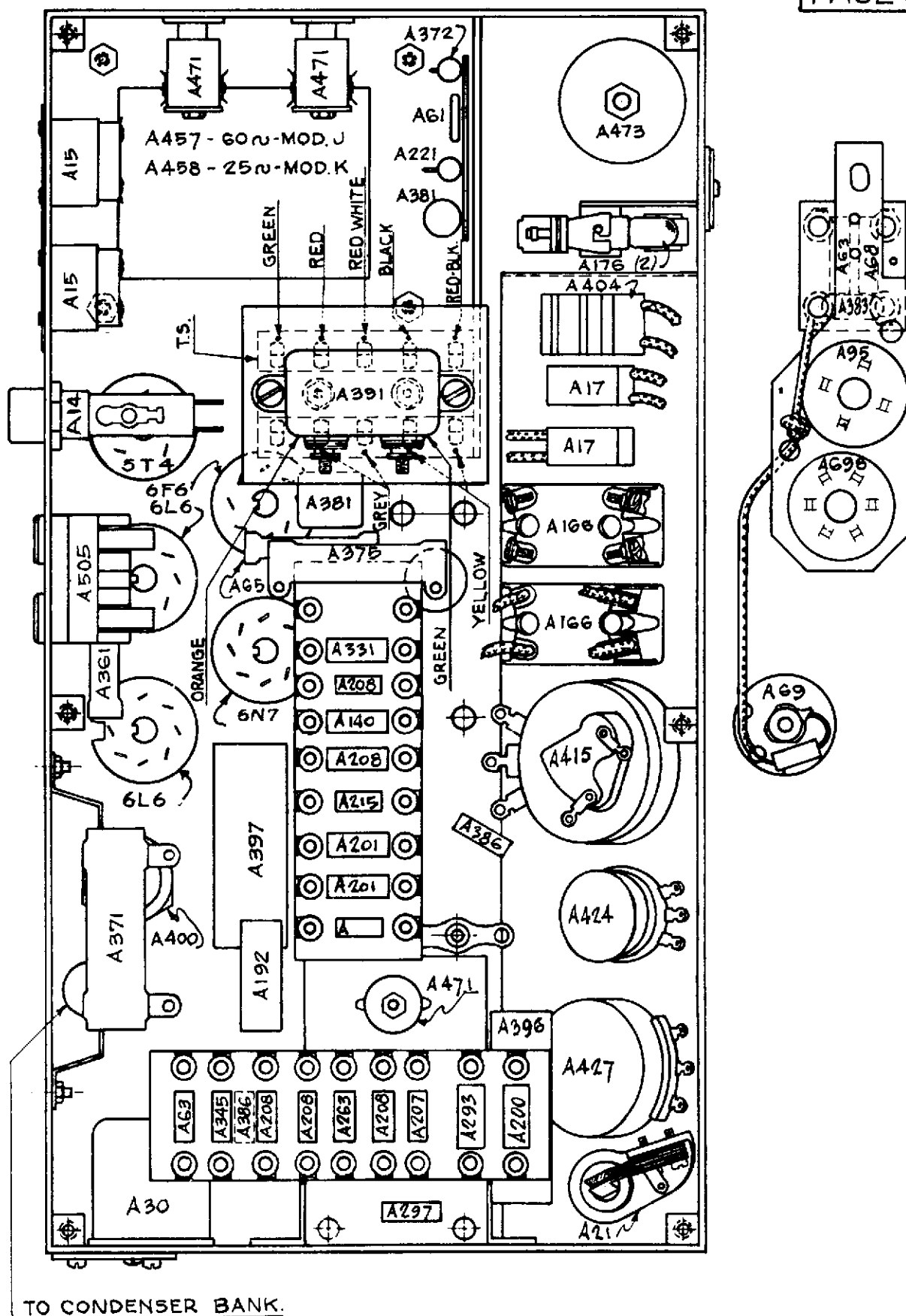


A457-60n-MOD. J  
A458-25n-MOD. K

NOTE :-  
\* MOUNTED IN CONDENSER BANK.  
⊗ MOUNTED ON SAME SHAFT.

SERVICE DATA	
WIRING DIAGRAM	
FILMOSOUND	
DESIGN 120	MODELS J&K
FOR USE ONLY WITH	DATE 6-30-37
PART NO. 02936	REV. 10-23-45





## SERVICE DATA

BOTTOM VIEW OF AMPLIFIER

FILMOSOUND

DESIGN 120

MODEL J & K

SUPERSEDES MODEL G

FOR USE ONLY WITH  
PART NO. 02936

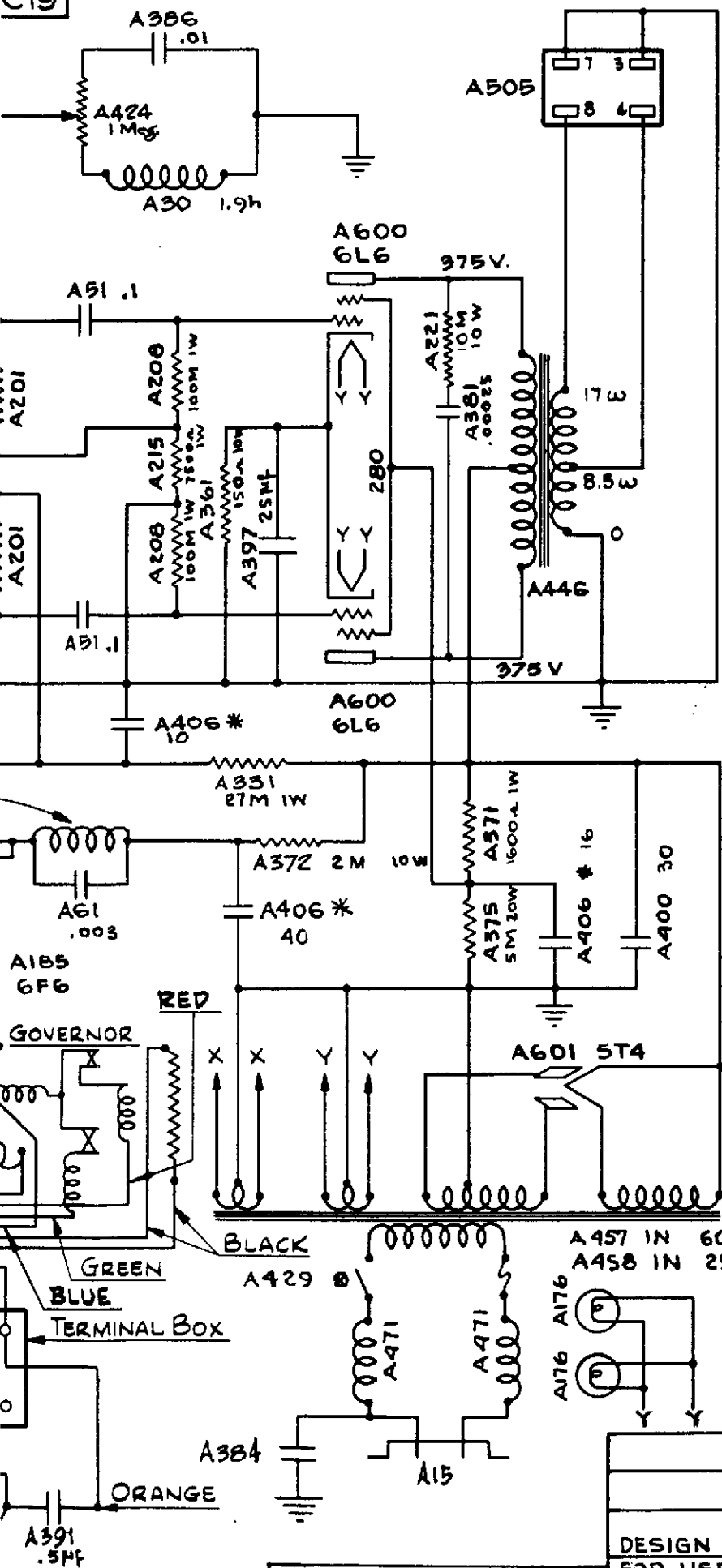
DATE 2-21-38  
REV. 10-22-45



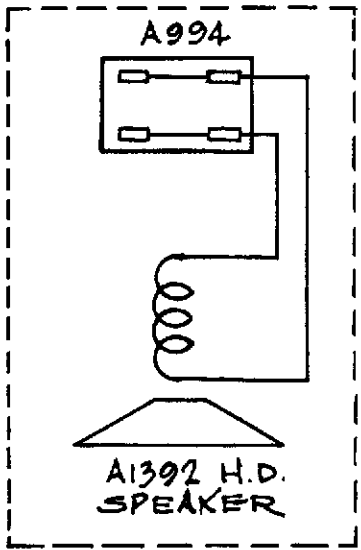
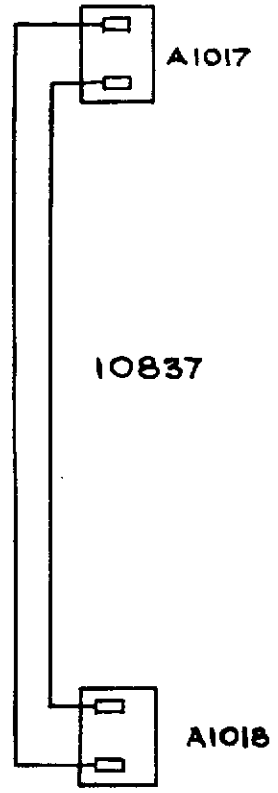




C19



COMPLETE CORD  
02937

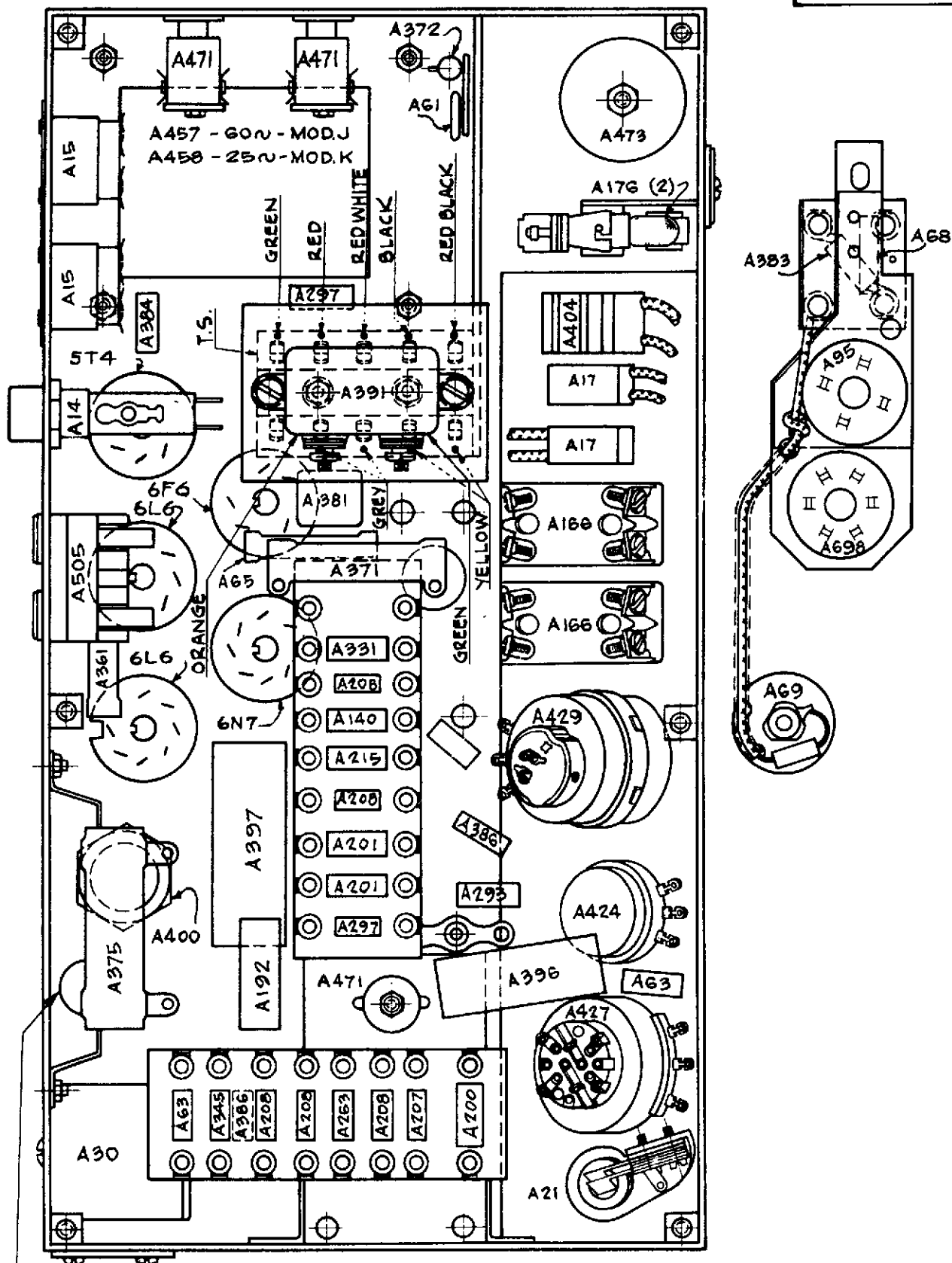


\* A Ⓢ INDICATE COMPONENTS  
OF SAME UNIT

SERVICE DATA	
WIRING DIAGRAM	
DESIGN 120	FILMOSOUND
FOR USE ONLY WITH	MODEL J & K
PART NO. 02936	DATE 5-10-38
	REV. 10-25-45

SUPERSEDES MOD. J (6-30-37)





TO CONDENSER BANK

SERVICE DATA  
BOTTOM VIEW OF AMPLIFIER  
FILMOSOUND

DESIGN 120

MODELS J,K

SUPERSEDES MOD J  
2-21-38

FOR USE ONLY WITH  
PART NO. 02936

DATE 5-5-38  
REV. 10-23-45



## SECTION D

DESIGN 130, MODEL CGENERAL INFORMATION.

This is the 1000- or 1200-watt lamp Filmosound, with amplifier separate from the projector. The phototube and exciter lamp are connected to the amplifier through cables. A rather elaborate switching arrangement is used on the amplifier, so study the instruction book until you are familiar with it. Try all the switches to understand their actions. When the amplifier line switch is in any "on" position, a resistance is in series with the transformer primary for "stand by" purposes. It is necessary to have the projector switch in the "on" position, which corresponds to the change-over lever position, in order to apply full voltage to the amplifier.

Note that the first 606 tube is connected as a pentode, the second as a triode, the 42 tube as a triode driver, and the 45 tubes as push-pull parallel output. The bias for the 42 and 45 tubes is obtained from the drop in resistor A362, which is in the negative return of the "B" supply. Three chokes are provided for filtering, as well as several condensers.

FILM VOLUME.

The volume is controlled by a gain control in the grid of the second 606 tube. Thus the voltages on the exciter lamp, and phototube are not changed by this control. The control, A413, is an adjustable control that adjusts the voltage on the oscillator as in the volume control of the Design 120, Model E. In this way the phototube voltages and exciter lamp voltages at both ends are set to the proper values. The semi-variable control, A421, gives an additional adjustment on the right phototube voltage so both projectors will give equal volumes.



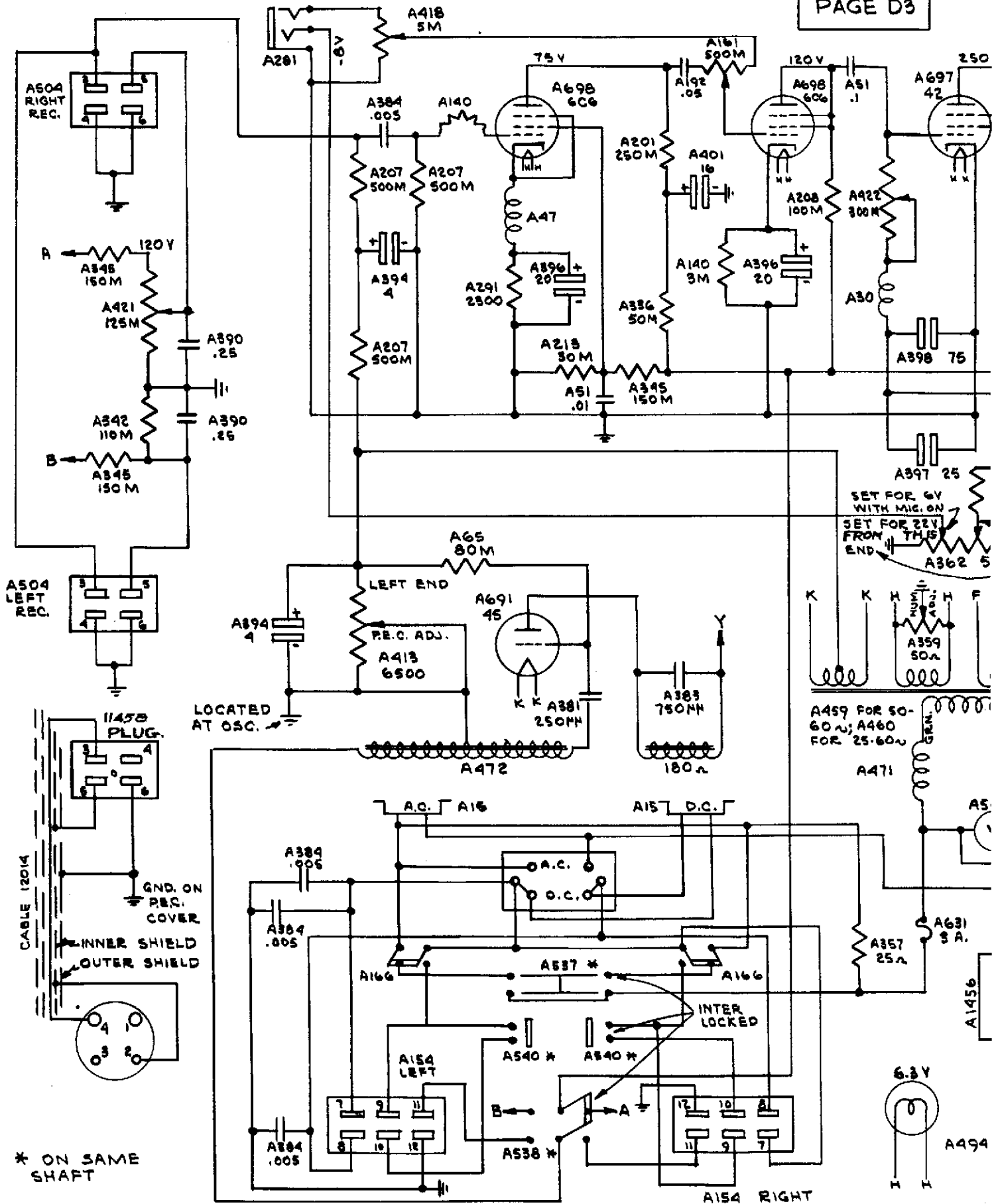
SPEAKER.

The speaker has its own field supply, provided by an 80 tube, condenser, and power transformer in the speaker case. Voltage is applied through terminals 13 and 14 of the speaker cable. This voltage, approximately 90 volts, is obtained from the power transformer of the amplifier. The voice coil impedance required is 36 ohms. The plate load impedance is 2000 ohms.

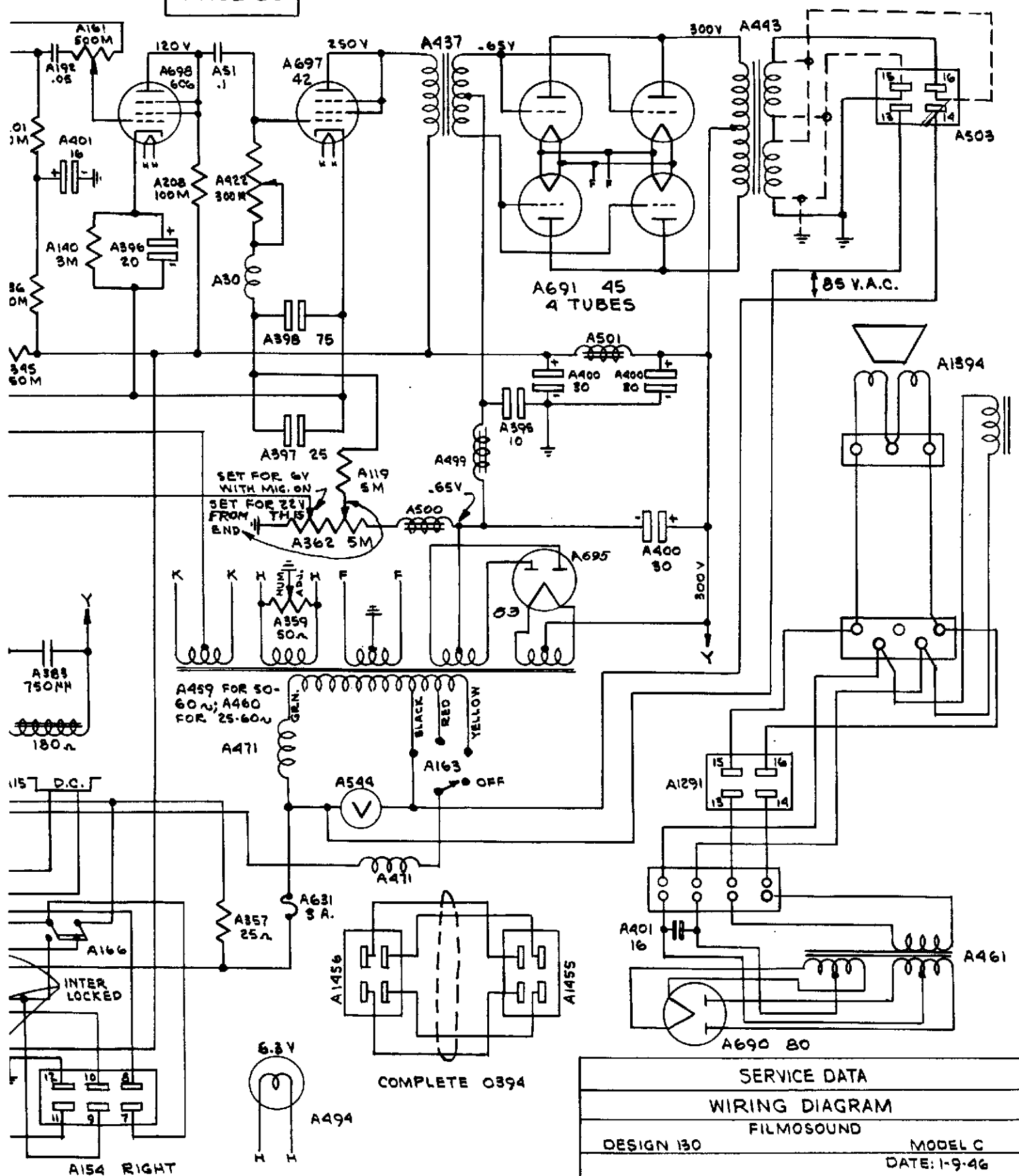
MICROPHONE.

This Filmosound uses a double-button carbon microphone with an external microphone transformer. Voltage is provided on the ring contact of the jack. A Western Electric No. 110 or Kellogg No. 191 plug should be used.

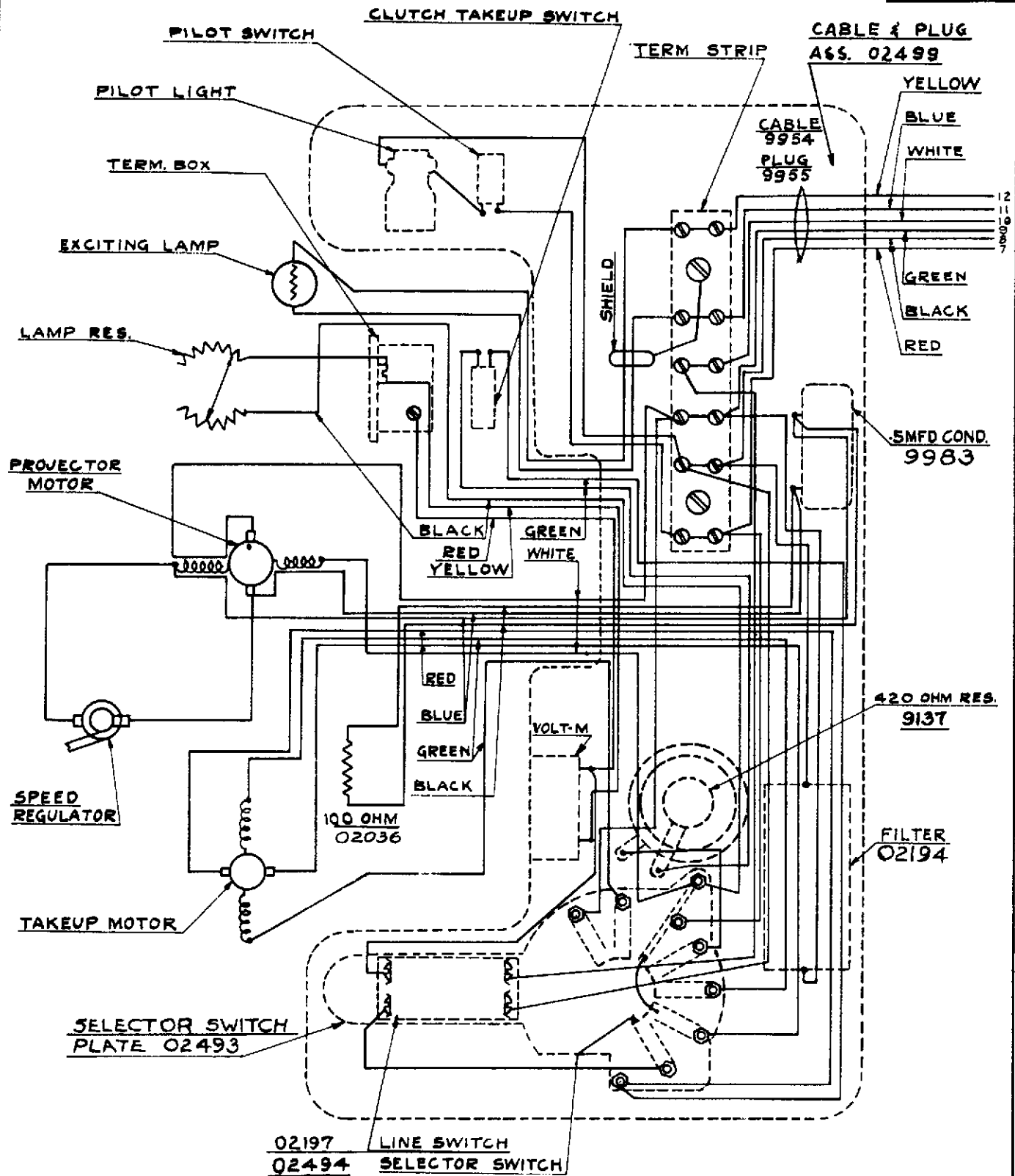












BASE ASSEMBLY SEEN FROM BOTTOM  
FOR WIRING

BELL & HOWELL CO CHICAGO U.S.A.	
FILMOSOUND DESIGN 130 MODEL C & D	
SERVICE DATA	DRAWN APVD. 6-29-36

SUPERSEDES MOD A&B



DESIGN 130, MODEL D, E  
(Dual and Single Switch)

GENERAL INFORMATION.

These two amplifiers are similar except for the output transformers. The Design 130, Model D has an electro-dynamic speaker and the Design 130, Model E, has the permanent-magnet type speaker. The amplifiers use four 6L6 tubes in the output and a 6F6 tube as the oscillator.

The single-dual switch when in "single" position changes the output impedance to match one speaker and also cuts a resistance into the output tube screens, thus lowering the output to 25 watts.

See 130-C General Information par. 1

FILM AND MICROPHONE VOLUME.

Film volume is controlled by a 500,000-ohm control in one grid of the 6N7 tube. The semi-variable control on the left end of amplifier controls the oscillator. The setting of this control will determine the maximum output of amplifier. The control on the right end is in the right FEC input voltage circuit and is for balancing both projector outputs.

Microphone volume is controlled by a 500,000-ohm control in the second 6N7 grid.

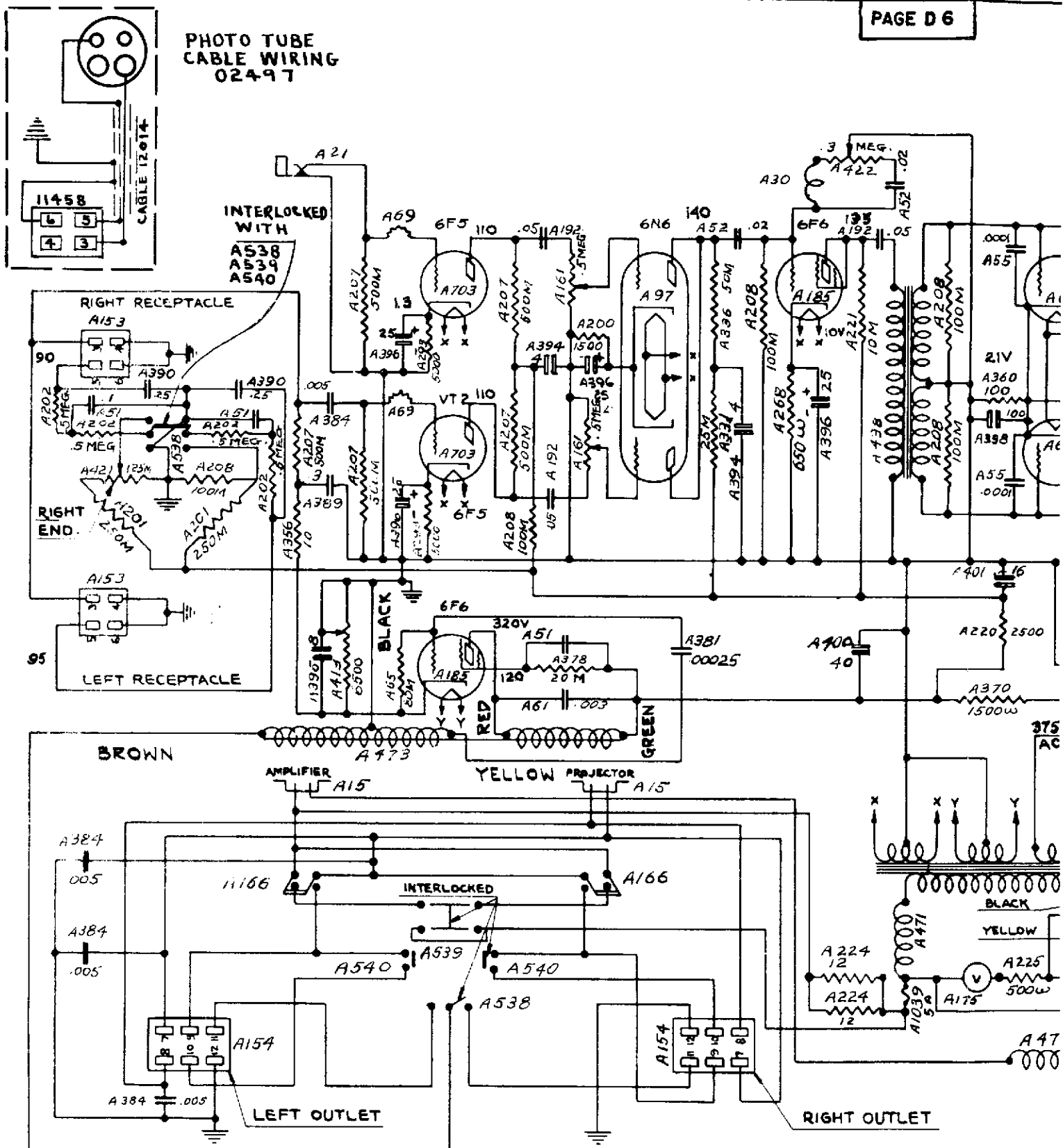
SPEAKER.

The Design 130, Model D, speaker has a separate field supply, provided by an 80 tube in the speaker case, which is fed through terminals 13 and 14 of the speaker cable. This voltage, approximately 90 volts, is obtained from the power transformer of the amplifier.

TUBES.

When replacing the 6L6 tubes in the amplifier, use the glass type 6L6G tubes but do not intermix with metal tubes.







FILMOSOUND  
DESIGN 130 MODEL D

### SERVICE DATA

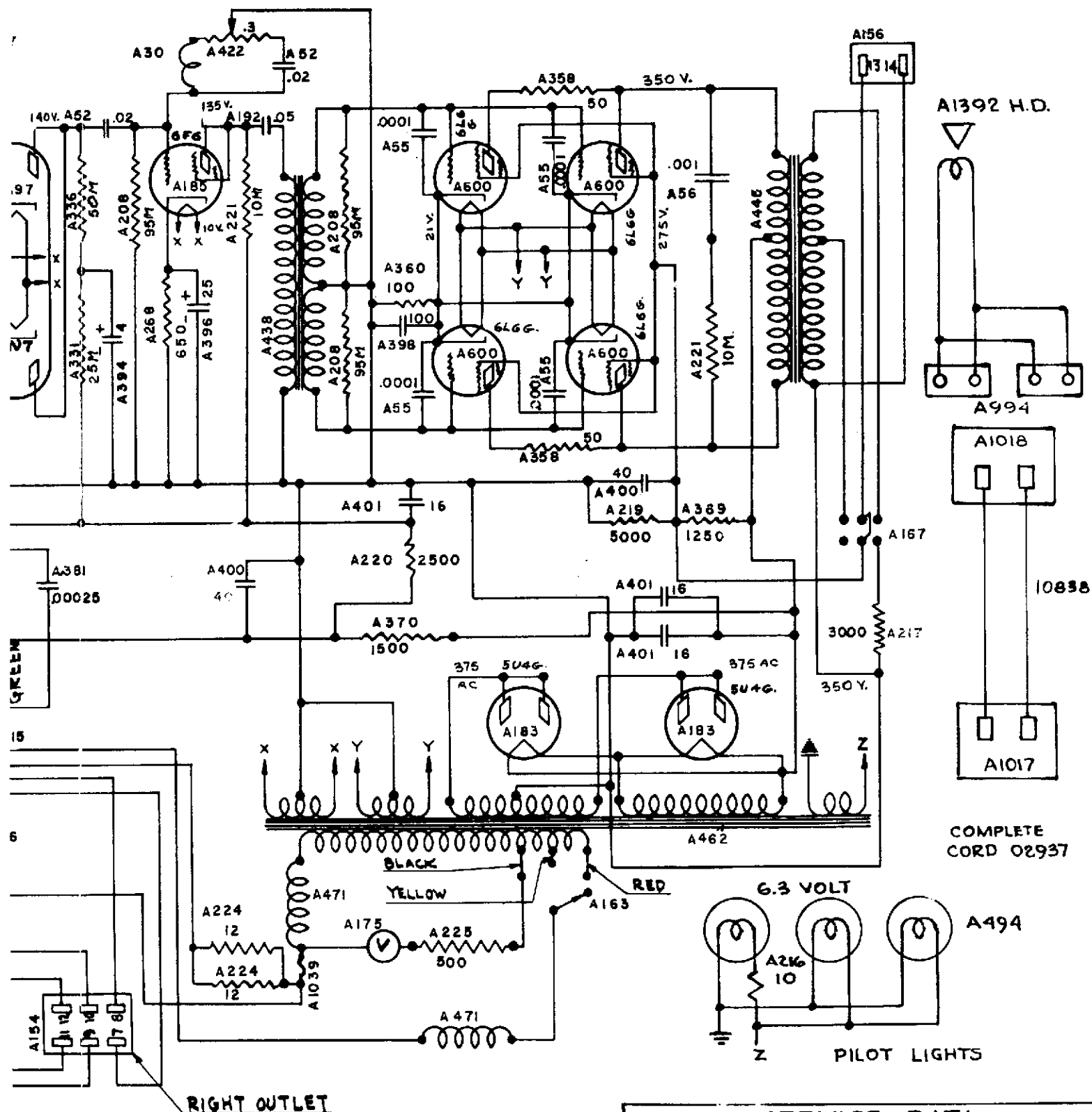
DRAWN *HE.*  
APVD,

**SUPERSEDES MOD. C**



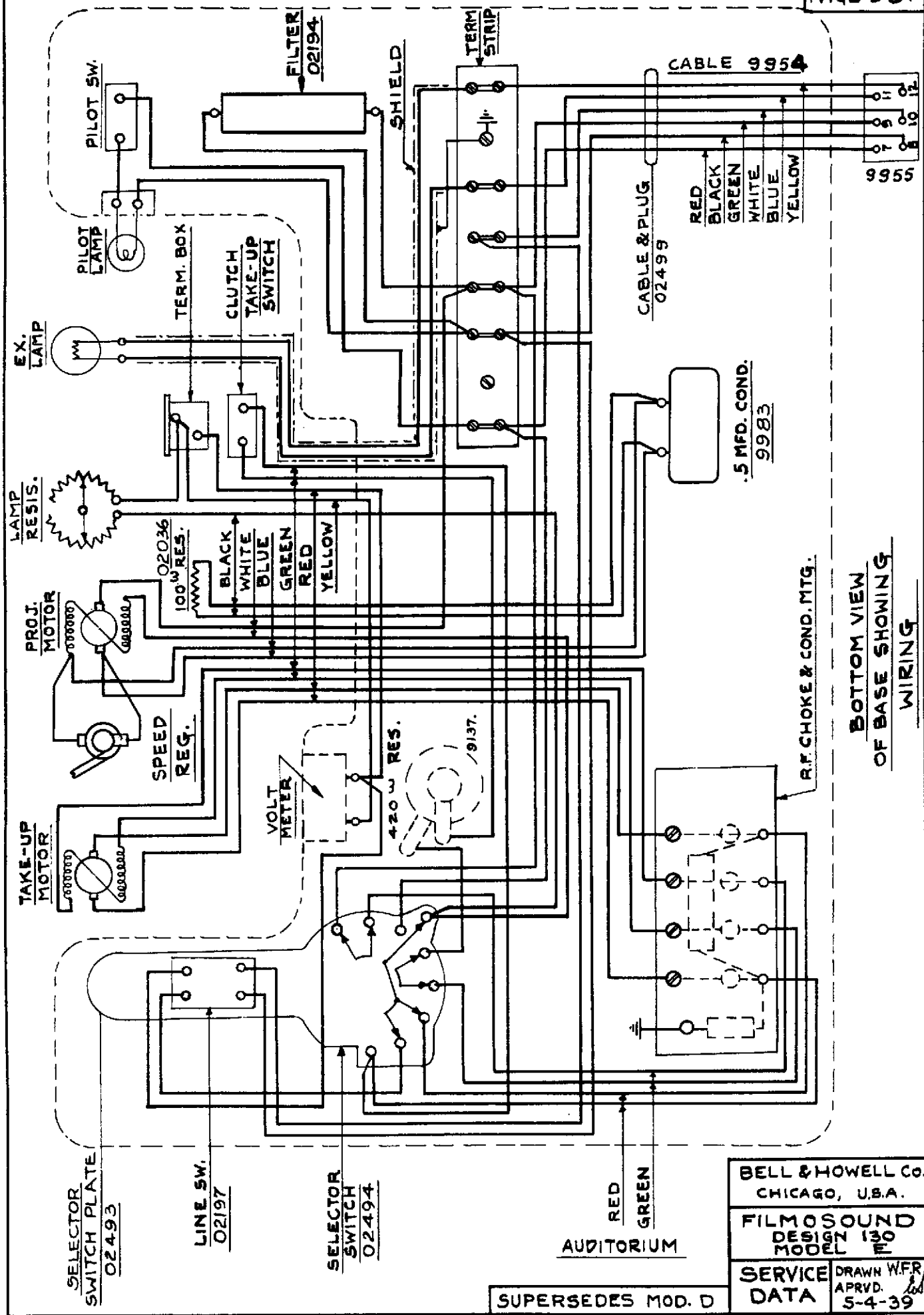






SERVICE DATA	
WIRING DIAGRAM	
FILMOSOUND	
DESIGN 130	MODEL E
FOR USE ONLY WITH PART NO.	DATE 12-21-45 REV.





BOTTOM VIEW  
OF BASE SHOWING  
WIRING

BELL & HOWELL Co. CHICAGO, U.S.A.	
FILMOSOUND DESIGN 130 MODEL E	
SERVICE DATA	DRAWN W.F.R. APRVD. 5-4-39



DESIGN 130 and 140 - AMPLIFIER NO. 03600

GENERAL INFORMATION.

This amplifier differs from other Design 130 types in that all three input tubes as well as the phase inverter have their filaments connected in series and are operated by the current flowing in the output tube cathode circuit.

Frequency characteristics of the amplifier may be altered by means of a tapped control on the rear of the amplifier.

Two microphone inputs are featured, one of which is under separate control. The second is mixed at a fixed level with the photocell input. Control is by the main film volume control.

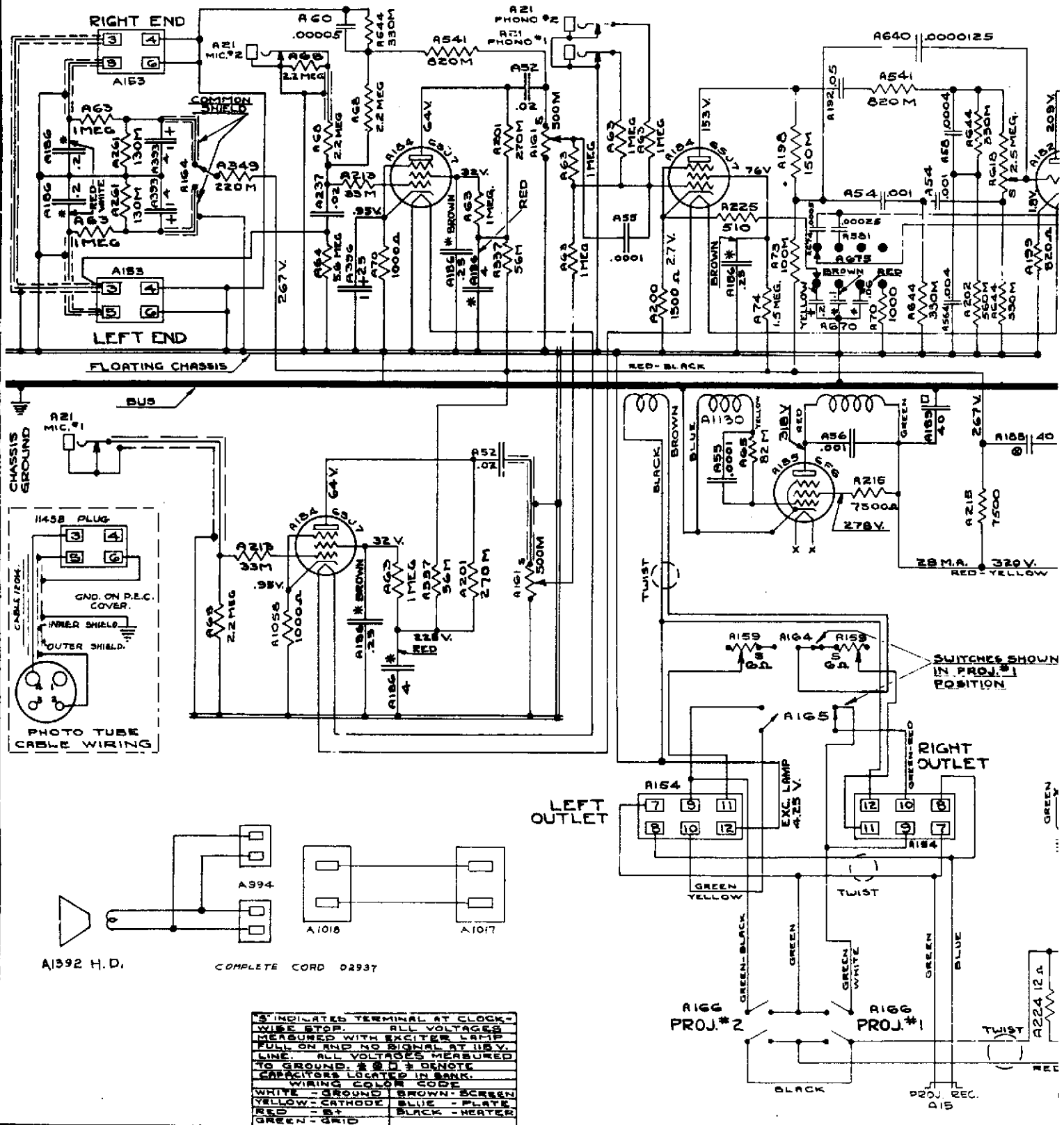
Two phonograph inputs are provided, neither of which has a volume control. Phonovolume should be controlled by means of the volume control on the phonograph.

The output transformer has a tapped secondary controlled by means of a switch on the rear of amplifier. The permanent-magnet type speaker has an impedance of 16 ohms.

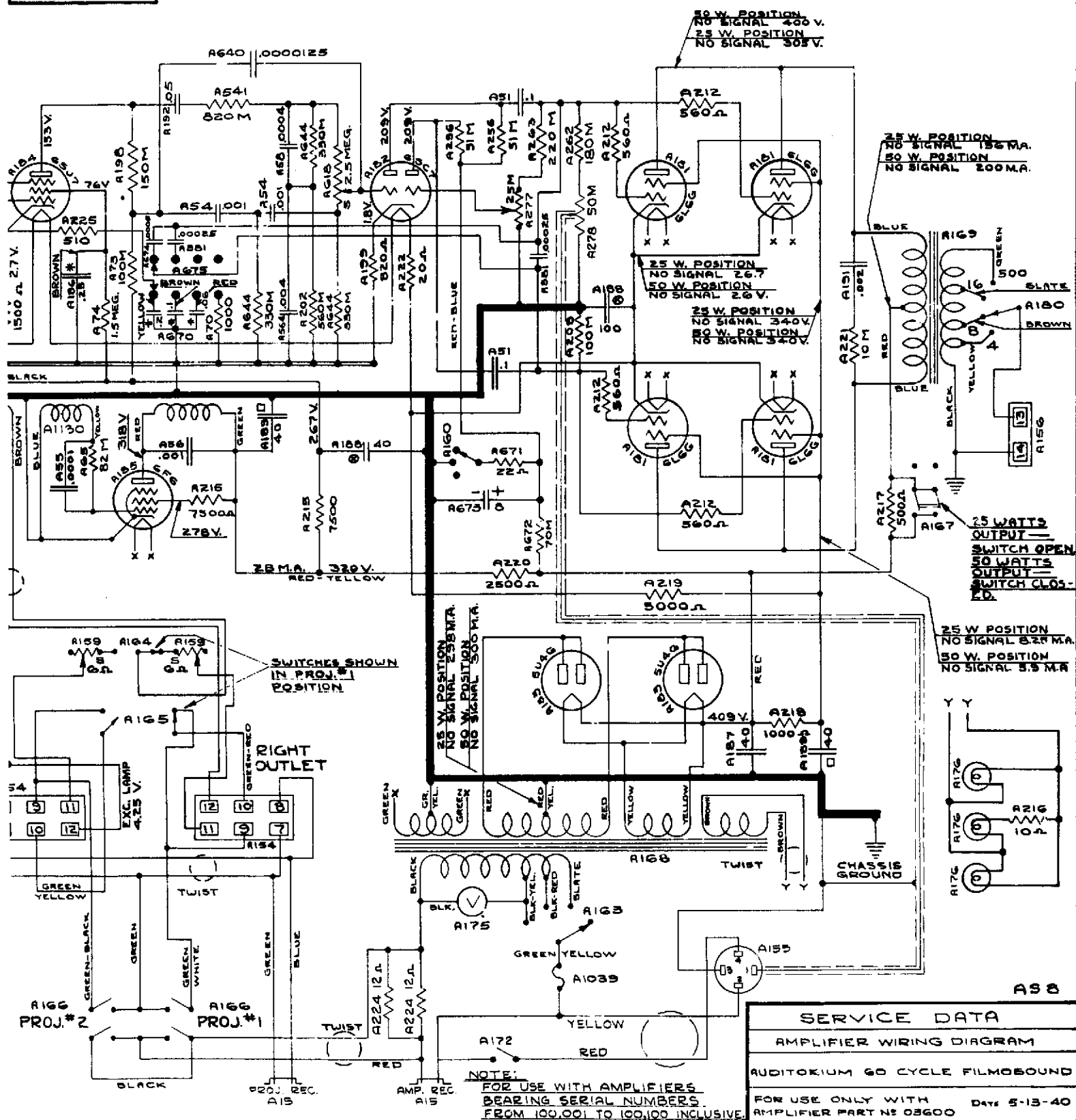
The power output is 25 watts with a single speaker and 50 watts with dual speakers.

See General Information 130-C, par. 1.











## SECTION E

DESIGN 138, MODELS A to L, GB, GB2, O AND PGENERAL INFORMATION.

This amplifier was designed originally to be serviced only at the factory. Therefore, in order to work on it, the rivets in the bottom plate will have to be removed. This is best accomplished by using a hammer and sharp chisel applied to the peened end of the rivet. When reinstalling the plate be sure to place "shakeproof" lock washers between it and the chassis in order to insure a perfect electrical connection.

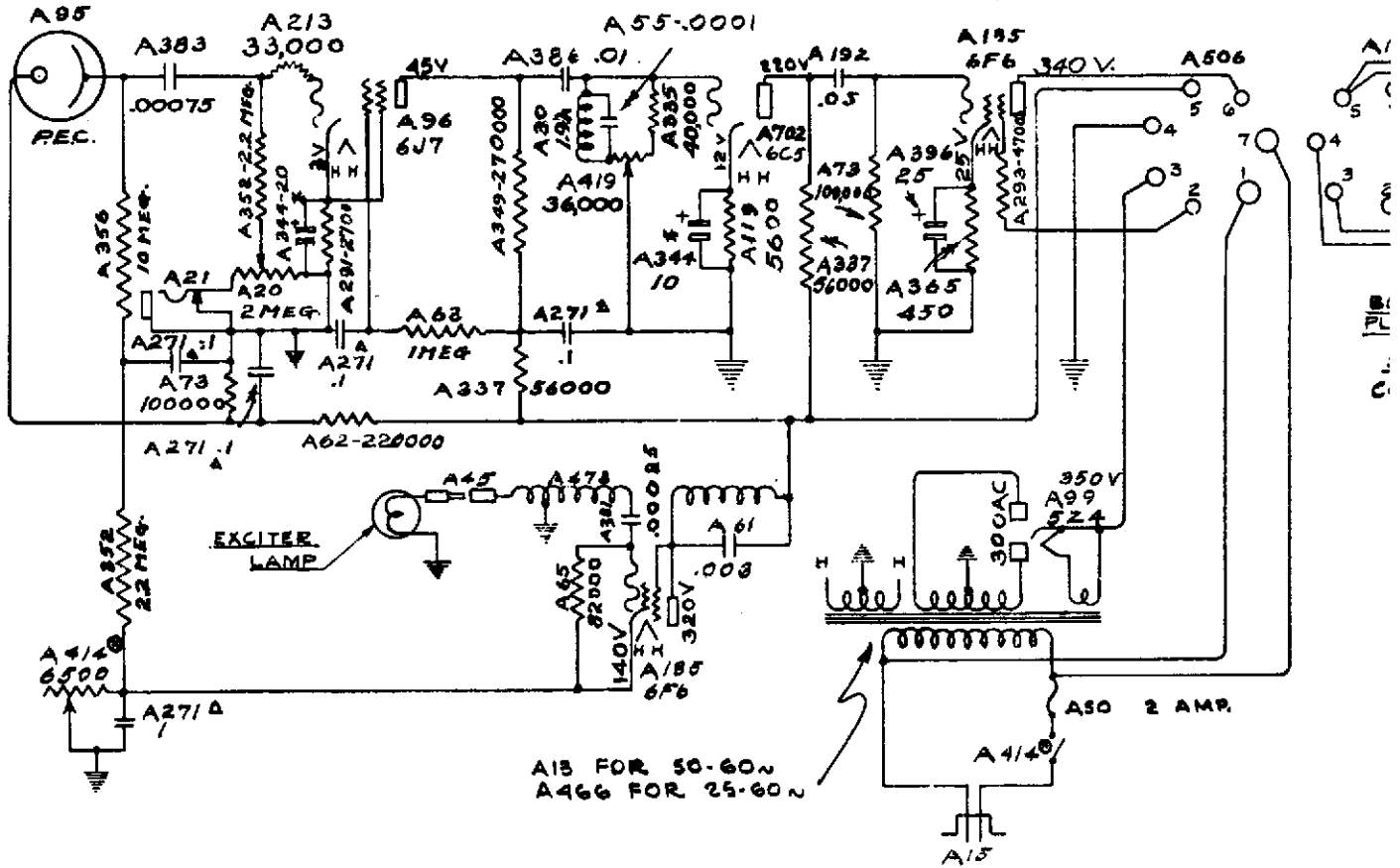
FILM VOLUME.

Film volume is controlled by single control acting on the photocell and oscillator tube. Failure of the volume to shut off will be due to either resistances A62 and A73 changing value, or to a leaky section of condenser bank A271 connected to this pair of resistors or connected to the junction of resistors A356 and A352. The voltage of this latter point, when measured with a 20,000 ohms per volt, or better, voltmeter, should equal the voltage at junction point of resistors A62 and A73. It should be between 100 and 115 volts.

Low volume and the burning up of resistor A293 will be caused by poor contact of terminal #6 of the speaker cord receptacle A506. When it is known that the speaker is not of the booster type, we recommend that pin No. 1 be broken off the speaker cord plug and inserted in the No. 1 opening of the receptacle. A bit of Dupont household or General Electric glyptol cement will hold it in place. This will prevent the plug from being inserted improperly in the amplifier.

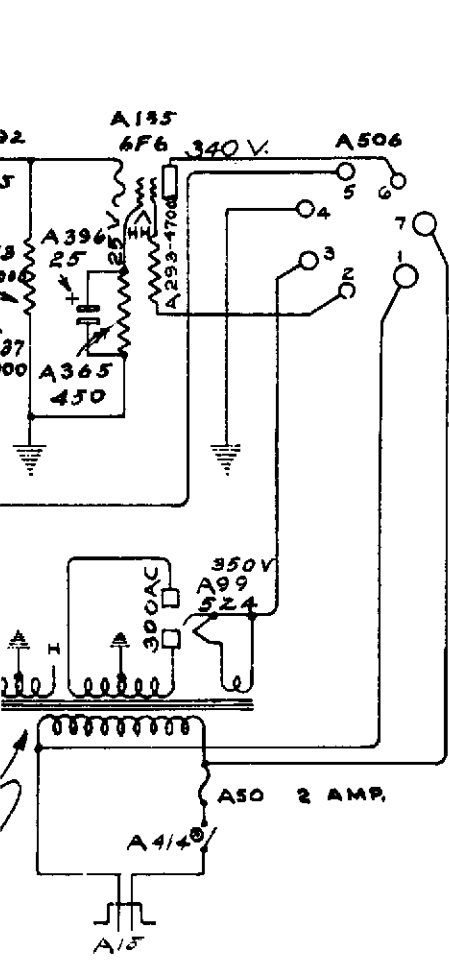
The power output of each of these models is 3.5 watts.



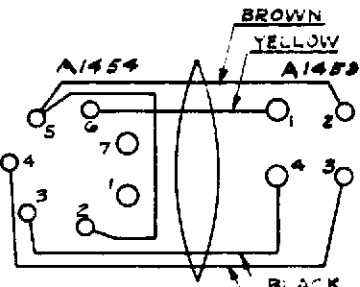


NOTE: @,\*,Δ DENOTE COMPONENTS OF SAME UNIT



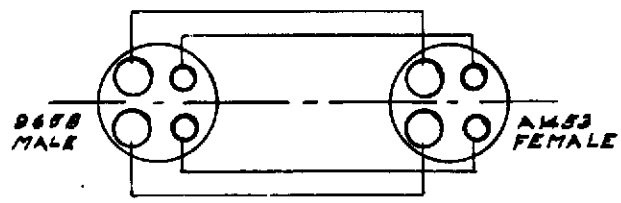


CORD  
USE A1342



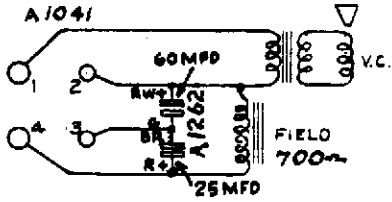
BOTTOM VIEW OF ALL  
PLUGS & RECEPTACLES

SPEAKER CABLE  
COMPLETE # 02695



SPEAKER EXTENSION  
CABLE # 02361

SPEAKER 8" A1040  
12" A1053  
VC 1.8A 8"  
6A 12"



SPEAKER CASE

SAME UNIT

BELL & HOWELL CO. CHICAGO U.S.A.

FILMOSOUND A·B·C·D·E·F·G·H  
DESIGN 138 MODELS J·K·L·GB·RB·  
SB·TM

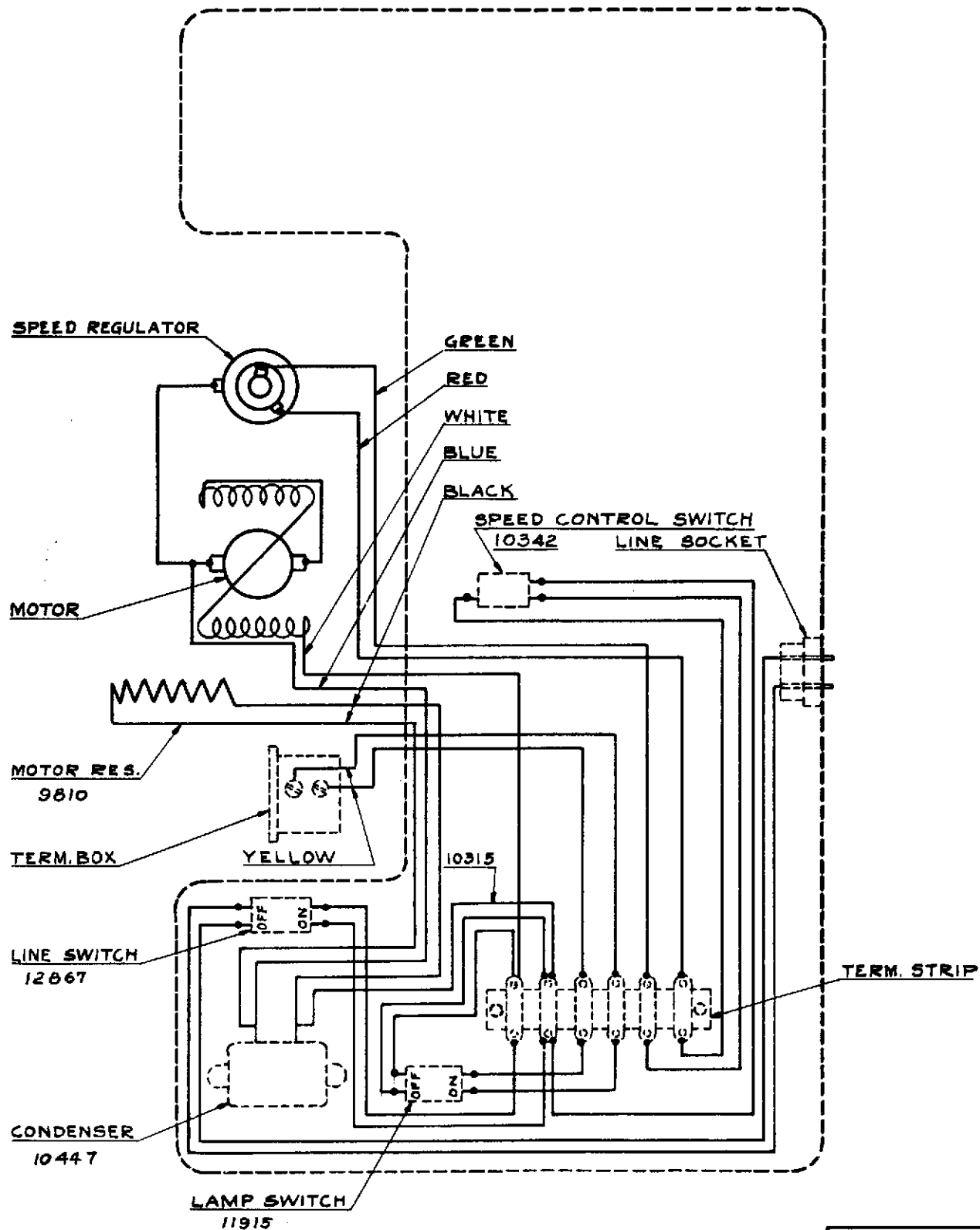
REVISED

12 18 45

SERVICE  
DATA

drawn. C. d. N.  
apvd.

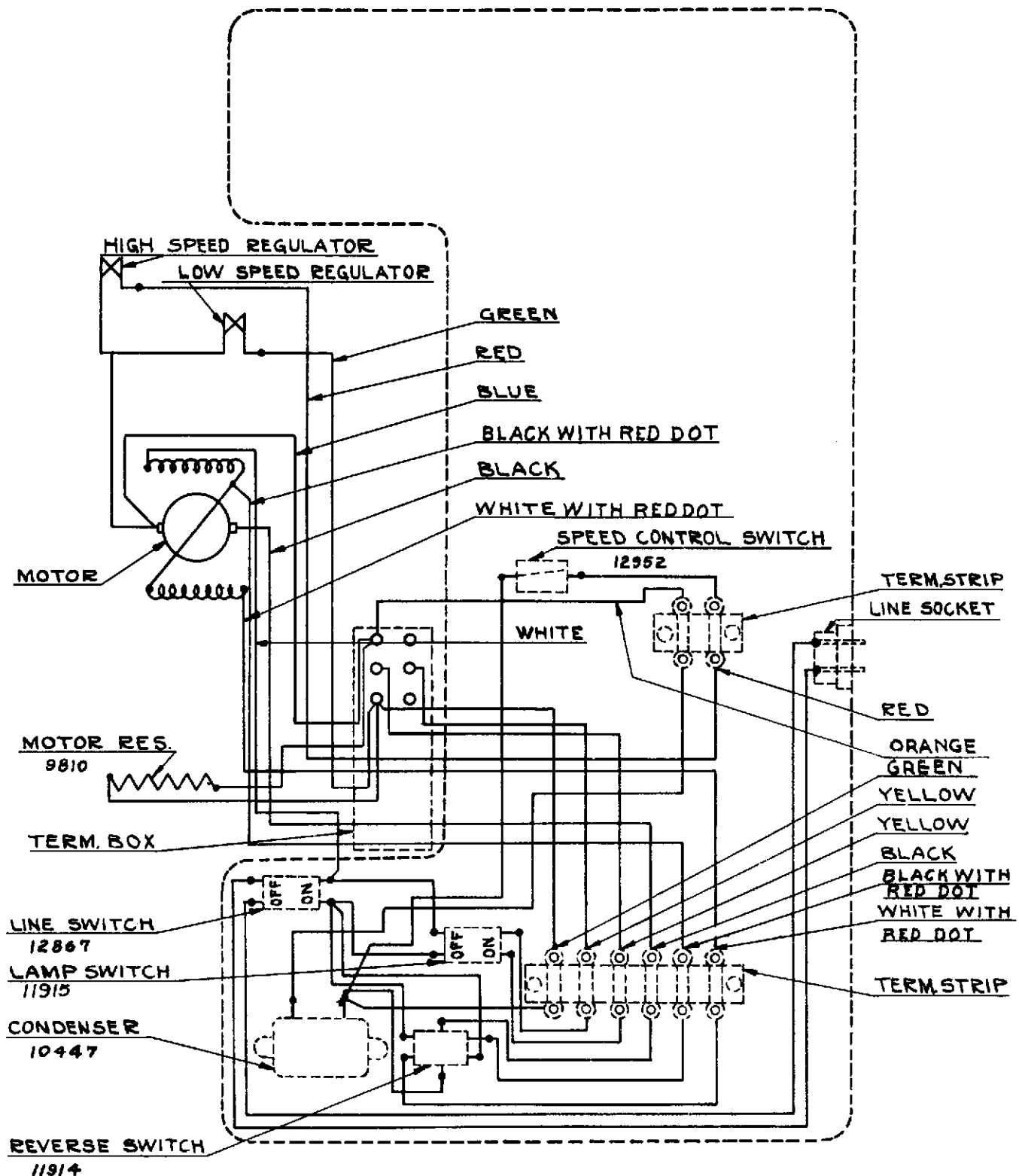




**BASE ASSEMBLY SEEN FROM BOTTOM  
FOR WIRING**

BELL & HOWELL CO. CHICAGO, U.S.A.	
FILMOSOUND DESIGN 138 MODELS A.B.C.E&D	
SERVICE DATA	DRAWN APVD 6-29-36



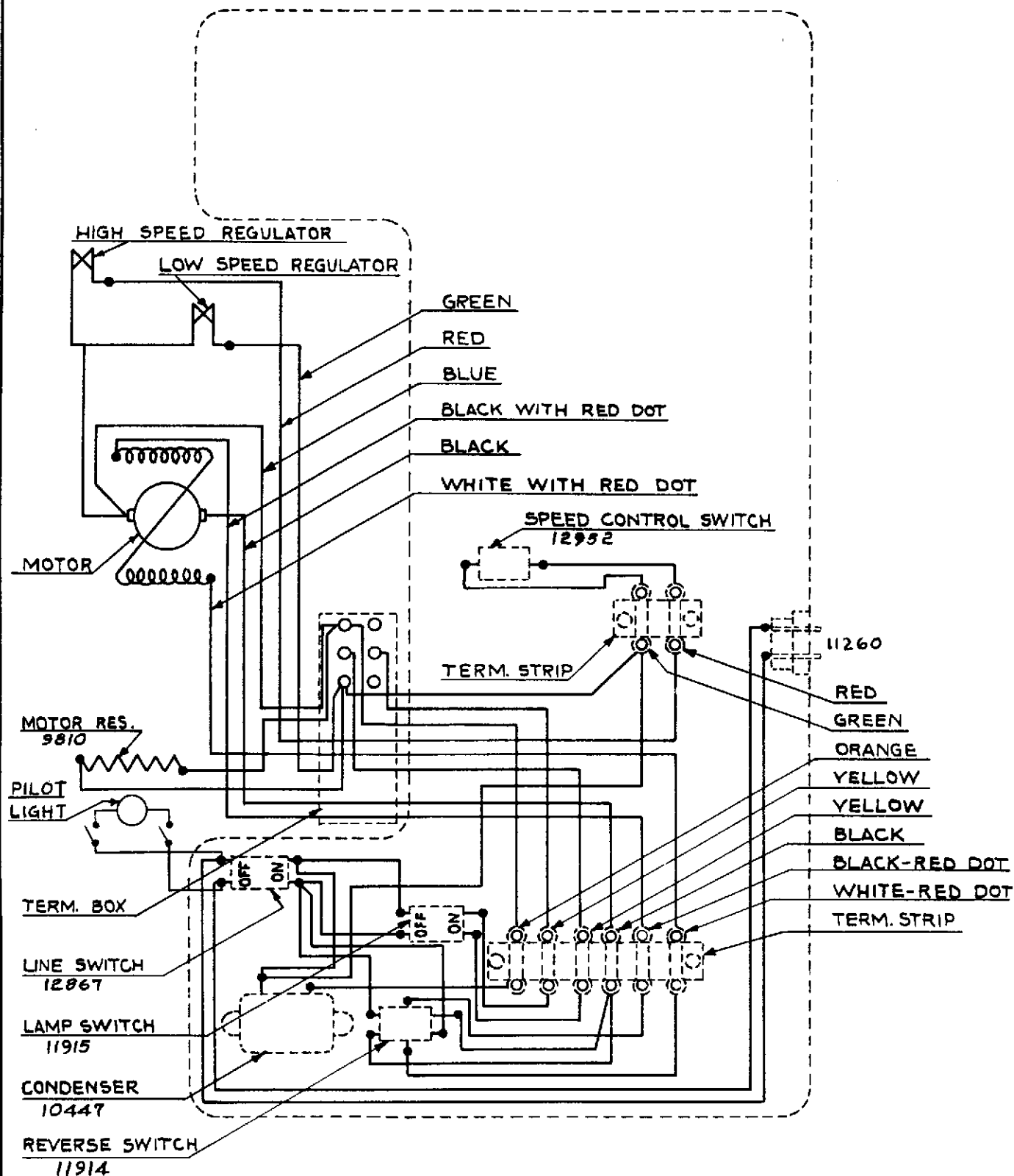


BASE ASSEMBLY SEEN FROM BOTTOM  
FOR WIRING

BELL & HOWELL CO.  
CHICAGO, U.S.A.  
FILMOSOUND  
DESIGN 138  
MODELS F-G-J & K  
SERVICE DATA  
DRAWN BY  
APVD W.S.D.  
4-12-37

SUPERSEDES MOD. ABC20





BASE ASSEMBLY SEEN FROM BOTTOM  
FOR WIRING

BELL & HOWELL CO.	
CHICAGO U.S.A.	
FILMO SOUND	
DESIGN 138	
MODELS-H&M2	
SERVICE DATA	DRAWN <i>ASC</i>
	APRVD. W.S.D.
	1-3-38

SUPERSEDES MOD. E.



DESIGN 138, BOOSTER AMPLIFIER NO. 02634GENERAL INFORMATION.

This amplifier was designed for use with the Design 138, Models A to L Filmosound to increase the output. It provides an output stage of two 6F6 tubes in push-pull.

The amplifier is located in the speaker case, and may be exposed by removing the four knurled screws on the back grill of the case. To remove the amplifier for servicing, remove the four screws holding it in the case, and cut off the eyelets holding the bottom cover plate.

The special speaker cable furnished with the booster amplifier connects the 6F6 tube in the Design 138 amplifier as a triode, and supplies 110 volts A.C. to the power transformer in the booster. Note that condensers A401, A501, A366, and A401 supply the filtering for the Design 138 amplifier, as they replace the speaker field and the condenser pack in the regular Design 138 speaker case. Resistors A298 and A333 provide a stabilizing action and keep the volume down, to reduce extraneous noises. The addition of the booster amplifier adds another stage of amplification so the hum, hiss, and microphonic noises will be increased. The tone control A420, with shaft extending through the rear grill, allows the hiss to be reduced by attenuating the high frequencies.

SPEAKER.

The speaker used with the booster is identical to that supplied with the Design 120, Models E and F Filmosounds. They have a 6,850-ohm field and 13-ohm voice coil. The tap supplies reduced voltage for the screen grids.

The speaker field is connected directly across the "B" supply of the booster. Condenser A401 provides sufficient filtering for the plate voltage. Remember in servicing that there are voltages from two "B"



supplies, one in the Design 138 amplifier and one in the booster amplifier.

The speaker cord should be very carefully checked for opens within the cord itself.

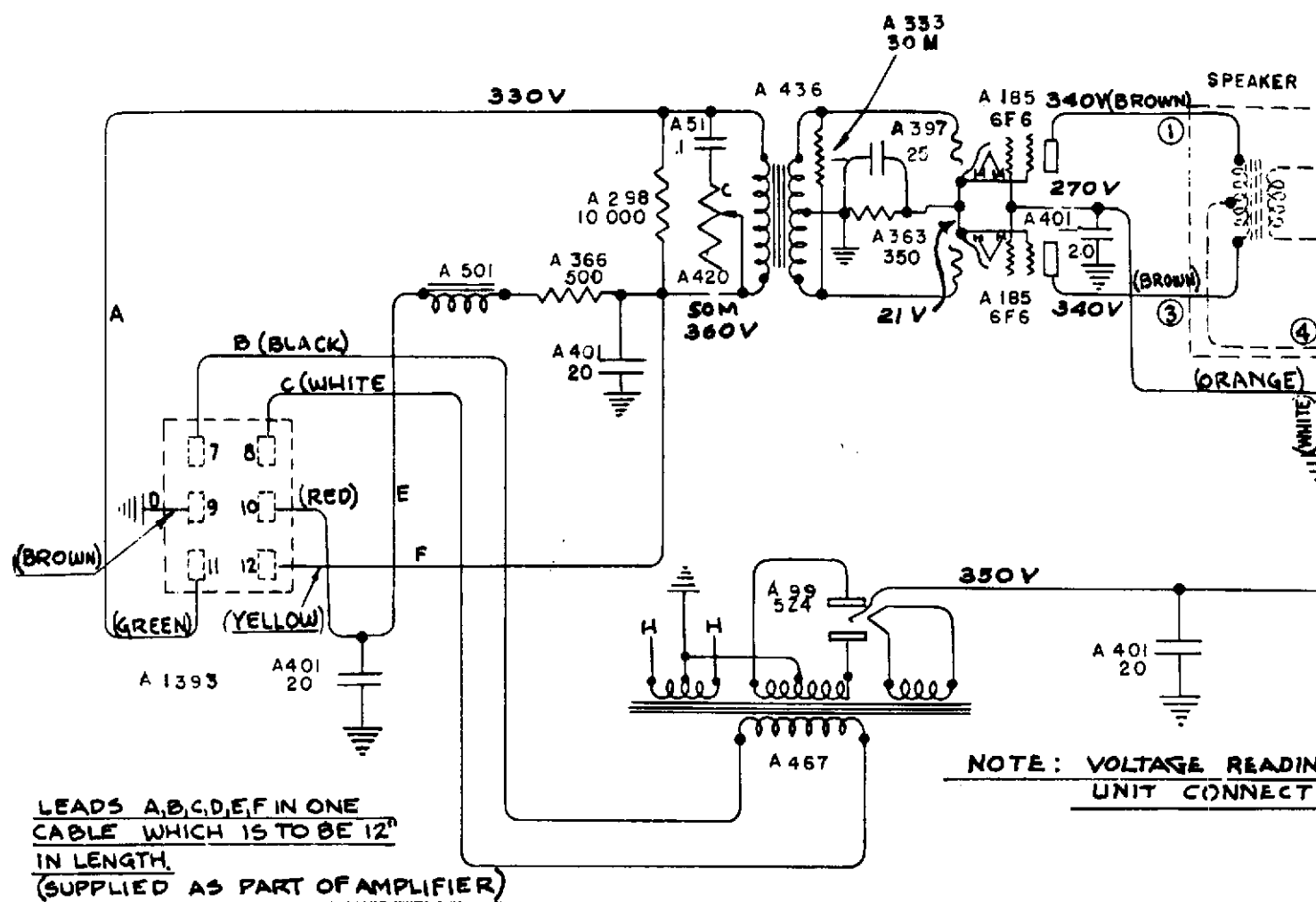
Voltage readings should be taken with the booster connected to the corresponding amplifier. The power should be on.

Resistance readings should be taken with the power shut off.

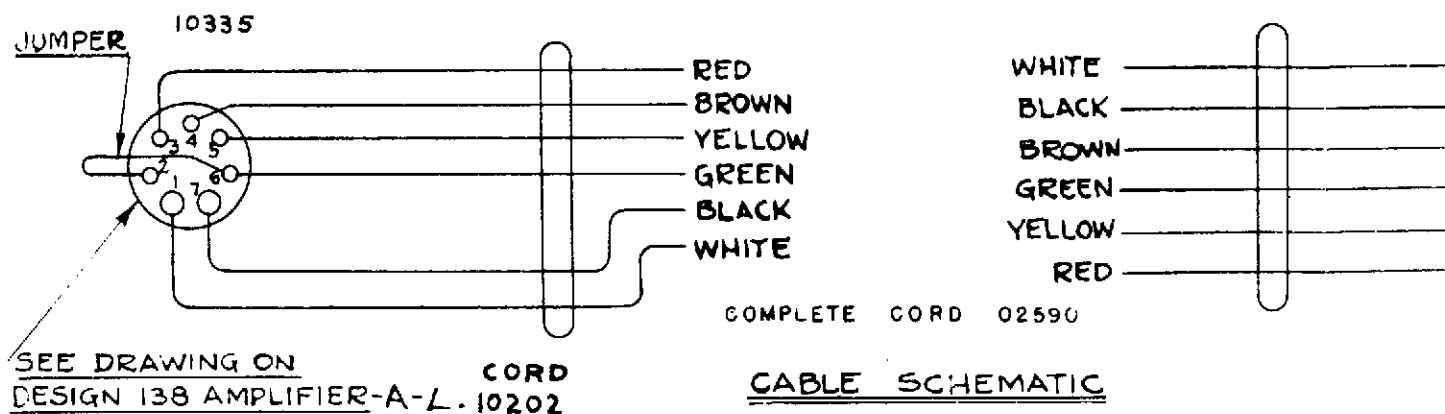
All values are approximate.

The power output of this amplifier is 12 watts.

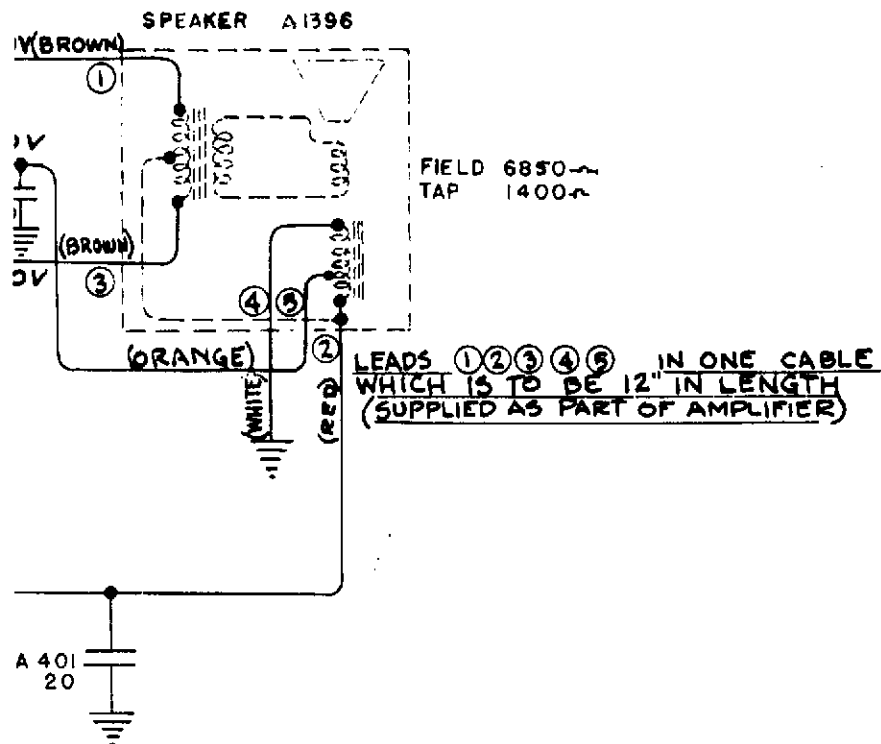




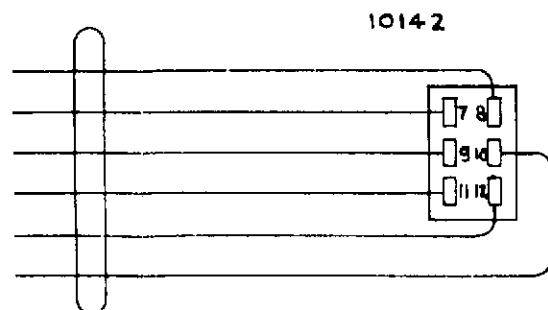
### BOOSTER AMPLIFIER SCHEMATIC







VOLTAGE READINGS MADE WITH  
UNIT CONNECTED TO F.O.S. AMPLIFIER.



BELL & HOWELL CO. CHICAGO USA

02634 BOOSTER AMPLIFIER  
FOR DESIGN 138 FILMOSOUND

REVISED 12-19-45

12 19 45

SERVICE  
DATA

drawn. C.J.N.  
apvd.



DESIGN 138, MODELS M, M-2, and MA

GENERAL INFORMATION.

The amplifier for the 138-M series of Filmosounds uses a 6L6 tube in the output and a 6F6 tube as the oscillator.

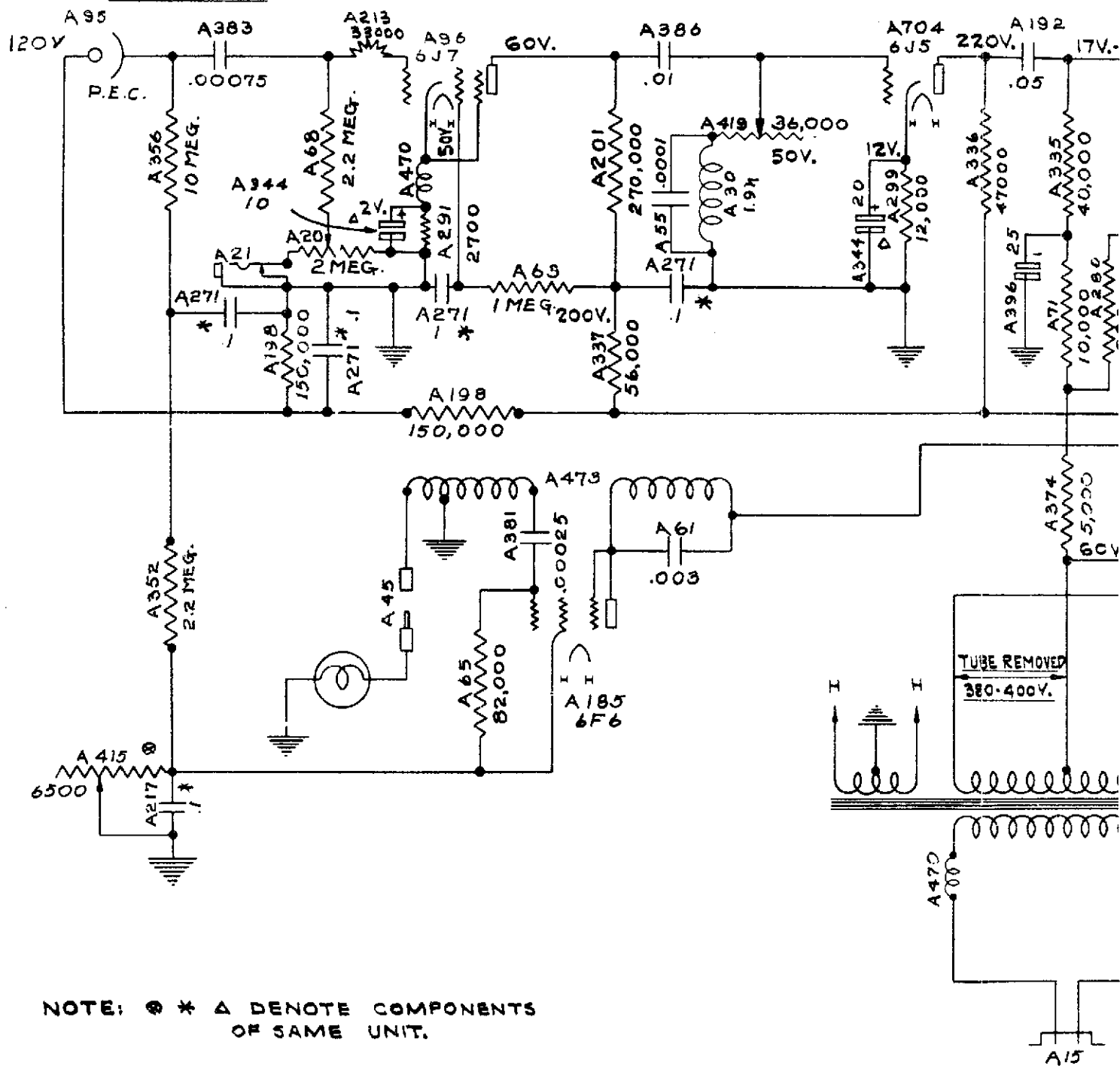
The voice coil impedance required is 1.8 ohms. The required plate load impedance is 4000 ohms. The power output is 8 watts.

The 6L6 tube operates on semi-fixed bias and, if distortion is noticed, the resistance A374 in the transformer high-voltage center tap circuit should be checked.



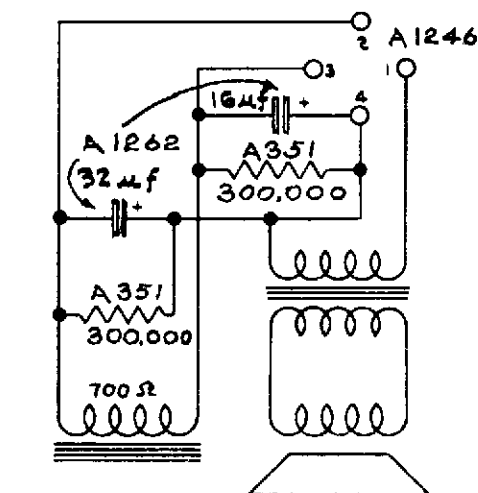
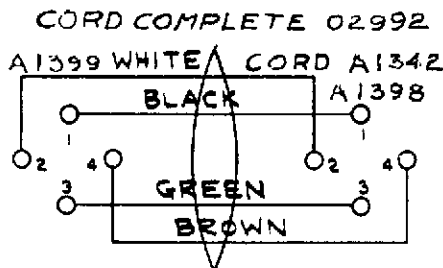
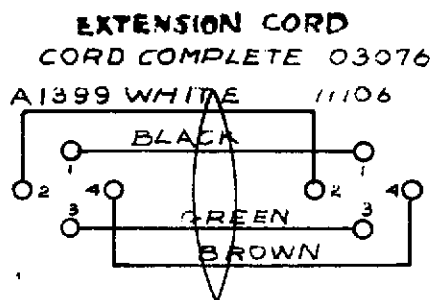
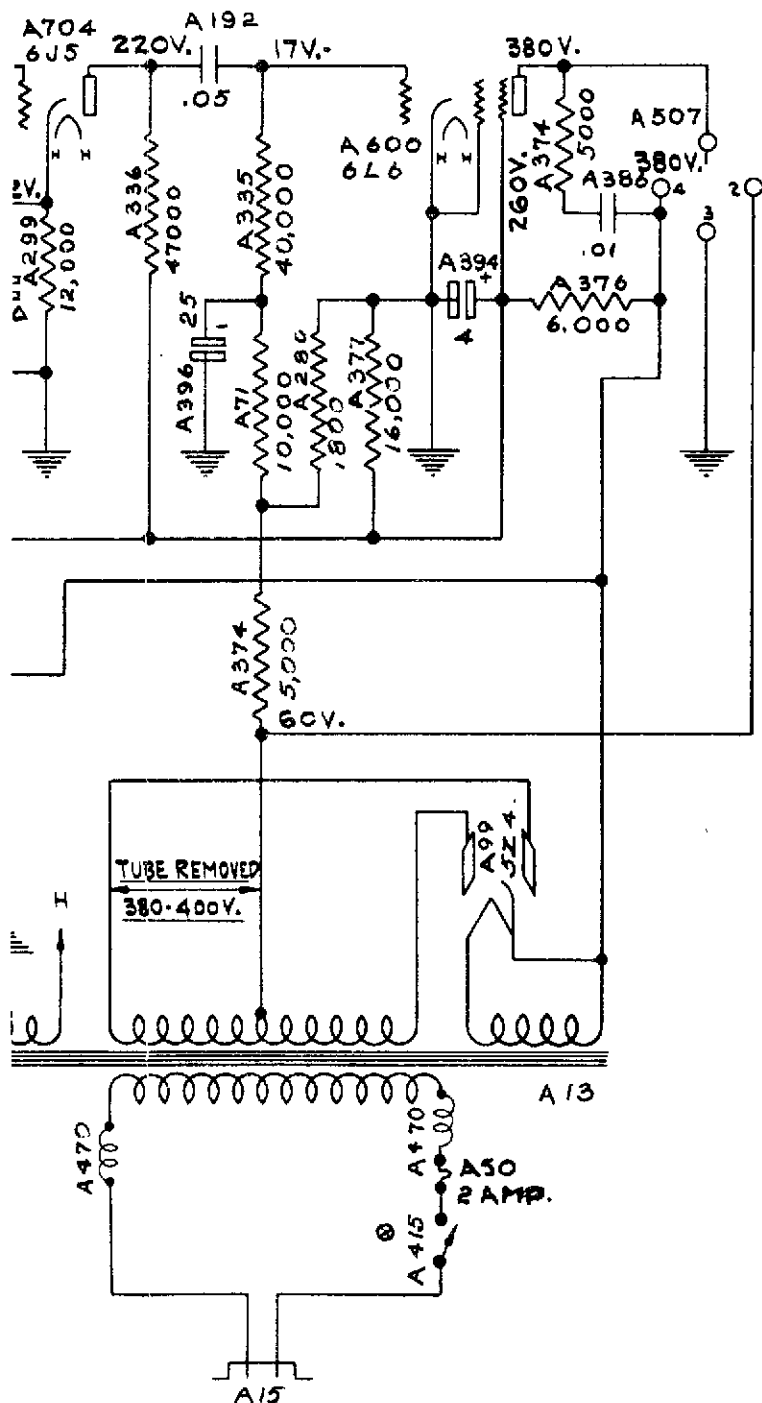
112 V. LINE  
(2000 w PER VOLT VOLTMETER READING)

"0" VOL. ON  
55V. VOL. OFF



NOTE: @ \* Δ DENOTE COMPONENTS  
OF SAME UNIT.





A1215 - 12" SPEAKER 6 A  
A1096 8" SPEAKER 1.8 A

BELL & HOWELL CO. CHICAGO USA

FILMOSOUND M. MA  
DESIGN 138 MODELS

REVISED 12 20 45

SUPERSEDES MOD. ABCE  
F H J L

12 20 45

SERVICE  
DATA

DRAWN C. J. N.  
APVD.



DESIGN 138, UTILITY, COMMERCIAL AND ACADEMY

(Amplifiers No. 03202, 03389, 03401, 03413, 03473, 03634, and 12634)

GENERAL INFORMATION.

The various models of the Utility, Commercial, and Academy Filmosounds are identified by the following method:

Utility	Commercial	Academy
138-R, -U, -X	138-S, -V, -Y	138-T, -W, -Z
Two cases 12" speaker	Single case 8" speaker	Two cases 8" speaker

Several different amplifiers were used in these models. Bell & Howell keeps a very accurate record of the type of amplifier used with every Filmosound serial number. Under no circumstances should they be changed to another type. Amplifiers may be identified by the numbers appearing on the front of the chassis to the left of the control panel or by a small plate attached to the bottom plate of amplifier. When replacing the amplifier bottom plate, place a small amount of Dupont household or General Electric glyptol cement on the screw threads. This will prevent the screws from working loose.

All amplifiers of this series use 6V6 tubes connected in push-pull and deliver 12 watts of undistorted power.

SPEAKER.

While the circuits vary somewhat, speakers are all interchangeable for testing purposes. The relay used in the later ones is only for discharging the filter condensers.



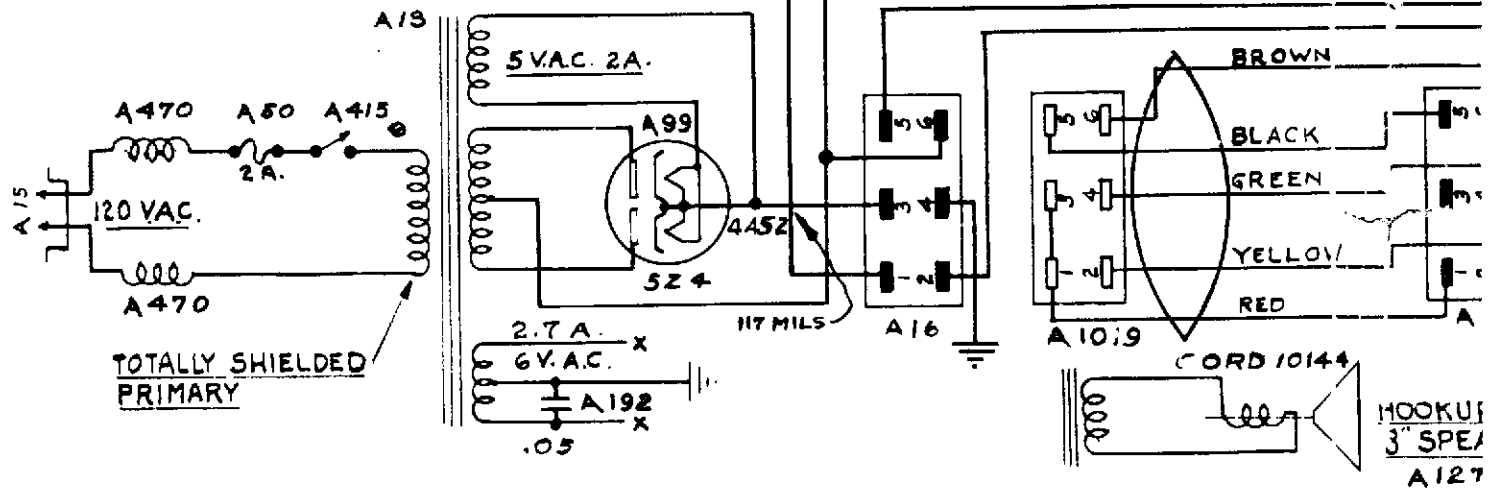
DESIGN 138, AMPLIFIER NO. 03202

GENERAL INFORMATION.

This amplifier uses a 6F6 tube as an oscillator. The speaker is different from the rest of these models, having a 50M, 10-watt resistor, part No. 11324, in the circuit. No relay is used.

Note that inverse feedback is used and that the tone control is in the input circuit of one of the output tubes.



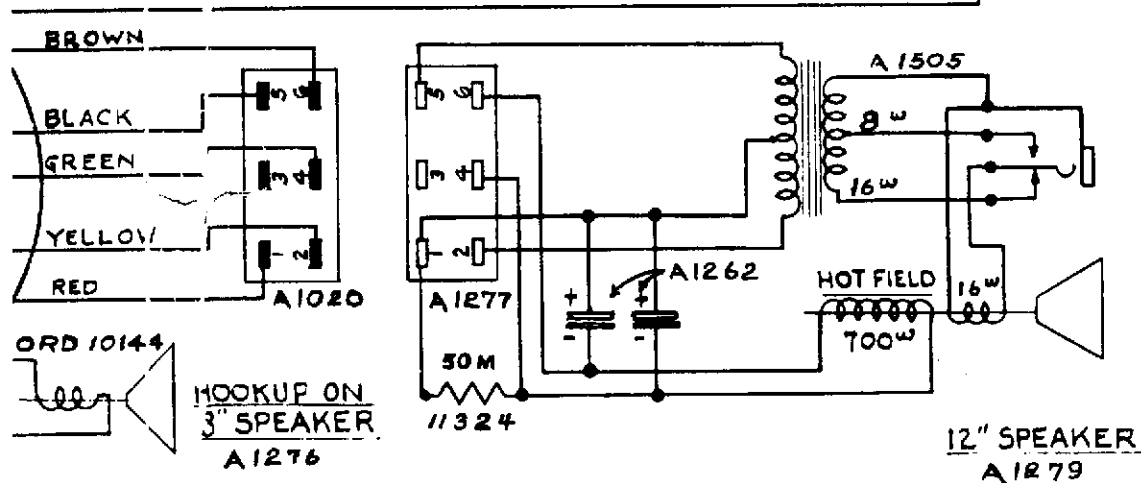


NOTE: \* @ DENOTE COMPONENTS  
OF SAME UNIT.

ALL GROUND  
EX. VOLTS MIN.  
EX. VOLTS MA

SUPERSEDES M & M





03202. FOR AMPLIFIER WITH SERIAL NOS. FROM 76615 TO 77214/

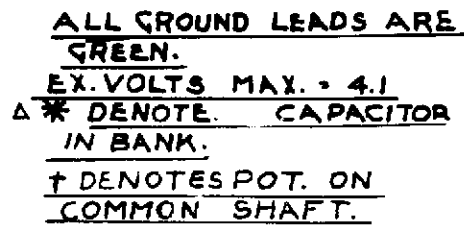


DESIGN 138, AMPLIFIER NO. 03389GENERAL INFORMATION.

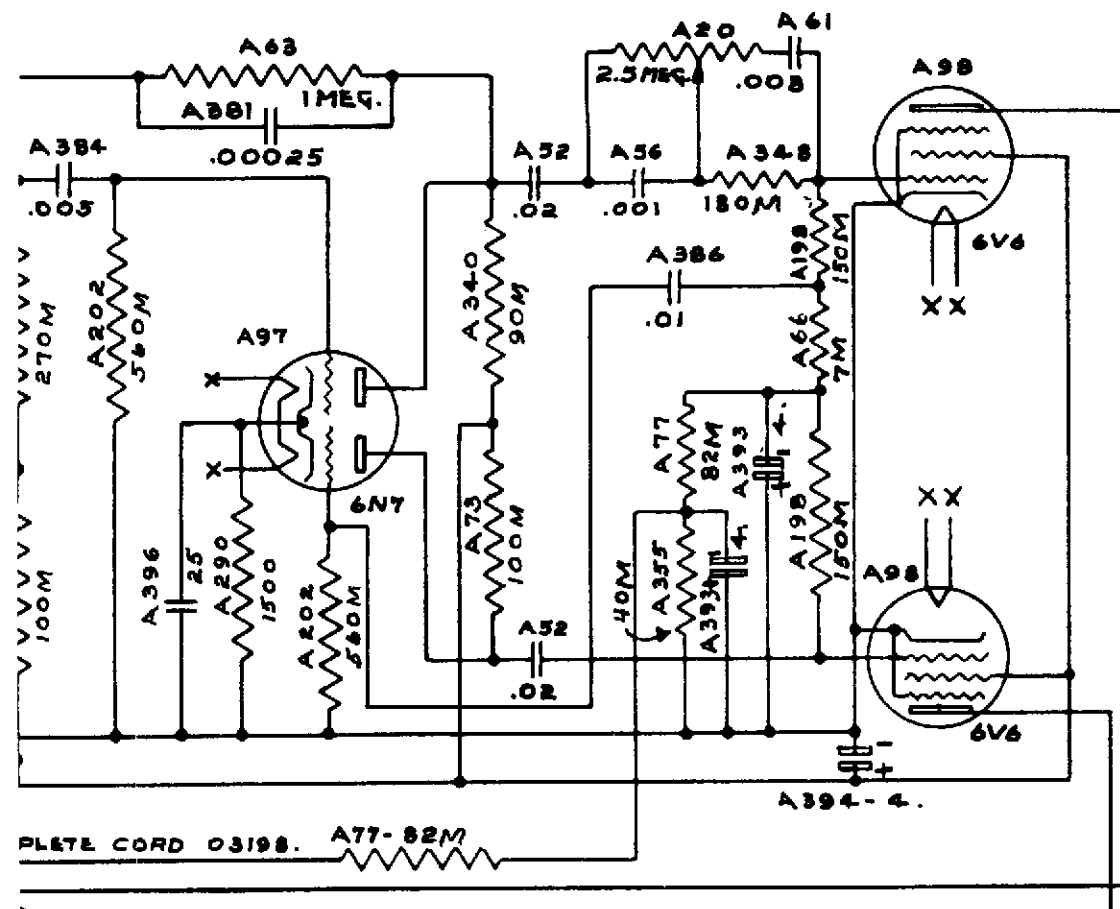
Many of these amplifiers became unstable after being in use for some time. Therefore, the following changes must be made whenever an amplifier wired like the diagram on page E-14 is encountered. A 7,000-10,000-ohm, 1/2-watt resistor should be inserted between the oscillator grid leak condenser combination and the tube grid or oscillator coil lead. The 70M screen resistor should be changed to a 30M, 1/2-watt resistor, A-170, and the bypass condenser should be disconnected and taped. Do not clip the lead at the condenser. Resistors A74 and A67 in the photocell and 6J7 grid circuit should be transposed. When re-installing resistor A-67, mount it with very short leads and place close to the coupling condenser A384. If amplifier is microphonic, move the condenser resistor combination slightly by means of a thin screw driver placed thru one of the bottom plate holes. Install a 50M, 1-watt resistor, A336, across the outside terminals of the photocell section of the volume control. The series feed resistor A349 (275M) should be changed to resistor A1043, 100M, 1/2-watt. The voltage at the junction point of the control and resistor should be between 100 and 120 volts. If the voltage is too high or too low, change the 100M resistor to one of lower or higher value. Do not remove original resistor from terminal strip. Lay new resistor in chassis close to the bottom plate stud, connecting it to the opposite end of original resistor which fed A428. Change microphone control A20.

The majority of these amplifiers have already been changed and are usually marked with a dot of red paint on one of the base plate rivets.

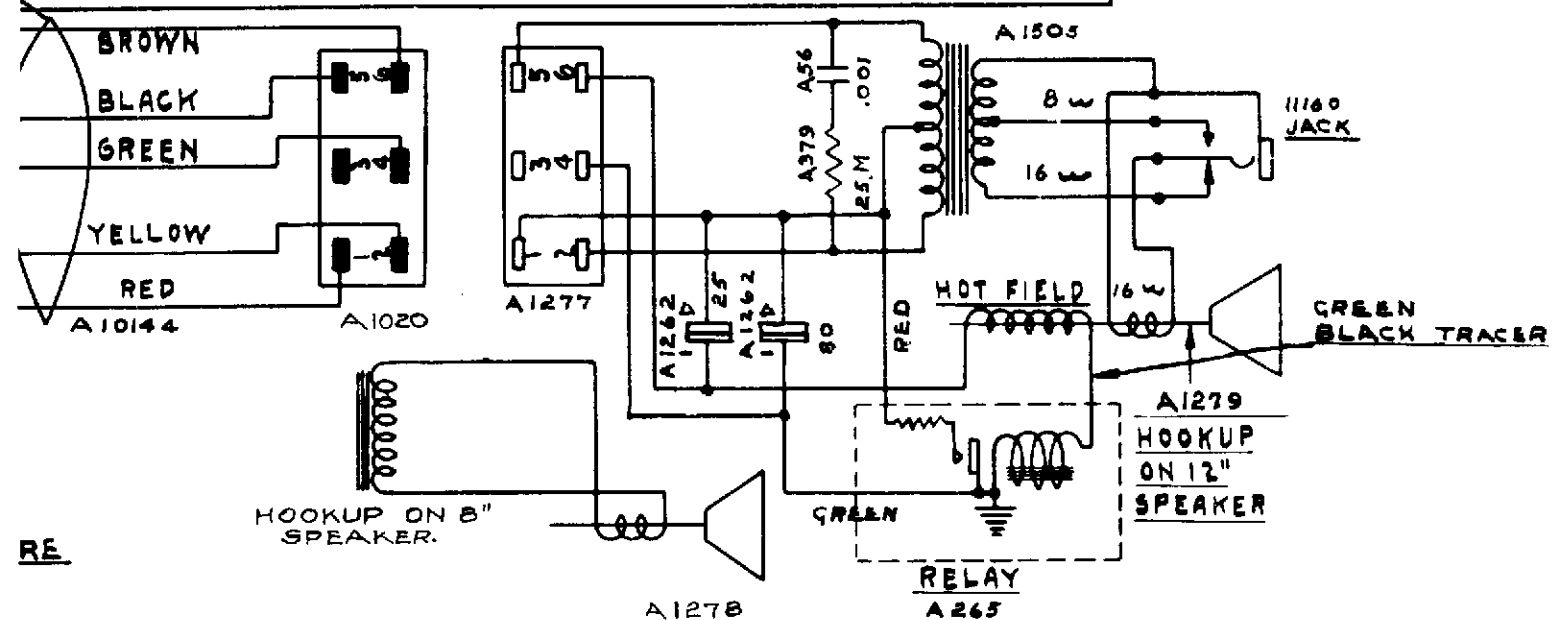








	AT ZERO. OUTPUT AND MIN. VOL CONTROL SET.
6V6 OSC	
IP	26.3
ISC	3.4
EP	335.
ESC	95.
6V6	
IP	34.
EP	348.
BIAS	-23.8
SCREEN	335.
6N7	190.
P.VOLTS	190.
P.VOLTS	188.
BIAS	-3.9
6J7	
PLATE	85.
SCREEN	24.
CATHODE	-0.5
TOT* B* CUR	130.
TOTAL REC. OUTPUT VOLT.	-420



BELL &amp; HOWELL CO. CHICAGO, USA

FILMOSOUND. A.S.T.  
DESIGN 138 MODELS RA, SA, TA

SUPERSEDES A.S.T. RA, SA, TA 12-1-38

1-3-46

SERVICE  
DATADRAWN. CJN  
APVD.

FOR USE WITH AMPLIFIER 03389.



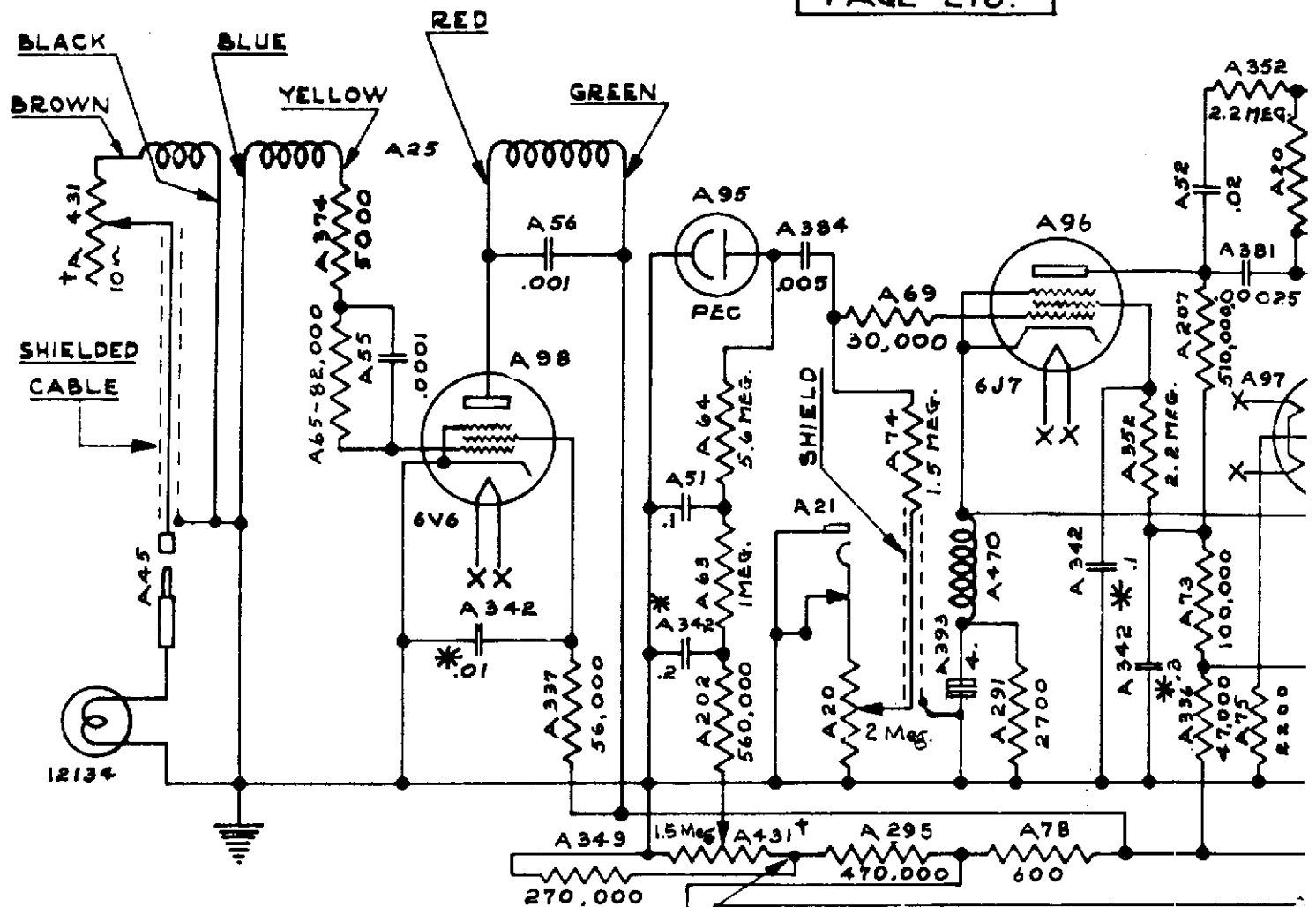
DESIGN 138, AMPLIFIER NO. 03401

GENERAL INFORMATION.

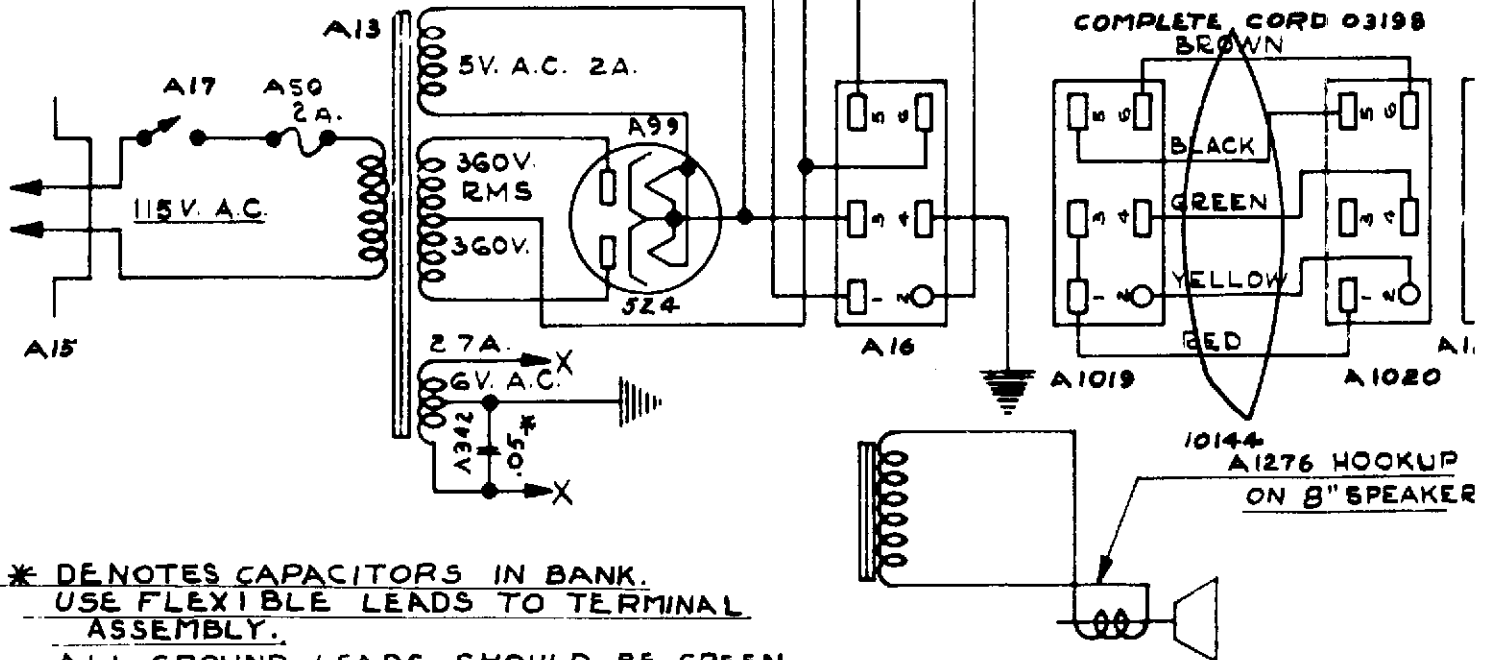
Failure of exciter lamp to operate may be due to shorted turns in oscillator coil. If tubes are known to be good and all voltages are correct then change coil.

When the exciter lamp voltage is excessive, remove the No. A337 screen resistor. Replace it with a 30M resistor No. A170 and disconnect the by-pass condenser lead. Tape up. Do not clip off at condenser bank.





MUST BE HELD BETWEEN 110-115 VOLTS

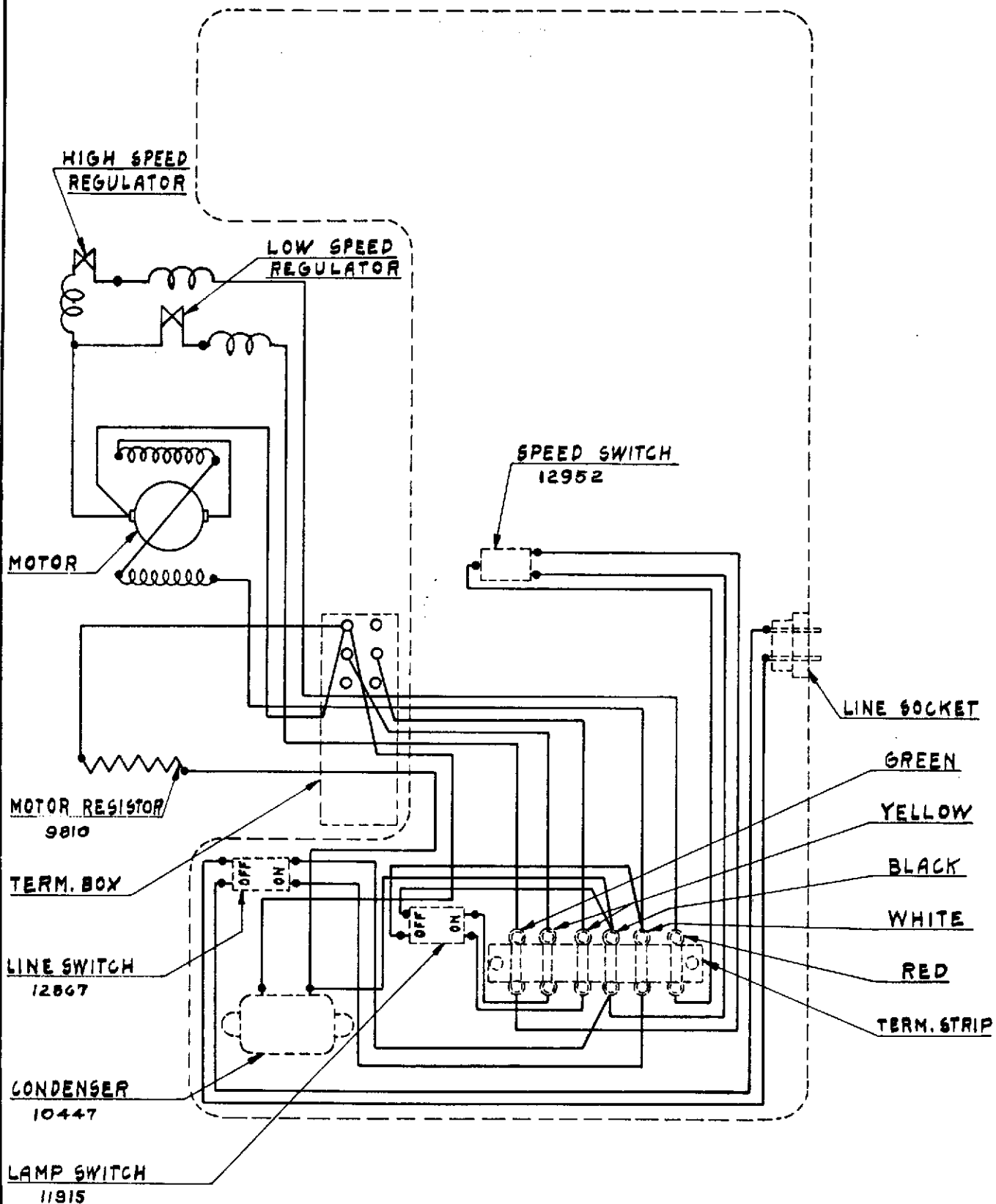


\* DENOTES CAPACITORS IN BANK.  
 USE FLEXIBLE LEADS TO TERMINAL ASSEMBLY.  
 ALL GROUND LEADS SHOULD BE GREEN.  
 † DENOTES POT. IN GANG.







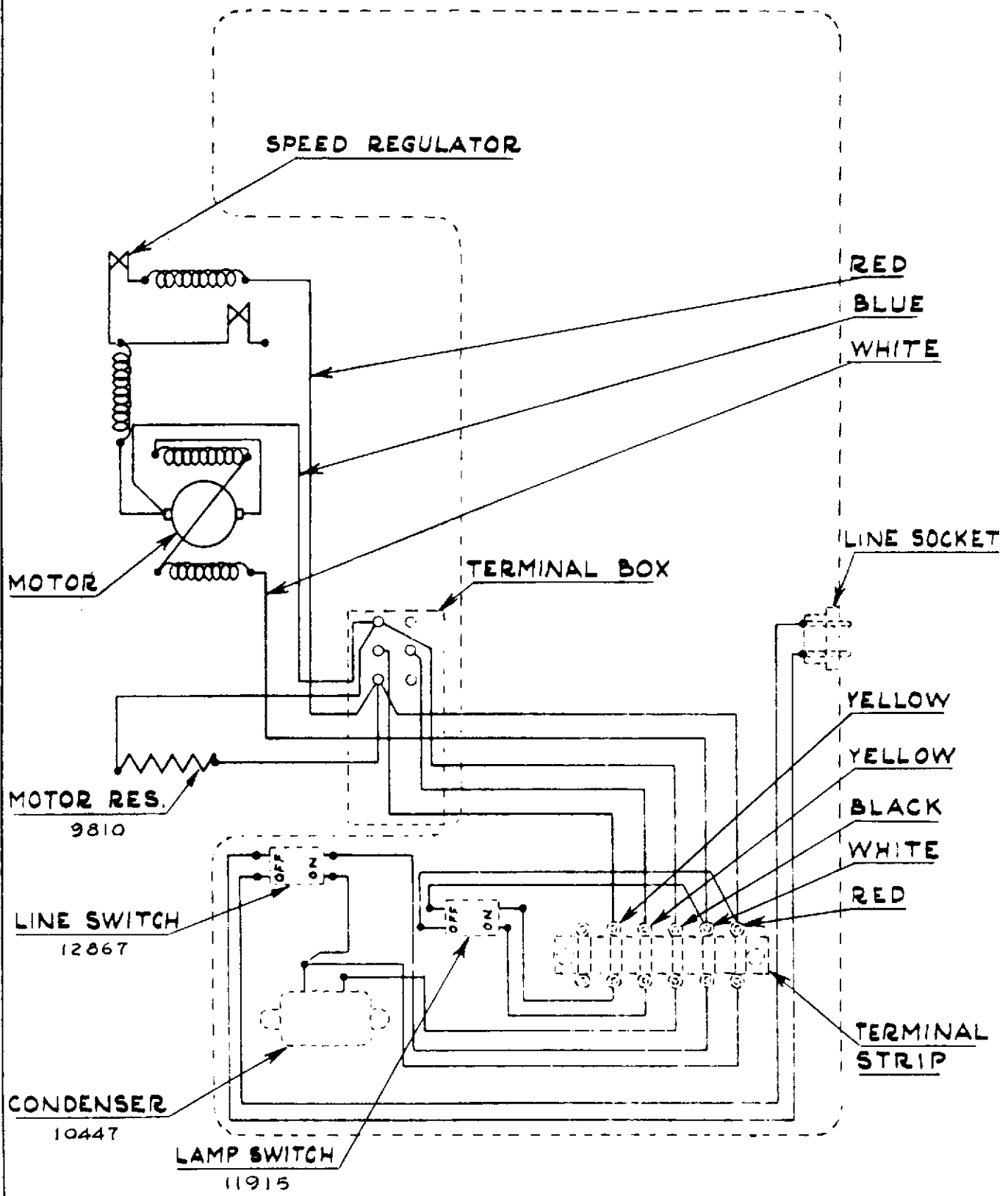


BOTTOM VIEW OF BASE ASSEMBLY  
SHOWING WIRING

ACADEMY

BELL & HOWELL CO. CHICAGO U.S.A.	
FILMOSOUND DESIGN 138	
SERVICE DATA	DRAWN P.L. APRD. 10-24-38





BASE ASSEMBLY SEEN FROM BOTTOM  
SHOWING WIRING

COMMERCIAL

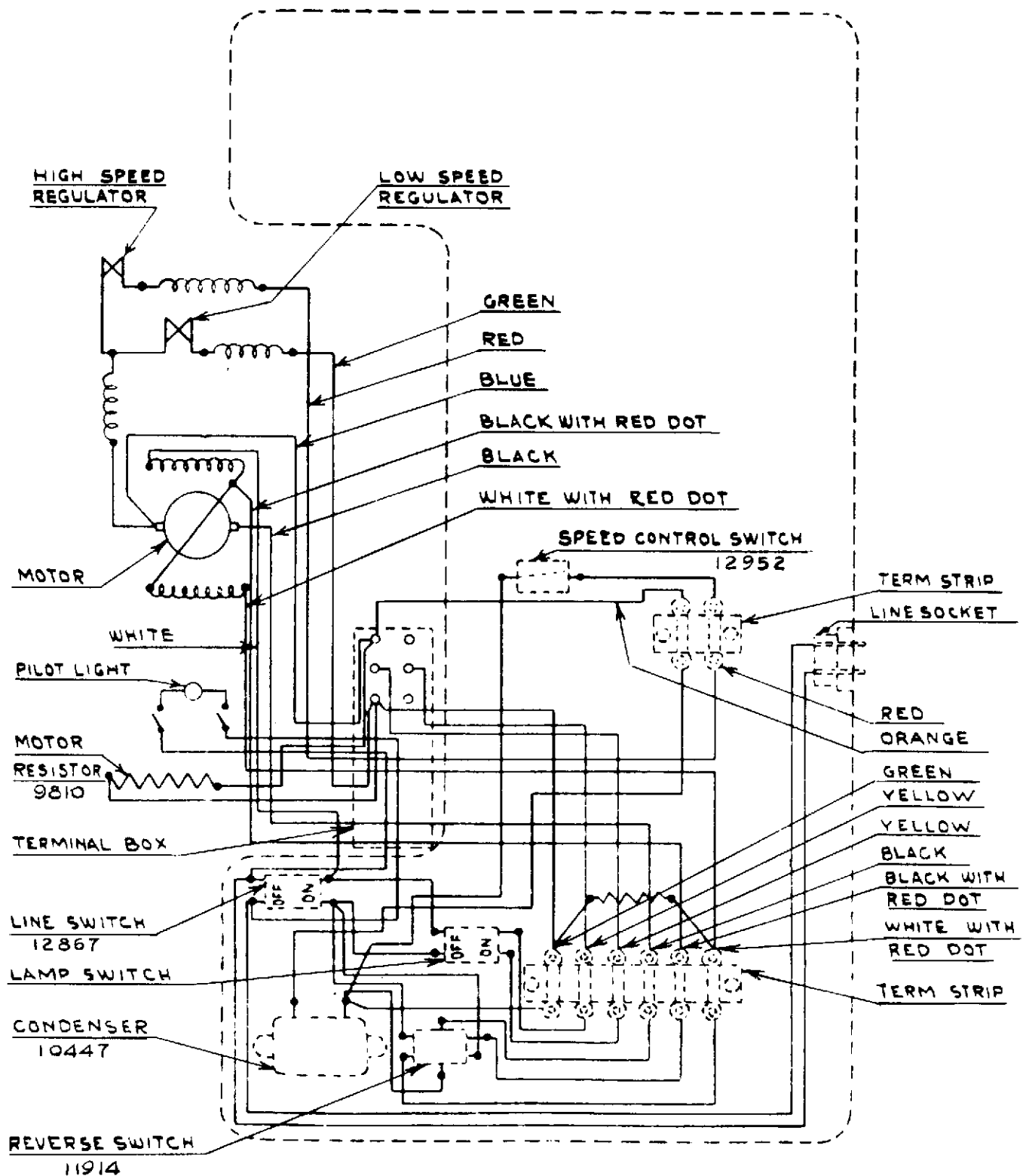
BELL & HOWELL CO  
CHICAGO, ILL.

FILMOSOUND  
DESIGN 138  
MODELS

SERVICE DATA	DRAWN ROL APVD 1-19-39
--------------	------------------------------

MOD'S. S-SA-SB  
SUPERSEDES (10-21-38)





BASE ASSEMBLY SEEN FROM BOTTOM  
FOR WIRING

UTILITY

BELL & HOWELL CO	
CHICAGO, U.S.A.	
FILMOSOUND	
DESIGN 138	
SERVICE DATA	DRAWN BY APVD 11-28-38



DESIGN 138, AMPLIFIERS NO. 03413, 03473, 03634, and 12634

GENERAL INFORMATION.

All of the above amplifiers are very much alike, the main difference being in the tone control circuits.

Low volume may be caused by a shorted section in condenser A37 and leaking between sections of condenser A38. The latter will usually become very hot when it is not in satisfactory condition. Fading of volume can also be caused by this condenser.

NOTE

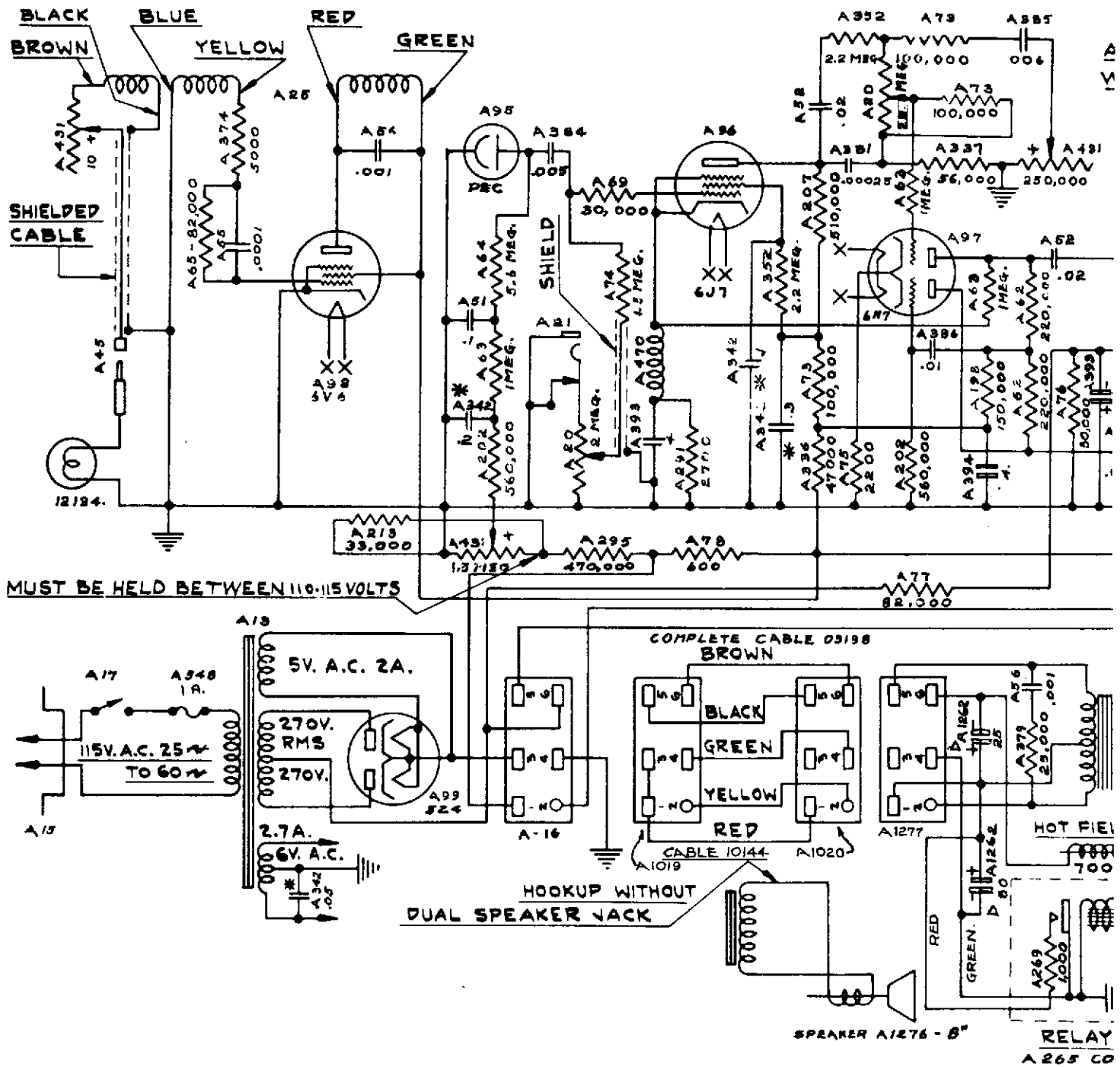
The 03634 and 12634 amplifiers use a 6SC7 phase inverter tube rather than the 6N7 tube.

The two tubes are not interchangeable.

Metal 6V6 tubes may be used thruout although a glass 6V6GT tube will usually be found in the oscillator socket. 6V6GT tubes may be used exclusively but it will be necessary to install grounded metal shields on the tubes in the output sockets.

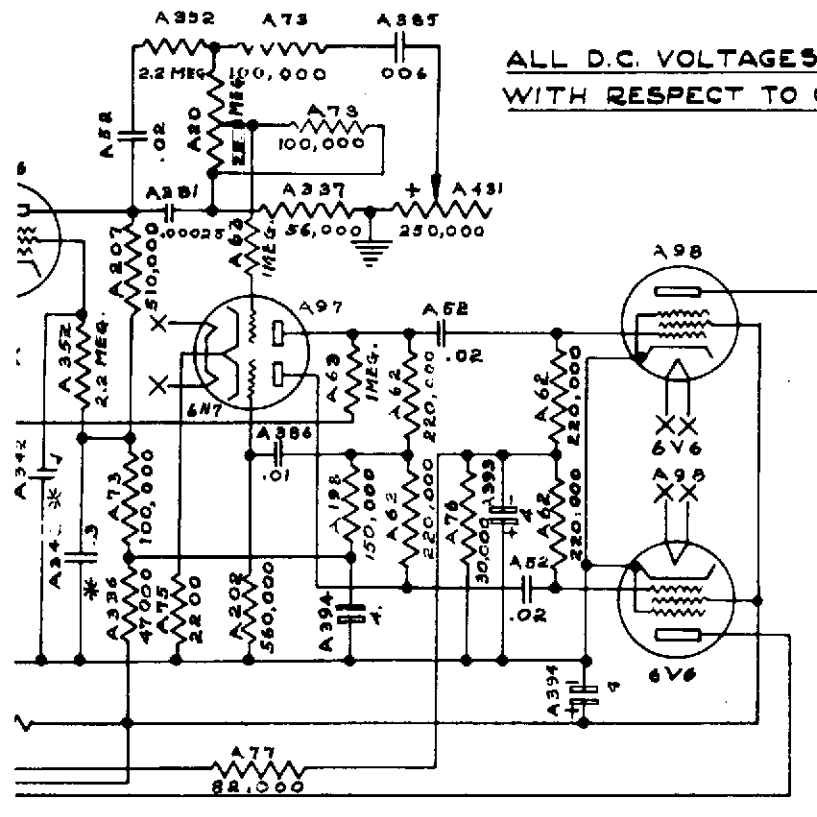
The 03413 amplifier is a 25-cycle amplifier. There are three series of them -- all bearing the same part number. The first series followed the 03401 circuit, the second the 03473 circuit and the third the 12634 circuit. Diagrams of the first two circuits are shown.





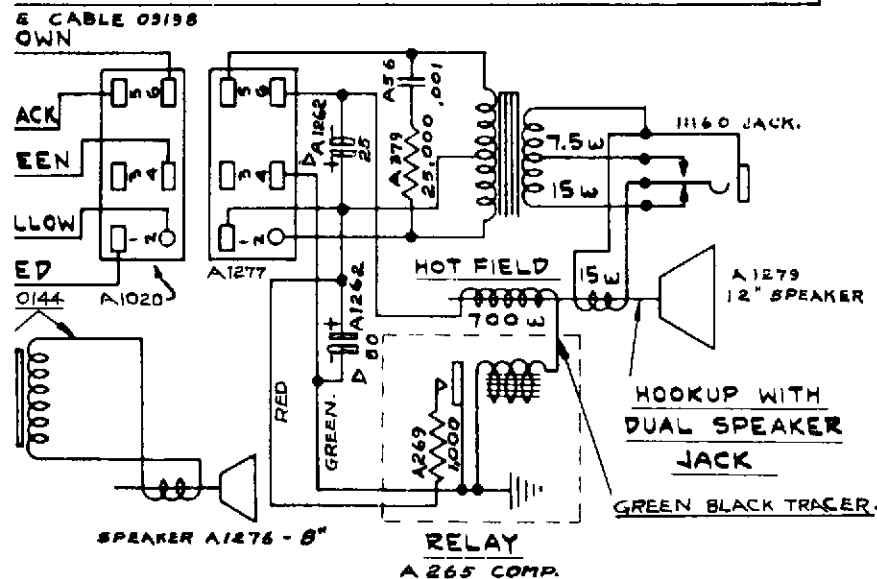
EX. VOLTS MIN. NO SIGNAL I.  
EX. VOLTS MAX. NO SIGNAL I.  
WITH V.T. METER.





ALL D.C. VOLTAGES ARE  
WITH RESPECT TO GROUND.

	AT ZERO OUTPUT AND MAXIMUM VOLUME CONTROL SETTING
6V6 OSC.	
IP	28 MA
ISC	4.5 MA
EP	250 VOLTS
ESC	250 VOLTS
6V6	
IP	28 MA
EP	265 VOLTS
BIAS	-15.6 VOLTS
SCREEN	250 VOLTS
6N7	
P1 VOLTS	70 VOLTS
P2 VOLTS	75 VOLTS
BIAS	1.2 VOLTS
6J7	
PLATE	42 VOLTS
SCREEN	22 VOLTS
CATHODE	-1 VOLT
TOTAL C. CURR.	90 MA
TOTAL RECT. OUTPUT VOLTS	330



\*S\* INDICATES TERMINAL AT CLOCKWISE  
STOP.

ALL VOLTAGES MEASURED WITH  
EXCITER LAMP FULL ON AND  
NO SIGNAL AT 115V. LINE. ALL  
VOLTAGES MEASURED TO GROUND.

† INDICATES CONTROLS ON SAME  
SHAFT.

\*Δ DENOTE CAPACITORS LOCATED  
IN BANKS.

WIRING COLOR CODE.

WHITE - GROUND BROWN - SCREEN  
YELLOW - CATHODE BLUE - PLATE  
RED - B+ BLACK - HEATER.  
GREEN - GRID

EX. VOLTS MIN. NO SIGNAL 1.5 VOLTS  
EX. VOLTS MAX. NO SIGNAL 4 VOLTS  
WITH V.T. METER.

COMMERCIAL  
ACADEMY  
UTILITY.

BELL & HOWELL CO. CHICAGO U.S.A.

FILMOSOUND  
DESIGN 138 MODELS RB SBTB

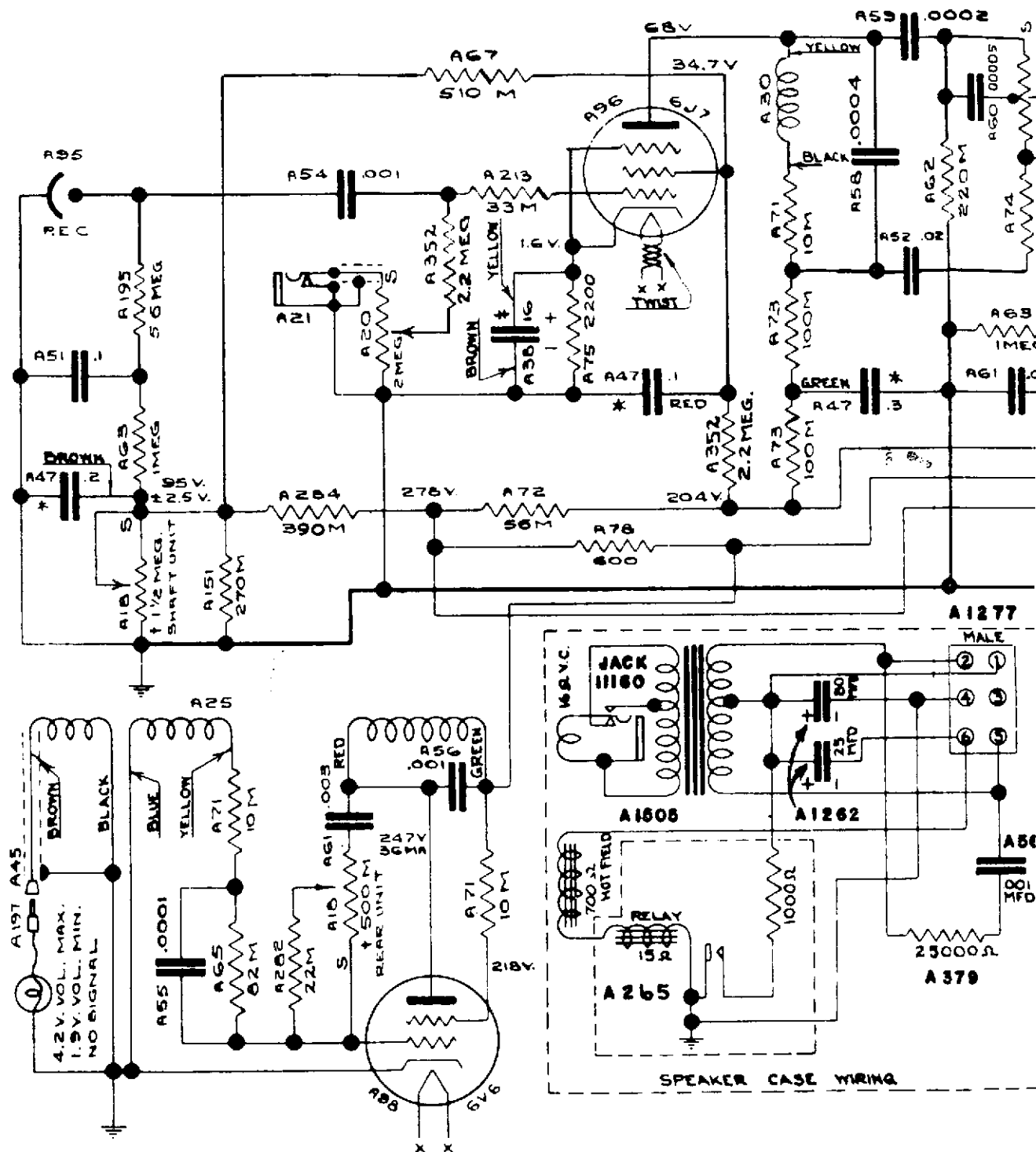
29-12-45

SERVICE  
DATA

DRAWN CJN  
APVD.

FOR USE WITH AMPLIFIER \*03413.

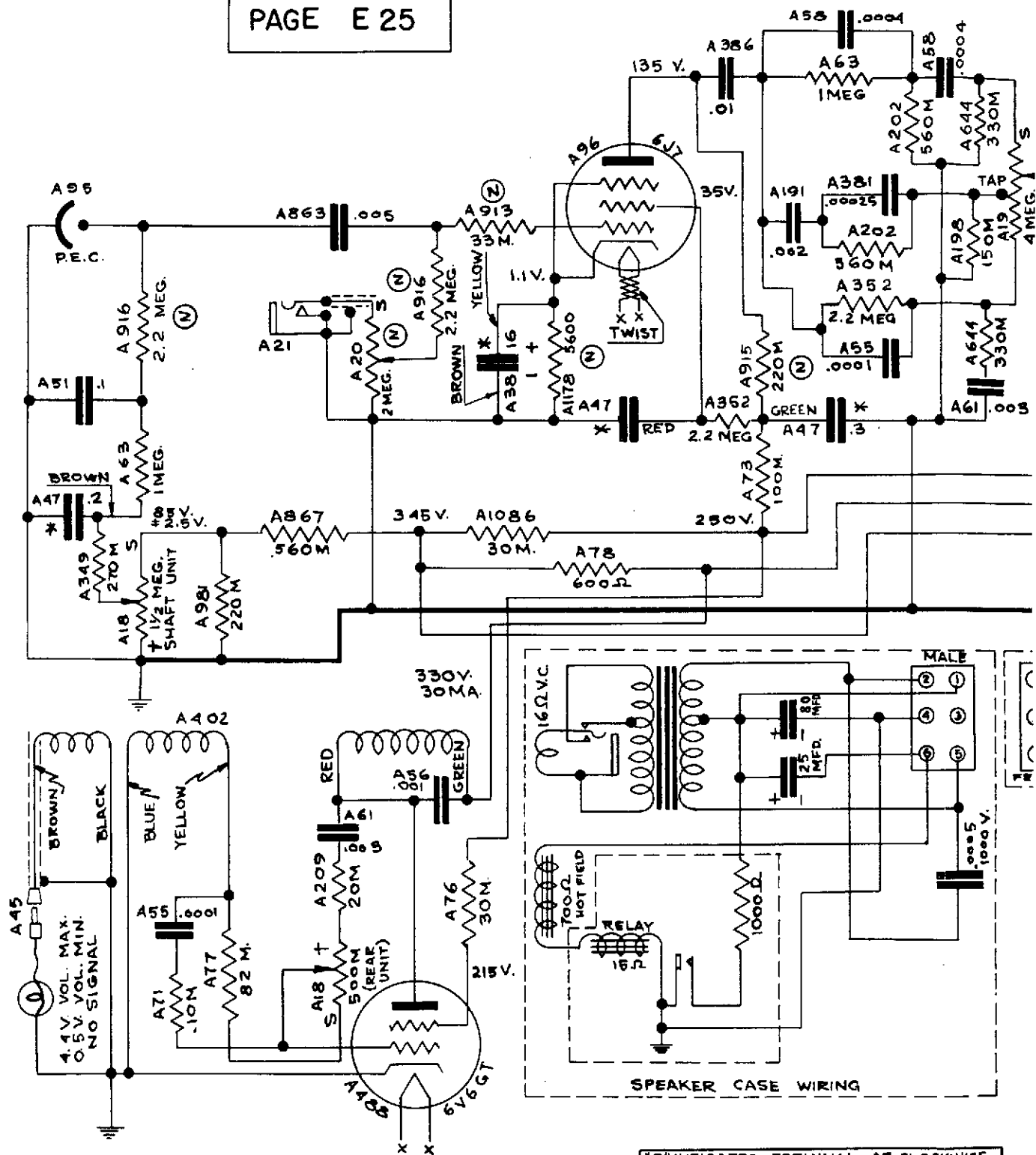




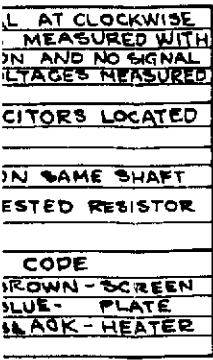






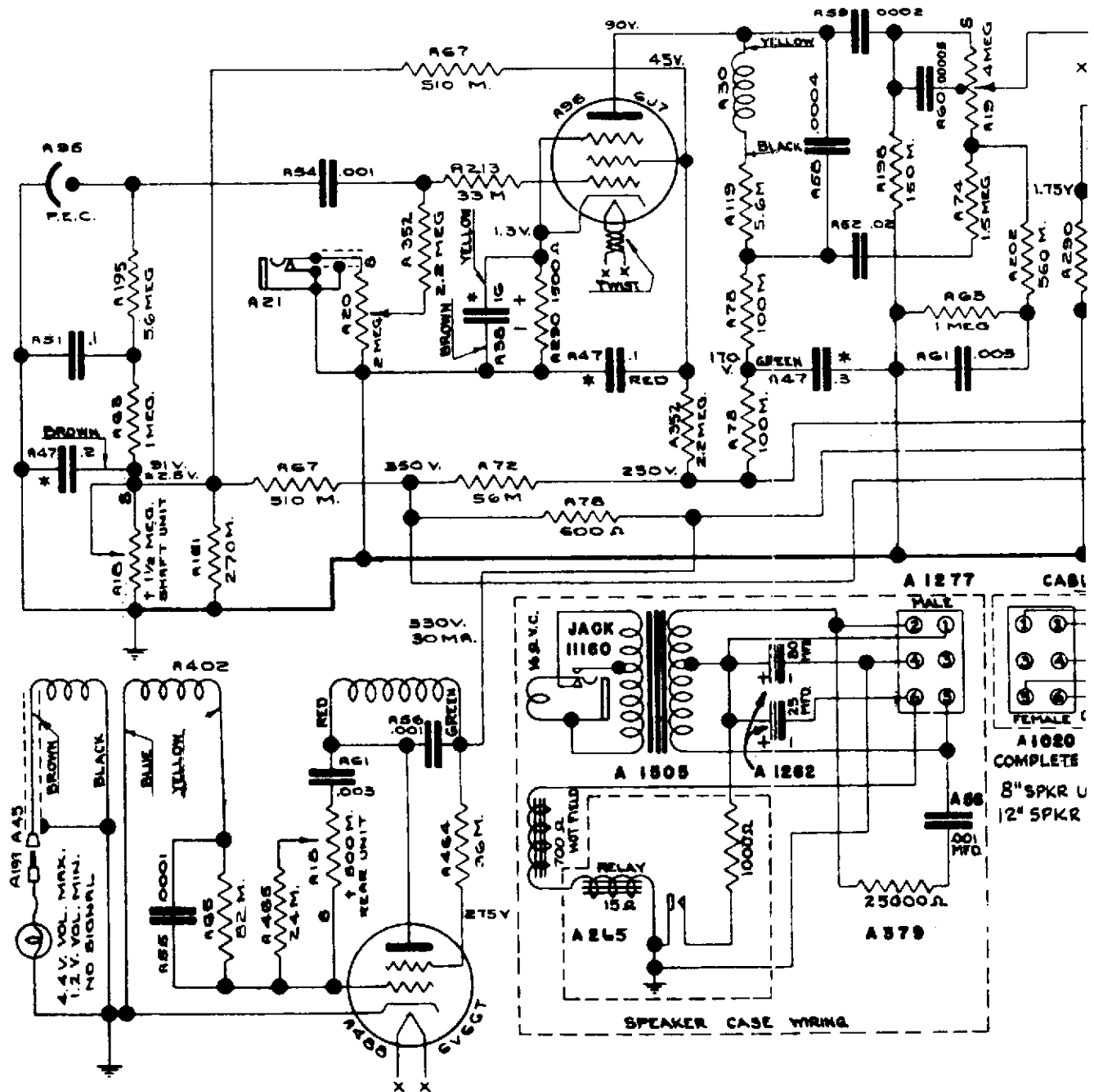






DATE 6-14-46



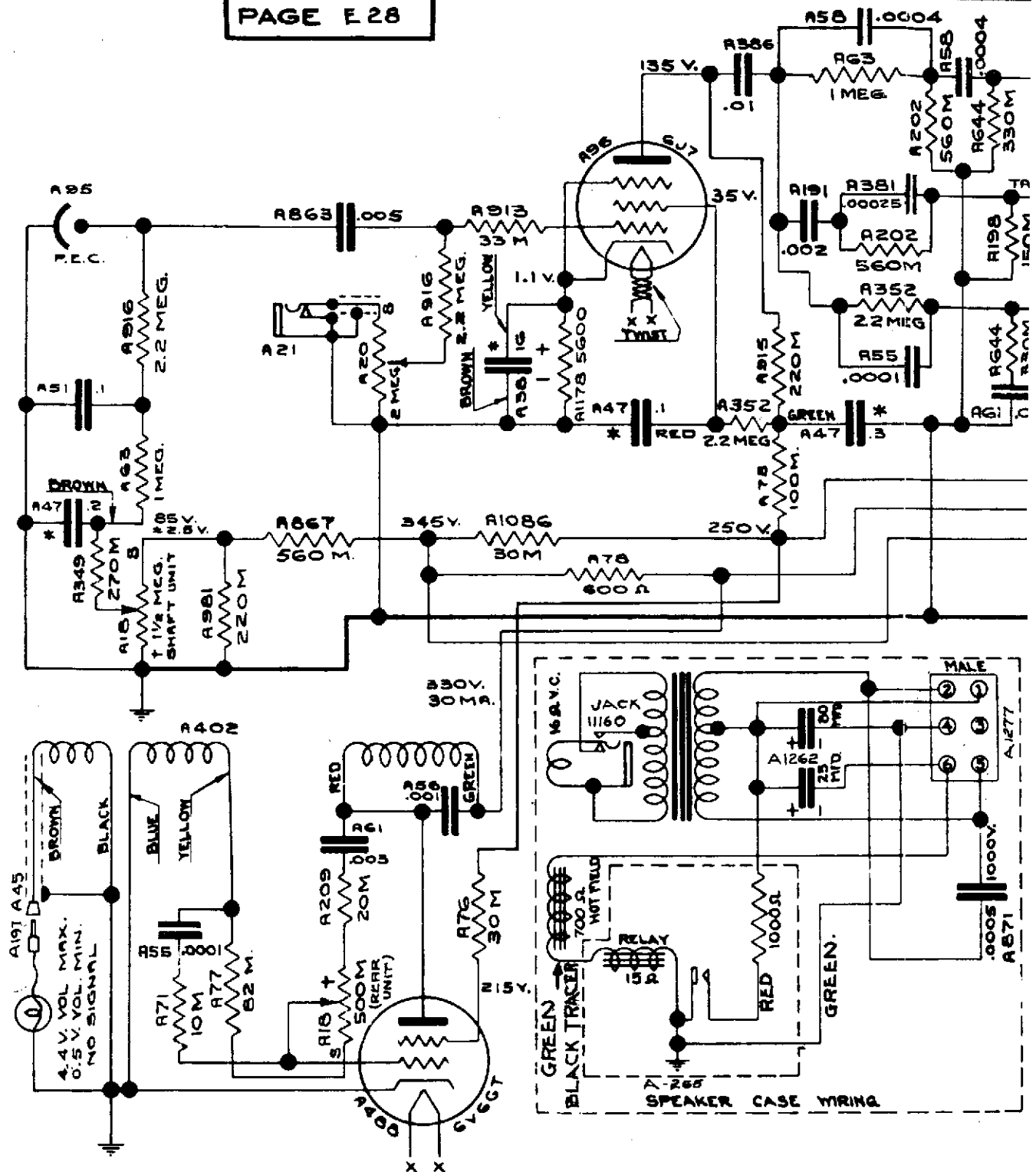


<p>'S INDICATES TERMINAL AT CLOCKWISE STOP. ALL VOLTAGES MEASURED WITH EXCITER LAMP FULL ON AND NO SIGNAL AT 115 V. LINE. ALL VOLTAGES MEASURED TO GROUND          * &amp; † DENOTE CAPACITORS LOCATED IN BANK          † INDICATED CONTROLS ON SAME SHAFT</p>	
<p>WIRING COLOR CODE</p>	
WHITE - GROUND	BROWN - SCREEN
YELLOW - CATHODE	BLUE - PLATE
RED - B+	BLACK - HEATER
GREEN - GRID	





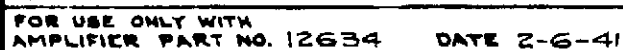




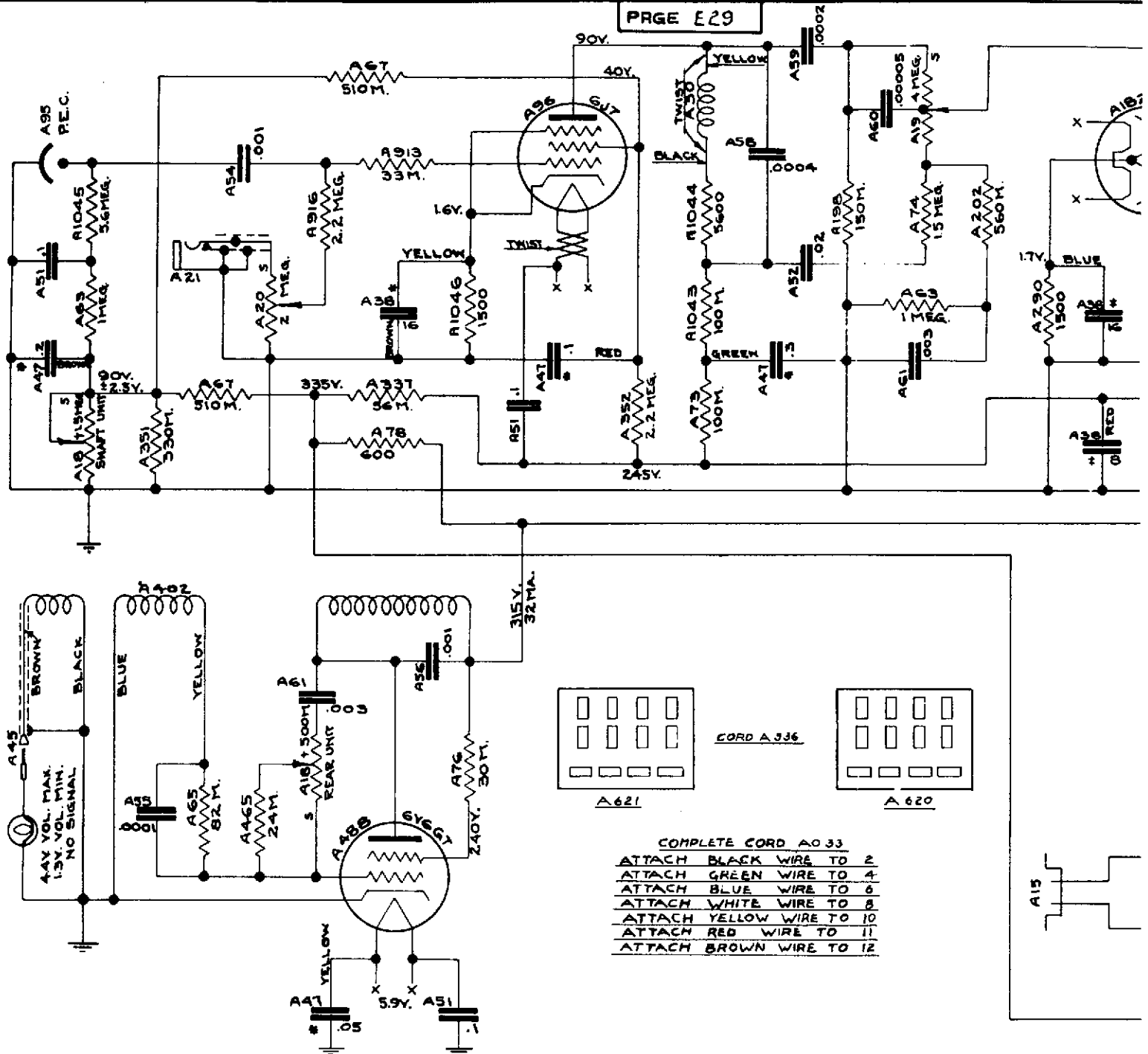
"S" INDICATES TERMINAL AT CLOCKWISE STOP. ALL VOLTAGES MEASURED W/ EXCITER LAMP FULL ON AND NO SIGNAL AT 115 V. LINE. ALL VOLTAGES MEASURED TO GROUND  
\* & @ DENOTE CAPACITORS LOCATED IN BANK.  
+ INDICATED CONTROLS ON SAME SH.

WIRING COLOR CODE	
WHITE - GROUND	BROWN - SCREEN
YELLOW - CATHODE	BLUE - PLATE
RED - B+	BLACK - HEATER
GREEN - GRID	









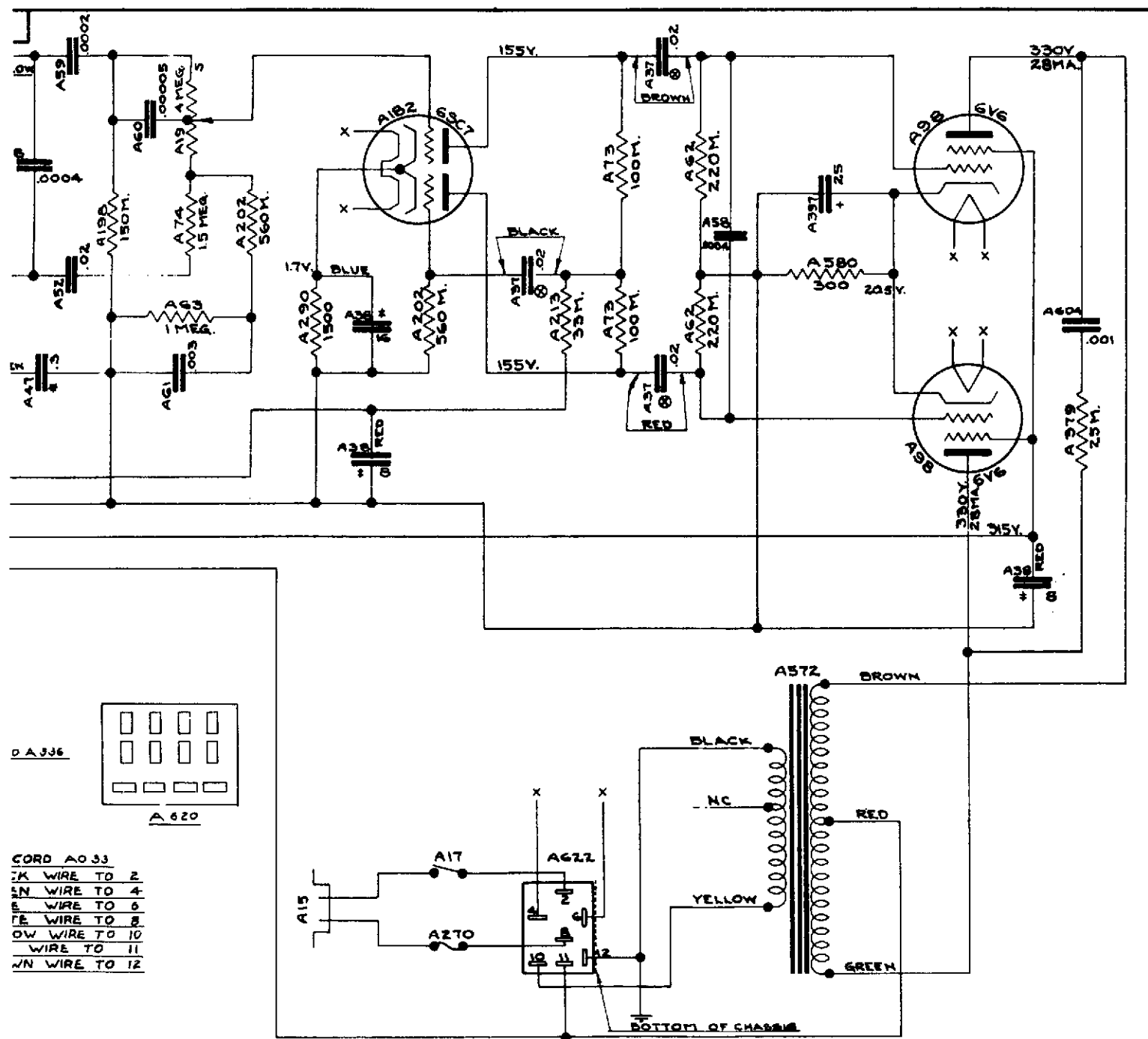
COMPLETE CORD AO 33

- |        |        |      |    |    |
|--------|--------|------|----|----|
| ATTACH | BLACK  | WIRE | TO | 2  |
| ATTACH | GREEN  | WIRE | TO | 4  |
| ATTACH | BLUE   | WIRE | TO | 6  |
| ATTACH | WHITE  | WIRE | TO | 8  |
| ATTACH | YELLOW | WIRE | TO | 10 |
| ATTACH | RED    | WIRE | TO | 11 |
| ATTACH | BROWN  | WIRE | TO | 12 |

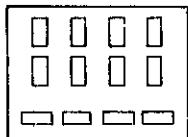
3 INDICATES TERMINAL AT CLOCKWISE  
STOP. ALL VOLTAGES MEASURED WITH  
EXCITER LAMP FULL ON AND NO  
SIGNAL AT J15Y LINE. ALL VOLTAGES  
MEASURED TO GROUND.  
R & C DENOTE CAPACITORS LOCATED  
IN BANK.  
+ INDICATES CONTROL ON SAME  
SHAFT.

WIRING COLOR CODE	
WHITE - GROUND	BROWN - SCREEN
YELLOW - CATHODE	BLUE - PLATE
RED - 8+	BLACK - HEATER
GREEN - GRID	





0 A 336



A 620

CORD A033  
 1K WIRE TO 2  
 5N WIRE TO 4  
 E WIRE TO 6  
 TE WIRE TO 8  
 OW WIRE TO 10  
 WIRE TO 11  
 WN WIRE TO 12

TESTS TERMINAL AT CLOCKWISE  
 VOLTAGES MEASURED WITH  
 LAMP FULL ON AND NO  
 115V LINE ALL VOLTAGES  
 TO GROUND.  
 NOTE CAPACITORS LOCATED  
 IN CONTROL ON SAME

WIRING COLOR CODE  
 GROUND BROWN - SCREEN  
 CATHODE BLUE - PLATE  
 B+ BLACK - HEATER

REVISED ⑧  
 C.O. 244 3-23-44

A513

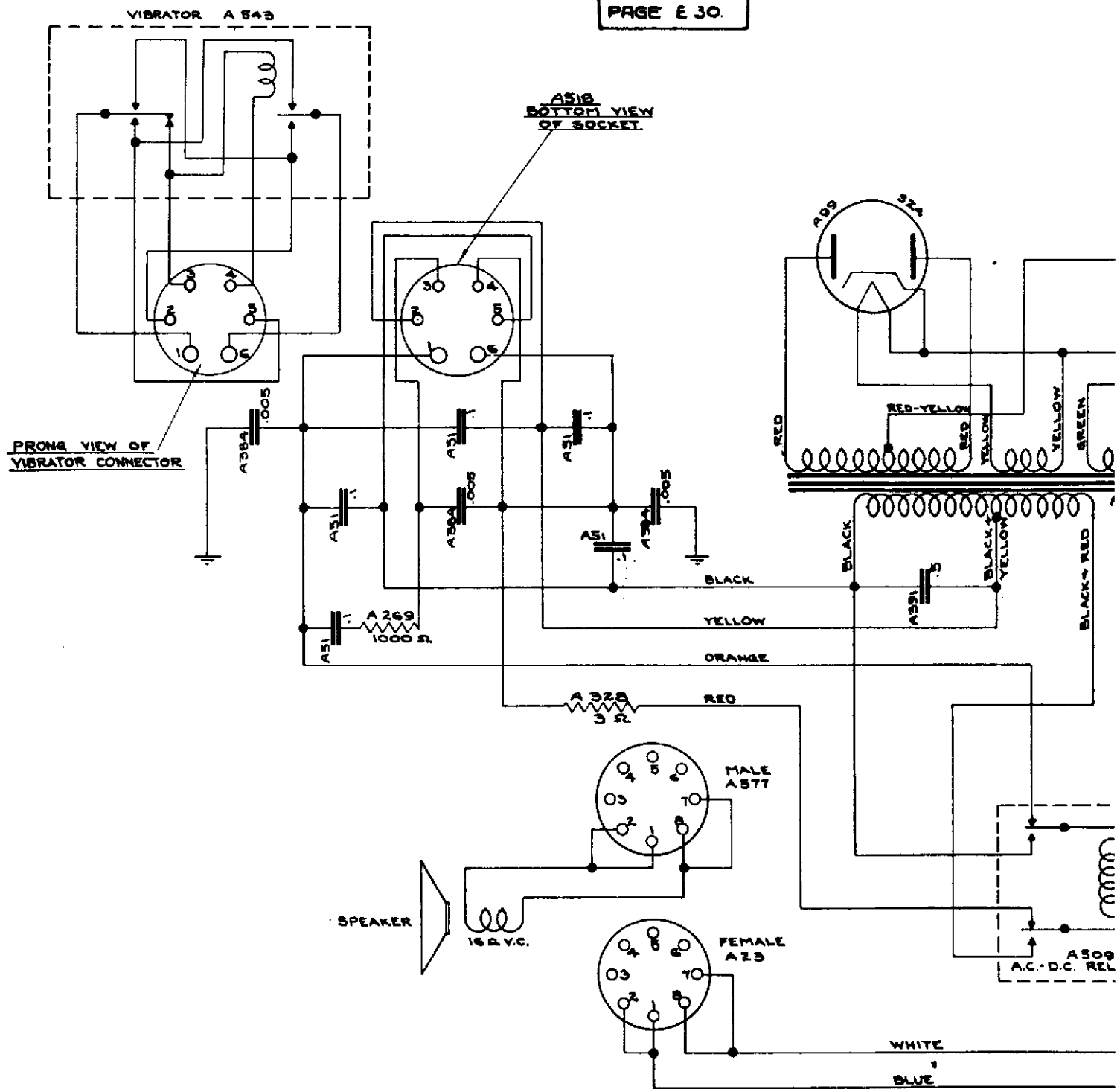
# SERVICE DATA

AMPLIFIER WIRING DIAGRAM

COMMERCIAL, ACADEMY, + UTILITY  
 A.C. - D.C. FILMSOUND

FOR USE ONLY WITH  
 AMPLIFIER PART # A056 DATE 5-7-40

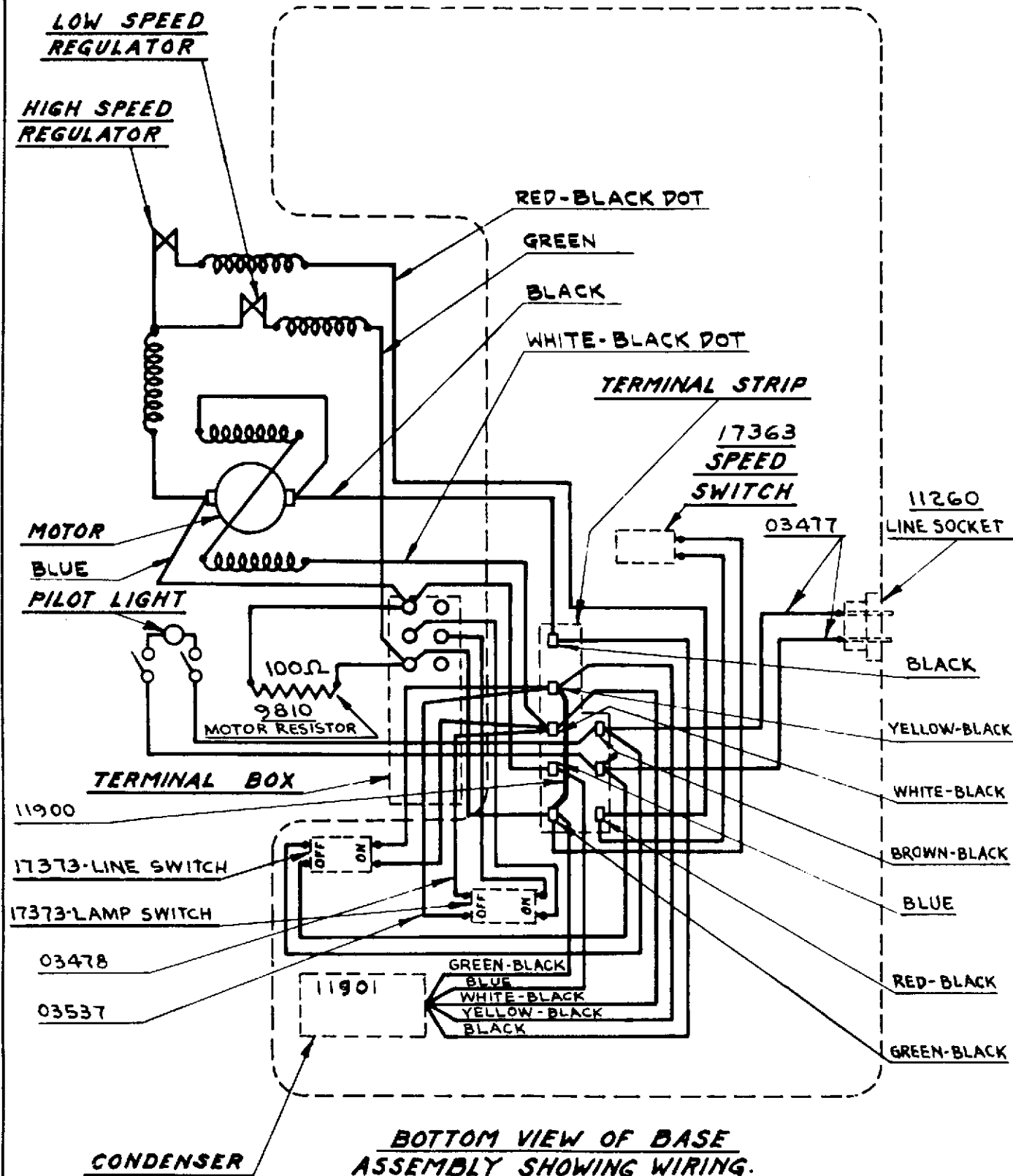












**FOR REPLACEMENT ORDER  
PART #12903**

**(60 & 25 CYCLE ACADEMY)**

**COLOR CODE**

11901		12903
GREEN - BLACK	=	WHITE WITH BLACK & GREEN
BLUE	=	WHITE WITH GREEN & RED
WHITE - BLACK	=	WHITE WITH BROWN
YELLOW - BLACK	=	WHITE WITH BLACK & ORANGE
BLACK	=	WHITE WITH BLACK & RED

**Bell & Howell Co. Chicago, Ill. U.S.A.**

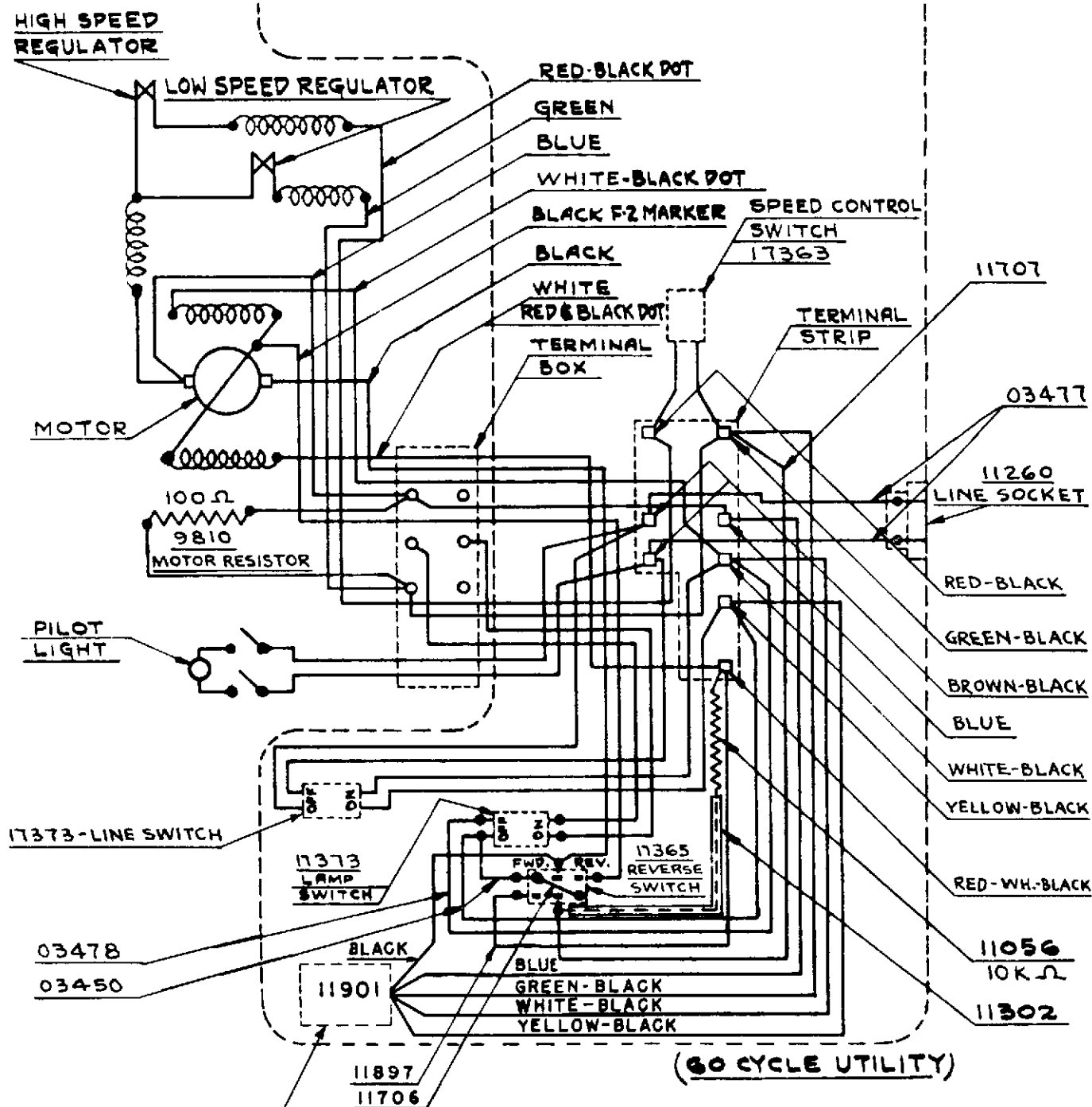
**PROJECTOR WIRING DIAGRAM FOR  
DESIGN 138 MODELS T-W-Z**

**DATE 2-17-53**

**SERVICE  
DATA**

**DRAWN  
APVD.**





CONDENSER  
FOR REPLACEMENT ORDER  
PART #12903

BOTTOM VIEW OF BASE  
ASSEMBLY SHOWING WIRING

COLOR CODE	
11901	12903
GREEN-BLACK	= WHITE WITH BLACK & GREEN
BLUE	= WHITE WITH GREEN & RED
WHITE-BLACK	= WHITE WITH BROWN
YELLOW-BLACK	= WHITE WITH BLACK & ORANGE
BLACK	= WHITE WITH BLACK & RED

Bell & Howell Co. Chicago, Ill. U.S.A.

PROJECTOR WIRING DIAGRAM FOR  
DESIGN 138 MODELS R-U-X

DATE 2-17-53	SERVICE DATA	DRAWN APVD.
--------------	--------------	-------------



SECTION F  
DESIGN 140-FILMOARC

GENERAL INFORMATION.

On page F2 will be found the projector and arc lamp - DC current - wiring diagrams. The Bell & Howell Filmoarc uses the Design 130 amplifier, information for which may be found under Section "D" of this manual.

Be sure the speaker selector switch in the rear of the amplifier is set to the "Single Speaker" position for single speaker and "Dual Speaker" position when two speakers are being used.

When ordering parts be sure to use the word "DETAIL" and number wherever shown.

Lamp house and rectifier parts have not been given a Bell & Howell number; therefore, it will be necessary to order them by description.

The Instructions and Manual of Operation for the Filmoarc thoroughly cover the projector lamp housing and rectifier.



SWITCH OPEN FOR SILENT AND  
CLOSED FOR SOUND SPEEDS

PAGE F2

PROJECTOR MOTOR

HIGH SPEED  
REGULATOR

GREEN

BLUE

BROWN

ORANGE

GOV.  
15721

15796

WHITE

BLUE

GREEN

WHITE

RED

BLACK

ORANGE

BROWN

GREEN

RED

BLACK

4 WIRE CABLE

S.P.-D.T. SWITCH  
15768

GREEN

15743

9810

MALE REC.  
15769

FEM. PL.  
15768

TERMINAL BLOCK IN SOUND HEAD

4 WIR

EXCITER LAMP

SHIELD

PROJECTOR WIRING DIAGR

3 WIRE RECEPTACLE TO LAMP

2 WIRE RECEPTACLE  
TO LAMP

3 WIRE PLUG  
FROM RECTI

SWITCH AND  
CIRCUIT BREAKER  
IF SWITCH ONLY CONNECT  
AS DOTTED LINE

TERMINAL STRIP

LINE  
115V 60~

BRONZE  
LUG

VOLT METER

RELAY

PRIMARY

SECONDARY

CHOK

TUNGAR TUBE G.E. #217283

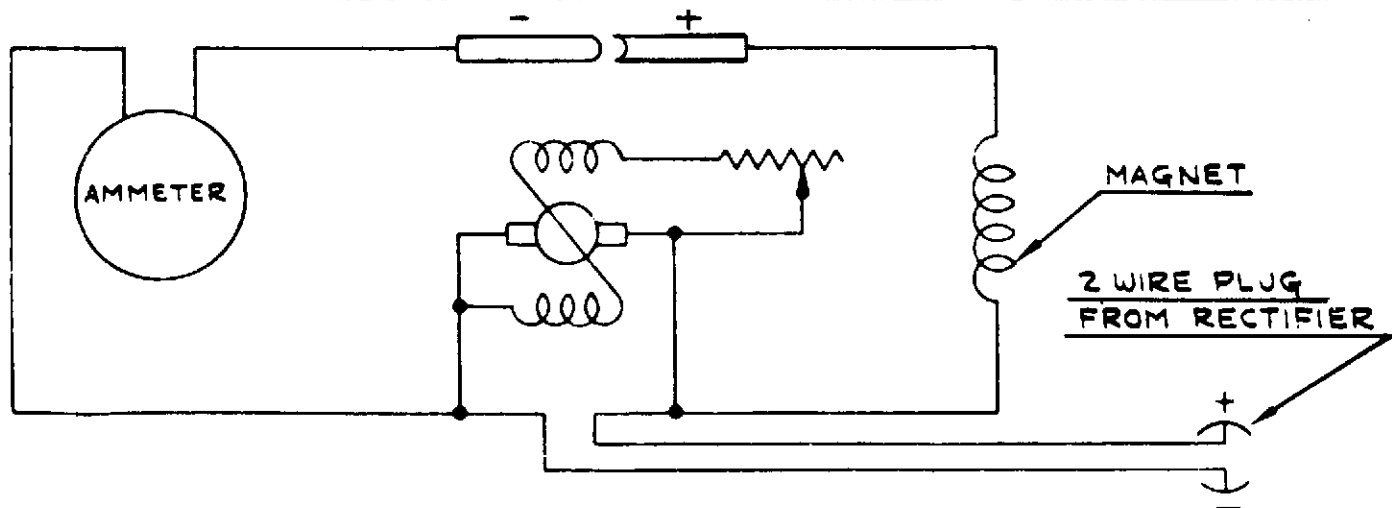
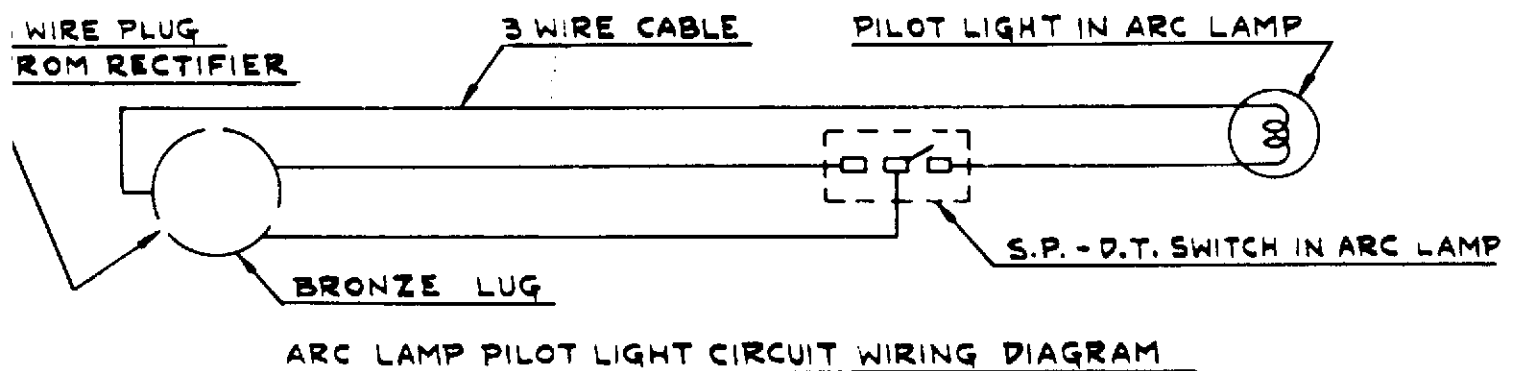
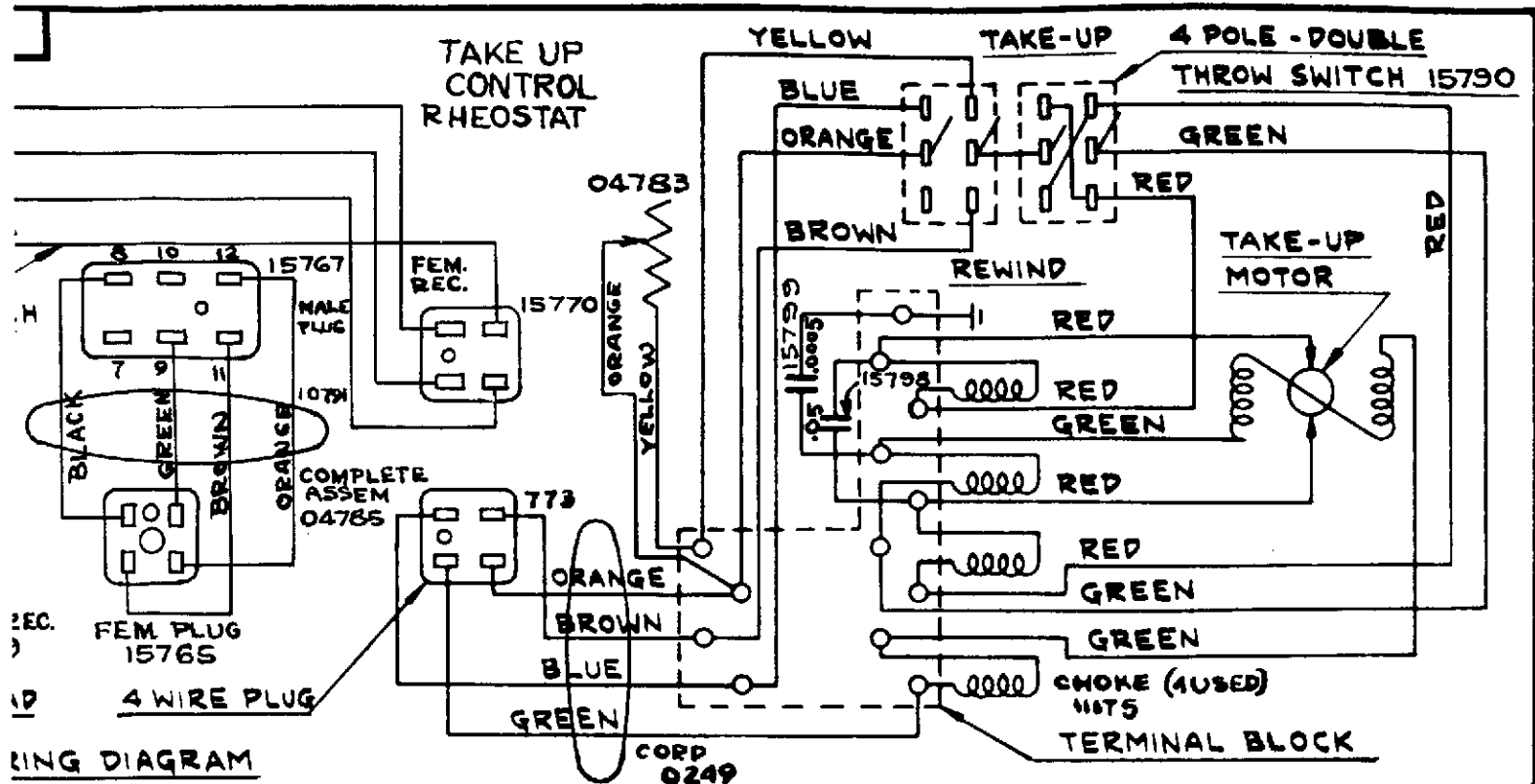
OR WESTINGHOUSE #766776

RECTIFIER WIRING DIAGRAM

AMP

ARC LAMP





BELL & HOWELL CO. CHICAGO U.S.A.

FILMO - ARC  
DESIGN 40 MODELS A-B-C-D-E-F-G-H

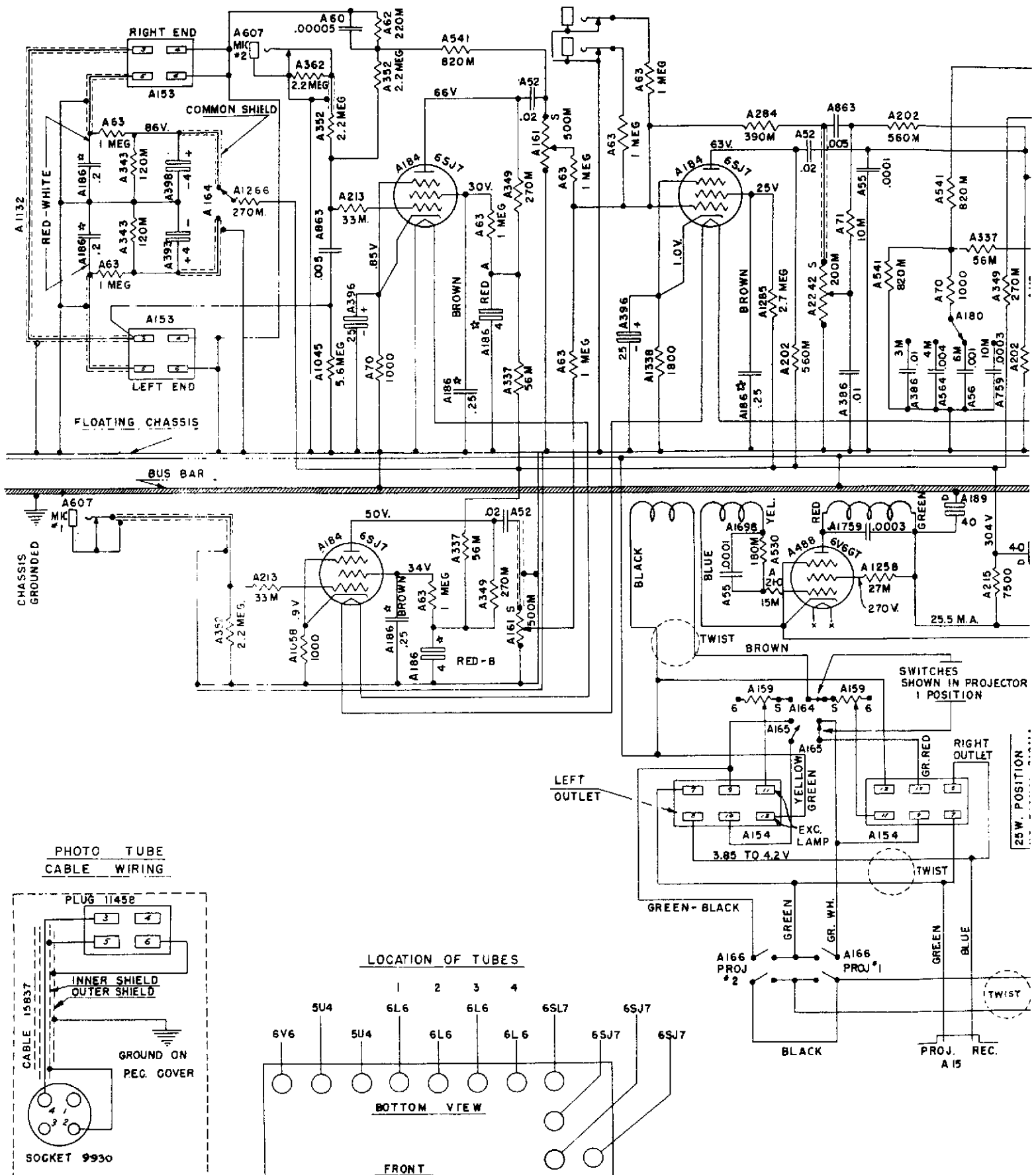
1-28-38

SERVICE  
DATA

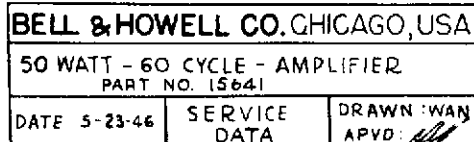
DRAWN PC R.  
APVD.



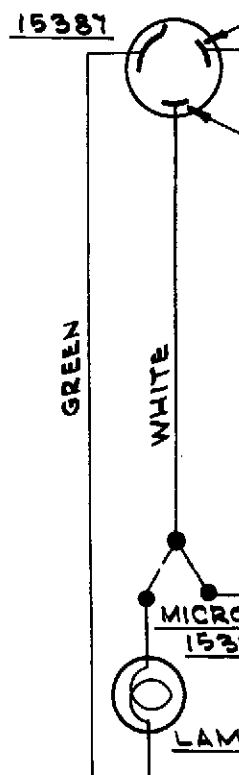
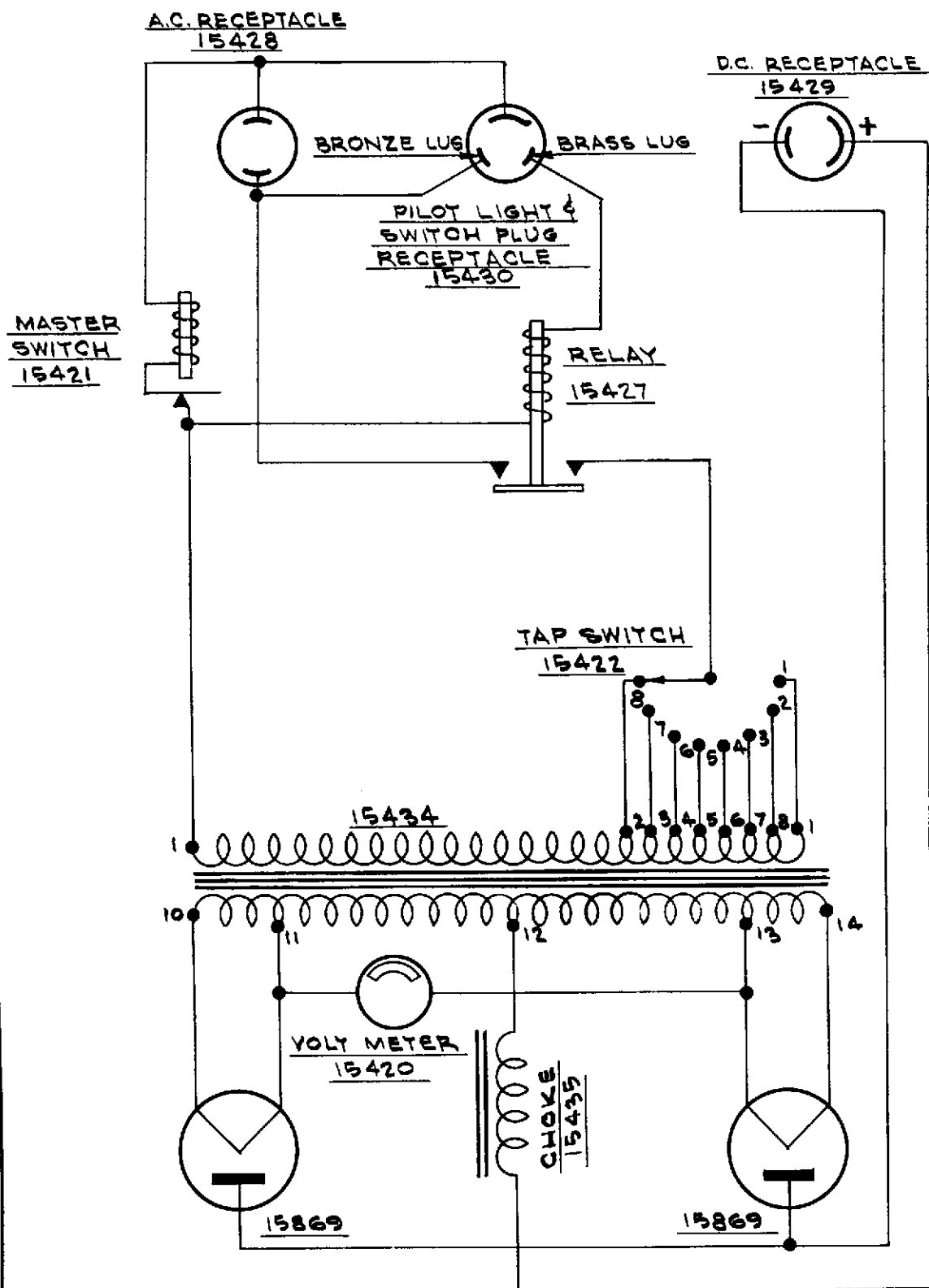
A607 PHONO #2  
A607 PHONO #1











PILOT LIGHT  
SWITCH PLUG  
IN LAMP HO

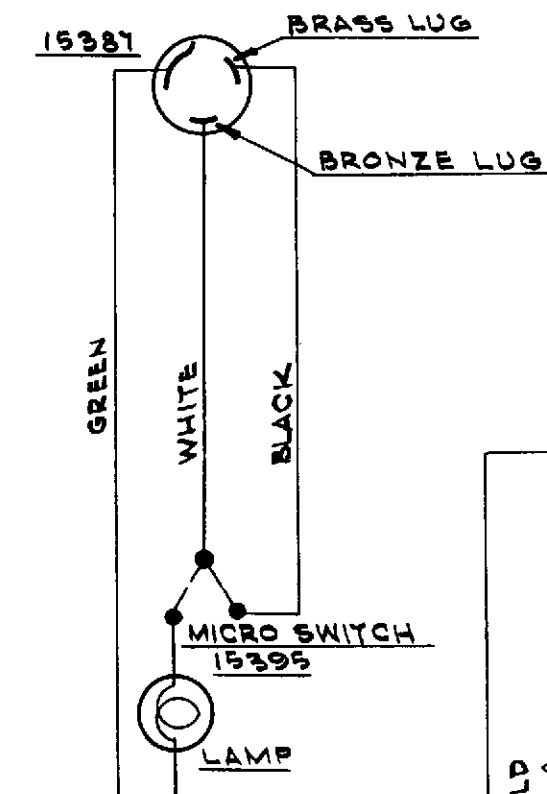
RECTIFIER CIRCUIT



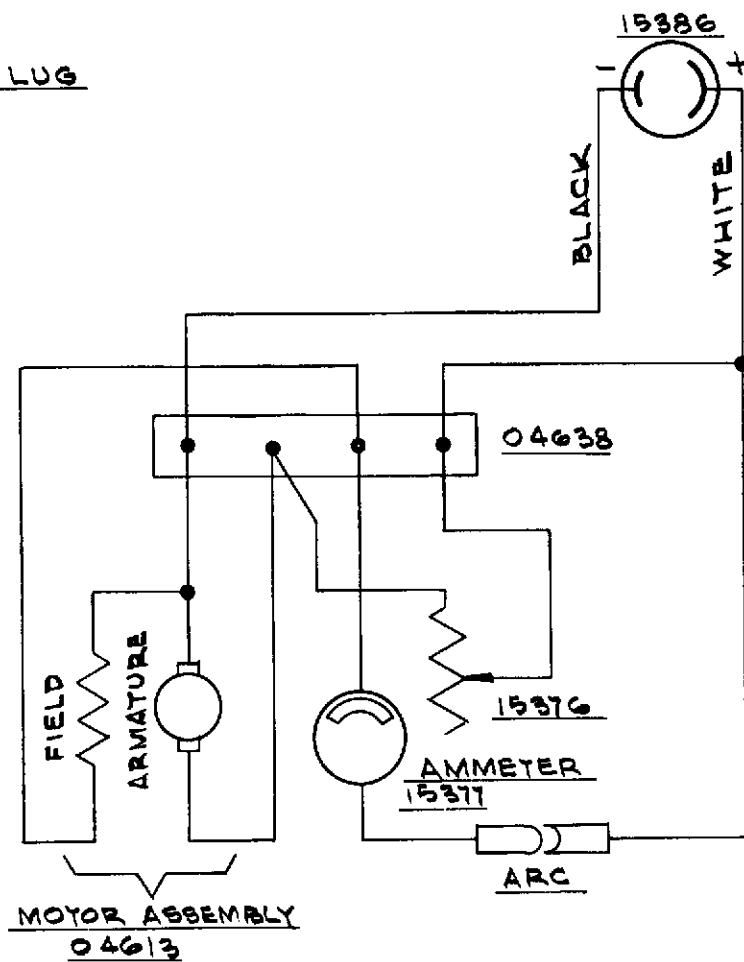
**F5**

PTACLE

3  
+



PILOT LIGHT &  
SWITCH CIRCUIT  
IN LAMPHOUSE

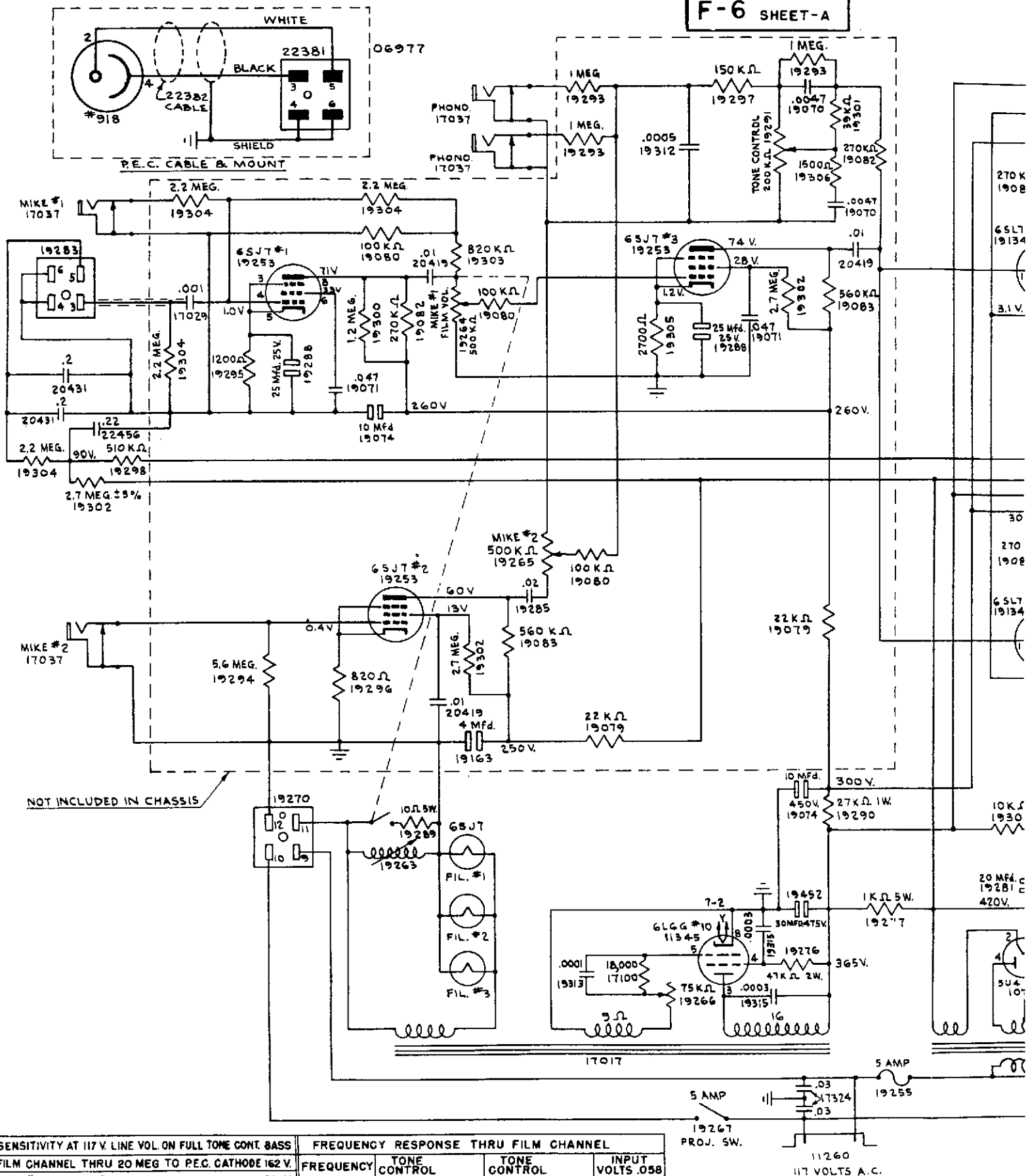


LAMP CIRCUIT

**SERVICE DATA**

WIRING DIAGRAM FILMOARC LAMP & RECTIFIER	
DESIGN 140 FILMOARC	MODEL R
DRAWN E.G.P. APVD.	DATE 4-21-48





SENSITIVITY AT 117 V. LINE VOL. ON FULL TONE CONT. BASS  
 FILM CHANNEL THRU 20 MEG TO P.E.C. CATHODE 162 V.  
 MIC. #1 DIRECT TO JACK .016 V.  
 MIC. #2 DIRECT TO JACK .004 V.  
 PHONO. DIRECT TO JACK 1.1 V.  
 MEASUREMENT MADE AT 1000  $\sim$  8  $\Omega$  RES. LOAD  
 OUTPUT VOLTAGE 13.8 V.  
 POWER OUTPUT AT 117 V. LINE 400  $\sim$  8  $\Omega$  LOAD  
 45 WATTS AT 5%

FREQUENCY RESPONSE THRU FILM CHANNEL				
FREQUENCY	TONE CONTROL	TONE CONTROL	INPUT VOLTS .058	
50	6.0	20.5		
100	3.5	18.0		
500	8.0	13.0		
1M	9.0	9.5		
3M	9.0	1.5		
5M	9.0	0		
7M	9.0	1.5		
10M	9.5	5.5		

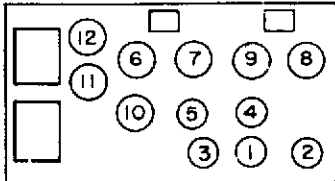
5 AMP 117V A.C.

WIRE COLOR CODE			
WHITE	GROUND	BLUE	P
YELLOW	CATHODE	BROWN	SC
RED	B +	BLACK	
GREEN	GRID	BLACK & WHITE	





COLOR CODE		
OUND	BLUE	PLATE
ODE	BROWN	SCREEN
B +	BLACK	AC
GRID	BLACK & WHITE	B-



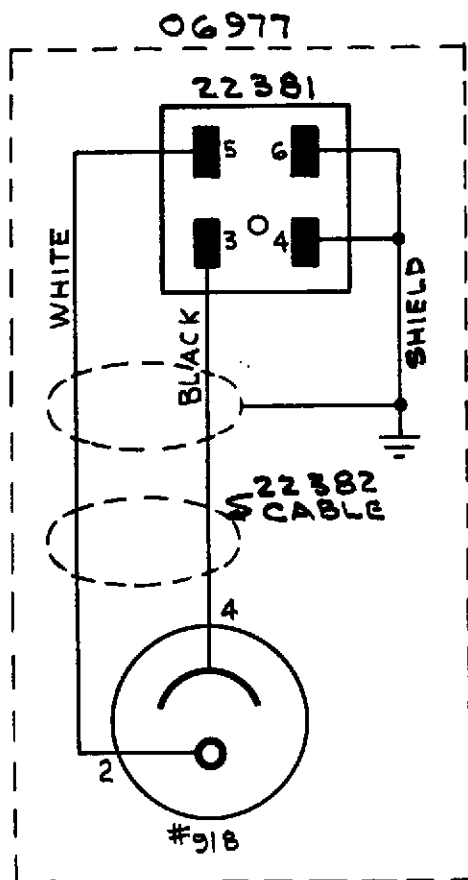
### TUBE LAYOUT

Bell & Howell Co. Chicago U.S.A.

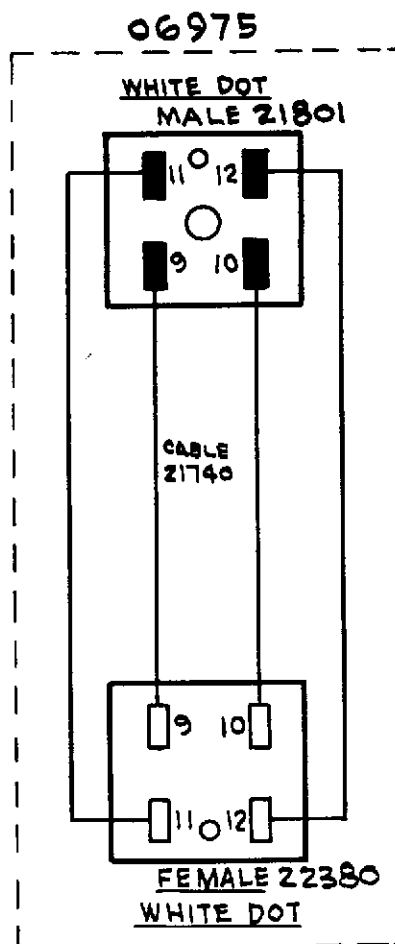
50W. AMPLIFIER WIRING DIAGRAM FOR  
DESIGNS 140 S,T,U (06529)

DATE 3-12-52	SERVICE DATA	DRAWN <i>ad</i> APVD. <i>L.L.</i>
--------------	--------------	--------------------------------------

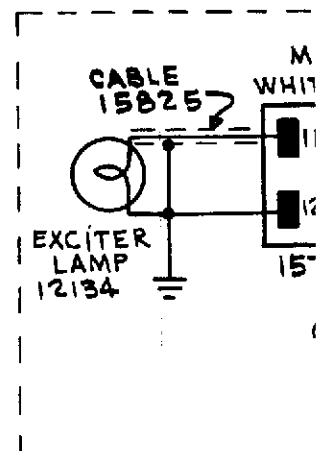
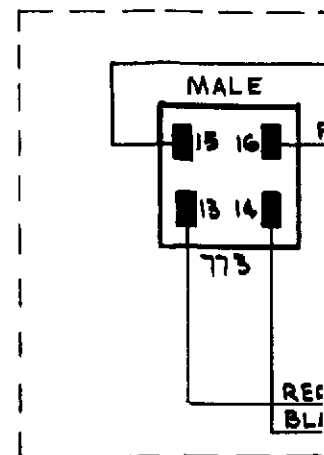




P.E.C. CABLE & MOUNT

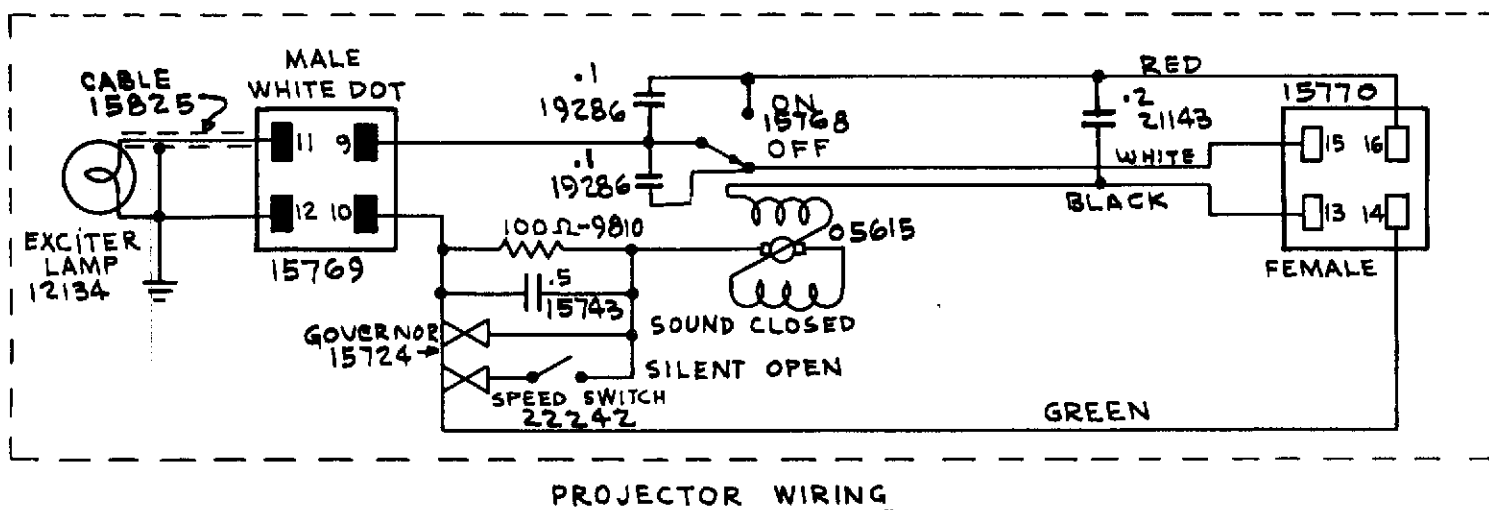
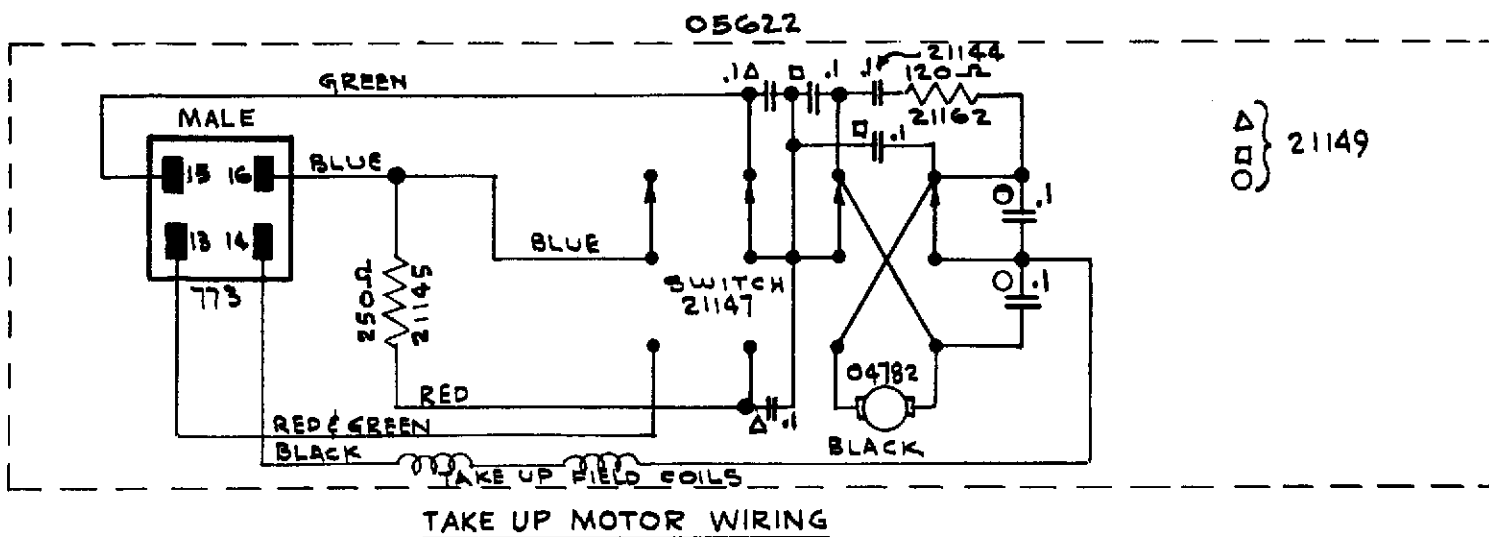


POWER CABLE TO PROJECTOR



PARTS ON THIS SHEET NOT INCLUDED IN AMPLIFIER CHASSIS







## SECTION G

DESIGN 142, MODEL AGENERAL INFORMATION.

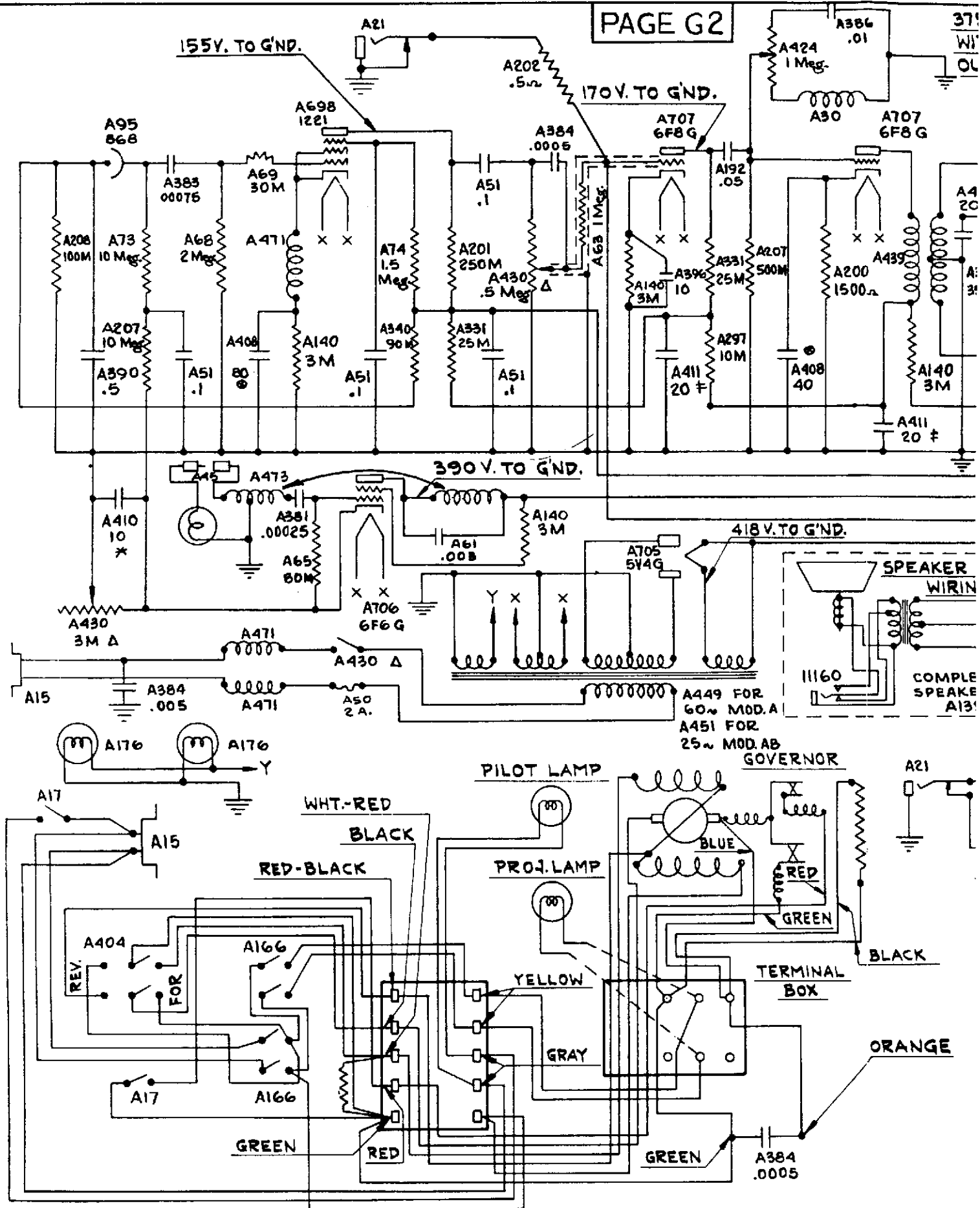
This amplifier used 6F6G tubes in the output. Note that the 6F8G tube is cascade operated, and not phase inverted. The power output is approximately 15 watts. Do not substitute metal for glass 6F6G tubes. Use only 2-ampere fuses.

If the exciter lamp life is short and if the line voltage is not over 117 volts, a change should be made in the oscillator tube wiring. The .003 MFD mica condenser, A-61, which tunes the oscillator is changed to a .001 MFD mica condenser, A604. The 3000-ohms screen resistor A140 is changed to a 5000-ohms, 1-watt resistor A293; the 1000-ohms resistor A368 is changed to a 5000-ohm, 1-watt resistor A293; and the 1000-ohm resistor A368 is changed to a 4000-ohm, 10-watt resistor A373. Resistor A368 is usually found mounted on the oscillator coil terminal on the end plates. Lay resistor A-293 against the oscillator tube socket terminals and connect it to terminals 4 and 6. Resistor A604 is then laid beside resistor A-293 and is connected to terminals 3 & 6.

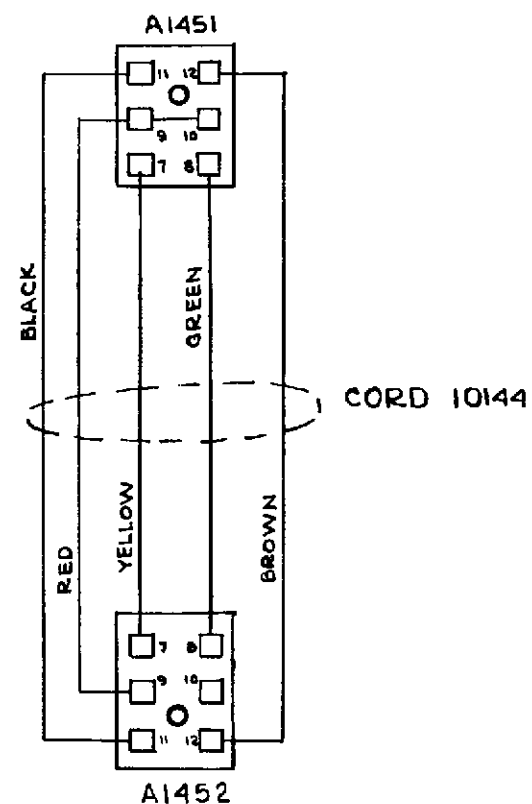
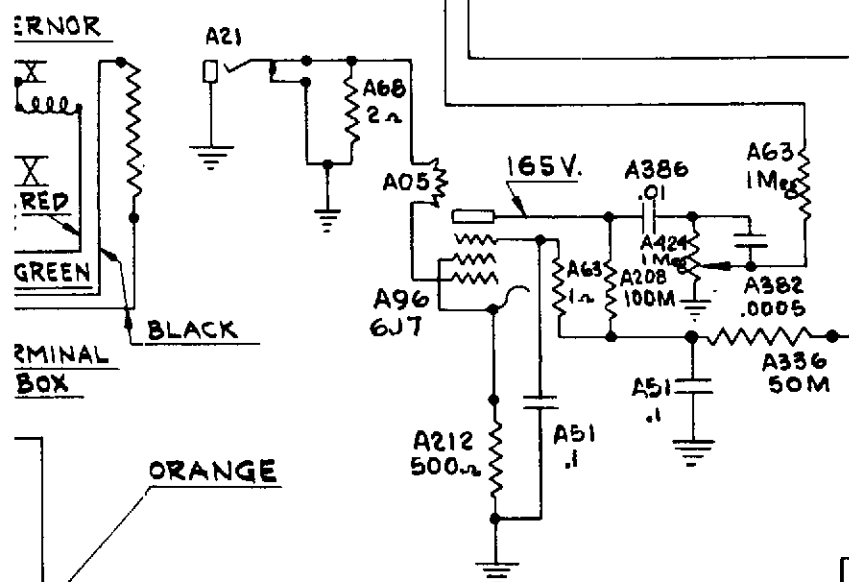
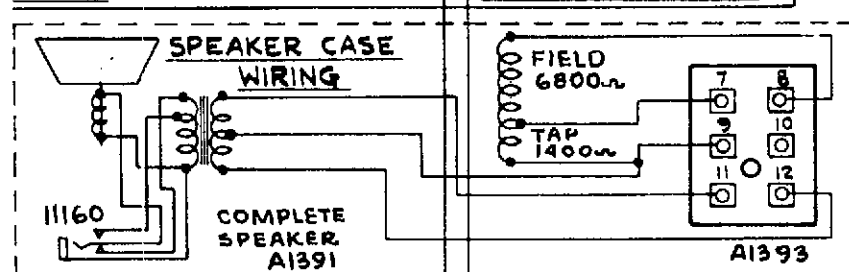
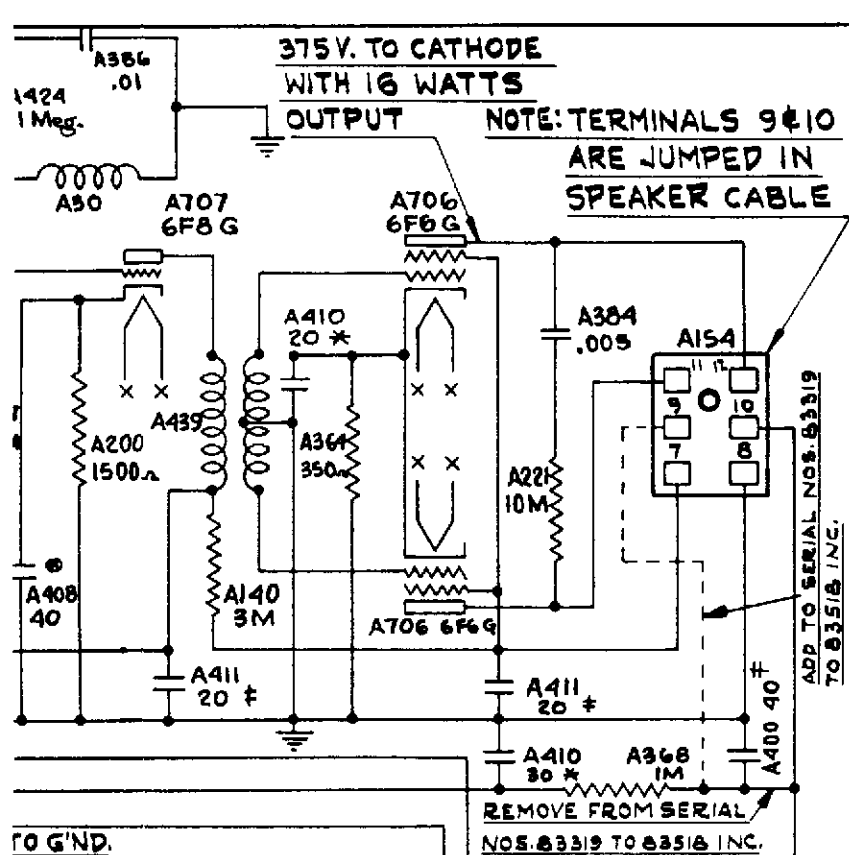
In cases of high line voltage and where the rectifier tube arcs over and results in fuse blowing, a 150-ohm, 10-watt resistor can be connected in series with the output of the rectifier. Be sure it is connected between the rectifier and first filter condenser. A convenient location for the resistor is in back of the speaker receptacle.

All speaker cables do not have terminals 9 and 10 strapped together in the male plugs. Be sure to do this.





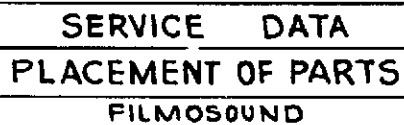




\* ♂ ♀ Δ DENOTE COMPONENTS  
OF SAME UNIT

SERVICE DATA	
WIRING DIAGRAM	
FILMOSOUND	
DESIGN 142	MODEL A
FOR USE ONLY WITH	DATE 1-2-46
PART NO	





MODEL A  
DATE 1-3-46



GENERAL INFORMATION.

This amplifier as well as the Model C and D amplifiers differs from all other Filmosound amplifiers in that two of the tubes have their filaments energized by some of the current flowing in the 6L6 output tubes bias circuit. Consequently, if one of the output tubes is bad it will upset the entire circuit.

The fuse used is a 3-ampere, type 3AG.

The 142B & BB (25-cycle) amplifiers were made in two series. The difference was in the tone control circuit.

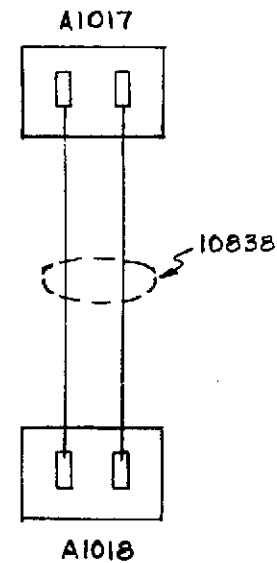
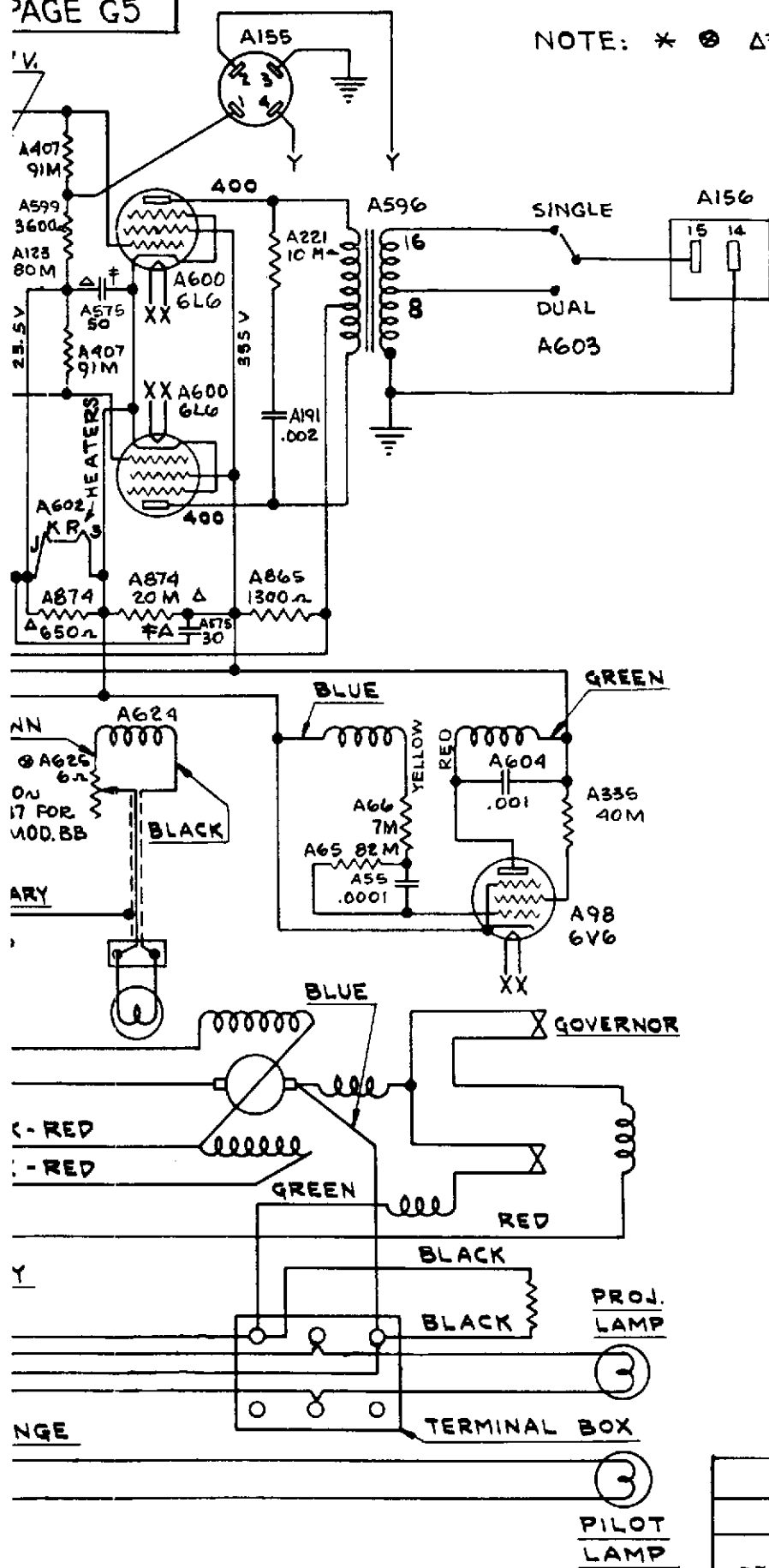
The power output is 25 watts.



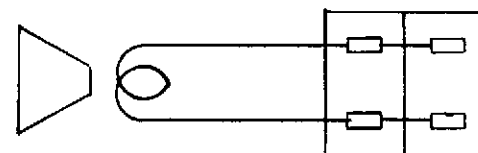




NOTE: \* ⊗ Δ ‡ Δ ∅ DENOTE COMPONENTS OF SAME UNIT

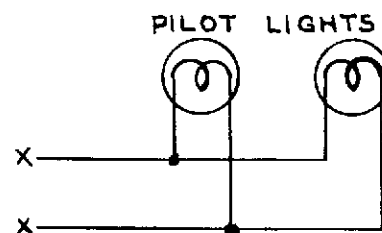


SPEAKER CORD COMPLETE 02937



SPEAKER A1392

A994



PILOT LIGHTS

# SERVICE DATA

## WIRING DIAGRAM

FILMOSOUND

DESIGN 142

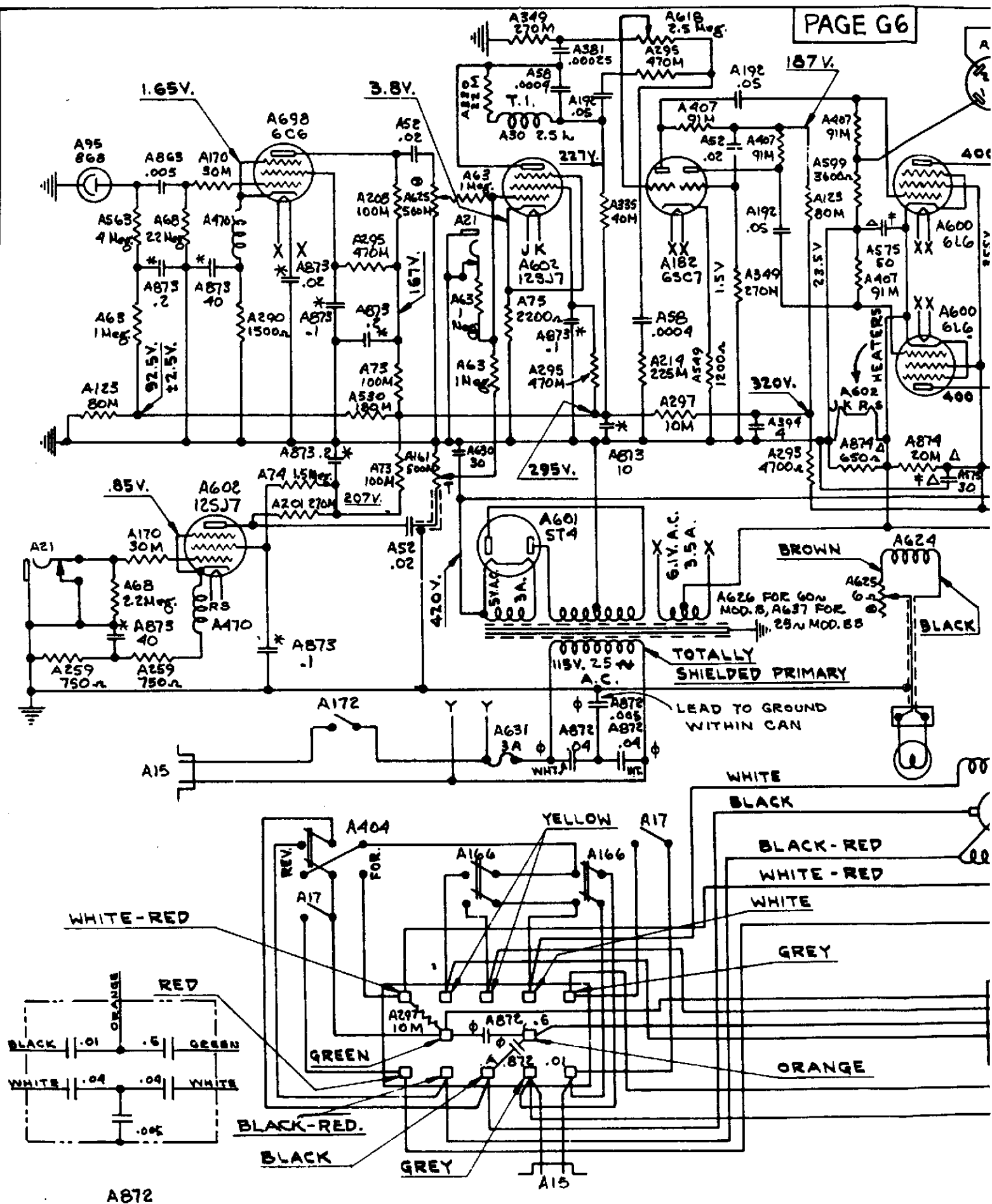
MODEL B

FOR USE WITH AMPLIFIER \*03304

DATE: 1-4-46

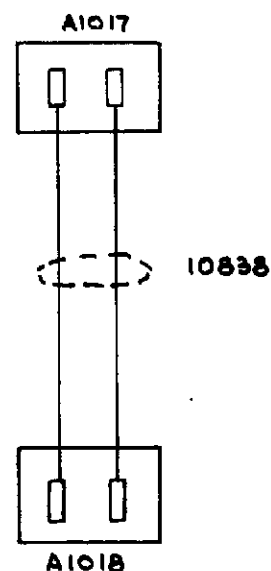
SERIAL NO'S 88521 TO 88670 INCL.



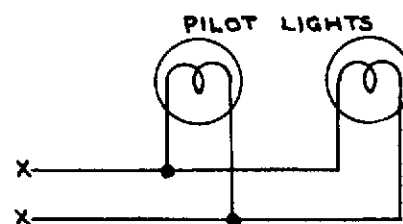
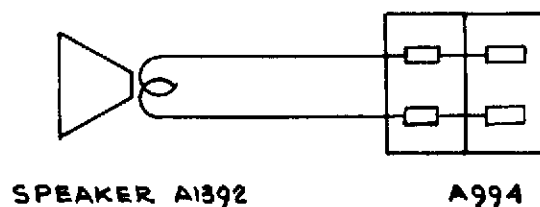




NOTE: \* @ Δ Δ† Φ DENOTE COMPONENTS  
OF SAME UNIT.

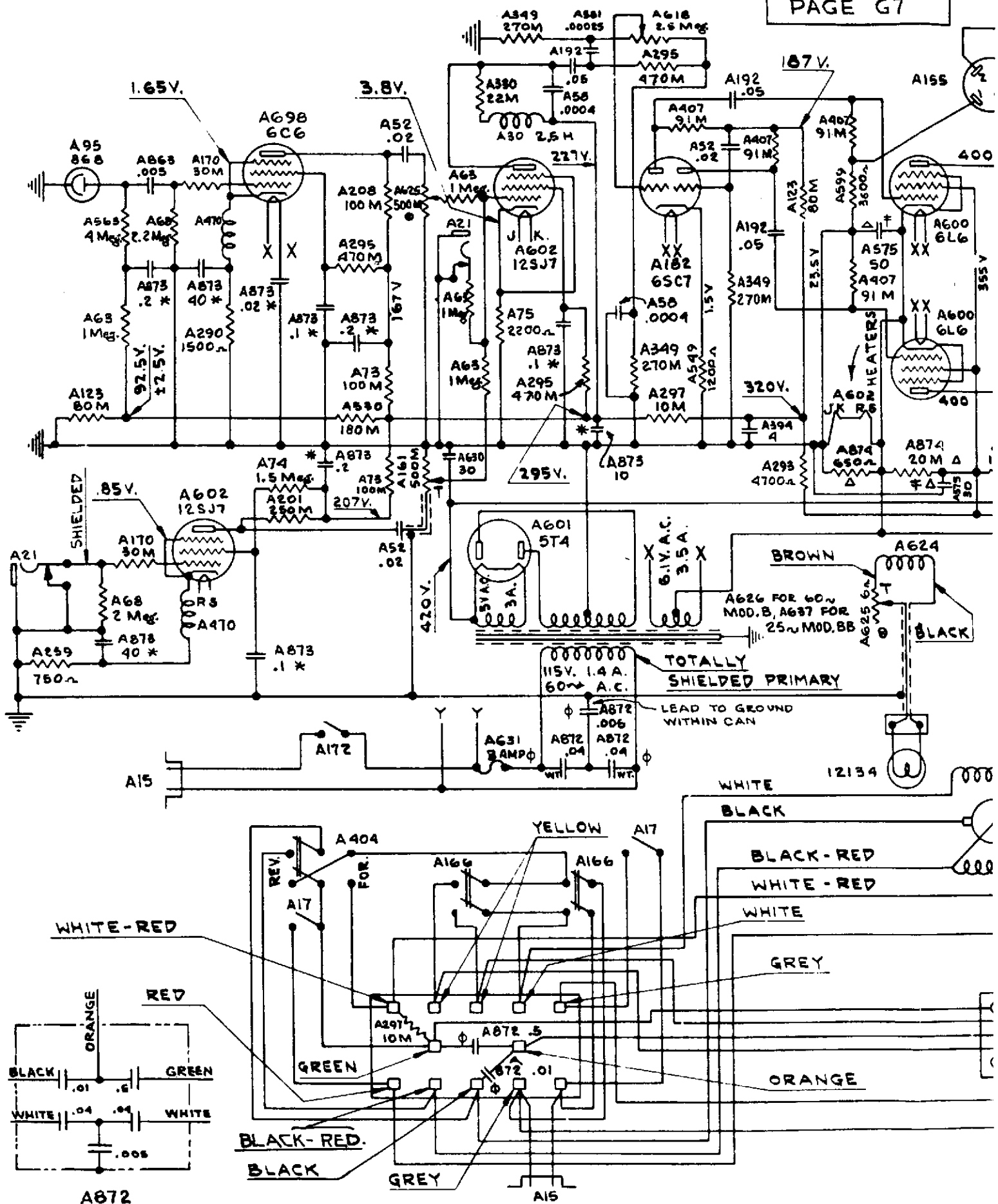


SPEAKER CORD COMPLETE 02937



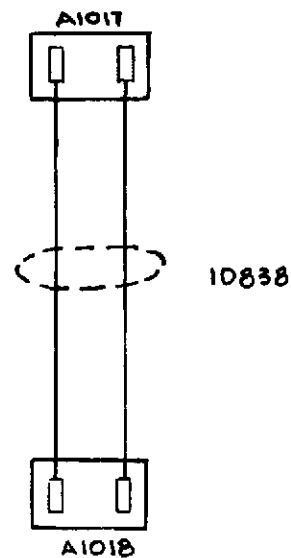
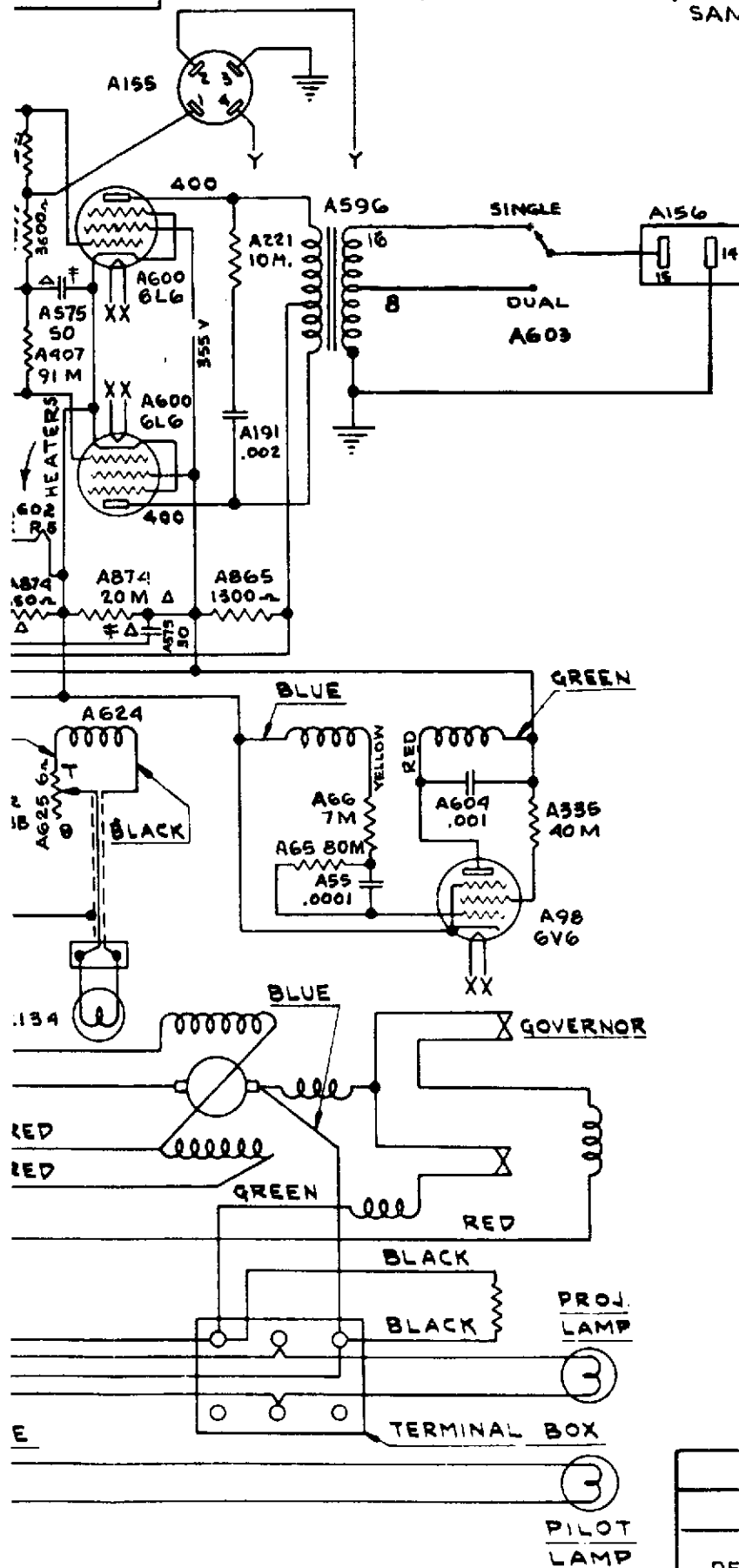
SERVICE DATA	
WIRING DIAGRAM	
FILMOSOUND	
DESIGN 142-25~	MODEL 55
FOR USE WITH AMPLIFIER #03312	DATE: 1-4-46
SERIAL NO'S 88671-88770 INCL.	



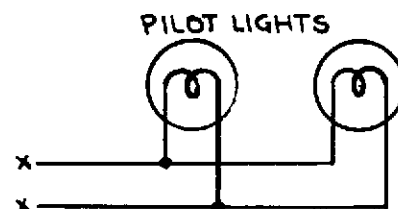
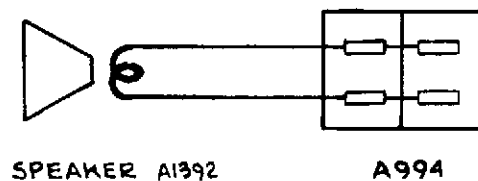




NOTE: \* @ Δ ≠ Δ φ DENOTE COMPONENTS OF SAME UNIT.

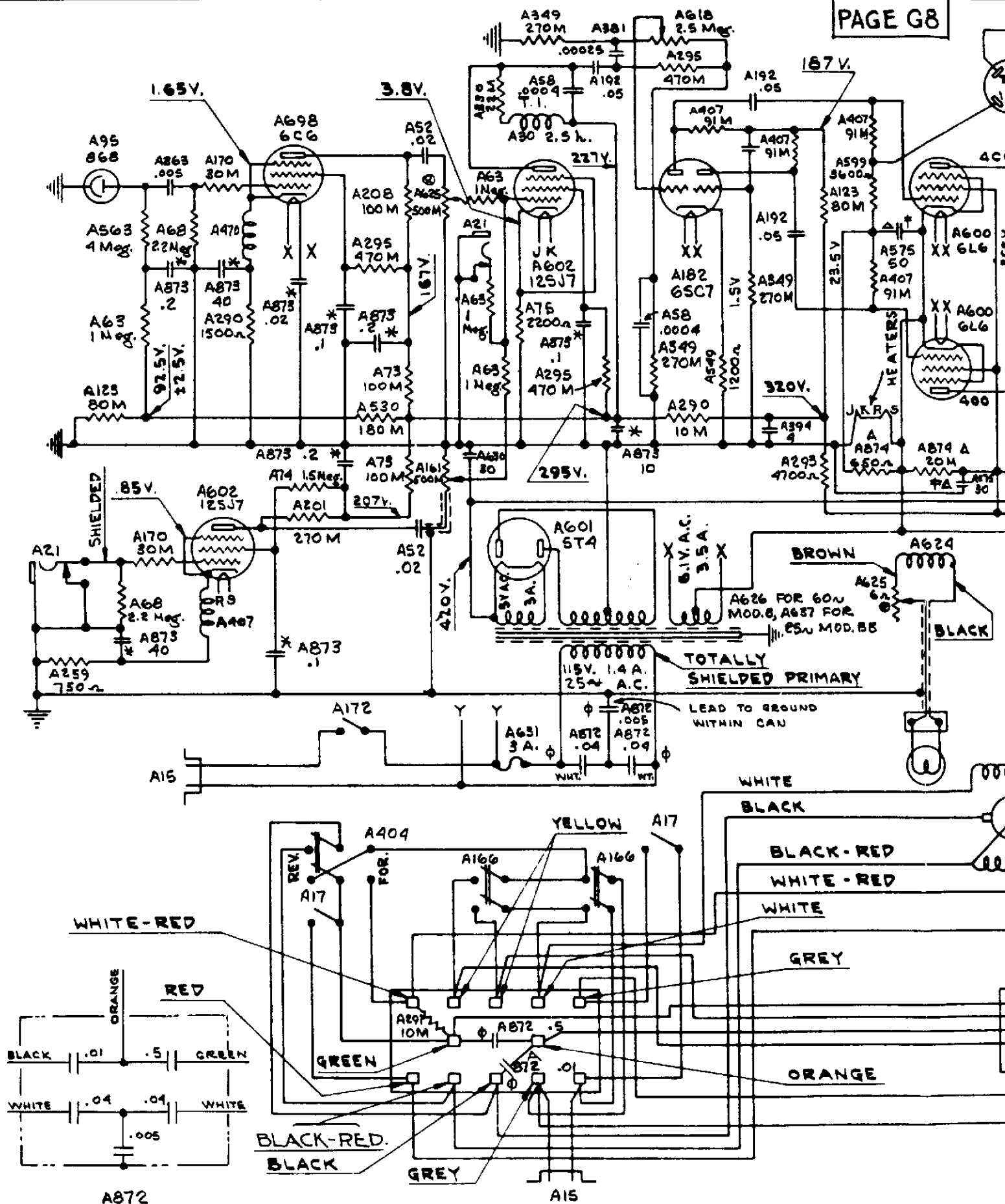


SPEAKER CORD COMPLETE 02937

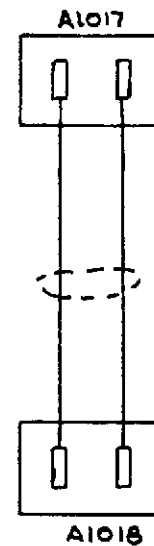
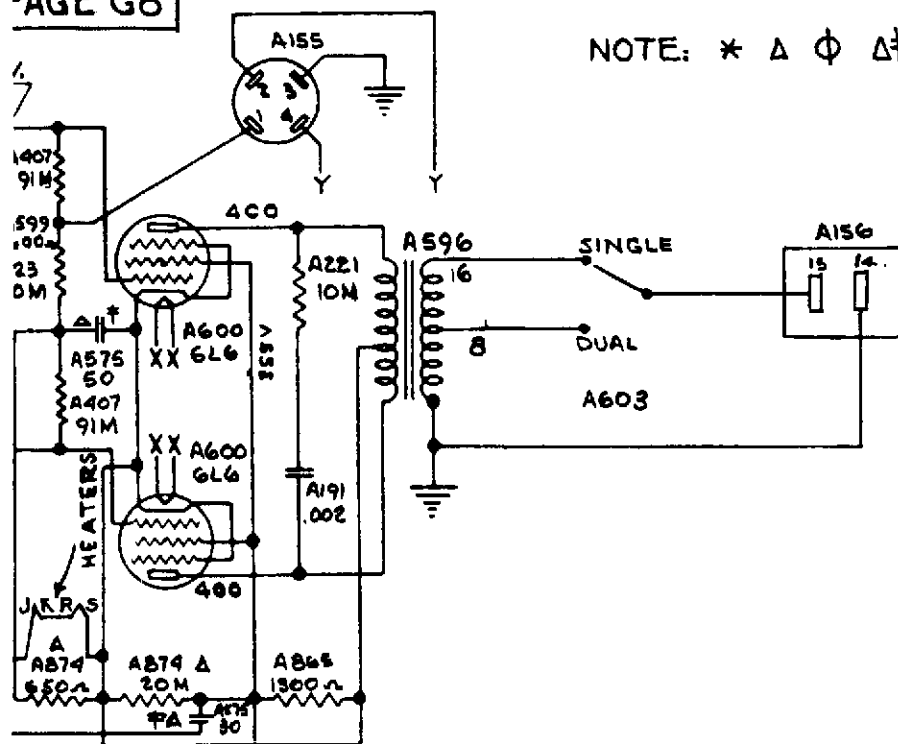


SERVICE DATA	
WIRING DIAGRAM	
FILMOSOUND	
DESIGN 142	MODEL B
FOR USE WITH AMPLIFIER *03304	DATE: 1-4-46
SERIAL NO'S 90427-90651, 93711-93960 INCL.	



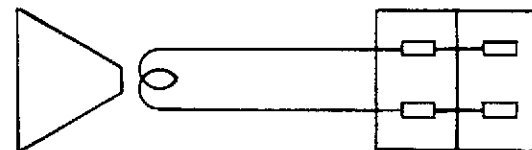
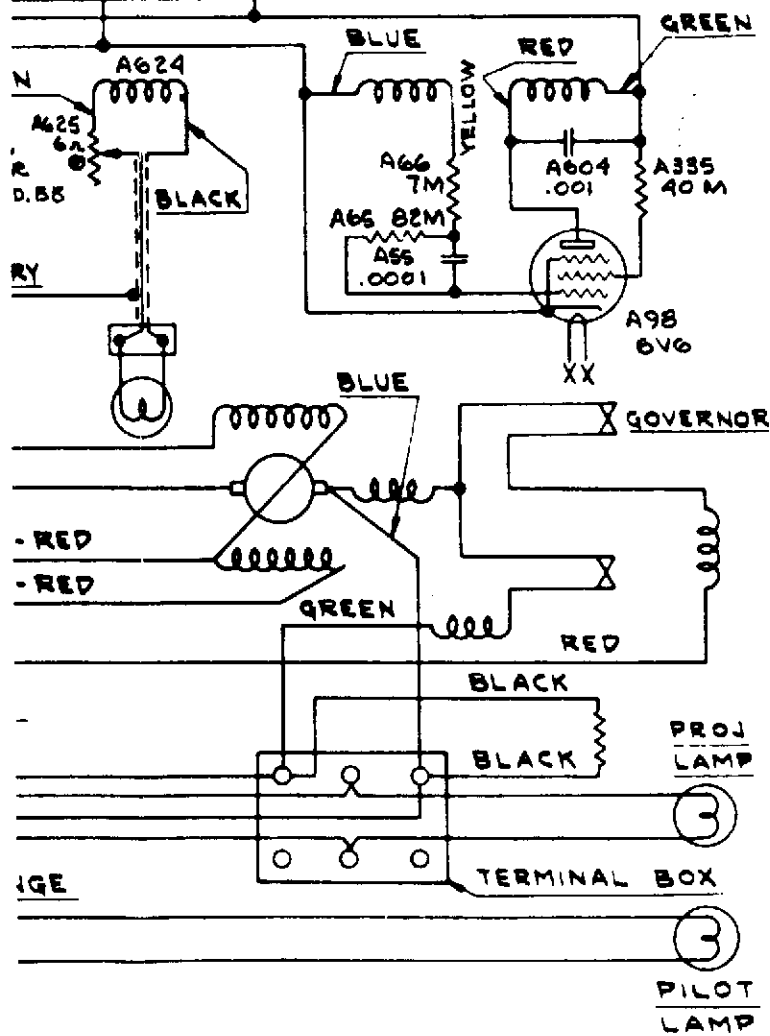






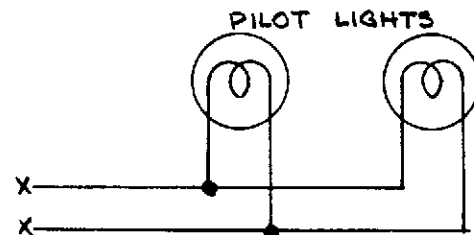
10838

SPEAKER CORD COMPLETE 02937



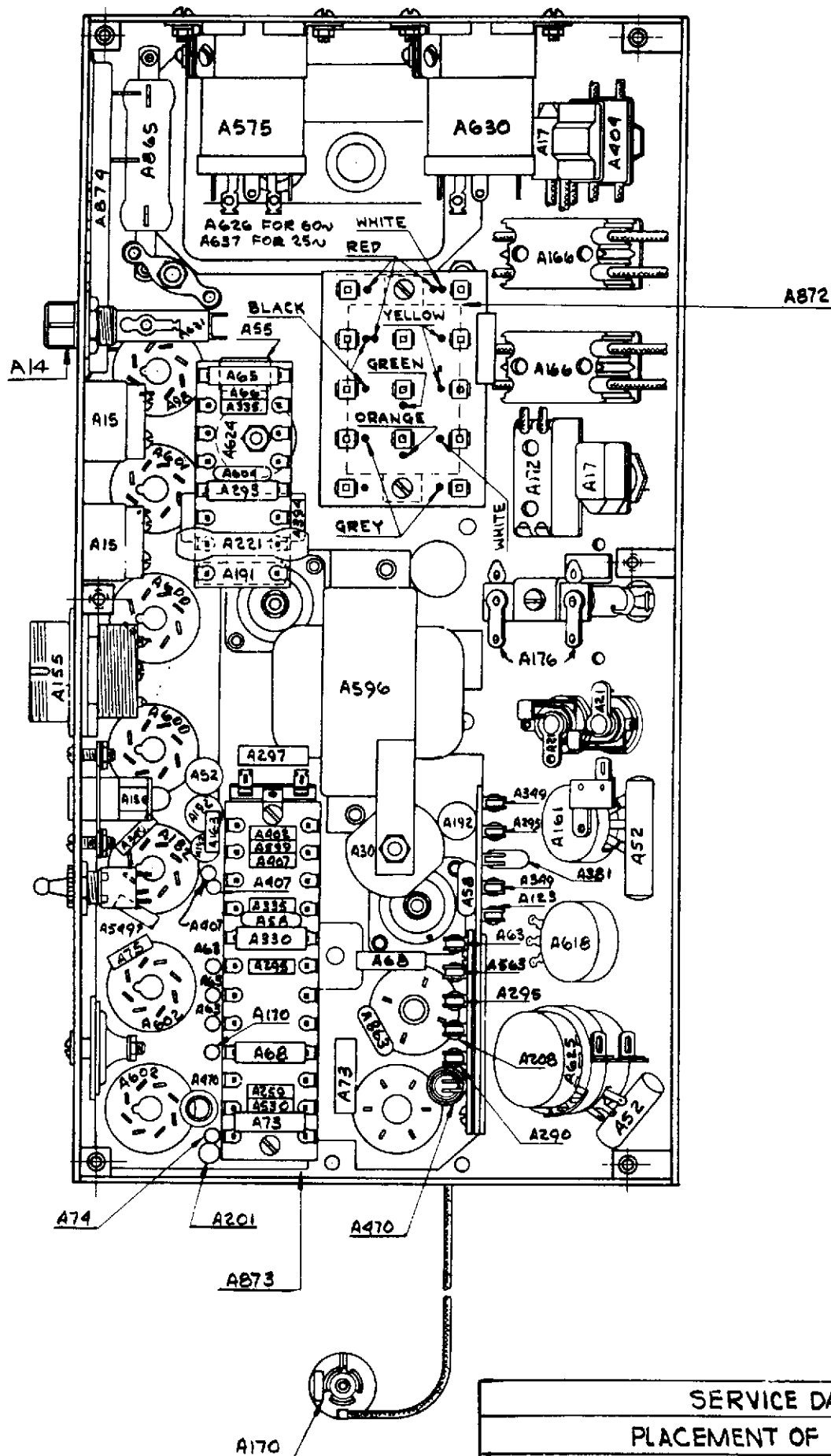
SPEAKER A1392

A994



SERVICE DATA	
WIRING DIAGRAM	
FILMOSOUND	
DESIGN 142	MODEL 88
FOR USE WITH AMPLIFIER #03312	DATE: 1-5-46
SERIAL NO. 90662 - 90676 INCL.	





SERVICE DATA	
PLACEMENT OF PARTS	
FILMOSOUND	
DESIGN 142	MODEL B
FOR USE ONLY WITH	DATE: 1-5-46
PART NO.	



DESIGN 142, MODEL C

GENERAL INFORMATION.

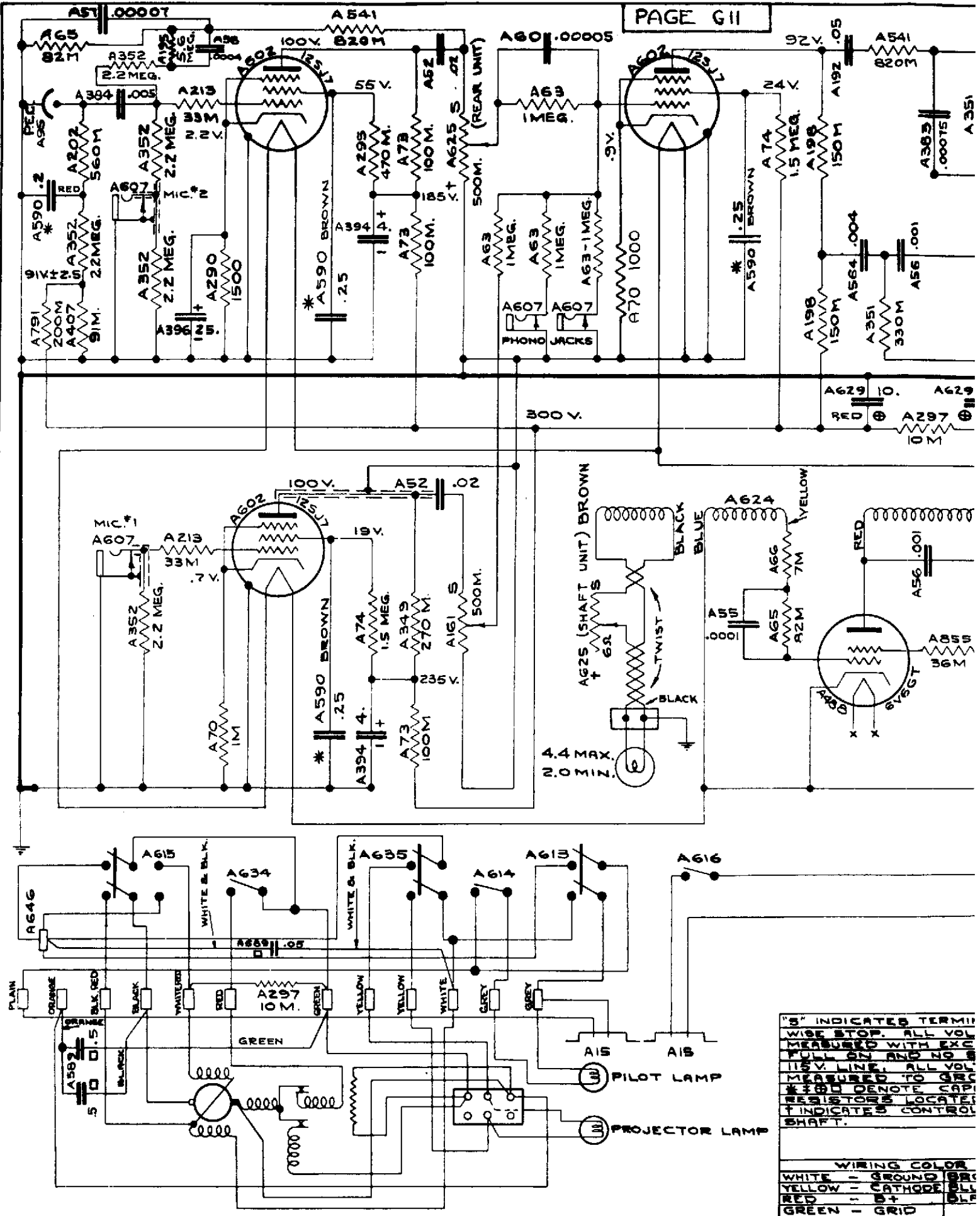
Amplifiers beginning with serial number 100901 do not have provisions for connecting a booster amplifier.

The three 12-volt tube filaments are series operated from the 6L6 tubes' cathode circuit.

The fuse used is a 3-ampere, type 3AG.

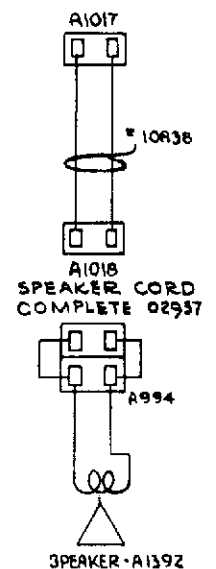
The power output is 25 watts.





"S" INDICATED TERMINAL WISE STOP. ALL VOL. MEASURED WITH EXC. FULL ON AND NO S. 115V. LINE. ALL VOL. MEASURED TO GRC. \*750 DENOTE CAP. RESISTORS LOCATED INDICATES CONTROL SHAFT.





AS 6

DATE  
6-14-40

WIRING COLOR CODE	
F - GROUND	BROWN - SCREEN
W - CATHODE	BLUE - PLATE
- B+	BLACK - HEATER
N - GRID	



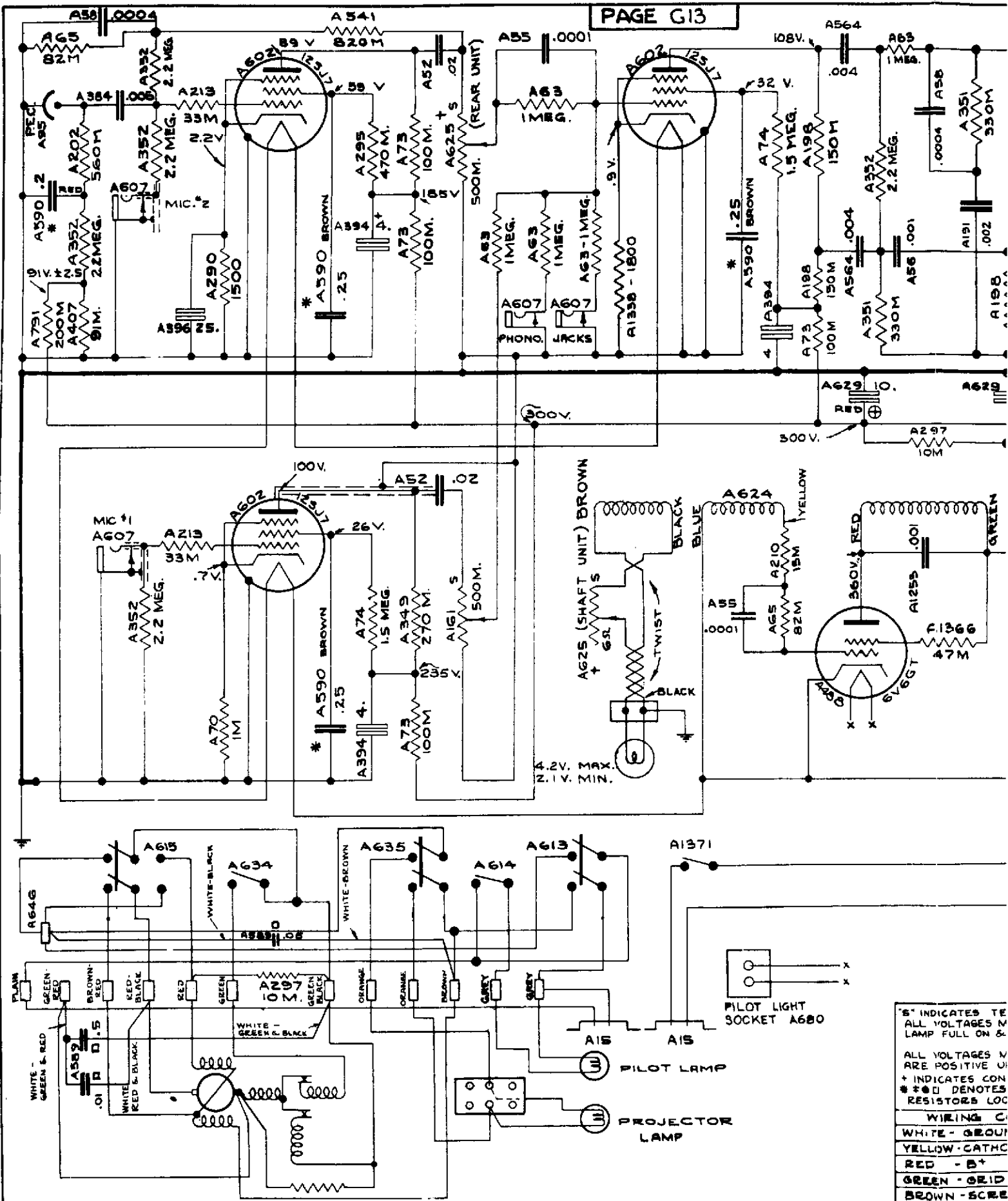






SERVICE DATA	
AMPLIFIER WIRING DIAGRAM	
MASTER 142 CB 25 CYCLE FILMOSOUND	
FOR USE ONLY WITH AMPLIFIER PART NO. 12219	DATE 8-7-40





"S" INDICATES TE  
 ALL VOLTAGES M  
 LAMP FULL ON &  
 ALL VOLTAGES M  
 ARE POSITIVE U  
 + INDICATES CON  
 \* 000 DENOTES  
 RESISTORS LOC  
 WIRING C  
 WHITE - GROUND  
 YELLOW - CATHC  
 RED - B+  
 GREEN - GRID  
 BROWN - SCRE

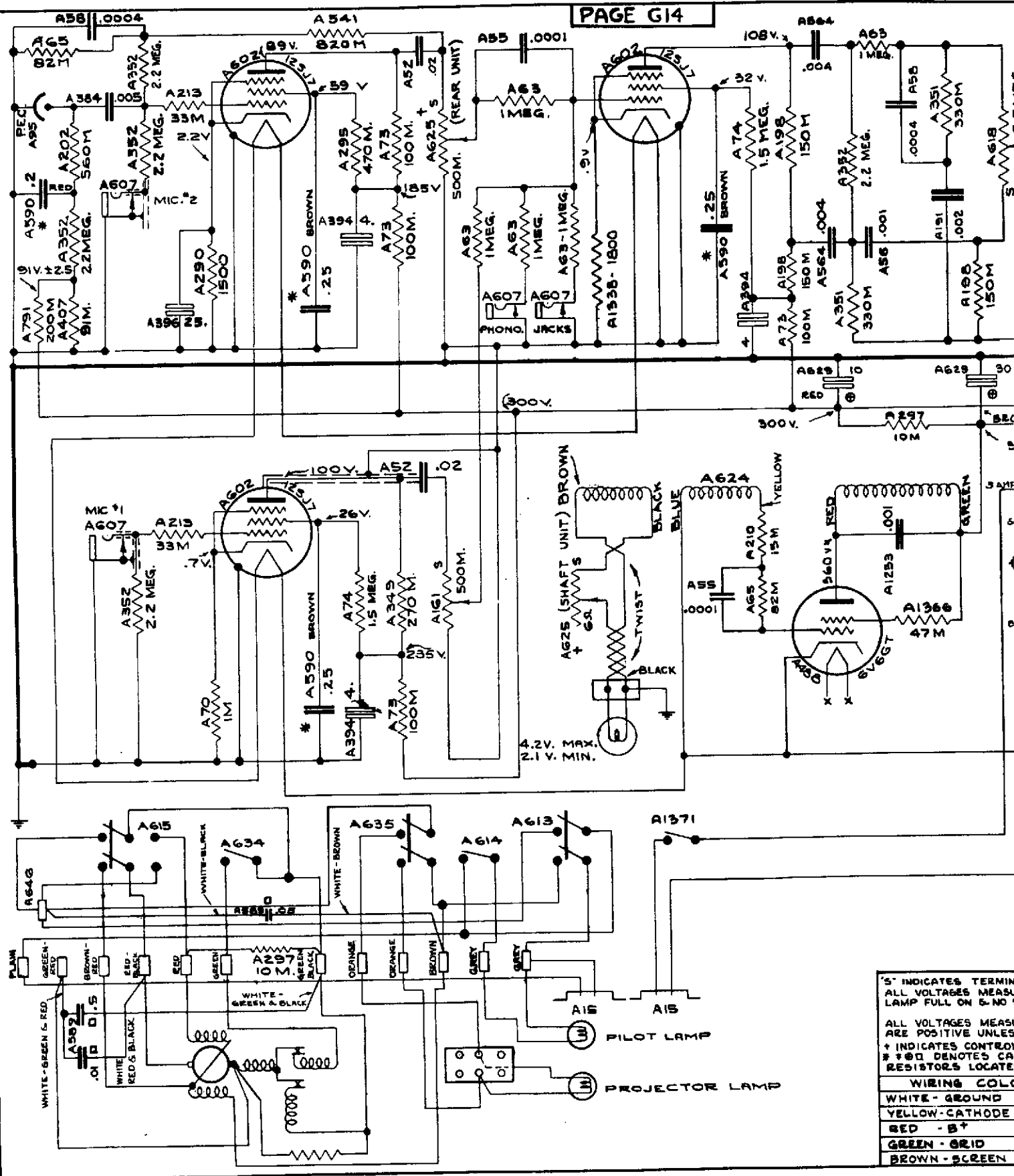




WIRING COLOR CODE	
WHITE - GROUND	BLUE - PLATE
YELLOW - CATHODE	BLACK - HEATER
RED - B+	
GREEN - GRID	
BROWN - SCREEN	

DATE  
6-4-41





'S' INDICATES TERMIN  
ALL VOLTAGES MEASU  
LAMP FULL ON & NO 5

ALL VOLTAGES MEASD  
ARE POSITIVE UNLES  
+ INDICATES CONTROL  
\* #00 DENOTES CAI  
RESISTORS LOCATED

WIRING COLC
-------------

**WHITE - GROUND**

YELLOW-CATHODE

RED - BY  
GREEN - GRID

BROWN - SCREEN







DESIGN 156, ALL MODELS

GENERAL INFORMATION.

Amplifiers part #12814, 12815, 13728, and 13817 use an electrodynamic speaker. The field consists of two windings. The 19000-ohm winding is across the B Power supply and the 4000-ohm winding feeds the oscillator. Should the latter winding short out it will cause excessive exciter lamp voltage. Should the 19000-ohm winding open up the field will not be properly energized, causing the volume to be low.

While the base pins and connection are alike, the 5Z4 and 5Y3GT rectifiers are not interchangeable in these amplifiers. Use the one indicated on the drawing.

All projectors using these amplifiers are equipped with a remote volume control jack. The control consists of a series rheostat connected into the exciter lamp circuit. The plug and jack are undersized phone type so that a microphone may not be accidentally connected to the circuit.

The special A. C. receptacle on the amplifiers is for connecting a polarity changer to a lower voltage tap on the power transformer in addition to making the regular line connection to the amplifier transformer.

Amplifiers part #12814, 12815, 13728 have two input circuits in addition to film. The microphone input has a volume control while the phonograph input does not.

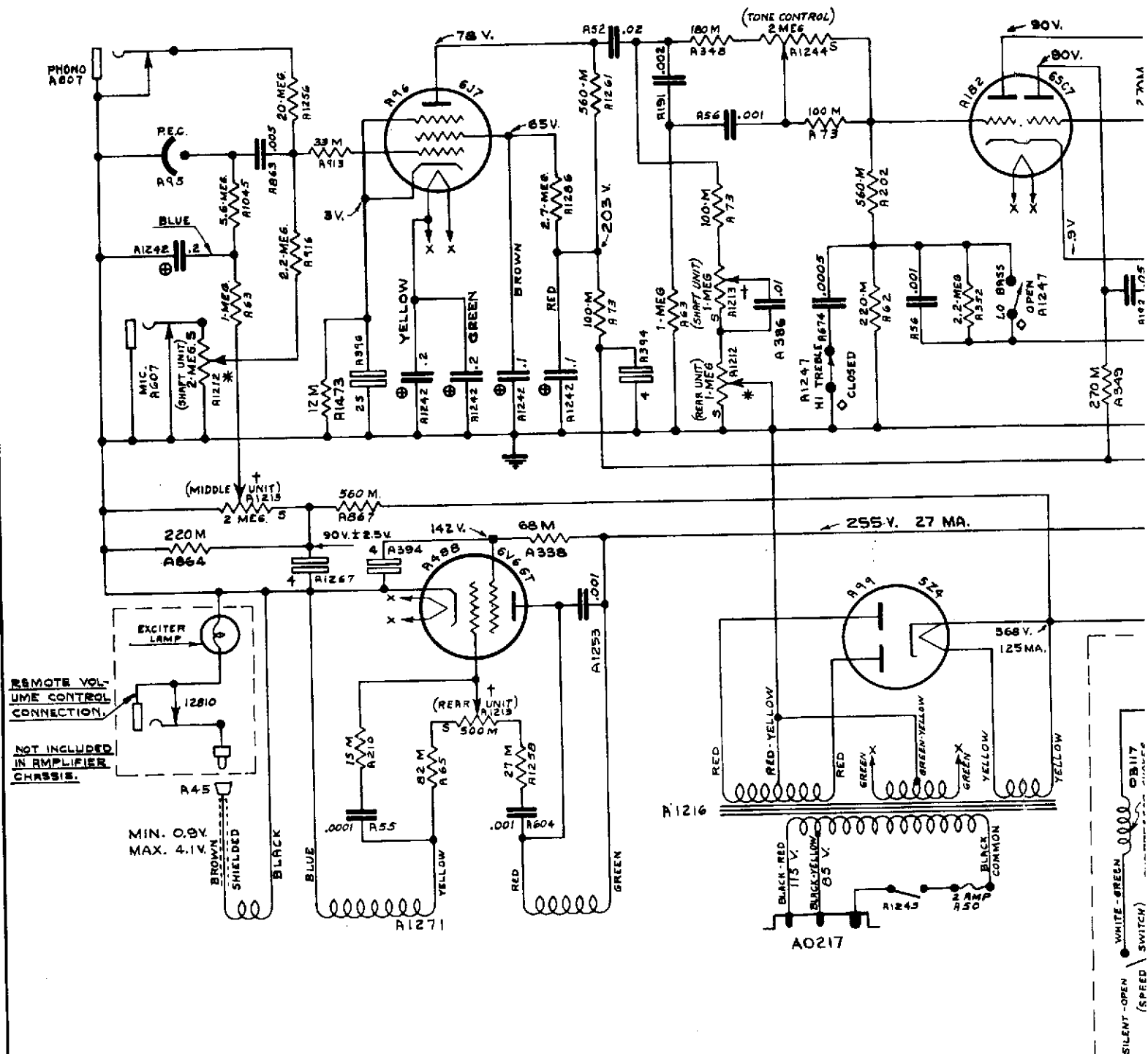
All Design 156 amplifiers deliver 12 watts of power.



DESIGN 156, AMPLIFIER NO. 12814

Two series of these amplifiers were manufactured. The difference was in the tone control circuits. The first series used one variable control and two switches. These switches shifted the frequency characteristics of the variable control circuit. The second series had two separate variable controls.





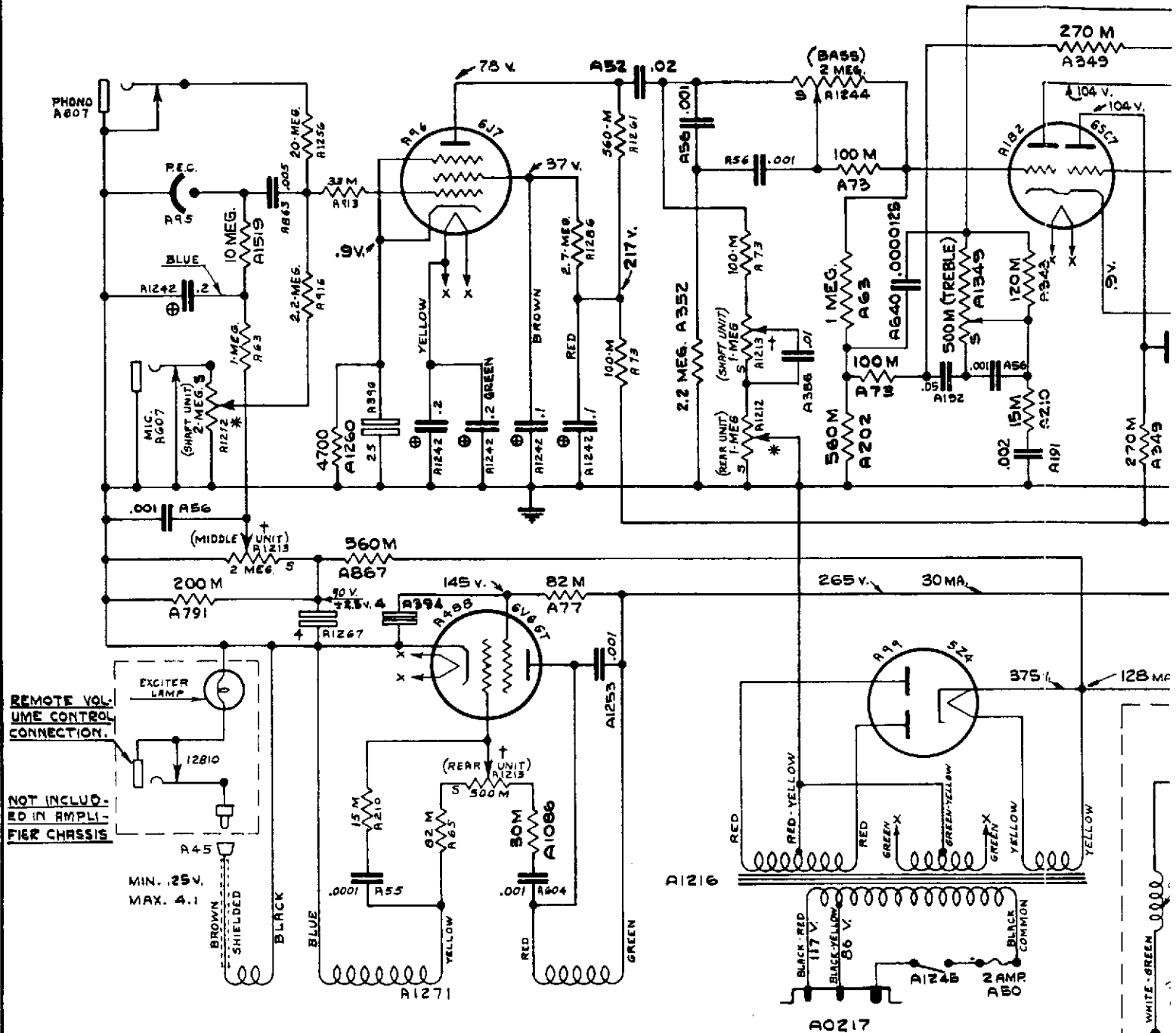
5. INDICATES TERMINAL AT CLOCKWISE STOP.  
ALL VOLTAGES MEASURED WITH EXCITER  
LAMP FULL ON AND NO SIGNAL AT  
115 VOLT LINE. ALL VOLTAGES MEASURED  
TO GROUND.  
⊙ INDICATES CAPACITORS LOCATED IN  
BANK.  
+ INDICATES CONTROLS ON SAME  
SHAFT.  
◊ SWITCHES SHOWN WITH SLIDE BUTTONS  
IN DOWN POSITION.

WIRING COLOR CODE			
WHITE	GROUND	BROWN	SCREEN
YELLOW	CATHODE	BLUE	PLATE
RED	B+	BLACK	HEATER
GREEN	GRID		









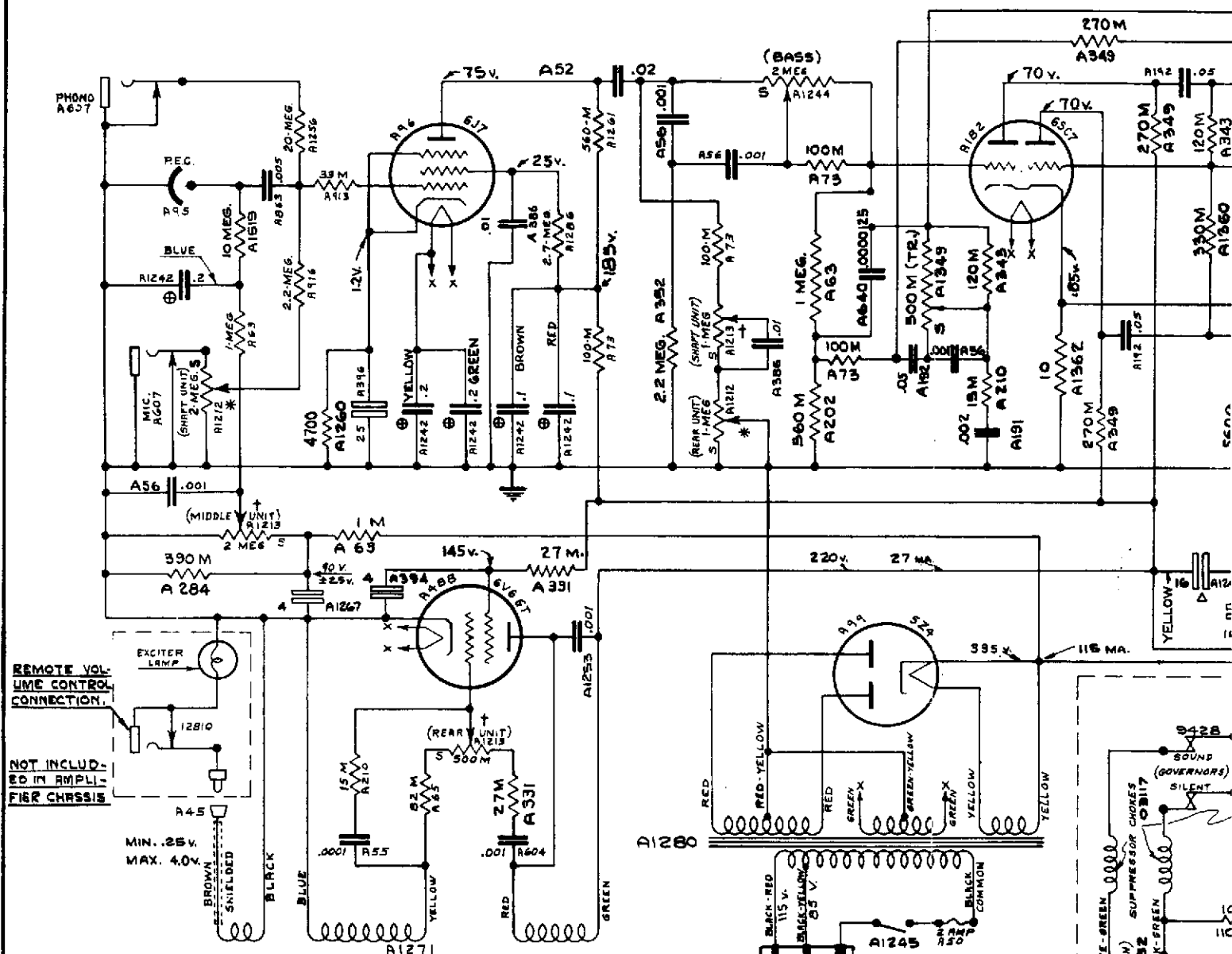
\* - INDICATES TERMINAL AT CLOCKWISE STOP.  
 ALL VOLTAGES MEASURED WITH EXCITED  
 LAMP FULL ON AND NO SIGNAL AT 117  
 VOLT LINE. ALL VOLTAGES MEASURED  
 TO GROUND.  
 @ - INDICATES CAPACITORS LOCATED  
 IN BANK.  
 - - - - - INDICATES CONTROLS ON SAME  
 SHUNT.

WIRING COLOR CODE			
WHITE	GROUND	BROWN	SCREEN
YELLOW	CATHODE	BLUE	PLATE
RED	B+	BLACK	HEATER
GREEN	GRID		









REMOTE VOL-  
UME CONTROL  
CONNECTION.

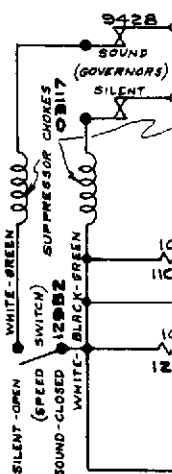
NOT INCLUD-  
ED IN AMPLI-  
FIER CHRSSIS

MIN. .25 V.  
MAX. 4.0 V.

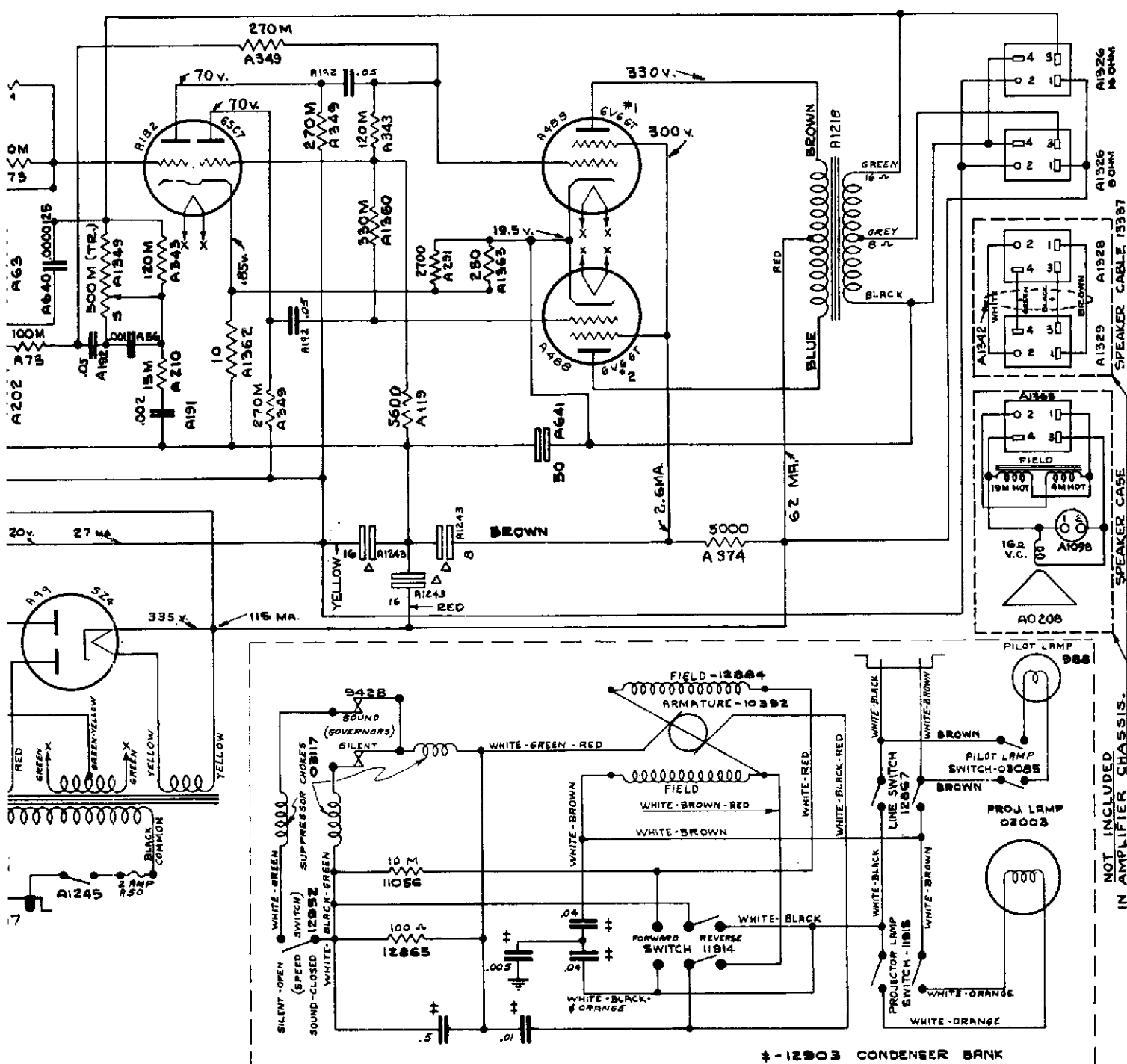
'S' INDICATES TERMINAL AT CLOCKWISE STOP.  
ALL VOLTAGES MEASURED WITH RECTIFIER  
LAMP FULL ON AND NO SIGNAL AT 115  
VOLT LINE. ALL VOLTAGES MEASURED  
TO GROUND.  
CA-INDICATES CAPACITORS LOCATED  
IN BANK.  
+ - INDICATES CONTROLS ON SAME  
SHRPT.

# WIRING COLOR CODE

WHITE — GROUND	BROWN — SCREEN
YELLOW — CATHODE	BLUE — PLATE
RED — B+	BLACK — HEATER
GREEN — GRID	







PROJECTOR WIRING DIAGRAM (156 UTILITY)  
NOT INCLUDED IN AMPLIFIER CHASSIS

AS44

# SERVICE DATA

## AMPLIFIER WIRING DIAGRAM

UTILITY, ACADEMY, & COMMERCIAL  
DESIGN 156 FILMOSOUND - 25 CYCLE

FOR USE ONLY WITH  
AMPLIFIER PART NO. 12815

DATE  
3-6-42

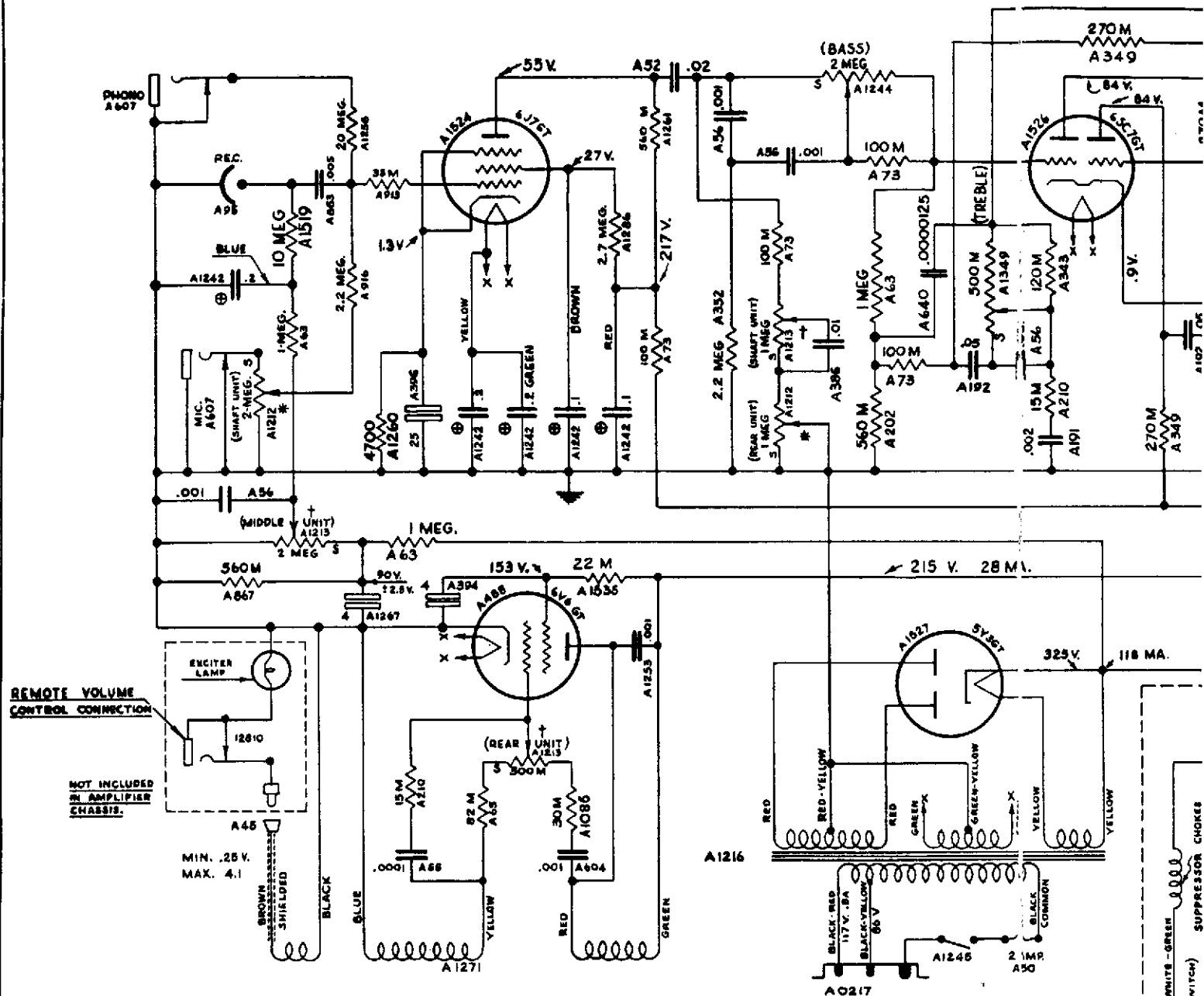


DESIGN 156, AMPLIFIER NO. 13728

This amplifier is very similar to the 12814.

It uses a 5Y3 GT rectifier and the voltages are correspondingly lower on many of the tube elements. Glass-type tubes are used throughout but the equivalent metal type may be substituted.



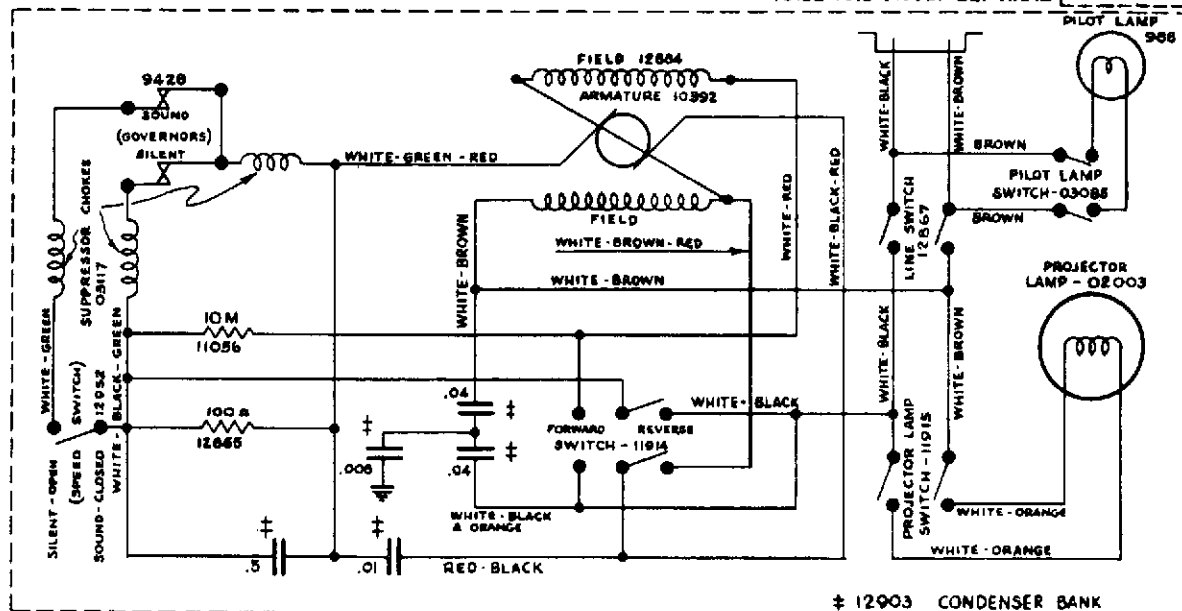


\*S'-INDICATES TERMINAL AT CLOCK/USE STOP.  
ALL VOLTAGES MEASURED WITH EXCITER LAMP  
FULL ON AND NO SIGNAL AT I17 VC.T LINE.  
ALL VOLTAGES MEASURED TO GROUND.  
●Δ-INDICATES CAPACITORS LOCATED IN BANK.  
+\* INDICATES CONTROLS ON SAME SHAFT.  
6V6GT #1 IS TUBE LOCATED BETWEEN  
6V6GT #2 AND 63C7.  
6V6GT #2 IS TUBE LOCATED AT REAR OF CHASSIS.

WIRING COLOR CODE	
WHITE — GROUND	BROWN — SCREEN
YELLOW — CATHODE	BLUE — PLATE
RED — B+	BLACK — HEATER
GREEN — GRID	



DATE  
9-22-42





DESIGN 156, AMPLIFIER NO. 13817

This amplifier is used in all Model 156-V Filmosounds.

The circuits are considerably different from the preceding amplifiers of this design. Note that the gain control is in the second tube grid circuit. There is but one external input. Do not confuse jack A1546, which is a jack switch located within the amplifier, with an input jack. It is operated by means of an insulated rod A1549 when a microphone or phonograph is plugged into the input jack A1543. The purpose of the switch jack is to short out the exciter lamp. Contacts are normally open.

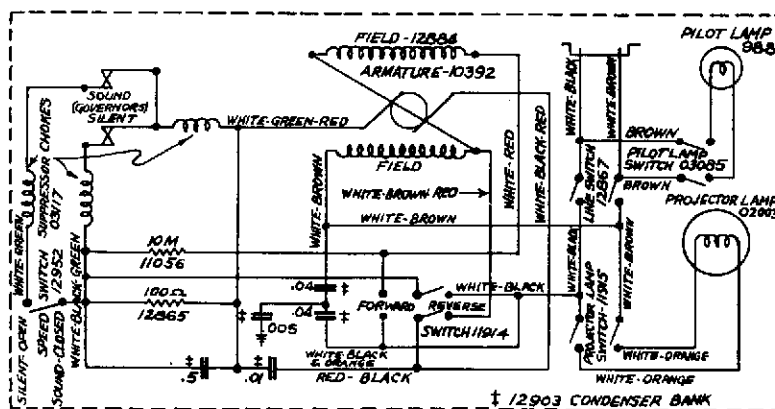
There is no control on the exciter lamp or P.E. voltage.

In cases of poor tone quality and instability, check choke, part number A1559. Part has the appearance of a metal-encased fixed condenser.

In the event that this amplifier lies idle for indefinite periods or is used under high humidity conditions, the photocell and associated circuits should be rewired as per amplifier, part number 14027, revised page H-16. See General Service Bulletin F-20.

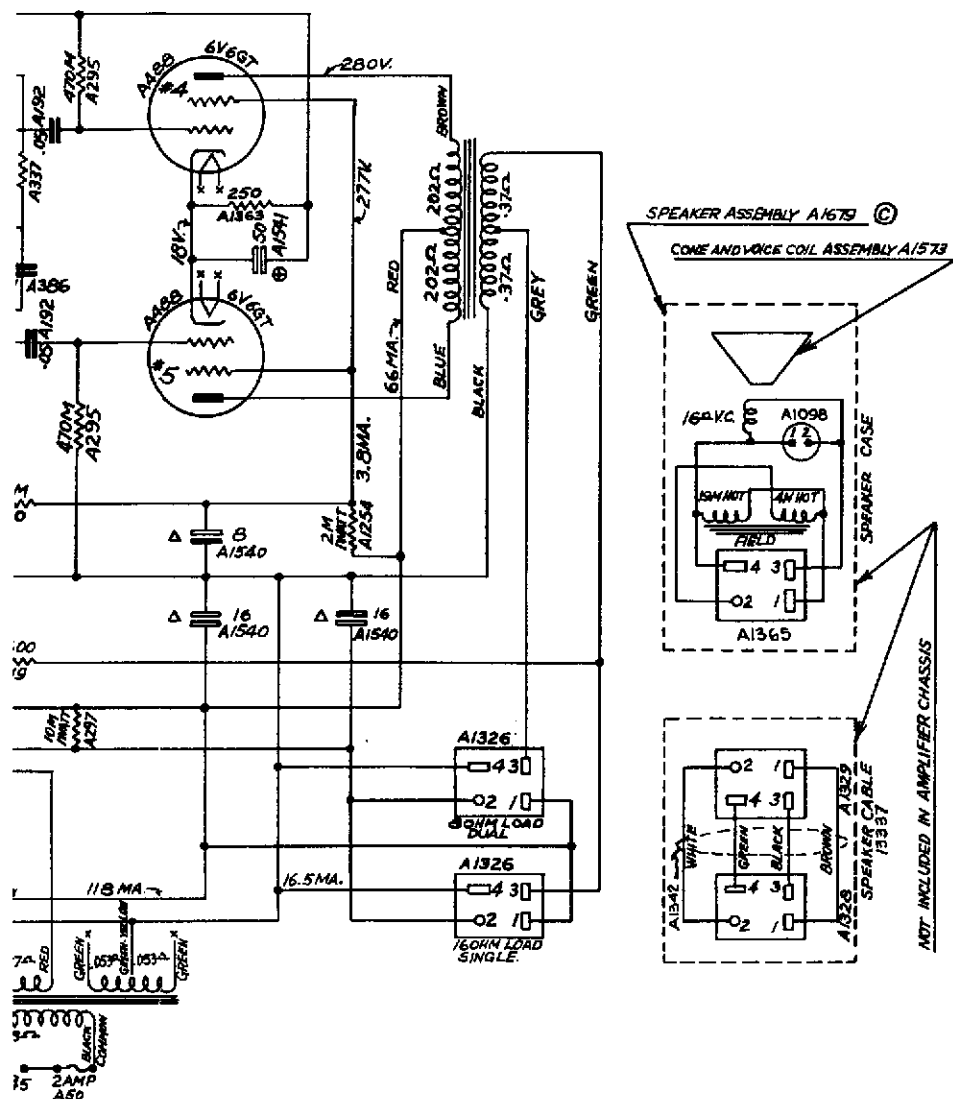
Note especially that new part A1911, 240M resistor does not connect to ground but runs to the output tube cathodes.





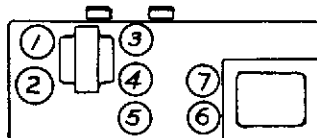
PROJECTOR WIRING DIAGRAM (156 UTILITY)  
NOT INCLUDED IN AMPLIFIER CHASSIS





\*S\* INDICATES TERMINAL AT CLOCKWISE STOP. ALL VOLTAGES MEASURED WITH RESPECT TO CHASSIS AT NO SIGNAL.

⊕ Δ INDICATES CAPACITORS LOCATED IN BANK.



WIRING COLOR CODE	
WHITE — GROUND	BROWN — SCREEN
YELLOW — CATHODE	BLUE — PLATE
RED — B+	BLACK — HEATER
GREEN — GRID	

AS72

SERVICE DATA

## AMPLIFIER WIRING DIAGRAM

DESIGN 156 MODEL VB 25 CYCLE

**FOR USE ONLY WITH  
AMPLIFIER PART N° 13065**

DATE  
3-30-44.



DESIGN 156 AND 179, AMPLIFIER NO. 14027  
(Amplifier serial number 100000 to 109003)

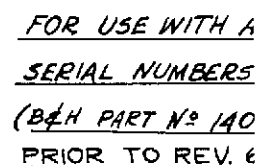
These amplifiers are similar to amplifier No. 13817. They use a permanent-magnet type of dynamic speaker.

In the event that these amplifiers lie idle for indefinite periods, which may cause the volume to be low, the photocell and associated circuits should be rewired as per General Service Bulletin F-20.

These three amplifiers are very similar. Note that the plate filter on output tubes is used only on the first of the series.

Some of these amplifiers may have the filament center tap connected to the output tube cathodes instead of direct to ground. This is to reduce hum which may be encountered when using certain makes of tubes.









PRIOR TO REV. 6-19-44

## SERVICE DATA

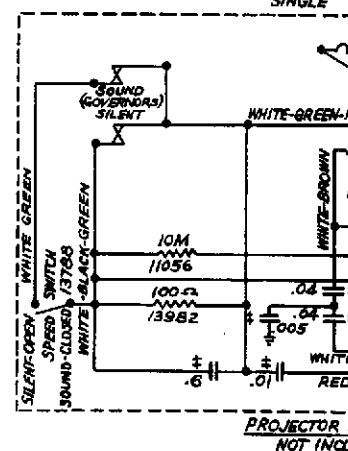
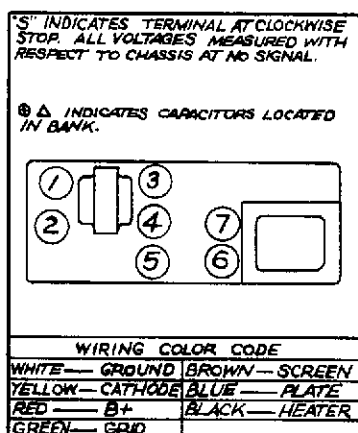
## AMPLIFIER WIRING DIAGRAM

**DESIGN 156 MODELS G&H 60 CYCLES**

FOR USE ONLY WITH AMPLIFIER  
PART NO. 14027

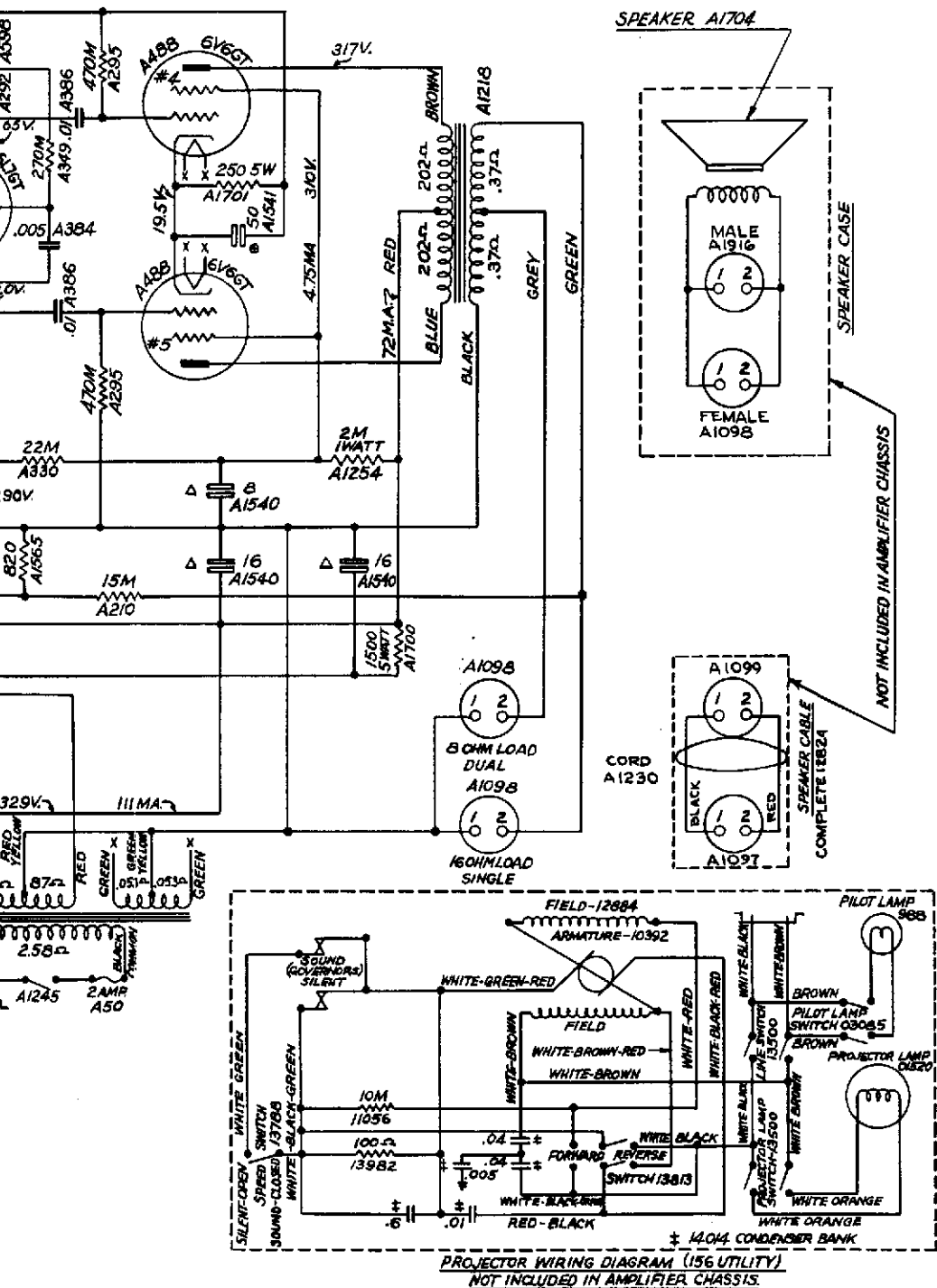
DATE  
4-2-46





FOR USE WITH ALL  
SERIAL NUMBERS  
PRIOR TO REV. .  
(B&H PART NO





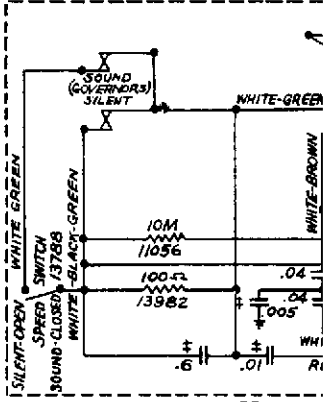
TO REPLACE VOLUME CONTROL, USE  
A1766 - 500M AND REMOVE TWO  
A202 RESISTORS.

FOR USE WITH AMPLIFIERS BEARING  
SERIAL NUMBERS 100,600 TO 105,000  
PRIOR TO REV 6-19-44  
(B & H PART N° 14027)

AS83

SERVICE DATA		
AMPLIFIER WIRING DIAGRAM		
DESIGN 156 MODELS G&H 60 CYCLE		
FOR USE ONLY WITH AMPLIFIER PART N° 14027		DATE 6-5-44.
REVISED 10-11-44		
REVISED 8-28-44		
REVISED 6-19-44		





WIRING COLOR CODE	
WHITE — GROUND	BROWN — SCREEN
YELLOW — CATHODE	BLUE — PLATE
RED — B+	BLACK — HEATER
GREEN — GRID	

PRIOR TO REV. 6-19-44

PROJECT  
NOT IN



DATE  
6-5-44.



DESIGN 179, AMPLIFIER NO. 14027 (Revised)  
(Amplifier serial numbers 109003 to 110002, and 114003 and up)

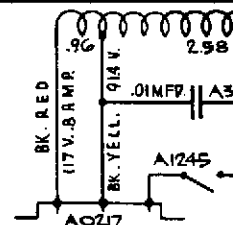
Several changes have been made in this amplifier as compared to other 14027 types. The volume control value is different. Most notable of all is the complete change in method of tone control. Note also that the filament winding center tap does not run to ground but is connected to the output tube cathodes. This brings all heaters above ground, the purpose of which is to reduce hum when certain makes of tubes are used.



WIRING COLOR CODE	
WHITE-GROUND	BROWN-SCREEN
YELLOW-CATHODE	BLUE-PLATE
RED-B+	BLACK-HEATER
GREEN-GRID	

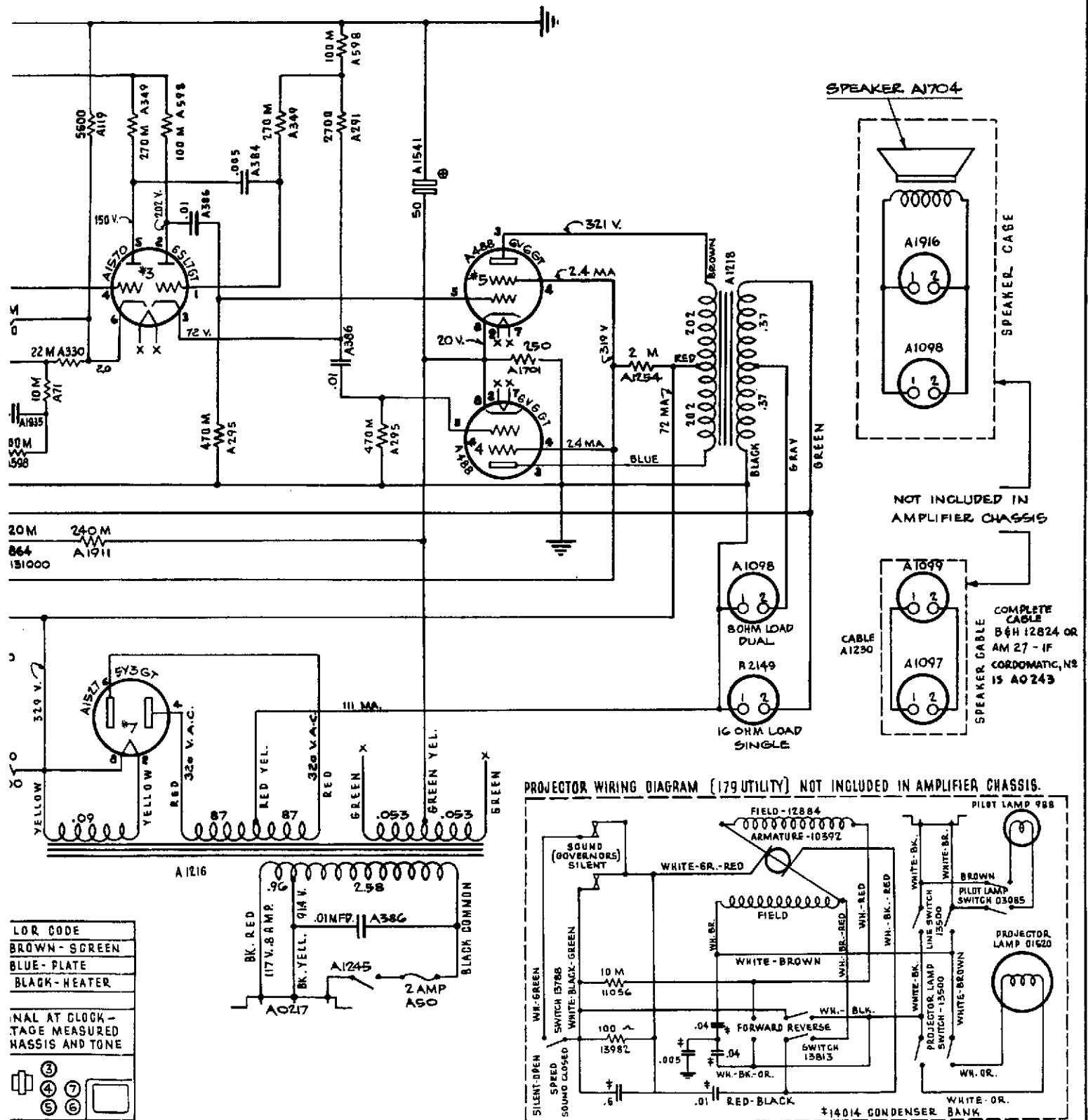
\*S\* INDICATES TERMINAL AT CLOCK-WISE STOP ALL VOLTAGE MEASURED WITH RESPECT TO CHASSIS AND TONE CONTROL BASS

⊕ INDICATES CAPACITORS IN BANK.



FOR USE WITH AMPLIFIER  
NUMBERS 109003 TO 1100





FOR USE WITH AMPLIFIERS BEARING SERIAL  
NUMBERS 109003 TO 110002 & 114003 UP

AS-87

### SERVICE DATA

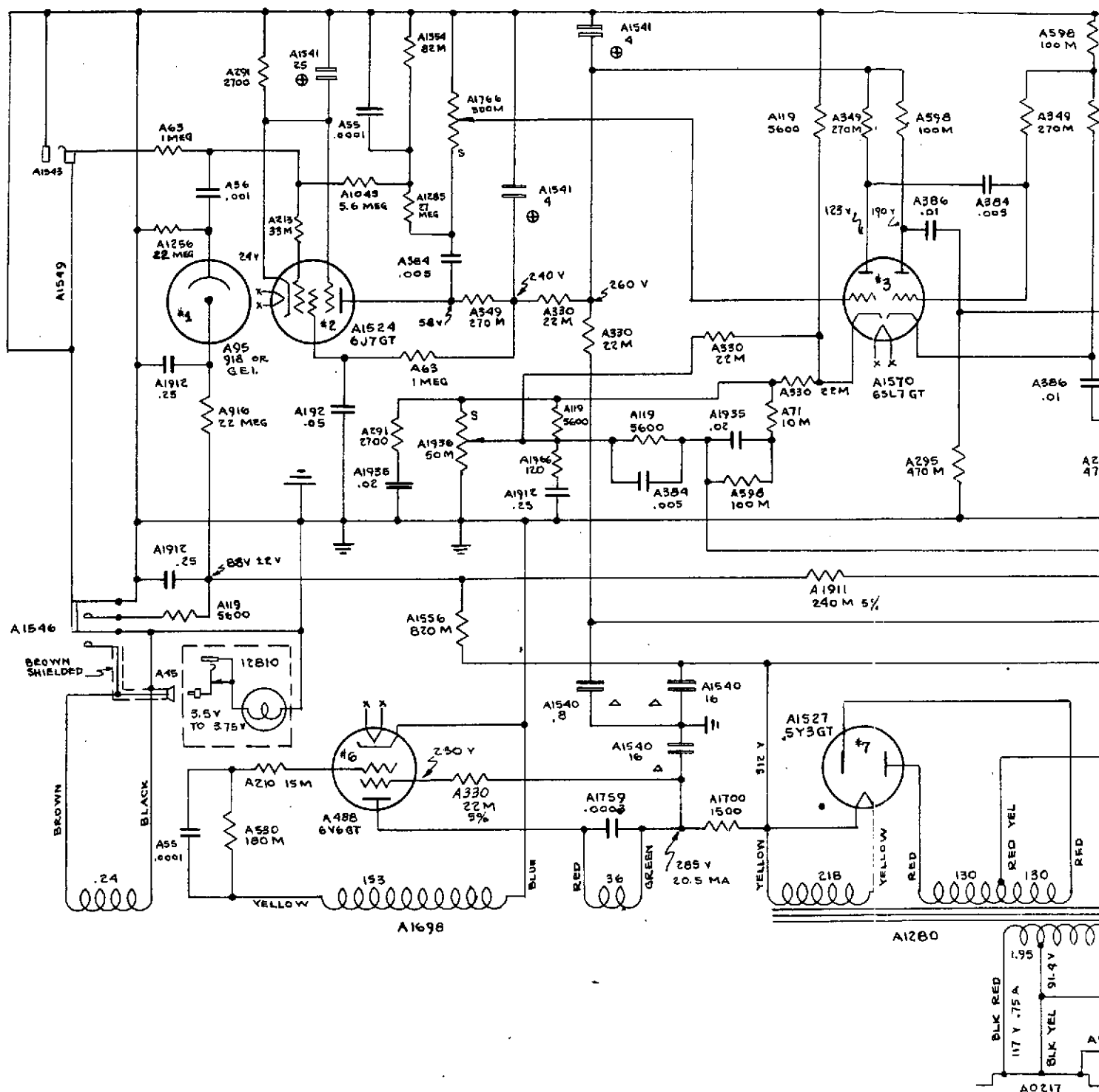
### AMPLIFIER WIRING DIAGRAM

DESIGN 179 MODEL A - 60 CYCLE

FOR USE ONLY WITH AMPLIFIER  
PART NO 14027

12-15-45





WIRING COLOR CODE	
WHITE-GROUND	BROWN-SCREEN
YELLOW-CATHODE	BLUE-PLATE
RED-B+	BLACK-HEATER
GREEN-GRID	

"S" INDICATES TERMINAL AT CLOCKWISE STOP. ALL VOLTAGES MEASURED WITH RESPECT TO CHASSIS & TONE CONTROL BASS.

⊕ Δ INDICATE CAPACITORS IN BANK.

①

②





SERVICE DATA	
AMPLIFIER WIRING DIAGRAM	
FILMOSOUND	
DESIGN 179AB	MODEL AB
FOR USE ONLY WITH PART NO. 14100	DATE 10-19-45



DESIGN 179, AMPLIFIER NO. 05311

This amplifier is a rather radical departure from any past Bell & Howell amplifier. It is not an AC-DC amplifier.

The power output is 10 watts maximum - 8 watts minimum.

In order to reduce weight, the power transformer has been eliminated.

Two selenium dry disc rectifiers connected in a voltage doubler circuit supply the high voltage DC for the tubes.

Tube filaments are series connected across the line.

The sound-silent projector switch partially shorts the exciter lamp when operating projector at silent speed.

An isolation transformer is used in the phono-microphone input circuit.

A .1 mfd condenser, part #17030, is connected from line to chassis to reduce motor crackle. In the event of shock complaint, the condenser should be changed to .03. It may, however, reduce the amplifier sensitivity. This condenser must be moulded plastic or metal encased. Aerovox Duranite 600 Volt .033 MFD may be used.

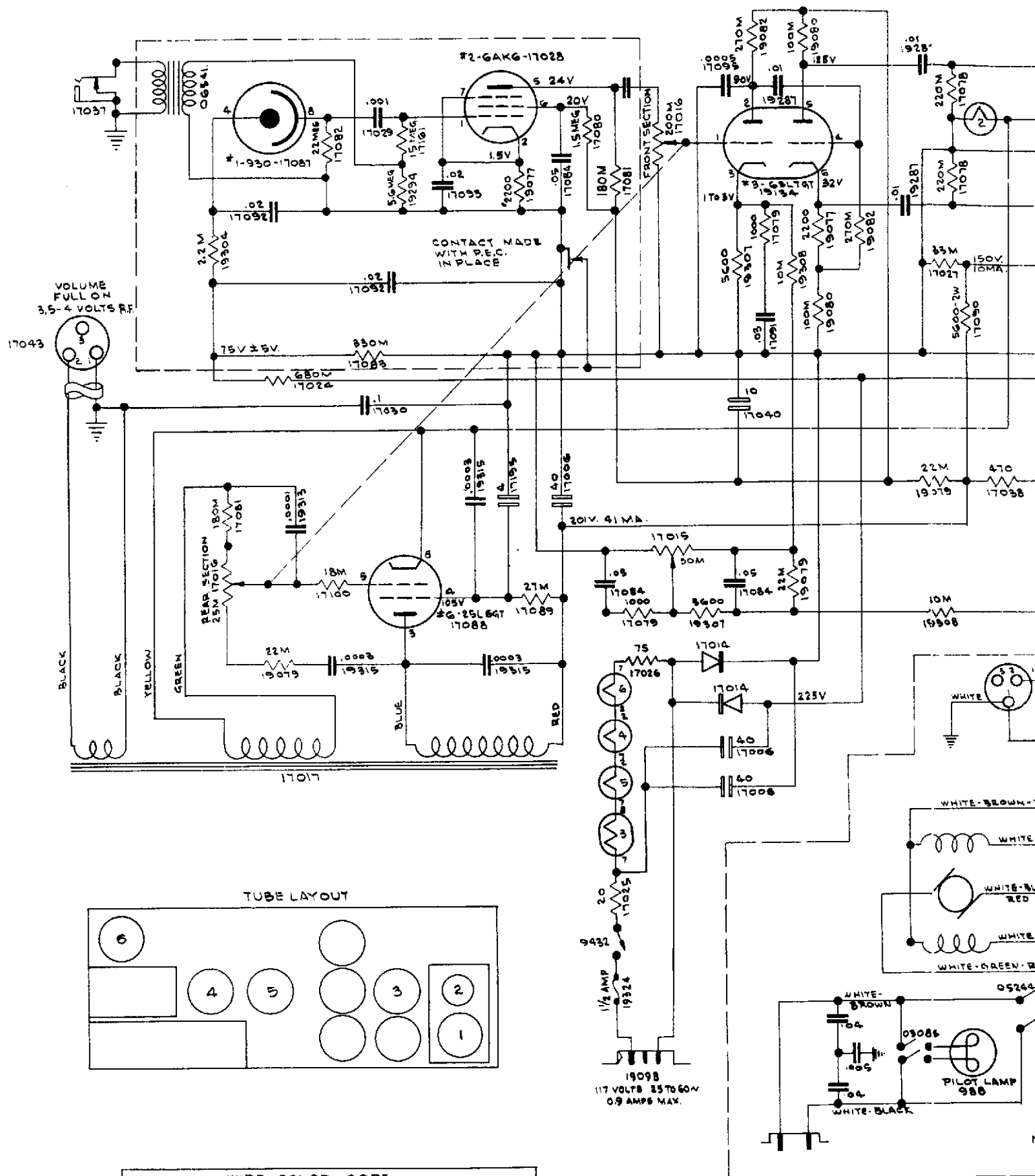
Complaints of noise, static, etc. are usually caused by a damaged photocell cover, part #08543. A sharp blow against the cover will loosen the angle bracket bond to cover. They cannot be repaired except at the factory. It is suggested that each Service Station have two covers in stock. The damaged cover may be returned for repair.

A loose PEC socket will also cause noise. Tighten by soldering locking ring to chassis.

Loss of volume (sudden) and sometimes noise are usually caused by electrolytic condenser (rear) having been hit, so that grounding ring on condenser is loose. Change condenser to repair.

Low volume is usually corrected by changing or interchanging 25L6G tubes.



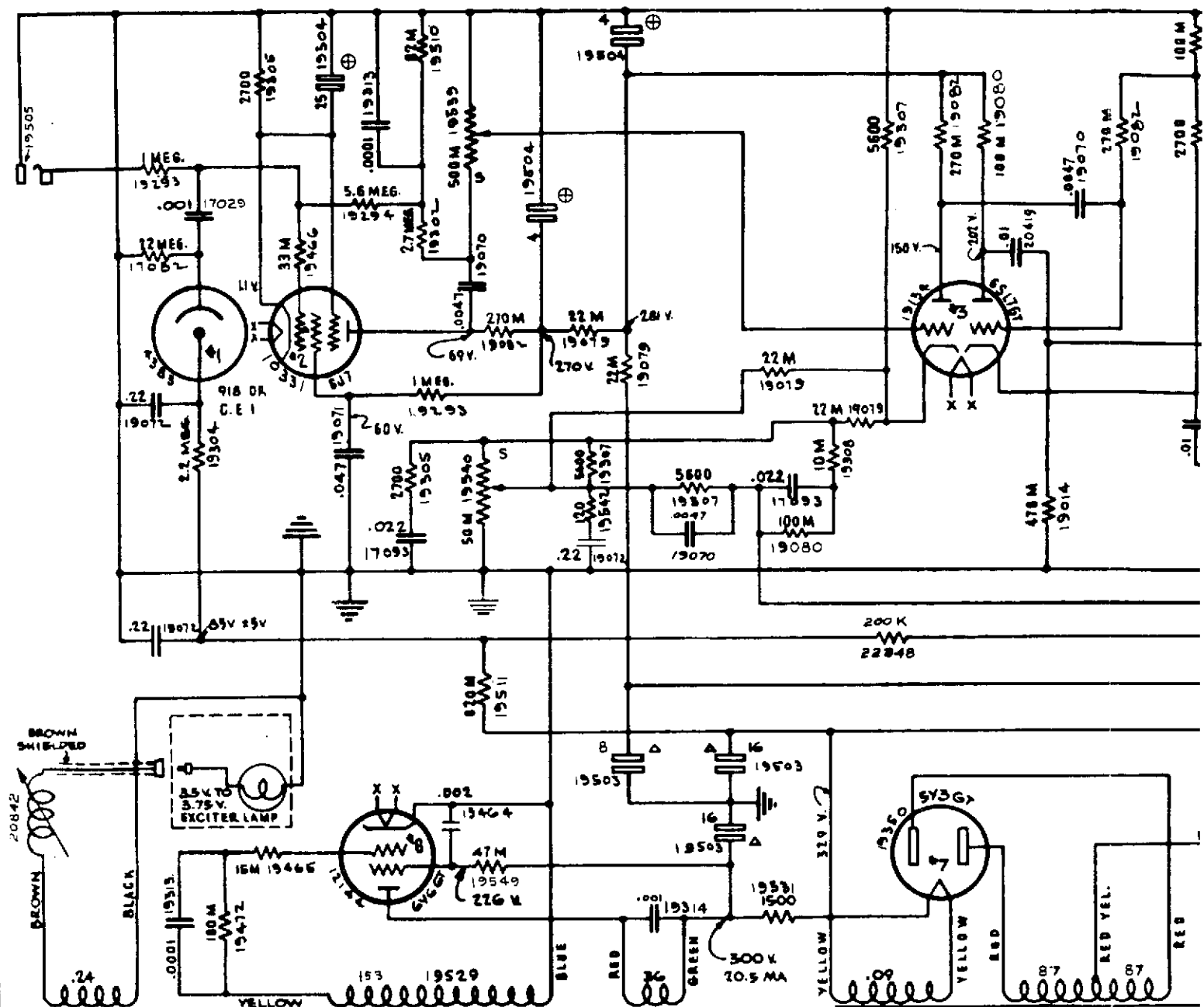


ALL VOLTAGES MEASURED  
WITH 11MEG OHM INPUT.





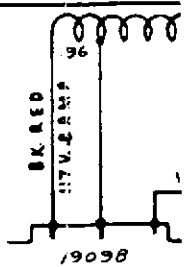




FREQUENCY RESPONSE (DB±1)			
INPUT SIGNAL APPLIED THRU 20 MESS TO P.E.C. CATHODE VOL. CONTROL ON FULL			
TONE CONTROL POSITION	①	②	③
INPUT VOLTAGE	.050	.050	.050
FREQUENCY	98	88	88
50	-16.0	-12.0	-1.0
100	-16.0	-11.5	-0.0
500	-7.5	-7.5	-3.5
1000	-4.5	-6.0	-4.0
3000	-1.5	-5.0	-3.5
5000	-2.6	-5.0	-4.0
7000	-4.5	-6.0	-5.0
10,000	-7.0	-8.5	-7.0

SENSITIVITY			
MEASURED AT 8 WATT OUTPUT AT 1000 CYCLES. TONE CONTROL BASS. VOLUME CONTROL SET AT MAXIMUM			
MICROPHONE INPUT: 0.012 VOLTS APPLIED DIRECTLY TO MIKE JACK			
FILM INPUT CHANNEL: 0.120 VOLTS APPLIED THRU 20 MESS TO P.E.C. CATHODE			
POWER OUTPUT AT 5% DISTORTION			
LINE VOLTS	FREQUENCY	WATTS	TOLERANCE
117	400	12.0	±12%
MEASURED WITH VOLUME CONTROL AT MAXIMUM AND TONE CONTROL BASS RESISTANCE OUTPUT LOAD.			
ALL MEASUREMENTS MADE WITH 117 VOLT A.C. 60 CYCLE LINE.			

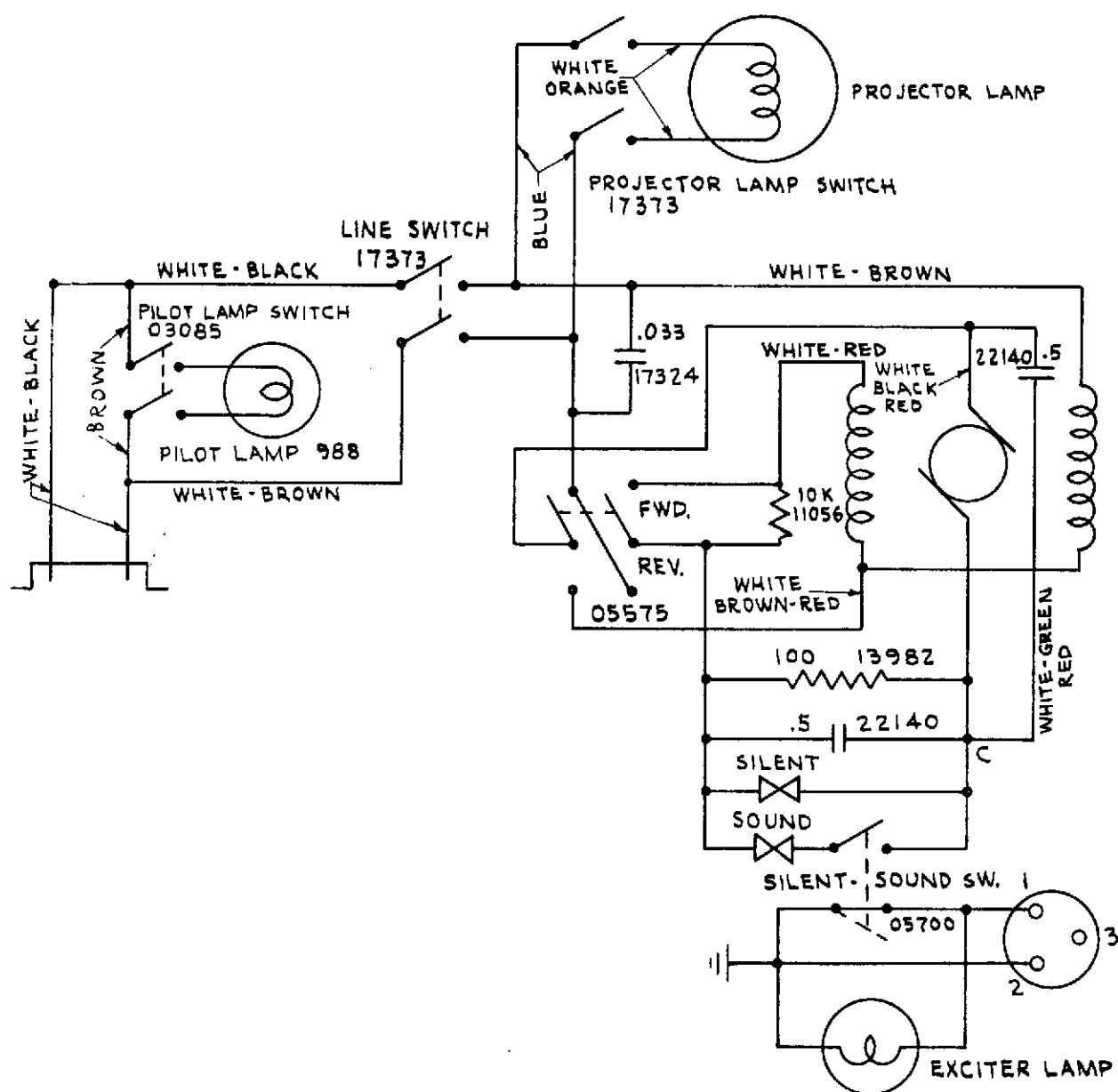
WIRING COLOR CODE	
WHITE-GROUND	BROWN-SCREEN
YELLOW-CATHODE	BLUE-PLATE
RED-B+	BLACK-HEATER
GREEN-GRID	
*S* INDICATES TERMINAL AT CLOCK-WISE STOP. ALL VOLTAGES MEASURED WITH RESPECT TO CHASSIS AND TONE CONTROL BASS.	
⊕ Δ INDICATES CAPACITORS IN BANK.	
①	③
②	④
	⑤
	⑥
	⑦
	⑧





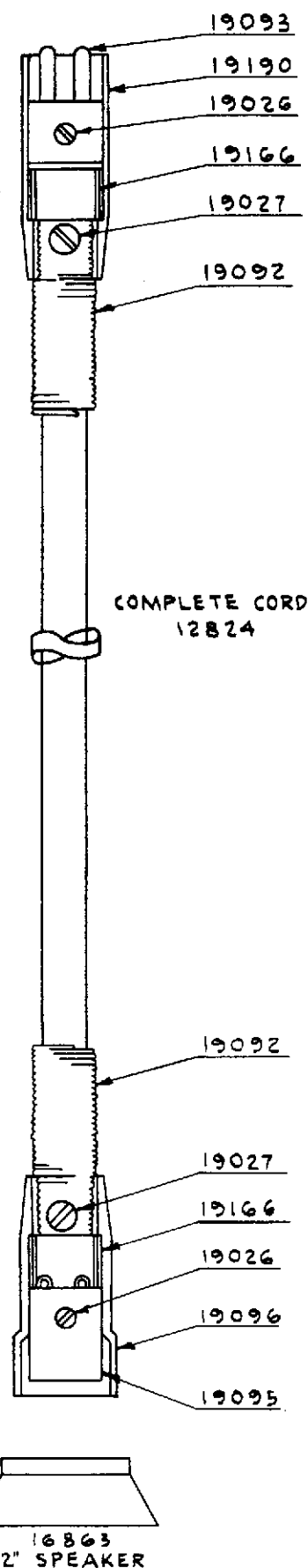
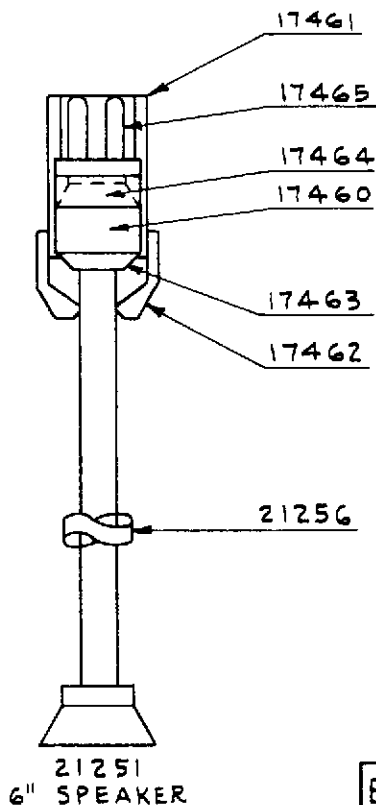
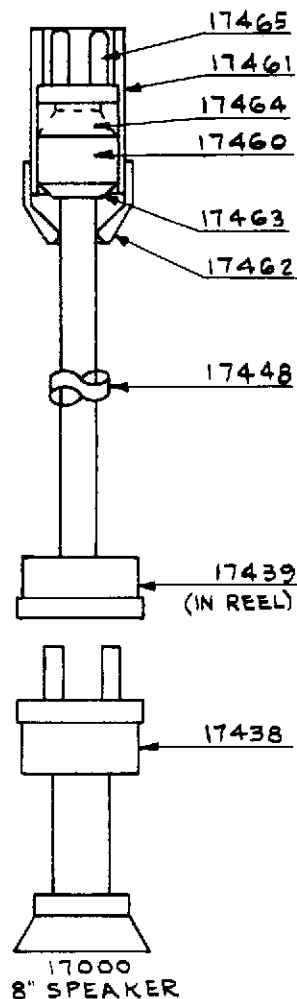






PARTS ON THIS SHEET NOT INCLUDED IN AMPLIFIER CHA



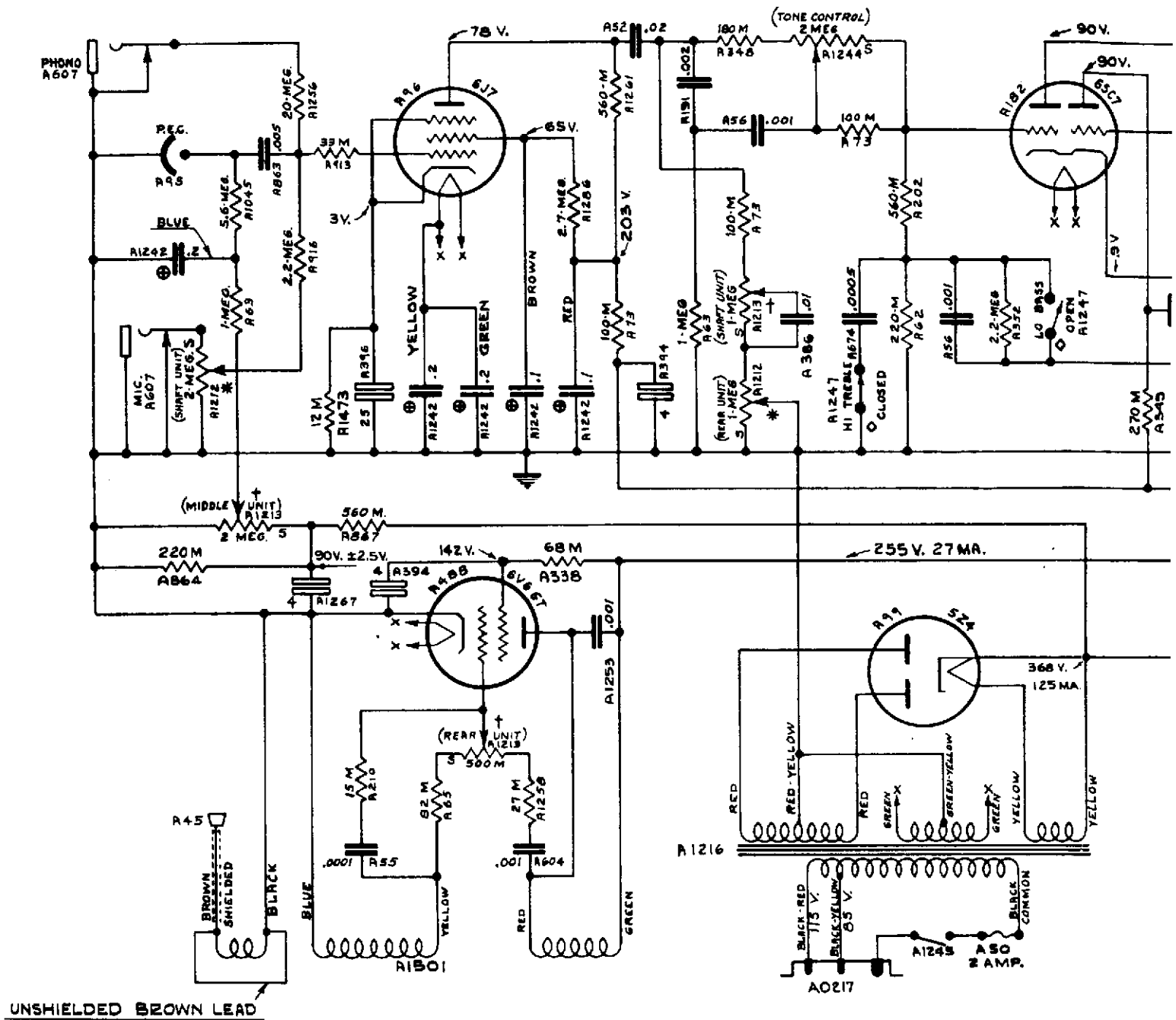


LAMP

N AMPLIFIER CHASSIS

Bell & Howell Co. Chicago U.S.A.		
PROJECTOR WIRING DIAGRAM & CABLES FOR DESIGNS 185 (ALL)		
DATE 3-3-52	SERVICE DATA	DRAWN <i>ad</i> APVD <i>LL</i>





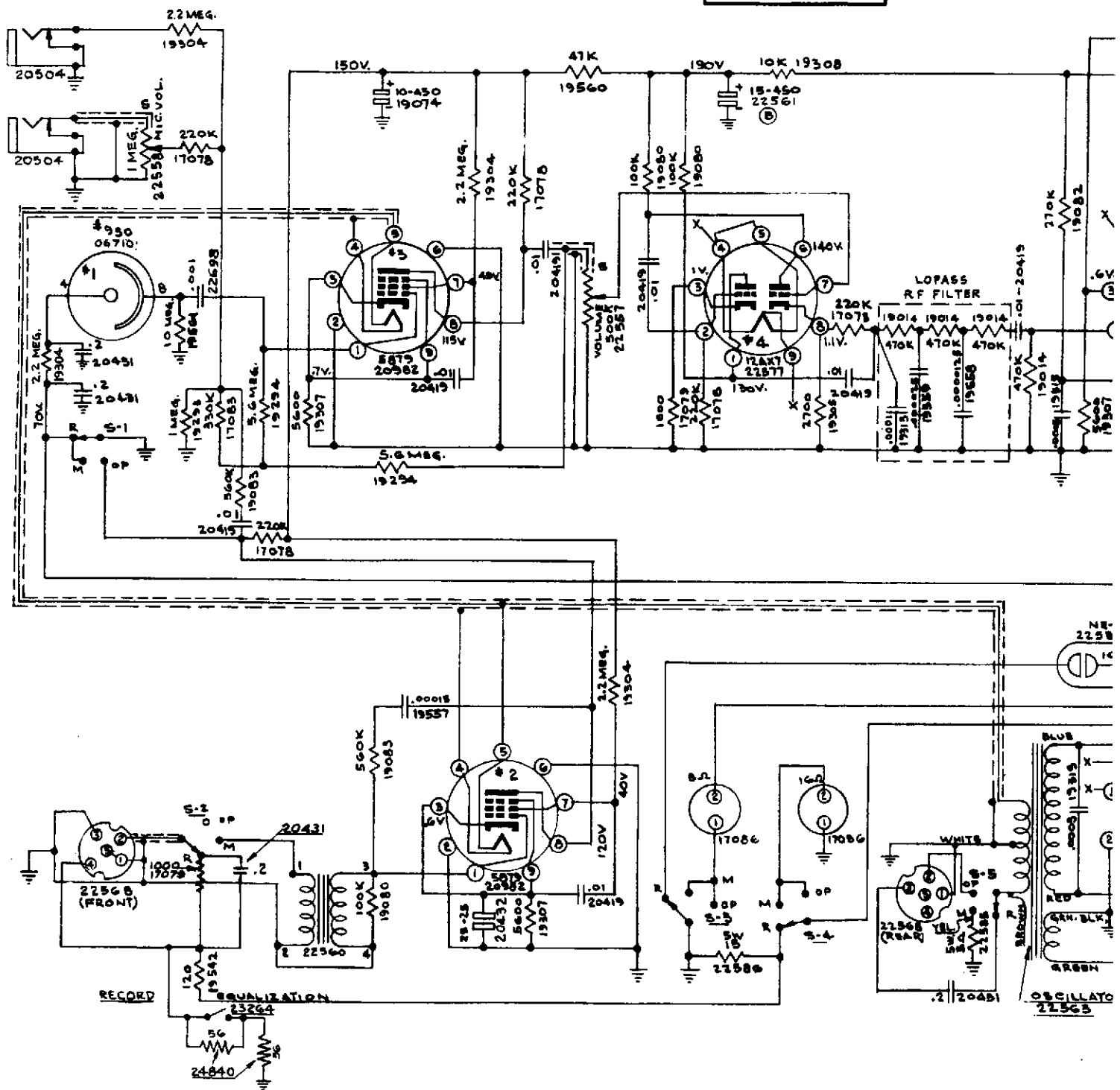
5\* INDICATES TERMINAL AT CLOCKWISE STOP.  
 ALL VOLTAGES MEASURED WITH EXCITER  
 CAMP FULL ON AND NO SIGNAL AT  
 115 VOLT LINE. ALL VOLTAGES MEASURED  
 TO GROUND.  
 C A INDICATES CAPACITORS LOCATED IN  
 BANK.  
 †\* INDICATES CONTROLS ON SAME  
 SHAFT.  
 O SWITCHES SHOWN WITH SLIDE BUTTONS  
 IN DOWN POSITION.

WIRING COLOR CODE			
WHITE	GROUND	BROWN	SCREEN
YELLOW	CATHODE	BLUE	PLATE
RED	B+	BLACK	HEATER
GREEN	GRID		





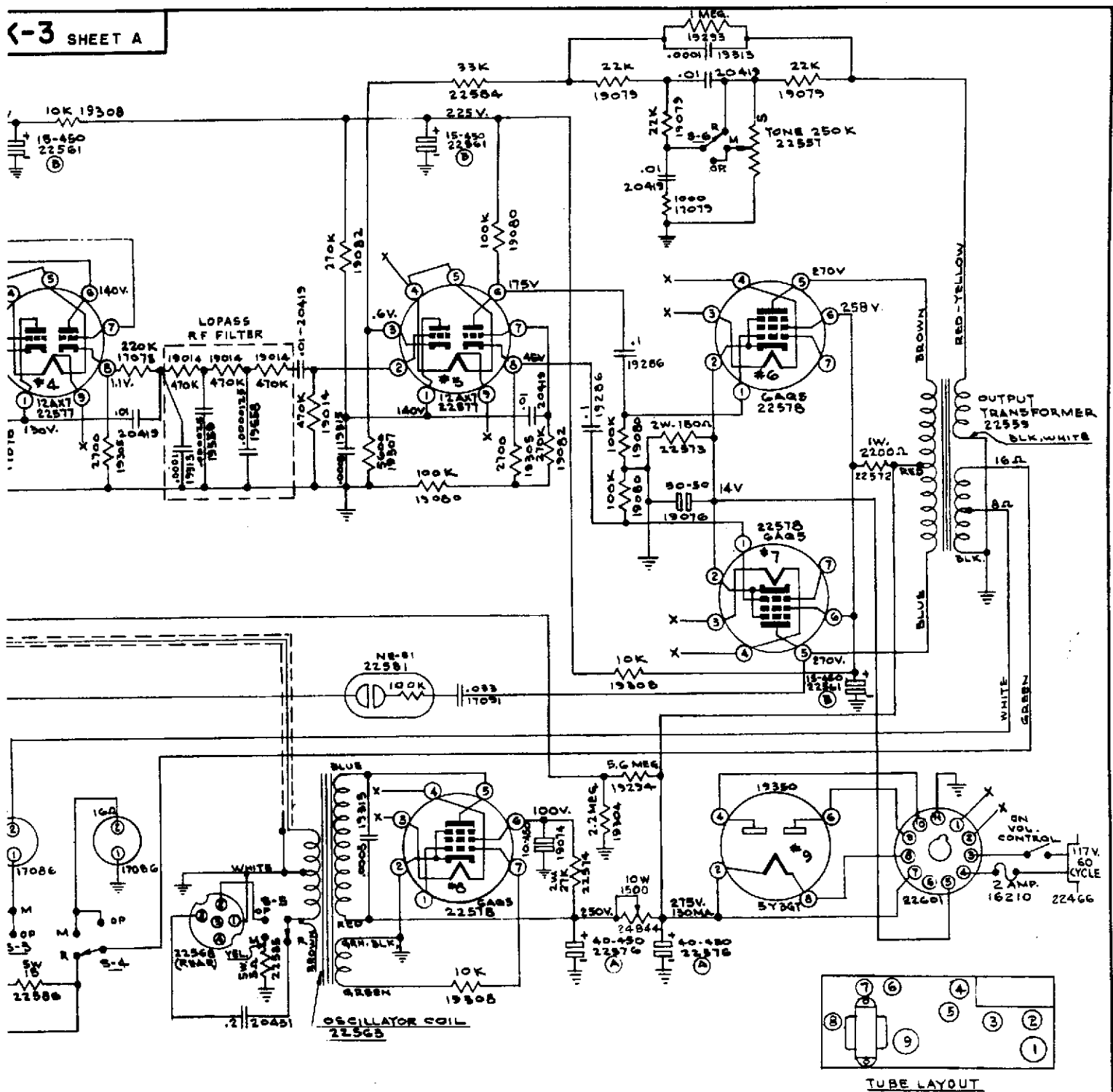




NOTE: VOLTAGES POINT TO POINT ARE  
BASED ON 117 VOLT A.C. LINE INPUT.

WHITE
YELLOW
RED
GREEN
BLUE





NOTE: VOLTAGES POINT TO POINT ARE  
BASED ON 117 VOLT A.C. LINE INPUT.

- ①-INDICATES CAPACITORS IN SAME CAN (22576)  
②-INDICATES CAPACITORS IN SAME CAN (22561)  
V-INDICATES TERMINAL AT CLOCKWISE STOP.  
VOLTAGES INDICATED MEASURED TO CHASSIS GROUND.  
(FUNCTION SWITCH IN MAG. OR OPT. PLAY BACK POSITION)  
ALL RESISTORS 1/2 WATT UNLESS INDICATED OTHERWISE  
S-1 TO S-6 (INCL) INDICATE SECTIONS OF SELECTOR SWITCH  
(22558)

WIRE COLOR CODE			
WHITE	GROUND	BROWN	SCREEN
YELLOW	CATHODE	BLACK	AC
RED	B+	WHITE & BLACK	B-
GREEN	GRID		
BLUE	PLATE		

**Bell & Howell Co. Chicago U.S.A.**

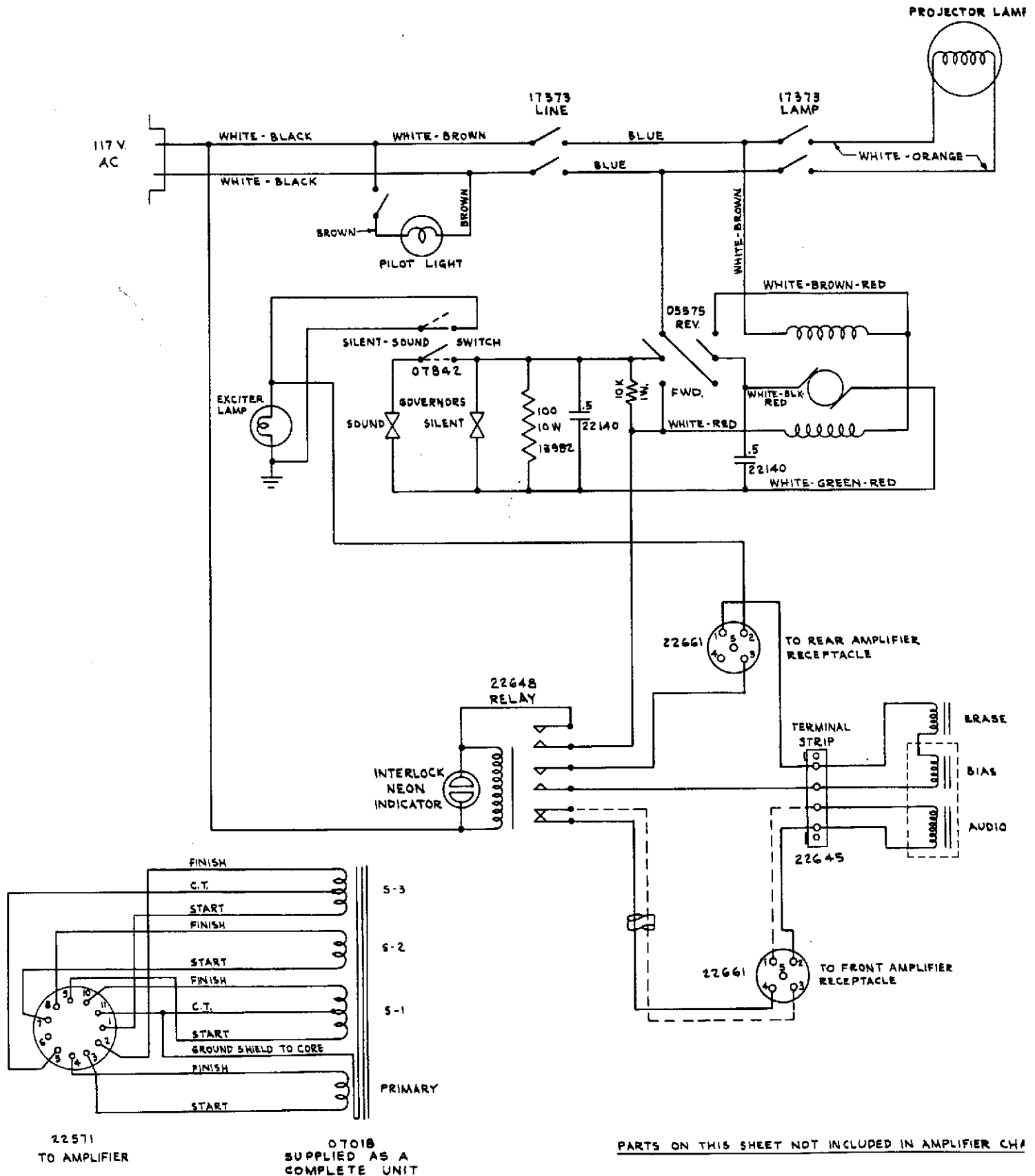
AMPLIFIER WIRING DIAGRAM  
FOR DESIGNS 202 (ALL)

DATE 3-3-52  
REVISED- 4-25-52

**SERVICE DATA**

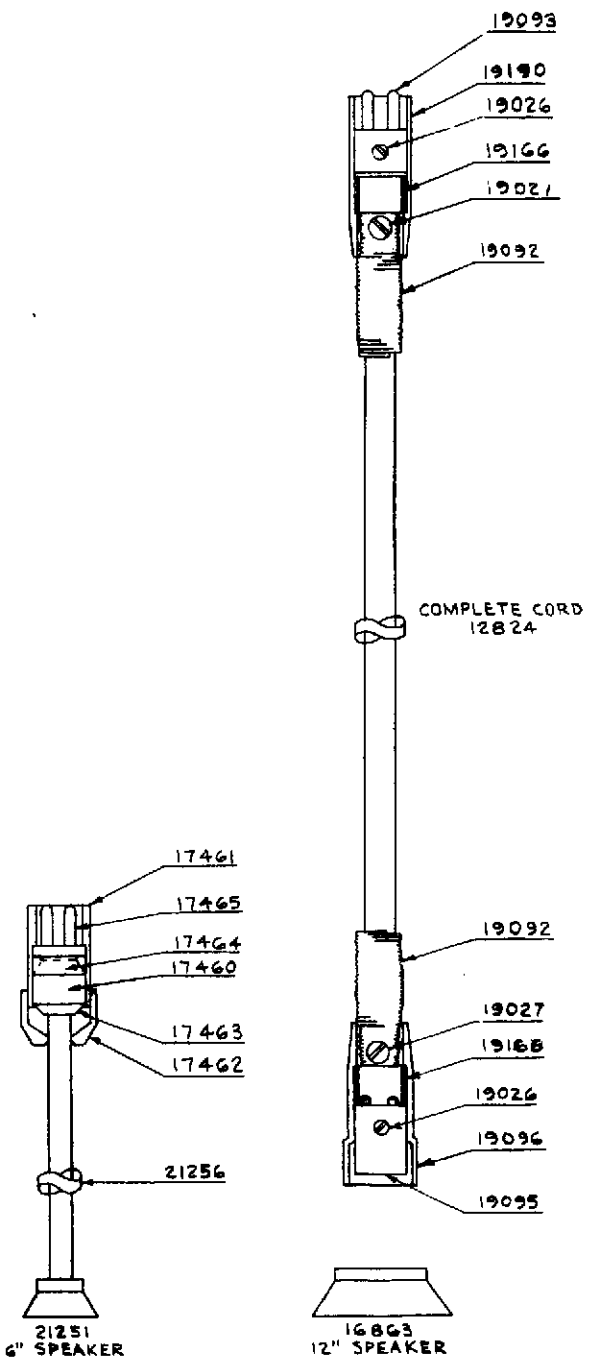
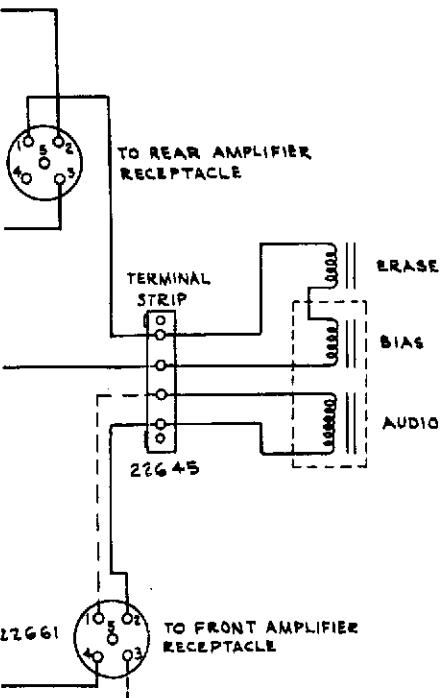
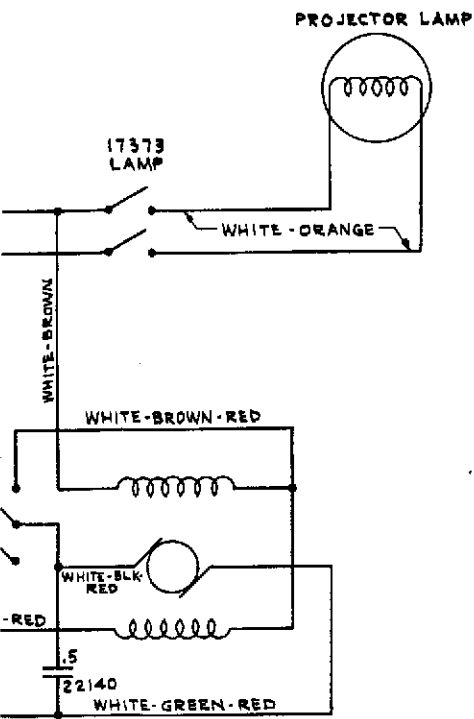
DRAWN *act*  
APVD. *TR*





PARTS ON THIS SHEET NOT INCLUDED IN AMPLIFIER CHA

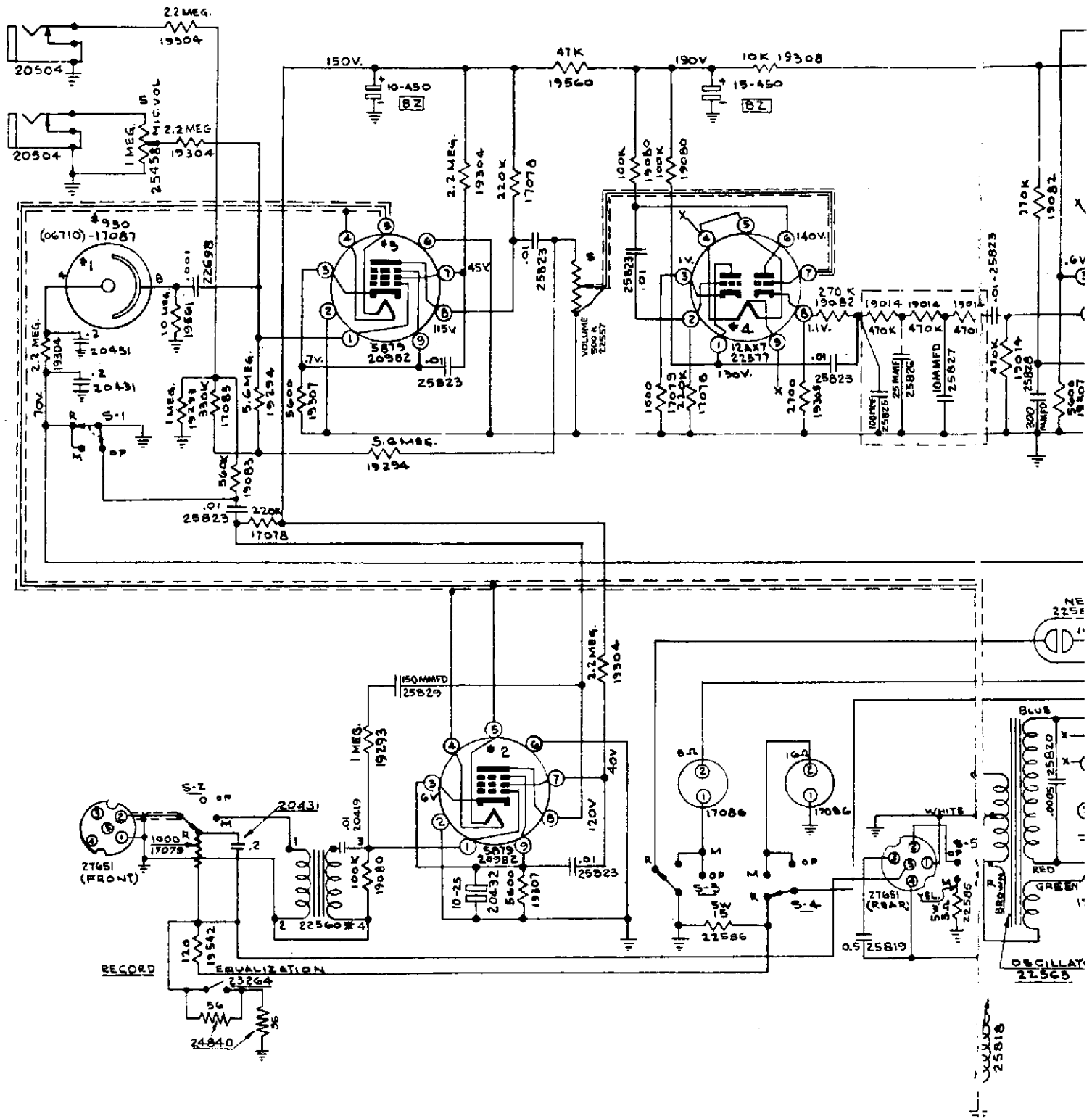




THIS SHEET NOT INCLUDED IN AMPLIFIER CHASSIS

Bell & Howell Co. Chicago U.S.A.		
AMPLIFIER WIRING DIAGRAM FOR DESIGNS 202 (ALL)		
DATE 3-3-52 REVISED 4-25-52	SERVICE DATA	DRAWN <i>act</i> APVD. <i>LL</i>





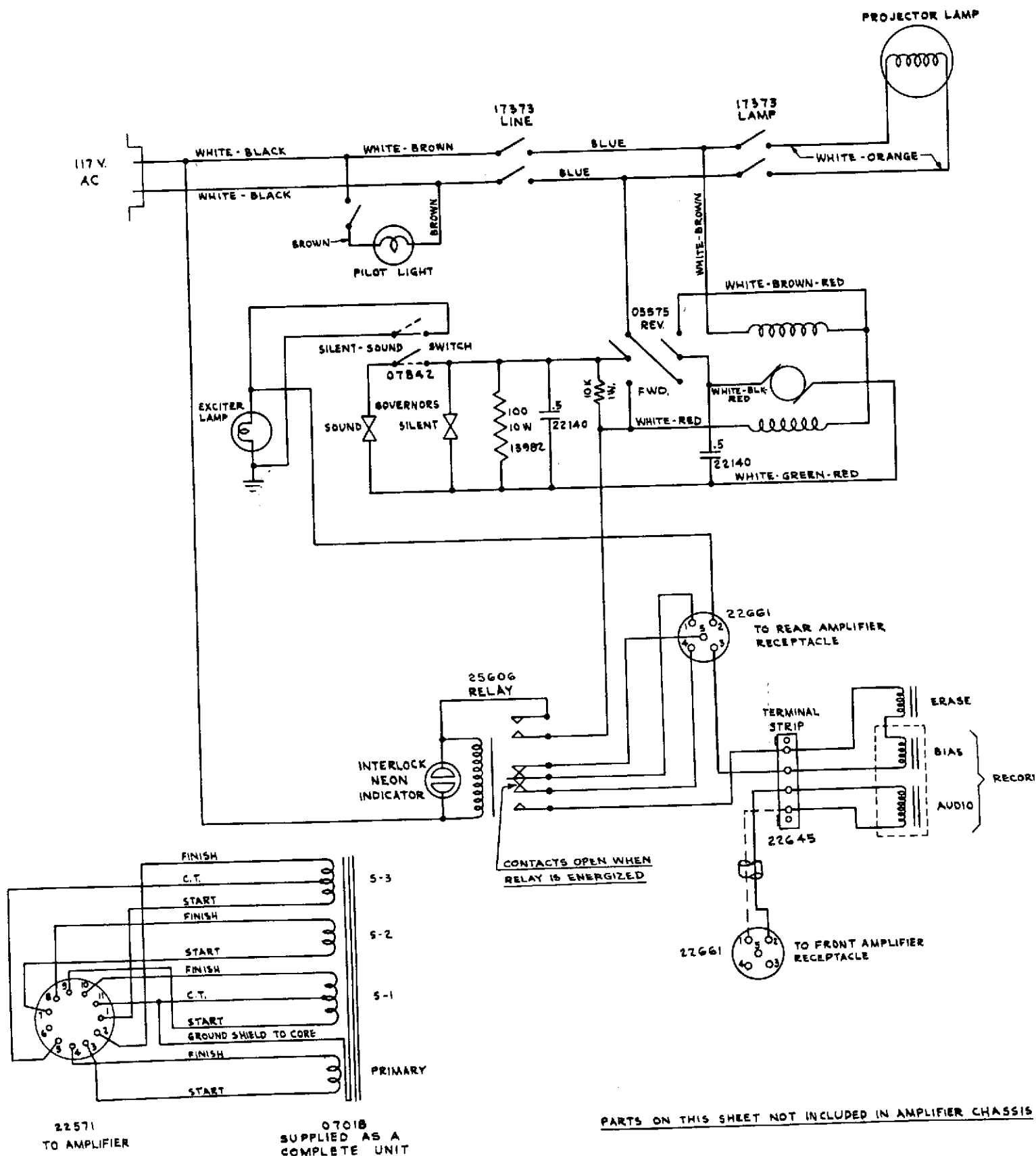
NOTE: VOLTAGES POINT TO POINT ARE  
BASED ON 117 VOLT A.C. LINE INPUT.

WHITE  
YELLOW  
RED  
GREEN



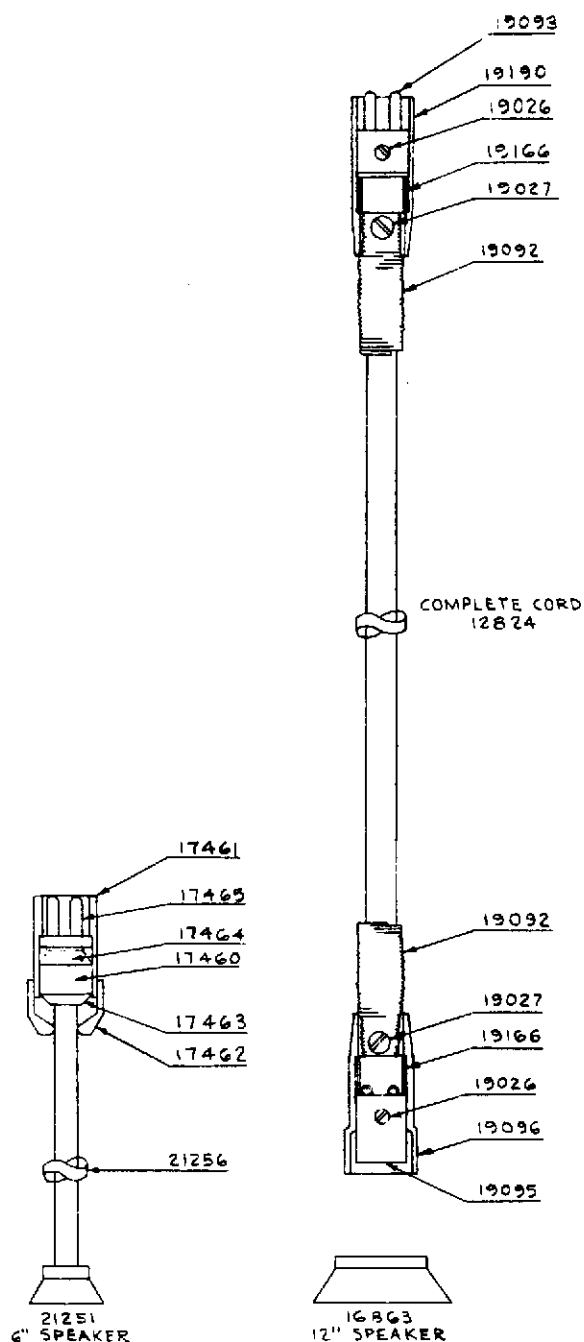
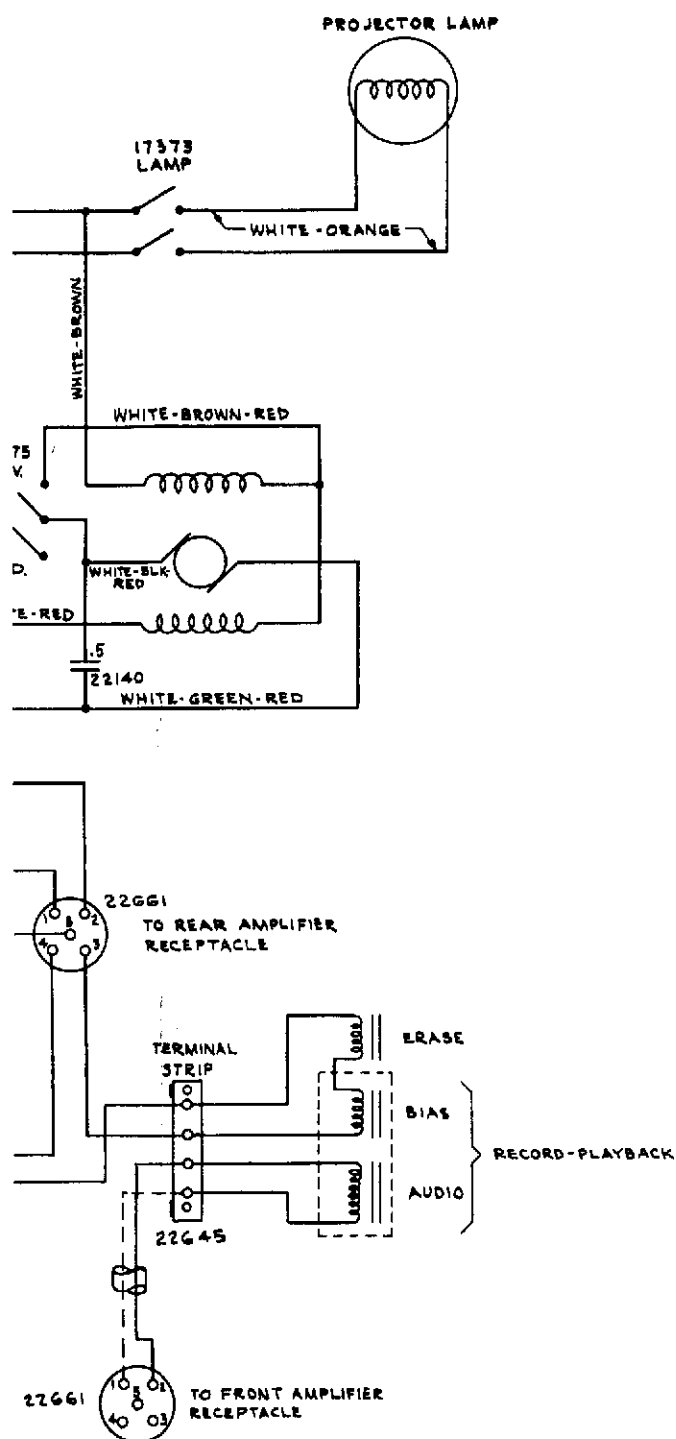






PARTS ON THIS SHEET NOT INCLUDED IN AMPLIFIER CHASSIS

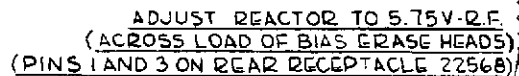




THIS SHEET NOT INCLUDED IN AMPLIFIER CHASSIS

Bell & Howell Co. Chicago U.S.A.		
AMPLIFIER WIRING DIAGRAM FOR DESIGNS 202 (ALL)		
DATE 11-6-53	SERVICE DATA	DRAWN <i>act</i> APVD. <i>act</i>





NOTE: VOLTAGES POINT TO POINT ARE  
BASED ON 117 VOLT A.C. LINE INPUT.

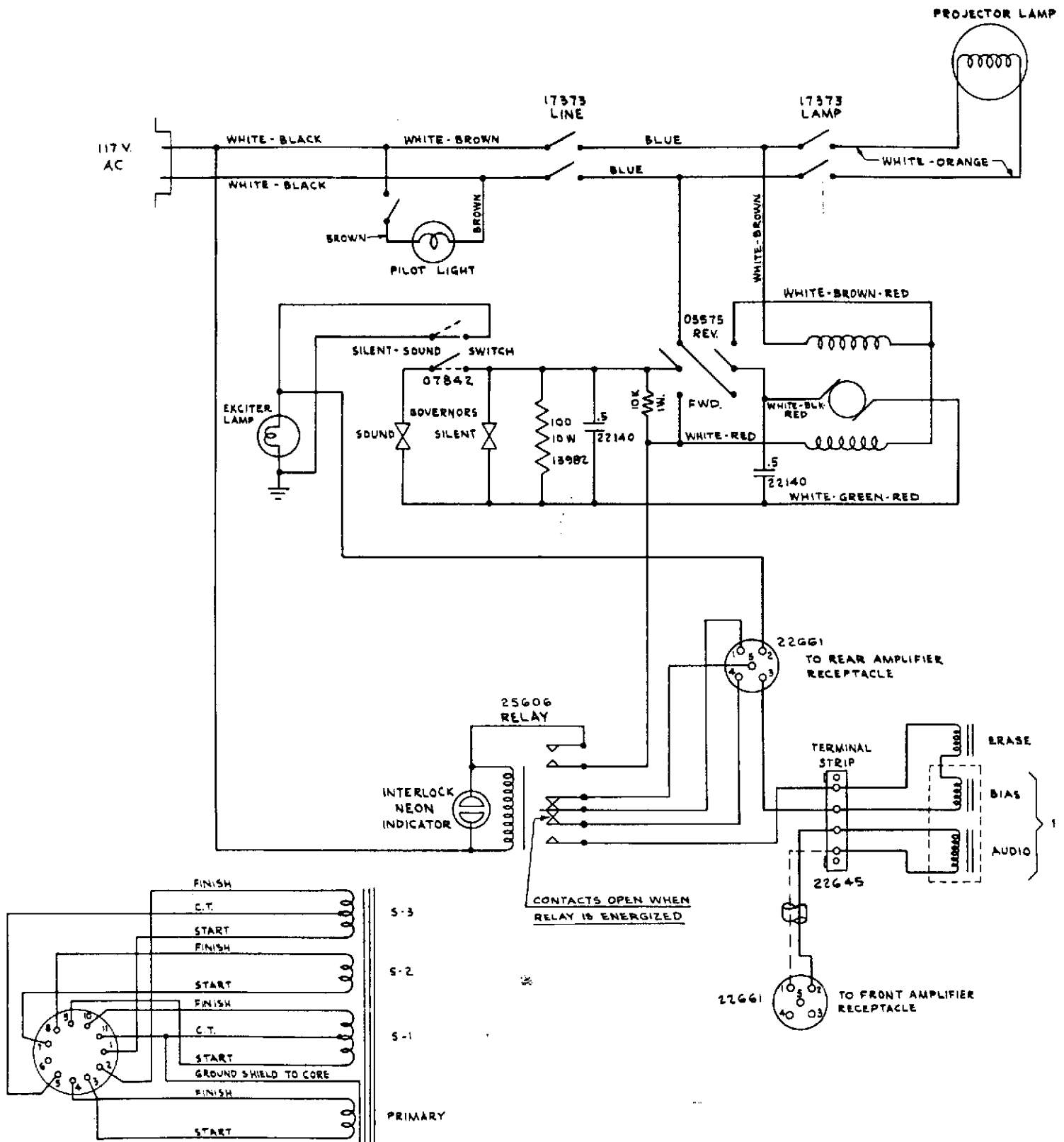


WIRE COLOR CODE			
WHITE	GROUND	BLUE	PLATE
YELLOW	CATHODE	BROWN	SCREEN
RED	B+	BLACK	AC
GREEN	GRID	WHITE & BLACK	B-







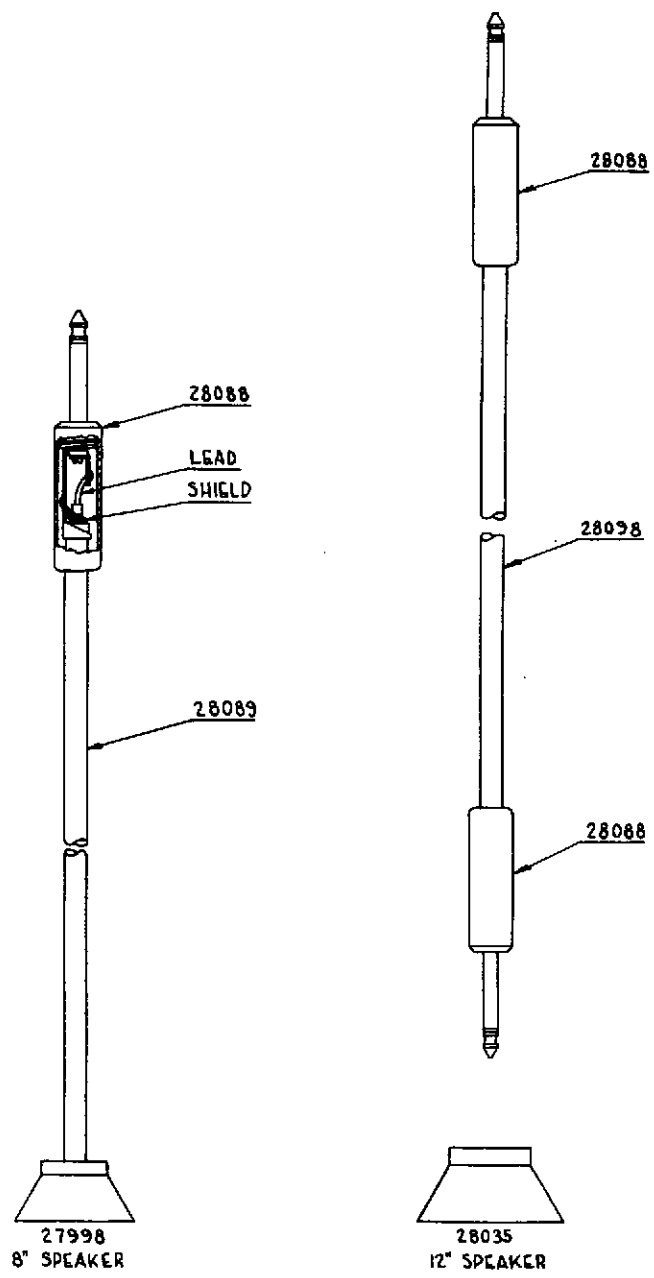
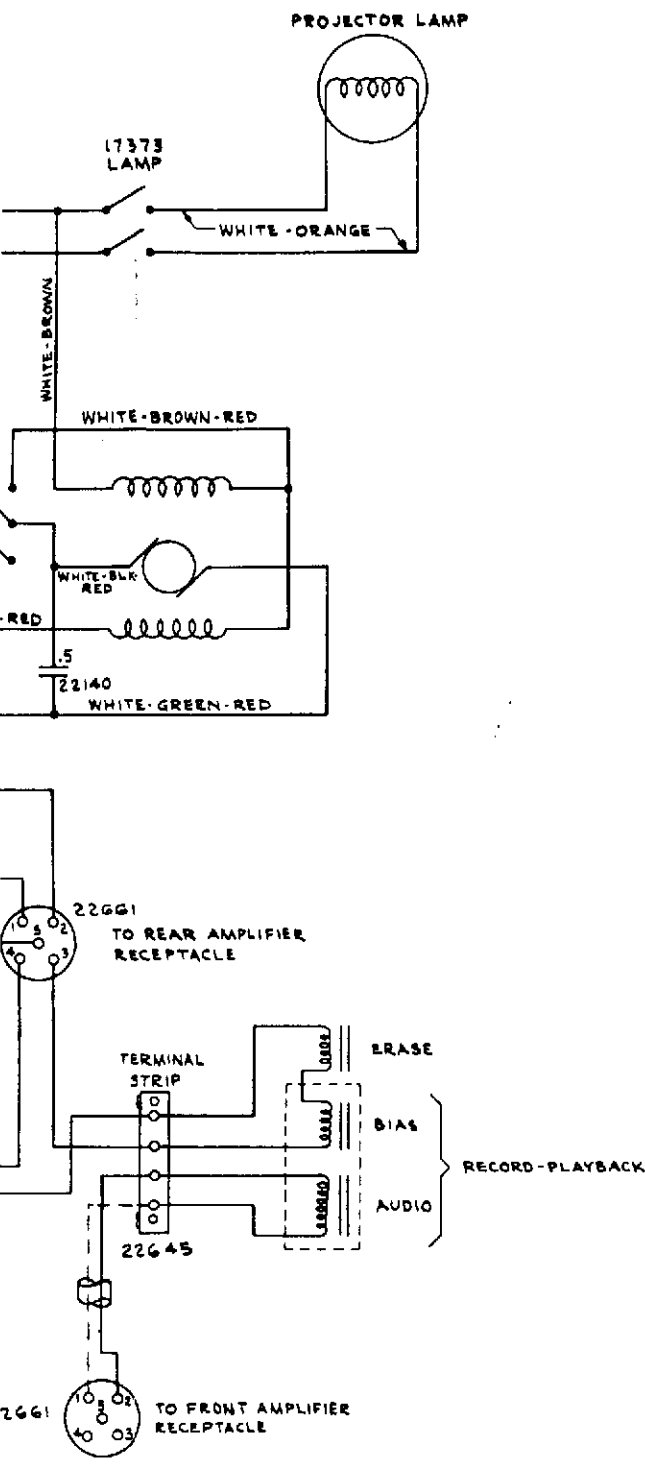


22571  
TO AMPLIFIER

09041  
SUPPLIED AS A  
COMPLETE UNIT

PARTS ON THIS SHEET NOT INCLUDED IN AMPLIFIER CHA:

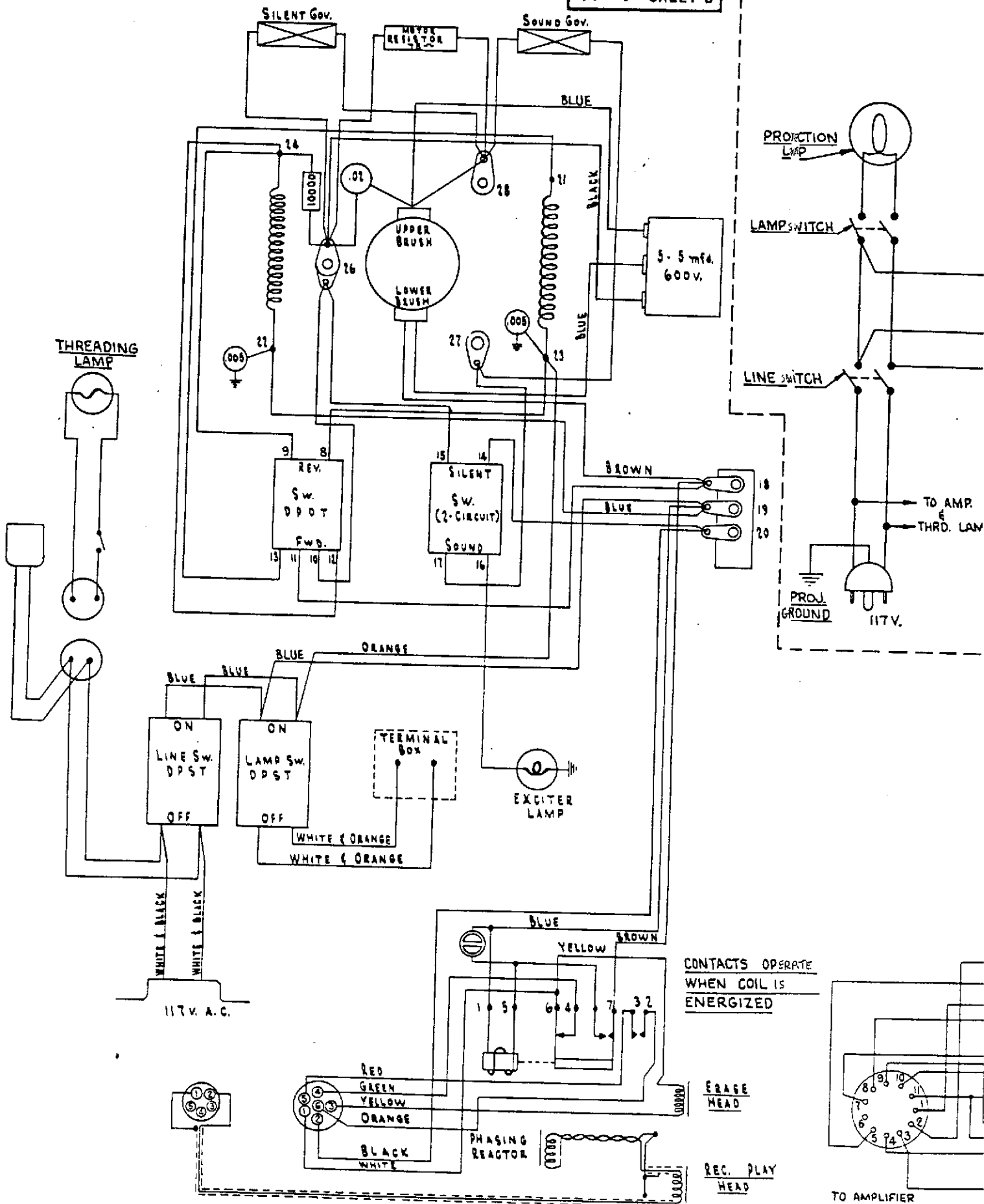




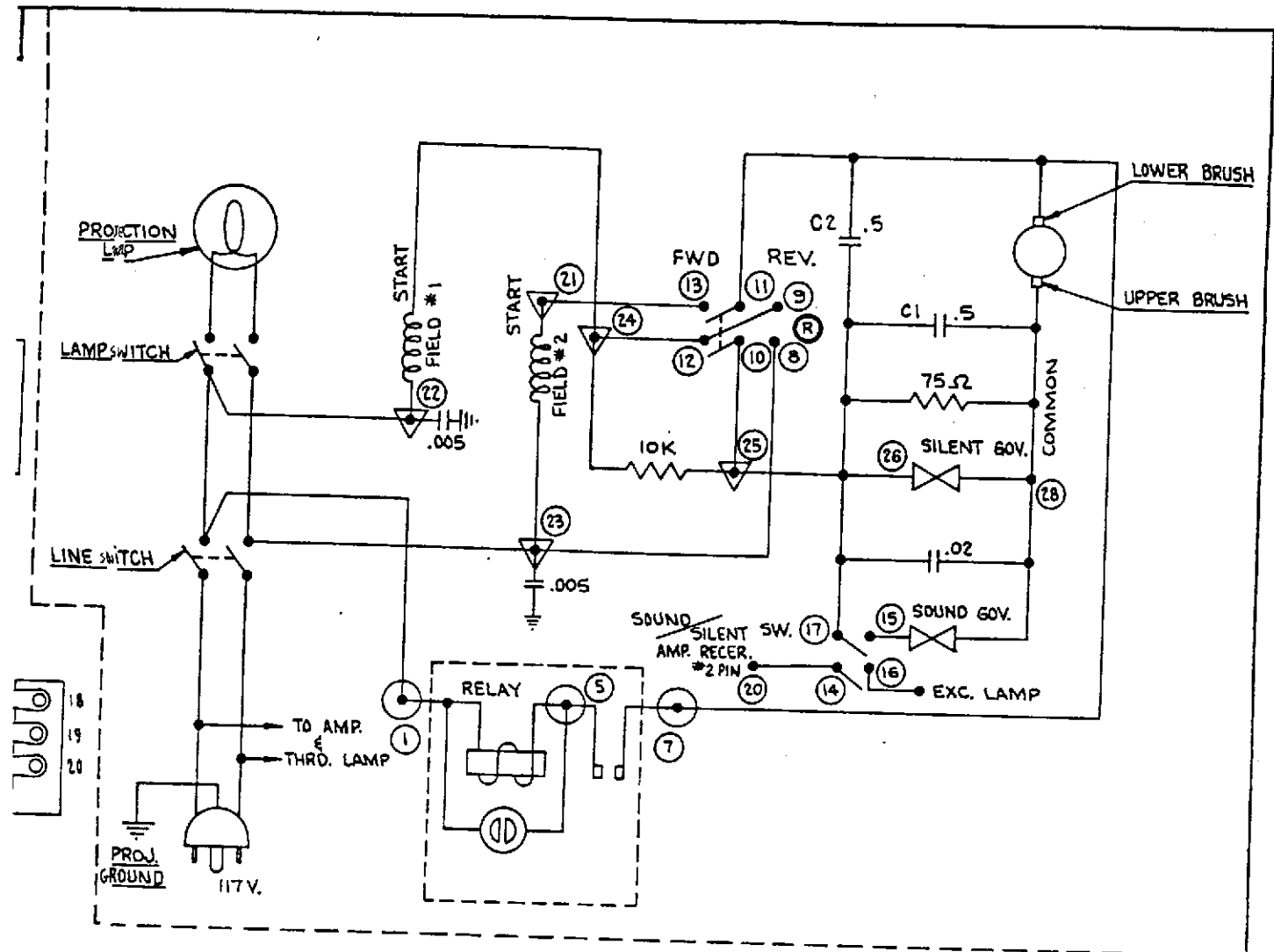
THIS SHEET NOT INCLUDED IN AMPLIFIER CHASSIS

Bell & Howell Co. Chicago U.S.A.		
AMPLIFIER WIRING DIAGRAM FOR DESIGNS 302 (ALL)		
DATE 11-25-55	SERVICE DATA	DRAWN <i>act</i> APVD. <i>L.L.</i>





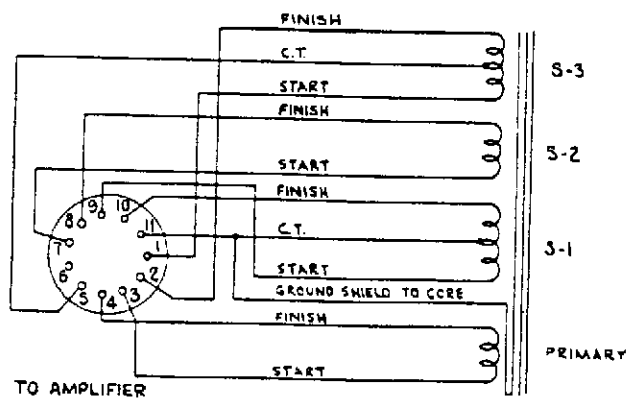




ACTS OPERATE  
N COIL IS  
RGIZED

LASE  
EAD

C. PLAY  
HEAD



PARTS ON THIS SHEET NOT INCLUDED  
IN AMPLIFIER CHASSIS.

Bell & Howell Co. Chicago U.S.A.

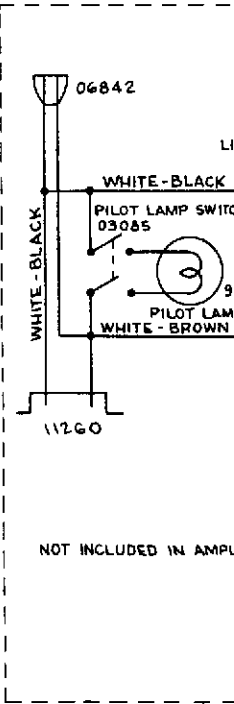
AMPLIFIER WIRING DIAGRAM  
FOR DESIGN 302 (MOD. D B E1) (09431)

DATE 2-14-57

SERVICE  
DATA

DRAWN *ael*  
APVD *LL*



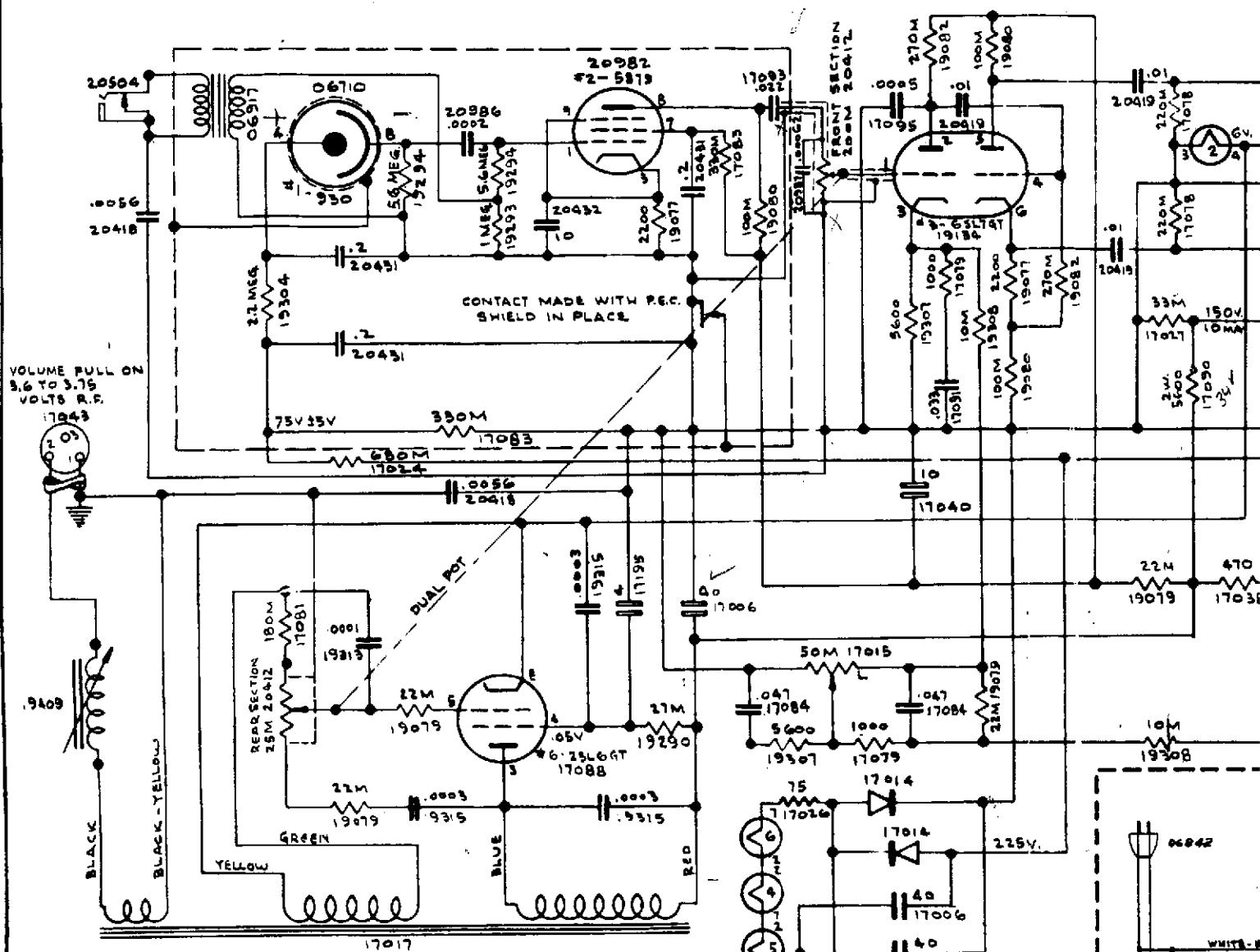




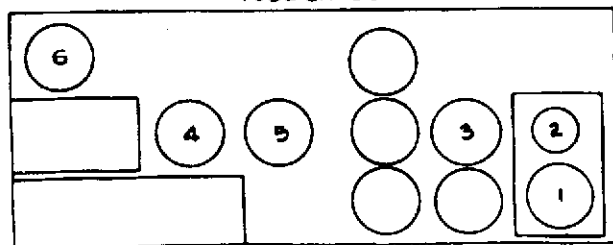




L-2

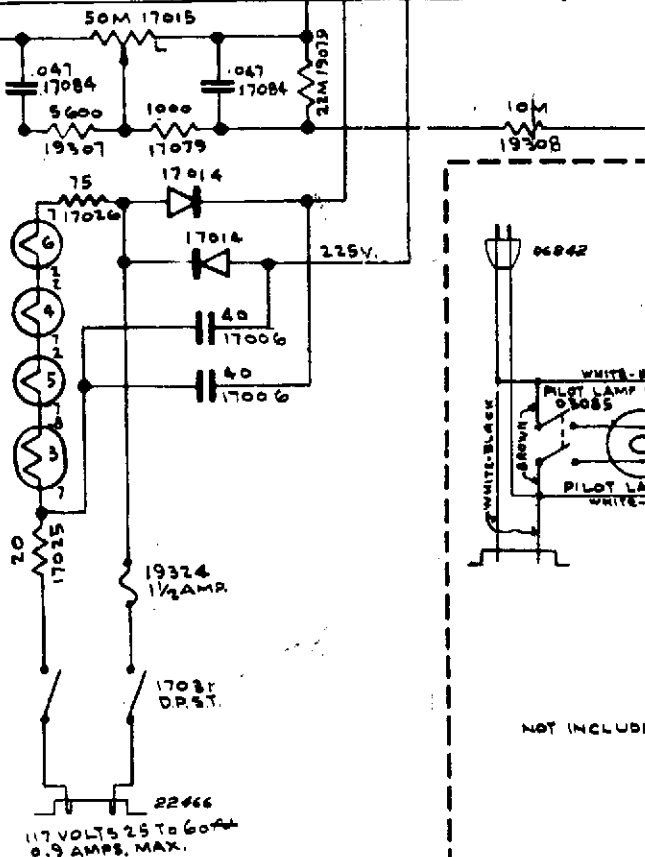


**TUBE LAYOUT**



WIRE COLOR CODE			
WHITE	GROUND	BROWN	SCREEN
YELLOW	CATHODE	BLACK	AC
RED	B+	WHITE & BLACK	B-
GREEN	GRID		
BLUE	PLATE		

ALL VOLTAGES MEASURED WITH METER  
WITH 11 MEGOHM INPUT.



**NOT INCLUDED**





**DRAWN**  
**APVD**



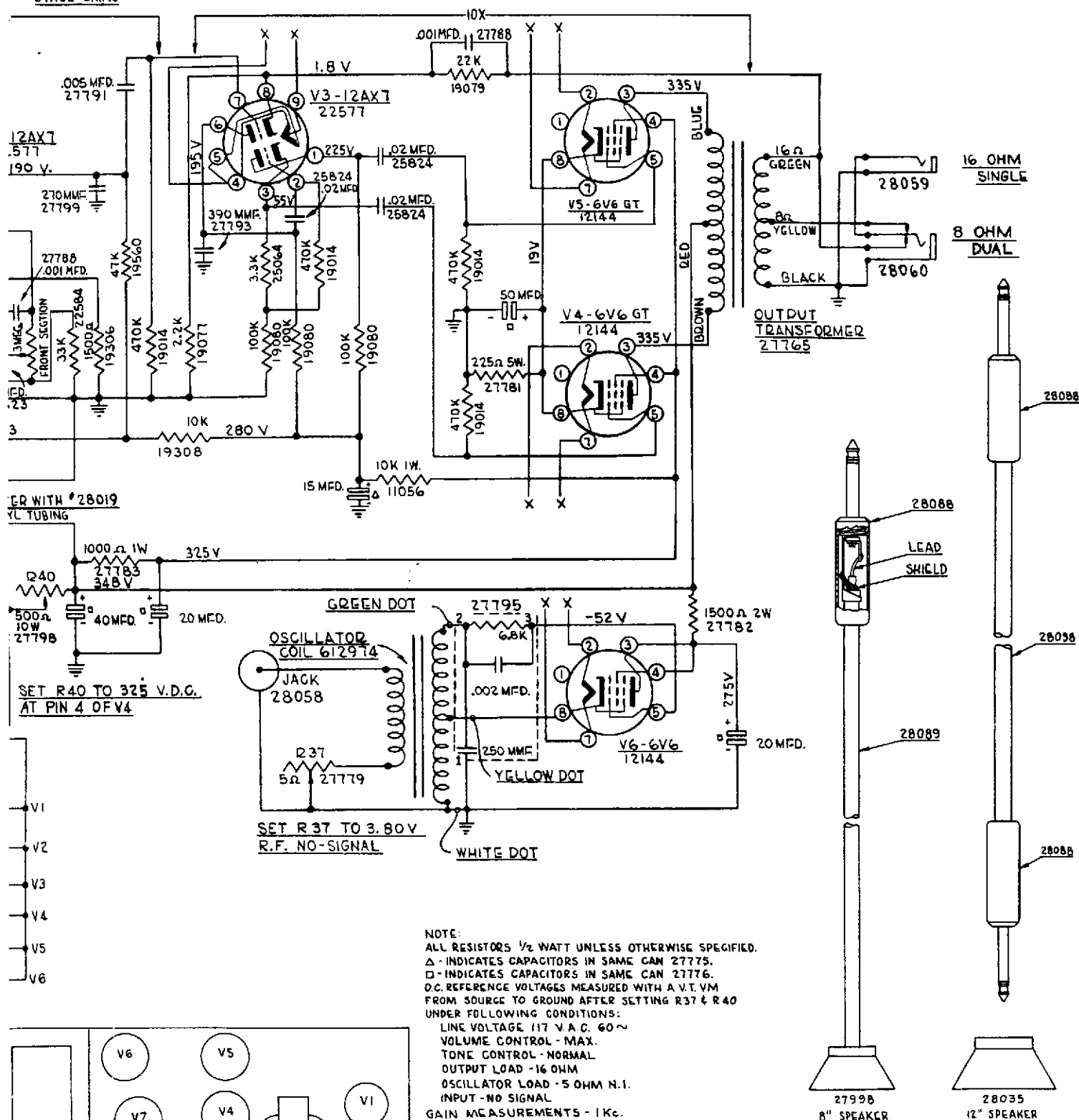
### STAGE GAINS

WIRE COLOR CODE		
GROUND	BLACK	CATHODE
FILAMENTS	BROWN	CONTROL GRIDS
B +	RED	PLATE
SCREEN GRIDS	ORANGE	AC



# M-1

STAGE GAINS



ER WITH #28019  
YL TUBING

SET R40 TO 325 V.D.C.  
AT PIN 4 OF V4

GREEN DOT

OSCILLATOR  
COIL 6129T4

JACK  
28058

SET R37 TO 3.80 V  
R.F. NO-SIGNAL

WHITE DOT

28088  
LEAD  
SHIELD

28089

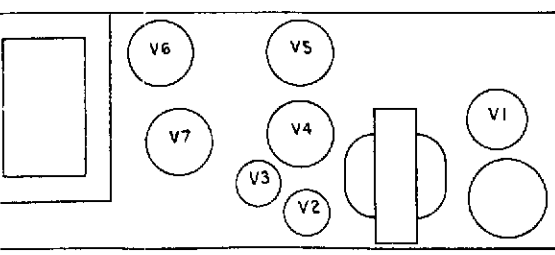
28098

28088

27998  
8" SPEAKER

28035  
12" SPEAKER

TUBE LAYOUT



WIRE COLOR CODE			
ROUND	BLACK	CATHODE	YELLOW
FLAMENTS	BROWN	CONTROL GRIDS	GREEN
+	RED	PLATE	BLUE
GREEN GRIDS	ORANGE	AC	GRAY

60 CYCLES

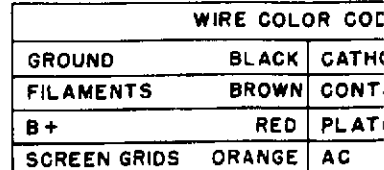
Bell & Howell Co. Chicago U.S.A.

15 W. AMPLIFIER WIRING DIAGRAM  
FOR DESIGNS 385 (08855)

DATE 11-10-55	SERVICE DATA	DRAWN <i>rel</i> APVD. <i>rel</i>
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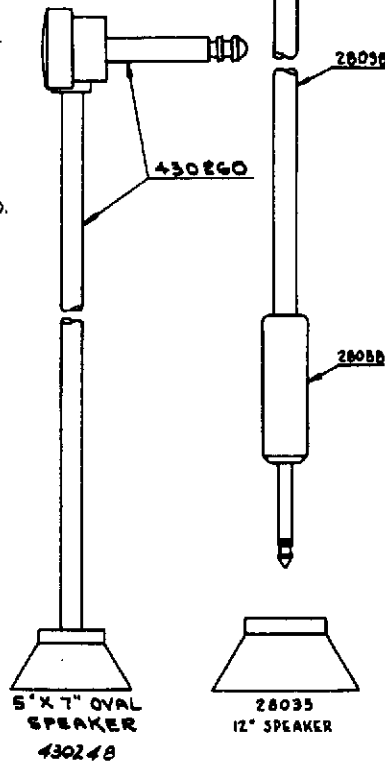


## STAGE GAINS



NOT INCLUDED IN AMPLIFIER CHASSIS





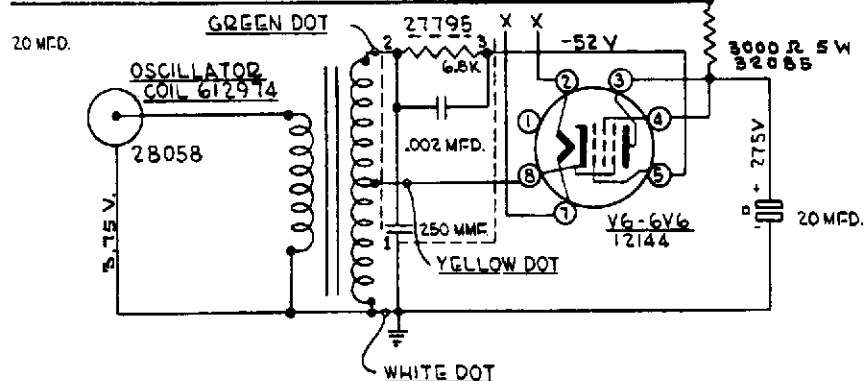
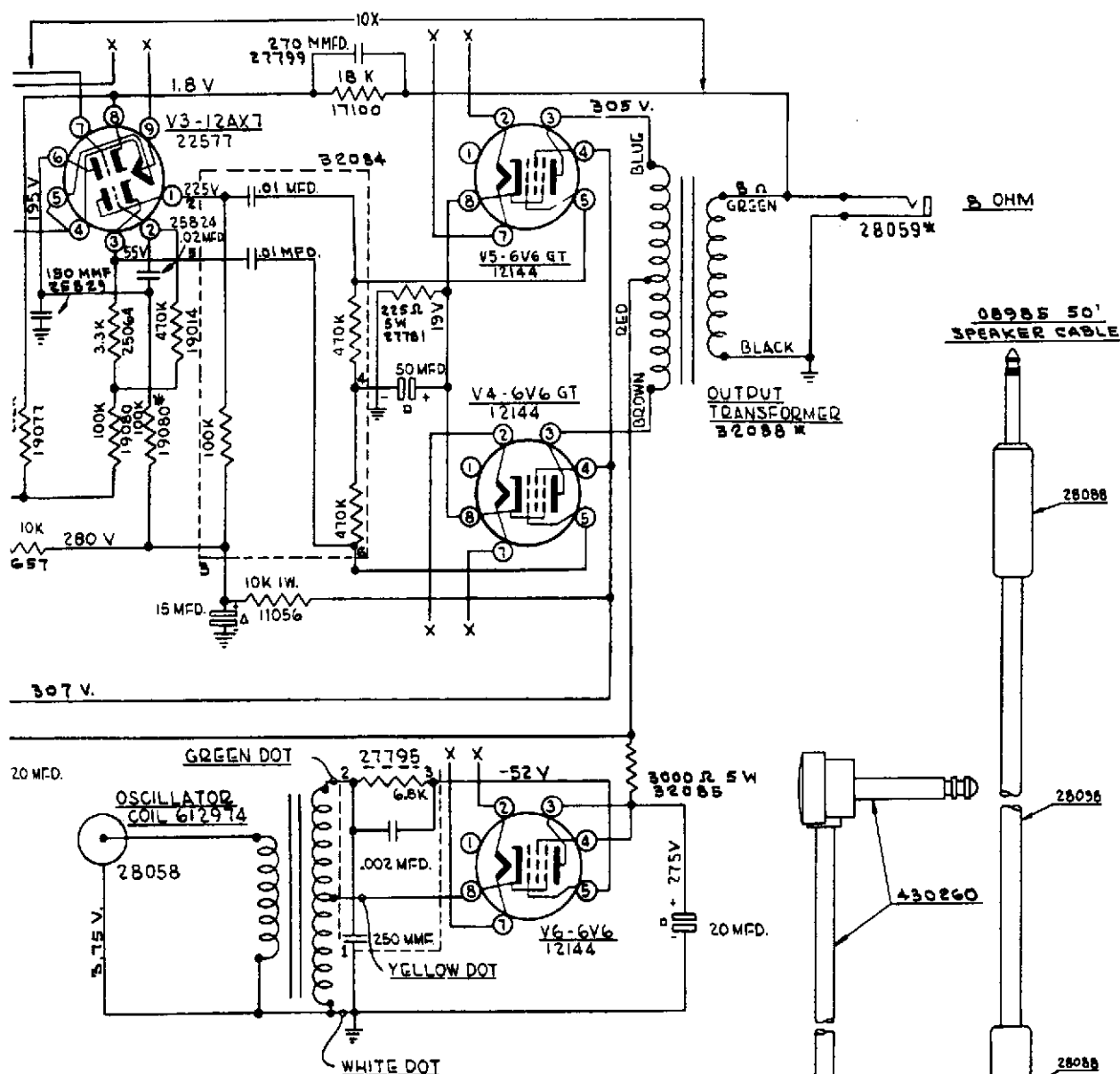
COLOR CODE		
ACK	CATHODE	YELLOW
ROWN	CONTROL GRIDS	GREEN
RED	PLATE	BLUE
NGE	AC	GRAY

Bell & Howell Co. Chicago U.S.A.		
15 W. AMPLIFIER WIRING DIAGRAM		
FOR DESIGNS 385-K & 399-K (08855-AA)		
DATE 3-26-59	SERVICE DATA	DRAWN R.Y.B. APVD. <i>RS</i>

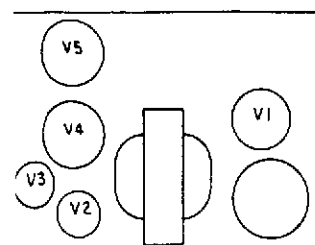


PROJ. WIRING  
DESIGNS 384-A & 398-A



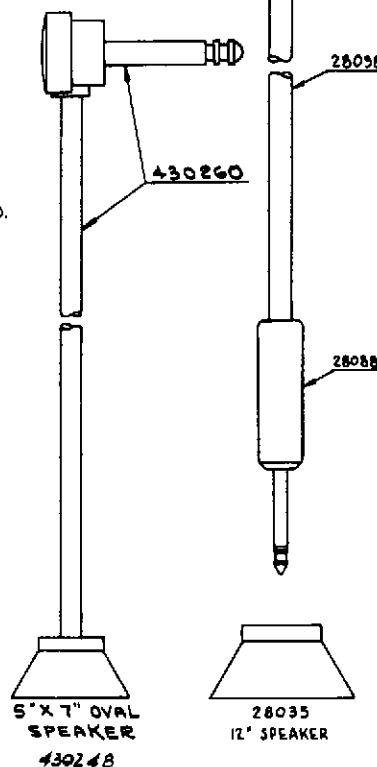


NOTE:  
ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SPECIFIED.  
Δ - INDICATES CAPACITORS IN SAME CAN 27775.  
□ - INDICATES CAPACITORS IN SAME CAN 27776.  
D.C. REFERENCE VOLTAGES MEASURED WITH A V.T. VM FROM SOURCE TO GROUND  
UNDER FOLLOWING CONDITIONS:  
LINE VOLTAGE 117 V.A.C. 60~  
VOLUME CONTROL - MAX.  
TONE CONTROL - NORMAL  
OUTPUT LOAD - 8 OHM  
OSCILLATOR LOAD - 5 OHM N.I.  
INPUT - NO SIGNAL  
GAIN MEASUREMENTS - 1 Kc.



LAYOUT

LOR CODE	
CATHODE	YELLOW
CONTROL GRIDS	GREEN
PLATE	BLUE
AC	GRAY



60 CYCLES

Bell & Howell Co. Chicago U.S.A.		
10 W. AMPLIFIER WIRING DIAGRAM		
FOR DESIGNS 384-A & 398-A (010214)		
DATE 1-26-59	SERVICE DATA	DRAWN K.V.B. APVD. KS