



*Richard  
Kineman*

**No. 344-C**

# THORDARSON

## TRANSMITTER GUIDE

**15¢**



**Thordarson Engineers Who Collaborated on This Guide**



**R. E. DAVY**  
Sales Engineer  
W9GKU

Designed custom-built radios as early as 1920. Then included short-wave receivers and amateur transmitters. Acquired license under call letters W9GKU in 1927. Was one of the pioneers in Class "B" modulation and cooperated with Thordarson engineers in designing and testing their first Class "B" modulation transformers. Joined Thordarson's technical staff in 1933 and assisted in the design and development of the present Thordarson line of transmitting components.

**WILFRED C. HOWE**  
Chief Engineer  
W9UVP

A licensed amateur with call letters W9UVP. His hobby in the amateur field is five meter work. Also confesses to another "Amateur" weakness in the photographic field.

Specializes in the development of high quality audio systems and components. Also, audio compensating and equalizing apparatus. Had the interesting experience of designing the 500 watt Class A audio system used in the Ford Building at the Chicago World's Fair of 1934.



**J. DOUGLAS FORTUNE**  
Sales Engineer for Amateur Field  
W9UVC

Started in radio in 1924 with Reinartz Receiver using a single UV-199. Built his first transmitter consisting of a test oscillator modulated by a pair of 45's. A licensed Amateur actively operating under the call of W9UVC.

Attended St. Joseph's College and studied electrical engineering at the Chicago Technical College. Engaged in laboratory and engineering work for several large radio manufacturers—among them Zenith, Steinite and Majestic—before joining Thordarson's technical staff.



**L. A. STINEMAN**  
Engineer  
W9EYU

Took up radio about 1921, as proud owner of a large green Duck Co. loose coupler and crystal detector. Later, after installing one of the original audiotron 2-filament detectors, heard some out-of-town sparks and decided to go on the air. Started in 1923 with call letters 8 BYL in Detroit with a 1/4" spark coil, with a top range of 2 1/2 miles. Operated various CW and phone transmitters in Chicago as 9EHY, later W9EYU. Also operated W9EYU in Lafayette, Indiana, while attending Purdue University. Spent one season after leaving school as operator at KDXT on the Great Lakes.



**LOUIS J. FOHR, JR.**  
Sales Engineer  
W9DCQ

First experience in radio on an old rejected Helix discarded from an old spark transformer. Later constructed a small receiver and transmitter with V.T. 12 tubes. Found D.X. fine business on 200 meters with 5 watt power, could work almost 100 miles if weather permitted.

Founder member of the Chicago Radiofone Club back in the early 20's. Helped construct the first 250 watt C.W. set at Synton and later a new high power modern rig at the University of Illinois.

Has had a wide experience in designing equipment and components for radio transmission including test equipment.



**A. D. MAYO, JR.**  
Engineer  
W4CBD

First Amateur call letters were 5DF, issued in 1924. Later 5AHU, 5AIY, W4ACU, W4CBD. Graduated from Alabama Polytech in 1933 where he was active in the Radio Club and the club station, W4AQ. This station was one of the oldest in the country and was formerly 5XA of early spark fame. Followed Ham Radio through its development—from a UV202, 5 watter with raw a.-c. on the plate to chemical rectifiers, master oscillator, p. a. arrangements, crystal control, phone and 1 KW input. Had designed special equipment such as ultra high frequency portable radiotelephone equipment, diathermy machines, and amateur equipment.







## FOREWORD

This guide is offered as a practical work-book to aid the builder and operator of amateur transmitters. It represents the effort, knowledge and experience of the Thordarson engineering staff, many of whom are active amateurs. The actual constructional information is supplemented by valuable data on the latest tubes, transformers and circuits. Much of this data has never before been published, especially the material on class B drivers and driver ratios. The circuits and tables cover the latest tubes and incorporate the most modern principles of engineering and design.

The material contained in the technical data section is of a fundamental nature and the principles involved will be as sound for use with later developments as they are for present equipment. For 43 years Thordarson has been a leader in the electrical industry, known the world over for the production of high quality transformers and as a source of dependable information. In keeping with the responsibility resulting from such a reputation, each circuit shown has been tried and tested. Such careful preparation means that you may

rely upon this manual to give you the finest available guidance in the construction of your transmitter.

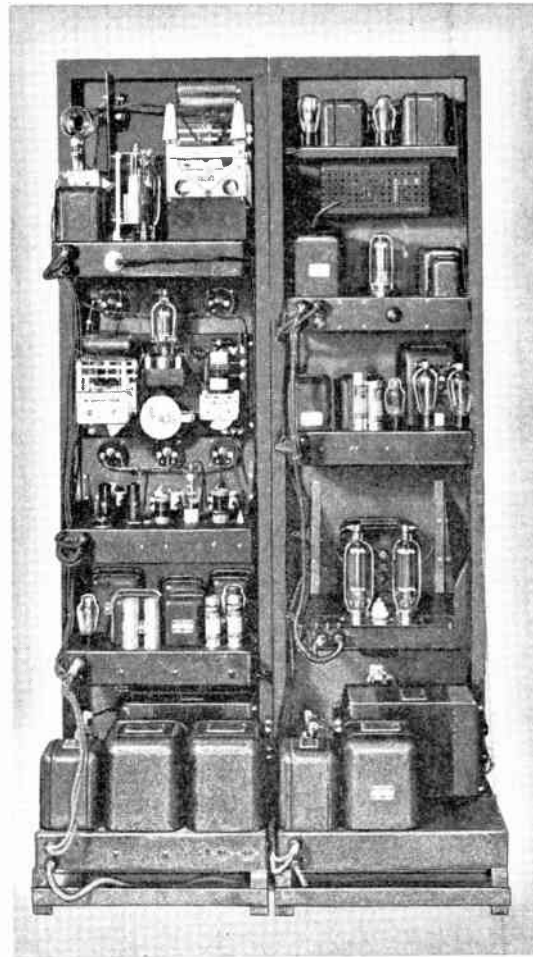
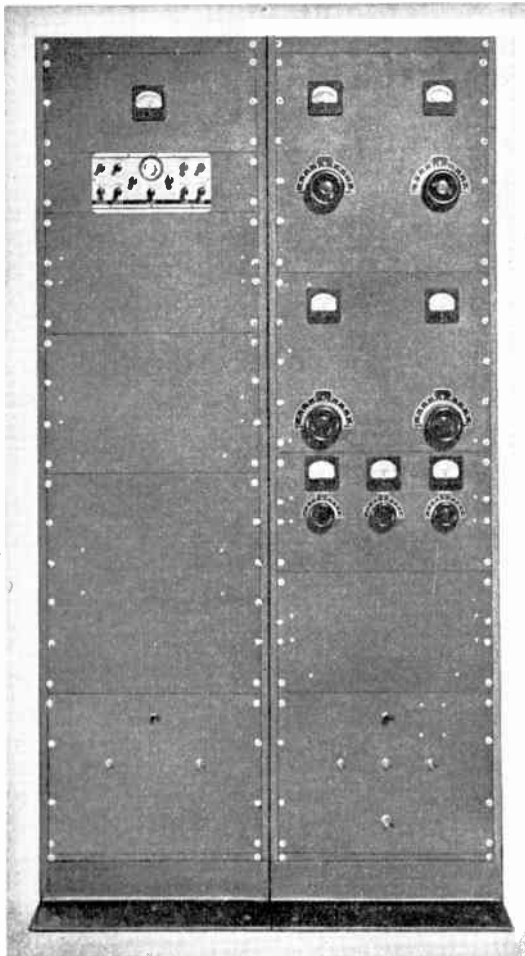
Transmitters are shown which range from a kilowatt down to the smallest and simplest model suitable for beginners.

A valuable feature of the guide is the convenience in the arrangement of the complete information pertaining to each transmitter. Starting with rack views of the transmitter and general information with relation to it, each transmitter description progresses through individual unit photographs, coil data, circuit diagram and parts list on immediately succeeding pages.

We are justly proud of this book and we offer it to you with the sincere wish that it will help you with your transmitter problems. If you have any problems or questions of a technical nature, do not hesitate to write our Engineering Department; the benefits of 43 years' experience in the transformer business are yours as part of the service which is offered to its customers by the Thordarson Electric Mfg. Company.

## TABLE OF CONTENTS

TRANSMITTERS		Page	
1000 watt transmitter .....		4	Class "B" Driving Power and Driver
500 watt transmitter .....		8	Transformer Ratio .....
400 watt transmitter .....		11	Overload of Modulator Tubes .....
250 watt transmitter .....		14	Class "A" Output Calculations .....
100 watt transmitter .....		17	Plate Circuit Regulation .....
Portable transmitter .....		20	Turns Ratio of Line to Class "B"
Beginners transmitter .....		21	Grid Transformers .....
400 watt transmitter .....		22	Bias Supply Circuits .....
600 watt transmitter .....	24-A		Matching Class "C" Loads .....
150 watt transmitter .....		25	Use of 6L6's as Drivers .....
100 watt transmitter .....		28	Determination of Correct Driver
5 and 10 meter transmitter .....		31	Transformer Ratio .....
			Driver and Modulator Combinations .....
			Multi-Match Modulation Transformer Ratios .....
			Oscilloscope Foundation Unit .....
			Speech Operation of Class "B" Modulators .....
			Revised FCC Regulations .....
TECHNICAL DATA			
Modulation Principles .....		34	
Class "B" Audio Output Calculations .....		34	



Here is a conservatively rated transmitter which is designed to handle the maximum allowable input of 1 kilowatt. The transmitter is built up in two racks, one containing the R.F. section with associated power supplies and the other the speech equipment, drivers, modulators, and necessary power equipment.

The exciter unit is built up on a separate chassis. Three stages are provided so that there is ample excitation on all bands. It may be found necessary to neutralize the 6L6 and the RK-39, especially if they are operated as straight buffers on the higher frequencies. These neutralizing condensers (NC-1, NC-2) may consist simply of a few turns of twisted wire. The RK-39 is link coupled to the T125 buffer; this stage should always be operated as a straight amplifier and all doubling should be done in the preceding low power stages. The buffer in turn is link coupled to the final stage, which consists of a pair of T-200's in push-pull. The plate voltage is 2500 volts and the plate current 400 M.A.; the grid current should be 125 M.A.

No pre-amplifier is incorporated in the transmitter proper. It is far more desirable, both from the standpoint of conveni-

ence and performance, to place the low level speech stages some distance from the transmitter. The impedance of the speech input is 500 ohms and the level approximately zero db. The first stage consists of a pair of 6F6's, triode connected, which provide ample grid swing for the 845's. The 845 drivers operate at 1250 volts, and the necessary bias is obtained from a resistor in the filament return. The 822 modulators operate at 2000 volts and provide ample power to modulate the 1 kilowatt input.

An important feature of high power equipment which has not been overlooked is the installation of an underload and two overload relays.

The underload relay is so connected that the class C current must be 250 M.A. before the modulator plate supply is turned on. Possible damage to the modulation transformer is avoided in the event that excitation to the final fails with a signal applied to the modulators. If the current of either the class C stage or the buffer should become excessive, the overload relay will automatically turn off all plate supplies. Another overload relay is installed in the modulator plate supply, how-

ever this relay controls only the modulators. In order to simplify operation, relays are also used to control the filaments and plate supplies. The wiring is so arranged that it is impossible to turn on the plate supplies without having the filament relay closed. This relay operation of both filament and plate supplies enables the transmitter to be controlled from the operating table simply by extending the light leads connected to the relay switches.

The correct bias for the 822 modulators is  $-67.5$ , and this is shown as battery bias in the diagram, although in the photograph an experimental bias supply is shown. This bias supply has not yet been fully developed and it is felt that it should be withheld until its performance is proven entirely satisfactory.

The pre-amplifier is shown on page 6. It is mounted in a metal cabinet and if remote control is desired the filament and plate relay switches may be mounted on this panel.

Extreme care should be taken in making adjustments on this transmitter; the voltages are dangerous and may easily cause a fatal shock.

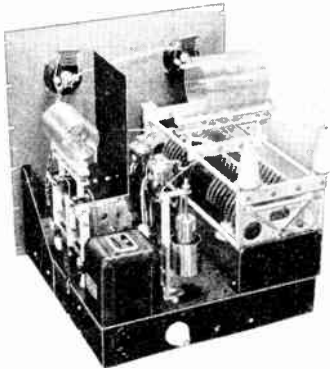




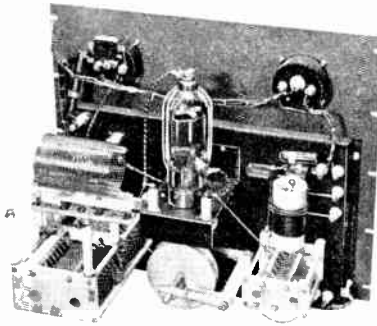
# 1000 Watt Transmitter

THORDARSON

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R. F. POWER AMPLIFIER  
Chassis: 17" x 17" x 3"; Panel: 19 1/4"



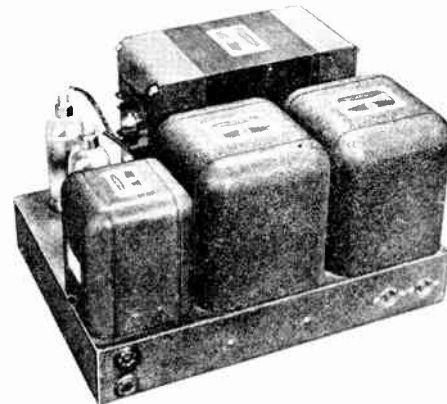
BUFFER  
Chassis: 17" x 10" x 1"; Panel: 15 3/4"



EXCITER UNIT  
Chassis: 17" x 10" x 3"; Panel: 10 1/2"



BIAS AND EXCITER POWER SUPPLIES  
Chassis: 17" x 13" x 3"; Panel: 10 1/2"



R.F. POWER SUPPLY  
Chassis: 20" x 15" x 3 1/4"; Panel: 14"



DRIVER AND SPEECH  
Chassis: 17" x 10" x 3"; Panel: 10 1/2"



DRIVER AND SPEECH POWER SUPPLY  
Chassis: 17" x 12" x 3"; Panel: 12 1/4"

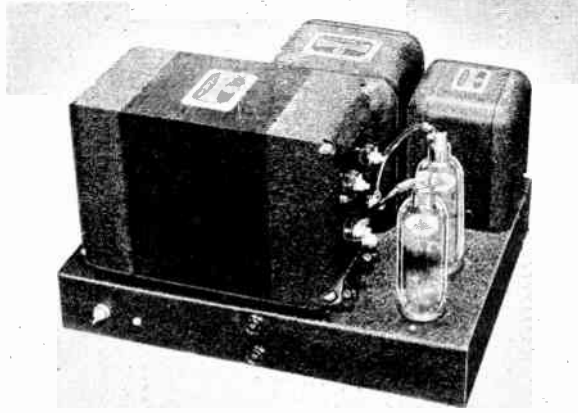


CLASS B MODULATOR  
Chassis: 13" w. x 13 1/2" d.; Panel: 19 1/4"

## TRANSMITTER GUIDE



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**MODULATOR POWER SUPPLY**  
Chassis: 20" x 15" x 3 1/4"; Panel: 14"

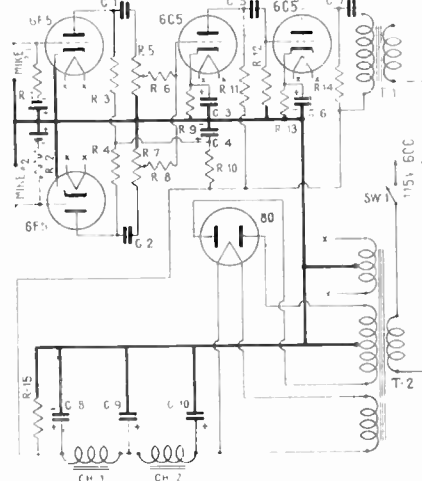


**PRE-AMPLIFIER CHASSIS AND ASSEMBLY**  
Chassis: 17" x 10" x 3"; Case: 19" x 13" x 8 3/4"

### COIL DATA

BAND	160	80	40	20	10
L1, L2, L3, L4	40T #18	26T #16	12T #16	8T #16	3T #16
L5, L6	36T #16 4 1/8" Diam.	34T #16 2 7/8" Diam.	22T #16 2 7/8" Diam.	16T #14 2 7/8" Diam.	4T #14 2 7/8" Diam.
L7	42T #14 5 1/8" Diam.	30T #10 4 1/8" Diam.	20T #10 3 1/4" Diam.	10T #10 3 1/4" Diam.	4T #10 3 1/4" Diam.
Link for L3, L4, L5, L6	4T #18 C.C.	3T #18 C.C.	2T #18 C.C.	2T #18 C.C.	2T #18 C.C.

L1, L2, L3 wound on 1 1/2" Diam. winding length 1 3/4". L4 wound on 1 3/4" Diam. winding length 2". Winding length of L5, L6, 4 1/2"; Winding length of L7, 6 1/2".



### PARTS LIST

- RESISTORS**
- R-1 50,000 ohms, 1 watt
  - R-2 200 ohms, 10 watts
  - R-3 10,000 ohms, 10 watts
  - R-4 200 ohms, 10 watts
  - R-5 10,000 ohms, 10 watts
  - R-6 50 ohms, 10 watts
  - R-7 5,000 ohms, 25 watts
  - R-8 2,000 ohms, 25 watts
  - R-9 2,000 ohms, 50 watts
  - R-10 10,000 ohms, 50 watts
  - R-11 1000 ohms, 75 watts
  - R-12 25,000 ohms, 50 watts
  - R-13 100,000 ohms 200 watts
  - R-14 100,000 ohms, 200 watts
  - R-15 50,000 ohms, 100 watts
  - R-16 500 ohm, 25 Watt T Pad
  - R-17 750 ohms, 10 watts
  - R-18 2000 ohms, 50 watts
- VARIABLE CONDENSERS**
- C-1 150 mmfd., Receiving type
  - C-2 \*260 mmfd., Receiving type
  - C-3 \*260 mmfd., Receiving type
  - C-4 150 mmfd., 3000 volt spacing
  - C-5 \*100 mmfd., 6000 volt spacing
  - C-6 \*200 mmfd., 3000 volt spacing
  - C-7 \*200 mmfd., 7500 volt spacing
- \*DUAL TYPE: CAPACITY AND VOLTAGE RATING PER SECTION**
- NC-1 See note in copy
  - NC-2 See note in copy
  - NC-3 12 mmfd., 8000 volt
  - NC-4 13 mmfd., 12,000 volt
  - NC-5 13 mmfd., 12,000 volt
- THORDARSON COMPONENTS TRANSFORMERS:**
- T-1 T-16F17
  - T-2 T-16F15

- T-3 T-11F51
  - T-4 T-15R60
  - T-5 T-16F11
  - T-6 T-15P11
  - T-7 T-11F54
  - T-8 T-15P21
  - T-9 T-11F54
  - T-10 T-15P21
  - T-11 T-16F09
  - T-12 T-15P15
  - T-13 T-15R03
  - T-14 T-16F16
  - T-15 T-11F51
  - T-16 T-15A67
  - T-17 T-15D76
  - T-18 T-68D19
  - T-19 T-11M78
- CHOKES**
- CH-1 T-15C36
  - CH-2 T-15C36
  - CH-3 T-15C45
  - CH-4 T-15C39
  - CH-5 T-15C48
  - CH-6 T-15C39
  - CH-7 T-15C45
  - CH-8 T-15C36
  - CH-9 T-15C36
  - CH-10 T-15C45
- RELAYS**
- Relay 1 S.P.S.T.
  - Relay 2 S.P.S.T.
  - Relay 3 Overload
  - Relay 4 Underload
  - Relay 5 Overload
- FIXED CONDENSERS**
- C-8 .001 mfd., 1000 volt mica
  - C-9 .001 mfd., 1000 volt mica
  - C-10 .001 mfd., 1000 volt mica
  - C-11 .0001 mfd., 1000 volt mica

- C-12 .001 mfd., 1000 volt mica
- C-13 .001 mfd., 1000 volt mica
- C-14 .0001 mfd., 1000 volt mica
- C-15 .001 mfd., 1000 volt mica
- C-16 .001 mfd., 1000 volt mica
- C-17 .001 mfd., 1000 volt mica
- C-18 .001 mfd., 1000 volt mica
- C-19 .001 mfd., 1000 volt mica
- C-20 .001 mfd., 1000 volt mica
- C-21 .001 mfd., 5000 volt mica
- C-22 .001 mfd., 1000 volt mica
- C-23 .001 mfd., 1000 volt mica
- C-24 .001 mfd., 1000 volt mica
- C-25 .001 mfd., 10,000 volt mica
- C-26 .001 mfd., 1000 volt mica
- C-27 .001 mfd., 1000 volt mica
- C-28 16 mfd., 450 volt Elect.
- C-29 2 mfd., 1000 volt
- C-30 2 mfd., 1000 volt
- C-31 2 mfd., 3000 volt

- C-32 2 mfd., 3000 volt
  - C-33 2 mfd., 3000 volt
  - C-34 2-mfd., 2000 volt
  - C-35 2 mfd., 2000 volt
  - C-36 8 mfd., 450 volt Elect.
  - C-37 8 mfd., 450 volt Elect.
  - C-38 .001 mfd., 1000 volt mica
- METERS**
- MA-1 0-100 M.A.
  - MA-2 0-150 M.A.
  - MA-3 0-150 M.A.
  - MA-4 0-100 M.A.
  - MA-5 0-500 M.A.
  - MA-6 0-250 M.A.
  - MA-7 0-750 M.A.
  - MA-8 0-750 M.A.
- R. F. CHOKES**
- RFC-1, 2, 3, 5 125 M.A.
  - RFC-4, 6 600 M.A.

### PRE-AMPLIFIER PARTS LIST

- CONDENSERS**
- C-1 .1 Mfd. 400 volt paper
  - C-2 .1 Mfd. 400 volt paper
  - C-3 10 Mfd. 25 volt Elect.
  - C-4 8 Mfd. 450 volt Elect.
  - C-5 .1 Mfd. 400 volt paper
  - C-6 10 Mfd. 25 volt Elect.
  - C-7 .1 Mfd. 400 volt paper
  - C-8 8 Mfd. 450 volt Elect.
  - C-9 8 Mfd. 450 volt Elect.
  - C-10 8 Mfd. 450 volt Elect.
- RESISTORS**
- R-1 5 Meg. 1/4 watt
  - R-2 5 Meg. 1/4 watt
  - R-3 100,000 ohms 1 watt
  - R-4 100,000 ohms 1 watt
  - R-5 500,000 ohm Vol. Control

- R-6 500,000 ohm 1/2 watt
  - R-7 500,000 ohm Vol. Control
  - R-8 500,000 ohm 1/2 watt
  - R-9 2000 ohm 1 watt
  - R-10 20,000 ohm 1 watt
  - R-11 50,000 ohm 1 watt
  - R-12 250,000 ohm 1 watt
  - R-13 2000 ohm 1 watt
  - R-14 50,000 ohm 1 watt
  - R-15 10,000 ohm 25 watt
- TRANSFORMERS**
- T-1 T-15A71
  - T-2 T-70R78
- CHOKES**
- CH-1 T-13C26
  - CH-2 T-13C26

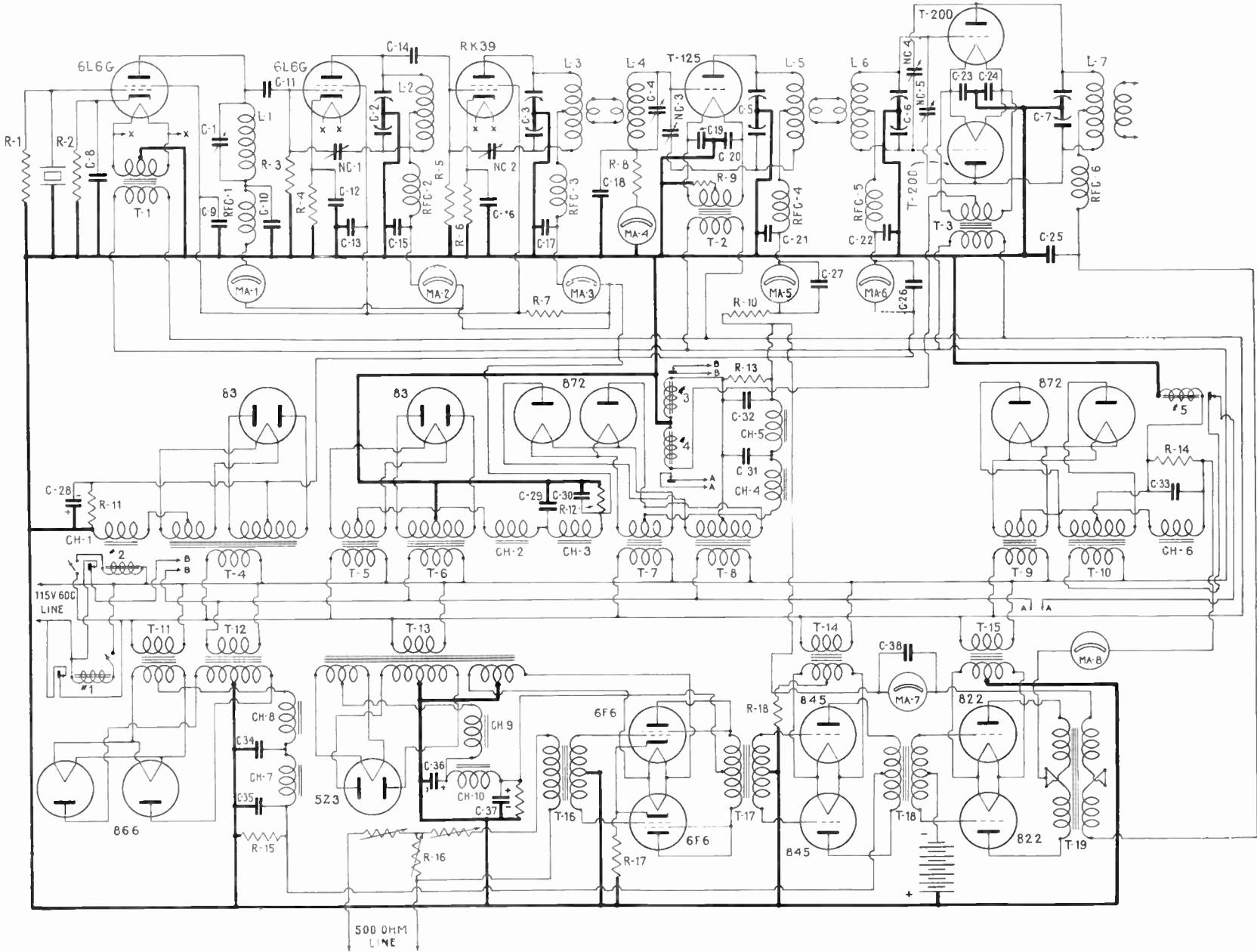


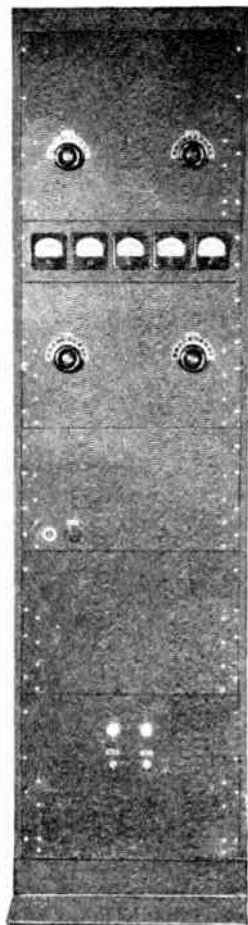


# 1000 Watt Transmitter

THORARSON

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← R. F. Power Amplifier →

← Exciter Unit →

← Speech Amplifier and Driver →

← Modulator and Low Voltage Power Supply →

← High Voltage Power Supply →



This is an extremely simple and efficient transmitter employing a minimum number of tubes and tuned circuits. The transmitter utilizes the Pierce crystal oscillator in which a tuned tank circuit is unnecessary. The 6L6 operates either as a straight buffer or as a frequency multiplier. Whenever harmonic operation is desired the 6L6 should be operated as a frequency multiplier and the 804 as a straight buffer. It was found necessary to neutralize the 6L6 not because of oscillation but due to the sharp increase in crystal current which occurred whenever the 6L6 was operated as a straight amplifier. However, neutralization is not necessary if the 6L6 is used as a doubler. This neutralizing condenser may consist of two pieces of twisted wire.

Only two power supplies are used for the entire transmitter: a 1250 volt unit supplies the final, the buffer, and the class

B modulators; and the 400 volt supply serves the balance of the transmitter. Whenever a class B modulator and an R.F. amplifier are operated from a common power supply an extra filter choke and condenser should be used between the point from which the modulator plate supply is taken and the R.F. supply. This extra filter is necessary to smooth out the variations which are caused in the power supply by the class B modulators. This choke and condenser also provide extra filtering for the R.F. The single section filter is sufficient for the class B modulator, since any ripple is effectively balanced out in the push-pull circuit. A large condenser should be used at the modulator supply in order to supply peak currents of short duration.

Since the output of the oscillator is rich in harmonics, care should be taken that

the 6L6 tank circuit is tuned to the desired harmonic. A calibrated absorption type wavemeter is extremely helpful in determining whether or not the tank is tuned to the right frequency. At no time should the plate voltage on the 6F6 be greater than 200 volts, or the screen voltage greater than 100 volts. The screen voltage on the 6L6 should be limited to 250 volts, because higher values cause the plate current to climb. There is no bias supply of any kind necessary since the 805's and the ZB-120's are zero bias types and the necessary bias for the 804 is obtained from a resistor in the grid circuit. The link coupling between the 804 and the final should be adjusted until the final grid current is 120 M.A. under load. The secondaries of the T-64M24 modulation transformer should be connected in parallel in order to properly match the load.

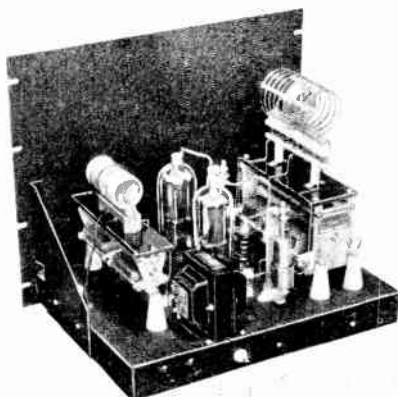




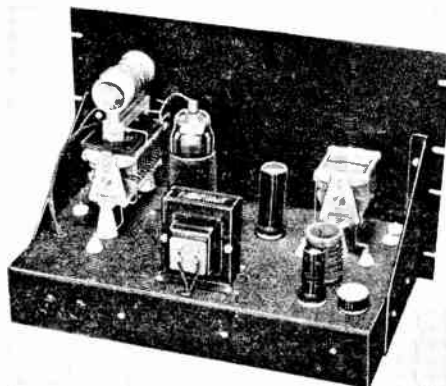
# 500 Watt Transmitter



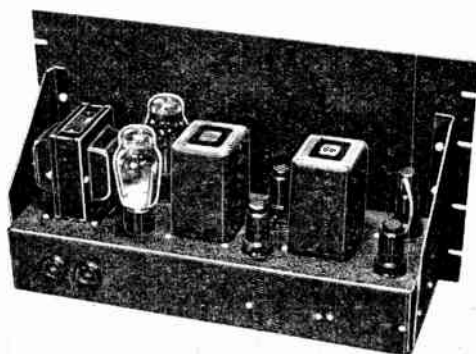
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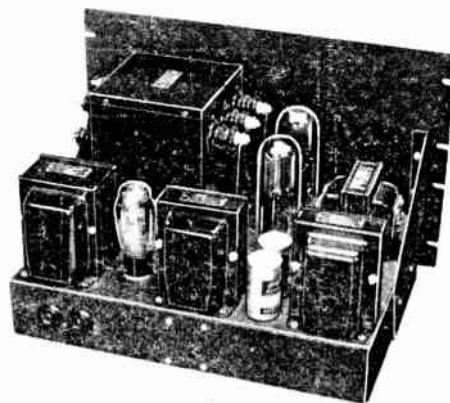
**POWER AMPLIFIER**  
Chassis: 17" x 12" x 2"; Panel: 15<sup>3</sup>/<sub>4</sub>"



**EXCITER UNIT**  
Chassis: 17" x 10" x 3"; Panel: 12<sup>1</sup>/<sub>4</sub>"



**SPEECH AMPLIFIER AND DRIVER**  
Chassis: 17" x 6" x 3"; Panel: 10<sup>1</sup>/<sub>2</sub>"



**MODULATOR AND LOW VOLTAGE POWER SUPPLY**  
Chassis: 17" x 12" x 3"; Panel: 12<sup>1</sup>/<sub>4</sub>"

COIL DATA					
Band	160	80	40	20	10
L1	40T #18	26T #16	12T #16	8T #16	3T #16
L2 and L3	40T #18	26T #16	12T #16	8T #16	3T #16
L4	36T #16 4 <sup>1</sup> / <sub>8</sub> " Diam.	34T #16 2 <sup>7</sup> / <sub>8</sub> " Diam.	22T #16 2 <sup>7</sup> / <sub>8</sub> " Diam.	16T #14 2 <sup>7</sup> / <sub>8</sub> " Diam.	4T #14 2 <sup>7</sup> / <sub>8</sub> " Diam.
Link for L2 and L3	4T #18 C. C.	3T #18 C. C.	2T #18 C. C.	2T #18 C. C.	2T #18 C. C.

L1 wound on 1<sup>1</sup>/<sub>2</sub>" diameter winding length 1<sup>3</sup>/<sub>4</sub>". Center tapped. L2 and L3 wound on 1<sup>3</sup>/<sub>4</sub>" diameter winding length 2". L3 Center tapped. L4 winding length 4<sup>1</sup>/<sub>2</sub>".

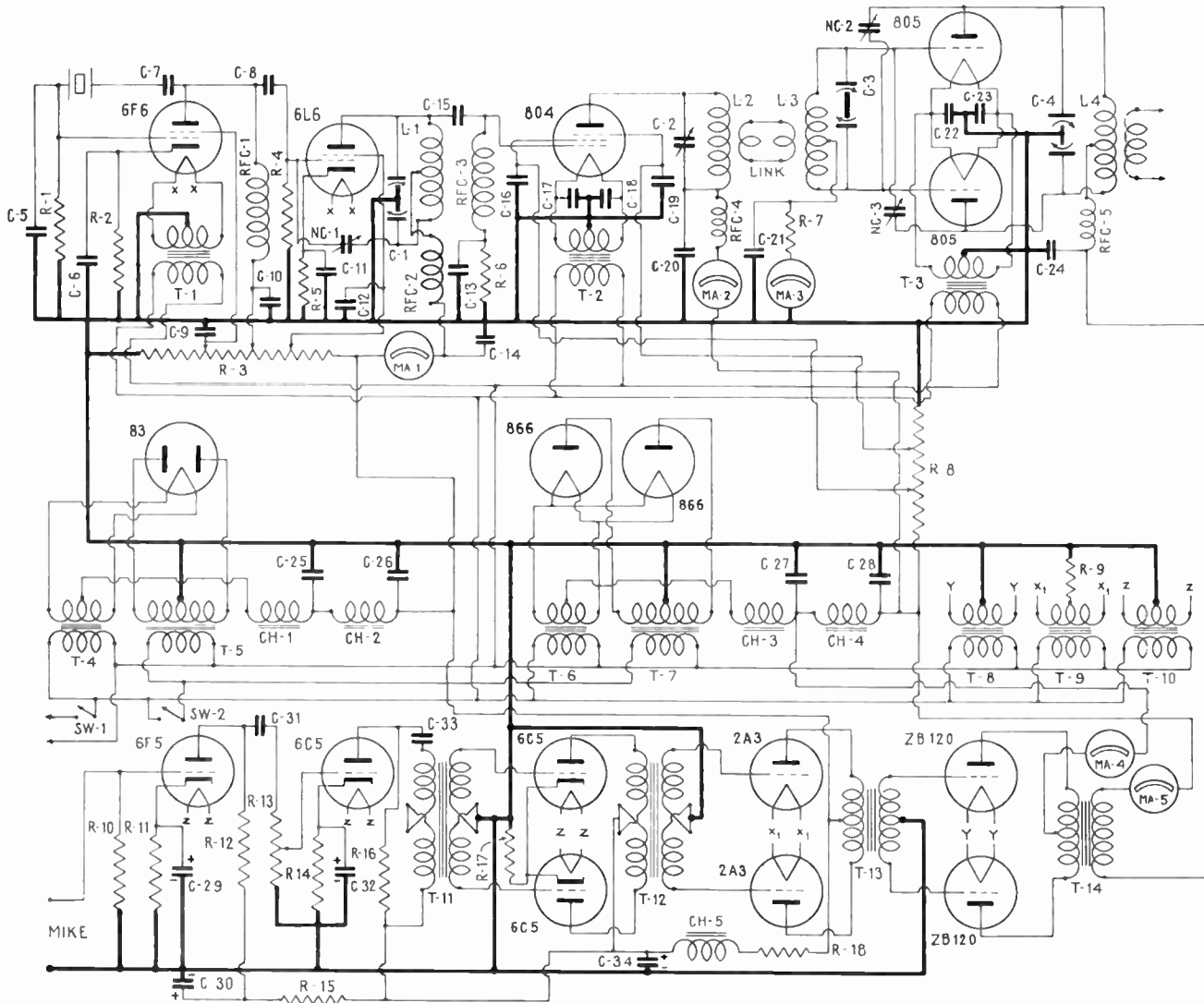


**HIGH VOLTAGE POWER SUPPLY**  
Chassis: 17" x 14" x 2"; Panel: 14"

## TRANSMITTER GUIDE



(Continued)



**PARTS LIST**

- RESISTORS**
- R-1 50,000 ohms, 10 watt
  - R-2 250 ohms, 10 watt
  - R-3 25,000 ohms, 50 watt, Var.
  - R-4 50,000 ohms, 10 watt
  - R-5 100 ohms, 10 watt
  - R-6 15,000 ohms, 10 watt
  - R-7 1,250 ohms, 50 watt
  - R-8 50,000 ohms, 100 watt, Var.
  - R-9 750 ohms, 10 watt
  - R-10 5 MEG. 1/4 watt
  - R-11 2,250 ohms, 1 watt
  - R-12 250,000 ohms, 1 watt
  - R-13 500,000 ohm, Vol. Control
  - R-14 2,000 ohms, 1 watt
  - R-15 20,000 ohms, 1 watt
  - R-16 50,000 ohms, 1 watt
  - R-17 500 ohms, 1 watt
  - R-18 5,000 ohms, 10 watt

- VARIABLE CONDENSERS**
- C-1 \*100 mmfd., 1,000 volt spacing
  - C-2 100 mmfd., 4,500 volt spacing

- C-3 \*200 mmfd., 2,000 volt spacing
  - C-4 \*200 mmfd., 3,000 volt spacing
- \*DUAL TYPE: CAPACITY AND VOLTAGE RATING PER SECTION**
- NC-1 See note in copy
  - NC-2 12 mmfd., 4,500 volt spacing
  - NC-3 12 mmfd., 4,500 volt spacing

- THORDARSON COMPONENTS**
- Transformers:**
- T-1 T-61F85
  - T-2 T-64F35
  - T-3 T-64F14
  - T-4 T-63F99
  - T-5 T-84P60
  - T-6 T-64F33
  - T-7 T-70P33
  - T-8 T-64F14
  - T-9 T-54F69
  - T-10 T-61F85
  - T-11 T-90A04
  - T-12 T-90A05
- Chokes:**
- CH-1 T-75C51
  - CH-2 T-75C51
  - CH-3 T-72C16
  - CH-4 T-64C10
  - CH-5 T-74C30

- T-13 T-75D10
  - T-14 T-64M24
- FIXED CONDENSERS**
- C-5 .00015 MFD., 1,000 volt mica
  - C-6 .01 MFD., 1,000 volt mica
  - C-7 .01 MFD., 1,000 volt mica
  - C-8 .01 MFD., 1,000 volt mica
  - C-9 .001 MFD., 1,000 volt mica
  - C-10 .001 MFD., 1,000 volt mica
  - C-11 .001 MFD., 1,000 volt mica
  - C-12 .001 MFD., 1,000 volt mica
  - C-13 .0001 MFD., 1,000 volt mica
  - C-14 .001 MFD., 1,000 volt mica
  - C-15 .0001 MFD., 1,000 volt mica
  - C-16 .001 MFD., 1,000 volt mica
  - C-17 .002 MFD., 1,000 volt mica
  - C-18 .002 MFD., 1,000 volt mica
  - C-19 .001 MFD., 1,000 volt mica
  - C-20 .001 MFD., 5,000 volt mica
  - C-21 .0001 MFD., 1,000 volt mica
  - C-22 .006 MFD., 1,000 volt mica
  - C-23 .006 MFD., 1,000 volt mica
  - C-24 .001 MFD., 5,000 volt mica

- C-25 2 MFD., 600 volt
- C-26 2 MFD., 600 volt
- C-27 2 MFD., 2,000 volt
- C-28 2 MFD., 2,000 volt
- C-29 10 MFD., 25 volts Elect.
- C-30 8 MFD., 450 volts Elect.
- C-31 .1 MFD., 400 volt paper
- C-32 10 MFD., 25 volt Elect.
- C-33 .1 MFD., 400 volt paper
- C-34 8 MFD., 450 volt Elect.

- METERS**
- MA-1 150 M.A.
  - MA-2 250 M.A.
  - MA-3 150 M.A.
  - MA-4 500 M.A.
  - MA-5 750 M.A.

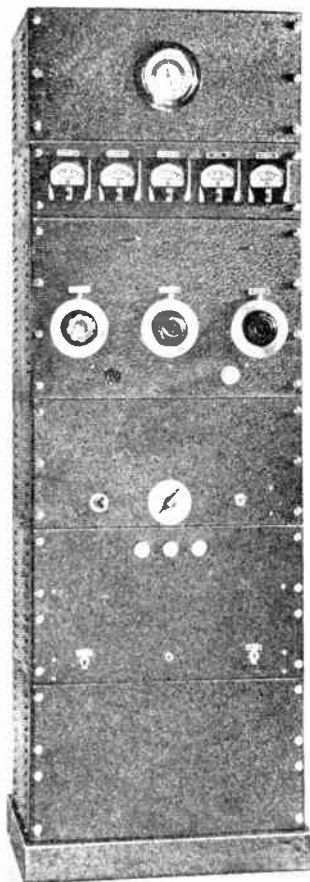
- R.F. CHOKES**
- RFC-1 125 M.A.
  - RFC-2 125 M.A.
  - RFC-3 125 M.A.
  - RFC-4 125 M.A.
  - RFC-5 660 M.A.





# 400 Watt Transmitter

THORDARSON



R. F. Unit

Speech Amplifier  
and Driver

Class B Modulator  
and Low Voltage Power Supply

High Voltage  
Power Supply



Photos courtesy of Popular Mechanics Magazine

The compact construction of this transmitter will lend itself to those conditions where operating space is at a premium, and where neat appearance and attractiveness are important features. Although small in size, the power input is conservatively rated at 400 watts, and an additional panel is provided for the addition of extra equipment. The transmitter as originally designed was intended for 10 and 20 meter operation; however, efficient operation on other bands may be obtained simply by changing coils.

A 40 meter crystal is recommended for both 20 and 10 meters and in both cases the 807 doubler tank is tuned to 20 meters; the RK-20 is used as a doubler for 10 meters only. Since sufficient final grid current was obtained with capacity coupling, it was deemed unnecessary to use link coupling which, due to the small size of the R.F. unit would tend to complicate the layout.

The crystal oscillator utilizes the Pierce circuit. If this transmitter is used on bands other than 20 and 10 so that the 807 tank is tuned to the crystal frequency, the 807 should be neutralized to reduce the crystal current at resonance. The neutralizing voltage may be obtained from a tapped coil or by means of a split stator condenser. The latter method is recommended since reneutralizing is unnecessary in changing bands. However, even with split stator, especially if the tube has a high plate to cathode capacity, it is sometimes necessary to reneutralize. This is noticeable if the setting of the split stator is different for different bands. Complete neutralization for any setting of the tank condenser may be obtained by placing a small variable condenser across the half of the split stator unit opposite the plate connection. This additional condenser compensates for the unbalance caused by the plate to filament capacity of the tube.

When capacity coupling is used, the additional grid to filament capacity of the following tube must be compensated for also.

Two power supplies are used for the entire transmitter, this further tends toward compactness. The 1250 volt supply handles the RK-20 buffer, and the T-55 final stage, as well as the 203Z modulators. The 400 volt unit supplies the 6F6 oscillator, the 807, and the speech amplifier. The driver transformer is a T-15D78 with a ratio of 3.8:1. The modulation transformer is a T-11M77. The correct connections are as follows:

For the primary: The modulator plates connect to No. 2 and No. 5; B+ connects to No. 3 and No. 4.

For the secondary: No 7 and No. 11 are joined, also No. 8 and No. 12; the secondary load connects to No. 7 and No. 8.



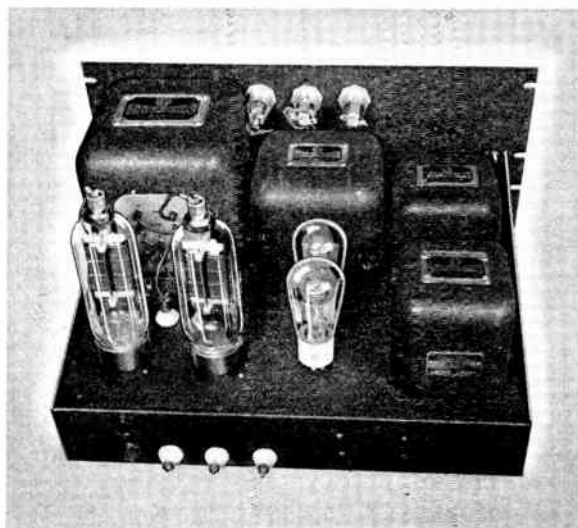
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**R. F. UNIT**  
Chassis: 17" x 13" x 3"; Panel: 12 1/4"



**SPEECH AMPLIFIER AND DRIVER**  
Chassis: 15" x 7 1/2" x 3"; Panel: 8 3/4"



**CLASS B MODULATOR AND LOW VOLTAGE POWER SUPPLY**  
Chassis: 17" x 13" x 3"; Panel: 10 1/2"



**HIGH VOLTAGE POWER SUPPLY**  
Chassis: 20 1/4" x 15 3/4" x 2 1/2"; Panel: 10 1/2"

COIL DATA		
BAND	20	10
L1	6T #10	—
L2	16T #14	4T #14
L3	10T #10	4T #10

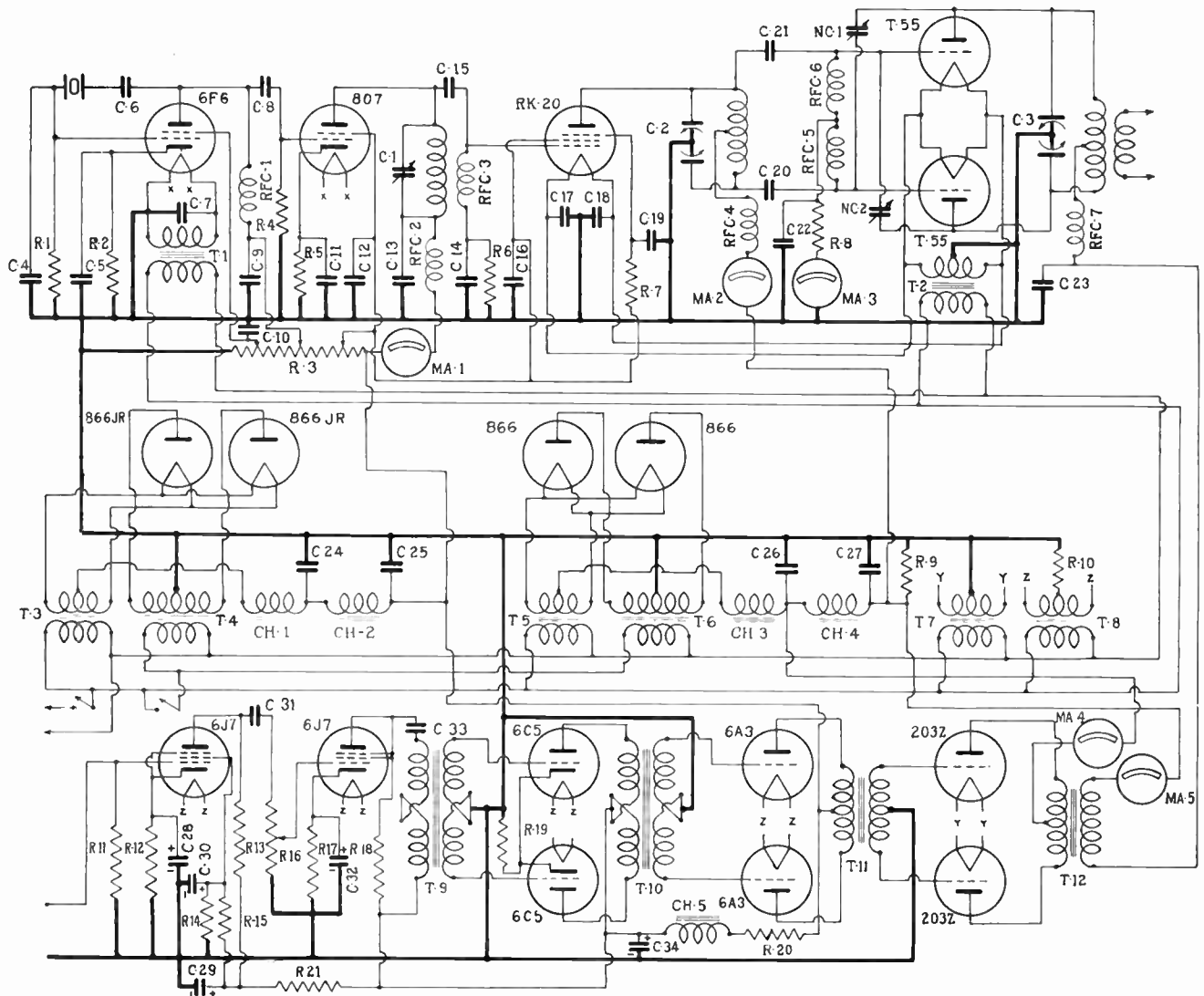
L1 wound on 1 1/2" diameter winding length 1 3/4". L2 wound on 2 7/8" diameter winding length 4 1/2". L3 wound on 3 1/4" diameter winding length 6 1/2".



# 400 Watt Transmitter

THORDARSON

(Continued)



## PARTS LIST

**RESISTORS**

R-1 50,000 ohms, 10 watts  
 R-2 250 ohms, 10 watts  
 R-3 25,000 ohms, 50 watts  
 R-4 50,000 ohms, 10 watts  
 R-5 100 ohms, 10 watts  
 R-6 15,000 ohms, 10 watts  
 R-7 50,000 ohms, 10 watts  
 R-8 5,000 ohms, 50 watts  
 R-9 50,000 ohms, 100 watts  
 R-10 750 ohms, 10 watts  
 R-11 5 MEG. 1/4 watt  
 R-12 2,250 ohms, 1 watt  
 R-13 250,000 ohms, 1 watt  
 R-14 20,000 ohms, 1 watt  
 R-15 100,000 ohms, 1 watt  
 R-16 500,000 ohms, vol. control  
 R-17 2,250 ohms, 1 watt  
 R-18 50,000 ohms, 1 watt  
 R-19 500 ohms, 1 watt  
 R-20 5,000 ohms, 10 watts  
 R-21 20,000 ohms, 1 watt

**VARIABLE CONDENSERS**

C-1 100 mmfd., 1,000 volt spacing  
 C-2 \*250 mmfd., 1,000 volt spacing  
 C-3 \*50 mmfd., 7,000 volt spacing  
 NC-1 NC-2\* 8 mmfd., 5,000 volt spacing

\*DUAL TYPE; CAPACITY AND VOLTAGE RATING PER SECTION

### THORDARSON COMPONENTS

Transformers:

T-1 T-16F17  
 T-2 T-16F14  
 T-3 T-16F08  
 T-4 T-15P11  
 T-5 T-16F10  
 T-6 T-15P16  
 T-7 T-16F16  
 T-8 T-16F17  
 T-9 T-15A74  
 T-10 T-15A75  
 T-11 T-15D77  
 T-12 T-11M77

Chokes:

CH-1 T-15C36  
 CH-2 T-15C45  
 CH-3 T-15C39  
 CH-4 T-15C48  
 CH-5 T-74C30

### METERS

MA-1 150 M.A.  
 MA-2 250 M.A.  
 MA-3 150 M.A.  
 MA-4 500 M.A.  
 MA-5 750 M.A.

### R.F. CHOKES

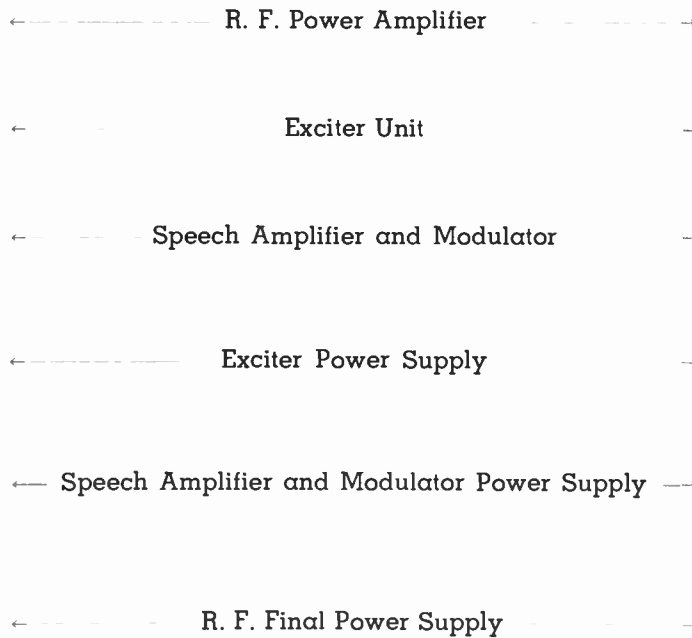
RFC-1 125 M.A.  
 RFC-2 125 M.A.  
 RFC-3 125 M.A.  
 RFC-4 125 M.A.  
 RFC-5 125 M.A.  
 RFC-6 125 M.A.  
 RFC-7 600 M.A.

### FIXED CONDENSERS

C-4 00015 MFD., 1000 volt mica  
 C-5 .01 MFD., 1000 volt mica  
 C-6 .01 MFD., 1000 volt mica  
 C-7 .001 MFD., 1000 volt mica  
 C-8 .01 MFD., 1000 volt mica  
 C-9 .001 MFD., 1000 volt mica  
 C-10 .001 MFD., 1000 volt mica

C-11 .001 MFD., 1000 volt mica  
 C-12 .001 MFD., 1000 volt mica  
 C-13 .001 MFD., 1000 volt mica  
 C-14 .0001 MFD., 1000 volt mica  
 C-15 .0001 MFD., 1000 volt mica  
 C-16 .001 MFD., 1000 volt mica  
 C-17 .006 MFD., 1000 volt mica  
 C-18 .006 MFD., 1000 volt mica  
 C-19 .001 MFD., 1000 volt mica  
 C-20 .0001 MFD., 1000 volt mica  
 C-21 .0001 MFD., 1000 volt mica  
 C-22 .0001 MFD., 1000 volt mica  
 C-23 .001 MFD., 5000 volt mica  
 C-24 2 MFD., 600 volts  
 C-25 2 MFD., 600 volts  
 C-26 2 MFD., 2000 volts  
 C-27 2 MFD., 2000 volts  
 C-28 10 MFD., 25 volts Elect.  
 C-29 8 MFD., 450 volts Elect.  
 C-30 8 MFD., 200 volts Elect.  
 C-31 .1 MFD., 400 volts Paper  
 C-32 10 MFD., 25 volts Elect.  
 C-33 .1 MFD., 400 volts Paper  
 C-34 8 MFD., 450 volts Elect.





The simple straightforward design of this transmitter will appeal to both newcomer and experienced amateur. The entire exciter unit, consisting of a 6L6 oscillator, 6L6 buffer-doubler, and RK-39 amplifier, is operated from a single 400 volt power supply. A separate 1250 volt power supply is used for the 250 watt amplifier stage which is a single Eimac 100TH tube.

The modulators are four 6L6's operated in push-pull parallel and these furnish ample power for complete modulation. The R.F. chokes shown in the plate leads of these tubes are made by winding 20 turns of No. 14 enamel wire around a pencil size form. After the coils have been wound they are slipped off the form and are self-supporting. These chokes eliminate any possibility of parasitic oscillations.

The neutralizing condensers NC-1, NC-2 consist of a few turns of well-insulated wire. There is no available condenser on the market with a sufficiently low value of minimum capacity. Once the tubes have been neutralized, preferably on the higher frequencies, the twisted wire may be secured by means of a piece of sealing wax, and the stages need not be re-neutralized in changing bands.

Fixed bias is used on the 6L6 modulators. This bias is developed across R-24 and is not affected by the fluctuating plate current. A separate supply, using two 83's, supplies plate power to the 6L6's. R-25, R-26, R-27, and R-28 are necessary to equalize the current through the 83's. If these resistors are not used, the total current will be taken by either one of the two plates. This precaution should be observed whenever two mercury vapor rectifier tubes are operated in parallel. A separate power supply is used to provide screen voltage to the 6L6's, as well as plate voltage to the drivers and speech

amplifier. Care should be taken that the negative terminal of C-31 and C-32 is insulated from ground and that the positive lug of C-33 is grounded. Two triode connected 6F6s in push-pull provide ample driving power for the 6L6's. The correct ratio of the T-15D79 is 6:1, total primary to one-half the secondary. The connections for the T-11M76 are as follows:

For the primary: The 6L6 plates are connected to terminals No. 1 and No. 6; B+ is connected to No. 2 and No. 5.

For the secondary: No. 8 and No. 11 are joined; the class C load is connected to No. 7 and No. 12.

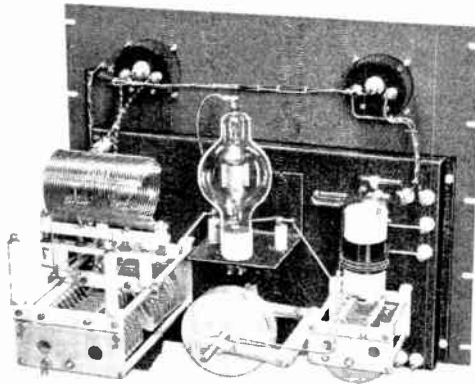
COIL DATA					
BAND	160	80	40	20	10
L1 L2 L3 L4	40T #18	26T #16	12T #16	8T #16	3T #16
L5	36T #16 4 1/8" Diam.	34T #16 2 7/8" Diam.	22T #16 2 7/8" Diam.	16T #14 2 7/8" Diam.	4T #14 2 7/8" Diam.
Link for L3 and L4	4T #18 C.C.	3T #18 C.C.	2T #18 C.C.	2T #18 C.C.	2T #18 C.C.
L1, L2, L3 Wound on 1 1/2" Diam. Winding length 1 3/4". L2, L3 center tapped. L4 Wound on 1 3/4" Diam. Winding length 2". L5 Center tapped winding length 4 1/2".					



# 250 Watt Transmitter

THORDARSON

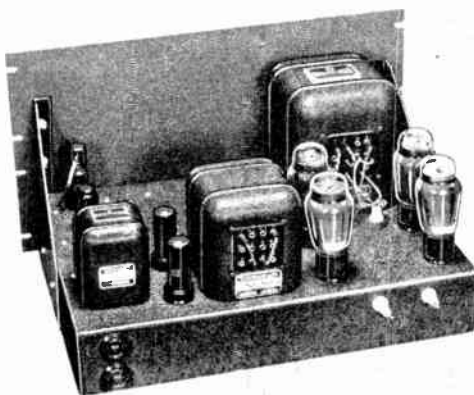
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POWER AMPLIFIER  
Chassis: 17" x 10" x 1"; Panel: 15 3/4"



EXCITER UNIT  
Chassis: 17" x 10" x 3"; Panel: 10 1/2"



SPEECH AMPLIFIER AND MODULATOR  
Chassis: 17" x 12" x 3"; Panel: 10 1/2"



EXCITER POWER SUPPLY  
Chassis: 17" x 10" x 3"; Panel: 10 1/2"



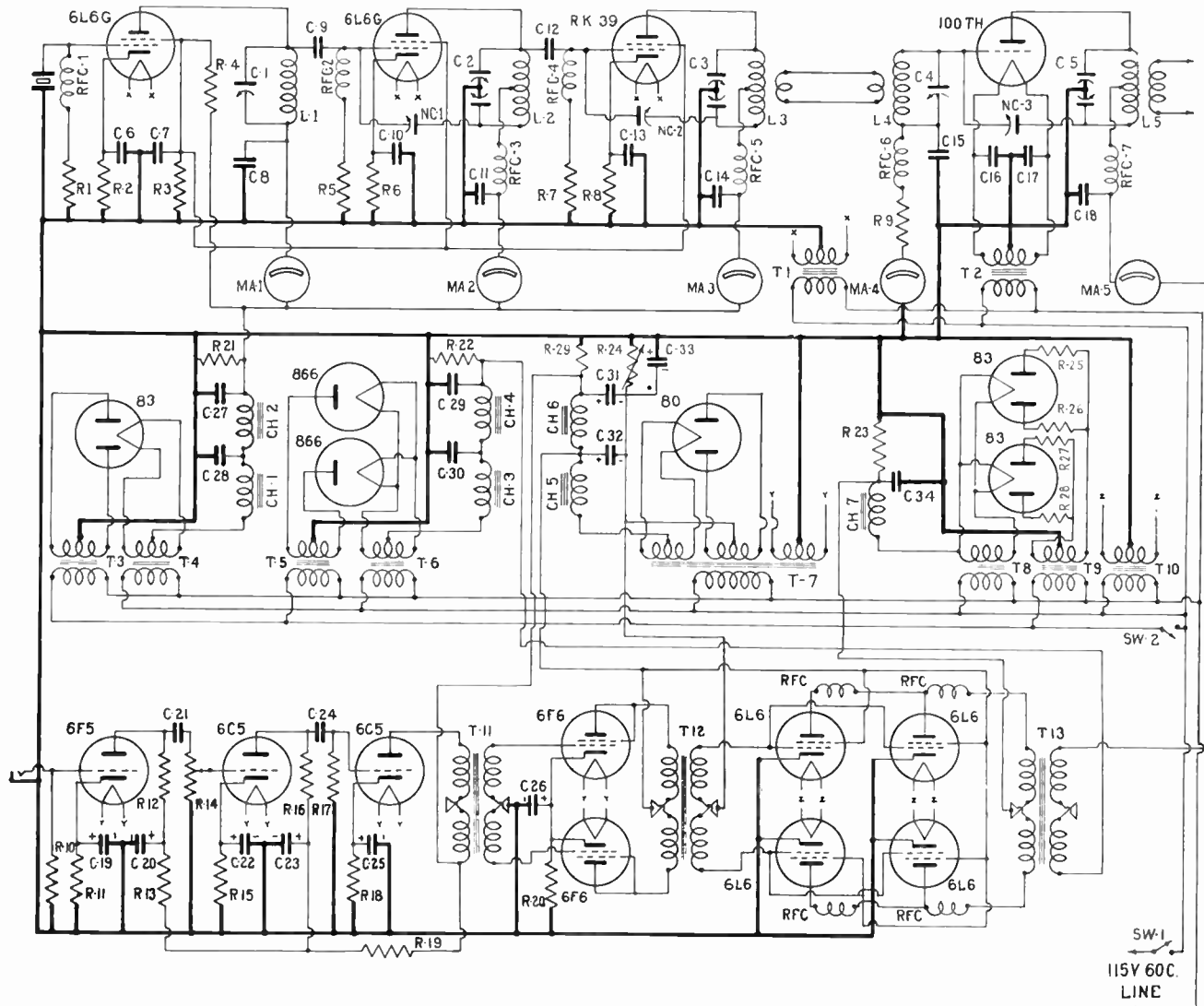
SPEECH AMPLIFIER AND MODULATOR POWER SUPPLIES  
Chcassis: 17" x 10" x 3"; Panel: 10 1/2"



R. F. FINAL POWER SUPPLY  
Chassis: 17" x 14" x 3"; Panel: 12 1/4"



(Continued)



**PARTS LIST**

- RESISTORS**  
 R-1 50,000 ohms, 1 watt  
 R-2 200 ohms, 10 watt  
 R-3 50,000 ohms, 10 watt  
 R-4 5,000 ohms, 25 watt  
 R-5 10,000 ohms, 10 watt  
 R-6 200 ohms, 10 watt  
 R-7 10,000 ohms, 10 watt  
 R-8 50 ohms, 10 watt  
 R-9 5,000 ohms, 25 watt  
 R-10 5 megohm, 1/4 watt  
 R-11 2250 ohms, 1 watt  
 R-12 250,000 ohms, 1 watt  
 R-13 20,000 ohms, 1 watt  
 R-14 500,000 ohm Vol. Control  
 R-15 2250 ohms, 1 watt  
 R-16 50,000 ohms, 1 watt  
 R-17 250,000 ohms, 1 watt  
 R-18 1250 ohms, 1 watt  
 R-19 20,000 ohms, 1 watt  
 R-20 500 ohms, 10 watt  
 R-21 25,000 ohms, 25 watt  
 R-22 50,000 ohms, 100 watt  
 R-23 10,000 ohms, 50 watt

- R-24 400 ohms, 50 watt, variable (adj. to 25 V)  
 R-25 50 ohms, 10 watt  
 R-26 50 ohms, 10 watt  
 R-27 50 ohms, 10 watt  
 R-28 50 ohms, 10 watt  
 R-29 15,000 ohms, 25 watt

- VARIABLE CONDENSERS**  
 C-1 150 mmfd., Receiving type  
 C-2 \*260 mmfd., Receiving type  
 C-3 \*260 mmfd., Receiving type  
 C-4 150 mmfd., 3000 volt spacing  
 C-5 \*100 mmfd., 7500 volt spacing

- \*DUAL TYPE: CAPACITY AND RATING PER SECTION**  
 NC-1 See Copy  
 NC-2 See Copy  
 NC-3 15 mmfd., 5000 volt spacing

- THORDARSON COMPONENTS**  
 Transformers:  
 T-1 T-16F17  
 T-2 T-16F12  
 T-3 T-15P11  
 T-4 T-16F11  
 Chokes:  
 CH-1 T-15C36  
 CH-2 T-15C45  
 CH-3 T-15C37  
 CH-4 T-15C46

- T-5 T-15P15  
 T-6 T-11F53  
 T-7 T-15R00  
 T-8 T-16F12  
 T-9 T-15R01 (Fils. not used)  
 T-10 T-73F60  
 T-11 T15A74  
 T-12 T-15D79  
 T-13 T-11M76

- FIXED CONDENSERS**  
 C-6 .001 mfd., 1000 volt mica  
 C-7 .001 mfd., 1000 volt mica  
 C-8 .001 mfd., 1000 volt mica  
 C-9 .0001 mfd., 1000 volt mica  
 C-10 .001 mfd., 1000 volt mica  
 C-11 .001 mfd., 1000 volt mica  
 C-12 .0001 mfd., 1000 volt mica  
 C-13 .001 mfd., 1000 volt mica  
 C-14 .001 mfd., 1000 volt mica  
 C-15 .001 mfd., 1000 volt mica  
 C-16 .001 mfd., 1000 volt mica  
 C-17 .001 mfd., 1000 volt mica  
 C-18 .001 mfd., 5000 volt mica  
 C-19 10 mfd., 25 volt Elect.  
 C-20 8 mfd., 450 volt Elect.

- CH-5 T-15C36  
 CH-6 T-47C07  
 CH-7 T-15C38  
 C-21 .1 mfd., 400 volt paper  
 C-22 10 mfd., 25 volt Elect.  
 C-23 8 mfd., 450 volt Elect.  
 C-24 .1 mfd., 400 volt paper  
 C-25 10 mfd., 25 volt Elect.  
 C-26 10 mfd., 50 volt Elect.  
 C-27 4 mfd., 600 volt  
 C-28 4 mfd., 600 volt  
 C-29 2 mfd., 2000 volt  
 C-30 2 mfd., 2000 volt  
 C-31 8 mfd., 450 volt Elect.  
 C-32 8 mfd., 450 volt Elect.  
 C-33 10 mfd., 50 volt Elect.  
 C-34 4 mfd., 600 volt

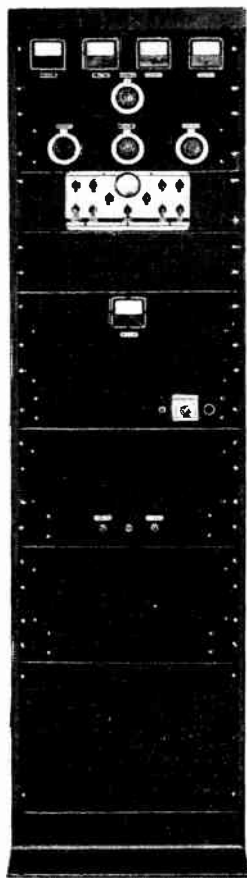
- METERS**  
 MA-1 100 M.A.  
 MA-2 150 M.A.  
 MA-3 150 M.A.  
 MA-4 100 M.A.  
 MA-5 500 M.A.  
**R.F. CHOKES**  
 RFC-1, RFC-2, RFC-3, RFC-4, RFC-5  
 RFC-6 125 M.A. Choke  
 RFC-7 250 M.A. Choke





# 100 Watt Transmitter

THORADSON



←----- R. F. Unit -----→

←----- Speech Amplifier and Modulator -----→

Speech Amplifier and Modulator Power Supplies --→

←----- R. F. Power Supply -----→



This up-to-date transmitter consists of a 6L6 tri-tet, an 809 buffer and a pair of 809's in the final. Comparatively high output on the harmonics of the crystal may be obtained directly from the crystal circuit, so that even on 10 meters the single 809 may be used as a straight buffer. The 6L6-G may be used as a regular tetrode oscillator simply by bending one of the rotor plates of C-1 so that C-1 is effectively shorted at its maximum setting. The small 150 M.A. pilot light in series with the crystal is a good crystal current indicator. The amount of crystal current may be roughly estimated by the brightness of the bulb. The buffer and the final amplifier operate at a plate voltage of 600 volts. The plate current of the final is 167 M.A. for an input of 100 watts and the final grid current should be 60 M.A. Due to the high amplification factor of the 809, it is not necessary to provide fixed bias, since the static plate current at 600 volts is only about 30 M.A. per tube. The value of the grid

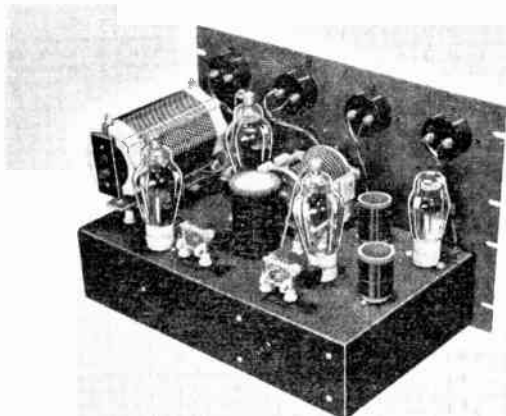
resistor is 2500 ohms for the push-pull stage and 5000 ohms for the buffer. The 809 modulators operate at 500 volts and at this voltage zero bias operation is possible. The plate supply for the speech amplifier and the 2A3 drivers is taken from the same unit which supplies power to the crystal oscillator. However, since the driver plate current does not fluctuate, the voltage supplied to the oscillator stage is not affected. The driver transformer is type T-15D79 and the correct ratio is 6:1, total primary to one-half the secondary. The connections for the T-11M75 modulation unit are as follows:

For the primary: The modulator plates are connected to No. 8 and No. 11; No. 9 and No. 10 are joined and connected to B+.

For the secondary: No. 2 and No. 3 also No. 4 and No. 5 are joined and the Class C load is connected to No. 2 and No. 4.



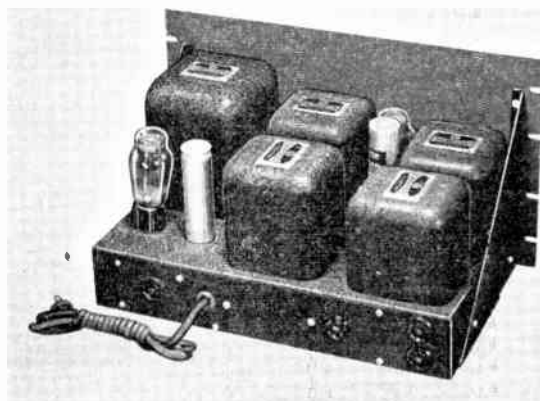
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**R. F. UNIT**  
Chassis: 17" x 10" x 4"; Panel 12 1/4"



**SPEECH AMPLIFIER AND MODULATOR**  
Chassis: 17" x 10" x 3"; Panel: 12 1/4"



**SPEECH AMPLIFIER AND MODULATOR POWER SUPPLIES**  
Chassis: 17" x 10" x 3"; Panel: 10 1/2"



**R. F. POWER SUPPLY**  
Chassis: 17" x 10" x 3"; Panel: 10 1/2"

**COIL DATA**

BAND	160	80	40	20	10
L1		This coil depends on the xtal. An 80 meter coil should be used for a 160 xtal; a 40 meter coil for a 80 meter xtal, etc. See note in copy for pentode operation.			
L2	40T #18	26T #16	12T #16	8T #16	3T #16
L3	38T #16 Diam. 2 1/4" Length 3"	26T #16 Diam. 1 1/2" Length 1 3/4"	12T #16 Diam. 1 1/2" Length 1 3/4"	8T #16 Diam. 1 1/2" Length 1 3/4"	3T #16 Diam. 1 1/2" Length 1 3/4"
L4	38T #12 Diam. 4 1/2" Length 4"	30T #14 Diam. 2 1/2" Length 3 3/4"	15T #14 Diam. 2 1/2" Length 3 3/4"	10T #14 Diam. 2" Length 4"	4T #14 Diam. 2" Length 4"

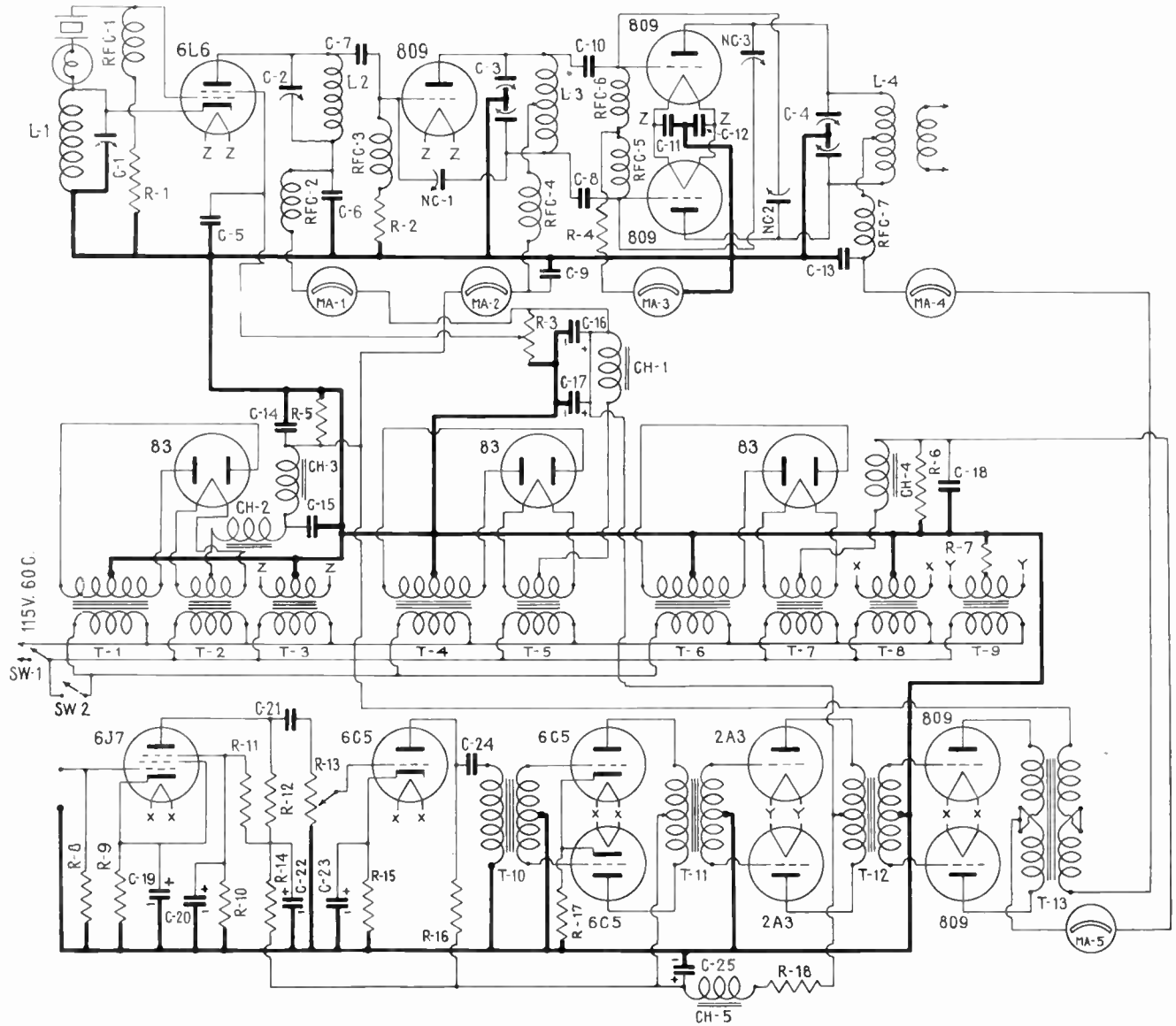
L2 wound on 1 1/2" Diam. winding length 1 3/4". L3 and L4 are center tapped.



# 100 Watt Transmitter

# THORDARSON

(Continued)



## PARTS LIST

- RESISTORS**
- R-1 50,000 ohms, 1 watt
  - R-2 5,000 ohms, 10 watt
  - R-3 25,000 ohms, 25 watt, var.
  - R-4 2,500 ohms, 25 watt
  - R-5 50,000 ohms, 50 watt
  - R-6 50,000 ohms, 50 watt
  - R-7 750 ohms, 10 watt
  - R-8 5 Meg., 1/4 watt
  - R-9 2,250 ohms, 1 watt
  - R-10 20,000 ohms, 1 watt
  - R-11 100,000 ohms, 1 watt
  - R-12 250,000 ohms, 1 watt
  - R-13 500,000 ohm vol. control
  - R-14 20,000 ohms, 1 watt
  - R-15 2,000 ohms, 1 watt
  - R-16 50,000 ohms, 1 watt
  - R-17 500 ohms, 1 watt
  - R-18 5,000 ohms, 25 watt

- VARIABLE CONDENSERS**
- C-1 350 mmfd., 1000 volt spacing
  - C-2 350 mmfd., 1000 volt spacing
  - C-3\* 100 mmfd., 1000 volt spacing
  - C-4\* 225 mmfd., 2000 volt spacing
- \*DUAL TYPE: CAPACITY AND VOLTAGE RATING PER SECTION**
- NC-1 15 mmfd., 2000 volt spacing
  - NC-2 15 mmfd., 2000 volt spacing
  - NC-3 15 mmfd., 2000 volt spacing

- THORDARSON COMPONENTS**
- Transformers:**
- T-1 T-15P13
  - T-2 T-16F11
  - T-3 T-11F51
  - T-4 T-15P11
  - T-5 T-16F11
  - T-6 T-15P12
  - T-7 T-16F11
  - T-8 T-11F50
- Chokes:**
- CH-1 T-15C36
  - CH-2 T-15C37
  - CH-3 T-15C46
  - CH-4 T-15C36
  - CH-5 T-74C30

- FIXED CONDENSERS**
- C-5 .001 mfd. mica, 1000 volt
  - C-6 .001 mfd. mica, 1000 volt
  - C-7 .0001 mfd. mica, 1000 volt
  - C-8 .0001 mfd. mica, 1000 volt
  - C-9 .001 mfd. mica, 1000 volt
  - C-10 .0001 mfd. mica, 1000 volt
  - C-11 .002 mfd. mica, 1000 volt
  - C-12 .002 mfd. mica, 1000 volt
  - C-13 .001 mfd. mica, 5000 volt
  - C-14 2 mfd., 1000 volt
  - C-15 2 mfd., 1000 volt
  - C-16 8 mfd., 450 volt Elect.
  - C-17 8 mfd., 450 volt Elect.
  - C-18 4 mfd., 1000 volt
  - C-19 10 mfd., 25 volt Elect.
- Tubes:**
- T-9 T-16F08
  - T-10 T-15A74
  - T-11 T-15A75
  - T-12 T-15D79
  - T-13 T-11M75

- FIXED CONDENSERS (continued)**
- C-20 8 mfd., 200 volt Elect.
  - C-21 .1 mfd., 400 volt paper
  - C-22 8 mfd., 450 volt Elect.
  - C-23 10 mfd., 25 volt Elect.
  - C-24 .1 mfd., 400 volt paper
  - C-25 8 mfd., 450 volt Elect.
- METERS**
- MA-1 0-100
  - MA-2 0-150
  - MA-3 0-100
  - MA-4 0-250
  - MA-5 0-300
- R.F. CHOKES**
- RFC-1 125 M.A. Choke
  - RFC-2 125 M.A. Choke
  - RFC-3 125 M.A. Choke
  - RFC-4 125 M.A. Choke
  - RFC-5 125 M.A. Choke
  - RFC-6 125 M.A. Choke
  - RFC-7 250 M.A. Choke

## TRANSMITTER GUIDE





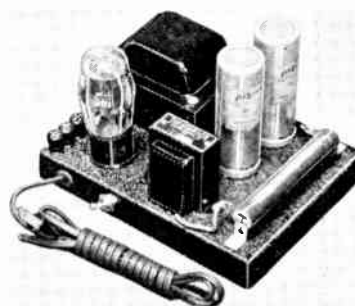
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**CASED VIEW**  
Dimensions: 10" x 8" x 7"



**CHASSIS VIEW**  
Chassis: 9 1/2" x 7 1/2" x 1"



**POWER SUPPLY**  
Chassis: 8" x 6" x 1"

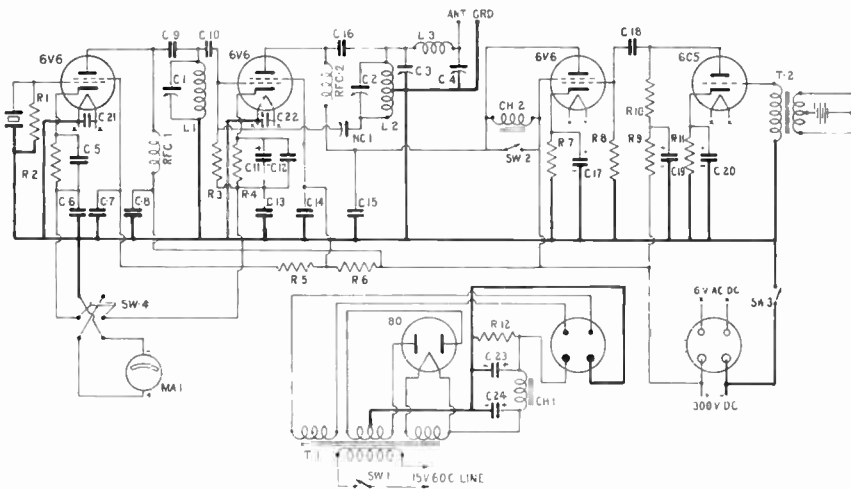
Most amateurs today fully realize the importance of reliable emergency and portable equipment. Anyone may be called upon to perform emergency communications duty at a moment's notice and every amateur should be prepared.

Aside from its value in emergency work, a portable transmitter is a very useful piece of equipment. If properly designed and constructed its stability is good and it may be used in place of a larger rig for a great many contacts. Often it can be used during quiet hours when higher power would cause interference. Antenna measurements, interference tests, receiver comparisons, are only a few of its uses around the station.

In the design of this transmitter all of its possible applications were taken into consideration. The crystal controlled 6V6 oscillator followed by a 6V6 amplifier gives stability and accurate frequency control. The antenna matching network allows the use of practically any antenna. A 6V6 as modulator makes it unnecessary

to carry a number of different tubes as spares in case of tube failure.

The A.C. power supply is built as a separate unit for use around the station or wherever A.C. power is available. A socket and plug arrangement for power allows the use of batteries, or a motor generator, when desired.



COIL DATA	
BAND	L1 L2
160	40T #18 Close Wound
80	25T #16 Close Wound
40	17T #16 Length 1 3/4"
20	8T #16 Length 1 1/2"
10	4T #16 Length 1 1/2"

Both coils center tapped. Diameter of both coils 1 1/2".

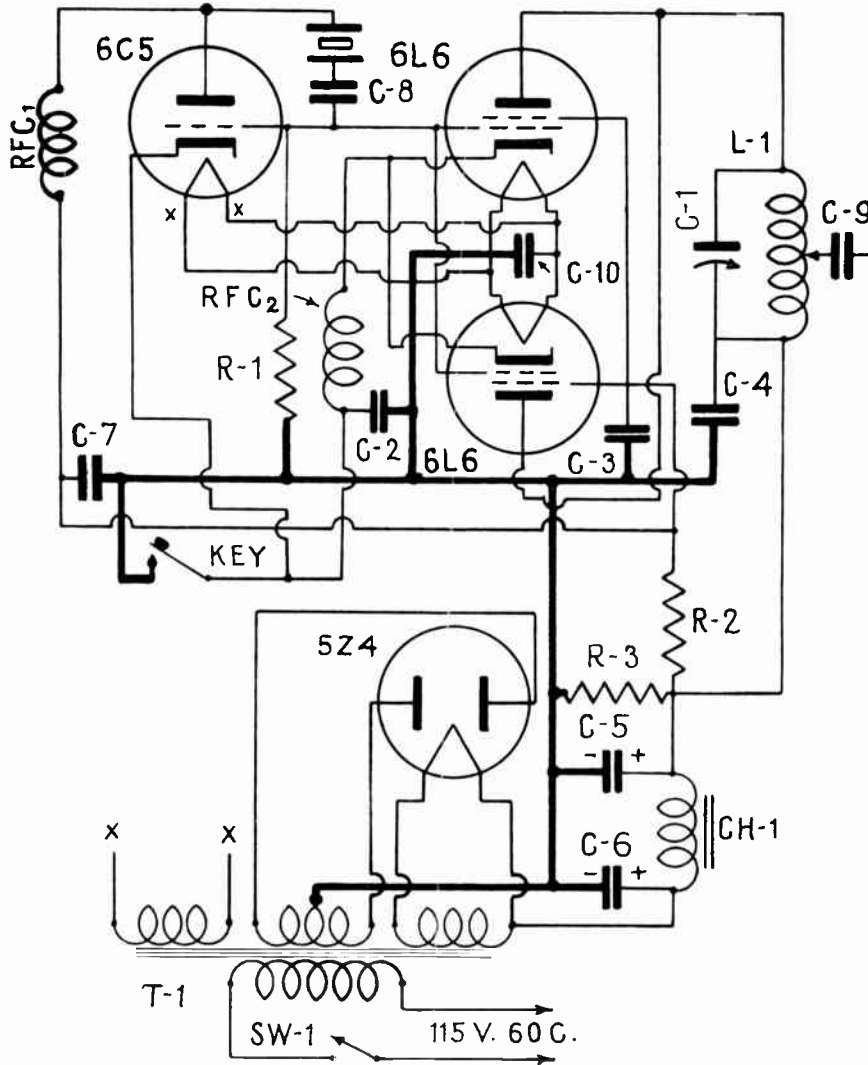
**PARTS LIST**

- RESISTORS**  
 R-1 50,000 ohms, 1 watt  
 R-2 350 ohms, 1 watt  
 R-3 50,000 ohms, 1 watt  
 R-4 100 ohms, 1 watt  
 R-5 50,000 ohms, 1 watt  
 R-6 20,000 ohms, 10 watt  
 R-7 350 ohms, 1 watt  
 R-8 1 megohm, 1 watt  
 R-9 20,000 ohms, 1 watt  
 R-10 100,000 ohms, 1 watt  
 R-11 3,000 ohms, 1 watt  
 R-12 15,000 ohms, 50 watt
- VARIABLE CONDENSERS**  
 C-1 260 mmf. receiving type  
 C-2 260 mmf. receiving type  
 C-3 260 mmf. receiving type  
 C-4 260 mmf. receiving type
- FIXED CONDENSERS**  
 C-5 .001 mfd., 500 volt mica  
 C-6 .001 mfd., 500 volt mica  
 C-7 .001 mfd., 500 volt mica  
 C-8 .001 mfd., 500 volt mica  
 C-9 .001 mfd., 500 volt mica  
 C-10 .0001 mfd., 500 volt mica  
 C-11 10 mfd., 50 volt elect.  
 C-12 .001 mfd., 500 volt mica  
 C-13 .001 mfd., 500 volt mica  
 C-14 .001 mfd., 500 volt mica  
 C-15 .0001 mfd., 500 volt mica  
 C-16 .001 mfd., 500 volt mica  
 C-17 10 mfd., 50 volt elect.  
 C-18 .1 mfd., 400 volt paper  
 C-19 8 mfd., 450 volt elect.  
 C-20 10 mfd., 25 volt elect.  
 C-21 .001 mfd., 500 volt mica  
 C-22 .001 mfd., 500 volt mica
- TRANSFORMERS**  
 T-1 T-75R47  
 T-2 T-58A37
- CHOKES**  
 CH-1 T-49C91  
 CH-2 T-49C91
- R.F.C.'S**  
 R.F.C.1 125 M.A. R.F. Choke  
 R.F.C.2 125 M.A. R.F. Choke
- METERS**  
 MA-1 190 M.A.
- SWITCHES**  
 SW-1 Single pole, single throw  
 SW-2 Single pole, single throw  
 SW-3 Single pole, single throw  
 SW-4 Double pole, double throw
- OTHER PARTS**  
 C-23 8 mfd., 450 volt elect.  
 C-24 8 mfd., 450 volt elect.  
 NC-1 Twisted Wire



# Beginner's Transmitter

THORDARSON



## PARTS LIST

- |                                       |                               |  |
|---------------------------------------|-------------------------------|--|
| <b>RESISTORS</b>                      | C-3 .001 mfd., 500 volt mica  | <b>TRANSFORMERS</b>                          |
| R-1 50,000 ohms, 1 watt               | C-4 .001 mfd., 500 volt mica  | T-1 T-70R62 power transformer                |
| R-2 20,000 ohms, 25 watt              | C-5 8 mfd., 450 volt elect.   |  |
| R-3 20,000 ohms, 25 watt              | C-6 8 mfd., 450 volt elect.   | <b>CHOKES</b>                                |
| <b>VARIABLE CONDENSERS</b>            | C-7 .001 mfd., 500 volt mica  | CH-1 T-49C91                                 |
| C-1 150 mmfd. variable receiving type | C-8 .0001 mfd., 500 volt mica | <b>R.F. CHOKES</b>                           |
| <b>FIXED CONDENSERS</b>               | C-9 .001 mfd. 500 volt mica   | RFC-1 2.5 mh R.F. Choke                      |
| C-2 .001 mfd., 500 volt mica          | C-10 .001 mfd., 500 volt mica | RFC-2 12 T. No. 18 enameled on 1/4" diameter |



CHASSIS VIEW  
Chassis: 8" x 3" x 1"

COIL DATA	
BAND	L1
160	40T #18 Close Wound
80	25T #16 Close Wound
40	17T #16 Length 1 3/4"
20	8T #16 Length 1 1/2"
10	4T #16 Length 1 1/2"
Diameter of all coils 1/2"	

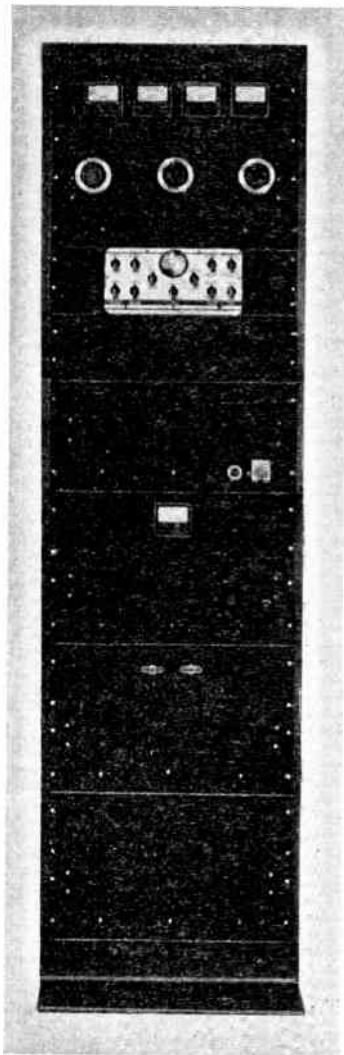
This transmitter is designed especially for the beginner. Low cost, small physical size, and simplicity are the features of the unit.

The transmitter actually consists of two stages. The first is the untuned Pierce oscillator and the second is a conventional stage using 6L6's in parallel. Only one tuning control is used and good efficiency may be obtained on all bands. An output

of several watts may be obtained on 10 meters, using a 40 meter crystal.

The values of all parts with the exception of RFC-2 are clearly indicated in the parts list. RFC-2 consists of 12 turns of No. 18 wire, wound on a one-quarter inch diameter. The coil may be wound over a pencil and the turns slipped off. The coil is then self-supporting.

When the amplifier stage is used as a frequency multiplier, care should be taken that the tank circuit is tuned to the desired harmonic. For this purpose a calibrated wavemeter is extremely helpful. The transmitter makes a very efficient exciter for a larger transmitter and the beginner may build the unit knowing that it can be utilized if higher power is used later.



←----- R. F. Unit -----→

←----- Speech Amplifier and Power Supply -----→

←----- Modulator -----→

←----- R. F. Power Supply -----→

←----- Modulator Power Supply -----→



This Thordarson powered 400 Watt Taylor transmitter is proving to be one of the most popular types in use today, principally because of its high power output on all bands, and the fact that only three tuned stages are employed.

To satisfy a demand for Thordarson power supplies and a suitable speech amplifier and modulator, the original model was duplicated in the Thordarson laboratory. Power supplies, speech amplifier, and a modulator were designed and built and the completed transmitter was put through the usual rigid tests. The final design, as shown, leaves nothing to be desired. Tuning adjustments are extremely simple, and, while the rating is 400 watts as compared to the Taylor 450 watt rating, there is no noticeable difference in power output and since the slight reduction in power input allows the use of inexpensive power supplies, the overall cost is considerably reduced.

Three power supplies are used: One low voltage supply for the oscillator, speech amplifier, and driver tubes; one high voltage supply for the T-55 buffer

and P.P. T-55 amplifier; and one high voltage supply for the T-55 class B modulators.

So that the builder will experience no difficulty in duplicating results, photos of each unit are shown and chassis dimensions are given. The placement of parts on the power supply chassis is not of particular importance. However, any change in the speech amplifier layout should be carefully considered if feedback and hum pick-up are to be avoided. The input circuit must be kept well away from power supply leads, power transformers, and filter chokes.

The placement of parts on the R.F. chassis is extremely important. Three stages on one chassis with this amount of power calls for careful planning and correct design. Too much deviation from the layout shown may make neutralization impossible, or will result in poor efficiency.

Inductive coupling is used between the buffer stage and the final. With this method one less tuned circuit is required and with proper design of the buffer coil, ample excitation may be obtained. The

values of L-3 and L-4 must be determined experimentally. With excessive coupling the final grid current as well as the buffer plate current will be high. On the other hand if the coupling is insufficient the grid current will be below normal. The coupling is adjusted by changing the number of turns on the grid windings, as well as by varying the spacing between the grid coils and the buffer tank coil. It is important that L-3 and L-4 have the same number of turns and that they be spaced equally from either end of the buffer tank coil. Final grid current should be about 50 M.A. under load. The correct modulation transformer for use with this transmitter is T-11M77. The connections are as follows:

For the primary: Modulator plates are connected to No. 1 and No. 6; B+ is connected to No. 3 and No. 4. For the secondary. No. 7 is joined to No. 9 and No. 10 to No. 12; the class C load is connected to No. 7 and No. 10

The correct driver transformer is T-15D77 and the ratio is 2.4:1. The bias required by the T-55's is -60 volts.

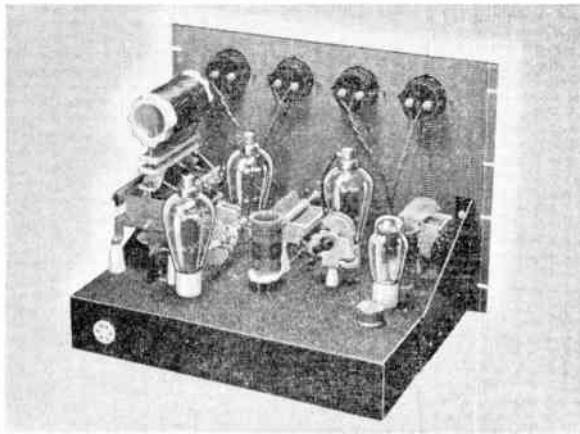




# 400 Watt Transmitter

THORDARSON

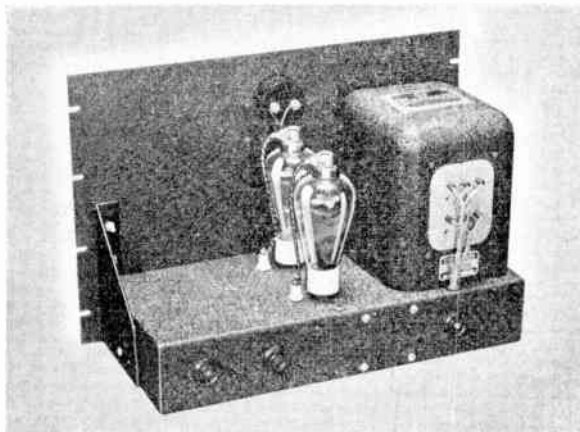
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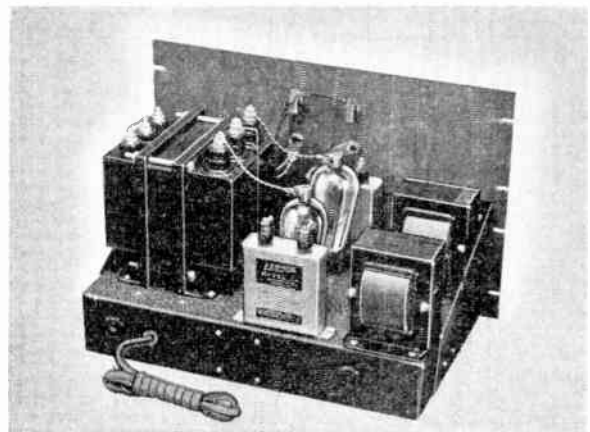
R. F. UNIT  
Chassis: 17" x 12" x 3"; Panel: 14"



SPEECH AMPLIFIER AND POWER SUPPLY  
Chassis: 17" x 10" x 3"; Panel: 8<sup>3</sup>/<sub>4</sub>"



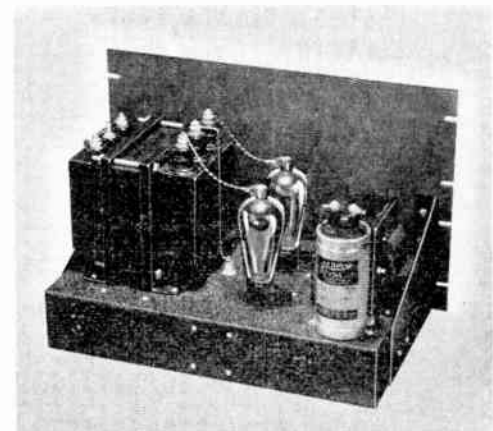
MODULATOR  
Chassis: 17" x 8" x 3"; Panel: 12<sup>1</sup>/<sub>4</sub>"



R. F. POWER SUPPLY  
Chassis: 17" x 10" x 3"; Panel: 12<sup>1</sup>/<sub>4</sub>"

COIL DATA					
BAND	160	80	40	20	10
L1	45 t. No. 18 2 <sup>1</sup> / <sub>4</sub> " dia. Close Wound	26 t. No. 18 1 <sup>1</sup> / <sub>2</sub> " dia. Close Wound	12 t. No. 18 1 <sup>1</sup> / <sub>2</sub> " dia. Close Wound	8 t. No. 18 1 <sup>1</sup> / <sub>2</sub> " dia. 1 <sup>3</sup> / <sub>4</sub> " long	
L2	42 t. No. 18 2 <sup>1</sup> / <sub>4</sub> " dia. Close Wound	30 t. No. 18 1 <sup>1</sup> / <sub>2</sub> " dia. Close Wound	16 t. No. 18 1 <sup>1</sup> / <sub>2</sub> " dia. Close Wound	10 t. No. 18 1 <sup>1</sup> / <sub>2</sub> " dia. 1" long	4 t. No. 18 1 <sup>1</sup> / <sub>2</sub> " dia. 1" long
L3 and L4* on each side of and on same form as L2	Each 17 t. No. 24 wire close wound 1 <sup>1</sup> / <sub>4</sub> " from L2 on each side	Each 10 t. No. 24 wire close wound 1 <sup>1</sup> / <sub>4</sub> " from L2 on each side	Each 6 t. No. 22 wire close wound 1 <sup>1</sup> / <sub>4</sub> " from L2 on each side	Each 3 t. No. 22 wire close wound 1 <sup>1</sup> / <sub>2</sub> " from L2 on each side	Each 3 t. No. 22 wire close wound 1 <sup>1</sup> / <sub>2</sub> " from L2 on each side
L5	46 t. No. 12 3" dia. 4" long	26 t. No. 10 2 <sup>1</sup> / <sub>2</sub> " dia. 4" long	20 t. No. 10 2 <sup>1</sup> / <sub>2</sub> " dia. 4" long	12 t. No. 10 2 <sup>1</sup> / <sub>2</sub> " dia. 4" long	6 t. No. 10 2 <sup>1</sup> / <sub>2</sub> " dia. 4" long

\*These values are only approximate and should be adjusted for normal plate current of the driver tube and maximum grid current of the amplifier tubes.

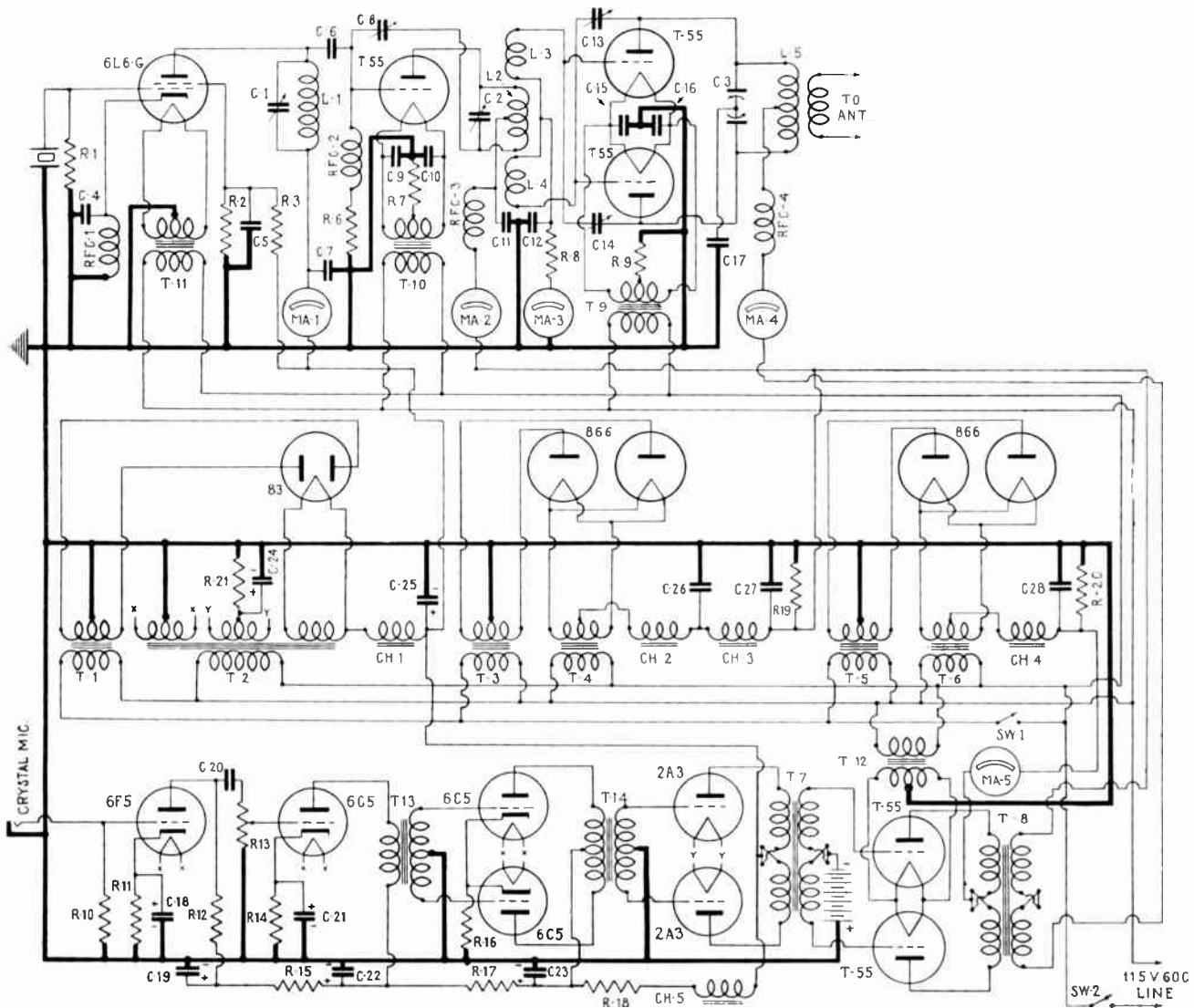


MODULATOR POWER SUPPLY  
Chassis: 17" x 10" x 3"; Panel: 12<sup>1</sup>/<sub>4</sub>"

## TRANSMITTER GUIDE



(Continued)



### PARTS LIST

- RESISTORS**
- R-1 100,000 ohms, 1 watt
  - R-2 35,000 ohms, 10 watt
  - R-3 10,000 ohms, 10 watt
  - R-4 Omitted
  - R-5 Omitted
  - R-6 5,000 ohms, 10 watt
  - R-7 400 ohms, 10 watt
  - R-8 5,000 ohms, 25 watt
  - R-9 200 ohms, 25 watt
  - R-10 5 megohm, 1/4 watt
  - R-11 2,250 ohms, 1 watt
  - R-12 250,000 ohms, 1 watt
  - R-13 500,000 ohm, vol. control
  - R-14 2,250 ohms, 1 watt
  - R-15 20,000 ohms, 1 watt
  - R-16 500 ohms, 1 watt
  - R-17 5,000 ohms, 10 watt
  - R-18 5,000 ohms, 10 watt
  - R-19 50,000 ohms, 100 watt
  - R-20 50,000 ohms, 100 watt
  - R-21 750 ohms, 10 watt

- VARIABLE CONDENSERS**
- C-1 105 mmfd. Receiving type
  - C-2 100 mmfd. 2,000 volt spacing
  - C-3\* 210 mmfd. 2,000 volt spacing
  - C-8 6 mmfd. Neut. Cond., 2,000 volt spacing
  - C-13 6 mmfd. Neut. Cond., 5000 volt spacing
  - C-14 6 mmfd. Neut. Cond., 5000 volt spacing
- \*DUAL TYPE: CAPACITY AND RATING PER SECTION
- FIXED CONDENSERS**
- C-4 .00015 mfd., 1,000 volt mica
  - C-5 .01 mfd., 1,000 volt mica
  - C-6 .0001 mfd., 2,500 volt mica
  - C-7 .01 mfd., 1,000 volt mica
  - C-9 .002 mfd., 1,000 volt mica
  - C-10 .002 mfd., 1,000 volt mica
  - C-11 .002 mfd., 2,500 volt mica
  - C-12 .002 mfd., 1,000 volt mica

- C-15 .002 mfd. 1,000 volt mica
- C-16 .002 mfd., 1,000 volt mica
- C-17 .002 mfd., 5,000 volt mica
- C-18 10 mfd., 25 volt Elect.
- C-19 8 mfd., 450 volt Elect.
- C-20 .1 mfd., 400 volt paper
- C-21 10 mfd., 25 volt Elect.
- C-22 8 mfd., 450 volt Elect.
- C-23 8 mfd., 450 volt Elect.
- C-24 10 mfd., 100 volt Elect.
- C-25 8 mfd., 450 volt Elect.
- C-26 2 mfd., 2,000 volt
- C-27 2 mfd., 2,000 volt
- C-28 2 mfd., 2,000 volt

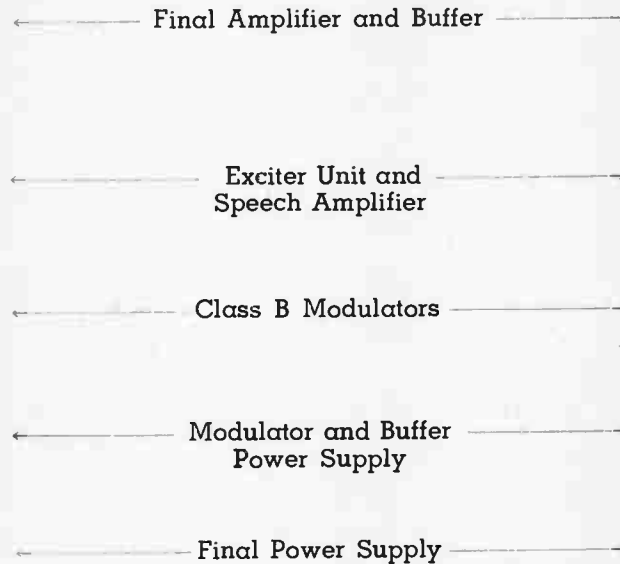
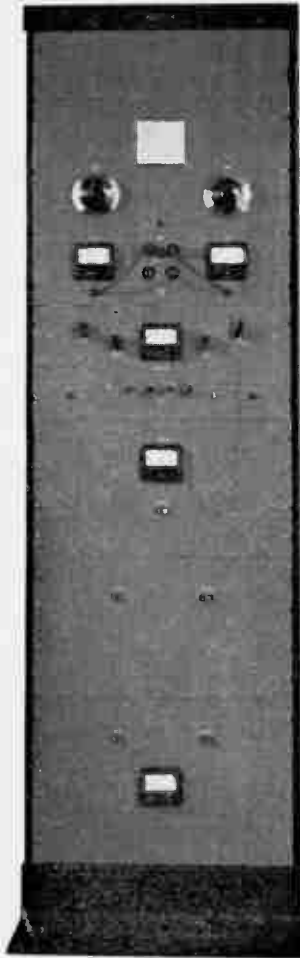
- TRANSFORMERS**
- T-1 T-53P03
  - T-2 T-79F84
  - T-3 T-16P03
  - T-4 T-16F10
  - T-5 T-16P03
  - T-6 T-16F10
  - T-7 T-15D77

- T-8 T-11M77
  - T-9 T-16F14
  - T-10 T-16F13
  - T-11 T-16F17
  - T-12 T-16F14
  - T-13 T-57A41
  - T-14 T-58A70
- CHOKES**
- CH-1 T-74C29
  - CH-2 T-16C21
  - CH-3 T-16C26
  - CH-4 T-16C21
  - CH-5 T-74C30
- RFC-1 125 ma, R.F. Choke  
 RFC-2 125 ma, R.F. Choke  
 RFC-3 125 ma, R.F. Choke  
 RFC-4 600 ma, R.F. Choke
- METERS**
- MA-1 0-100 M.A.
  - MA-2 0-100 M.A.
  - MA-3 0-100 M.A.
  - MA-4 0-500 M.A.
  - MA-5 0-500 M.A.



# 600 Watt Transmitter

THORNDARSON



This 600 watt transmitter, designed and built by the National Company, is available in kit form. Much of the difficult work connected with transmitter construction may be avoided by the use of these completely punched chassis. The chassis are attractively finished in light gray lacquer and are supplied complete with engraved panels and all necessary hardware. The factory wired combination exciter unit and speech amplifier eliminates the source of many of the real "headaches" usually encountered in the work of building a transmitter.

The transmitter proper consists of a pair of Eimac 100TH's in the final driven by a single Eimac 35T, and both stages are built up as a complete unit. Jacks are provided so that the two meters on the front panel may be used to read the grid or the plate currents of either the buffer or the amplifier stage. The jacks are mounted on bakelite and recessed so that all danger of

accidental contact is eliminated. Complete neutralization is accomplished by the symmetrical push-pull layout, and the neutralizing condensers for both the buffer and the final are conveniently mounted so that they are accessible from either side of the rack. The 35T buffer is link-coupled from the exciter unit through a low impedance line, and the 35T grid circuit is a plug-in pre-tuned unit which further tends to simplify band changing. The modulators consist of a pair of Taylor 203Z's in class B, and both the modulators and the 35T buffer operate from the same 1250 volt supply. The class B modulator grids are connected to the output of the speech amplifier through a T-15D82 line to class B grid transformer. Provision is made by means of a jack for keying the exciter unit. Since the transmitter was built primarily as a phone transmitter, an external bias supply (page 39, figure 14) must be used on the buffer and final stages if CW operation is desired. If a considerable amount of CW

operation is contemplated, this bias supply unit may be built up and permanently mounted in the extra panel space provided at the top of the rack.

The high quality C.H.T. line of transformers is used throughout. These transformers are conservatively rated for continuous operation, and their attractive appearance presents a pleasing contrast to the gray chassis.

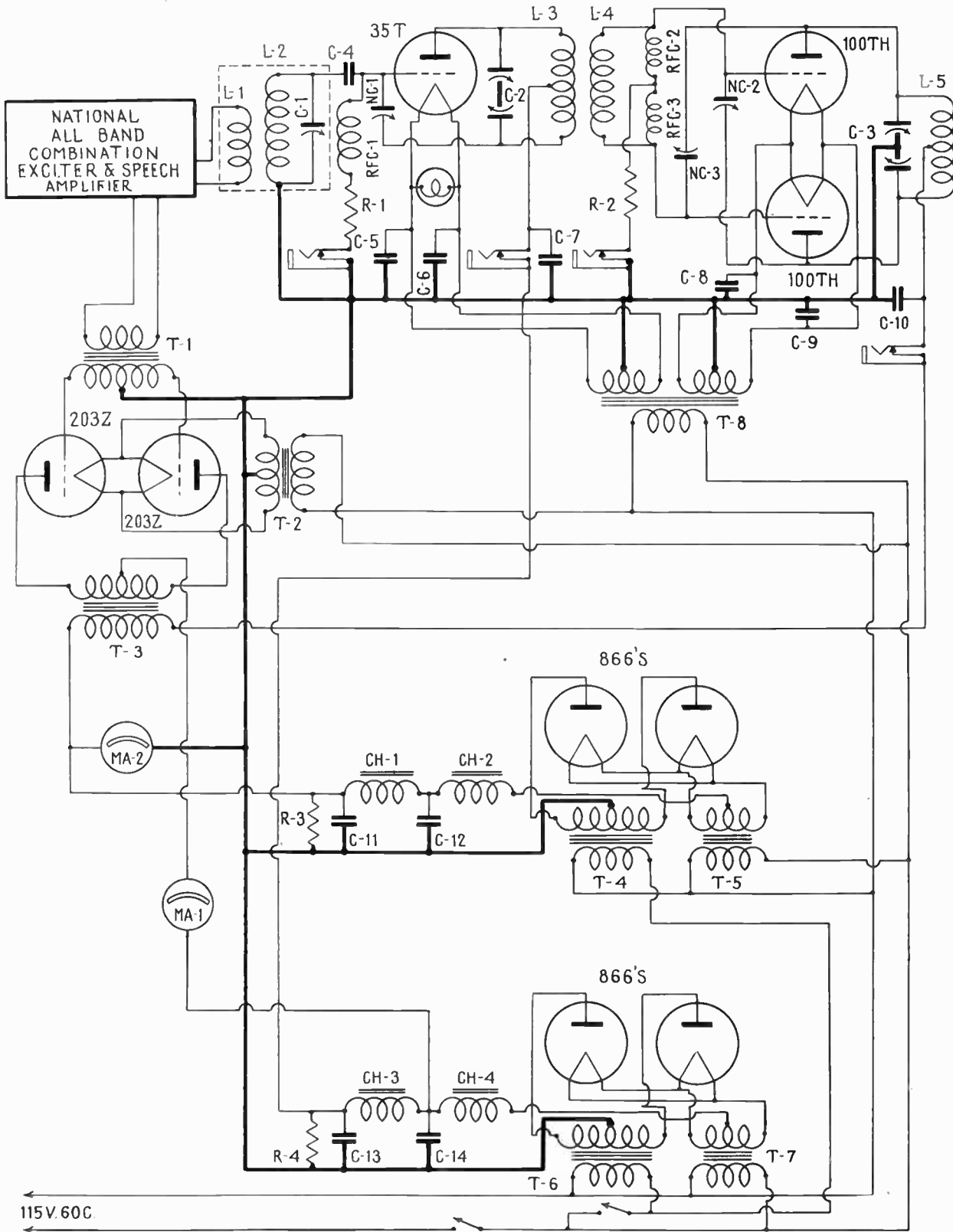
The correct ratio of the T-15D82 driver transformer is 1 to .85, and the connections for the T-11M77 are as follows: the modulator plates connect to terminals #1 and #6, #2 and #5 are joined and connect to the modulator supply. For the secondary, #7 is connected to #11 and #8 to #12; the class C load connects to #7 and #8.

A booklet containing more complete information on this transmitter may be obtained by sending 10 cents to the National Company at Malden, Massachusetts.





(Continued)





# 600 Watt Transmitter



(Continued)

## PARTS LIST

### RESISTORS

- R-1 20,000 ohms, 2 watts
- R-2 12,000 ohms, 10 watts
- R-3 100,000 ohms, 50 watts
- R-4 100,000 ohms, 50 watts

### CONDENSERS

- C-4 .001 mfd., 1000 volt mica
- C-5 .01 mfd., 1000 volt mica
- C-6 .01 mfd., 1000 volt mica
- C-7 .001 mfd., 5000 volt mica
- C-8 .01 mfd., 1000 volt mica
- C-9 .01 mfd., 1000 volt mica
- C-10 .001 mfd., 10,000 volt mica
- C-11 2 mfd., 2500 volt
- C-12 2 mfd., 2500 volt

- C-13 2 mfd., 1500 volt
- C-14 2 mfd., 1500 volt

### VARIABLE CONDENSERS

- C-1 50 mmfd. (National FXTB Paralleled Units)
- C-2 \*100 mmfd. (National TMC-100 D)
- C-3 \*40 mmfd. (National TMA-40 DC)

- NC-1 Neutralizing Condenser National NC-800
- NC-2 Neutralizing Condenser National NC-150
- NC-3 Neutralizing Condenser National NC-150

\*Dual Type: Capacity per section

### TRANSFORMERS

- T-1 T-15D82
- T-2 T-11F51
- T-3 T-11M77
- T-4 T-15P19
- T-5 T-11F53
- T-6 T-15P15
- T-7 T-11F53
- T-8 T-40734 (Special ThorDARSON Transformer)

### CHOKES

- CH-1 T-15C46
- CH-2 T-15C37
- CH-3 T-15C46
- CH-4 T-15C37

### MISCELLANEOUS

- RFC-1, RFC-2, RFC-3 Chokes (Nat. R-100)
  - MA-1 0-500 M.A. DC
  - MA-2 0-3000 V DC
- The foundation units are designated as follows:
- Buffer-Final Amplifier Type NT100PC
  - Modulator Unit Type NT300PC
  - High Voltage Power Unit Type NT2000PC
  - Medium Power Unit Type NT1200PC
- The combination exciter unit and speech amplifier is designated as NTE.

## COIL DATA

BAND	80	20	10
L-1	2T #22 DSC	2T #22 DSC	2T #22 DSC
L-2	35T #28 E 1" Diam. 60T per inch	8T #24 E 1" Diam. 24T per inch	4T #24 E 1" Diam. 24T per inch
L-3	44T #16 E 1 3/4" Diam. 18T per inch	16T #16 E 1 3/4" Diam. 6T per inch	6T #16 E 1 3/4" Diam. 2 1/2T per inch
L-4	28T #16 E 1 3/4" Diam. 18T per inch	13T #22 DSC Wound between turns of L-3	5T #16 E Wound between turns of L-3
L-5	30T #10 Nat. Form XR14 8T per inch	12T #10 Nat. Form XR10A 7T per inch	4T #10 Nat. Form XR10A 4T per inch

L-1, L-2 Wound on Nat. Coil Form XR2. L-3, L4 Wound on Nat. Coil Form XR13. L-3, L-5 Center Tapped.

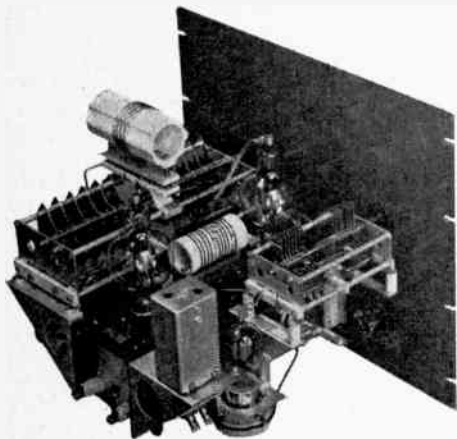
## COMBINATION EXCITER UNIT AND SPEECH AMPLIFIER

The combination exciter unit and speech amplifier used on the 600 watt transmitter is also available in an attractive cabinet. This unit has truly a universal application: the band-switched exciter may be used for any transmitter and since the present trend in class B audio design is toward the use of high mu, low drive tubes, the 2A3 speech amplifier provides ample driving power for even the largest class B modulator. The low output impedance of both the exciter and the speech amplifier enables the unit to be placed on the operating table a considerable distance from the transmitter. All circuits in the exciter unit are pre-tuned and band switching is accomplished by means of a push-button system. A separate knob is provided for the selection of the desired crystal. A single meter mounted at the center of the panel may be switched to read the plate current of the various stages. Further information regarding this unit may be obtained by writing directly to the National Company.

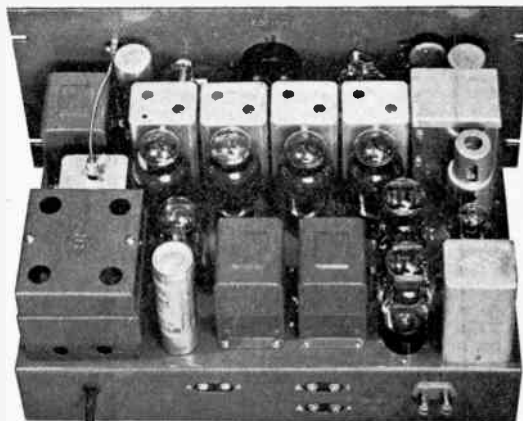




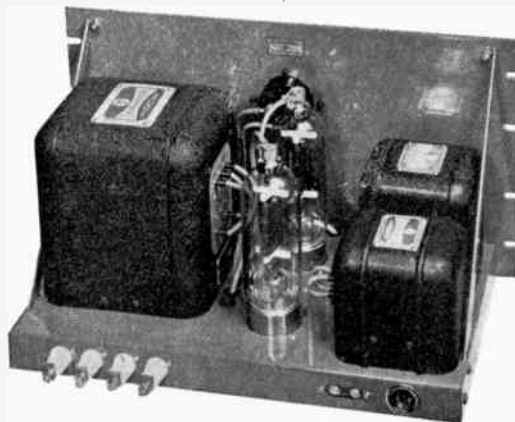
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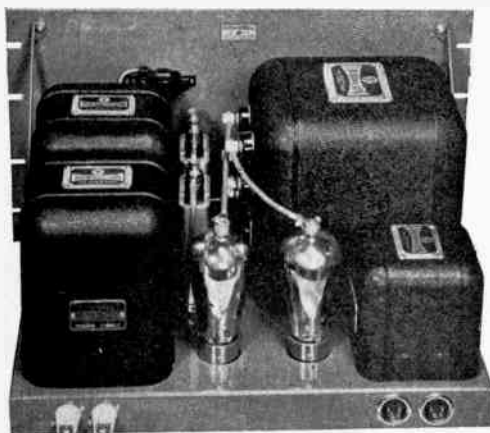
FINAL AMPLIFIER AND BUFFER



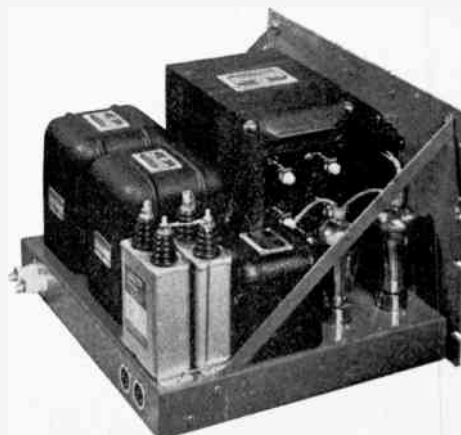
EXCITER UNIT AND SPEECH AMPLIFIER



CLASS B MODULATOR



MODULATOR AND BUFFER POWER SUPPLY



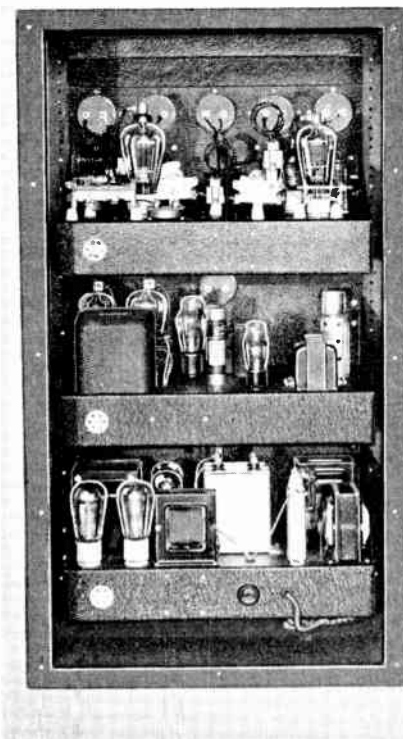
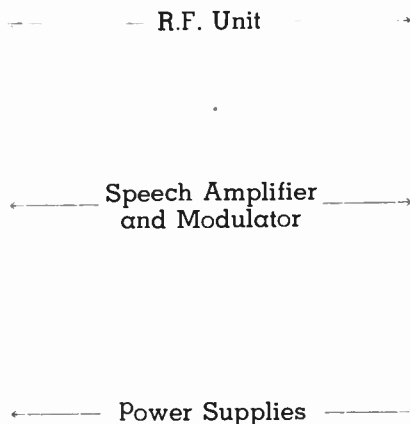
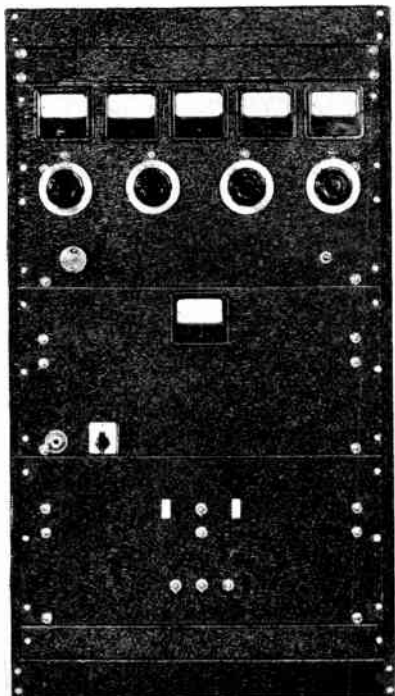
FINAL POWER SUPPLY





# 150 Watt Transmitter

THORDARSON



This 150 watt transmitter, designed by the Taylor Tube Company, features simplicity, low cost, and good efficiency on all bands. Only three stages are used: a 6L6G or 6F6G oscillator, a T-20 buffer, and a T-55 amplifier.

The T-55 plate tuning condenser used has a maximum capacity of 100 mmfd. per section and a minimum capacity per section of 13 mmfd. One section of the condenser is used for the 10 and 20 meter coils while both sections are used in parallel for 40, 80 and 150 meter coils. This results in good L-C ratios over the full range from 10 to 160 meters.

The grid tuning condenser, C-3, may be used as an excitation control. This should be adjusted on the low frequency side of resonance so that the T-55 grid current is about 25 M.A. under load. Current should never exceed the maximum rating of 40 M.A.

The unit may be used in four different combinations on 20, 40, 80 and 160 meters and in two combinations on 10 meters:

1. It can be operated straight through on the crystal frequency. A type 6F6G is recommended as the oscillator on 20 and 40 meters.

2. The crystal may be  $\frac{1}{2}$  the output frequency, doubling in the oscillator and working straight through in the buffer and final. This is the method recommended for 20 and 40 meters.

3. The crystal may be  $\frac{1}{4}$  the output frequency, doubling in the crystal stage and again in the T-20 stage.

4. The crystal may be  $\frac{1}{2}$  the output

frequency, working straight through in the crystal stage and doubling in the T-20 stage. Combination 3 or 4 is used for 10 meter operation, 3 with a 40 meter crystal and 4 with a 20 meter crystal.

For the power supply three different voltages are necessary: 400, 750 and 1000 volts. The speech amplifier and oscillator operate from the 400 volt supply, the T-20 buffer and class B modulators operate at 750 volts and the T-55 at 1000 volts. The 750 volts for the buffer and modulators and the 1000 volts for the T-55 amplifier are obtained from one transformer, but two sets of rectifiers and two filters are used.

In operation the total current of the oscillator and speech amplifier is about 150 M.A., the T-20 buffer, 50 M.A. and

the T-55, 150 M.A. The no signal plate current of the modulators is about 25 MA. and this swings to about 80 M.A. for 100 per cent modulation.

It will be noticed that 5 toggle switches are shown. Switch No. 1 is a master switch. Switch No. 2 is the plate supply switch and Switch No. 3 is used in the tune-up procedure only, to throw off the modulator and R. F. amplifier supplies. Switch No. 4 controls the speech and modulator filaments as well as the filaments of the rectifier in the modulator power supply. These filaments are turned off for C.W. However, if C.W. is used, the secondary of the modulation transformer should be shorted. Switch No. 5 reads the grid current of either the buffer or the final stage.

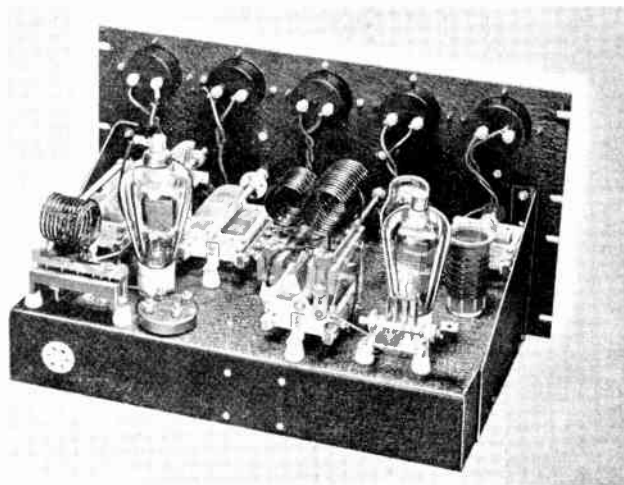
## COIL DATA

BAND	160	80	40	20	10
L <sub>1</sub>	45 t. No. 18 2 $\frac{1}{4}$ " dia. Close Wound	26 t. No. 18 1 $\frac{1}{2}$ " dia. Close Wound	12 t. No. 18 1 $\frac{1}{2}$ " dia. Close Wound	8 t. No. 18 1 $\frac{1}{2}$ " dia. 1 $\frac{3}{4}$ " long	
L <sub>2</sub>	72 t. No. 20 1 $\frac{3}{4}$ " dia. Close Wound	36 t. No. 14 1 $\frac{3}{4}$ " dia. Close Wound	22 t. No. 14 1 $\frac{3}{4}$ " dia. Close Wound	14 t. No. 10 1 $\frac{3}{4}$ " dia. 2 $\frac{3}{4}$ " long	8 t. No. 10 1 $\frac{3}{4}$ " dia. Approx. 3" long
L <sub>3</sub>	78 t. No. 20 1 $\frac{3}{4}$ " dia. Close Wound	44 t. No. 16 1 $\frac{3}{4}$ " dia. Close Wound	24 t. No. 14 1 $\frac{3}{4}$ " dia. Close Wound	10 t. No. 10 1 $\frac{3}{4}$ " dia. Short as Possible	6 t. No. 14 1 $\frac{3}{4}$ " dia. Short as Possible
L <sub>4</sub>	46 t. No. 16 1 $\frac{3}{4}$ " dia. Close Wound	19 t. No. 14 1 $\frac{3}{4}$ " dia. Close Wound	16 t. No. 10 1 $\frac{3}{4}$ " dia. 2 $\frac{1}{2}$ " long	10 t. No. 10 1 $\frac{3}{4}$ " dia. 1 $\frac{7}{8}$ " long	5 t. No. 10 3 $\frac{3}{4}$ " dia. 2 $\frac{3}{4}$ " long

## TRANSMITTER GUIDE

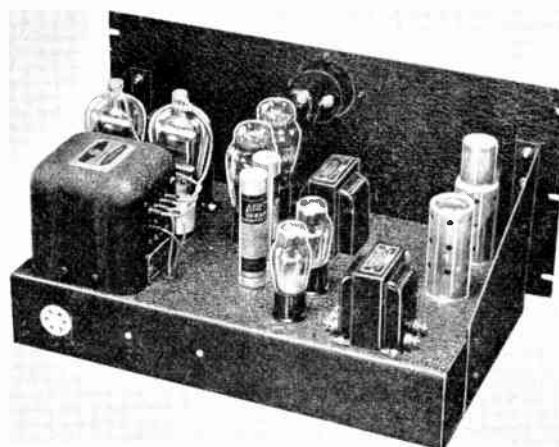


(Continued)



R. F. UNIT  
shown at left  
Chassis: 17" x 10" x 3"; Panel: 12<sup>1</sup>/<sub>4</sub>"

SPEECH AMPLIFIER AND MODULATOR  
shown at right  
Chassis: 17" x 10" x 3"; Panel: 8<sup>3</sup>/<sub>4</sub>"



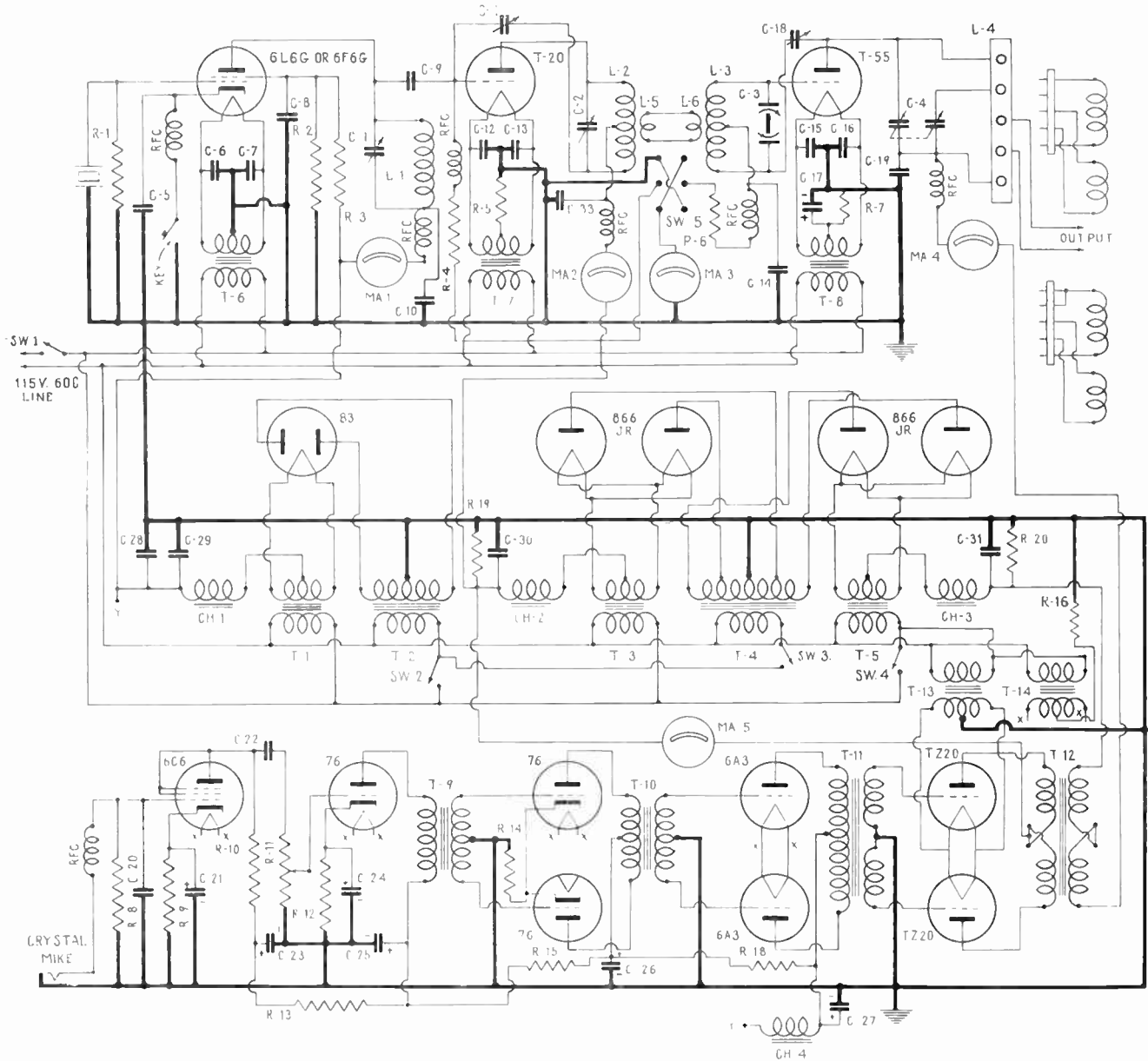
POWER SUPPLIES  
shown at left  
Chassis: 17" x 10" x 3"; Panel: 8<sup>3</sup>/<sub>4</sub>"



# 150 Watt Transmitter

THORARSON

(Continued)



### PART LIST

- RESISTORS**
- R-1 100,000 ohms, 1 watt
  - R-2 35,000 ohms, 10 watt
  - R-3 10,000 ohms, 10 watt
  - R-4 10,000 ohms, 10 watt
  - R-5 400 ohms, 10 watt
  - R-6 5,000 ohms, 25 watt
  - R-7 400 ohms, 10 watt
  - R-8 5 megohms, 1/4 watt
  - R-9 2,250 ohms, 1 watt
  - R-10 250,000 ohms, 1 watt
  - R-11 250,000 ohm, vol. control
  - R-12 2,250 ohms, 1 watt
  - R-13 50,000 ohms, 1 watt
  - R-14 1,500 ohms, 1 watt
  - R-15 10,000 ohms, 1 watt
  - R-16 750 ohms, 10 watt
  - R-18 3,000 ohms, 10 watt
  - R-19 25,000 ohms, 100 watt
  - R-20 50,000 ohms, 100 watt

- TUNING CONDENSERS**
- C-1 100 mmfd. Receiving type
  - C-2 100 mmfd. 1,000 volt spacing

- C-3\* 100 mmfd. Receiving type
- C-4\* 100 mmfd. 2,000 volt spacing
- C-11 6 mmfd. neut. cond.
- C-18 6 mmfd. neut. cond.

- \*DUAL TYPE: CAPACITY AND SPACING PER SECTION**
- FIXED CONDENSERS**
- C-5 .00015 mfd., 1,000 volt mica
  - C-6 .001 mfd., 1,000 volt mica
  - C-7 .001 mfd., 1,000 volt mica
  - C-8 .001 mfd., 1,000 volt mica
  - C-9 .0001 mfd., 2,500 volt mica
  - C-10 .001 mfd., 1,000 volt mica
  - C-12 .001 mfd., 1,000 volt mica
  - C-13 .001 mfd., 1,000 volt mica
  - C-14 .001 mfd., 1,000 volt mica
  - C-15 .001 mfd., 1,000 volt mica
  - C-16 .001 mfd., 1,000 volt mica
  - C-17 8 mfd., 450 volt Elect.
  - C-19 .002 mfd., 5,000 volt mica
  - C-20 .0001 mfd., 1,000 volt mica
  - C-21 10 mfd., 25 volt Elect.

- C-22 .1 mfd., 400 volt paper
- C-23 8 mfd., 450 volt Elect.
- C-24 10 mfd., 25 volt Elect.
- C-25 8 mfd., 450 volt Elect.
- C-26 8 mfd., 450 volt Elect.
- C-27 8 mfd., 450 volt Elect.
- C-28 4 mfd., 600 volt
- C-29 4 mfd., 600 volt
- C-30 4 mfd., 1,500 volt
- C-31 4 mfd., 1,500 volt

- TRANSFORMERS**
- T-1 T-16F11
  - T-2 T-53P03
  - T-3 T-16F08
  - T-4 T-16P05
  - T-5 T-16F08
  - T-6 T-16F17
  - T-7 T-16F13
  - T-8 T-16F13
  - T-9 T-57A41
  - T-10 T-58A70
  - T-11 T-51D00

- T-12 T-11M75
- T-13 T-16F13
- T-14 T-73F60

- CHOKES**
- CH-1 T-16C20
  - CH-2 T-16C20
  - CH-3 T-16C20
  - CH-4 T-13C30

- METERS**
- MA-1 100 M.A.
  - MA-2 150 M.A.
  - MA-3 50 M.A.
  - MA-4 300 M.A.
  - MA-5 300 M.A.
  - MA-6 1 1/2 Ampere R.F. Ammeter

- RFC RF Chokes**
- SWITCHES**
- SW-1 SPST
  - SW-2 SPST
  - SW-3 SPST
  - SW-4 SPST
  - SW-5 DPDT



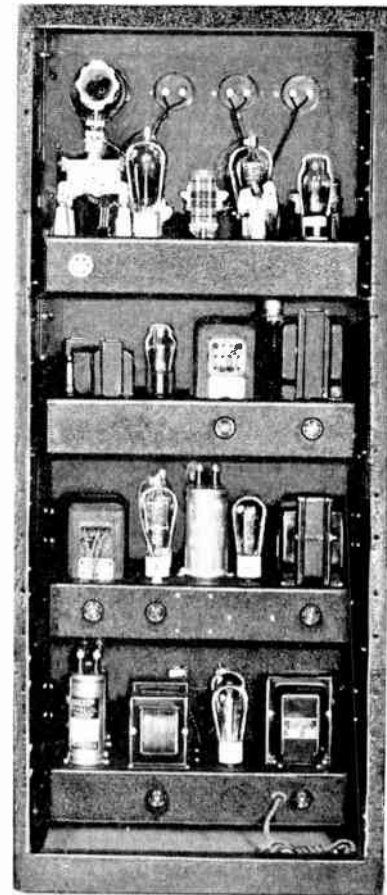


← R. F. Unit →

← Speech Amplifier and Power Supply →

← Modulator and Power Supply →

← R. F. Power Supply →



As far as design is concerned this transmitter is practically the same as the Taylor 400 watt transmitter, but the use of smaller tubes, and therefore more inexpensive power supplies, results in a highly efficient rig of medium power at moderate cost.

In general the same precautions should be observed as were stressed in the 400 watt transmitter. The buffer coil should be adjusted for optimum excitation to the final stage. The grid current should be approximately 35 M.A. with plate voltage applied and the antenna coupled so that the input is 100 watts.

When operated on ten meters, the buffer stage is used as a doubler and best results are obtained by using a TZ-20 tube in this position in place of the T-20.

A single power supply with a type 83 rectifier furnishes plate voltage for the oscillator, speech amplifier and driver tubes. Since the type 45 driver tubes are operated strictly class A, without plate current fluctuations, the oscillator voltage is

entirely free of any modulating effect such as would be caused by variation in the plate current of the driver tubes.

A series resistor reduces the power supply voltage to approximately 330 volts at the plates of the 45 tubes; the cathode bias further reduces the effective plate voltage to 275 volts, which is the maximum allowable on this type of tube. Better driver regulation is obtained when the tubes are operated at maximum plate voltage, so that the step-down ratio of the driver transformer is as high as possible.

The TZ-20 class B modulators operate at 650 volts. At this voltage ample audio power is developed to modulate fully the input of 100 watts. A Multi-Match modulation transformer is used and correct matching is obtained with connections as follows:

Connect modulator plates to terminals No. 2 and No. 5. Join terminals 7 and 11 and terminals 8 and 12. Connect secondary load to terminals 7 and 8.

The correct ratio of the T-15D78 driver transformer is 3.2:1.



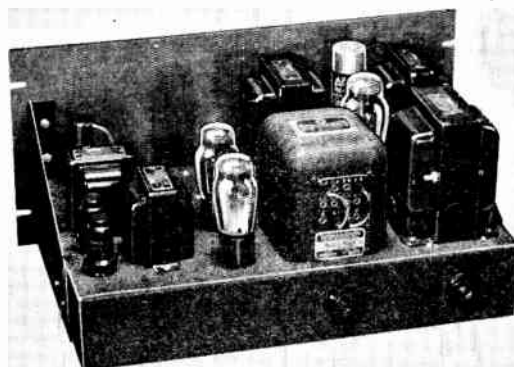
# 100 Watt Transmitter

THORADSON

(Continued)



R. F. UNIT  
Chassis: 17" x 12" x 3"; Panel: 14"



SPEECH AMPLIFIER AND POWER SUPPLY  
Chassis: 17" x 10" x 3"; Panel: 8 3/4"



MODULATOR AND POWER SUPPLY  
Chassis: 17" x 10" x 3"; Panel: 10 1/2"



R. F. POWER SUPPLY  
Chassis: 17" x 10" x 3"; Panel: 10 1/2"

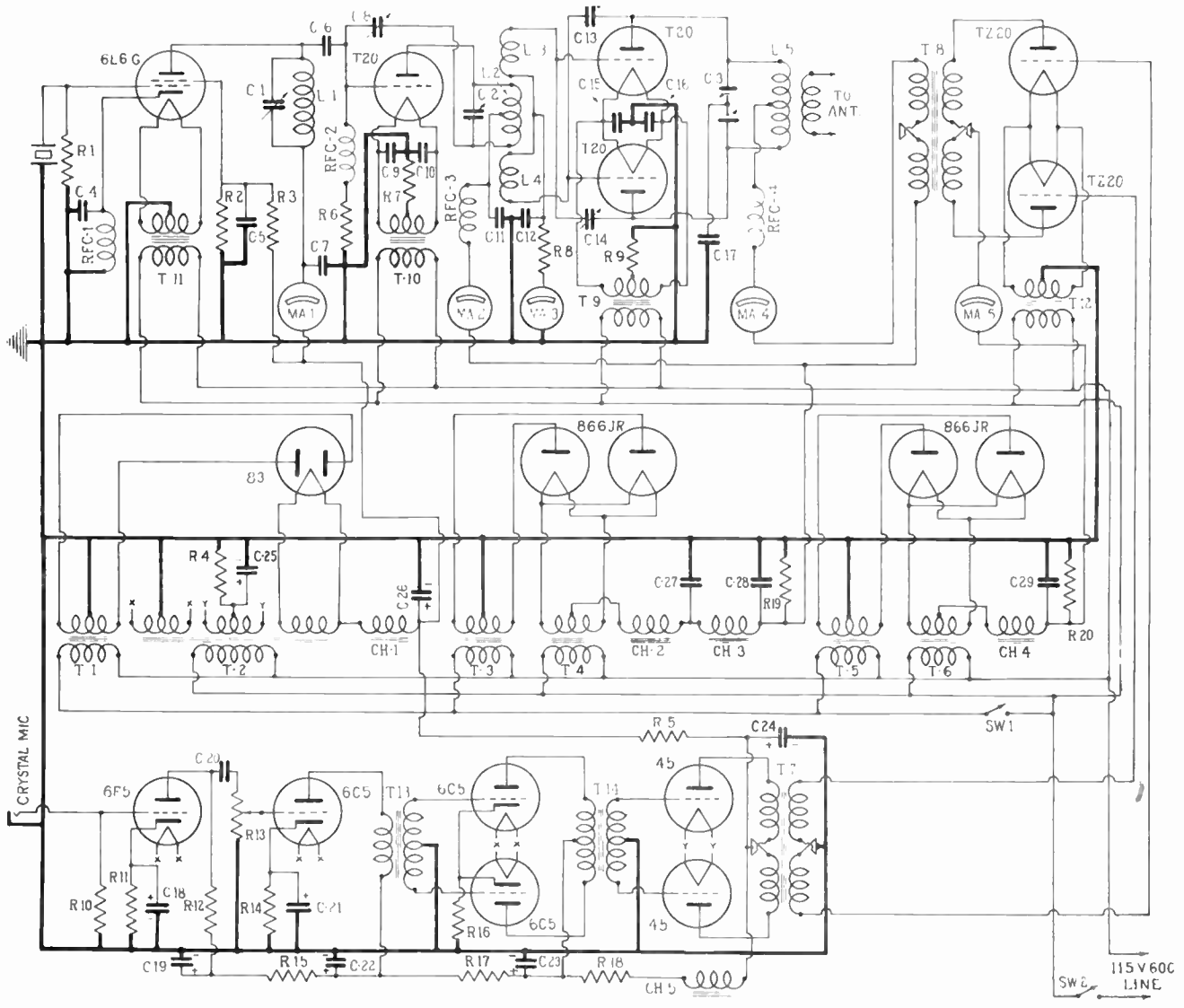
## COIL DATA

BAND	160	80	40	20	10
L <sub>1</sub>	45 t. No. 18 2 1/4" dia. Close Wound	26 t. No. 18 1 1/2" dia. Close Wound	12 t. No. 18 1 1/2" dia. Close Wound	8 t. No. 18 1 1/2" dia. 1 3/4" long	
L <sub>2</sub>	42 t. No. 18 2 1/4" dia. Close Wound	30 t. No. 18 1 1/2" dia. Close Wound	16 t. No. 18 1 1/2" dia. Close Wound	10 t. No. 18 1 1/2" dia. 1" long	4 t. No. 18 1 1/2" dia. 1" long
L <sub>3</sub> and L <sub>4</sub> on each side of and on same form as L <sub>2</sub>	Each 17 t. No. 24 wire close wound 1/4" from L <sub>2</sub> on each side	Each 10 t. No. 24 wire close wound 1/4" from L <sub>2</sub> on each side	Each 6 t. No. 22 wire close wound 1/4" from L <sub>2</sub> on each side	Each 3 t. No. 22 wire close wound 1/2" from L <sub>2</sub> on each side	Each 3 t. No. 22 wire close wound 1/2" from L <sub>2</sub> on each side
L <sub>5</sub>	46 t. No. 12 3" dia. 4" long	26 t. No. 10 2 1/2" dia. 4" long	20 t. No. 10 2 1/2" dia. 4" long	12 t. No. 10 2 1/2" dia. 4" long	6 t. No. 10 2 1/2" dia. 4" long

\*These values are only approximate and should be adjusted for normal plate current of the driver tube and maximum grid current of the amplifier tubes.



(Continued)



### PARTS LIST

- RESISTORS**
- R-1 100,000 ohms, 1 watt
  - R-2 35,000 ohms, 10 watt
  - R-3 10,000 ohms, 10 watt
  - R-4 750 ohms, 10 watt
  - R-5 750 ohms, 10 watt
  - R-6 10,000 ohms, 10 watt
  - R-7 400 ohms, 10 watt
  - R-8 2,500 ohms, 25 watt
  - R-9 200 ohms, 10 watt
  - R-10 5 megohms, 1/4 watt
  - R-11 2,250 ohms, 1 watt
  - R-12 250,000 ohms, 1 watt
  - R-13 500,000 ohm, vol. control
  - R-14 2,250 ohms, 1 watt
  - R-15 20,000 ohms, 1 watt
  - R-16 500 ohms, 1 watt
  - R-17 5,000 ohms, 10 watt
  - R-18 2,500 ohms, 10 watt
  - R-19 50,000 ohms, 100 watt
  - R-20 50,000 ohms, 100 watt

- VARIABLE CONDENSERS**
- C-1 105 mmfd. receiving type
  - C-2 105 mmfd. receiving type
  - C-3 210 mmfd. per section
  - C-8 6 mmfd. neut. cond.
  - C-13 6 mmfd. neut. cond.
  - C-14 6 mmfd. neut. cond.
- FIXED CONDENSERS**
- C-4 .00015 mfd. 1,000 volt mica
  - C-5 .01 mfd. 1,000 volt mica
  - C-6 .0001 mfd. 2,500 volt mica
  - C-7 .01 mfd. 1,000 volt mica
  - C-9 .002 mfd. 1,000 volt mica
  - C-10 .002 mfd. 1,000 volt mica
  - C-11 .002 mfd. 2,500 volt mica
  - C-12 .002 mfd. 1,000 volt mica
  - C-15 .002 mfd. 1,000 volt mica
  - C-16 .002 mfd. 1,000 volt mica
  - C-17 .002 mfd. 5,000 volt mica
  - C-18 10 mfd. 25 volt Elect.
  - C-19 8 mfd. 450 volt Elect.

- C-20 .1 mfd. 400 volt paper
  - C-21 10 mfd. 25 volt Elect.
  - C-22 8 mfd. 450 volt Elect.
  - C-23 8 mfd. 450 volt Elect.
  - C-24 8 mfd. 450 volt Elect.
  - C-25 10 mfd. 100 volt Elect.
  - C-26 8 mfd. 450 volt Elect.
  - C-27 2 mfd. 1,500 volt
  - C-28 2 mfd. 1,500 volt
  - C-29 2 mfd. 1,500 volt
- TRANSFORMERS**
- T-1 T-53P03
  - T-2 T-79F84
  - T-3 T-16P00
  - T-4 T-16F08
  - T-5 T-16P00
  - T-6 T-16F08
  - T-7 T-15D78
  - T-8 T-11M75
  - T-9 T-16F14
  - T-10 T-16F13

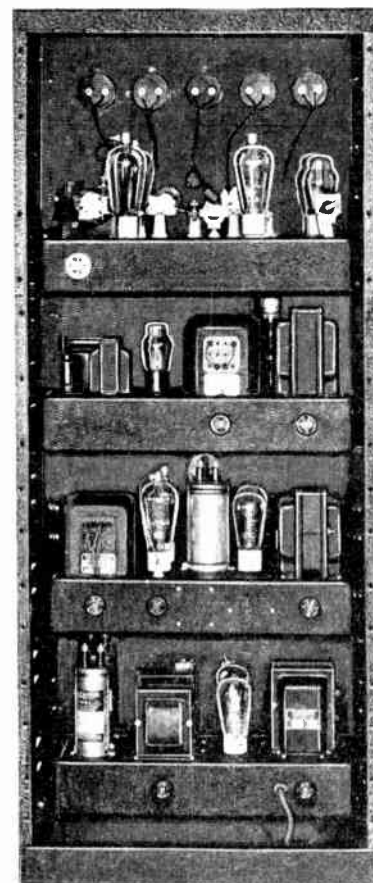
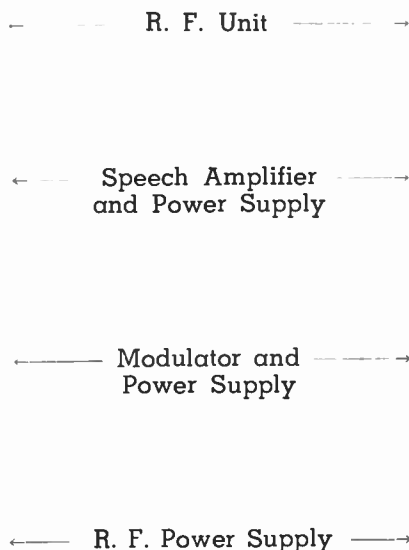
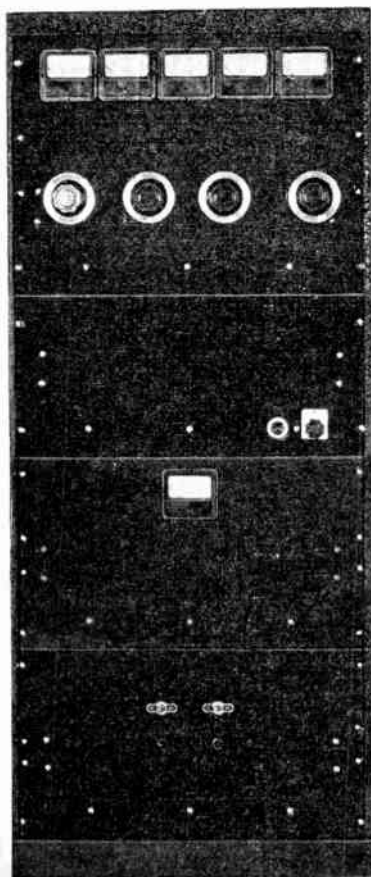
- T-11 T-16F17
  - T-12 T-16F14
  - T-13 T-57A41
  - T-14 T-58A70
- CHOKES**
- CH-1 T-74C29
  - CH-2 T-16C20
  - CH-3 T-16C25
  - CH-4 T-16C20
  - CH-5 T-74C30
- METERS**
- MA-1 100 M.A.
  - MA-2 150 M.A.
  - MA-3 100 M.A.
  - MA-4 300 M.A.
  - MA-5 300 M.A.
- RFC-1 125 ma R.F. Choke  
 RFC-2 125 ma R.F. Choke  
 RFC-3 125 ma R.F. Choke  
 RFC-4 250 ma R.F. Choke





# 5 and 10 Meter Transmitter

THORDARSON



The use of modulated oscillators for ultra-high frequency operation is no longer considered good practice. The signal from such a transmitter is extremely broad and badly distorted, and can only be satisfactorily received on a broad receiver.

The best practice is to use a crystal controlled oscillator with the necessary frequency multipliers. But even fair efficiency is difficult to achieve unless great care is used in the selection of parts and in layout. Good insulation is an absolute necessity since capacities that are not even considered at low frequencies can be large enough to by-pass considerable energy at ultra-high frequencies.

This transmitter was designed by the Taylor Tube Company especially for 5 and 10 meter operation. Good insulation, careful layout, tuning condensers for correct L/C ratios all combine to make this a "better than usual" transmitter for the higher frequencies. At the same time its construction is simple and easy for the less experienced builder.

The circuit itself is not unusual in any way. A type 6L6G or 6F6G tube is used as the crystal oscillator followed by a 6L6G frequency multiplier,

a T-20 or TZ-20 buffer-doubler and push-pull T-20's as amplifiers. The type 6F6G tube is used as an oscillator with a 20 meter crystal and the type 6L6G with a 40 meter crystal.

The speech amplifier is a high gain unit with exceptionally good response characteristics and was designed for use with the popular crystal type microphones. The use of zero bias TZ-20 tubes as modulators eliminates the bias supply problem, thus simplifying layout and construction considerably.

All in all this is an ideal transmitter for the man who wants good quality and dependable performance on the high frequency bands.

The correct modulation transformer for use with this transmitter is T-11M75. The connections are as follows:

For the primary: Modulator plates connect to No. 2 and No. 5. No. 3 and No. 4 are joined and connect to B+.

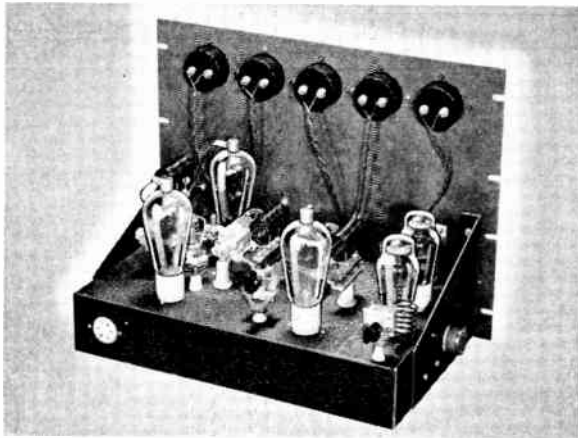
For the secondary: No. 7 and No. 11 are joined; also No. 8 and No. 12. The class C load is connected to No. 7 and No. 8.

The driver transformer is a T-15D78 and the correct ratio is 3.2:1.

## TRANSMITTER GUIDE



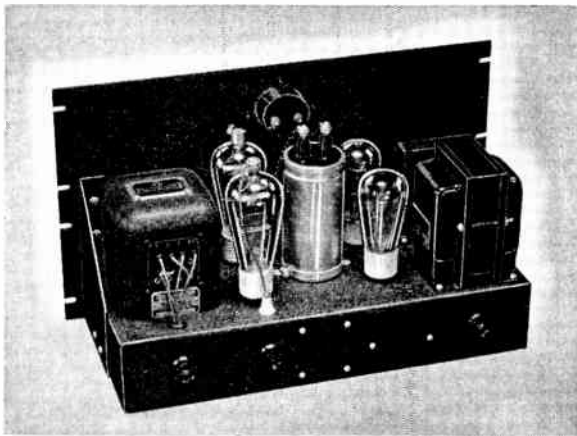
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**R. F. UNIT**  
Chassis: 17" x 10" x 3"; Panel: 14"



**SPEECH AMPLIFIER AND POWER SUPPLY**  
Chassis: 17" x 10" x 3"; Panel: 8¾"



**MODULATOR AND POWER SUPPLY**  
Chassis: 17" x 16" x 3"; Panel: 10½"



**R. F. POWER SUPPLY**  
Chassis: 17" x 10" x 3"; Panel: 10½"

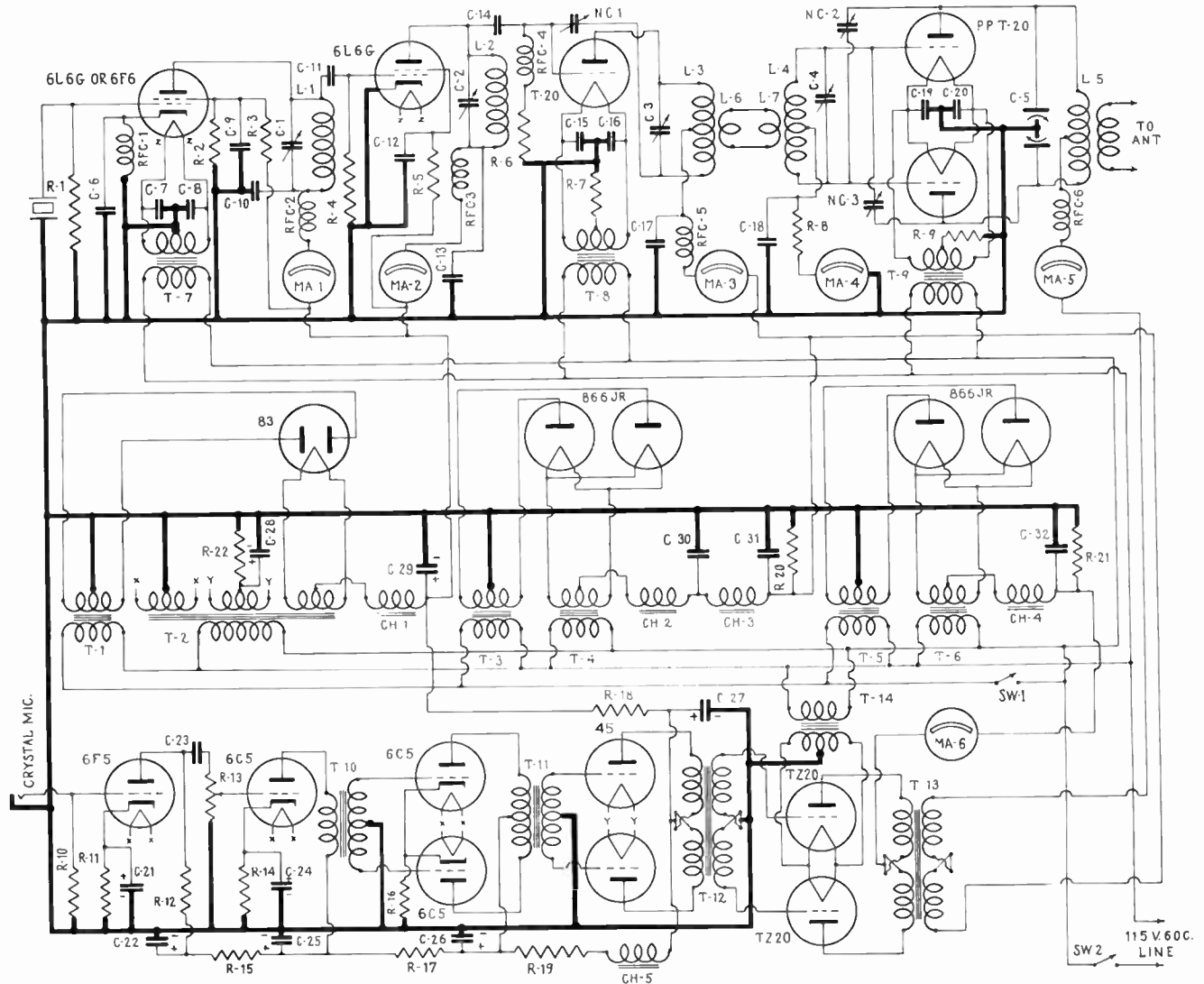
COIL DATA			
Band	10		5
L <sub>3</sub>	14 t. No. 10 1" dia. 2¾" long		6 t. No. 10 1" dia. 1¾" long
L <sub>4</sub>	12 t. No. 10 1" dia. 2¼" long		4 t. No. 10 1" dia. 1" long
L <sub>5</sub>	16 t. No. 10 1" dia. 2¾" long		6 t. No. 10 1" dia. 1½" long
L <sub>1</sub>	16T #14	1" dia.	1⅝" long
L <sub>2</sub>	7T #10	1" dia.	1½" long



# 5 & 10 Meter Transmitter

THORDARSON

(Continued)



## PARTS LIST

- RESISTORS**
- R-1 100,000 ohms, 1 watt
  - R-2 35,000 ohms, 10 watt
  - R-3 10,000 ohms, 10 watt
  - R-4 50,000 ohms, 1 watt
  - R-5 25,000 ohms, 10 watt
  - R-6 5,000 ohms, 10 watt
  - R-7 400 ohms, 10 watt
  - R-8 2,500 ohms, 25 watt
  - R-9 200 ohms, 10 watt
  - R-10 5 megohms, 1/4 watt
  - R-11 2,250 ohms, 1 watt
  - R-12 250,000 ohms, 1 watt
  - R-13 500,000 ohm, vol. control
  - R-14 2,250 ohms, 1 watt
  - R-15 20,000 ohms, 1 watt
  - R-16 500 ohms, 1 watt
  - R-17 5,000 ohms, 1 watt
  - R-18 750 ohms, 10 watt
  - R-19 2,500 ohms, 10 watt
  - R-20 50,000 ohms, 100 watt
  - R-21 50,000 ohms, 100 watt
  - R-22 750 ohms, 10 watt

- TUNING CONDENSERS**
- C-1 35 mmfd. Receiving type
  - C-2 35 mmfd. Receiving type
  - C-3 35 mmfd. 1,000 volt spacing
  - C-4 35 mmfd. 1,000 volt spacing
  - C-5 35 mmfd. per section 1,000 volt spacing
  - NC-1 6 mmfd. 1,000 volt spacing
  - NC-2 6 mmfd. 1,000 volt spacing
  - NC-3 6 mmfd. 1,000 volt spacing

- FIXED CONDENSERS**
- C-6 .00015 mfd. 1,000 volt mica
  - C-7 .001 mfd. 1,000 volt mica
  - C-8 .001 mfd. 1,000 volt mica
  - C-9 .01 mfd. 1,000 volt mica
  - C-10 .01 mfd. 1,000 volt mica
  - C-11 .0001 mfd. 2,500 volt mica
  - C-12 .01 mfd. 1,000 volt mica
  - C-13 .01 mfd. 1,000 volt mica
  - C-14 .0001 mfd. 2,500 volt mica
  - C-15 .001 mfd. 1,000 volt mica
  - C-16 .001 mfd. 1,000 volt mica
  - C-17 .002 mfd. 2,500 volt mica
  - C-18 .002 mfd. 1,000 volt mica

- C-19 .001 mfd. 1,000 volt mica
- C-20 .001 mfd. 1,000 volt mica
- C-21 10 mfd. 25 volt Elect.
- C-22 8 mfd. 450 volt Elect.
- C-23 .1 mfd. 400 volt paper
- C-24 10 mfd. 25 volt Elect.
- C-25 8 mfd. 450 volt Elect.
- C-26 8 mfd. 450 volt Elect.
- C-27 8 mfd. 450 volt Elect.
- C-28 10 mfd. 100 volt Elect.
- C-29 8 mfd. 450 volt Elect.
- C-30 2 mfd. 1,500 volt
- C-31 2 mfd. 1,500 volt
- C-32 2 mfd. 1,500 volt

- TRANSFORMERS**
- T-1 T-53P03
  - T-2 T-79F84
  - T-3 T-16P00
  - T-4 T-16F08
  - T-5 T-16P00
  - T-6 T-16F08
  - T-7 T-16F17
  - T-8 T-16F13
  - T-9 T-16F14

- T-10 T-57A41
- T-11 T-58A70
- T-12 T-15D78
- T-13 T-11M75
- T-14 T-16F14

- CHOKES**
- CH-1 T-74C29
  - CH-2 T-16C20
  - CH-3 T-16C25
  - CH-4 T-16C20
  - CH-5 T-74C30

- METERS**
- MA-1 100 M.A.
  - MA-2 100 M.A.
  - MA-3 150 M.A.
  - MA-4 100 M.A.
  - MA-5 300 M.A.
  - MA-6 300 M.A.
  - RFC-1 125 ma R.F. Choke
  - RFC-2 125 ma R.F. Choke
  - RFC-3 125 ma R.F. Choke
  - RFC-4 125 ma R.F. Choke
  - RFC-5 125 ma R.F. Choke
  - RFC-6 250 ma R.F. Choke





**MODULATION PRINCIPLES**

Modulation of an R.F. carrier may be accomplished in a number of different ways: plate modulation, grid modulation, and screen or suppressor modulation. By far the most popular is plate modulation; and with the merits of class B audio accepted facts, the trend of even the largest broadcast stations, which in the past used low level modulation, is toward the use of plate modulation in the final stage.

Plate modulation is accomplished by varying the plate voltage on the class C stage in accordance with the wave shape of the signal from the modulators. If the normal class C plate voltage is 1000 volts, for 100 per cent modulation the plate voltage (due to the voltage from the modulators) will swing from zero to 2000 volts.

In Figure 1 is shown a carrier which is 100 per cent modulated by a sine wave.

The unmodulated carrier is shown from A to B; the modulated portion, from B to C. The distances a and b represent either voltage or current amplitudes; and for 100

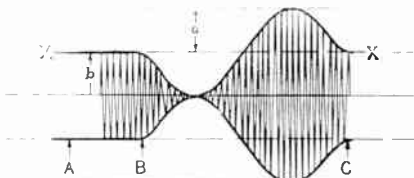


FIG. 1

per cent modulation, they are equal. This modulated wave may be thought of as the regular carrier surmounted by a sine wave, the axis of which (X-X') is placed along the top of the carrier. This sine wave signal and the power represented in it must be supplied by the modulators. The amplitude of the carrier is b, and the carrier power is thus equal to  $Kb^2$ , where K is a constant. The amplitude of the sine wave from the modulators is a, which is equal to b; and since the effective value is  $.707b$ , the power in the sine wave is  $K(.707b)^2$  or  $.5Kb^2$ . The sideband power supplied by the modulators is thus one-half the carrier power. It should be borne in mind, however, that these figures hold only for a sine wave; and from this comes the statement that for 100 per cent modulation, the output of the modulators must be one-half the class C input.

A more general statement which would eliminate the wave form of the modulators would take into account peak modulator

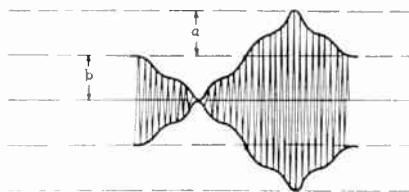


FIG. 2

power, rather than average power. In Figure 1, since a equals b, the carrier power  $Kb^2$  is equal to the peak modulator power  $Ka^2$ .

In Figure 2 is shown a carrier 100 per cent modulated by a complex wave.

The distance a is still equal to the distance b; and it may be seen that the average power represented in the sidebands is much less than the power in a sine wave of equivalent amplitude a, since the area under the complex wave is less. The average power in the sidebands, then, is less than one-half the carrier power. Speech wave form is similar to the wave form in Figure 2 in that the average sideband power is similarly less than half the carrier power. In other words, to modulate 100 per cent an input of 100 watts, the peak power supplied by the modulators is 100 watts; although for a sine wave this 100 watts of peak power represents but 50 watts of average power, and for voice frequencies this 100 watts of peak power may represent only 30 watts of average power. This does not mean that a 30 watt amplifier will modulate an input of 100 watts on voice frequencies; but it does mean, in order to modulate 100 per cent on input of 100 watts, that the peak modulator power must be 100 watts regardless of wave form.

Figure 3 shows a partially modulated carrier.

Here, a is less than b; and the percentage of modulation is equal to  $(\frac{a}{b} \times 100)$ .

The modulator power for any percentage

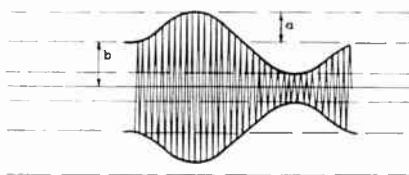


FIG. 3

of modulation may be easily calculated. Suppose that it is necessary to know the modulator power for 50 per cent modulation. This sideband power is equal to  $K(.707a)^2$  or  $.5Ka^2$ . However, since a equals  $.5b$ , for 50 per cent modulation, the sideband power is  $.5K(.5b)^2$  or  $.125Kb^2$ . The modulator power for 50 per cent modulation is equal to  $.125$  times the class C input. It would be possible to modulate 50 per cent an input of 100 watts with a modulator power of 12.5 watts.

**CLASS B AUDIO OUTPUT CALCULATIONS**

Because of the relatively low power output of class A amplifiers and the fact that the plate dissipation is maximum for no-signal conditions, the overall efficiency of such an amplifier is very low. Where considerable audio power is desired the size of the tubes and the cost of plate power supply, per watt output, increases so rapidly that such amplifiers are seldom used.

The grid swing in the class A amplifiers is usually limited to the negative region for the entire input cycle because, in general, grid swings into the positive region result in plate circuit distortion.

According to the definition of a class B amplifier, the bias is such that the operating plate current is small, so that for the no-signal conditions the plate dissipation is low. The class B amplifier is the most efficient type of amplifier for audio frequencies, and may attain a plate efficiency of 65 to 70 per cent at full output power for some of the larger tubes.

Although a class B audio amplifier operates with two tubes in a push-pull circuit, only one tube supplies power to the load at any one instant.

Since only one tube operates at a time, the plate curve of only one tube is used in making class B calculations. In Figure 4 is shown the plate curve of a type T-20

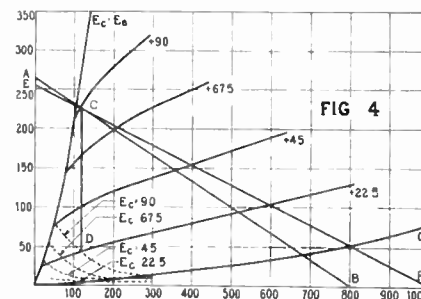


FIG. 4

tube. The normal plate to plate load for a pair of these tubes is 12,000 ohms for an output of 70 watts at a plate voltage of 800 volts. The plate load on one class B tube is one quarter the plate to plate load; and in this case, the plate load is  $\frac{12000}{4}$  or 3000 ohms. The load line corresponding to this load is shown at AB. Since the tubes operate at 800 volts, the load line intersects the abscissa at 800 volts; and the point of intersection on the ordinate is  $\frac{800}{3000}$  or 266 M.A.

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In reality, this load line AB is the relation between the useful drop across the load and the tube drop. In order that the tube drop be low and consequently the efficiency high, it is necessary to operate in the positive grid region. For instance, at the intersection of the load line and the curve  $i = 45$ , it may be seen that the tube drop is approximately 350 volts; and the useful drop across the load line is only 450 volts. The peak plate current at this intersection is 150 M.A. At this point the drop across the load may be checked, and it should be equal to  $(.150 \times 3000)$  or 450 volts. Assuming that the voltage on the grids of class B stage is a sine wave, this voltage drop across the load is in reality the peak value of a sine wave voltage across the load. This voltage, then, must be multiplied by .707 in order to obtain an effective value from which power is calculated. The effective value of the voltage across the load is then equal to  $(.150 \times 300 \times .707)$ . Since the power is equal to EI, if the voltage  $(.150 \times 3000 \times .707)$  is multiplied by the effective current, we will have the power output of the class B stage. The effective value of the current is  $(.707 \times .150)$ . The class B power output, then is  $(.150 \times 3000 \times .707) (.150 \times .707)$  or  $(.150)^2 \times 3000 \times (.707)^2$ . If .150 is designated by I and 3000 by R, the class B output is  $I^2R \times (.707)^2$  or  $\frac{I^2R}{2}$

which is the well-known expression for class B output. I is called the dynamic plate current, and the average value for a sine wave as read on a D.C. meter is .636 I. For any dynamic peak plate current I, the power output is  $\frac{I^2R}{2}$ ; and the power input is .636IE. The class B efficiency is thus

$$\frac{I^2R}{2 \times .636 IE^2} = \frac{IR}{1.272 E}$$

The plate dissipation per tube is

$$\frac{.636 IE - \frac{I^2R}{2}}{2}$$

In the above numerical example, the class B output is 33.8 watts, the efficiency is 44 per cent, and the plate dissipation per tube is 18 watts.

If the grid swing is increased to +90 volts, the dynamic peak plate current is 230 M.A., the power output is 80 watts, the efficiency is 68 per cent, and the plate dissipation per tube is 18.5 watts. It may be seen from the curve that the drop across

the tube is now only 125 volts, and the drop across the load is 675 volts. We see that the higher the voltage across the load, the higher the efficiency. If now we may assume that the entire voltage is effectively across the load, we may figure the maximum theoretical efficiency of a class B stage. Using the same notations of I, R, and E, the dynamic plate current is  $\frac{E}{R}$ ; and the power output is  $\frac{E^2}{R^2} \times \frac{R}{2}$ . The power input is .636 IE, or  $.636 \frac{E^2}{R}$ . The efficiency is

$$\frac{\frac{E^2}{R^2} \times \frac{R}{2}}{.636 \frac{E^2}{R}} = \frac{1 \times 100\%}{1.272} = 78.5\%$$

which is the maximum theoretical efficiency of a class B amplifier.

### CLASS B DRIVING POWER AND DRIVER TRANSFORMER RATIO

In the previous discussion on class B output, it was stated that a certain amount of power is required to drive a class B amplifier. The grid circuit of the class B amplifier is a non-linear impedance. At some positive value of the grid signal voltage E, the grid current may be 5 ma.; if the signal voltage is increased to 2E, the grid current may be 15 or 20 ma., depending upon the actual value of E and upon the plate circuit conditions. The grid circuit may be compared to a variable impedance which decreases in value as the grid voltage increases. The driver, then, must supply power to a varying load; and if the class B grids are to be driven properly, this driving power must be supplied in such a way that the grid voltage does not drop appreciably as the power taken by the grid circuit increases. In other words, the source of power must have good regulation.

In Figure 5 is shown the equivalent circuit of a single class B grid. The driver stage may be considered a source of

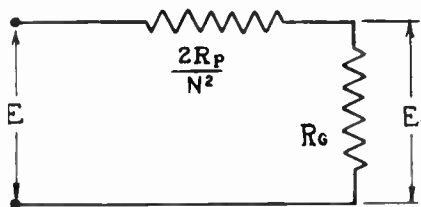


FIG. 5

voltage E of perfect regulation which supplies power through  $\frac{2R_p}{N^2}$ , the equivalent resistance of the driver tubes. Rg is the instantaneous impedance of the grid circuit, which varies from an infinite (in the case of class B tubes operating with fixed bias) to a very definite value. In order to maintain the voltage E1 constant regardless of the value of Rg, the resistance  $\frac{2R_p}{N^2}$  must be small compared to Rg.

The actual value of  $\frac{2R_p}{N^2}$  is the driver tube plate impedance referred to one-half the secondary; and in the case of a push-pull driver, it is equal to the plate resistance of both tubes divided by the turns ratio squared of the driver transformer. This ratio is figured from the total primary to one-half the secondary. It may be seen that in order to reduce the resistance of the source, the driver tubes must have low plate resistance, the driver transformer should have as high a step-down ratio as possible, and the ohmic resistance of both the primary and the secondary of the driver transformer should be small. It is the function of the driver transformer to reflect into the plate circuit of the driver tubes a load of such value that the required driving power is just developed with full excitation to the driver grids. If this is done, the driver transformer will have as high a step-down ratio as is consistent with delivering the necessary voltage to the class B grids.

In Figure 4, if the grid voltage is +90 (point C) with the 12,000 ohm plate to plate load, the grid current as read on the dotted curve (point D) is 45 ma. The average driving power, then, is

$$EI \text{ or } .707 (90 \text{ r class B bias}) \times (.707 \times 45) = .707 (90 : 40) \times (.707 \times 45) \text{ or } EI = 2.92 \text{ watts.}$$

Suppose that a pair of 2A3 tubes operating at 250 volts are to be used as drivers. Although the 2A3 tubes are capable of about 10 watts output, in this case only 2.92 watts are necessary; and the 2A3 tubes should operate with a plate to plate load of a value such that the 2.92 watts are just developed with full excitation to the driver grids. The power output of the 2A3 push-pull stage is approximately: (see class A output calculations, page 36).

$$\left\{ \frac{\mu E_g}{R_p + R_i} \right\}^2 \times R_i \text{ or } \left\{ \frac{4.2 \times 43.5}{800 + R_i} \right\}^2 \times R_i.$$

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Where  $R_L$  is one-half the plate to plate load, equating  $\left\{ \frac{183}{800 + R_L} \right\}^2 \times R_L$  equal to 2.92, then the value of  $R_L$  is 9800 ohms.

The peak voltage developed across the driver primary is equal to  $\frac{(183 \times 9800)}{(9800 + 800)} \times 2$  or 358 volts.

The class B grid swing is 90+40 or 130 volts. The driver transformer step down ratio is  $\frac{358}{130}$  or 2.75 to 1. Actually, this ratio should be lowered about 15 per cent to allow the driving power to be developed slightly below the grid current point of the drivers. The correct ratio, then is 2.2 to 1.

**OVERLOADING OF  
MODULATOR TUBES**

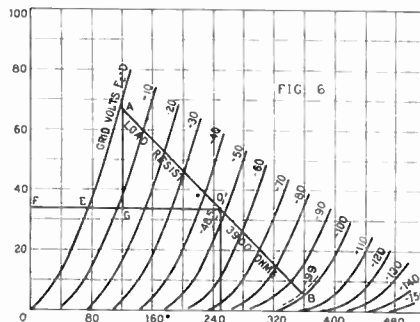
As we have already seen, the peak modulator power to modulate 100 per cent a given input is equal to the class C input. This statement holds true regardless of modulator wave form. Since ordinary speech wave form is peaked, the average power in speech is considerably less than the average power in a sine wave of equivalent amplitude. In other words, for speech, an average modulator power of between 250 and 300 watts is required to modulate 100 per cent a class C input of one kilowatt.

This does not mean, however, that 250 to 300 watts of audio based on sine wave output will modulate an input of one kilowatt with voice input. This is the source of a great deal of confusion, as it is frequently claimed that a modulator set-up with an output of say 200 watts will modulate up to 800 watts with voice frequencies. This is a fallacy, for if the operating constants of the amplifier have been correctly set for the 200 watt average condition, the peak power output is 400 watts, and the maximum amount of power capable of being modulated is 400 watts, regardless of modulator wave form. However, it is possible to obtain higher values of peak power from certain types of class B tubes without greatly exceeding the rated plate dissipation. If the tube insulation is good, the plate voltage and the plate to plate load may be increased without increasing the dynamic peak plate current.

Using the T20 tube as an example, Figure 4, the load line  $\frac{12000}{4}$  is shown at AB. The normal power output is given as 70 watts; from the equation  $\frac{I^2 R}{2}$ , this power requires a dynamic peak plate current of 215 M.A. Since this tube may be modulated at 750 volts, it seems reasonable to assume that at least 1000 volts may be used safely in a class B audio amplifier. The tube drop with the normal rating is 155 volts, so the voltage available across the load with 1000 plate volts is 1000-155 or 845 volts. Since the dynamic peak current is still 215 M.A., the new plate to plate load is now  $\frac{845}{.215} \times 4$  or 15,700 ohms, which is shown at EF. The peak power output is  $845 \times .215$  or 182 watts. In other words, a pair of T20's operating at 1000 volts with a plate to plate load of 15,700 ohms would modulate an input of 182 watts at voice frequencies.

This modulator set-up is also capable of delivering 91 watts output based on a sine wave signal, although the plate dissipation is exceeded. The average plate input to the two tubes is  $.215 \times 1000 \times .636$  or 137 watts; and the plate dissipation per tube is thus  $\frac{137.91}{2}$  or 23 watts. This overload is not serious even with a sine wave signal, and the plate voltage may be further increased to 1100 volts with a corresponding increase in the plate to plate load and power output.

The required class B driving power is practically unchanged; however, since the class B bias must be increased slightly to take care of the increase in plate voltage, the driving voltage must be increased by the amount of increase in the bias voltage.



**CLASS A OUTPUT  
CALCULATIONS**

The class A amplifier is an amplifier in which the grid bias voltage permits a steady plate current flow of such a value that the plate current varies directly as the grid voltage for the complete cycle of 360 electrical degrees. The resulting output voltage for the ideal class A amplifier is an exact reproduction of the grid voltage.

It is particularly important, especially in driver calculations, to calculate class A power output from the value of tube plate resistance alone. In Figure 6 are shown the plate curves of the type 45 tube. Each one of the curves marked  $E_c = 0, -10, -20, \text{etc.}$ , is the slope of the tube plate resistance.

Let us assume that the operating conditions of a single 45 tube are as follows: plate voltage, 250 volts; bias, -48.5 volts; and plate load, 3900 ohms. The operating point "O" may be located at the intersection of a line drawn vertically from 250 volts and the curve marked  $E_c = -48.5$ . A load line, AB, corresponding to 3900 ohms is drawn through the point "O"; this load line is merely the relation between load voltage and plate current. To determine the slope of the 3900 ohm load, divide 250 by 3900; this gives 64 M.A., which, when added to the static current of 32 M.A., gives the point on the ordinate through which the 3900 ohm load passes.

A line OE is drawn through the operating point "O". This line OE corresponds to an infinitely high plate load and theoretically is the maximum voltage which may be developed across the plate load.

The voltage FE is the tube drop due to the static plate current and is equal approximately to the tube resistance multiplied by the static plate current. The voltage OE is now the voltage actually available for use across the load and for the additional tube drop due to the increase in plate current. If a line AG is drawn at right angles to OE, then OG is the actual voltage across the load; and GF is the total tube drop. Since OG is the voltage across the 3900 ohm load, it is possible to calculate the power output

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of the tube. The peak signal current is equal to  $\frac{OG}{3900}$ . This peak current is also equal to the voltage  $E_g$  divided by  $R_p$ , the plate resistance of the tube. Thus the peak signal current is equal to  $\frac{OE}{R_p + 3900}$  or  $\frac{OE}{R_p + R}$  if 3900 ohms be replaced by  $R$ .

Since this current is a peak value and since power is figured on the basis of a sine wave,  $I$  must be multiplied by .707 to give an effective value. Therefore  $I = \frac{.707 OE}{R_p + R}$ . Since power equals  $I^2 R$ , the power output of the tube is

$$\left\{ \frac{.707 OE}{R_p + R} \right\}^2 \times R = \left\{ \frac{OE}{R_p + R} \right\}^2 \times \frac{R}{2}$$

All that remains to be done is to find the value of  $OE$  in terms of the tube constants.

By definition, the amplification factor of a tube is the ratio of a plate voltage change to a grid voltage change which produces a like change in the plate current. If  $E_c$  is the grid voltage change and if  $E_p$  is the plate voltage change, then the amplification factor,  $\mu$ , is equal to  $\frac{E_p}{E_c}$  or  $E_p = \mu E_c$ . Since in the above case the grid voltage change is 48.5 volts, the maximum plate voltage change is  $48.5\mu$ , which is equal to  $OE$ . The power output of the class A stage is thus

$$\left\{ \frac{48.5\mu}{R_p + R} \right\}^2 \times \frac{R}{2}$$

For a more general equation, if 48.5 is replaced by  $E_c$  (which may be any grid voltage swing up to 48.5 volts), the power output is

$$\left\{ \frac{\mu E_c}{R_p + R} \right\}^2 \times \frac{R}{2}$$

This is a simplified formula for determining the power output of a class A stage. If two tubes are used in push-pull, the above output is doubled and  $R$  is one-half the total plate-to-plate load on the push-pull tubes.

## PLATE CIRCUIT REGULATION

Correct driver transformer design is not the only consideration in driver regulation. All of the circuit between the driver grids and the class B grids is involved.

The voltage regulation of any generat-

ing device is its ability to furnish different amounts of current (hence power) to the load with little change in voltage. A device has poor regulation if the voltage falls rapidly with increased power drain. There is, then, a loss of voltage in the output, or load circuit, when regulation is poor, and since this voltage does not appear across the load, it must be lost in the generating source where it is, of course, not effective.

If the voltage regulation is poor at the class B grids, there must be voltage losses either in the driver transformer or the driver tubes. If the design of the driver transformer is correct, the regulation is negligible compared with that tolerable at the class B grids. The driver tubes, then, must be the source of poor regulation, and since a voltage drop can occur only across an impedance of some sort, resistive or otherwise (the only impedance in the driver tube is the plate resistance) this must be the source of trouble.

A tube may be considered a source of voltage  $E$ , having perfect regulation, which supplies power to a load  $R$  through resistance  $R_p$ . (Figure 7).

This resistance  $R_p$  is called the plate resistance of the tube. It is possible to determine the value of  $R_p$  by means of

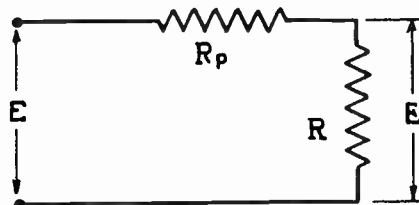


FIG. 7

two measurements. If  $R$  be removed so that there is no load across  $E_1$ , then  $E_1$  is equal to  $E$ . If  $R$  is now replaced, the voltage  $E_1$  will be less than  $E$  due to the voltage drop across  $R_p$ . The total current is  $\frac{E}{R_p + R}$ ; and the voltage drop across  $R_p$  is  $\frac{E \times R_p}{R_p + R}$  which is equal to  $E - E_1$ . Therefore,

$$E - E_1 = \frac{E \cdot R_p}{R_p + R}$$

where every value is known except  $R_p$ , and this can be determined from the formula.

In the same way, it is possible to determine the plate resistance directly

from the plate characteristics of the tube. In Figure 8 are shown the plate characteristics of the 2A3 tube. The operating conditions are as follows: 250 volts on the plate and 43.5 volts of bias. Assuming that the peak grid swing is 43.5 volts, then operation is between the operating point  $O$  and the Curve  $E_c = O$ . For an infinite load (load line parallel to the abscissa), the peak voltage developed across the load is  $OA$ , or 250-70 volts or 180 volts. If a 2500 ohm load is now placed in the plate circuit, the voltage across the load is then only  $OB$ , or 250-110 volts or 140 volts. The difference between 180 and 140 volts or 40 volts is caused by the plate resistance of the tube. Therefore, if in the equation

$$E - E_1 = \frac{E \cdot R_p}{R_p + R}$$

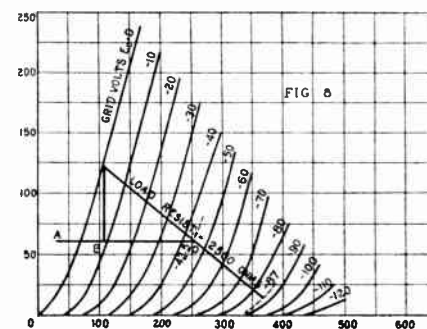
we substitute our known values, the value of the plate resistance may be found.

$$180 - 140 = \frac{180 \cdot R_p}{R_p + 2500}$$

and  $R_p = 715$  ohms.

Referring to Figure 7—the value of  $E_1$  may be determined for different values of  $R_p$  by removing  $R$ . It will be seen that with lower values of  $R_p$  the difference between  $E_1$  and  $E$  decreases.

An inspection of the characteristics of tube types available for driver purposes will show that only power triodes, such as 2A3's, 45's etc., have relatively low plate resistance values. Pentode and beam power tubes, because of their high plate resistance values, are not suitable as drivers. The type 6L6 tubes can be used with highly satisfactory results if inverse feed-back is employed to reduce the effective plate resistance to a low value.





**URNS RATIO OF  
LINE TO CLASS B  
GRID TRANSFORMERS**

There seems to be some confusion on the subject of transformers which couple a line to the grids of class B tubes. Either the principles of operation are not completely understood, or they are entirely overlooked. This misunderstanding usually arises when a given amplifier with a 500 ohm output winding is used to drive a class B audio stage. It is common practice, especially if the amplifier is located some distance from the class B stage, to connect a line from the 500 ohm winding of the amplifier directly to a line to grid transformer rather than to replace the output transformer on the amplifier with a driver transformer. This practice is perfectly correct when the line to grid transformer is designed to operate with the specific output transformer on the amplifier.

Actually, the operating conditions of a tube when used as a power amplifier are entirely different from the conditions under which it operates as a driver. As a power amplifier, the plate load is of such a value that the power output is a maximum with a reasonable amount of distortion, and the plate load is constant throughout the cycle. However, as a driver, power output is not the prime consideration. The plate load, which varies throughout the cycle with the class B grid swing, should be as high as is consistent with developing the required driving power. Good regulation is thus the most important feature of the driver, and this is obtained by making the plate load high in comparison with the tube plate resistance.

In ordinary power amplifier design, the plate to plate load is fairly low. For push-pull 2A3's it may be 3000 or 5000 ohms; however, when used as drivers, the 2A3's should have a plate-to-plate load two or three times these values. Since the line to grid transformer is connected to the output of the amplifier, its function is to reflect a load of such a value that the required driving power is just developed with full excitation to the driver grids.

Suppose that an amplifier using 2A3's with a plate-to-plate load of 3000 ohms were coupled to a line to grid transformer through a 500 ohm line and suppose that the 2A3's were to be coupled directly to the class B grids through a driver transformer, the correct turns ratio of the driver transformer would be 3.2 to 1. Then, when the amplifier is connected to the class B grids through the line, the turns ratio from the total primary of the output transformer on the amplifier to one-half the secondary on the line to grid transformer should also be 3.2 to 1.

Assuming that the plate-to-plate load on the 2A3's is 3000 ohms, the turns ratio of the output transformer from the primary to the 500 ohm secondary is 2.45 to 1. The correct ratio of the line to grid transformer to give an effective overall ratio

of 3.2 to 1 is 1 to .765. If the plate-to-plate load on the 2A3's had been 5000 ohms instead of 3000 ohms, the turns ratio of the line to grid transformer would have been 1 to .98 in order to preserve the overall ratio of 3.2 to 1. It may be seen from this that the correct turns ratio of the line to class B grid transformer is entirely dependent upon the turns ratio of the output transformer with which it is used, and that the so-called 500 ohm line is merely a connecting link between the two transformers.

Frequently some engineers make the mistake of designing a line to class B grid transformer on the sole basis of the so-called 500 ohm line. To give a concrete example, let us assume that it is necessary to design a line to grid transformer to couple from the above amplifier when the only known condition is the fact that the output of the amplifier is 500 ohms. Suppose that the class B stage consists of a pair of 830-B's. The average driving power required by the 830-B's is 6 watts, and the peak grid swing is 135 volts. The minimum grid impedance is thus 1500 ohms. The turns ratio of the line to grid transformer on the basis that the impedance of the line is 500 ohms would be 1 to 1.73. This would give an effective overall ratio of 1.41 to 1 instead of the correct value of 3 to 1. This change in effective ratio would result in very poor driver regulation. Actually, the impedance of the "500 ohm line" with the correct ratio is 2250 ohms at the peak of the wave, and the average value over the entire cycle is much higher. The plate-to-plate load on the drivers in the case of the 3 to 1 ratio is 13,500 ohms, whereas with the incorrect ratio the plate-to-plate load is the original value of 3000 ohms.

Less driver excitation is required for the 3000 ohm plate-to-plate load, and for this reason it may seem that the lower effective ratio is more satisfactory. However, the driver distortion is much higher with the lower plate-to-plate load.

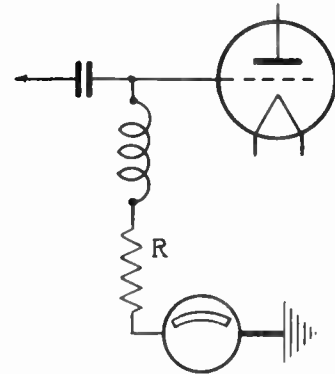
In actual practice, the turns ratio of the line to grid transformer is increased from the theoretical value to allow for the losses in the transformer. These losses are not great, and if the theoretical value is increased 10 to 15 per cent, sufficient class B grid swing will be developed with excitation slightly below the grid current point of the drivers.

Unless the output transformer on the amplifier has adequate primary inductance, the overall frequency response of the amplifier will suffer due to the changes in the value of the plate-to-plate load on the output transformer. However, this change in frequency response is usually not great enough to be considered.

Thus, it may be readily seen that to design a line to class B grid transformer properly, the method using the so-called 500 ohm line should be disregarded in favor of the method which takes into account the actual turns ratio of the output transformer.

**BIAS SUPPLY CIRCUITS**

A radio frequency amplifier may be biased by means of a resistor in the grid circuit, by cathode bias, by some external bias supply, or by a combination of any of the above methods. The first method, using the resistor in the grid circuit, is one very commonly used. The bias voltage is developed (see Figure 9) by virtue of the rectified grid current flowing through the grid resistor R.



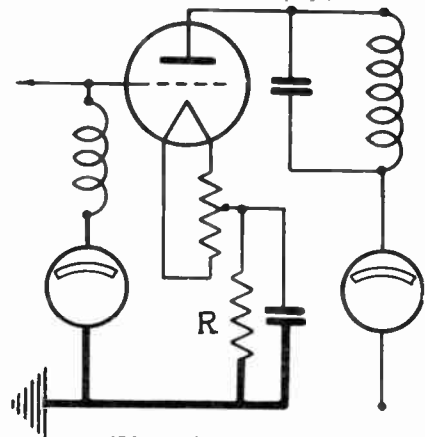
**FIG. 9**

If the value of R is 10,000 ohms and if the rectified grid current as read by the meter is 20 M.A., the bias is 200 volts. If the excitation is removed, the bias automatically drops to zero; and the tube may be damaged due to excessive plate current. This method should be used only with zero bias tubes or with tubes with a high amplification factor because, with these types, the plate current is low even without bias. In calculating driving power, the power dissipated in the bias resistor must be taken into account along with the actual grid driving power required by the tube.

The second method, that of using cathode bias, is shown in Figure 10. The bias is developed across R by virtue of the plate current.

The bias is equal to the value of R multiplied by the meter readings. I: may

*(Continued on next page)*



**FIG. 10**



(Continued from preceding page)

be seen that the effective voltage on the plate is lessened by the amount of the bias voltage. The bias resistor should be adequately by-passed. This method is often used in conjunction with the first method. Enough cathode bias is provided to limit the plate current to a safe value when excitation is removed.

The third and simplest method of obtaining bias is by means of an external bias supply. In Figure 11 the bias is adjust-

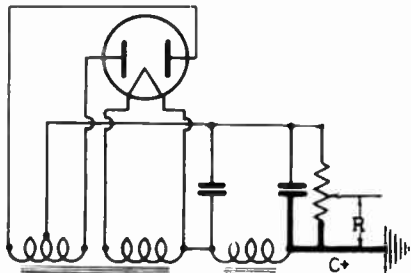


FIG. 11

able from zero to the maximum voltage of the supply. The bias should always be adjusted with the RF amplifier turned on, so that the rated grid current flows through the bias supply. The bias voltage is developed across R by both the current delivered by the rectifier and by the rectified grid current from the RF stage.

Bias to a number of RF stages may be supplied by a single bias supply. In Figure 12 three stages are supplied. These

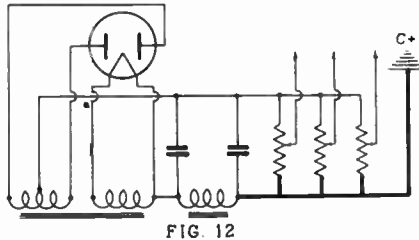


FIG. 12

stages may be adjusted separately; and the adjustment of one will not affect the others, provided that the bleeder current from the bias supply is large compared to the grid current.

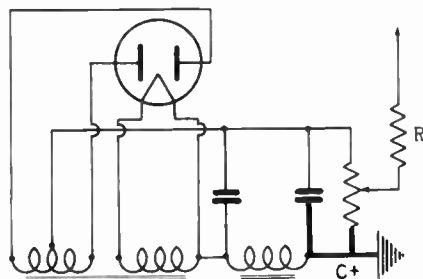


FIG. 13

It may be necessary to provide more

bias than the bias supply will deliver. In that case the circuit of Figure 13 is used. The bias over and above the voltage of the supply is developed across R by grid current alone. The bias supply should be turned on along with the filaments in order to eliminate the possibility of turning on the plate supply without bias. In Figure 14 is shown a bias circuit using trans-

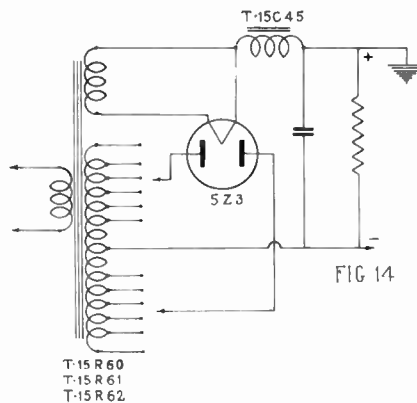


FIG. 14

formers designed for this type of service. The secondaries are tapped to cover ranges of 90 to 150 volts, 150 to 275 volts and 275 to 500 volts.

## MATCHING CLASS C LOADS

The matching of class C loads has for its basis regular transformer theory. The transformer consists essentially of two or more windings on an iron core. The windings are coupled to one another so that, if an AC voltage is applied across one winding, a voltage in proportion to the turns ratio is induced in the other winding. A transformer may be thought of, therefore, as an impedance changing device as well as a voltage changer.

In Figure 15 is shown a transformer with a step up ratio of 1 to N. Let us place E volts across the primary, then the

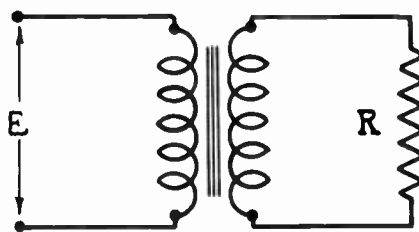


FIG. 15

secondary voltage due to the step up ratio, will be NE volts. Now let us place a resistance R across the secondary and determine what equivalent primary resist-

ance is reflected from R ohms across the secondary. Since the secondary voltage is NE, the secondary current is  $\frac{NE}{R}$ ; and the power in the resistor is  $\frac{NE}{R} \times NE$  or  $\frac{N^2 E^2}{R}$ . The power in the secondary circuit must come from the primary; and neglecting transformer losses, the primary power is also  $\frac{N^2 E^2}{R}$ .

However, this primary power is delivered at a voltage E. The primary current is thus equal to

$$\frac{\frac{N^2 E^2}{R}}{E} = \frac{N^2 E}{R}$$

The primary impedance Z is thus equal to  $\frac{E}{I}$ , or

$$\frac{E}{\frac{N^2 E}{R}} = \frac{R}{N^2}$$

The reflected primary impedance is equal to the turns ratio of the transformer squared (from secondary to primary) multiplied by the impedance across the secondary. In the case of a class B output transformer, for instance, the transformer itself is an impedance changing device which will reflect a class B plate to plate load which is entirely dependent upon the class C load. As an example, suppose that we have a class B transformer which normally operates from a 10,000 ohm plate to plate load to an 8,000 ohm class C load. The impedance ratio is thus 1.25 to 1; it is possible to operate this transformer with almost any plate to plate load, depending upon the class C load on the secondary.

Since the class C voltage is usually fixed, the usual procedure is to determine the correct transformer ratio for a given modulator power and class C voltage. Let us assume that our available class C voltage is 2000 volts and that we have enough audio power to modulate 500 watts input. The class C load in this case is  $\frac{2000^2}{500}$  or 8,000 ohms. If our modulators have a plate to plate load of 12,000 ohms, the output transformer has an impedance ratio of 12,000 to 8,000 or a turns ratio of  $\sqrt{\frac{12,000}{8,000}}$  or 1.22 to 1.

Let us assume that the above transformer is on hand and that we wish to modulate 200 watts input with a pair of tubes which require a plate to plate load of 15,000 ohms. We must determine the class C operating conditions in order that the above transformer may be used. Since the impedance ratio of the transformer is 1.5 to 1, the correct secondary load, in

(Continued on next page)





(Continued from preceding page)

order to reflect a 15,000 ohm plate to plate load, is 10,000 ohms. From the relation  $\frac{E^2}{R} = 200$  where R is 10,000 ohms.

We find that the value of class C voltage E is equal to 1000 volts. Knowing the class C voltage, the correct class C current is thus 200 divided by 1000 or 200 ma.

Following the same line of reasoning, it is possible to match almost any plate to plate load with a given transformer by determining the correct class C operating conditions.

**THE USE OF 6L6 TUBES AS DRIVERS**

With the introduction of beam power tubes and their high power output the question of their adaptability as drivers naturally arises. The beam power tube has a high plate resistance characteristic which is undesirable in a good driver tube, and for this reason, the 6L6 as a tetrode is not a good driver. However, with a suitable amount of inverse feedback, it is possible to decrease the effective plate resistance to a suitable value.

Basically, inverse feedback consists in feeding back into the grid circuit a portion of the voltage developed in the plate circuit. This feedback is out of phase with the voltage in the grid circuit, so that the effective gain of the 6L6's is lowered and the plate resistance decreased. With inverse feedback a beam power tube may be made to assume the characteristics of a low mu triode, the plate resistance of which is a function of the amount of inverse feedback. In Figure 16 the amount

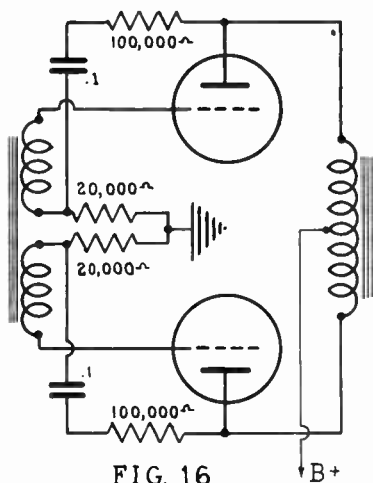


FIG. 16

of feedback is  $\frac{20,000}{100,000 + 20,000}$  or 16.6 per cent.

If an amount of inverse feedback N is used, the plate resistance may be considered shunted with a resistance equal to  $\frac{1}{N \times \text{Mutual Conductance}}$ . With 16.6 per cent feedback, the effective plate resistance consists of 22,500 and 1000 ohms in parallel for a value of 960 ohms. The pair of 6L6's in Figure 16 then, have the same characteristics as a pair of triodes with a plate resistance of 960 ohms.

A much simpler method of obtaining the correct amount of feedback voltage is shown in Figure 17. In this circuit the driver transformer has a special tertiary winding T<sub>3</sub> to supply the correct feedback voltage.

The power output of a pair of 6L6's with inverse feedback is calculated by the method outlined under "Class A Output Calculations." The plate resistance is already known and the value of μ with feedback is equal to  $\frac{\mu_0}{N\mu + 1}$  where μ<sub>0</sub> is the original amplification factor of the tube without feedback or 135 in the case of the

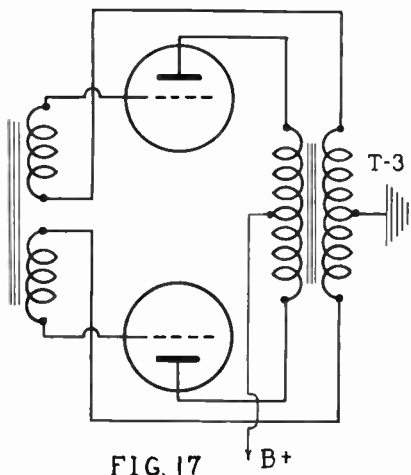


FIG. 17

6L6. The only remaining unknown factor in the equation for class A power output is E<sub>g</sub>, which is slightly different from the permissible grid swing with conventional triodes. In the case of the 6L6 with inverse feedback the plate characteristics are somewhat crowded at low values of plate voltage and, if the grid swing is too great, serious distortion will result although the grid swing may still be in the negative region. Operation is further complicated by the fact that for driver purposes the

6L6's are operated with a plate to plate load several times greater than the optimum value for maximum power output. The plate characteristics with feedback are fairly uniform down to the point at which the tube drop is equal to the product of the plate resistance and the static plate current. The minimum plate voltage is thus I<sub>s</sub>R<sub>p</sub> where I<sub>s</sub> is the static plate current and R<sub>p</sub> the plate resistance with feedback. The voltage difference between I<sub>s</sub>R<sub>p</sub> and the plate supply voltage is the peak signal voltage which is equal to μE<sub>g</sub>. All values are now known and the peak voltage at any power output may be determined.

With biased class B tubes the 6L6 driver stage is operated into an open load during part of the cycle and oscillation may occur due to the phase shift between the signal voltage applied to the driver grids and the voltage developed in the plate circuit. This shift is further increased by the capacity and inductance associated with the input transformer. Oscillation will exist only for that part of the signal during which the driver stage is unloaded and it is therefore noticeable only on an oscilloscope. If the oscillation does appear it may be eliminated by placing a 50,000 ohm, 1 watt resistor across each half of the input transformer and also by placing a 25,000 ohm, 5 watt resistor across the primary of the driver transformer. It is recommended that these resistors be installed whether oscillations are suspected or not.

The improvement resulting from inverse feedback may be seen from the curves of Figure 18, in which voltage output is plotted against different values of plate to plate load. This plate to plate load corresponds to the varying grid impedance. Curve B was obtained with and curve A without feedback. It may be seen that the regulation has been considerably improved by the addition of feedback and that this is the only method of obtaining satisfactory driving performance from 6L6's.

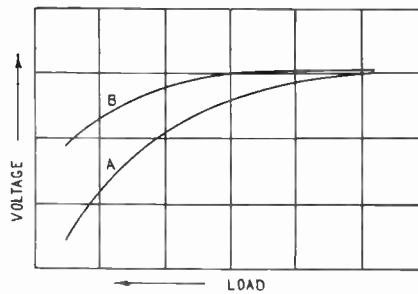


FIG. 18



# DETERMINATION OF CORRECT DRIVER TRANSFORMER RATIO



## DETERMINATION OF CORRECT DRIVER TRANSFORMER RATIO

The determination of the correct driver transformer ratio is of extreme importance if the most is to be realized from a class B audio stage. In Figure 19 are shown curves from which the correct ratio may be quickly determined. The only data about the class B tube which must be known are the average driving power and the peak A.F. grid voltage.

As an example, from the data furnished by the tube manufacturer, the average class B driving power for type 805 tubes is 6 watts, and the peak A.F. grid voltage is 117.5 volts.

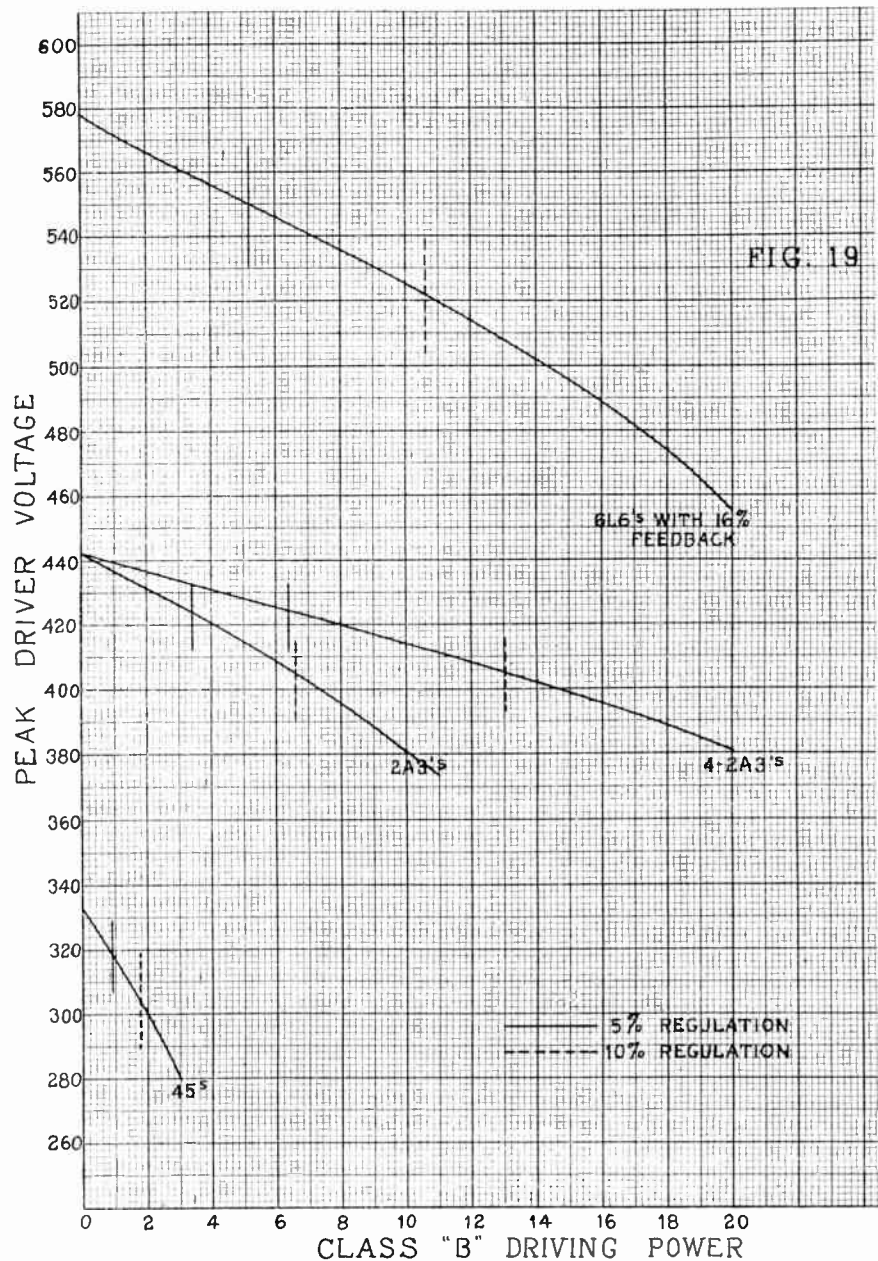
Curves on the 2A3 show that at 6 watts output a peak voltage of 408 volts is developed across the primary of the driver transformer. The ratio of the driver transformer is then  $\frac{408}{117.5}$  or 3.48 to 1, total primary to one-half the secondary.

Although a tube may be capable of high power output when used as a power amplifier, it should not be used as a driver if the required class B driving power is comparable to its maximum power output. In other words, the output of a pair of 2A3's is 15 watts; however, these tubes operating as drivers should not be called upon to deliver more than 8 watts of driving power. A pair of 2A3's will deliver 3.4 watts with a regulation of 5 per cent, which is the limit for broadcast work, or 6.6 watts with 10 per cent regulation. Regulation much higher than this will result in excessive distortion.

It is frequently necessary to know the results of varying the driver transformer turns ratio from the optimum value. If the step-down ratio is too great, the required class B grid voltage will not be developed; and as a result the class B output is necessarily limited. If, on the other hand, the ratio is too low, the required class B grid voltage will be developed but the regulation will be poor and the signal distorted. The turns ratio should be so proportioned that the required class B driving voltage is developed at a point slightly below the grid current point of the drivers. Under this condition the driving power is developed across as high a plate to plate load as possible, providing the maximum step down ratio. If the ratio is too low, there is danger of over-driving

the class B stage. The operating conditions of the class B stage are such that the minimum plate voltage at peak output is comparable in value to the positive grid swing. Beyond this point the grid impedance changes abruptly and the dynamic characteristic of the tube curves sharply. There is thus the possibility of over-driving the class B stage and introducing excessive distortion in the class B plate circuit, to say nothing of the driver distortion. With

the low step-down ratio the signal to the driver grids is somewhat less than it is with the correct ratio; for this reason it may seem that the lower ratio is more effective. However, it must be borne in mind that the purpose of the driver transformer is not to provide gain but a source of good regulation. Suitable driver tubes and driver transformers for the various operating conditions of the different class B tubes are shown on Page 42.



The tubes are operated self-biased as follows: 2A3's, 300 volts; 6L6's, 400 volts plate, 300 volts screen; 45's, 275 volts.





## DRIVER AND MODULATOR COMBINATIONS



### DRIVER AND MODULATOR COMBINATIONS

Thordarson Multi-Match Driver Transformers are equipped with "Plug-in Terminals" to facilitate varying the ratio. The numbers on the jacks indicate the ratio of the transformer (Primary to 1/2 Secondary) when connected to the "G" jacks with jumpers.

Take two pieces of flexible insulated wire (approximately No. 16 gauge) about three inches long. Attach a Plug-in Terminal to each end of these wires. Four plugs are furnished with the unit for this

purpose. Insert one plug of each lead into the jacks marked "G", and the remaining plug of each jumper into the proper jacks, as selected from the table below.

Solder-lugs for Driver tube plate and Modulator tube grid connections are recessed in the base for sub-panel wiring. If leads are soldered to the lugs before the transformer is mounted, a 1/2" hole in the chassis, insulated with a rubber grommet, is adequate. A square hole, approximately 2 1/2" x 2 1/2", is necessary if the lugs must be accessible from the bottom of the chassis. Since the windings

of the transformer are split, the two inside lugs should be wired together for the center tap connections of both primary and secondary.

Some modulator tubes have the grid connection on top. In this case, the solder lugs marked "G" and the "G" jacks are disregarded. Connection is made directly from the tube grids to the numbered ratio jacks.

Type 45 or 2A3 tubes are recommended for use with all Multi-Match Driver transformers except T-15D84, which has a special feed back winding for use with Type 6L6 tubes.

P-P Class B Tubes	MODULATOR STAGE					DRIVER STAGE					Ratio 500 Ohm Line to 1/2 Sec.
	Power Output Watts	Plate Volts	Bias Volts	Pl. to Pl. Load Ohms	Use Mod. Trans. No.	P-P Driver Tubes	Trans. Ratio, Pri. to 1/2 Sec.	Use Driver Trans. No.	Trans. for 500 Ohm Line		
<b>R.C.A. TUBES</b>											
46	28	400	0	5,600	T-11M74	*45	5:1	T-15D79	T-15D82	1:1.85	
46	48	600	0	9,600	T-11M75	*45	5:1	T-15D79	T-15D82	1:1.85	
4-46's	56	400	0	2,800	T-11M75	*45	5:1	T-15D79	T-15D82	1:1.85	
4-46's	96	600	0	4,800	T-11M76	*45	5:1	T-15D79	T-15D82	1:1.85	
203A	200	1000	-35	6,900	T-11M77	†2A3	2.2:1	T-15D77	T-15D82	1:1.5	
203A	200	1000	-35	6,900	T-11M77	**6L6	3.5:1	T-15D84	T-15D82	1:1.25	
203A	260	1250	-45	9,000	T-11M77	†2A3	2:1	T-15D77	T-15D82	1:1.5	
203A	260	1250	-45	9,000	T-11M77	**6L6	3.5:1	T-15D84	T-15D82	1:1.25	
4-203A	400	1000	-35	3,450	T-11M78	†4-2A3	2.25:1	T-15D81	T-15D83	1:1.25	
4-203A	400	1000	-35	4,500	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.25	
4-203A	520	1250	-45	3,450	T-11M78	†4-2A3	2:1	T-15D80	T-15D83	1:1.25	
4-203A	520	1250	45	4,500	T-11M78	**6L6	4:1	T-15D84	T-15D83	1:1.25	
211	200	1000	-77	6,900	T-11M77	2A3	2:1	T-15D77	T-15D82	1:1.75	
211	260	1250	-100	9,000	T-11M77	2A3	1.8:1	T-15D76	T-15D82	1:2	
800	90	750	-40	6,400	T-11M76	2A3	2.6:1	T-15D77	T-15D82	1:1.25	
800	100	1000	-55	12,500	T-11M76	2A3	2.8:1	T-15D77	T-15D82	1:1.25	
800	100	1000	-55	12,500	T-11M76	45	2.2:1	T-15D77	T-15D82	1:1.2	
801	45	600	-75	10,000	T-11M74	2A3	2.6:1	T-15D77	T-15D82	1:1.25	
801	45	600	-75	10,000	T-11M74	45	2:1	T-15D77	T-15D82	1:2.25	
801	75	750	80	11,000	T-11M75	45	1.8:1	T-15D76	T-15D82	1:2.25	
801	75	750	80	11,000	T-11M75	2A3	2.4:1	T-15D77	T-15D82	1:1.4	
805	300	1250	0	6,700	T-11M77	2A3	3.4:1	T-15D78	T-15D82	1:1.25	
805	370	1500	-16	8,200	T-11M78	2A3	3:1	T-15D78	T-15D82	1:1.25	
806	500	2000	-150	11,500	T-11M78	†4-2A3	1.25:1	T-15D80	T-15D83	1:2	
806	500	2000	-150	11,500	T-11M78	**6L6	1.5:1	T-15D84	T-15D83	1:2.5	
808	190	1250	-15	12,700	T-11M77	2A3	3.4:1	T-15D78	T-15D82	1:1.25	
809	60	500	0	5,200	T-11M75	2A3	6:1	T-15D79	T-15D82	1:1.75	
809	60	500	0	5,200	T-11M76	45	4:1	T-15D79	T-15D82	1:1.25	
809	100	750	-5	8,400	T-11M76	2A3	6:1	T-15D79	T-15D82	1:1.75	
809	100	750	-5	8,400	T-11M76	45	4:1	T-15D79	T-15D82	1:1.25	
838	200	1000	0	6,900	T-11M77	2A3	3.8:1	T-15D78	T-15D82	1:1.85	
838	260	1250	0	9,000	T-11M77	2A3	3.8:1	T-15D78	T-15D82	1:1.85	
†-838	400	1000	0	3,450	T-11M78	4-2A3	3.25:1	T-15D81	T-15D83	1:1.75	
†-838	400	1000	0	3,450	T-11M78	**6L6	3.5:1	T-15D84	T-15D83	1:1.25	
†-838	520	1250	0	4,500	T-11M78	4-2A3	3.25:1	T-15D81	T-15D83	1:1.75	
†-838	520	1250	0	4,500	T-11M78	**6L6	3.5:1	T-15D84	T-15D83	1:1.25	
1608	50	425	-15	4,800	T-11M75	*45	4:1	T-15D79	T-15D82	1:1.25	
<b>TAYLOR TUBES</b>											
T-20	50	600	-30	8,100	T-11M75	*45	2.2:1	T-15D77	T-15D82	1:2	
T-20	70	800	-40	12,000	T-11M75	*45	2:1	T-15D77	T-15D82	1:2.25	
TZ-20	70	800	0	12,000	T-11M75	*45	3.2:1	T-15D78	T-15D82	1:1.4	
T-55	175	1000	-40	6,900	T-11M77	2A3	2.8:1	T-15D77	T-15D82	1:1.25	
T-55	225	1250	50	9,400	T-11M77	2A3	2.6:1	T-15D77	T-15D82	1:1.4	
T-55	275	1500	-60	12,000	T-11M77	2A3	2.4:1	T-15D77	T-15D82	1:1.4	
T-155	Same as HD-203-A										
203-A	Same as R.C.A. 203A										
4-203A	Same as R.C.A. 203A										
HD-203A	300	1500	-50	9,600	T-11M77	2A3	2.6:1	T-15D77	T-15D82	1:1.25	
HD-203A	300	1750	67.5	13,000	T-11M77	2A3	2.6:1	T-15D77	T-15D82	1:1.25	
HD-203A	400	1750	67.5	10,000	T-11M78	2A3	2.2:1	T-15D77	T-15D82	1:1.75	
HD-203A	400	2000	75	12,500	T-11M78	2A3	2.2:1	T-15D77	T-15D82	1:1.75	
HD-203A	500	2000	-75	10,000	T-11M78	2A3	2:1	T-15D77	T-15D82	1:1.75	
HD-203A	500	1500	-50	6,400	T-11M78	†4-2A3	2:1	T-15D80	T-15D83	1:1.25	
HD-203A	500	1500	50	6,400	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.4	
HD-203A	600	1750	67.5	7,600	T-11M78	4-2A3	1.75:1	T-15D80	T-15D83	1:1.4	
HD-203A	600	1750	67.5	7,600	T-11M78	**6L6	2.5:1	T-15D84	T-15D83	1:1.75	
203B	300	1250	-45	7,900	T-11M77	†2A3	1.8:1	T-15D76	T-15D82	1:2	
4-203B	600	1250	-45	3,900	T-11M78	†4-2A3	1.75:1	T-15D80	T-15D83	1:1.4	
4-203B	600	1250	-45	3,900	T-11M78	**6L6	2.5:1	T-15D84	T-15D83	1:1.75	
203Z	200	1000	0	6,900	T-11M77	2A3	4.5:1	T-15D79	T-15D82	1:1.75	
203Z	260	1100	0	6,700	T-11M77	†2A3	3.8:1	T-15D78	T-15D82	1:1.85	
203Z	300	1250	0	7,900	T-11M77	†2A3	3.8:1	T-15D78	T-15D82	1:1.85	

(Continued on next page)

## TRANSMITTER GUIDE





# DRIVER AND MODULATOR COMBINATIONS



(Continued)

P-P Class B Tubes	MODULATOR STAGE				DRIVER STAGE					
	Power Output Watts	Plate Volts	Bias Volts	Pl. to Pl. Load Ohms	Use Mod. Trans. No.	P-P Driver Tubes	Trans. Ratio, Pri. to 1/2 Sec.	Use Driver Trans. No.	Trans. for 500 Ohm Line	% Ratio 500 Ohm Line to 1/2 Sec.
<b>TAYLOR TUBES—Continued</b>										
Z11	Same as R.C.A. Z11									
T-756	100	850	-25	9,400	T-11M76	2A3	3:1	T-15D78	T-15D82	1:1.25
T-756	125	850	-25	7,500	T-11M76	2A3	2:1	T-15D77	T-15D82	1:1.75
T-814	500	2000	-150	11,500	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2
T-814	500	2000	150	11,500	T-11M78	*6L6	1.5:1	T-15D80	T-15D82	1:3.15
T-822	Same as HD-203A									
TZ-40	175	1000	0	6,800	T-11M77	2A3	4:1	T-15D79	T-15D82	1:85
TZ-40	175	1000	0	6,800	T-11M77	45	2.6:1	T-15D77	T-15D82	1:1.5
TZ-40	100	750	0	6,000	T-11M76	2A3	4.5:1	T-15D79	T-15D82	1:1.75
TZ-40	100	750	0	6,000	T-11M76	45	3:1	T-15D78	T-15D82	1:1.4
<b>EIMAC TUBES</b>										
35T	115	1000	-30	11,000	T-11M76	2A3	3.2:1	T-15D78	T-15D82	1:1.25
35T	130	1250	-35	16,000	T-11M77	2A3	3.4:1	T-15D78	T-15D82	1:1.25
50T	100	1000	-90	8,000	T-11M76	2A3	1.8:1	T-15D76	T-15D82	1:1.75
50T	135	1250	-112	12,000	T-11M77	2A3	1.6:1	T-15D76	T-15D82	1:2
50T	160	1500	-140	16,800	T-11M77	2A3	1.4:1	T-15D76	T-15D82	1:2.25
100TH	210	1000	0	5,200	T-11M77	2A3	3.4:1	T-15D78	T-15D82	1:1.25
100TH	260	1250	0	7,200	T-11M77	2A3	3.6:1	T-15D78	T-15D82	1:1.25
100TH	300	1500	-10	9,600	T-11M77	2A3	3.6:1	T-15D78	T-15D82	1:1.25
100TH	380	2000	-20	16,000	T-11M78	2A3	3.8:1	T-15D78	T-15D82	1:85
100TL	170	1000	-90	5,200	T-11M77	†2A3	1.4:1	T-15D76	T-15D82	1:2.25
100TL	230	1250	-112	7,200	T-11M77	†2A3	1.2:1	T-15D76	T-15D82	1:2.75
100TL	270	1500	-140	9,600	T-11M77	2A3	1.2:1	T-15D76	T-15D82	1:2.75
100TL	350	2000	-185	16,000	T-11M78	2A3	1:1	T-15D76	T-15D82	1:3.15
100TL	170	1000	-90	5,200	T-11M77	**6L6	2:1	T-15D84	T-15D82	1:2
100TL	230	1250	-112	7,200	T-11M77	**6L6	1.5:1	T-15D84	T-15D82	1:2.5
100TL	270	1500	-140	9,600	T-11M77	**6L6	1.5:1	T-15D84	T-15D82	1:2.5
100TL	350	2000	-185	16,000	T-11M78	**6L6	1.5:1	T-15D84	T-15D82	1:2.5
150T	500	2000	-150	11,500	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2
150T	600	2500	-195	14,000	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2
150T	500	2000	-150	11,500	T-11M78	**6L6	1.5:1	T-15D84	T-15D83	1:2.5
150T	600	2500	-195	14,000	T-11M78	**6L6	1.5:1	T-15D84	T-15D83	1:2.5
250TH	300	1000	0	4,000	T-11M77	**6L6	3.5:1	T-15D84	T-15D83	1:1.25
250TH	400	1250	0	5,200	T-11M78	**6L6	3.5:1	T-15D84	T-15D83	1:1.25
250TH	500	1500	-22.5	6,400	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.4
250TL										
<b>RAYTHEON TUBES</b>										
RK-18	100	1000	-50	12,000	T-11M76	*45	2.4:1	T-15D77	T-15D82	1:1.75
RK-18	100	1000	-50	12,000	T-11M76	2A3	4:1	T-15D79	T-15D82	1:85
RK-31	110	1000	0	13,600	T-11M76	*45	4:1	T-15D79	T-15D82	1:1.25
RK-31	140	1250	0	17,000	T-11M77	*45	4:1	T-15D79	T-15D82	1:1.25
RK-31	110	1000	0	13,600	T-11M76	2A3	6:1	T-15D79	T-15D82	1:1.75
RK-31	140	1250	0	17,000	T-11M77	2A3	6:1	T-15D79	T-15D82	1:1.75
<b>AMPEREX TUBES</b>										
HF-100	260	1500	-52	12,000	T-11M77	2A3	3.2:1	T-15D78	T-15D82	1:1.25
HF-100	350	1750	-62	16,000	T-11M78	2A3	2.4:1	T-15D77	T-15D82	1:1.4
ZB-120	150	750	0	4,800	T-11M77	2A3	4:1	T-15D79	T-15D82	1:85
ZB-120	200	1000	0	6,900	T-11M77	2A3	4:1	T-15D79	T-15D82	1:85
ZB-120	245	1250	0	9,000	T-11M77	2A3	4.5:1	T-15D79	T-15D82	1:75
ZB-120	300	1500	-9	11,200	T-11M77	2A3	4:1	T-15D79	T-15D82	1:85
HF-200	500	2000	-100	11,200	T-11M78	2A3	1.8:1	T-15D76	T-15D82	1:1.75
HF-200	500	2500	-130	16,000	T-11M78	2A3	2:1	T-15D77	T-15D82	1:1.75
HF-200	600	2500	-130	16,000	T-11M78	2A3	1.8:1	T-15D76	T-15D82	1:1.75
HF-200	500	2000	-100	11,200	T-11M78	**6L6	2.5:1	T-15D84	T-15D82	1:1.75
HF-200	600	2500	-130	16,000	T-11M78	**6L6	2.5:1	T-15D84	T-15D82	1:1.75
<b>HEINTZ &amp; KAUFMAN GAMMATRON TUBES</b>										
HK-154	200	1000	-155	7,500	T-11M77	2A3	1.4:1	T-15D76	T-15D82	1:2.25
HK-154	223	1250	-210	11,400	T-11M77	2A3	1.2:1	T-15D76	T-15D82	1:2.75
HK-354	100	1000	-60	15,000	T-11M76	2A3	2.6:1	T-15D77	T-15D82	1:1.25
HK-354	220	1500	-100	15,000	T-11M77	2A3	2.2:1	T-15D77	T-15D82	1:1.75
HK-354	400	2000	-150	15,000	T-11M78	2A3	1.4:1	T-15D76	T-15D82	1:2.25
354E	319	1500	-25	10,000	T-11M77	**6L6	3:1	T-15D84	T-15D83	1:1.25
354E	472	2000	-37.5	11,000	T-11M78	**6L6	2.5:1	T-15D84	T-15D83	1:1.4
354E	595	2500	-50	16,000	T-11M78	**6L6	2.5:1	T-15D84	T-15D83	1:1.4
354F	290	1500	-15	12,000	T-11M77	**6L6	3.5:1	T-15D84	T-15D83	1:1.25
354F	445	2000	-22.5	12,000	T-11M78	**6L6	3.5:1	T-15D84	T-15D83	1:1.25
354E	319	1500	-25	10,000	T-11M77	4-2A3	2.25:1	T-15D81	T-15D83	1:1.25
354E	472	2000	-37.5	11,000	T-11M78	4-2A3	2:1	T-15D80	T-15D83	1:1.25
354E	595	2500	-50	16,000	T-11M78	4-2A3	1.75:1	T-15D80	T-15D83	1:1.4
354F	290	1500	-15	12,000	T-11M77	4-2A3	2.75:1	T-15D81	T-15D83	1:85
354F	445	2000	-22.5	12,000	T-11M78	4-2A3	2.5:1	T-15D81	T-15D83	1:85
<b>WESTERN ELECTRIC TUBES</b>										
242A	Same as R.C.A. 211									
261A	Same as R.C.A. 211									
276A	Same as R.C.A. 211									

§Note: This ratio is correct only when the tubes supplying power to the 500 ohm line are of the same type and operated under the same conditions as the driver tubes listed under "P.P. Driver Tubes." 2A3 driver tubes are operated with 300 plate volts, self biased, unless preceded by †. 45 driver tubes are operated with 275 plate volts, self biased, unless preceded by \*. †2A3 driver tubes are operated with 300 plate volts, fixed bias. \*45 driver tubes are operated with 250 plate volts, self biased. \*\*6L6's with 16.6% feed-back, 400 volts plate, 300 volts screen.



**MULTI-MATCH MODULATION TRANSFORMER RATIOS**

Tapped double winding coils as used in Multi-Match modulation transformers make possible a large number of impedance ratios, so many in fact that it is not practical to list in table form all the combinations possible. However, there are occasions when the modulator plate to plate load, or the class C load, are of values not shown in the table and yet are within the range covered by the transformer. The chart shown on the opposite page (Fig. 20) may be used to determine the correct turns ratio when the plate to plate load and class C load are known. The transformer connections may then be found from the list of ratios in the adjoining table. As an example, to match a 10,000 ohm plate to plate load to a class C load of 5000 ohms, a

turns ratio of  $\sqrt{\frac{5000}{10,000}}$  or .707 is neces-

sary. This ratio is shown on the curve at "O" where a line drawn vertically at "10,000 ohms", on the plate load line intersects the class C curve marked "5000 ohms." The nearest higher ratio shown in the table is .715. The connections shown in the table should be used to secure this ratio. In this particular case these connections are:

For the primary, connect the modulator plates to terminals 2 and 5; 3 and 4 are joined and connect to the modulator plate supply. For the secondary, join terminals 7-11 and 8-12. Connect the class C load to terminals 7 and 8.

Since only part of the winding is used for some combinations, the maximum allowable value of plate to plate load is necessarily limited. This maximum value is shown in the last column of the table and should not be exceeded.

When the class C load is an odd value not covered by one of the curves, it may be interpolated between the two nearest curves.

Care should be taken that the DC secondary current does not exceed the maximum rating of the transformer. A parallel connected secondary will carry twice the current of a series connection, and in the event that the class C current is greater than the allowable current of the series connection, a parallel connection must be used. Whenever the exact ratio cannot

be found, the next higher ratio should be used. This reflects a lower value of plate to plate load, across which the modulator power is more easily developed. If a plate to plate load higher than normal is used, maximum audio power cannot be developed, and if the grids are driven harder so that the class B current increases to the normal value, serious distortion will result. With a plate to plate load slightly lower than normal, the efficiency is some-

what reduced for a given output. However, for speech the plate dissipation is below normal and the slight decrease in efficiency will in no way cause the plate dissipation to be exceeded. At no time should the class B modulators be operated without a load, and if CW operation is desired with a transmitter which normally incorporates a modulator, the secondary of the modulation transformer must be shorted.

Turns Ratio Primary to Secondary	Primary		Secondary				Maximum Allowable Plate to Plate Load	
	P	B-B	Series		Parallel			
			P	Join	Connect to	Join		Connect to
2.8	8	9-10	11	3-4	1-6	-	-	8000 Ohms.
2.6	1	2-5	6	9-10	7-12	-	-	10000 Ohms
2.2	1	2-5	6	8-9	7-12	-	-	10000 Ohms
2.18	8	9-10	11	3-4	2-6	-	-	8000 Ohms
2.07	2	3-4	5	9-10	7-12	-	-	12000 Ohms
2.02	8	9-10	11	2-3	1-6	-	-	8000 Ohms
1.8	1	2-5	6	8-11	7-12	-	-	10000 Ohms
1.74	2	3-4	5	8-9	7-12	-	-	12000 Ohms
1.7	1	2-5	6	9-10	8-12	-	-	10000 Ohms
1.565	8	9-10	11	3-4	2-5	-	-	8000 Ohms
1.43	2	3-4	5	8-11	7-12	-	-	12000 Ohms
1.4	8	9-10	11	-	-	1-3	1-4	8000 Ohms
						4-6	-	
1.35	2	3-4	5	9-10	8-12	-	-	12000 Ohms
1.3	1	2-5	6	-	-	7-9	7-10	10000 Ohms
						10-12	-	
1.25	8	9-10	11	2-5	1-6	-	-	8000 Ohms
1.155	1	3-4	6	9-10	7-12	-	-	20000 Ohms
1.035	2	3-4	5	-	-	7-9	7-10	12000 Ohms
						10-12	-	
.977	1	3-4	6	8-9	7-12	-	-	20000 Ohms
.905	7	8-11	12	3-4	1-6	-	-	16000 Ohms
.9	1	2-5	6	-	-	7-11	7-8	10000 Ohms
						8-12	-	
.868	7	9-10	12	3-4	1-6	-	-	20000 Ohms
.8	1	2-5	6	9-10	8-11	-	-	10000 Ohms
.8	1	3-4	6	8-11	7-12	-	-	20000 Ohms
.78	8	9-10	11	-	-	2-3	2-4	8000 Ohms
						4-5	-	
.754	1	3-4	6	9-10	8-12	-	-	20000 Ohms
.715	2	3-4	5	-	-	7-11	7-8	12000 Ohms
						8-12	-	
.702	7	8-11	12	3-4	2-6	-	-	16000 Ohms
.672	7	9-10	12	3-4	2-6	-	-	20000 Ohms
.655	7	8-11	12	2-3	1-6	-	-	16000 Ohms
.638	2	3-4	5	9-10	8-11	-	-	12000 Ohms
.628	7	9-10	12	2-3	1-6	-	-	20000 Ohms
.622	8	9-10	11	-	-	2-6	1-2	8000 Ohms
						1-5	-	
.578	1	3-4	6	-	-	7-9	7-10	20000 Ohms
						10-12	-	
.505	7	8-11	12	3-4	2-5	-	-	16000 Ohms
.483	7	9-10	12	3-4	2-5	-	-	20000 Ohms
.452	7	8-11	12	-	-	1-3	1-4	16000 Ohms
						4-6	-	
.432	7	9-10	12	-	-	1-3	1-4	20000 Ohms
						4-6	-	
.402	7	8-11	12	2-5	1-6	-	-	16000 Ohms
.4	1	3-4	6	-	-	7-11	7-8	20000 Ohms
						8-12	-	
.4	1	2-5	6	-	-	8-9	8-10	10000 Ohms
						10-11	-	
.385	7	9-10	12	2-5	1-6	-	-	20000 Ohms
.357	1	3-4	6	9-10	8-11	-	-	20000 Ohms
.318	2	3-4	5	-	-	8-9	8-10	12000 Ohms
						10-11	-	
.252	7	8-11	12	-	-	2-3	2-4	16000 Ohms
						4-5	-	
.242	7	9-10	12	-	-	2-3	2-4	20000 Ohms
						4-5	-	
.2	7	8-11	12	-	-	2-6	1-2	16000 Ohms
						1-5	-	
.192	7	9-10	12	-	-	2-6	1-2	20000 Ohms
						1-5	-	
.178	1	3-4	6	-	-	8-9	8-10	20000 Ohms
						10-11	-	





# MULTI-MATCH MODULATION TRANSFORMER RATIOS



(Continued)

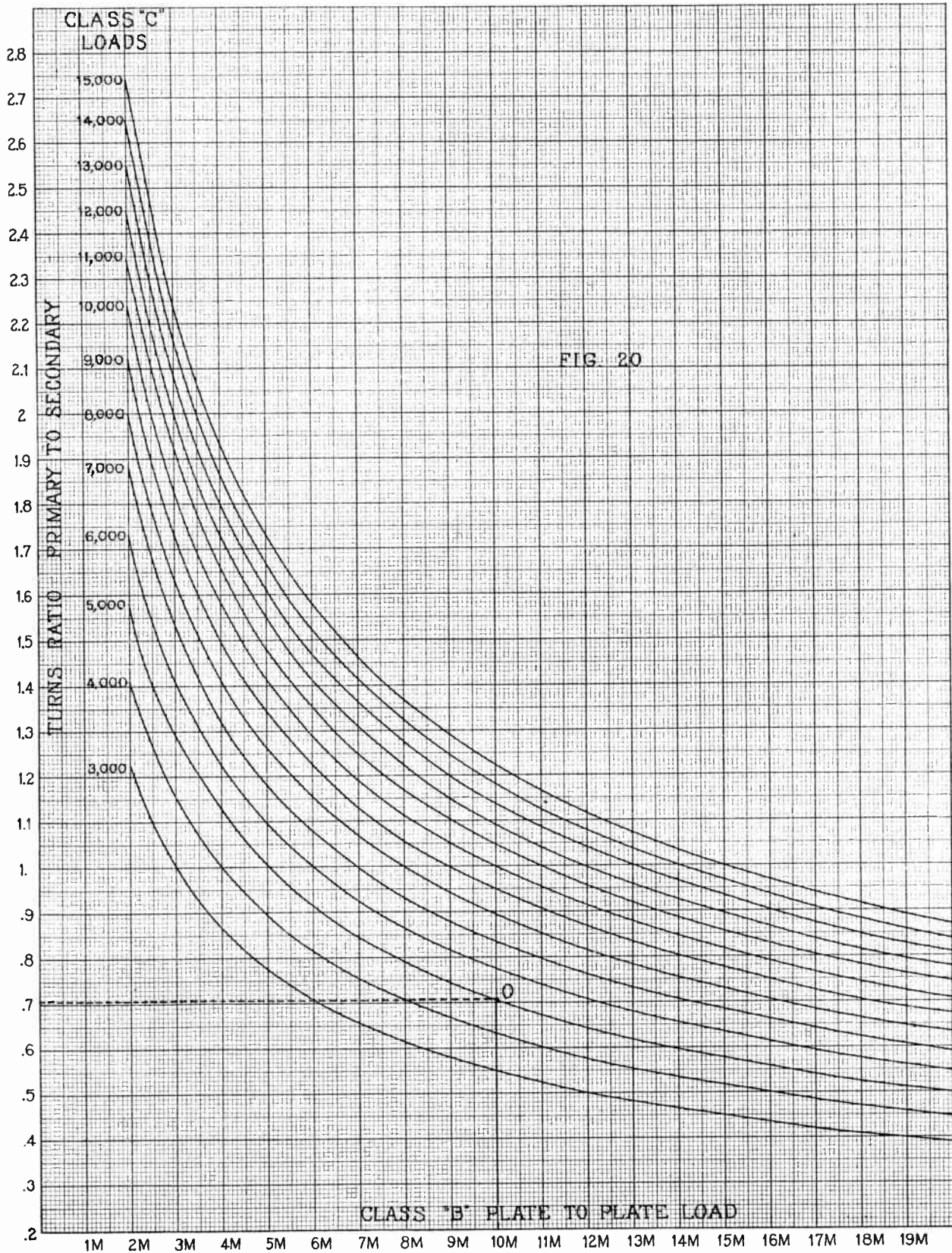


FIG. 20





**OSCILLOSCOPE FOUNDATION UNIT**

This oscilloscope, with an over-all size of 6 3/4" x 10 1/2" x 5-3/16", is ideal for rack and panel mounting. Its circuit (Figure 26) includes optional amplifiers for both the vertical and the horizontal deflection plates, a linear sweep, and a 60 cycle sweep, so that it is complete in every respect. A magnifying lens enlarges the image on the 913 tube to a full two inches



and enhances the appearance of the front panel. It may be easily built by any amateur at a very low cost and is one of the most valuable pieces of equipment in the ham shack. Notice how it is used in the transmitter on Pages 4, 17 and 22.

**USING THE 'SCOPE**

Figure 21 shows the correct method of using the 'scope to measure the percentage modulation by the trapezoid method. The pick-up coil-condenser combination should tune to the transmitter frequency and should be shunted by a 10,000 ohm 1 watt stabilizing resistor. This pick-up coil is link coupled to the plate tank of the final, the coupling being varied until the proper height carrier is secured with no modulation. This should be a little less than one-half inch since 100 per cent modulation will increase the over-all height 100 per cent and the image must remain on a 1 inch surface. The pick-up coil should be tuned to resonance with the carrier before this link coupling is adjusted.

The audio component is taken from a bleeder across the secondary of the modulation transformer through a .05 mfd., 5000 volt condenser. The resistor should have a combined value high enough to draw very low current (about 1 M.A.) and the

tapped resistor should have a voltage drop of about 100 volts. The deflection on the screen may be controlled by the horizontal amplifier control.

Notice on the diagram that the vertical amplifier is "off" and the sweep is "external." In other words, the R.F. signal is applied directly to the vertical plates of the cathode ray tube.

Connections for the envelope method of measuring percentage modulation are shown in Figure 22. The R.F. signal is secured in the same way as described for the trapezoid method. The horizontal sweep may be either 60 cycle or some other frequency from the linear sweep. Since most voice frequencies are near 200 c.p.s., the 60 cycle sweep will show three loops, a convenient number to show percentage modulation.

When a sine wave signal is available for testing, the trapezoid method is best, the figure being most easily interpreted.

Analysis of the A.F. characteristics of the speech amplifier and modulator may be determined as shown in Figure 23. The values are determined in the same manner as described for the measurement of percentage modulation, including the 5000 volt condenser. An analysis such as this requires a sine wave signal from a beat frequency oscillator. The drawings of

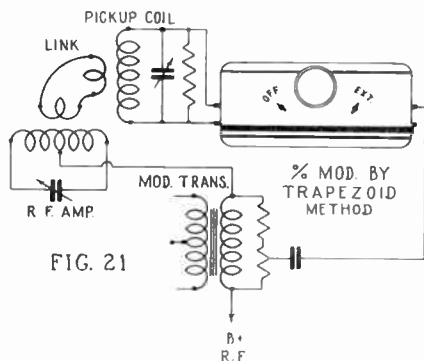


FIG. 21

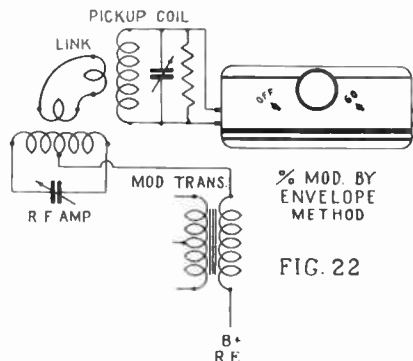


FIG. 22

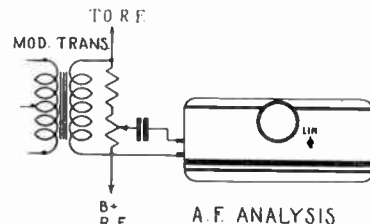


FIG. 23

Figure 24 show the sort of image normally seen on the cathode ray screen under different conditions. Experience, plus a study of the many excellent articles on this subject, will aid the operator in interpreting the various images and figures seen on the 'scope.

Many amateurs use their oscilloscope in conjunction with their receiver to monitor the incoming signals. In this case the 'scope is kept on the operating table, instead of being mounted on the transmitter panel.

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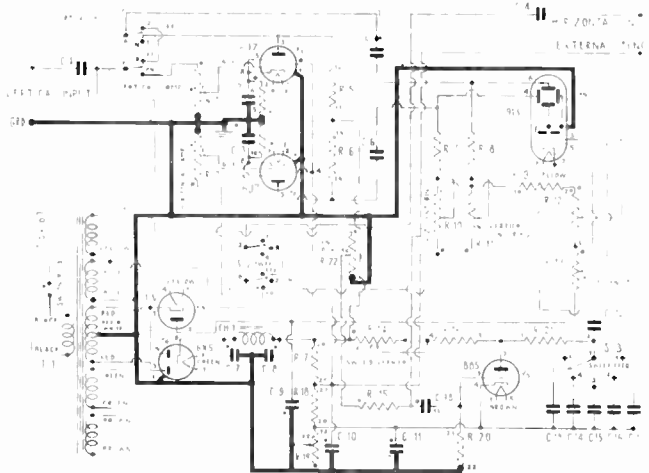


FIG. 26

(Continued from preceding page)

For this use it is usually necessary to add an extra I.F. stage to the receiver to give sufficient R.F. voltage for the oscilloscope. This stage is not used by the receiver itself, but is added as an external

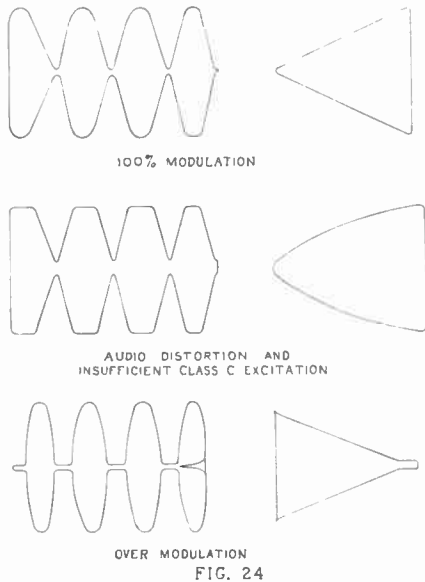


FIG. 24

unit as shown in Figure 25. The addition of this extra stage will upset the alignment of the last I.F. stage so it should be realigned. The added I.F. transformer should also be aligned at the same frequency as the receiver.

Receivers which have two I.F. stages may have sufficient gain to operate the 'scope without this addition. In this case the vertical plates of the 'scope are connected to the plate of the last I.F. tube through a .1 mfd. condenser, and the last I.F. transformer realigned.

If the envelope method is used, the horizontal sweep may be either the 60 cycle sweep or the linear sweep, using a fre-

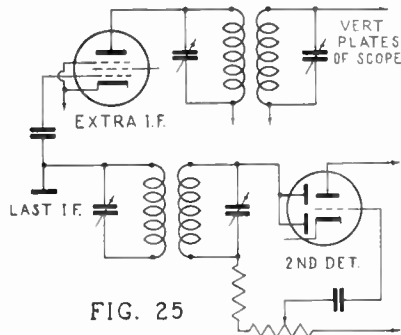


FIG. 25

quency of about 200 c.p.s. The horizontal sweep voltage for the trapezoid method is obtained from the detector load resistor. In either method the vertical plates secure the R.F. signal from the I.F. stage as explained above.

**SPEECH OPERATION OF CLASS B MODULATORS**

The amateur transmitter is designed essentially for the transmission of speech. Although this affects the R.F. section only slightly, it does have a great deal to do with the operation of the class B modulator especially since the modulator plate current is generally used as a modulation indicator. If a class B modulator is operated according to the manufacturer's specifications, the modulator plate current with speech should never approach the manufacturer's value. If the current is driven up to this value, serious distortion will result, both in the driver stage and the class B stage. The quality has the peculiar strained sound which is so typical of hundreds of stations using class B improperly. The characteristics of speech are such that for a given peak power (which determines modulation percentage) the average power (indicated by the plate meter) is just one-half the power in a sine wave. It follows from this that, for speech, the modulator plate current is just one-half the manufacturer's rating for 100 per cent modulation. As an example, the class B plate current of a pair of TZ-20's is 140 M.A.; with speech, 100 per cent modulation will be obtained if the average plate current is "kicked up" to 70 M.A. The manufacturer lists this value of current only because the sine wave is a convenient wave form for power measurements.

**F. C. C. REGULATIONS RADIO SPECTRUM RE-ALLOCATED**

Heretofore the rules of the Commission with respect to the use of radio for practical purposes have been confined to that portion of the radio spectrum from 10 kilocycles to 25,000 kilocycles. As a result of experimentation during the past few years, and as a result of a hearing held on June 15, 1936, and further as the result of collaboration with the various Government Departments utilizing radio for their own purposes, the Commission has decided to provide allocations of frequencies to various classes of service in the newly developed portion of the radio spectrum from 25,000 kilocycles to 300,000 kilocycles. In other words, from the standpoint of space in the so-called radio ether, there now comes under regulation ten times the "ether space" than has ever before been attempted in this country.

The Commission's Order in addition took into consideration certain minor changes developing as a result of experience in the older established portion of the spectrum up to and including 25,000 kilocycles. However, the most significant action is with reference to the so-called ultra high frequencies up to and including 300,000 kilocycles, and in this the Commission has not only allocated space for various radio services utilized for the preservation of life and property, but also has allocated considerable space for broadcasting, including television.

Order No. 18 carries with it Part I of Rule 229 covering the allocation of frequencies between 10 kilocycles and 30,000 kilocycles. It is pointed out that no changes are involved with respect to frequencies between 10 kilocycles and 25,000 kilocycles and 28,000 and 30,000 kilocycles. Since Rule 229 was printed in 1932, the Commission has from time to time adopted a number of individual changes with respect to certain services. The order gives an up-to-the-minute listing of such changes and should be considered merely as a recapitulation of frequencies in accordance with past actions of the Commission with the exception of the band 25,000 to 28,000 kilocycles, which has been specifically re-allocated to new services except for broadcasting between 25,600 and 26,600 kilocycles, effective 3:00 A.M., E.S.T., October 13, 1938.

Order No. 19 carries with it Part II of Rule 229 covering the allocation of frequencies between 30,000 to 300,000 kilocycles. All of the frequencies listed in this range, except amateur between 56,000 and 60,000 kilocycles, are assigned to specific services for the first time. All outstanding licenses in this frequency range, except amateur and point-to-point communication in Hawaii, are for experimental services.

Inasmuch as only a relatively few frequencies above 25,000 kilocycles are now in use, it may be possible for the Commission to make some regular assignments within this band prior to the effective date of the order; however, it is not expected that the existing licensed frequencies will be changed over to the new frequencies or that assignments of a permanent nature will be made on the present experimental channels prior to the effective date of the order.

**TELEVISION**

Seven channels between 44,000 and 108,000 kilocycles are made available for the assignment of television stations. Television broadcast is also assigned twelve channels between 156,000 and 300,000 kilocycles. Each television channel is 6 megacycles in width and provides for the picture broadcast as well as the accompanying synchronized sound. Television stations will be assigned these channels on an experimental basis with the same requirements as are now imposed. This experimental basis will be continued until the several remaining technical problems have been solved and standards of transmission and reception are adopted.

In the band 41,020 to 43,980 kilocycles, 75 channels are made available for assignment to aural broadcast stations. The Commission at an early date will consider carefully the needs and requirements for high frequency broadcast stations using both conventional modulation and frequency modulation, as well as the needs of educational broadcast systems. The record of the June 15, 1936 hearing concerning the purpose and needs for the educational broadcast systems will be given most careful consideration in the details of assignment.



**No. 344-C**

**THORDARSON**

**TRANSMITTER  
GUIDE**

**15<sup>c</sup>**

**THORDARSON ELECTRIC MFG. CO.**

**500 W. HURON ST., CHICAGO, ILL.**

*Demand "Power by Thordarson"*

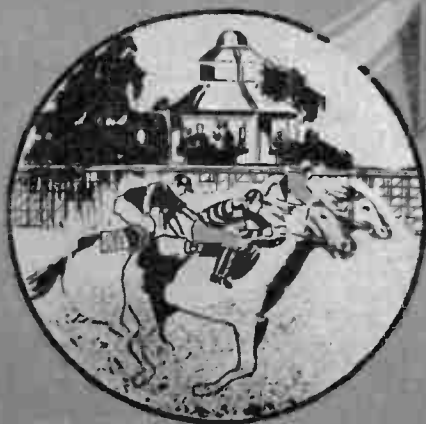
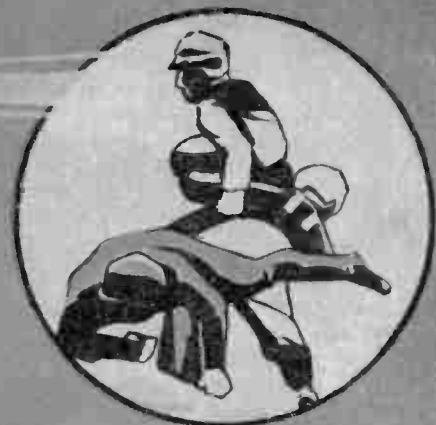




# THORDARSON



AMPLIFIER GUIDE 346-D



Price 15c

# Building Modern Amplifiers

By JEROME H. KLEKER

Chief Sales Engineer, Thordarson Electric Manufacturing Company

THE development of amplifiers is steadily progressing. Today the average builder can turn out a unit capable of results which a few years back could be obtained only in the laboratory. Improvements in tubes, transformers, and circuits make it possible to obtain higher power output from a comparatively small amplifier. Good frequency response is easily obtained and harmonic distortion can be held to the point where it is negligible.

The modern amplifier for Public Address must be entirely self contained. The gain must be high to accommodate low level microphones, and the hum level should be low especially where speakers with good low frequency response are used. The power output rating must be actual undistorted watts at all frequencies, and not just nominal or the tube manufacturers maximum output rating of the tubes used. The amplifiers described in this booklet are modern in these respects and incorporate numerous other improvements.

Thordarson engineers produced these amplifiers strictly for the Sound man and amplifier builder, taking into consideration the high standard of results which are always expected of custom built apparatus. Frequency response, power output, and distortion measurements were made periodically throughout their development on expensive laboratory equipment, thus insuring the most out of each amplifier complement. The final construction of the amplifier is reached only when each part is aiding in the superior performance of the unit.

Inverse feedback is used in most of the amplifiers because of the numerous advantages it offers. Distortion is reduced to minimum, frequency response is made more linear and the overall stability of the amplifier is improved. The constructor is urged to read each and every

article. The suggestions offered in the different models will aid in building any amplifier.

In order to facilitate construction, standard sized chassis are used wherever possible. These are nationally available from parts suppliers. Complete mechanical drawings showing socket and mounting holes make cut and try layout unnecessary and save considerable time in building an amplifier. If drills and punches are not available your local parts supplier may be able to do the necessary work for you.

Full size chassis templates for any amplifier are available from the factory for 15c postpaid. By using a full size drawing the chassis can be marked directly without measurement.

All parts listed are nationally advertised brands and are readily available. Substitution is recommended only when they are of equal quality and the electrical and physical characteristics are the same. Small hardware, etc., is not listed inasmuch as the builder usually has this material on hand.

Assembly of the amplifier is usually started by mounting tube sockets, controls, transformers, and chokes on the chassis. The bottom view photos are marked to indicate the placement of the more important parts used in the amplifier. Small bakelite strips with solder lugs were used in some cases to support small resistors and condensers. If the strips are not available, these parts may be self supported by their leads. The use of the strips, however, tend to make a neater and more rigid wiring job and are recommended.

Proceed to wire the amplifier by starting with the filament or heater circuits. No. 18 stranded pushback wire is suitable.

Wire the power supply next and finally the small resistors, condensers, and controls. It is quite important to use shielded wire as indicated in the circuit diagrams since hum and feedback is liable to result otherwise. Where the schematic diagrams show shielded resistors and condensers this is accomplished by first inserting the part in a piece of spaghetti tubing or wrapping with insulating material such as varnished cambric and then covering with shielding braid. The shielding of the parts so indicated is important in the reduction of hum.

After the assembly and wiring is completed recheck carefully before installing tubes and applying power. When certain that the wiring is correct the power can be applied and voltages checked carefully. It is advisable to measure all voltages and power output before the amplifier is placed in service. This will prevent overloading of tubes or parts due to improper adjustments, bad connections or oscillation.

Due to the high power sensitivity of beam power tubes they sometimes oscillate at a high inaudible frequency if placement of leads is not correct or shielding and grounds are insufficient. Oscillation can also be caused by improper phasing of the inverse feedback circuit. Reversal of the leads, connecting the feedback winding of the output transformer to the grid returns of the input transformer, will change the phase relationship of the feedback voltage. The use of an oscilloscope is recommended in determining when these conditions take place and in correcting same. The article on page 31 will be helpful in the proper testing of an amplifier with the oscilloscope.

Correspondence is invited to aid in the solution of your amplifier problems.

## TABLE OF CONTENTS

Building Modern Amplifiers.....	2	Single Channel Pre-Amplifier .....	20
Advantages of Inverse Feedback.....	3	Four Channel Pre-Amplifier.....	22
8 Watt Amplifier .....	4	Dual Tone Control.....	24
15 Watt Amplifier .....	6	Matching Speaker Loads.....	26
25 Watt Amplifier .....	8	Chassis Drawing, 6 V. D.C. Amplifier .....	27
40 Watt Amplifier .....	10	Chassis Drawing, 2A3 and 15 Watt Amplifier	28
60 Watt Amplifier .....	12	Chassis Drawing, 25 and 40 Watt Amplifier.	29
120 Watt Amplifier .....	14	Chassis Drawing, 60 and 120 Watt Amplifier	30
2A3 Phono Amplifier.....	16	Testing Amplifiers.....	31
6 Volt DC, 115 Volt AC, Mobile Amplifier .	18	Factory Built Amplifiers.....	32





A beam power amplifier to be truly modern should incorporate inverse feedback. It is a commonly recognized fact that low plate resistance tubes such as the 2A3 are superior from the standpoint of low distortion and good quality. With inverse feedback the high plate resistance beam power tube may be made to take on the characteristics of the low- $\mu$  triode, yet retain most of its high power sensitivity. The important advantages obtained by the use of inverse feedback are fourfold: first, reduction of wave form distortion; second, improvement of frequency response; third, reduction of hum; and fourth, reduction of "hangover" effect. The only disadvantage of inverse feedback lies in the fact that the gain is considerably reduced.

### EXPLANATION OF INVERSE FEEDBACK

In the circuit of Fig. 1, a certain amount of the voltage developed in the plate circuit is fed back out of phase with the signal in the grid circuit. If without inverse feedback a certain voltage  $E_0$  is developed across the output circuit with an input voltage  $E_1$ , the gain of the stage is  $E_0$  divided by  $E_1$ . If now a certain percentage  $N$  of the voltage  $E_0$  is fed back to the grid circuit in such a way that the voltage is out of phase with the input voltage  $E_1$ , the total input voltage to obtain an output voltage of  $E_0$  is  $(N E_0 + E_1)$  and

the gain of the stage is  $\frac{E_0}{(N E_0 + E_1)}$ . The

ratio  $N$  is the percentage of the output voltage which is fed back to the input circuit. It may be readily seen that if  $N$  is large the gain of the stage depends more upon  $N$  than upon the circuit constants.

The ratio reduction in gain by the addition of inverse feedback may be readily determined by dividing the gain without feedback by the gain with feedback.

### REDUCTION OF DISTORTION

As was pointed out in the above paragraph, an inverse feedback circuit feeds back a certain portion of the output voltage to the grid circuit. If distortion is introduced in the amplifier stage a certain amount of the distorted voltage will be fed back into the grid circuit and this will tend to cancel out the distortion developed in the amplifier stage. If in the circuit of Fig. 1 a certain amount of distortion voltage  $B$  is present in the output circuit the distortion voltage fed into the grid circuit

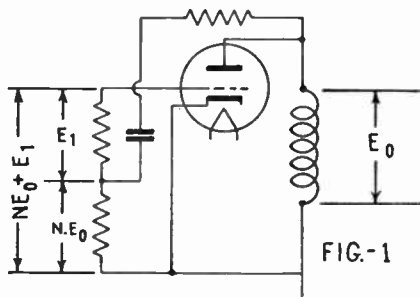


FIG. 1

will be  $N \times B$  and this quantity multiplied by the gain of the stage will give the cancelling effect of the inverse feedback. The total distortion present in the output is then equal to the sum of the distortion without inverse feedback and the distortion cancelled by the inverse feedback. In other words, if  $b$  is the distortion without inverse feedback, the total distortion,  $B$ , with inverse feedback is equal to  $(b + B) \times N \times A$ , where  $A$  is the gain of the stage. Evaluating  $B$  gives the quantity

$\frac{b}{1 + NA}$ . In other words the distortion

is reduced by the ratio of  $\frac{1}{1 + NA}$ .

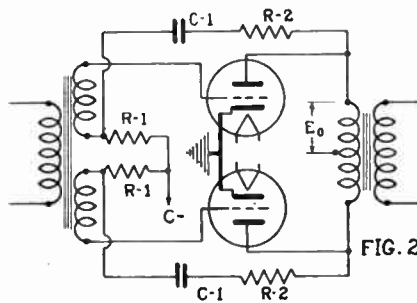


FIG. 2

Fig. 2 shows the ordinary method of obtaining inverse feedback with the resistor-condenser method. The amount of inverse feedback is equal to  $\frac{R_1}{R_1 + R_2}$  assuming

that the reactance of the condenser  $C_1$  is negligible over the operating frequencies. However, this assumption is not necessarily true especially at the lower frequencies and the circuit of Fig. 3 is much more efficient from this standpoint. In Fig. 3 the feedback voltage is obtained from a tertiary winding on the output transformer. This method also provides a much better overload characteristic since the resistance in the grid circuit is negligible and it is quite possible to operate the tubes in the grid current region.

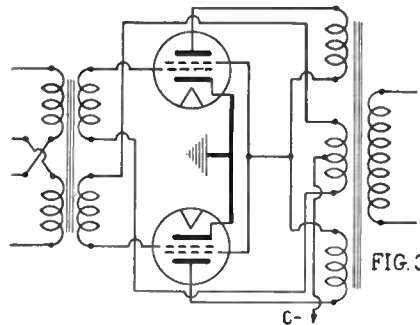


FIG. 3

### REDUCTION OF PLATE RESISTANCE

In addition to the reduction in distortion obtained by inverse feedback, there is also a reduction in the plate resistance of the tubes. A high plate resistance is a

definite disadvantage in the case of a power tube which operates into a speaker load which is more or less variable depending upon the impedance of the voice coil. In the circuit of Fig. 4, it may be easily seen that the voltage  $E$  developed across the load depends a great deal upon the actual value of  $R_1$ , which is the reflected impedance of the voice coil. This is due to the fact that the signal current depends almost entirely upon the high plate resistance of the tube. Since the load resistance is low in comparison to the plate resistance, the voltage developed across the load is almost directly proportional to the impedance of the load which varies appreciably with change in frequency. In Fig. 5 it may be seen that the voltage across the load does not vary so much since the signal current depends both upon the load and upon the plate resistance of the tube. If the voice coil has an appreciable amount of reactance the impedance rises with the frequency causing distortion and giving an unnatural amount of "highs." The high plate resistance is unsuitable from another view point, that of the amount of low frequency distortion which may be tolerated. This low frequency distortion is not

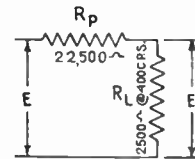


FIG. 4

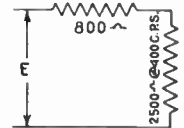


FIG. 5

due to the characteristics of the tubes which remain unchanged regardless of the frequency, but depends upon the magnetizing current in the output transformer. The magnetizing current is a distorted nonsinusoidal wave and this current, on flowing through the high plate resistance of the tube, develops a nonsinusoidal voltage drop across the tube which, when subtracted from the input signal, results in a distorted wave across the output. Unfortunately, most amplifiers today are measured for distortion at 400 c.p.s. where the magnetizing current is practically negligible. It is not uncommon to find beam power amplifiers without inverse feedback which have only 25 per cent of the rated power at 40 or 50 cycles. This low frequency distortion is particularly objectionable since all harmonics fall within the audible range. Inverse feedback effectively reduces the plate resistance so that the distorted voltage drop caused by the magnetizing current is exceedingly small with the result that there is very little distortion across the output circuit. With a poor output transformer it is quite possible for the distortion to be as high as 30 per cent at 40 cycles without inverse feedback.

### "HANGOVER" EFFECT

"Hangover effects," or transients caused by the loud speaker cone vibrating at its natural period when shock excited, are greatly reduced by the use of inverse feedback. The lower plate resistance provides a considerable amount of damping so that the oscillations or transients are reduced. With regular beam power tubes the shunt-

(Continued on page 27)





TOP VIEW

**T**HIS small amplifier is useful in many everyday applications especially for voice amplification. Political meetings, Ballyhoo, etc., usually can be handled successfully with a small amplifier system capable of delivering about 8 watts of audio power.

Three high gain resistance coupled stages will accommodate even the lowest level high impedance microphones. The phono pick-up signal is mixed into the second stage through a resistance network, providing independent control of microphone and phono without one affecting the other. A good selection of output impedances make it easy to match any P.M. or electro-dynamic loud speaker. The amplifier supplies 6 watts of field power which is sufficient for an 8 or 10 inch loud speaker (5000 ohm field). One or more additional P.M. speakers may be connected if desired.

The construction of the amplifier is comparatively simple, especially since the chassis layout is shown. A full size drawing is also available making it possible to spot the hole centers the chassis with a punch if this method of construction is preferred. After all holes have been drilled or punched, mount all the parts, starting with tube sockets, controls and transformers.

Wire the tube heaters first and then proceed with common ground connections. After wiring the "B" supply, install and wire the small resistors, condensers, etc. Use shielded wire as indicated in the diagram and shield resistors R-1, R-6 and R-8 by inserting in spaghetti tubing and covering with a shielded braid. This shielding aids in eliminating annoying hum and cross talk, ordinarily encountered in high gain amplifiers.

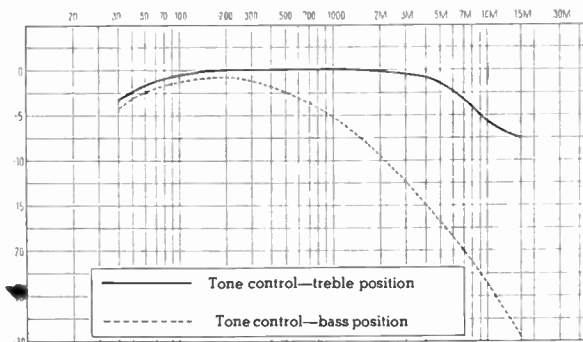
The wiring of the speaker socket is such that either an electro dynamic or P.M. speaker may be used without altering connections in the amplifier. This is accomplished by properly wiring the speaker plug. If a 5000 ohm field is used, connect the field to the plug prongs corresponding to socket contacts "G" and "A". If a P.M. speaker is used a jumper wire must be connected in the plug to prongs "G" and "B". Do not operate the amplifier unless a 5000 ohm speaker field is connected or the plug inserted with the jumper wire.

Make voice coil connections to contacts "G" (common) and either 2, 4, 8 or 500 whichever matches the speaker impedance. The output terminals marked 500 ohms facilitate connecting to a line in portable set-ups. However, be sure a jumper plug from "G" to "B" is inserted when this is used.

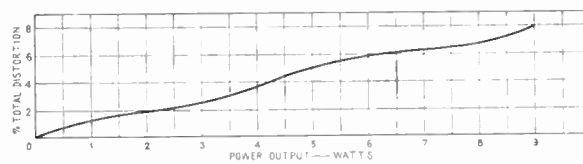
It is recommended that the tubes be inserted and speaker and other accessories connected before the amplifier is turned on. Voltages are given on the schematic diagram. All voltages should be checked with a good volt-meter before the amplifier is allowed to operate for any length of time. 10% tolerance is permissible in voltage measurements.

**TECHNICAL DATA**

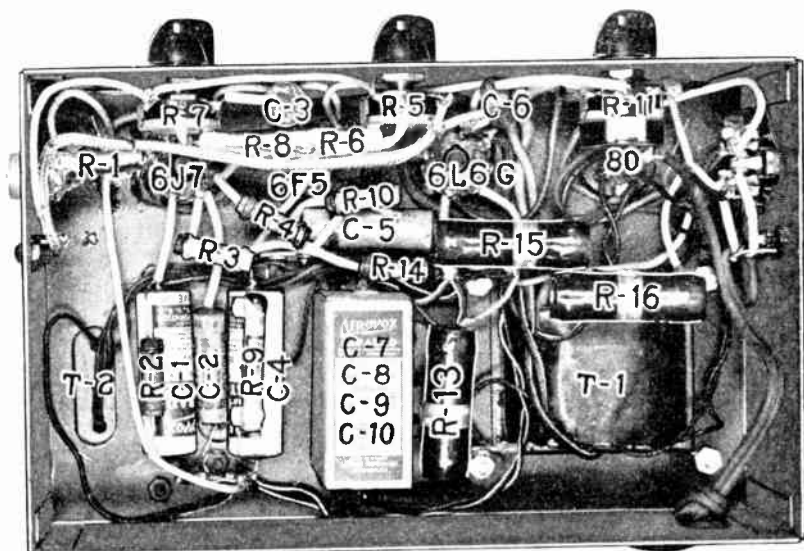
- Power Output:** 8 watts or + 31.25 db.
- Coverage:** 100,000 to 200,000 cu. ft. indoors; 6,000 to 10,000 sq. ft. outdoors (depending on speaker efficiency and noise level).
- Input Circuits:** One 5 megohm channel for high impedance crystal, dynamic, or velocity microphone, and one channel for high impedance crystal or magnetic pick-up. The two channels may be mixed.
- Field Supply:** 6 watts available for 5000 ohm speaker field.
- Output Impedances:** 2, 4, 8, and 500 ohms.
- Frequency Response:** Within  $\pm 1$  db from 45 c.p.s. to 6000 c.p.s.
- Tone Control:** Maximum position attenuates 1000 c.p.s. 5 db, 5000 c.p.s. 17 db, and 10,000 c.p.s. 23 db.
- Gain:** Microphone input 111 db; phono input 66 db (based on 100,000 ohms input impedance).
- Hum:** 61.5 db below maximum output.
- Tubes:** 1-6J7, 1-6F5, 1-6L6G, 1-80.
- Power Consumption:** 85 watts, 115 volts, 50-60 cycles.
- Dimensions:** 10" long, 5" deep, 9" high.



FREQUENCY-RESPONSE CURVE



DISTORTION CURVE



BOTTOM VIEW







TOP VIEW

**T**HE output power of this amplifier is sufficient to satisfy the requirements of a large number of installations. This is especially true since the distortion present at full output is low, being less than 5% total. This percentage is generally accepted as undistorted and permits operating at full output with high quality reproduction.

Thordarson CHT transformers are used in this model and are recommended for best results, appearance, etc. Regular types may be substituted as indicated in the parts list but it will be necessary to locate the mounting holes when drilling the chassis since the drawing is based on the use of CHT units. An added advantage is the better selection of output impedances available with the CHT output transformer.

Beam power 6V6-G output tubes are operated in a class A1 circuit employing inverse feedback. The output transformer contains a separate feedback winding which produces a voltage 10% of that developed in the primary. The voltage is fed out of phase into the grid returns of the input transformer secondary. This method of feedback is superior to the resistor-capacity method inasmuch as there is no frequency discrimination, and any distortion that might develop in the output is corrected. It should be noted that the input transformer has a split secondary winding which is essential when this method of feedback is used.

A high impedance microphone and high impedance phono channel with independent controls accommodate any type of microphone and crystal or magnetic pick-up. Amplifier gain is sufficient to obtain full output from microphone and pick-up under normal operating conditions.

The circuit diagram shows two speaker sockets which are used for making speaker voice-coil and field connections. If electro-dynamic speakers are used, ten watts of field excitation is available for one 5,000 ohm, or one or two 2,500 ohm fields. The table below indicates how the connections are made to the speaker sockets. Note that a jumper wire is used on the speaker field terminal board for some conditions of operation.

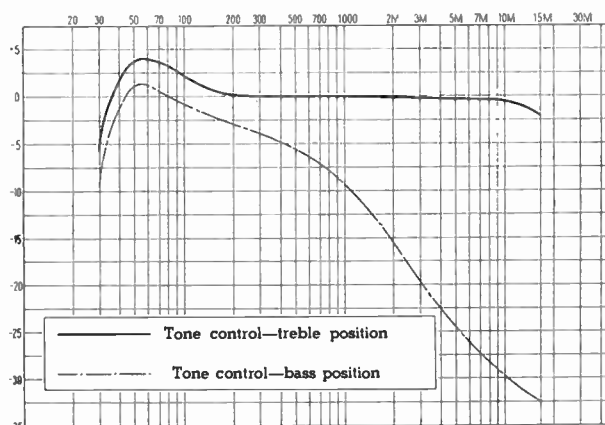
	Jumper	Connect to Prongs
1-5000 ohm field	remove	1-5
1-2500 ohm field	C-2	2-5
2-2500 ohm fields	remove	B-E and 2-5
Field Supply not used	1-C	

Speaker voice coil or line connections are made at 3, 4, and C, D of the speaker sockets or the output terminal board. The CHT output transformer, T-2, incorporates a terminal board with jacks and a plug for selecting the proper output impedance.

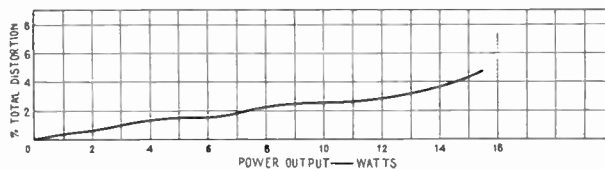
Terminal board marked POL. V. is provided to supply a polarizing voltage for static types of microphones or a photo electric cell. When the static microphone is used connect a jumper wire to terminals 1 and 2 which completes the circuit. Under no condition should this jumper be left in place when a crystal, dynamic, or velocity microphone is connected to the amplifier.

Photo electric cells of the gas filled type usually require 90 volts operating voltage. Since the normal voltage applied to the input plug is approximately 270 volts, this should be reduced to 90 volts by connecting a 5 megohm 1 watt resistor from the junction of C-1 and R-2 to ground. In the event that a static microphone or photo electric cell is never to be used R-1, R-2, and C-1 may be eliminated.

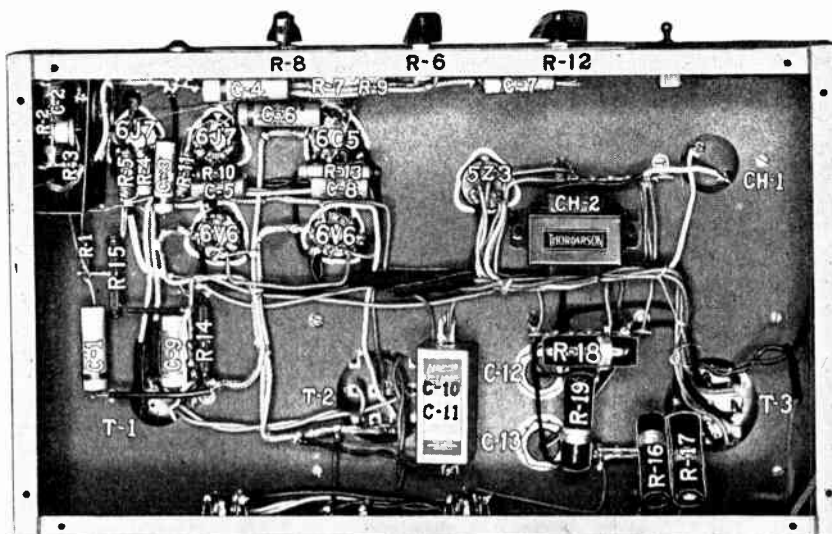
It is important to employ the shielding of wires and parts as shown in the diagram if hum, noise, and oscillation are to be eliminated. Enclose R-1, R-3, and C-2 in a metal container for minimum hum. The constructor is advised to read the article on page 31 if any difficulty is experienced in adjusting the amplifier.



FREQUENCY-RESPONSE CURVE



DISTORTION CURVE

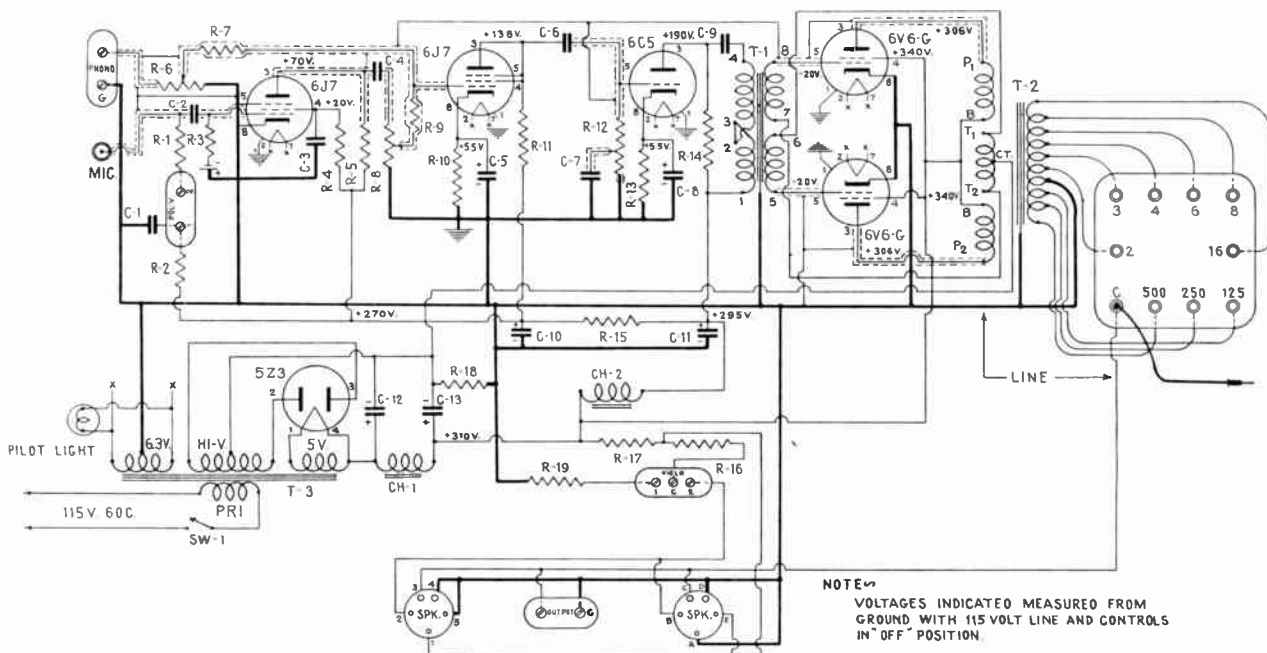


BOTTOM VIEW





# 15 WATT AMPLIFIER



## TECHNICAL DATA

**Power Output:** 15 watts undistorted or + 34 db (less than 5% distortion).

**Coverage:** 200,000 to 500,000 cu. ft. indoors; 10,000 to 20,000 sq. ft. outdoors (depending on speaker efficiency and noise level).

**Input Circuits:** One 5 megohm channel for high impedance crystal, dynamic, or velocity microphone, and one channel for high impedance crystal, or magnetic pick-up. The two channels may be mixed. Polarizing voltage is provided for static microphone or photo electric cell.

**Field Supply:** 10 watts available for one 5000 ohm field, or one or two 2500 ohm fields.

**Output Impedances:** 2, 3, 4, 6, 8, 16, 125, 250, or 500 ohms with CHT output transformer, or 4, 8, 15, 250, or 500 ohms with regular output transformer.

**Frequency Response:** Within  $\pm 1$  db from 40 c.p.s. to 15,000 c.p.s. with bass boost of 3.5 db below 100 c.p.s.

**Tone Control:** Maximum position attenuates 10,000 c.p.s. 28 db.

**Gain:** Microphone input 113 db; phono input 72 db (based on 100,000 ohms input impedance).

**Hum:** 74 db below maximum output.

**Tubes:** 2-6J7, 1-6C5, 2-6V6-G, 1-5Z3.

**Power Consumption:** 112 Watts, 115 volts, 50-60 cycles.

**Dimensions:** 17" long, 10" deep, 9" high.

## PARTS LIST

### THORDARSON TRANSFORMERS AND CHOKES

Diagram No.	CHT	REG.	
T-1	T-15A74	T-15A74	Input Transformer
T-2	T-15S90	T-17S11	Output Transformer
T-3	T-15R06	T-70R62	Power Transformer
CH-1	T-15C54*	T-57C54	First Choke
CH-2	T-67C46	T-67C46	Second Choke

\*Windings in parallel.

### RESISTORS

Diagram No.	Ohms	Watts	Type
R-1	10 MEG.	1/2	IRC BT-1/2
R-2	10 MEG.	1/2	IRC BT-1/2
R-3	5 MEG.	1/2	IRC BT-1/2
R-4	3 MEG.	1	IRC BT-1
R-5	500,000	1	IRC BT-1
R-6	1 MEG.	Volume Control	Yaxley type "O"
R-7	500,000	1/2	IRC BT-1/2
R-8	1 MEG.	Volume Control	Yaxley type "O"
R-9	500,000	1/2	IRC BT-1/2
R-10	5,000	1	IRC BT-1
R-11	100,000	1	IRC BT-1
R-12	500,000	Tone Control	Yaxley type "M"
R-13	1,000	1	IRC BT-1
R-14	20,000	1	IRC BT-1
R-15	20,000	1	IRC BT-1
R-16	2,500	25	Ohmite, Wirewound
R-17	1,500	25	Ohmite, Wirewound
R-18	125	25	Ohmite, Wirewound, Tolerance +10%, -0%
R-19	2,500	25	Ohmite, Wirewound

### TUBES

2	6J7
1	6C5
2	6V6-G
1	5Z3

### CONDENSERS

Diagram No.	Mfd.	Voltage	Type
C-1	.1	400V Paper	Aerovox #484
C-2	.03	400V Paper	Aerovox #484
C-3	.04	400V Paper	Aerovox #484
C-4	.1	400V-Paper	Aerovox #484
C-5	10	25V Elect.	Cornell-Dubilier BR-102
C-6	.1	400V Paper	Aerovox #484
C-7	.03	400V Paper	Aerovox #484
C-8	10	25V Elect.	Cornell-Dubilier BR-102
C-9	.1	400V Paper	Aerovox #484
C-10, C-11	8-8	450 W. V. Elect.	Aerovox P13S-450
C-12	8	600V Elect.	Aerovox GL600
C-13	8	600V Elect.	Aerovox GL600

### MISCELLANEOUS PARTS

1	10x17x3" chassis and cover—Par-Metal AF 1017
1	10x17" chassis bottom plate—Par-Metal BP 4526
1	4-contact socket — Amphenol S4
5	Octal sockets — Amphenol S8
2	5-contact sockets — Amphenol S5
2	5-prong speaker plugs — Amphenol PM5
1	Mic. connector — Amphenol PC1M
1	Mic. connector — Amphenol MC1F
1	Pilot light socket and jewel — Yaxley #310R
1	6.3V Pilot light — Maada #40
2	Metal tube grid caps
2	Metal grid cap shields
1	"Microphone" control plate
1	"Phono" control plate
1	"Tone" control plate
3	Control knobs
1	AC line cord & plug
1	Mallory bias cell — 1.5 V. — #F7
1	Mallory bias cell holder — #GB-1A
1	SPST switch — Arrow II & II #20992
3	Two screw terminal boards
1	Three screw terminal board

For complete mechanical drawing of chassis see page 28 Full size template of chassis available from ThorDARSON 15c net, postpaid.

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.



**T**HE use of inverse feedback makes it possible to obtain 25 watts of undistorted output from this amplifier with only 300 volts applied to the plates and screens of the power tubes. These low voltages increase tube and condenser life considerably which is a decided advantage. The output tubes are operated in a class AB1 circuit, under which condition no driving power is required; a single 6C5 tube supplies sufficient grid excitation through a C.H.T. input transformer. The windings of this transformer are balanced so that there is a cancelling effect for any hum that might be picked up. Degeneration or inverse feedback is obtained by coupling the tertiary winding of the output transformer to the secondary of the input transformer.

The input circuits are arranged to handle two high impedance microphones and a phono pick-up. Mixing takes place in the second stage in a resistor network that is more simple and economical than electronic mixing. Control action is smooth, and the changing of one control setting does not affect another. It is important, however, to shield resistors R-11, R-12, and R-13, and the leads as shown in the diagram. The impedance of these circuits is high, making them susceptible to hum pick-up and cross-talk unless adequately isolated.

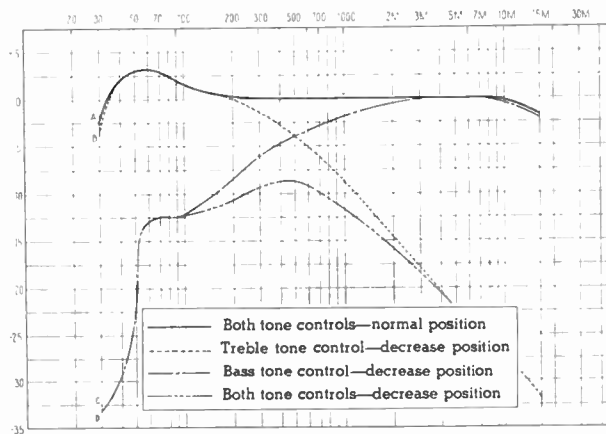
Frequency response is adjusted with two tone controls — one for bass and one for treble. With the tone controls in the normal position, the response of the amplifier is decidedly flat—from 30 to 15,000 cycles per second. There is approximately 3 db accentuation at 60 c.p.s. which is purposely brought about by resonating the primary of the input transformer with condenser C-13. This boost is desirable in radio and record reproduction and can be eliminated with the bass tone control for voice work if necessary. The adjustment of both controls helps eliminate feedback when bad acoustical conditions exist.

To insure good quality, loud speakers with a diameter of at least 12 inches are recommended. They should be capable of efficiently han-

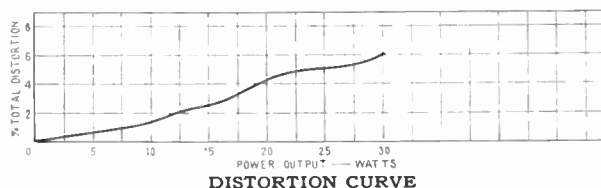
dling 15 watts of audio power each if the full 25 watt output of the amplifier is to be utilized. Either P M or electro-dynamic speakers are suitable since the amplifier will supply 18 watts for field excitation. This is adequate for one large speaker with a 5000 ohm field, or one or two smaller speakers with 2500 fields. A three-screw terminal board is provided for connecting a jumper wire in the event that P M speakers are used. Use table below in wiring the speaker plugs.

	<b>Jumper</b>	<b>Connect to Prongs</b>
1-5000 ohm field	none	1-5
1-2500 ohm field	C-2	2-5
2-2500 ohm field	none	B-E and 2-5
Field supply not used	1-C	

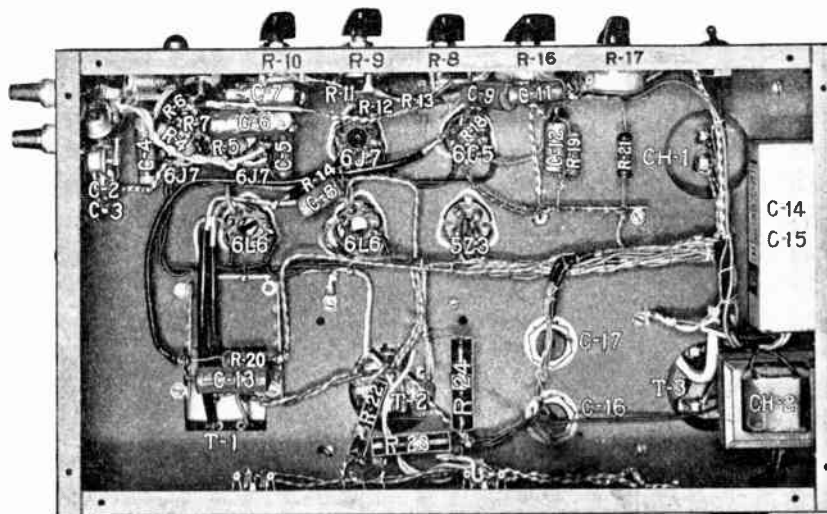
A polarizing voltage may be applied to the input connectors by connecting jumper wires on terminal board marked "POL. V." Refer to the 15 watt amplifier for further details on polarizing voltage for static microphones and photo electric cells.



**FREQUENCY-RESPONSE CURVE**



**DISTORTION CURVE**

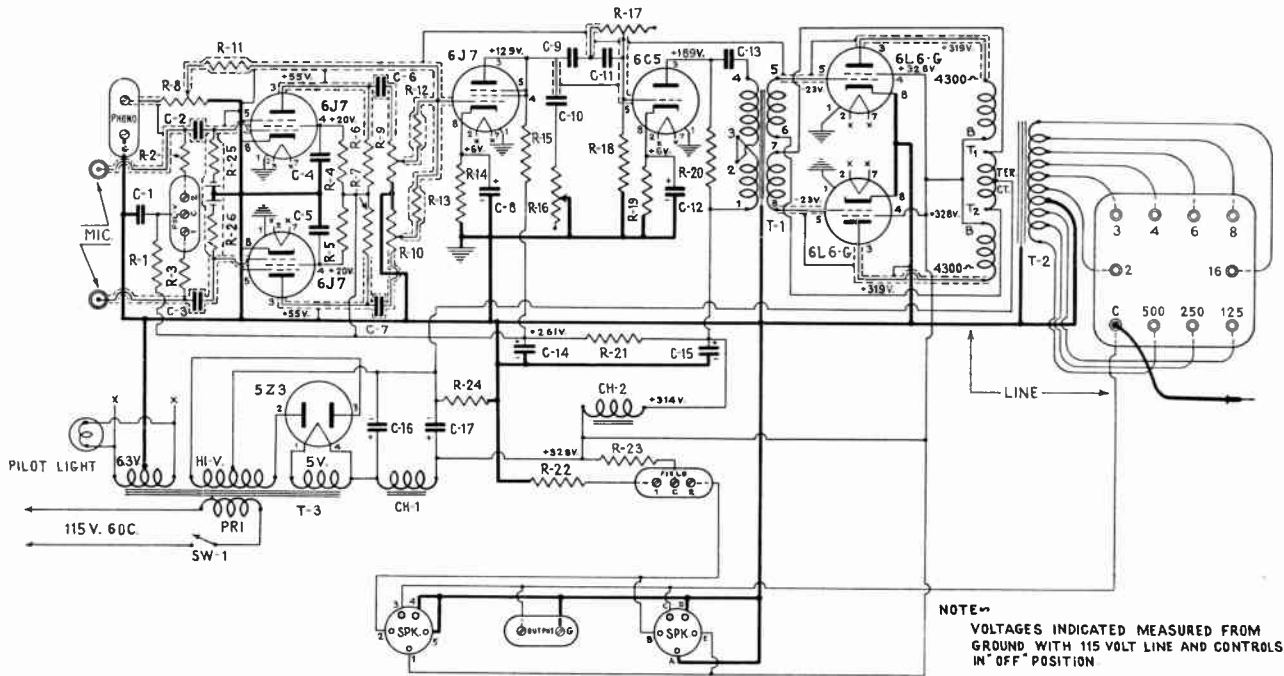


**BOTTOM VIEW**



# 25 WATT AMPLIFIER

# THORDARSON



NOTE—  
VOLTAGES INDICATED MEASURED FROM  
GROUND WITH 115 VOLT LINE AND CONTROLS  
IN "OFF" POSITION

## TECHNICAL DATA

**Power Output:** 25 watts undistorted or + 36.2 db (less than 5% distortion).

**Coverage:** 500,000 to 1,000,000 cu. ft. indoors; 20,000 to 30,000 sq. ft. outdoors (depending on speaker efficiency and noise level).

**Input Circuits:** Two 5 megohm channels for high impedance crystal, dynamic, or velocity microphones, and one channel for high impedance crystal or magnetic pick-up. All channels can be mixed. Polarizing voltage is available for static microphone or photo electric cell.

**Field Supply:** 18 watts for one 5000 ohm field, or one or two 2500 ohm fields.

**Output Impedances:** 2, 3, 4, 6, 8, 16, 125, 250, or 500 ohms with CHT output transformer or 4, 8, 15, 250, or 500 ohms with regular output transformer.

**Frequency Response:** Within  $\pm 1$  db from 35 c.p.s. to 15,000 c.p.s. with bass boost of 3.5 db below 100 c.p.s.

**Tone Controls:** Two: bass control attenuates 12 db at 60 c.p.s.; treble control attenuates 27 db at 10,000 c.p.s.

**Gain:** Microphone input, 113 db; phono input 72 db (based on 100,000 ohms input impedance).

**Hum:** 74.5 db below maximum output.

**Tubes:** 3-6J7, 1-6C5, 2-6L6G, 1-5Z3.

**Power Consumption:** 180 watts, 115 volts, 50-60 cycles.

**Dimensions:** 17" long, 10" deep, 9" high.

## PARTS LIST

### THORDARSON TRANSFORMERS AND CHOKES

Diagram No.	CHT	REG.	Type
T-1	T-15A74	T-15A74	Input Transformer
T-2	T-15S91	T-17S12	Output Transformer
T-3	T-15R07	T-17R30	Power Transformer
CH-1	T-15C55*	T-67C49	First Choke
CH-2	T-67C46	T-67C46	Second Choke

\*Windings in series.

### CONDENSERS

Diagram No.	Mfd.	Voltage	Type
C-1	.1	400V Paper	Cornell-Dubilier DT-4P1
C-2	.03	400V Paper	Cornell-Dubilier DT-4S3
C-3	.03	400V Paper	Cornell-Dubilier DT-4S3
C-4	.04	400V Paper	Cornell-Dubilier DT-4S4
C-5	.04	400V Paper	Cornell-Dubilier DT-4S4
C-6	.1	400V Paper	Cornell-Dubilier DT-4P1
C-7	.1	400V Paper	Cornell-Dubilier DT-4P1
C-8	10	25 V Elect.	Cornell-Dubilier BR-102
C-9	.1	400V Paper	Cornell-Dubilier DT-4P1
C-10	.03	400V Paper	Cornell-Dubilier DT-4S3
C-11	.001	600V Paper	Cornell-Dubilier DT-6D1
C-12	10	25V Elect.	Cornell-Dubilier BR-102
C-13	.1	400V Paper	Cornell-Dubilier DT-4P1
C-14	8-8	450 WV Elect.	Cornell-Dubilier EH-9808SL
C-15			Aerovox GL600
C-16	8	600V Elect.	Aerovox GL600
C-17	8	600V Elect.	Aerovox GL600

### MISCELLANEOUS PARTS

1	10x17x3" Chassis and cover — ICA #3875
1	10x17" Chassis bottom plate — ICA #4067
6	Octal sockets — Amphenol S8
1	4-contact socket — Amphenol S4
2	5-contact sockets — Amphenol S5
2	5-prong speaker plugs — Amphenol PM5
2	Mic. input connectors — Amphenol PC1M
2	Mic. input connectors — Amphenol MC1F
2	Three screw terminal boards
2	Two screw terminal boards
1	Pilot light socket and jewel — Yaxley 310R
1	6.3V Pilot light bulb — Mazda #40
1	SPST toggle switch — Arrow H&H #20992
5	Control knobs
3	Metal tube grid caps
3	Metal grid cap shields
1	AC line cord and plug — Belden #1725
2	Bias cells, 1.5 volts — Mallory #F7
2	Bias cell holders — Mallory #GB-1A
2	"Mic" control plates
1	"Phono" control plate
2	"Tone" control plates (bass and treble)

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.

For complete mechanical drawing of chassis see page 29, Full size template of chassis available from Thorardson, 15c net, postpaid.

### RESISTORS

Diagram No.	Ohms	Watts	Type
R-1	10 MEG.	1/2	IRC BT-1/2
R-2	10 MEG.	1/2	IRC BT-1/2
R-3	10 MEG.	1/2	IRC BT-1/2
R-4	3 MEG.	1	IRC BT-1
R-5	3 MEG.	1	IRC BT-1
R-6	500,000	1	IRC BT-1
R-7	500,000	1	IRC BT-1
R-8	250,000		Yaxley type "M"
R-9	1 MEG.		Yaxley type "O"
R-10	1 MEG.		Yaxley type "O"
R-11	500,000	1/2	IRC BT-1/2
R-12	500,000	1/2	IRC BT-1/2
R-13	500,000	1/2	IRC BT-1/2
R-14	5,000	1	IRC BT-1
R-15	100,000	1	IRC BT-1
R-16	500,000		Yaxley UC-513
R-17	9 MEG.		Yaxley UC-508
R-18	250,000	1/2	IRC BT-1/2
R-19	1,000	1	IRC BT-1
R-20	20,000	1	IRC BT-1
R-21	20,000	1	IRC BT-1
R-22	2,500	25	Ohmite Wire Wound
R-23	2,500	25	Ohmite Wire Wound
R-24	100	25	Ohmite Wire Wound, Tolerance +10% - 0%
R-25	5 MEG.	1/2	IRC BT-1/2
R-26	5 MEG.	1/2	IRC BT-1/2

### TUBES

3	Type 6J7
1	Type 6C5
2	Type 6L6-G
1	Type 5Z3





**T**HE characteristics of 6L6 beam power tubes are such that they may be used in the construction of amplifiers ranging from 5 to 60 watts output. Their power output depends on the class of operation employed, such as A<sub>1</sub>, AB<sub>1</sub>, AB<sub>2</sub>. This is determined by the applied plate, screen and grid voltages, the plate load and driving power.

This 40 watt amplifier uses two 6L6-G tubes operating in class AB<sub>2</sub> with approximately 400 volts on the plates and 250 volts on the screens. Adequate driving power is supplied by a triode connected 6F6 tube through a CHT driver transformer. The use of inverse feedback and ample driving power make it possible to obtain 40 watts output without using fixed bias. This simplifies the construction of the amplifier considerably.

Two microphones and two phono pick-ups may be connected to the amplifier at one time. The two phono channels are especially desirable where dual turn-tables are employed for continuous record reproduction. Also a suitable radio tuner can be connected to one of the phono channels for broadcast reception in conjunction with one phono pick-up. Complete mixing makes possible the selection of one or more input channels for reproduction at the same time.

A dual tone control circuit recently developed in Thordarson's laboratory operates in the cathode circuit of the 6C5 tube. One control affects only the low or bass frequencies, and the other controls the high or treble frequencies. Operation is such that with the controls in the center or vertical position the frequency response is normal, as illustrated by the frequency response curve. Turning the bass control to the left increases the bass response and to the right reduces it. The treble control functions in the same manner. More detailed description of this type of control and its effect on the amplifier frequency response is given on page 24.

Two 5Z3 rectifier tubes connected in a parallel circuit provide excellent power supply regulation. The additional tube also allows higher total current which is desirable for speaker field excitation. The amplifier supplies 25 watts for speaker fields, (250 volts at 100 MA) which is adequate for one large auditorium speaker or for two to four smaller speakers. The following table indicates how speaker field connections are made to the speaker sockets and the proper position of the field supply jumper wire.

	Jumper	Connect to prongs
1 - 2500 ohm field	1-C	1-2
2 - 1250 ohm field	1-C	2-5 and A-E
2 - 5000 ohm field	1-C	1-2 and A-B
4 - 2500 ohm field	1-C	2-5 and A-E*
Field supply not used	C-2	

\*Connect two fields in parallel to each plug.

Make speaker voice-coil or line connections to contacts 3-4 and C-D of the speaker sockets or to the output terminal board. Impedance matching is accomplished by inserting the plug into the proper jack on the CHT output transformer terminal board.

## TECHNICAL DATA

**Power Output:** 40 watts undistorted or +38.25 db (Less than 5% distortion).

**Coverage:** 1,000,000 to 2,000,000 cu. ft. indoors; 30,000 to 50,000 sq. ft. outdoors (depending on speaker efficiency and noise level).

**Input Circuits:** Two high impedance channels for crystal, dynamic, or velocity microphones, and two high impedance phono channels for crystal or magnetic pick-ups. All four channels may be mixed.

**Field Supply:** 25 watts are available for one 2500 ohm, two 1250 ohm, two 5000 ohm, or four 2500 ohm fields.

**Output Impedances:** 2, 3, 4, 6, 8, 16, 125, 250 or 500 ohms with CHT output transformer or 4, 8, 15, 250 or 500 ohms with regular output transformer.

**Frequency Response:** Within  $\pm$  2 db, 30 to 15,000 c.p.s. (Tone controls in normal position).

**Tone Controls:** Two; Bass control varies response from + 12 db to -35 db at 40 c.p.s. and treble control varies response from + 8 db to -35 db at 7,000 c.p.s. from normal. It is possible to obtain practically any desired frequency response.

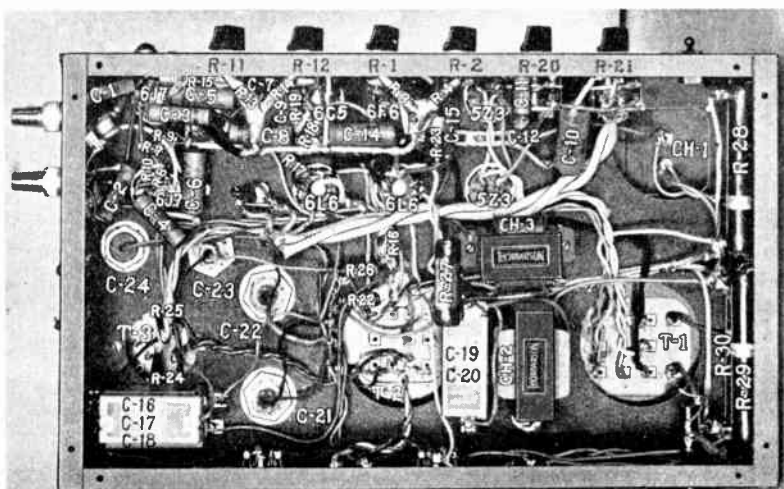
**Gain:** Microphone inputs, 118.5 db; phono inputs, 74 db (based on 100,000 ohms input impedance).

**Hum:** 75 db below maximum output.

**Tubes:** 2-6J7, 1-6F5, 1-6C5, 1-6F6, 2-6L6G, 2-5Z3.

**Power Consumption:** 220 watts, 115 volts, 50-60 cycles.

**Dimensions:** 17" long, 10" deep, 9" high.

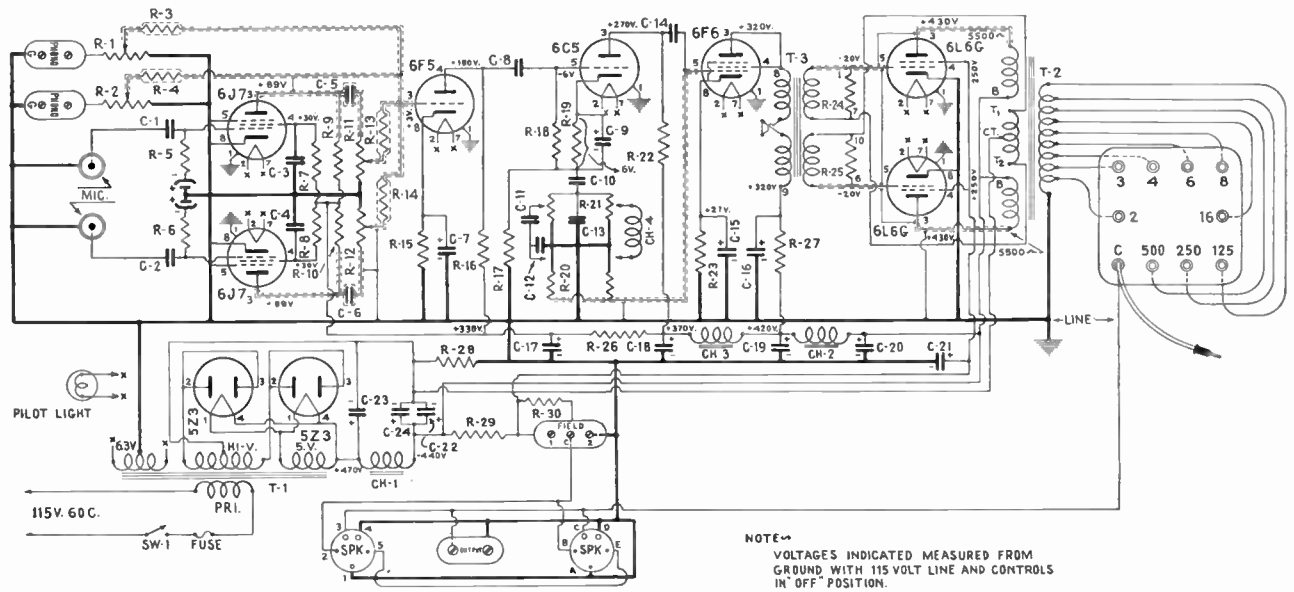


BOTTOM VIEW



# 40 WATT AMPLIFIER

# THORDARSON



## PARTS LIST

TRANSFORMERS AND CHOKES			
Diagram No.	CHT	REG.	Type
T-1	T-15R08	T-17R31	Power Transformer
T-2	T-15S92	T-17S14	Output Transformer
T-3	T-15D85	T-15D85	Driver Transformer
CH-1	T-15C56*	T-75C51	First Choke
CH-2	T-18C92	T-18C92	Second Choke
CH-3	T-67C46	T-67C46	Third Choke
CH-4	T-14C70	T-14C70	Tone Control Choke

\* Windings in series.

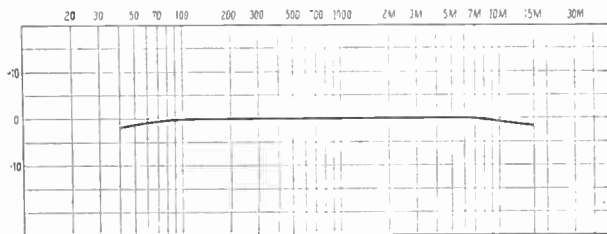
CONDENSERS			
Diagram No.	Mfd.	Voltage	Type
C-1	.03	400V Paper	Aerovox #484
C-2	.03	400V Paper	Aerovox #484
C-3	.04	400V Paper	Aerovox #484
C-4	.04	400V Paper	Aerovox #484
C-5	.1	400V Paper	Aerovox #484
C-6	.1	400V Paper	Aerovox #484
C-7	10	25V Elect.	Aerovox PR25
C-8	.1	400V Paper	Aerovox #484
C-9	10	25V Elect.	Aerovox PR25
C-10	.5	400V Paper	Aerovox #484
C-11	.01	400V Paper	Aerovox #484
C-12	.01	400V Paper	Aerovox #484
C-13	.003	400V Paper	Aerovox #484
C-14	.1	400V Paper	Aerovox #484
C-15	10	25V Elect.	Aerovox PR25
C-16, C-17	8-8	450V Elect.	Aerovox PBS450
C-18,	8	450V Elect.	Aerovox PBS450
C-19	8	600V Elect.	Aerovox PBS600
C-20	8	600V Elect.	Aerovox PBS600
C-21	8	600V Elect.	Aerovox GL600
C-22	8	600V Elect.	Aerovox GL600
C-23	8	600V Elect.	Aerovox GL600
C-24	8	600V Elect.	Aerovox GL600

RESISTORS			
Diagram No.	Ohms	Watts	Type
R-1	500,000	Volume Control	Centralab N-103
R-2	500,000	Volume Control	Centralab N-103
R-3	500,000	1/2	Centralab #310
R-4	500,000	1/2	Centralab #310
R-5	5 Megohms	1/2	Centralab #310
R-6	5 Megohms	1/2	Centralab #310
R-7	3 Megohms	1/2	Centralab #310
R-8	3 Megohms	1/2	Centralab #310
R-9	500,000	1/2	Centralab #310
R-10	500,000	1/2	Centralab #310
R-11	1 Megohm	Volume Control	Centralab N-104
R-12	1 Megohm	Volume Control	Centralab N-104
R-13	500,000	1/2	Centralab #310
R-14	500,000	1/2	Centralab #310
R-15	5,000	1	Centralab #314
R-16	250,000	1/2	Centralab #310
R-17	20,000	1/2	Centralab #310
R-18	250,000	1/2	Centralab #310
R-19	1,000	1	Centralab #314
R-20	Special Dual	Tone Control	Thordarson R-1068
R-21	Special Dual	Tone Control	Thordarson R-1068
R-22	20,000	1	Centralab #314
R-23	900	10	Ohmite, Wirewound
R-24	10,000	1/2	Centralab #310
R-25	10,000	1/2	Centralab #310
R-26	20,000	1	Centralab #314
R-27	2,500	25	Ohmite, Wirewound
R-28	80	50	Ohmite, Wirewound
R-29	1,800	50	Ohmite, Wirewound
R-30	2,500	50	Ohmite, Wirewound

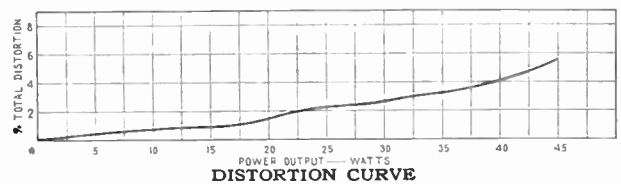
TUBES	
2	Type 6J7
1	Type 6F5
1	Type 6C5
1	Type 6F6
2	Type 6L6-G
2	Type 5Z3

MISCELLANEOUS PARTS	
1	10x17x3" Chassis and cover — ICA #3875
1	10x17" Chassis bottom plate — ICA #4067
2	5-Contact sockets — Amphenol S5
2	4-Contact sockets — Amphenol S4
7	Octal sockets — Amphenol S8
2	5-Prong speaker plugs — Amphenol PM5
3	Metal tube grid caps
3	Metal tube grid cap shields
1	Pilot light socket and jewel — Yaxley #310R
1	6.3V Pilot light bulb — Mazda #40
1	SPST toggle switch — Arrow H&H #20992
2	Mic. input connectors — Amphenol #PC1M
2	Mic. input connectors — Amphenol #MC1F
1	Primary line cord and plug — Belden #1725
2	Bias cells, 1.5 volts — Mallory #F7
2	Bias cell holders — Mallory #GB-1A
2	"Mic." control plates
2	"Phono" control plates
2	"Tone" control plates
6	Volume control knobs
1	Fuse mounting — Littlefuse #1075
1	Fuse, 5 amp.
1	2-Screw terminal board, output
2	2-Screw terminal boards, phono input
1	3-Screw terminal board, field supply

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.



FREQUENCY RESPONSE CURVE



DISTORTION CURVE

For complete mechanical drawing of chassis see page 29. Full size template of chassis available from THORDARSON 15c net, postpaid.





TOP VIEW

**T**HIS 60 watt amplifier has sufficient undistorted power output for practically any loud speaker installation. Four type 6L6-G output tubes operate in a push-pull parallel class AB1 circuit. Under these conditions no driving power is required making it possible to use a single 6C5 tube for excitation of the power stage. Distortion in the power stage is reduced to a minimum by the use of inverse feedback. Laboratory tests of amplifiers without inverse feedback indicate that distortion at full output may be less than 5% at 400 c.p.s., however it may increase to as much as 30 to 40% at bass and treble frequencies. This peculiarity of pentode and tetrode power tubes is quite easily corrected by the use of inverse feedback. The output of this amplifier has less than 6% distortion at all frequencies between 30 and 10,000 c.p.s.

In wiring the amplifier, shield all leads in the grid and plate circuits of the output tubes. The schematic diagram indicates clearly where shielding is necessary. This should not be overlooked since shielding is important in modern amplifiers employing tubes with high power sensitivity. Connect the colored leads of the output transformer to the numbered terminals of T-3 as indicated in the diagram. If the leads of the tertiary winding are reversed oscillation is sure to result in the output stage.

Two rectifier tubes are used; one for the plate and bias voltages of the output stage; the other for the screens of the output tubes and the balance of the amplifier. The effect of this circuit is similar to fixed bias and also provides excellent screen voltage regulation which is essential for maximum undistorted output. Interstage coupling through the B supply is also eliminated, since the plate circuit of the 6L6-G tubes is supplied from a separate rectifier.

The amplifier as illustrated is constructed with regular Thordarson transformers and chokes except T-15A74. This is a Thordarson CHT input transformer which incorporates hum balancing construction, and a split secondary winding. The use of this transformer is essential since hum pick-up must be held to a minimum, and a split secondary is required for the inverse feedback connection. A CHT output transformer is also available as given in the parts list. In addition to having a better selection of secondary impedances the CHT output transformer is more efficient and has better frequency characteristics. Both the CHT and the regular output transformer have the 10% feedback winding.

A dual tone control circuit is used in the cathode circuit of the 6C5 tube. Since the control of frequencies is accomplished by means of degeneration, this stage provides very little gain. This stage therefore is strictly for tone control purposes. Refer to page 24 for more detailed information on this circuit and sketch showing connections to the special tone controls.

Both microphone circuits are susceptible to hum pick-up and "cross-talk" unless

properly shielded. A box may be formed from thin metal and placed as illustrated in the bottom view. Mount the bias cells, C-1, C-2, R-5, and R-6 on the inside wall of the chassis before fastening the metal box in place. Resistors R-3, R-4, R-13 and R-14 must also be shielded individually, as shown in the schematic drawing, to prevent hum and "cross-talk" from developing at this point.

## TECHNICAL DATA

**Power Output:** 60 watts undistorted or +40 db (less than 6% distortion).

**Coverage:** 2,000,000 to 3,000,000 cu. ft. indoors, 50,000 to 75,000 sq. ft. outdoors, (depending on speaker efficiency and noise level).

**Input Circuits:** Two high impedance channels for crystal, dynamic, or velocity microphones, and two high impedance phono channels for crystal, or magnetic pick-ups. All channels may be mixed.

**Output Impedances:** 4, 8, 15, 250, or 500 ohms with regular output transformer as shown or 2, 3, 4, 6, 8, 16, 125, 250, or 500 ohms with CHT output transformer.

**Frequency Response:** Within  $\pm 2$  db from 40 to 15,000 c.p.s. (tone controls in normal position).

**Tone Controls:** Two; bass control varies response from + 8 db at 70 c.p.s. to - 30 db at 40 c.p.s., and treble control varies response from + 9 db to - 27 db at 7000 c.p.s. from normal. Practically any desired frequency response may be obtained.

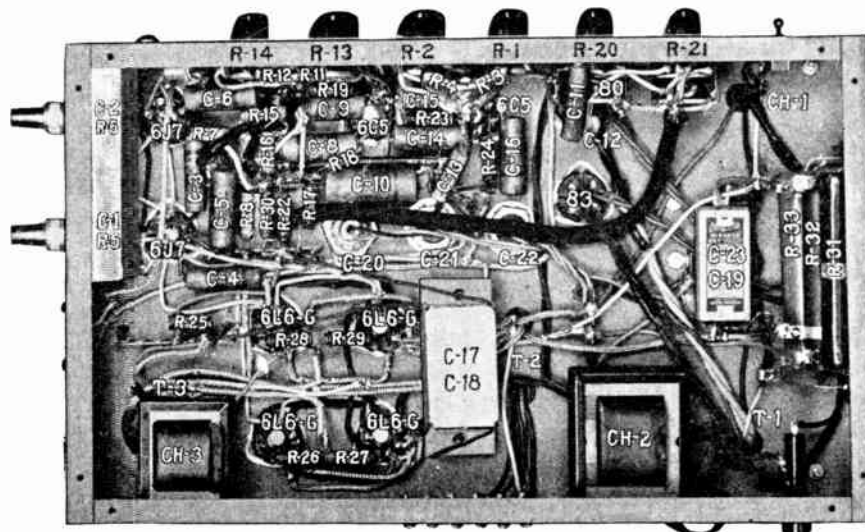
**Gain:** Microphone inputs, 112 db; phono inputs, 73 db (based on 100,000 ohms input impedance).

**Hum:** 75 db below maximum output.

**Tubes:** 3-6J7, 2-6C5, 4-6L6-G, 1-80, 1-83.

**Power Consumption:** 225 watts, 115 volts, 50-60 cycles.

**Dimensions:** 17" long, 10" deep, 9" high.



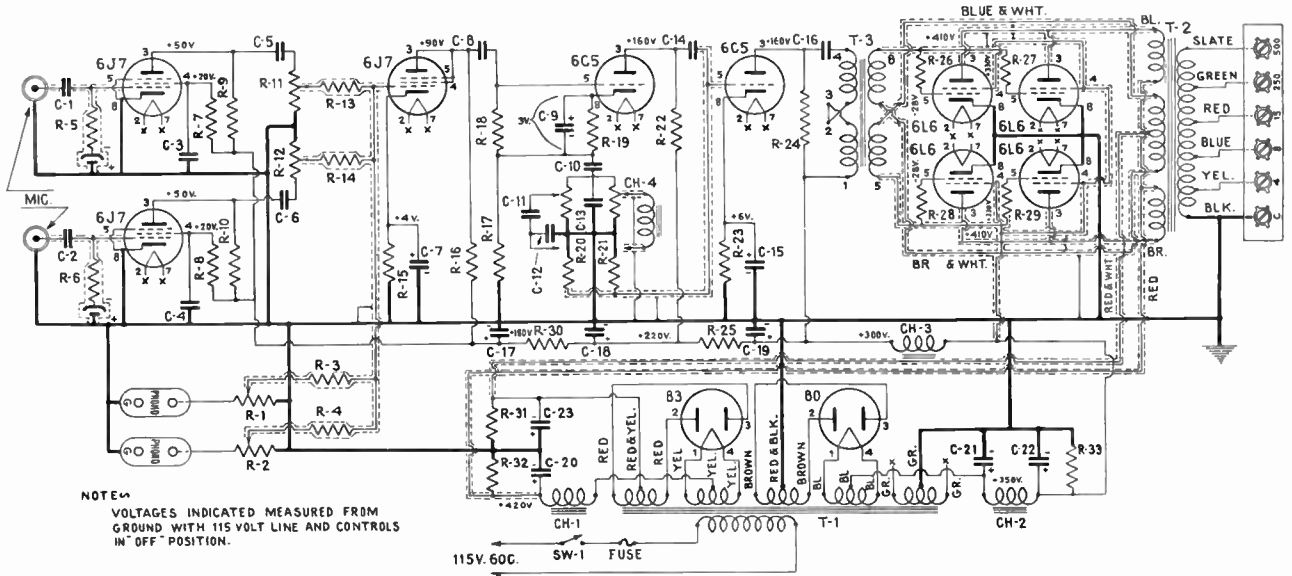
BOTTOM VIEW





# 60 WATT AMPLIFIER

# THORDARSON



NOTE—  
VOLTAGES INDICATED MEASURED FROM  
GROUND WITH 115 VOLT LINE AND CONTROLS  
IN "OFF" POSITION.

## PARTS LIST

### THORDARSON TRANSFORMERS AND CHOKES

Diagram No.	Description
T-1	T-89R28 Power Transformer
T-2	T-17S15 or T-15S93 Output Transformer
T-3	T-15A74 Input Transformer
CH-1	T-75C51 Choke
CH-2	T-68C07 Choke
CH-3	T-67C46 Choke
CH-4	T-14C70 Tone Control Choke

### CONDENSERS

Diagram No.	Mfd.	Voltage	Type
C-1	.03	400V Paper	Cornell-Dubilier #DT-4S3
C-2	.03	400V Paper	Cornell-Dubilier #DT-4S3
C-3	.04	400V Paper	Cornell-Dubilier #DT-4S4
C-4	.04	400V Paper	Cornell-Dubilier #DT-4S4
C-5	.1	400V Paper	Cornell-Dubilier #DT-4P1
C-6	.1	400V Paper	Cornell-Dubilier #DT-4P1
C-7	10	25V Elect.	Cornell-Dubilier #BR-102
C-8	.1	400V Paper	Cornell-Dubilier #DT-4P1
C-9	10	25V Elect.	Cornell-Dubilier #BR-102
C-10	.5	400V Paper	Cornell-Dubilier #DT-4P5
C-11	.04	400V Paper	Cornell-Dubilier #DT-4S4
C-12	.003	600V Paper	Cornell-Dubilier #DT-61D3
C-13	.001	600V Paper	Cornell-Dubilier #DT-61D1
C-14	.1	400V Paper	Cornell-Dubilier #DT-4P1
C-15	10	25V Elect.	Cornell-Dubilier BR-102
C-16	.1	400V Paper	Cornell-Dubilier #DT-4P1
C-17	8-8	450V Elect.	Aerovox PBS 450
C-18	8	450V Elect.	Aerovox PBS 450
C-19	8	600V Elect.	Aerovox GL600
C-20	8	450V Elect.	Aerovox GLS450
C-21	8	450V Elect.	Aerovox GLS450
C-22	8	450V Elect.	Aerovox GLS450
C-23	8	450V Elect.	Aerovox PBS 450

Diagram No.	Ohms	Watts	Type
R-1	1 MEG.	Volume Control	Centralab N-104
R-2	1 MEG.	Volume Control	Centralab N-104
R-3	500,000	1/2	Centralab #310
R-4	500,000	1/2	Centralab #310
R-5	5 MEG.	1/2	Centralab #310
R-6	5 MEG.	1/2	Centralab #310
R-7	3 MEG.	1	Centralab #314
R-8	3 MEG.	1	Centralab #314
R-9	500,000	1/2	Centralab #310
R-10	500,000	1/2	Centralab #310
R-11	1 MEG.	Volume Control	Centralab N-104
R-12	1 MEG.	Volume Control	Centralab N-104
R-13	500,000	1/2	Centralab #310
R-14	500,000	1/2	Centralab #310
R-15	1,000	1	Centralab #314
R-16	100,000	1	Centralab #314
R-17	20,000	1	Centralab #314
R-18	250,000	1/2	Centralab #310
R-19	2,000	1	Centralab #314
R-20	Dual Tone Control		Thordarson R-1068
R-21	Dual Tone Control		Thordarson R-1068
R-22	20,000	1	Centralab #314
R-23	1,000	1	Centralab #314
R-24	50,000	1	Centralab #314
R-25	20,000	1	Centralab #314
R-26	200	1	Centralab #314
R-27	200	1	Centralab #314
R-28	200	1	Centralab #314
R-29	200	1	Centralab #314
R-30	20,000	1	Centralab #314
R-31	125	50	Ohmite, Wirewound, +10%, -0%
R-32	40,000	50	Ohmite, Wirewound
R-33	10,000	25	Ohmite, Wirewound

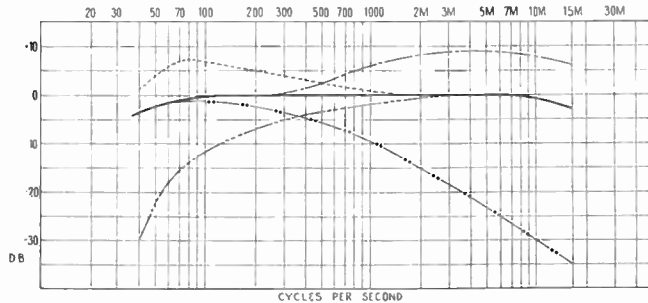
Diagram No.	Type
3	Type 6J7
2	Type 6C5
4	Type 6L6-G
1	Type 80
1	Type 83

### TUBES

### MISCELLANEOUS PARTS

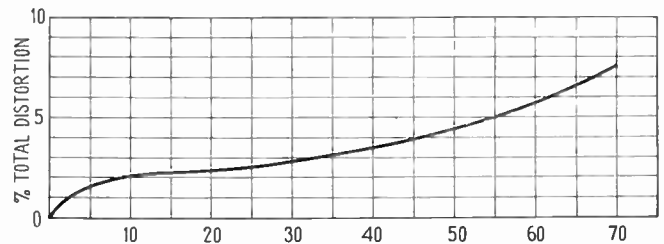
1	10x17x3" Chassis and cover — Bud #1127
1	10x17" Chassis bottom plate — Bud #689
9	Octal sockets — Amphenol S8
2	4-Contact sockets — Amphenol S4
2	Mic. input connectors — Amphenol PC1M
1	Mic. input connectors — Amphenol MC1F
1	6-Screw output terminal board
1	Fuse mounting — Littlefuse #1075
1	Fuse, 5 amp.
1	AC line cord and plug — Belden #1725
2	2-Screw terminal boards
1	Pilot light socket and jewel — Yaxley #310R
1	Pilot light, 6.3 volts — Mazda #40
1	SPST toggle switch — Arrow H&H #20992
3	Metal tube grid caps
3	Metal tube grid cap shields
2	"Mic" control plates
2	"Phono" control plates
2	"Tone" control plates
6	Control knobs
2	Bias cells, 1.5 volts — Mallory #F7
2	Bias cell holders — Mallory #GB-1A

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.



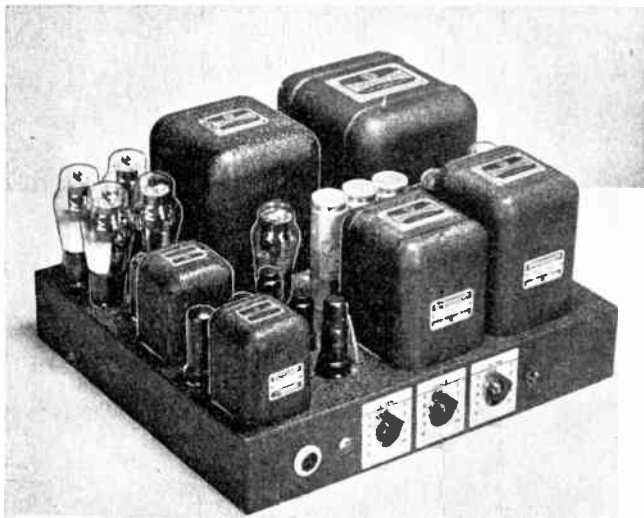
FREQUENCY RESPONSE CURVE

— Tone controls normal  
 - - - Bass increase — Treble normal  
 . . . Bass normal — Treble increase  
 - · - · - Bass normal — Treble decrease  
 - - - - - Bass decrease — Treble normal



WATTS OUTPUT  
DISTORTION CURVE

For complete mechanical drawing of chassis see page 30. Full size template of chassis available from THORDARSON 15c net, postpaid.



TOP VIEW

THE power output of this amplifier is adequate for the largest installations either indoors or out. The input circuit is arranged to operate from a pre-amplifier such as those described on pages 20 and 22. These pre-amplifiers have low impedance output transformers, making it possible to operate them several hundred feet from the 120 watt unit. A 500 ohm resistor (R-1) is connected across the input circuit of the 120 watt amplifier to match the 500 ohm output impedance of the pre-amplifier. This method is satisfactory since the 6J7 input tube provides approximately the same voltage gain as would be obtained from a line to grid transformer. Should it be desired to operate from a single high impedance pick-up without a pre-amplifier, resistor R-1 can be disconnected from the circuit. Under these conditions the amplifier gain is 90 db which is sufficient for full power output.

The second stage is the tone control and contributes very little to the overall gain of the amplifier. An article describing this tone control circuit may be found on page 24. If the tone control is not required, the 6C5 stage and associate parts can be eliminated without seriously affecting the gain of the amplifier.

A dotted line "A. . . . A" is shown on the circuit diagram just before the 6F6 driver tube grids. If the unit is to be used only as a booster amplifier, eliminate all those parts ahead of the dotted line. For connection to a 500 ohm line use a line to P-P grid transformer such as T-15A67 instead of T-15A74 as shown. The overall gain of the booster with this transformer is about 43 db. Therefore, full output will be obtained when a 0 db signal is fed to the unit (1.73 volts across 500 ohms.)

Four type 6L6-G tubes operate in a push-pull parallel class AB2 circuit with inverse feedback. With this set-up it is possible to obtain maximum undistorted power output from beam power tubes. The driver stage consists of two 6F6 tubes connected as triodes. These provide excellent regulation which is essential when the output tube grids are driven positive.

It is necessary to shield the entire wiring of the final stage. This is easily done by using single shielded wire similar to that used for antenna lead in. Take care that the shielding does not come in contact with the tube socket contacts and other terminals. Ground all shielding carefully. If the amplifier oscillates interchange the leads connecting to terminals 7 and 6 on driver transformer T-4. This reverses the phase relationship of the feedback voltage with respect to the input voltage.

Two power supplies, entirely independent of one another, make it possible to obtain excellent regulation of the bias and screen voltages. The plate

supply of the output stage uses two type 83 rectifier tubes. An 80 is used to supply fixed bias and screen voltage to the output stage as well as plate voltage for the balance of the amplifier. A separate filter system for each supply isolates the output stage and insures stability. Resistors in series with the 83 tube plates help distribute the current evenly. These resistors are necessary when mercury vapor rectifier tubes are wired parallel.

Before operating the amplifier insert all tubes except the 83's and adjust R-26 until 24.5 volts are measured at the 6L6 grids. After the 83's are placed in the sockets turn the amplifier on and measure the bias voltage again. If any change is noted correct by adjusting R-26.

## TECHNICAL DATA

**Power Output:** 120 watts or + 43 db (less than 8% distortion).

**Coverage:** Up to 5,000,000 cu. ft. indoors; 100,000 to 150,000 sq. ft. outdoors (depending on speaker efficiency and noise level).

**Input Circuit:** Single channel; may be adapted to low or high impedance.

**Output Impedances:** 84, 100, 125, 166, 250 or 500 ohms; selected by plug and jacks on terminal board of CHT output transformer.

**Frequency Response:** Within ±1 db from 40 to 15,000 c.p.s. (tone controls in normal position).

**Tone Controls:** Two; bass control varies response from + 7 db at 60 c.p.s. to -20 db at 30 c.p.s., and treble control varies response from +7.5 db to -20 db at 10,000 c.p.s. from normal. Practically any desired frequency response may be obtained.

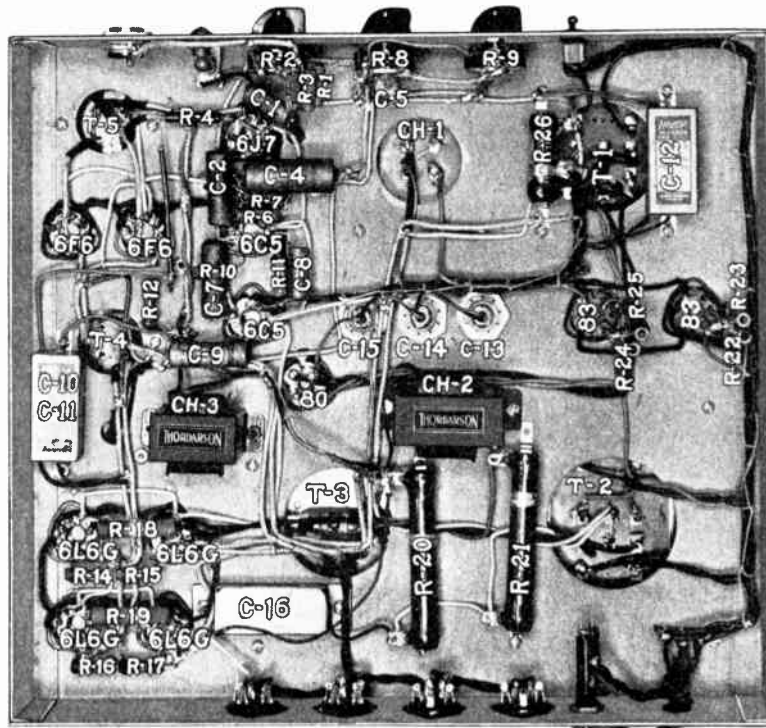
**Gain:** 90 db with high impedance input resistor (based on 100,000 ohms input impedance); 72.5 db with 500 ohm input resistor. (If line to grid transformer is used, gain is approximately 90 db.)

**Hum:** 73 db below maximum output.

**Tubes:** 1-6J7, 2-6C5, 2-6F6, 4-6L6-G, 1-80, 2-83.

**Power Consumption:** 570 watts with no signal; 720 watts at maximum output.

**Dimensions:** 17" long, 15" deep, 9" high.



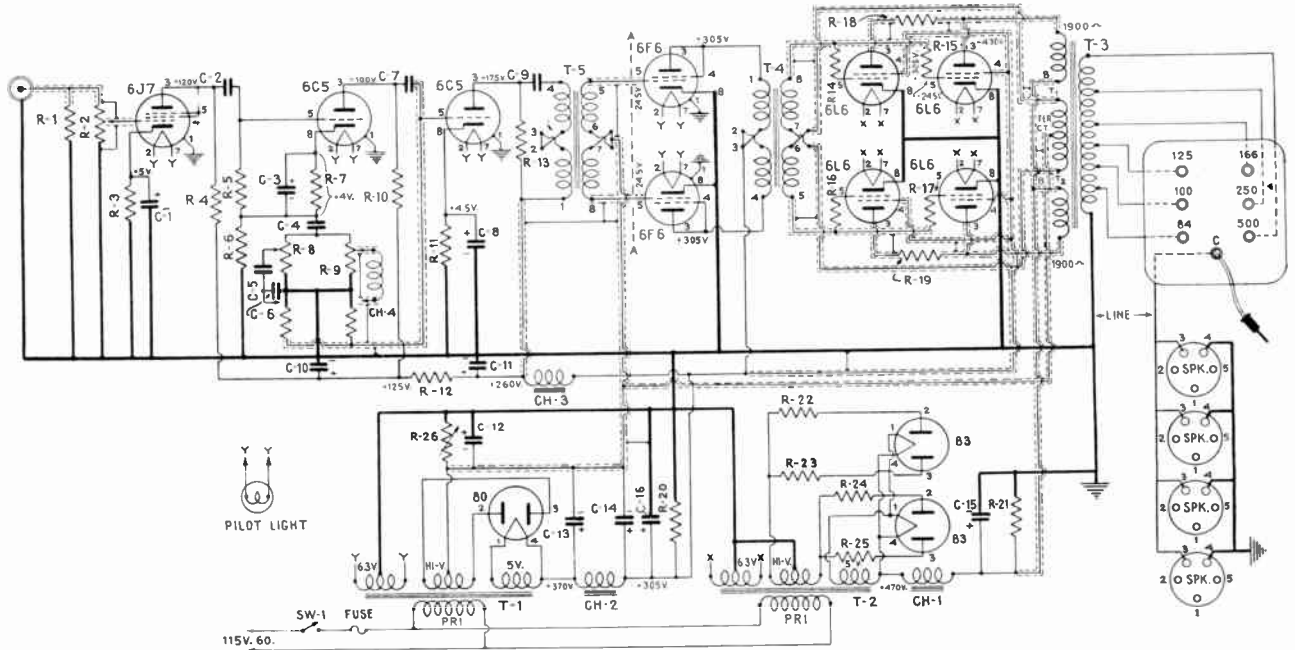
BOTTOM VIEW





# 120 WATT AMPLIFIER

## THORDARSON



### PARTS LIST

#### THORDARSON TRANSFORMERS AND CHOKES

Diagram No.	Description
T-1	T-15R06 Power Transformer
T-2	T-15R01 Power Transformer
T-3	T-15S94 Output Transformer
T-4	T-15I86 Driver Transformer
T-5	T-15A74 Input Transformer
CH-1	T-15C56 Choke*
CH-2	T-68C07 Choke
CH-3	T-67C46 Choke
CH-4	T-14C70 Tone Control Choke

\*Winding in Series.

#### CONDENSERS

Diagram No.	Mfd.	Voltage	Type
C-1	10	25 V. Elect.	Cor.-Dub. #BR-102
C-2	.1	400 V. Paper	Cor.-Dub. #DT-4P1
C-3	10	25 V. Elect.	Cor.-Dub. BR-102
C-4	.5	400 V. Paper	Cor.-Dub. #DT-4P5
C-5	.04	400 V. Paper	Cor.-Dub. #DT-4S4
C-6	.1	400 V. Paper	Cor.-Dub. #DT-4P1
C-7	.1	400 V. Paper	Cor.-Dub. #DT-4P1
C-8	10	25 V. Elect.	Cor.-Dub. #BR-102
C-9	.1	400 V. Paper	Cor.-Dub. #DT-4P1
C-10, C-11	8-8	450 V. Elect.	Cor.-Dub. #JR-588
C-12	16	200 V. Elect.	Cor.-Dub. #JR-216
C-13	8	600 V. Elect.	Aerovox #GL600
C-14	8	600 V. Elect.	Aerovox #GL600
C-15	8	600 V. Elect.	Aerovox #GL600
C-16	8	450 V. Elect.	Cor.-Dub. #JR-508

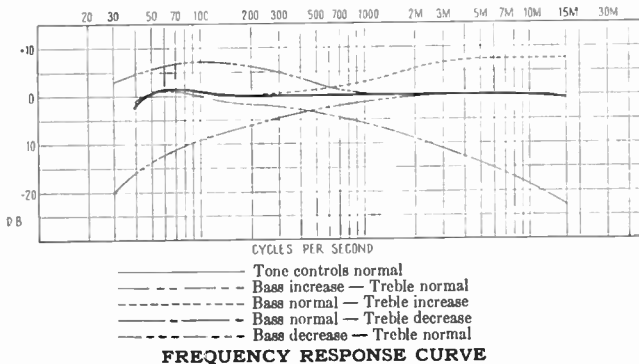
Diagram No.	Ohms	Watts	Type
R-1	500	1	Centralab #314
R-2	1 MEG.	Volume Control	Centralab N-104
R-3	5,000	1	Centralab #314
R-4	50,000	1	Centralab #314
R-5	250,000	1/2	Centralab #310
R-6	20,000	1	Centralab #314
R-7	1,000	1	Centralab 314
R-8		Dual Tone Control	Thoradson R-1068
R-9		Dual Tone Control	Thoradson R-1068
R-10	20,000	1	Centralab #314
R-11	1,000	1	Centralab #314
R-12	50,000	1	Centralab #314
R-13	20,000	1	Centralab #314
R-14	200	1	Centralab #314
R-15	200	1	Centralab #314
R-16	200	1	Centralab #314
R-17	200	1	Centralab #314
R-18	25	10	Ohmite, Wirewound
R-19	25	10	Ohmite, Wirewound
R-20	10,000	50	Ohmite, Wirewound
R-21	10,000	50	Ohmite, Wirewound
R-22	50	10	Ohmite, Wirewound
R-23	50	10	Ohmite, Wirewound
R-24	50	10	Ohmite, Wirewound
R-25	50	10	Ohmite, Wirewound
R-26	300	25	Ohmite, Semi-Var.

TUBES: 1-6J7, 2-6C5, 2-6F6, 4-6L6G, 1-80, 2-83

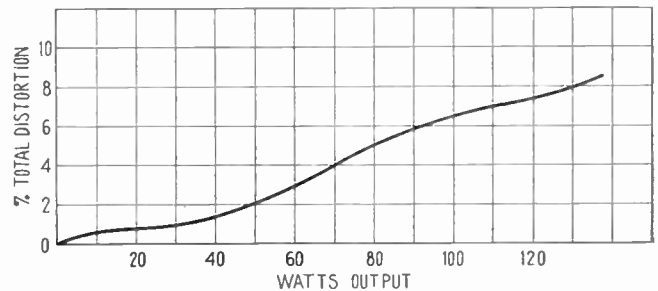
#### MISCELLANEOUS PARTS

1	17x15x3" Chassis with bottom plate
1	"Gain" control plate
2	"Tone" control plates
3	Volume control knobs
1	AC line cord and plug — Belden #1725
1	Fuse mounting — Littlefuse #1075
1	Fuse, 10 ampere
9	Octal Sockets — Amphenol S8
3	4-Contact sockets — Amphenol S4
4	5-Contact sockets — Amphenol S5
4	5-Prong speaker plugs — Amphenol PM5
1	Input connector — Amphenol PC3F
1	Input connector — Amphenol MC3M
1	Pilot light socket and jewel — Yaxley #310R
1	Pilot light bulb, 6.3 volts — Mazda #40
1	Metal tube grid cap
1	Metal tube grid cap shield
1	SPST toggle switch — Arrow H&I #20992

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.



FREQUENCY RESPONSE CURVE



DISTORTION CURVE

For complete mechanical drawing of chassis see page 30. Full size template of chassis available from THORDARSON, 15c net, postpaid.





transformer has filament voltage available for either type tubes.) A Tru-Fidelity output transformer, T-90S13, makes voice coil or line impedances of 1.25, 3.75, 5, 7.5, 10, 15, 50, 125, 200, 250, 333 or 500 ohms available.

A form of degeneration is used in a new way to provide the unusually flexible tone compensating circuit shown. This circuit is so important and interesting that it is described in detail on page 24.

On the front panel are the two gain controls, near the input jacks; the expander control; a pilot light; the meter, with a switch at the far end of the chassis to measure the plate current of either or both output tubes; the on-off switch; the two tone controls and the plate current switch just mentioned.

In the photograph is shown the special shielding around the two small resistors from the gain controls. The circuit used results in a minimum of cross-talk, shielding them as shown removes the last possibility of it. Cover the resistors with cambric sleeving, then enclose them in a braid shield.

**T**HIS 10-watt Tru-Fidelity audio amplifier, with volume expansion and dual tone control, will meet the requirements of the most discriminating listener. It is an improved version of the Thordarson 10-watt Tru-Fidelity unit, specially adapted to meet phonograph and radio tuner requirements. The amplifier features an unusually flexible tone control and volume expansion, making it possible to reproduce recordings with a high degree of naturalness. The volume expander is especially useful in restoring the range of symphonic renditions. No pre-amplifier stages are included as they are not needed and would materially increase the cost of construction.

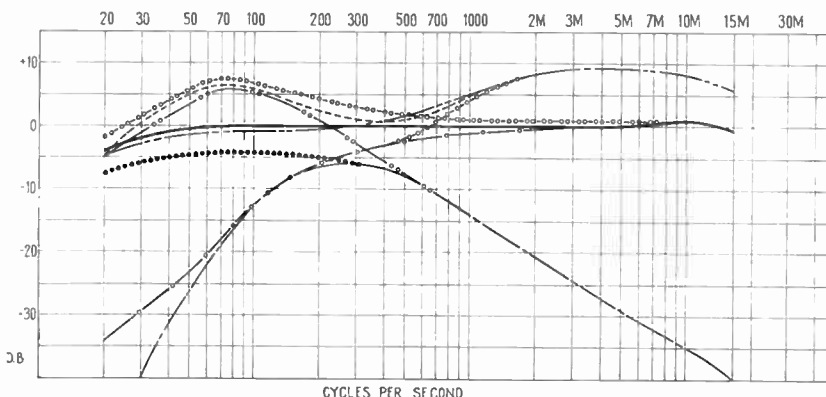
With the bass and treble tone controls in "normal" position, the frequency response is flat. Through the use of the dual tone controls the bass may be boosted 7 db between 50 and 200 cycles or dropped 30 db from normal at 30 cycles. The treble may be boosted 9 db at 7000 or dropped 30 db at 10,000 cycles. These controls are independent, so any acoustical condition may be satisfied.

At the rated output of 10 watts, the distortion is but 3.7% and at 16 watts only 4.8%, which is still within high fidelity specifications.

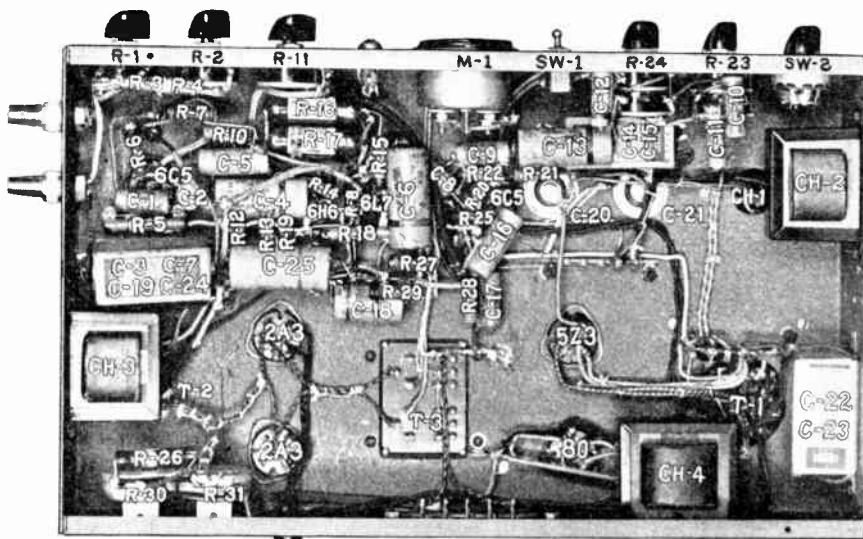
The amplifier consists of five stages giving a gain of 70 db from either phono input (measured across a 100,000 ohm input). This gain is with the volume expansion off. When the expander is at maximum the volume level may be increased 11 db making a total overall gain of 81 db available. This is more than sufficient for any phono or tuner application.

Two phono inputs are mixed and fed into a 6C5 stage with a gain of 10. The output of this stage is fed into a 6L7, the gain of which varies according to the expansion voltage fed into it by the action of the 6C5-6H6 volume expansion stage. The energy for the expander stage is taken from the grid of the fourth stage 6C5.

The output of the 6L7 is fed into a 6C5 tone control tube which has a gain of 1.4 with the controls in "normal" position. This in turn is fed into another 6C5 and then, through a T-90A04 Tru-Fidelity transformer, to two 2A3's or 6A3's in push pull. (The power



FREQUENCY-RESPONSE CURVE



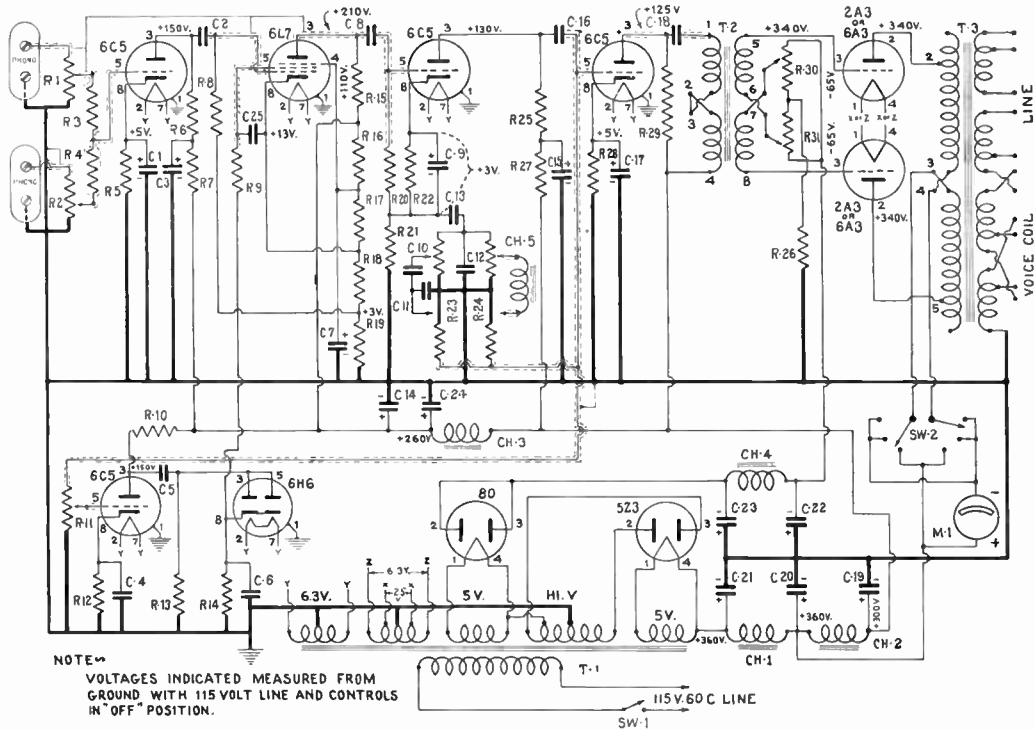
BOTTOM VIEW

For complete mechanical drawing of chassis see page 28, also, full size template available from Thordarson 15c net postpaid.



# 2A3 PHONO AMPLIFIER

# THORDARSON



## TECHNICAL DATA

**Power Output:** 10 watts or + 32.2 db with 3.7% distortion; 16 watts or + 34.1 db with 4.8% distortion.

**Input Circuits:** Two high impedance phono channels for crystal or magnetic pick-up or radio tuner. Individual controls for mixing or fading.

**Output Impedances:** 1.25, 3.75, 5, 7.5, 10, 15, 50, 125, 200, 250, 333 or 500 ohms — selected by connecting output terminals to desired impedance of transformer.

**Frequency Response:** Within ± 1 db from 30 to 15,000 c.p.s. (tone controls in normal position).

**Tone Controls:** Two: bass control varies response from + 7 db at 70 c.p.s. to -30 db at 30 c.p.s.; treble control varies response from + 9 db to -30 db at 7,000 c.p.s.

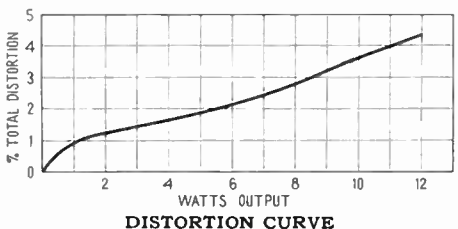
**Gain:** 70 db with volume expander "OFF"; 81 db with volume expander "ON".

**Hum:** 64 db below maximum output.

**Tubes:** 4-6C5, 1-6L7, 1-6H6, 2-2A3 or 6A3, 1-80, 1-5Z3.

**Power Consumption:** 235 watts, 115 volts, 50-60 cycles.

**Dimensions:** 17" long, 10" deep, 9" high.



## PARTS LIST

### THORDARSON TRANSFORMERS AND CHOKES

Diagram No.	Description
T-1	T-15R05 Power Transformer
T-2	T-90A04 Audio Transformer
T-3	T-90S13 Output Transformer
CH-1	T-15C5* First Choke
CH-2	T-74C30 Second Choke
CH-3	T-67C46 Third Choke
CH-4	T-18C92 Bias Choke
CH-5	T-14C70 Tone Control Choke

\*Winding in parallel.

Diagram No.	Ohms	Watts	Type
R-1	1 MEG.	Volume Control	Centralab N-104
R-2	1 MEG.	Volume Control	Centralab N-104
R-3	500,000	1/2	Centralab #310
R-4	500,000	1/2	Centralab #310
R-5	2,000	1	Centralab #314
R-6	20,000	1	Centralab #314
R-7	20,000	1	Centralab #314
R-8	1 MEG.	1/2	Centralab #310
R-9	500,000	1/2	Centralab #310
R-10	100,000	1	Centralab #314
R-11	1 MEG.	Volume Control	Centralab N-104
R-12	10,000	1/2	Centralab #310
R-13	100,000	1/2	Centralab #310
R-14	250,000	1/2	Centralab #310
R-15	100,000	1	Centralab #314
R-16	10,000	10	Ohmite Brown Devil
R-17	10,000	10	Ohmite Brown Devil
R-18	800	1	Centralab #314
R-19	200	1	Centralab #314
R-20	250,000	1/2	Centralab #310
R-21	20,000	1	Centralab #314
R-22	1,000	1	Centralab #314
R-23	Dual Tone Control		Thordarson R1068
R-24	Dual Tone Control		Thordarson R1068
R-25	20,000	1	Centralab #314
R-26	3,500	10	Ohmite Brown Devil
R-27	50,000	1	Centralab #314
R-28	1,000	1	Centralab #314
R-29	50,000	1	Centralab #314
R-30	3,000	Potentiometer	Yaxley #C3MP
R-31	3,000	Potentiometer	Yaxley #C3MP

### TUBES

4	Type 6C5
1	Type 6L7
1	Type 6H6
2	Type 2A3 or 6A3
1	Type 80
1	Type 5Z3

### CONDENSERS

Diagram No.	Mfd.	Voltage	Type
C-1	10	25 V Elect.	Cor.-Dub. #BR-102
C-2	.1	400 V Paper	Aerovox #484
C-3, C-7	8-8	450 WV Elect.	Aerovox PBS 450
C-4	.5	400 V Paper	Aerovox #484
C-5	.1	400 V Paper	Aerovox #484
C-6	.5	400 V Paper	Aerovox #484
C-8	.1	400 V Paper	Aerovox #484
C-9	10	25 V Elect.	Cor.-Dub. #BR-102
C-10	.03	400 V Paper	Aerovox #484
C-11	.03	400 V Paper	Aerovox #484
C-12	.002	400 V Paper	Aerovox #484
C-13	.5	400 V Paper	Aerovox #484
C-14, C-15	8-8	450 WV Elect.	Aerovox PBS 450
C-16	.1	400 V Paper	Aerovox #484
C-17	10	25 V Elect.	Cor.-Dub. #BR-102
C-18	.25	400 V Paper	Aerovox #484
C-19, C-24	8-8	450 WV Elect.	Aerovox PBS 450
C-20	8	450 V Elect.	Aerovox G 450
C-21	8	450 V Elect.	Aerovox G 450
C-22, C-23	8-8	450 WV Elect.	Aerovox PBS 450
C-25	.5	400 V Paper	Aerovox #484

### MISCELLANEOUS PARTS

1	10x17x3" Chas. and screen cover—Par-Metal #AF1017
1	10x17" Chas. bottom plate—Par-Metal #BP4526
1	0-150 MA DC meter — Triplett #223
1	SPST toggle switch — Arrow H&I #20992
1	Two gang three position switch — Yaxley #3223-J
6	Octal sockets — Amphenol S8
4	4-Contact sockets — Amphenol S4
1	Metal tube grid cap
1	Metal tube grid cap shield
2	"Volume" control plates
2	"Tone" control plates
1	"Expansion" control plate
1	Three position meter switch plate
6	Control knobs
2	Mic. connectors — Amphenol PC1M
2	Mic. connectors — Amphenol MC1F
1	AC line cord and plug — Belden #1725
1	Pilot light socket and jewel — Yaxley 310R
1	Pilot light bulb, 6.3 volts — Mazda #40
2	Brackets—Yaxley RB #248

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.





TOP VIEW

The combination 6 volt D.C., 115 volt A.C. amplifier has become very popular, especially in mobile public address work. Its flexibility permits operation almost anywhere that a 6 volt storage battery can be placed, such as rural gatherings, picnics, beach parties, motor boats, barn dances, etc. It is the ideal unit for portable and rental work since the undistorted power output of 20 watts is sufficient for most installations. Results are alike on both battery and 115 volt A.C. supplies with no sacrifice in the quality of reproduction.

The amplifier is similar to the 25 watt unit described on page 8; two 6L6-G's operate in a class AB<sub>1</sub> circuit with approximately 300 volts applied to the plates and screens. Inverse feedback reduces the distortion which is lower than ordinarily encountered in 6 volt amplifiers of this type. Two input channels accommodate a low level high impedance microphone and high impedance phono pick-up. The gain of the amplifier is more than adequate for full output with either "Mic" or "Phono".

Operation from 6 volts D.C. is made possible by incorporating a heavy duty vibrator to convert the D.C. into alternating current. Dual operation is accomplished by having both a 6 volt vibrator primary and a 115 volt primary on one and the same transformer. Two 6W5-G tubes rectify the high voltage for both battery and A.C. operation. A 6.3 volt secondary on the transformer supplies the heater current for A.C. operation only. The heaters are switched to the battery automatically for 6 volt operation by inserting the proper power supply plug. Two plugs are used, one being wired for 115 volt and the other for 6 volt operation. These plugs are wired as indicated on the schematic diagram.

Three switches are required. Two are used for 6 volt operation, one being a heavy duty type which controls the total 6 volt supply and the other is connected in the vibrator circuit and provides standby operation. The third is the "On" and "Off" switch for operation from 115 volts A.C.

When operating from a 6 volt

battery, turn the main heavy duty switch "On" first and wait a minute or so for the tube heaters to warm up before turning on the vibrator switch. The vibrator switch controls the "B" supply and when turned "On" the battery drain increases from 4.5 amperes (which is the heater current) to about 19 amperes. This switch is a desirable feature since the battery can be conserved without waiting for the heaters to warm up when operation is desired.

All converters, whether rotary or the vibrator type, develop a certain amount of high frequency hash. This disturbance is easily picked up in the amplifier circuit unless proper isolation and shielding is employed. Therefore, it is advisable to construct the amplifier as closely as possible to the illustrations and diagram. All shielding should be incorporated where shown. A small metal box is formed and fastened in place by the Amphenol connector PC1M. One side of the box is left open to tighten the connector and insert C1, R1, and the bias cell and holder. Pass a shielded lead through the small hole for the 6J7 grid connection. Wire the lead and parts and test the amplifier before soldering the box side in place.

**TECHNICAL DATA**

**Power Output:** 20 watts undistorted or 35.5 db (less than 5% distortion).

**Coverage:** 500,000 to 1,000,000 cu. ft. indoors; 15,000 to 25,000 sq. ft. outdoors (depending on speaker efficiency and noise level).

**Input Circuits:** One 5 megohm channel for high impedance crystal, dynamic or velocity microphone, and one channel for high impedance crystal or magnetic pick-up. Channels may be mixed and faded.

**Output Impedances:** 4, 8, 15, 250, or 500 ohms with regular transformer, or 2, 3, 4, 6, 8, 16, 125, 250, or 500 ohms with CHT output transformer.

**Frequency Response:** Within  $\pm 2$  db from 50 to 8,000 c.p.s. with bass boost of 5 db at 70 c.p.s.

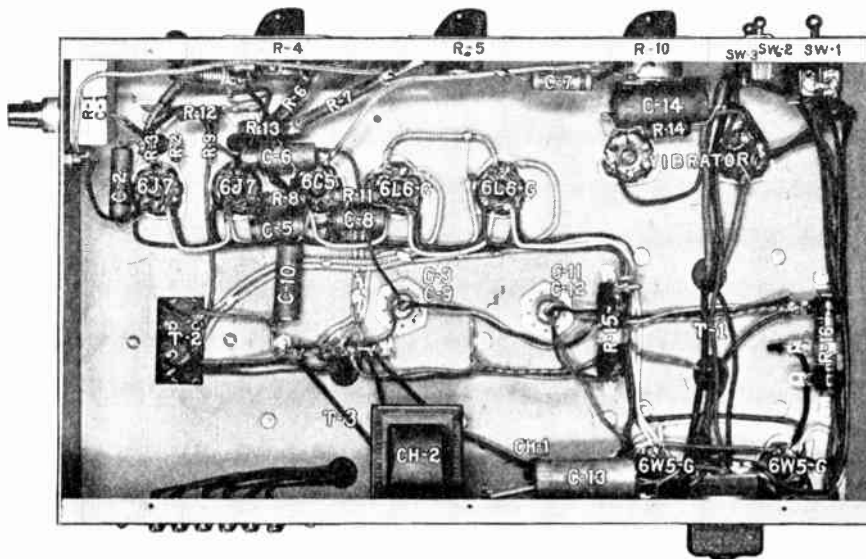
**Gain:** Microphone input, 114 db; phono input, 75 db (based on 100,000 ohms input impedance).

**Hum:** 70 db below maximum output.

**Tubes:** 2-6J7, 1-6C5, 2-6L6-G, 2-6W5-G.

**Power Consumption:** 100 watts at 115 volts, 50-60 cycles, or 19 amps. at 6V. D.C. (4.5 amperes on standby position).

**Dimensions:** 17" long, 10" deep, 9" high.

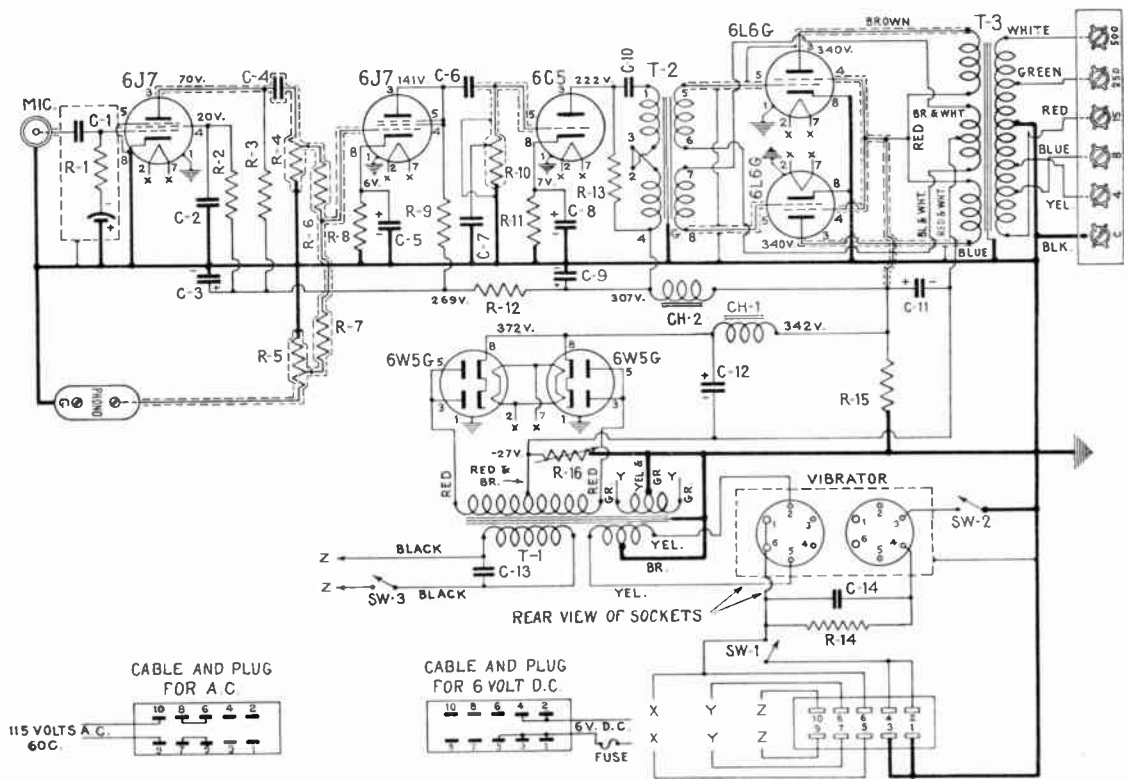


BOTTOM VIEW





# 6 Volt DC - 115 Volt AC AMPLIFIER



## PARTS LIST

### THORADARSON TRANSFORMERS AND CHOKES

Diagram No.	Part	Description
T-1	T-14R40	Power Transformer
T-2	T-15A74	Input Transformer
T-3	T-17S12 or T-15S91	Output Transformer
CH-1	T-17C00-B	First Choke
CH-2	T-37C36	Second Choke

### RESISTORS

Diagram No.	Ohms	Watts	Type
R-1	5 MEG.	1/2	Centralab #310
R-2	3 MEG.	1/2	Centralab #310
R-3	500,000	1/2	Centralab #310
R-4	1 MEG.	Volume Control	Centralab #N-104
R-5	1 MEG.	Volume Control	Centralab #N-104
R-6	500,000	1/2	Centralab #310
R-7	500,000	1/2	Centralab #310
R-8	5,000	1	Centralab #314
R-9	100,000	1/2	Centralab #310
R-10	500,000	Tone Control	Centralab #N-103
R-11	1500	1	Centralab #314
R-12	20,000	1	Centralab #314
R-13	20,000	1	Centralab #314
R-14	200	1	Centralab #314
R-15	25,000	25	Ohmite Wire Wound
R-16	300	25	Ohmite Semi-Variable

### CONDENSERS

Diagram No.	Mfd.	Voltage	Type
C-1	.03	400V Paper	Aerovox #484
C-2	.04	400V Paper	Aerovox #484
C-3			
C-4	.1	400V Paper	Aerovox #484
C-5	10	25V Elect.	Cornell-Dubilier BR-102
C-6	.1	400V Paper	Aerovox #484
C-7	.01	400V Paper	Aerovox #484
C-8	10	25V Elect.	Cornell-Dubilier BR-102
C-9	.1	400V Paper	Aerovox #484
C-10			
C-11			
C-12	8-8	450V Dual Elect.	Aerovox #2GL450
C-13	.5	400V Paper	Aerovox #484
C-14	.5	200V Paper	Aerovox #284

### MISCELLANEOUS PARTS

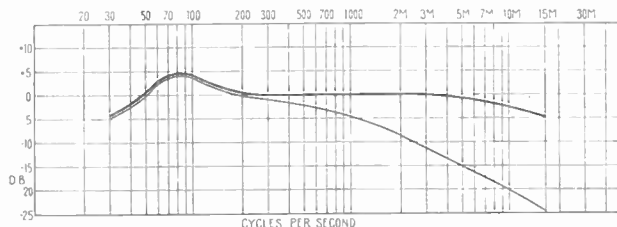
1	10x17x3" Chassis and cover — ICA #3875
1	10x17" Chassis bottom plate — ICA #4067
7	Octal sockets — Amphenol S8
2	6-contact socket — Amphenol S6
1	Mic. input connector — Amphenol PC1M
1	Mic. input connector — Amphenol MC1F
1	Six screw output terminal board
1	Two screw phono input terminal board

### MISCELLANEOUS PARTS (Continued)

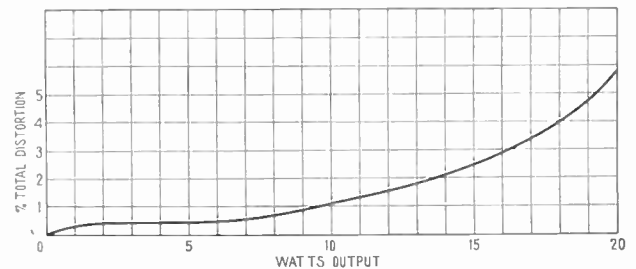
1	AC line cord and plug
1	Jewel and Bracket — Yaxley #310R
1	6.3 volt pilot light — Mazda #40
2	SPST Toggle switches — Arrow 11&H #20992
1	DPST Toggle switch — 6 v 25 amp. — C-H #8244
2	Metal tube grid caps
2	Metal tube grid shields
3	Control knobs
3	Control plates
2	10-contact power plugs — H. B. Jones #S-310-FHT
1	10-contact power plug — H. B. Jones #P-310-CB
1	Vibrator — Electronics #490
1	Bias cell — 1.5 volts — Mallory #F7
1	Bias cell holder — Mallory #GB-1A
1	pc. tinned copper — 6x5x.010"
1	30 amp fuse
1	Fuse holder for 30 amp fuse
2	Battery clips 50 amp capacity
Battery Cable: #10 stranded wire, rubber covered.	
Tube Complement: 2-6J7, 1-6C5, 2-6L6-G, 2-6W5-G	

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.

FOR MECHANICAL DRAWING OF CHASSIS SEE PAGE 27



FREQUENCY-RESPONSE CURVE



DISTORTION CURVE



TOP VIEW

**A**LTHOUGH pre-amplifiers are not as popular as they were some years back, there are cases where their use is recommended or necessary. The sound installation which requires that the microphone be located several hundred feet or more from the main power amplifier, can make good use of a pre-amplifier of the type shown on these pages. The gain is about 60 db, which will raise the level of the average low level microphone to approximately 0 db. Its output impedances are 500, 333, 250, 200, 125 or 50 ohms. The 500 or 200 ohm impedances are most commonly used. When a line operates under these conditions, any hum or disturbance which is picked up is so far below the signal level that it is not objectionable in the output of the loud speakers. High impedance microphones, such as the crystal, velocity and dynamic, should not be used at distances greater than 50 to 100 feet without such a pre-amplifier. When this distance is exceeded, losses occur either in signal level or frequency response.

This single channel amplifier is entirely self-contained, and operates from 115 volts 60 cycle current. It can be used in conjunction with the 120 watt amplifier described on page 14 or any of the amplifiers described in the Amplifier Guide, if the proper input impedance is built into the amplifier. Best results are obtained when a high quality hum balancing transformer having a 200 or 500 ohm primary is placed in the phono circuit of the amplifier. Thor-darson T-90A00 or T-15A66 is suitable for this purpose. Best results are obtained when the gain control on the pre-amplifier is almost all the way on and that on the main amplifier cut down to control the output of the system.

The assembly and wiring of the pre-amplifier is quite simple; however, care should be taken in placing and wiring those parts enclosed in the dotted line on the schematic

diagram. Condenser C-1 and resistors R-1 and R-2 may require shielding if hum is to be cut to a minimum. It is recommended that the chassis be provided with a base to fully enclose the bottom of the pre-amplifier. Where no base is used, it may be necessary to shield all those parts included in the above mentioned dotted line.

The output transformer T-2 is shown connected to a five-contact socket. The connections indicated provide coupling to either a 200 or 500 ohm line. The additional impedances are obtainable by properly connecting the secondary of the transformer. Full instructions are supplied with each transformer for obtaining these other impedances.

**TECHNICAL DATA**

**Output Level:** 0 db or .006 watts (less than 1% distortion).

**Gain:** 59.9 db (based on 100,000 ohm input impedance).

**Frequency Response:** Within  $\pm 1$  db from 30 to 15,000 c.p.s.

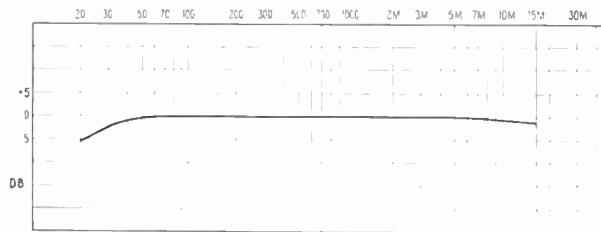
**Input:** 5 megohms for one high impedance crystal, dynamic, or velocity microphone.

**Output:** Low impedance line — 500, 333, 250, 200, 125, or 50 ohms.

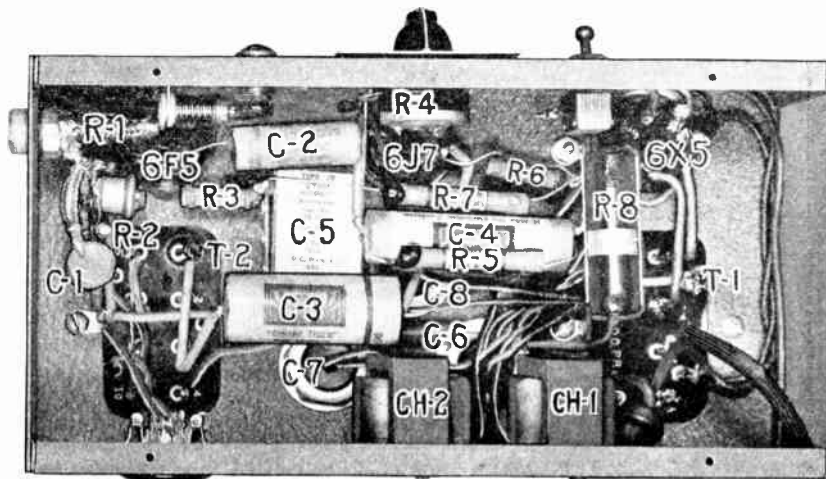
**Tubes:** 1-6F5, 1-6J7, 1-6X5.

**Power Consumption:** 17.5 watts, 115 volts, 50-60 cycles.

**Dimensions:** 9 1/2" long, 5" deep, 6" high — with cover 8 1/2" high.



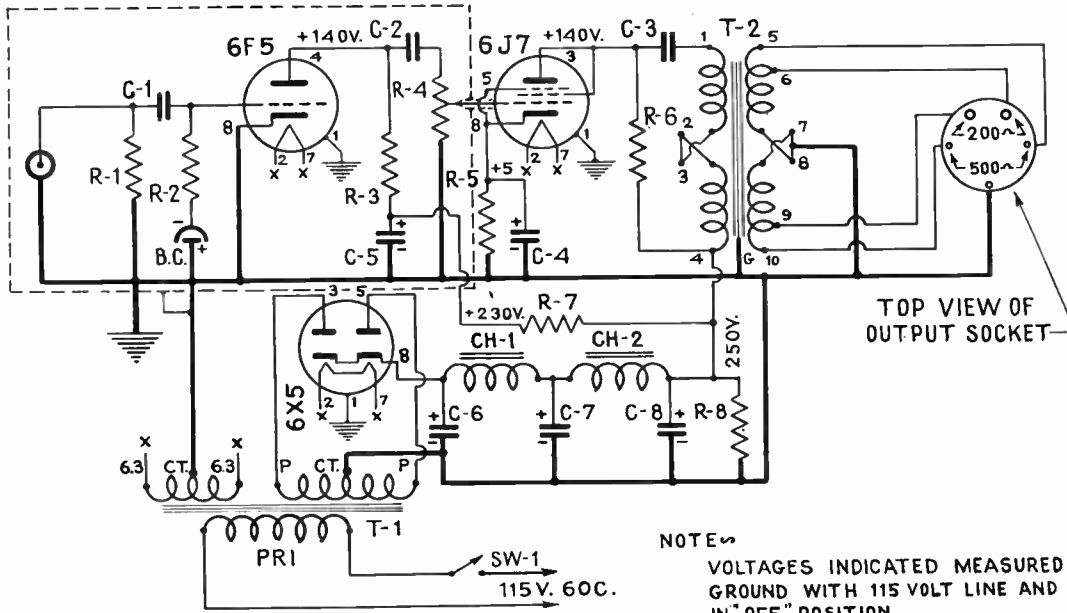
FREQUENCY-RESPONSE CURVE



BOTTOM VIEW



# SINGLE CHANNEL PRE-AMPLIFIER



## PARTS LIST

### THORDARSON TRANSFORMERS AND CHOKES

Diagram No.	Description
T-1	T-15R04 Plate and Filament Transformer
T-2	T-15A71 Tube to Line Transformer
CH-1	T-13C26 Choke
CH-2	T-13C26 Choke

Diagram No.	Ohms	Watts	Type
R-1	5 MEG.	1/2	IRC BT-1/2
R-2	5 MEG.	1/2	IRC BT-1/2
R-3	100,000	1	IRC BT-1
R-4	250,000	Volume Control	Yaxley type "M"
R-5	2,000	1	IRC BT-1
R-6	50,000	1	IRC BT-1
R-7	20,000	1	IRC BT-1
R-8	50,000	10	Ohmite Brown Devil

Diagram No.	Mfd.	Voltage	Type
C-1	.1	400 V Paper	Cornell-Dubilier #DT-4P1
C-2	.1	400 V Paper	Cornell-Dubilier #DT-4P1
C-3	.5	400 V Paper	Cornell-Dubilier #DT-4P5
C-4	10	25 V Elect.	Cornell-Dubilier #ED-2100
C-5	8	450 V Elect.	Cornell-Dubilier #JR-508
C-6	8	450 V Elect.	Cornell-Dubilier #KR-508
C-7	8	450 V Elect.	Cornell-Dubilier #KR-508
C-8	8	450 V Elect.	Cornell-Dubilier #KR-508

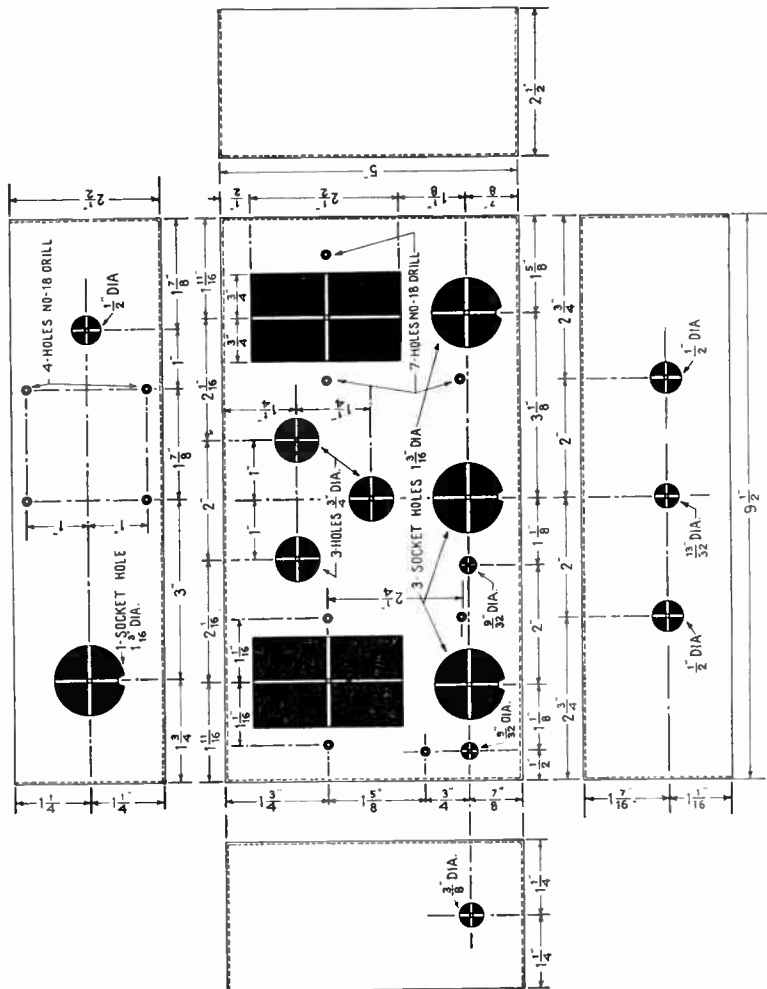
Diagram No.	Type
1	Type 6F5
1	Type 6J7
1	Type 6X5

### MISCELLANEOUS PARTS

1	5x9 1/2 x 2 1/4" Chassis and cover — Bud No. 699
1	5x9 1/2" Chassis bottom plate — Bud No. 680
3	Octal sockets — Amphenol S8
1	Output socket — Amphenol S5
1	Output plug — Amphenol PM5
1	Mic. input connector — Amphenol MC1F
1	Mic. input connector — Amphenol PC1M
2	Metal tube grid caps
2	Metal tube grid cap shields
1	AC line cord & plug — Belden No. 1725
1	SPST switch — Arrow H&H No. 20992
1	Volume control knob, black
1	Volume control dial plate
1	Pilot light bracket and jewel — Yaxley No. 310R
1	Bias cell, 1.5 Volts — Mallory No. F7
1	Bias cell holder — Mallory No. GB-1A
1	Pilot light bulb, 6.3 volts — Mazda No. 40

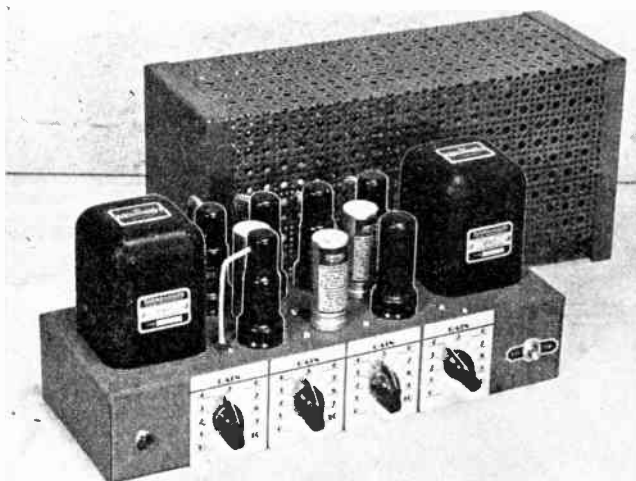
NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.

NOTE  
VOLTAGES INDICATED MEASURED FROM GROUND WITH 115 VOLT LINE AND CONTROLS IN "OFF" POSITION.



Chassis drawing of Single Channel Pre-Amplifier. Full size template available from THORDARSON, 15c net, postpaid.





TOP VIEW

**T**HE multiple channel pre-amplifier and mixer is useful where more input circuits must be accommodated than the regular amplifier will handle. Most main amplifiers accommodate only one or two microphones. Like the single channel pre-amplifier on the previous page, this unit may be operated several hundred feet from the main amplifier if necessary without serious loss of volume level or frequency response. The main amplifier should be equipped with a 200 ohm or 500 ohm input transformer to match the output impedance of the pre-amplifier. Thordarson transformers T-90A00 or T-15A66 are suitable for this use. The 120 watt amplifier on page 14 is designed to operate with a pre-amplifier and mixer of this type.

The circuit diagram as shown will accommodate four low level high impedance microphones. If it is preferable to handle only three low level microphones and a phono pick-up, one of the 6F5 pre-amplifier tubes and associated parts can be eliminated. The phono pick-up will then operate directly into volume control R-16. Likewise, two pre-amplifier tubes can be eliminated if two phono pick-up channels are more desirable.

Dotted lines are shown on the circuit diagram indicating that portion of the circuit which is susceptible to hum and noise pick-up. In the laboratory model, it was necessary to shield resistors R-17, R-18, R-19, and R-20 and all the leads connecting

to them as well as the grid leads to the 6F5 tubes. Additional shielding should not be necessary if the chassis is fully enclosed with a chassis bottom plate. Bias cells provide bias for the 6F5 input tubes, thus eliminating any disturbance that might develop in the cathode circuit of these tubes.

**TECHNICAL DATA**

**Output Level:** 0 db or .006 watts (less than 1% distortion).

**Gain:** 55 db (based on 100,000 ohm input impedance).

**Frequency Response:** Within  $\pm 2$  db from 20 to 15,000 c.p.s.

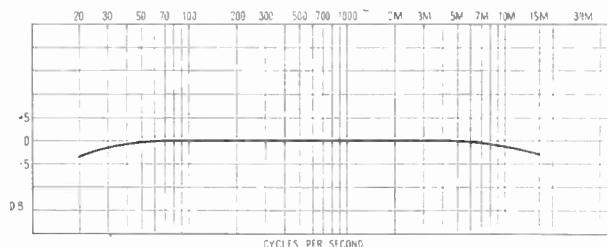
**Input Circuits:** Four 5 megohm channels for high impedance crystal, dynamic or velocity microphones.

**Output:** Low impedance line — 500, 333, 250, 200, 166, 125, or 50 ohms.

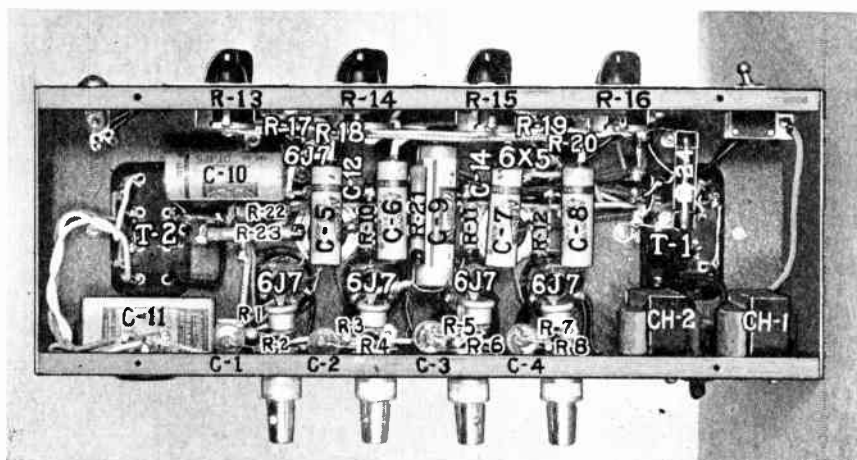
**Tubes:** 4-6F5, 1-6J7, 1-6X5.

**Power Consumption:** 25 watts, 115 volts, 50-60 cycles.

**Dimensions:** 13 $\frac{1}{2}$ " long, 5" deep, 6" high — with cover 8 $\frac{1}{2}$ " high.



FREQUENCY-RESPONSE CURVE



BOTTOM VIEW



# FOUR CHANNEL PRE-AMPLIFIER



## PARTS LIST

### THORDARSON TRANSFORMERS AND CHOKES

#### Diagram No.

T-1	T-15R04 Power Transformer
T-2	T-15A71 Tube to Line Output Transformer
CH-1	T-13C26 Choke
CH-2	T-13C26 Choke

### RESISTORS

Diagram No.	Ohms	Watts	Type
R-1	5 MEG.	1/2	IRC BT-1/2
R-2	5 MEG.	1/2	IRC BT-1/2
R-3	5 MEG.	1/2	IRC BT-1/2
R-4	5 MEG.	1/2	IRC BT-1/2
R-5	5 MEG.	1/2	IRC BT-1/2
R-6	5 MEG.	1/2	IRC BT-1/2
R-7	5 MEG.	1/2	IRC BT-1/2
R-8	5 MEG.	1/2	IRC BT-1/2
R-9	100,000	1	IRC BT-1
R-10	100,000	1	IRC BT-1
R-11	100,000	1	IRC BT-1
R-12	100,000	1	IRC BT-1
R-13	500,000	Volume Control	Yaxley type "O"
R-14	500,000	Volume Control	Yaxley type "O"
R-15	500,000	Volume Control	Yaxley type "O"
R-16	500,000	Volume Control	Yaxley type "O"
R-17	500,000	1/2	IRC BT-1/2
R-18	500,000	1/2	IRC BT-1/2
R-19	500,000	1/2	IRC BT-1/2
R-20	500,000	1/2	IRC BT-1/2
R-21	2,000	1	IRC BT-1
R-22	50,000	1	IRC BT-1
R-23	20,000	1	IRC BT-1
R-24	50,000	10	Ohmite Brown Devil

### CONDENSERS

Diagram No.	Mfd.	Voltage	Type
C-1	.1	400 V Paper	Aerovox #484
C-2	.1	400 V Paper	Aerovox #484
C-3	.1	400 V Paper	Aerovox #484
C-4	.1	400 V Paper	Aerovox #484
C-5	.1	400 V Paper	Aerovox #484
C-6	.1	400 V Paper	Aerovox #484
C-7	.1	400 V Paper	Aerovox #484
C-8	.1	400 V Paper	Aerovox #484
C-9	10	25 V Elect.	Cor.-Dub. #BR-102
C-10	.5	400 V Paper	Cor.-Dub. DT-4P5
C-11	8	450 V Elect.	Aerovox #PBS5
C-12	8	450 V Elect.	Aerovox #GLS450
C-13	8	450 V Elect.	Aerovox #GLS450
C-14	8	450 V Elect.	Aerovox #GLS450

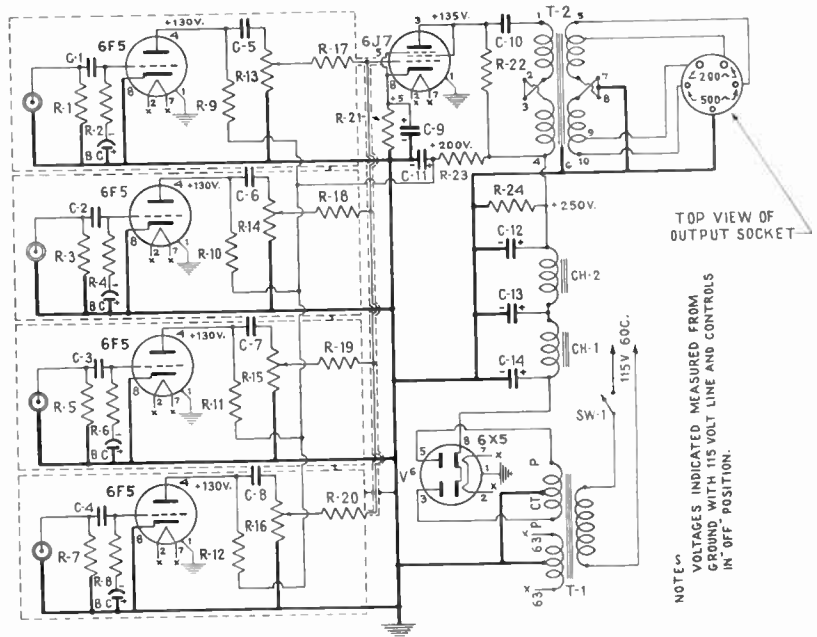
### TUBES

4	Type 6F5
1	Type 6J7
1	Type 6X5

### MISCELLANEOUS PARTS

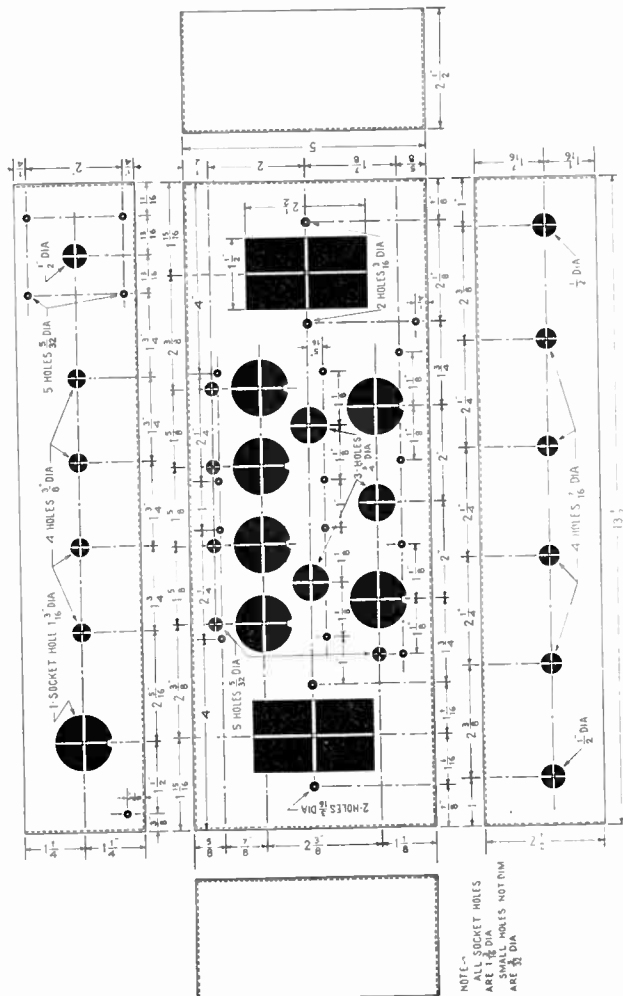
1	5x13 1/2 x 2 1/2" Chassis and screen cover — Bud No. 1125
1	5x13 1/2" Chassis bottom cover — Bud No. 685
6	Octal sockets — Amphenol S8
1	5-contact socket — Amphenol S5
1	5-prong output plug — Amphenol PM5
4	Mic. connectors — Amphenol PC1M
4	Mic. connectors — Amphenol MC1F
5	Metal tube grid caps
5	Metal grid cap shields
1	AC line cord and plug — Belden No. 1725
1	SPST Toggle Switch — Arrow H & H No. 20992
4	Control knobs
4	"Volume" control plates
1	Pilot light bracket and jewel — Yaxley No. 310R
4	Bias cells 1.5 volts — Mallory No. F7
4	Bias cell holders — Mallory No. GB-1A
1	5.3V Pilot light — Mazda No. 40

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.



TOP VIEW OF OUTPUT SOCKET

NOTE: VOLTAGES INDICATED MEASURED FROM GROUND WITH 115 VOLT LINE AND CONTROLS IN OFF POSITION.



NOTE: ALL SOCKET HOLES ARE 1/8\"/>

Chassis drawing of Four Channel Pre-Amplifier. Full size template of chassis for drilling, showing all mechanical dimensions available from THORDARSON, 15c net postpaid.



TOP VIEW  
DUAL TONE CONTROL

Thordarson's development of this "Dual Tone Control" was prompted by the many requests of sound men for an effective tone compensating system to boost or attenuate the bass or treble frequencies independently of each other. Examination of the schematic diagram will show that the final circuit is simple and not at all complicated to construct. The unit described here is identical in circuit details to the tone compensation employed in the amplifiers shown elsewhere in this "Amplifier Guide." It is constructed on a small chassis, making it adaptable to practically any existing amplifier.

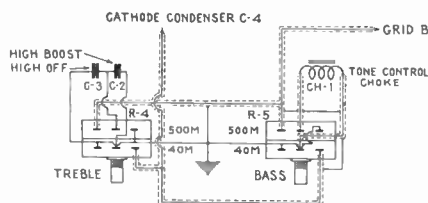
Operation is based on degeneration in the cathode circuit of a 6C5 or equivalent tube. If resistance is introduced in the cathode circuit, any signal developed by the tube will also appear across the resistance. This signal voltage is opposite in phase and in series with the voltage impressed on the grid and cathode of the tube. Degeneration takes place and the amplification of the tube is reduced. In this application the plate loading resistor R-6 is made small and the cathode resistor R-3 large so that a greater part of the voltage developed by the tube appears in the cathode circuit.

Since the circuit is resistive there is little or no frequency discrimination at audio frequencies, and all frequencies are degenerated an equal amount. If the cathode resistance is shunted with an inductance (of the proper value) the resistance at low frequencies is practically shorted out due to the low impedance of the choke at low frequencies. Therefore degeneration of the low frequencies is eliminated and the greater part of the signal developed by the tube appears across the load resistor R-6. The result is an increase in the low frequency response of the circuit. Likewise

if a condenser (of the proper value) is shunted across the cathode resistor, the low impedance of the condenser at high frequencies reduces the impedance of the circuit and degeneration of the higher frequencies is reduced. The high frequency response of the circuit is thus increased.

Attenuation of the low frequencies can be accomplished by shunting the grid circuit of the following stage with a choke or inductance. It so happens that the value of the choke (described above) used in the bass boost circuit also has the correct value for an attenuation circuit. The high frequencies can be attenuated by shunting the same grid circuit with a suitable condenser.

The function of control R-5 is to introduce the choke CH-1 into either the cathode circuit for bass boost or the grid circuit for bass decrease. Control R-4 applies condenser C-2 to the cathode circuit for treble increase, or C-3 to the grid circuit for



treble decrease. The controls are coupled to the cathode through condenser C-4 and to the following grid by a shielded lead. The small pictorial drawing illustrates clearly how connections are made to the controls.

To install the tone control unit into an existing amplifier, locate the coupling condenser in a resistance coupled stage (preferably the plate circuit of the second stage of the amplifier). Remove the condenser from the circuit and connect the shielded lead of condenser C-1 and the shielded lead of C-5 in its place. Make sure that the lead from C-1 connects to the plate of the tube preceding the tone control unit. Ground the shields of these leads to the amplifier to complete the ground circuit. Connect the unshielded lead to a well filtered point of the amplifier B supply circuit. A pair of twisted wires not over 3 feet long may be used for the filament supply. No difficulty should be experienced with hum or other disturbance since the unit can be placed several feet from the amplifier. It is also possible to build the tone control into an amplifier if there is adequate room and care is taken not to mount the choke and controls near the power transformer.

## PARTS LIST FOR THE DUAL TONE CONTROL

Diagram No.	THORDARSON
CH-1	Tone Control Choke, T-14C70
R-4	Dual Tone Control, Thordarson R-1068
R-5	Dual Tone Control, Thordarson R-1068

### RESISTORS

	Ohms	Watts	Type
R-1	250,000	1/2	Centralab #310
R-2	1,000	1	Centralab #314
R-3	20,000	1	Centralab #314
R-6	20,000	1	Centralab #314

### CONDENSERS

	Mfd.	Voltage	Type
C-1	.1	400	Cornell-Dubilier #DT-4P1
C-2	.04	400	Cornell-Dubilier #DT-4S4
C-3	.01	400	Cornell-Dubilier #DT-4S1
C-4	10	200	Aerovox #PR-200
C-5	.1	400	Cornell-Dubilier #DT-4P1

### TUBE

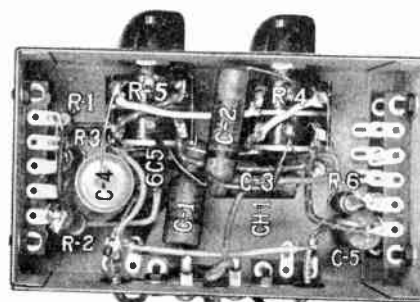
- 1 Type 6C5

### MISCELLANEOUS PARTS

- 1 Chassis 6" long, 3 1/2" wide, 3" high
- 1 Chassis bottom plate
- 4 5-lug resistor mtg. strips
- 2 2-lug resistor mtg. strips
- 1 2-screw terminal board
- 1 Octal socket Amphenol S8
- 2 Control knobs
- 2 "Tone" control plates

NOTE: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.

Curves are shown on opposite page illustrating tone controls in various positions. Full size template of the chassis drawing also shown on opposite page available from THORDARSON, 15c net, postpaid.



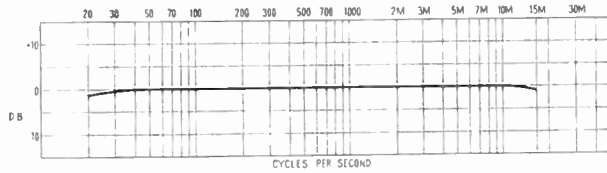
BOTTOM VIEW



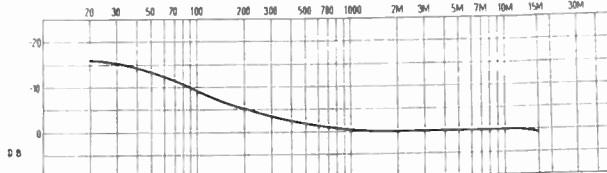


# DUAL TONE CONTROL

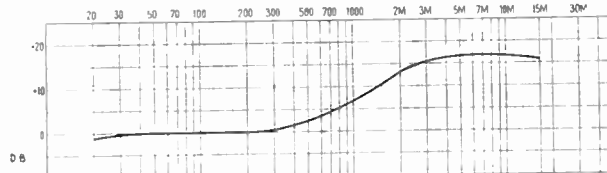
THORDARSON



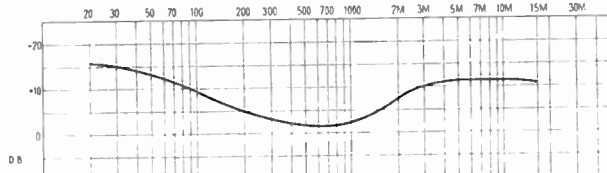
Bass Control normal — Treble Control normal



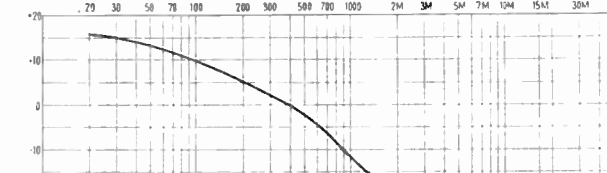
Bass Control increase — Treble Control normal



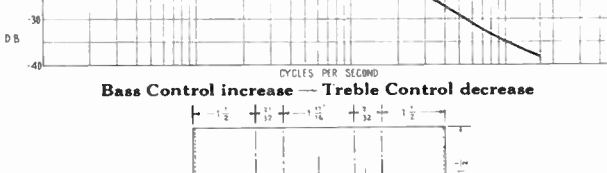
Bass Control normal — Treble Control increase



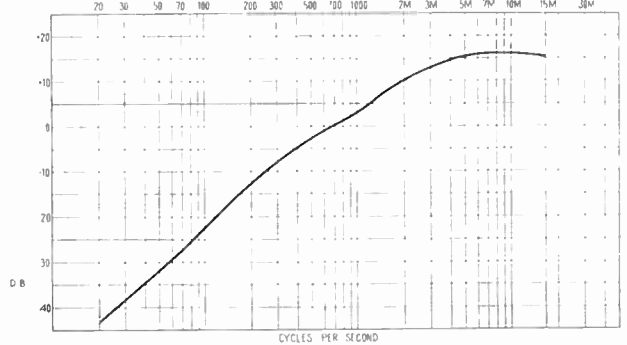
Bass Control increase — Treble Control increase



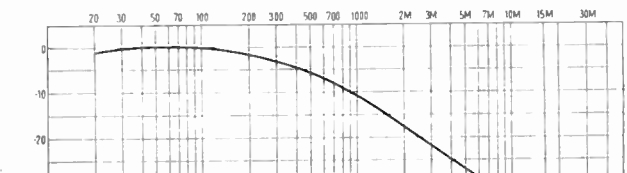
Bass Control increase — Treble Control decrease



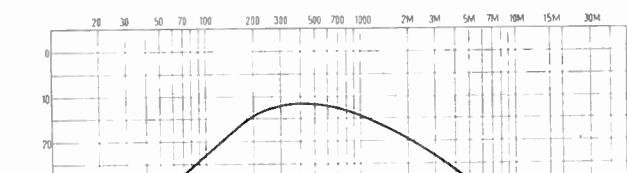
Bass Control decrease — Treble Control increase



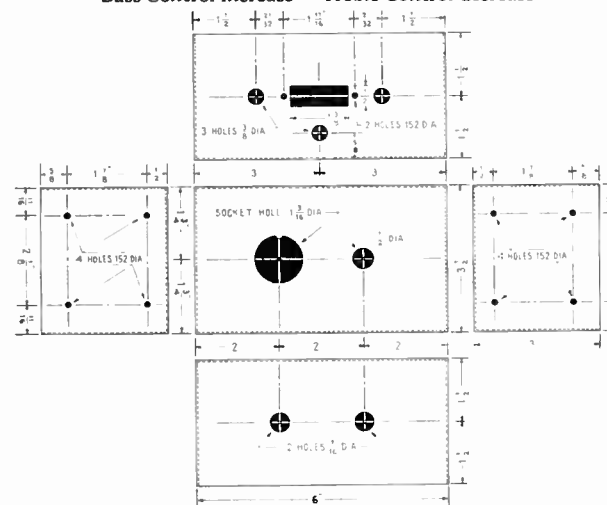
Bass Control decrease — Treble Control normal



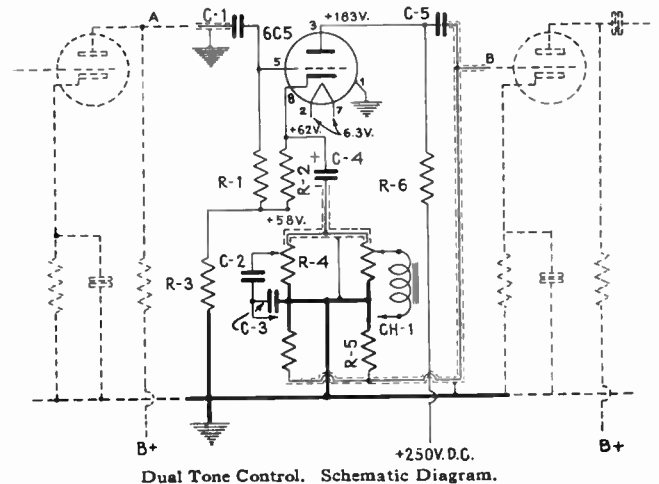
Bass Control normal — Treble Control decrease



Bass Control decrease — Treble Control decrease



Chassis drawing of Dual Tone Control Unit. Full size template available from Thordarson, 15c net, postpaid.



Dual Tone Control. Schematic Diagram.

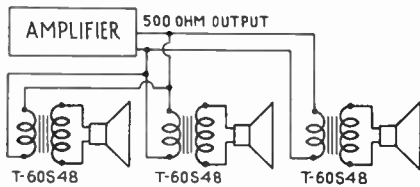


Fig. 1

It is frequently necessary to match a number of speakers to a 500 ohm line in such a way that the speakers take unequal power. It is an easy matter to connect a number of speakers to a 500 ohm line so that each speaker takes the same amount of power and it is also an easy matter to determine the correct impedance ratio of each line to speaker transformer. In Fig. 1, if each of the speakers has a voice coil impedance of 10 ohms, the impedance ratio of the transformers should be 1500:10 so that the three 1500 ohm impedances in parallel will give an impedance of 500 ohms, which is the correct value for the 500 ohm line. In this case, if the total power supplied to the 500 ohm line is 30 watts, each speaker will take one-third of this or ten watts. If this power is to be divided so one speaker receives 15 watts, one 10 watts and one 5 watts, one must make a change in the ratio of the three transformers.

The voltage developed across the 500 ohm line is 122 volts. ( $W = \frac{E^2}{R}$ ;  $W = 30$ ,  $R = 500$ ,  $E = \sqrt{15,000}$  or 122 volts).

Given the voltage across the 500 ohm line and the voltage required across each voice coil for the desired amount of power, it is an easy matter to determine the turns ratio and the impedance ratio necessary in the various transformers.

For the first speaker, requiring 15 watts of audio, the voltage across the voice coil is 12.25 volts; ( $W = \frac{E^2}{R}$ ;  $W = 15$ ,  $R = 10$ ,

$E = \sqrt{10 \times 15} = 12.25$  volts). Similarly, the voltage across the speaker requiring 10 watts is 10 volts and the voltage across the speaker requiring 5 watts is 7 volts. The turns ratio of the various transformers is

$\frac{122}{12.25}$  or 10:1. Also  $\frac{122}{10}$  or 12.2:1, and also  $\frac{122}{7}$  or 17.5:1. The impedance ratio of the

transformer is the turns ratio squared and the actual primary impedance is equal to the turns ratio squared, multiplied by the voice coil impedance of 10 ohms. The reflected primary impedances are all different. However, when the three are paralleled, they result in an impedance of 500 ohms, which is the correct value for the 500 ohm line. In this case, the power delivered to each of the speakers is entirely different from the condition under Fig. 1.

It must be remembered when using this method of calculation the total power in the individual voice coils must total the power in the primary from which the value of primary voltage was computed.

Frequently it is not possible to match the impedance of the speaker exactly. Whenever this is not possible and whenever there is a sufficient number of taps

on the output of the amplifier, it should be connected in such a way that a lower plate to plate load than normal is reflected. In other words, if it is necessary to match a 15 ohm speaker to an output transformer which has a 16 ohm tap and a 14 ohm tap, the 15 ohm speaker should be connected to the 16 ohm tap. This will reflect a somewhat lower value of plate to plate load so that it is possible to obtain slightly more power from the amplifier although the distortion will be somewhat greater at the peak output. This is much better than connecting the 15 ohm speaker to the 14 ohm tap, thus reflecting a higher plate to plate load and causing the amplifier to overload at a much lower value of power output. This is especially true of pentode and beam power tubes, where the higher value of plate to plate load will result in a flat top wave and severe distortion will result.

**IMPEDANCE RATIO**

The transformer is an impedance changer and as such it is not necessarily associated with any one value of impedance. In other words, if a transformer is designed to couple a 500 ohm line to a 10 ohm voice coil, the impedance ratio of the transformer is 50:1, and the same transformer for all practical purposes will just as effectively couple a 1000 ohm line to a 20 ohm coil or a 250 ohm line to a 5 ohm voice coil, provided, of course, that the power handling ability of the transformer is not exceeded. The only serious result of using the primary of a transformer for an impedance other than that for which it was designed is the changing of the frequency response of the transformer and its operating efficiency. In other words, a transformer designed for 500 ohms operation has a certain amount of inductance, which, when used with a 1000 ohm line, will give poorer low frequency response and better high frequency response. On the other hand, a transformer designed for 500 ohm operation when used on a 250 ohm line, will provide better low frequency response but the high frequency response will drop off considerably.

Thordarson line to voice coil transformer, T-60S48, may be used to reflect a primary impedance from 500 to 3000 ohms. It has been designed with high primary inductance and low leakage so that the

frequency response is good over this range. The secondary has a number of taps making it possible to match practically any voice coil impedance or obtain any desired turns ratio. The accompanying table indicates what turns and impedance ratios may be obtained as well as the voice coil impedances when one to six transformers are connected in parallel to a 500 ohm line. The table will aid in connecting voice coils of the same or different impedance where the distribution of power is equal, without the above computation. Only one speaker should be connected to each transformer.

Where there are a number of speakers which already have 500 ohm input transformers to be connected to a 500 ohm line a matching transformer must be used. A number of 500 ohm speakers connected in parallel may be matched to the 500 ohm amplifier output with T-76S74 matching autotransformer. This unit provides five impedances in addition to the original 500 ohms — 250, 166, 125, 100, and 84 ohms. These values are the result of connecting 2, 3, 4, 5, or 6, 500 ohm speakers in parallel.

Two 500 ohm speakers connected in parallel will reflect an impedance of 250 ohms. Connections are made to the common terminal No. 7 and terminal No. 5. If three speakers are used, the reflected impedance will be 166 ohms, in which case the common terminal and terminal No. 4 are used.

THORDARSON transformer T-53S81 will couple a 500 or 250 ohm line to voice coils having 4, 8, or 15 ohms impedance. If desired, two of these transformers may be connected to a 500 ohm line by using a series connection and the 250 ohm tap. It is also possible to connect several speaker voice coils to one of the T-53S81 transformers. If the voice coils have 15 ohms impedance each, two of them could be connected in parallel to the 8 ohm tap. Four 15 ohm voice coils can be wired in series parallel to the 15 ohm tap or in parallel to the 4 ohm tap.

The wires connecting the transformer to the speaker coil should not be any longer than necessary. Long voice coil leads result in loss of power and low frequencies. Heavy wire should be used if the transformer is separated from the speaker more than a foot or so.

**Table for Connecting Dynamic Speakers of Various Impedances in Same Output System**

Secondary Terminals	Turns Ratio	Imped. Ratio	SECONDARY MATCHING IMPEDANCE T-60S48 TRANSFORMER					
			No. of Transformers in Parallel Across 500-ohm Line					
			1	2	3	4	5	6
2 - 4	89:1	7950	.06	.1	.2	.2	.3	.4
5 - 6	65:1	4200	.1	.2	.4	.5	.6	.7
2 - 5	47:1	2200	.2	.4	.7	.9	1.1	1.3
4 - 6	39:1	1500	.3	.6	1.0	1.3	1.6	1.9
3 - 6	32:1	1000	.4	.7	1.1	1.4	1.8	2.1
2 - 6	27:1	730	.6	1.2	2.0	2.7	3.4	4.0
6 - 7	26:1	670	.7	1.4	2.2	2.9	3.6	4.3
1 - 2	19:1	360	1.3	2.7	4.	5.4	6.8	8.1
1 - 3	17:1	290	1.7	3.3	5.	6.7	8.4	10.
1 - 4	16:1	250	2.	4.0	6.	8.	10.	12.
3 - 7	14½:1	210	2.4	4.8	7.2	9.6	12.	14.4
1 - 5	13¾:1	190	2.6	5.3	8.	10.6	13.3	16.
2 - 7	13¼:1	175	2.8	5.6	8.4	11.2	14.	16.8
1 - 6	11¼:1	125	4.	8.	12.	16.	20.	24.
1 - 7	7.9:1	62	8.	16.	24.	32.	40.	48.



# ADVANTAGES OF INVERSE FEEDBACK (Continued)

## CHASSIS DRAWING — 6V. D.C. 115V. A.C. AMPLIFIER



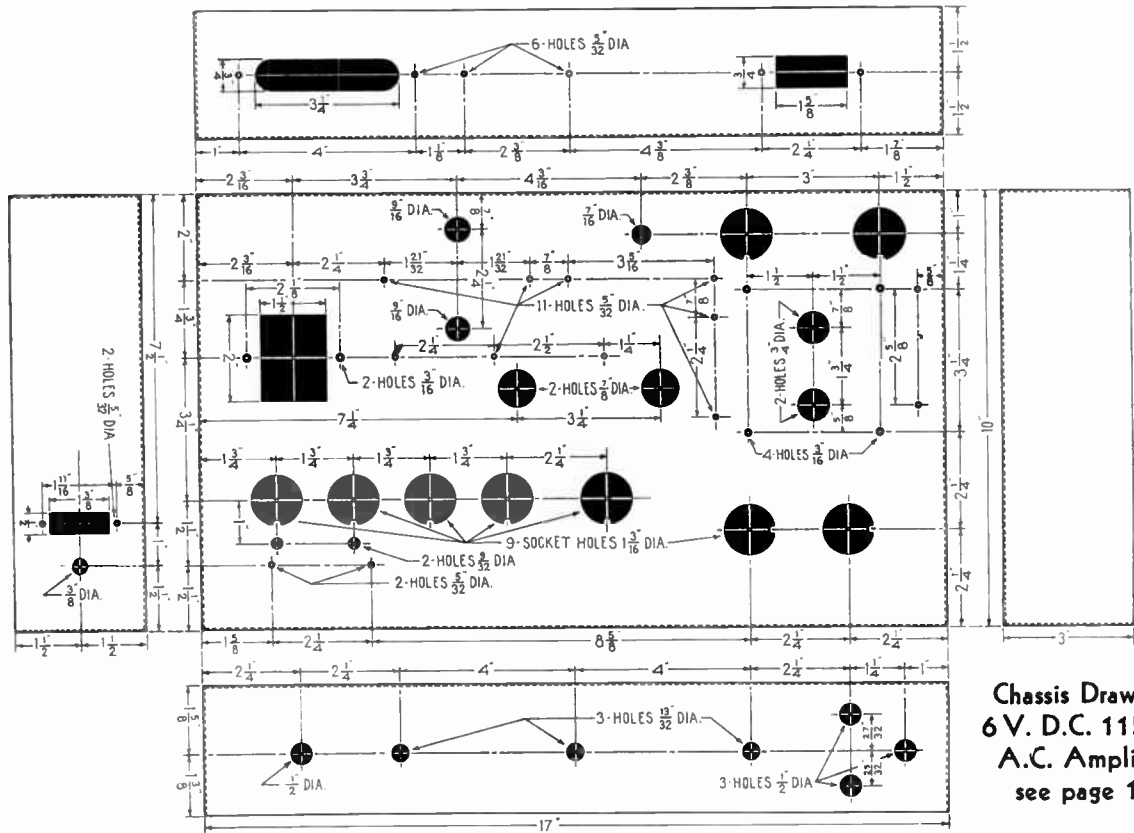
(Continued from page 3)  
ing effect of the tube is exceedingly small with the result that the damping is negligible. As a result, unnatural "boominess" may result when the speaker is shock excited and the cone vibrates at its own natural period. The natural period depends upon the physical construction of the speaker and is usually in the neighborhood of 50 to 150 cycles.

### HUM

Hum in the output stage is cancelled out in much the same way as distortion, since

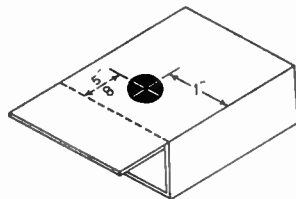
the hum developed in the stage and the voltage fed into the grid circuit are out of phase and tend to cancel. It must be remembered, however, that distortion not appearing in the stage or hum from a previous stage will not be cancelled by inverse feedback in the output stage. Great reductions in plate circuit distortion and plate resistance may be obtained by the use of large amounts of inverse feedback. However, the limiting factor in inverse feedback is the amount of desired gain from the stage in question. In actual design the amount of inverse feedback is a

compromise between the gain and the desired reduction in distortion. If there is enough gain in the previous stages and if the driver tube can supply the necessary peak voltage, it will be advisable to increase the amount of inverse feedback in order to reduce the plate resistance and the plate circuit distortion. However, if the plate resistance is fairly low and if the plate circuit distortion is a reasonable value, there is not much advantage gained in further reducing the gain by the addition of more inverse feedback.

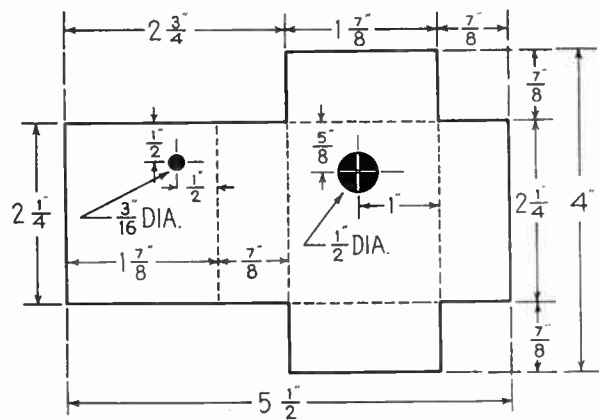


Chassis Drawing  
6V. D.C. 115V.  
A.C. Amplifier  
see page 18

Input Circuit Shield Can

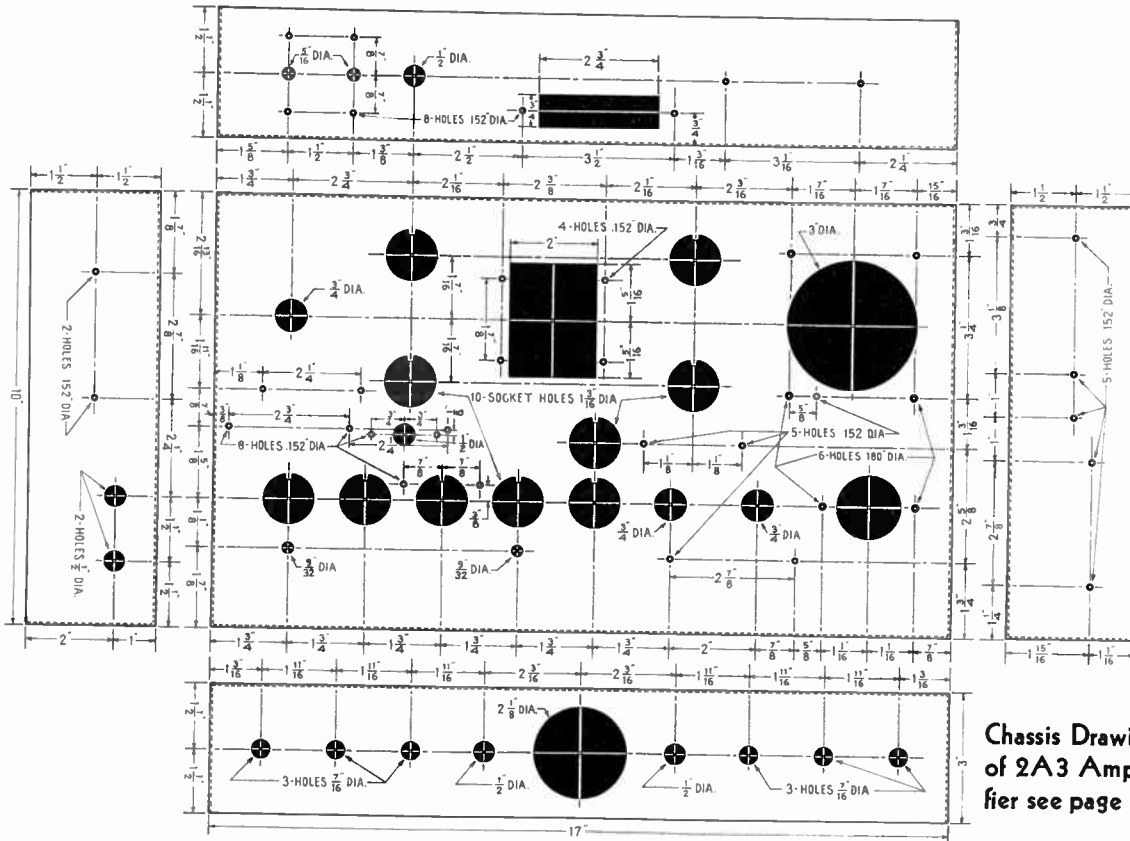


Cut shield from metal and bend to form a can as above, solder together leaving one side open until mounted, and small parts are installed and wired.

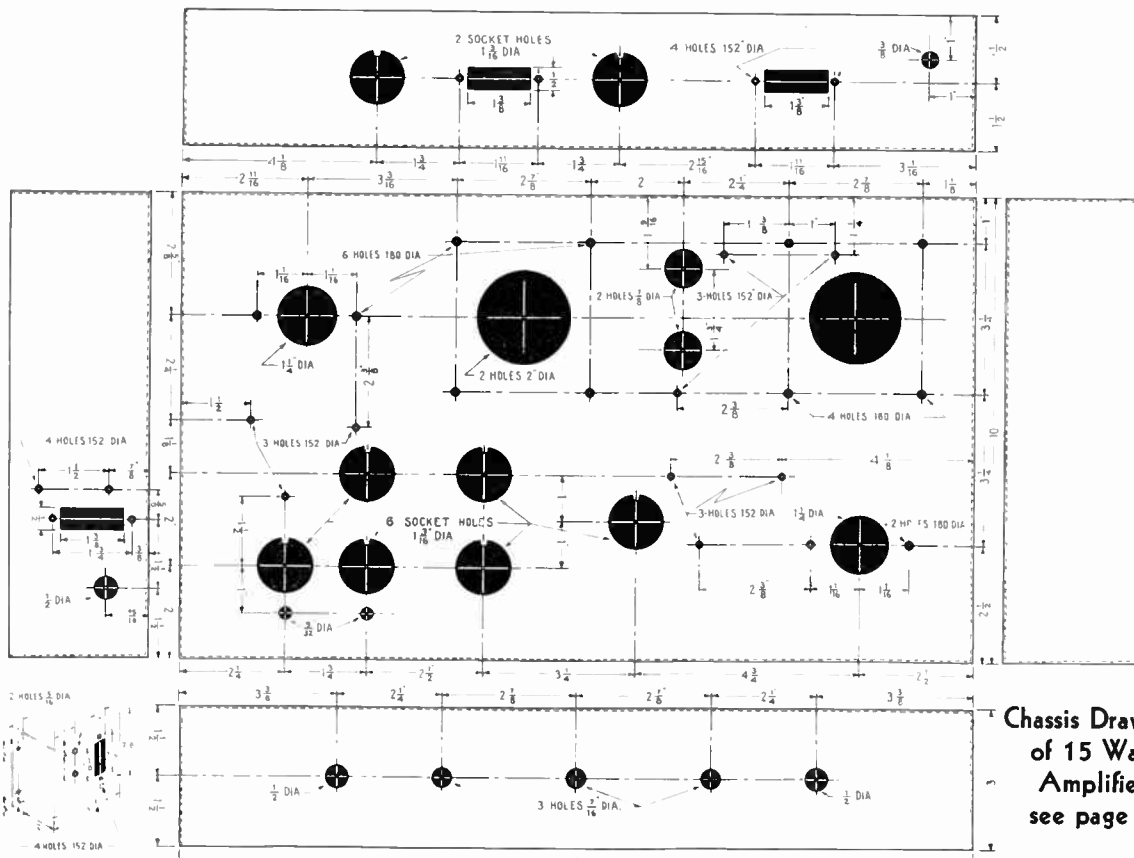


Full size template of Chassis available from Thordarson, 15c net, postpaid





Chassis Drawing of 2A3 Amplifier see page 16

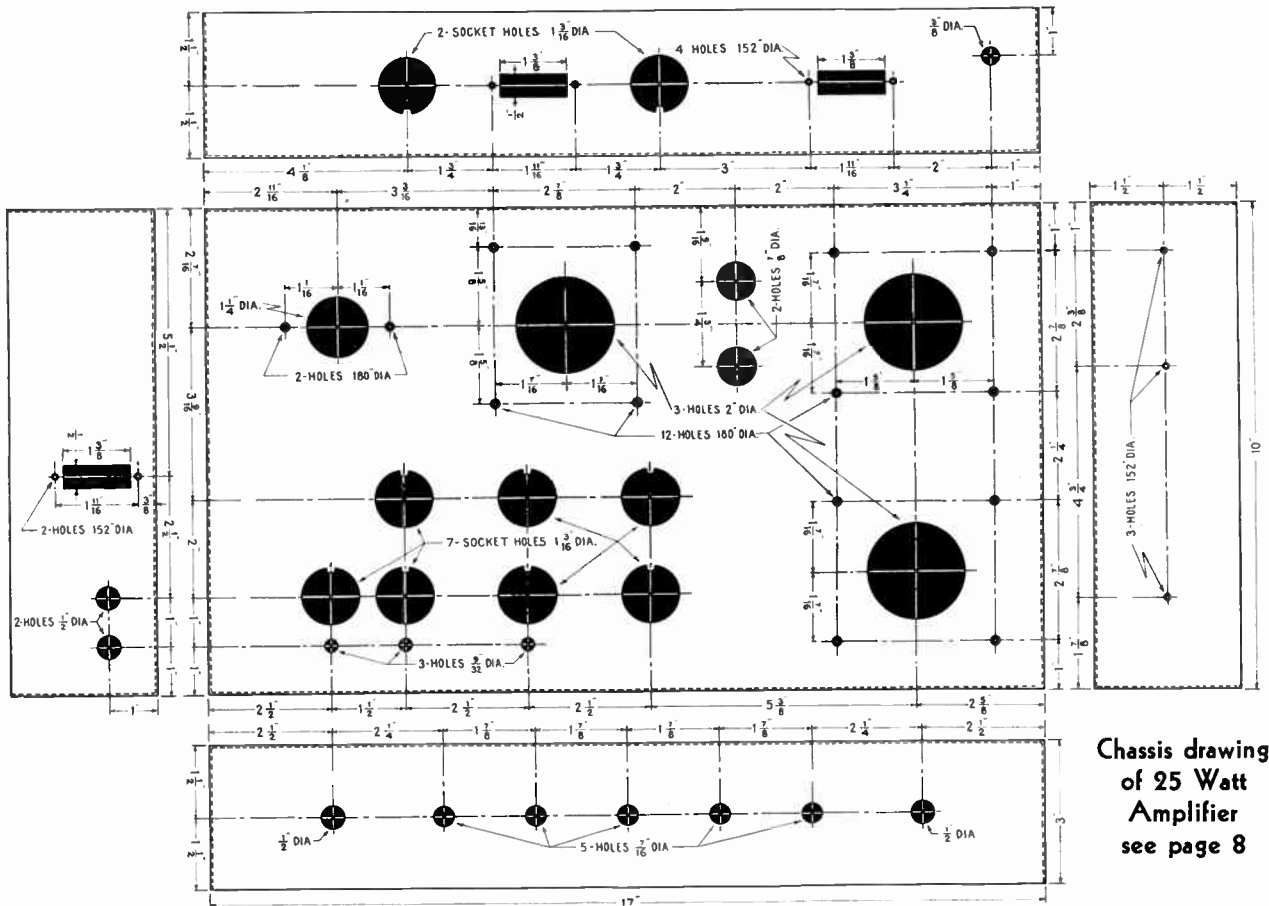


Chassis Drawing of 15 Watt Amplifier see page 6

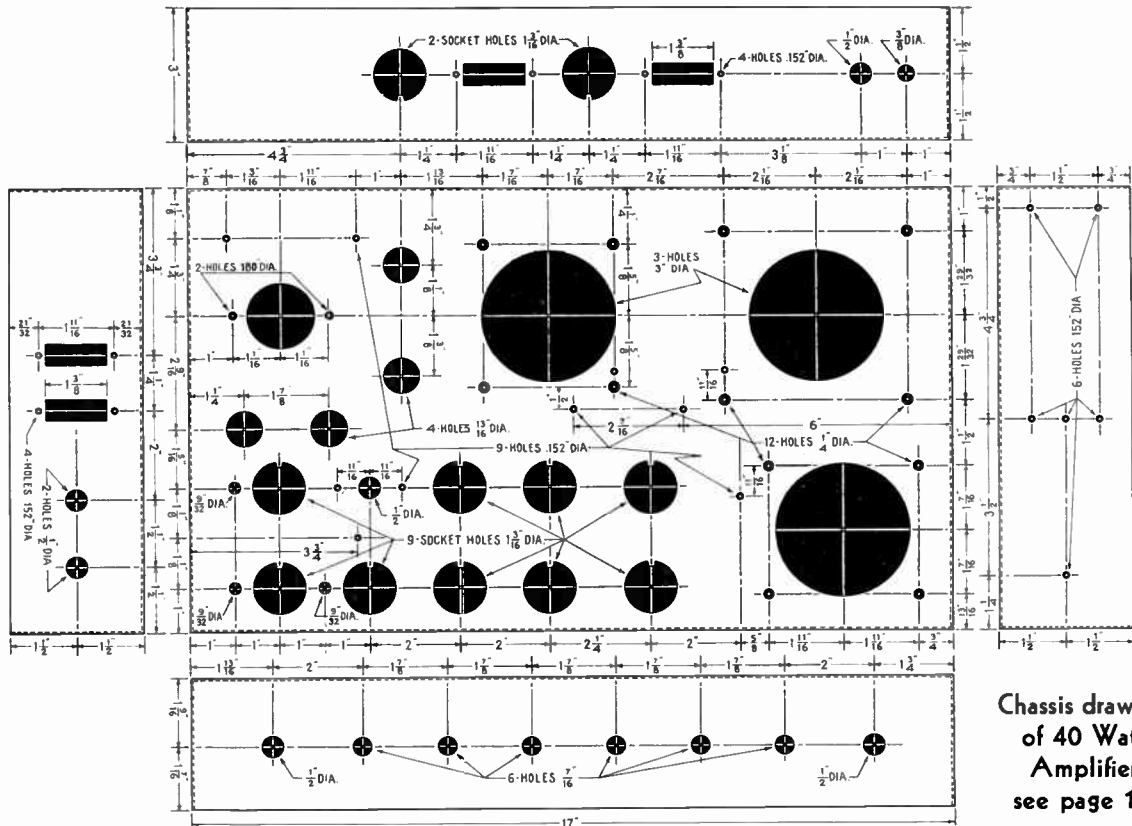


# CHASSIS DRAWINGS — 25 and 40 WATT AMPLIFIERS

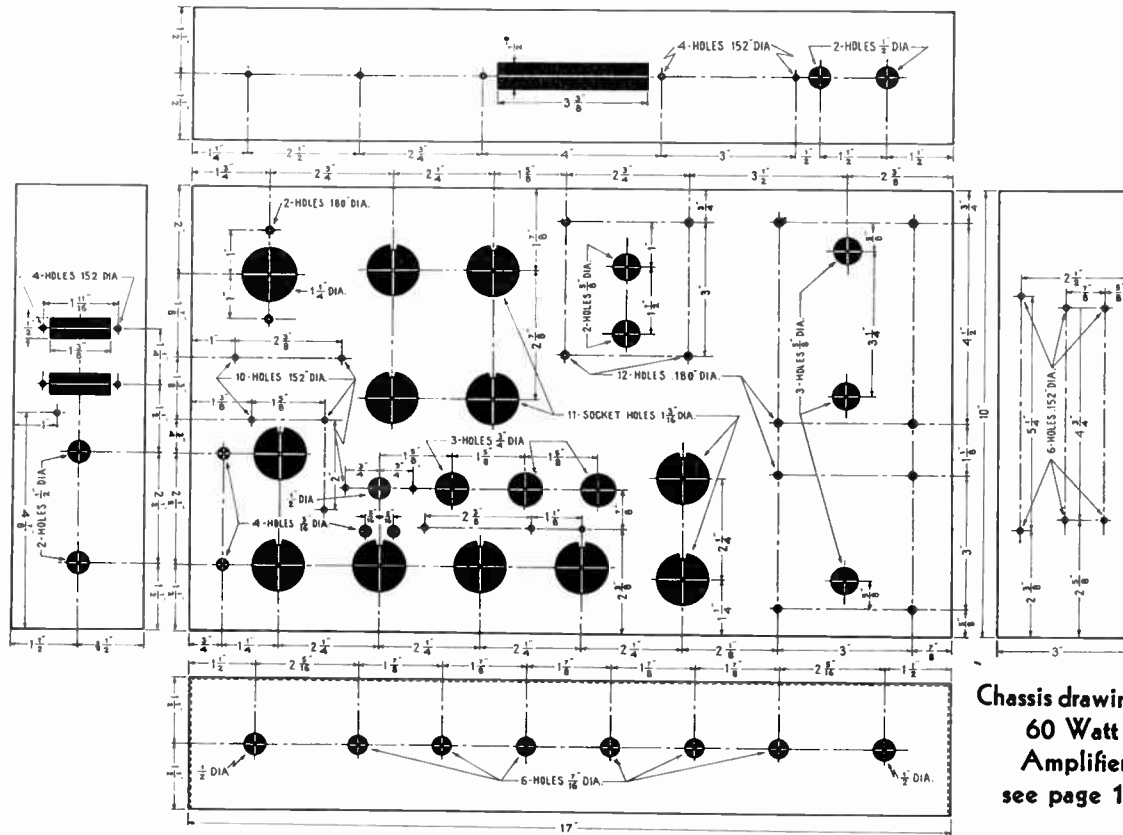
Full Size Templates of Chassis Drawings Available from THORDARSON, 15c net postpaid



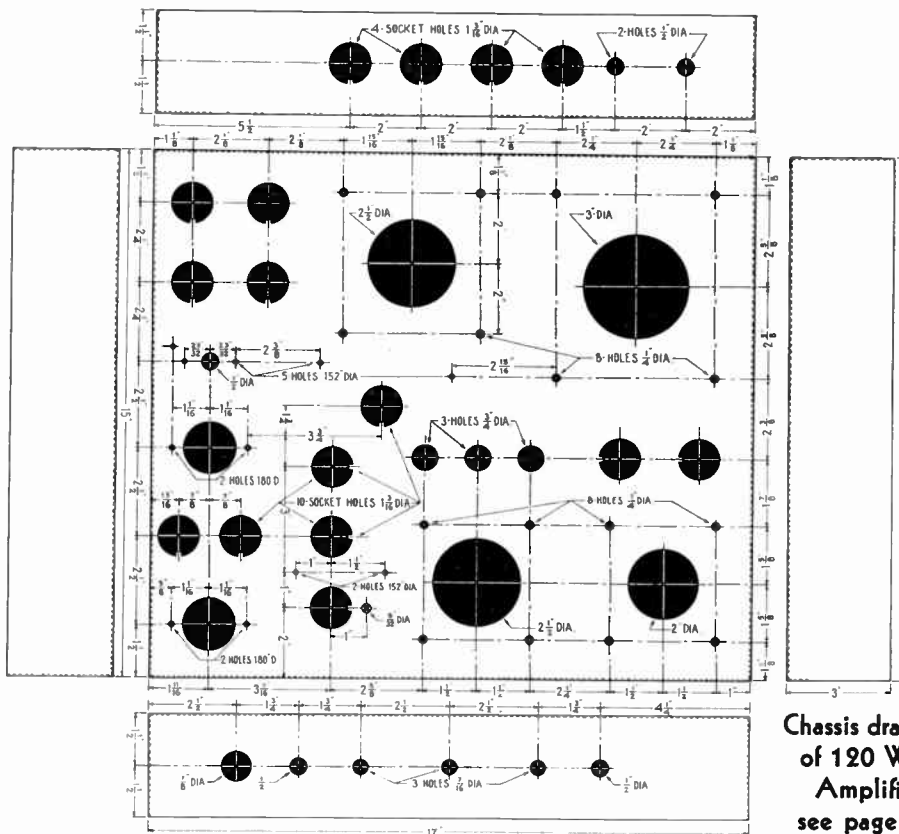
Chassis drawing of 25 Watt Amplifier see page 8



Chassis drawing of 40 Watt Amplifier see page 10



Chassis drawing of  
**60 Watt  
 Amplifier**  
 see page 12



Chassis drawing  
 of 120 Watt  
 Amplifier  
 see page 14



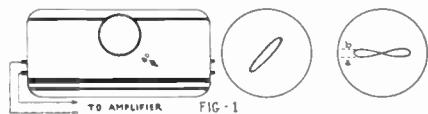


Practically nothing is said concerning the testing of amplifiers in the constructional articles in this guide. This subject is too broad to be covered in such limited space. The following ideas and suggestions will be of great help to the Sound Man who builds or repairs his own amplifiers. They are the results of long experience in the laboratory and in answering letters on this subject from our many friends and customers.

There are certain basic test instruments that should be available to every sound man and certain routines in their use that should be known and followed, if the full benefit is to be secured from them. These instruments include a good audio oscillator, a cathode ray oscilloscope, a selection of 50 or 75 watt resistors with values of 500 ohms or equal to output impedances to be used (these are to be used as substitute voice coil and line loads when measuring the output of an amplifier), and a vacuum tube voltmeter with a high range. For accurate overall gain measurements an accurate micro-volt meter is needed to measure the audio voltage applied to the input of the amplifier, and an output meter with no frequency discrimination.

### CHECKING HUM

One of the first problems encountered by the constructor is the elimination of Hum from an amplifier. The oscilloscope is very useful in determining the frequency of the Hum, its location, and when it has been reduced to a negligible quantity.



To determine the frequency of HUM, feed a portion of the output of the amplifier to the vertical input of the oscilloscope. Turn the sweep selector switch to "60 cycle". A 120 cycle HUM will produce some form of a figure eight on the screen of the cathode ray tube as shown in Fig. 1. This indicates that the hum is coming through the power supply circuit, and is caused by lack of filtering or isolation of the different stages. On the other hand, a 60 cycle HUM, usually picked up by induction in the wiring, transformers or chokes will produce some form of circle — no crossing of lines. (Fig. 1).

The best procedure in checking HUM is to pull all tubes but the outputs and clear up any HUM that originates in that stage. Next insert the correct tubes and proceed to the driver stage, the interstage and the inputs successively. It will usually be found that HUM is picked up most often in the input stages. For this reason they must be well shielded. Notice that the resistors and leads associated with this portion of the circuit are always shown as being shielded in the diagrams. This is important in the elimination of HUM and cross talk between inputs. Such simple things as the placement of leads, transformers, tone control chokes, etc., will affect the amount of HUM present in the amplifier. Any defective condensers in the filter circuit will usually be shown at

the first of the test and of course should be replaced with perfect units.

On the oscilloscope the height of the image on the screen is a measure of the amount of HUM. This is shown in Fig. 1 as the distance "a"—"b". Note: This height is affected by the voice coil impedance across which the tests are made. The greater the impedance, the easier it is to detect HUM on the oscilloscope. The ear will of course tell when HUM is no longer noticeable, but will not aid sufficiently in the location and elimination of the source. Tube hiss, which will appear after a gain of approximately 100 db has been reached, should not be confused with HUM.

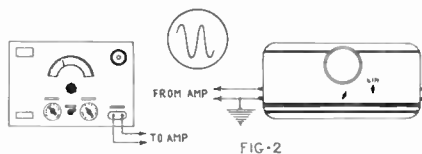
### OSCILLATION

Another source of trouble, especially in modern high gain amplifiers and those using an inverse feedback circuit, is parasitic oscillation.

If the transformers shown on the parts lists in this guide are used, and the circuit diagrams and various constants are followed, there can be but one main reason for oscillations. This is the reversal of the tertiary winding of the output transformers. All other sources of oscillation have been carefully eliminated.

The following suggestions for the curing of oscillation are given for the benefit of those building their own amplifiers from parts other than those recommended in this guide.

1. Complete shielding of the entire wiring of the final stage including the tertiary center tap.
2. Insert a 200 ohm ½ watt resistor in each output tube grid lead.
3. Connect .001 Mfd., or smaller, con-



densers from the output stage grid leads to ground, or the junction of the above mentioned 200 ohm resistors to ground.

4. Connect a by-pass condenser across the self bias resistor.
5. Connect a 25 ohm 10 watt resistor in series with each plate of push-pull parallel output tubes.
6. Insert 10,000 ohm or larger resistors across each half of the secondary of the driver transformer.
7. Connect a resistor across the total secondary of the driver transformer, the value to be as high as possible and still stop the oscillations.

A simple test procedure for the source of oscillation is as follows: First, reverse the tertiary winding of the output transformer. Second, remove the inverse feedback system entirely to make certain this part of the circuit is or is not responsible. Third, try the various circuit changes as previously outlined.

### DISTORTION MEASUREMENTS

The most popular way to check the distortion in an amplifier is shown in Fig. 2. The output of the amplifier is fed to the vertical input of the scope and an audio signal with a sine wave characteristic is fed to the input of the amplifier. Since a

sine wave is uniform, any deviation from it is easily recognized.

It is not possible to distinguish distortion on the oscilloscope below 5 or 6 per cent. The only distortion which may be readily seen with this method is the flat top wave. This flat top may be caused by operating into the curved portion of the tube characteristic in the case of triodes or by using too high a plate load in the case of a pentode. Driving a class A or AB power stage so heavily as to draw grid current will also cause this form of distortion.

Where distortion is present the leads from the vertical input of the oscilloscope should be moved to the output and input of each successive stage, beginning with the final, until the defective one is located.

### OUTPUT MEASUREMENTS

Output measurements are usually taken across a resistor, substituted for the impedance which would usually be connected to the secondary. Use an accurate output meter when making these measurements. From the formula Power (Watts) equals  $\frac{E^2}{R}$ , it is then easy to compute the output of the amplifier.

An oscilloscope is almost a necessity in measuring power output if usable output is to be considered. Most amplifiers are capable of considerably higher output than their usual rating but with high distortion. An output with a maximum distortion of less than 8% is all that is really useful.

Connect the vertical input of the oscilloscope across the same load resistor that is used for the output voltage measurements. Increase the output, through the use of the gain control, until the sine wave form begins to distort. Back the gain down until no noticeable distortion is present, then take the output voltage reading. The oscilloscope will begin to show distortion when about 6% is present.

A point often forgotten is that an amplifier passes many frequencies, thus the watts output should be fairly constant over the entire frequency range if the amplifier has any quality at all. An amplifier with 25 watts output at 400 cycles should also deliver 25 watts with no noticeable distortion at 50 c.p.s. and to at least 8,000 c.p.s. These measurements are not possible unless the laboratory equipment previously mentioned is available.

### OVERALL GAIN

No rating can be so abused as the db gain of an amplifier. This is true because of the nature of the measurements involved. The decibel is a unit of power measurement so the resistance across which the voltage measurements are computed will influence the mathematical, not the actual, result.

To compute the overall gain, a carefully measured input voltage is applied to the input of the amplifier and the output voltage measured. The gain is figured in decibels through the use of the formula  $db = 10 \log \frac{P_o}{P_i}$ , where  $P_o$  is the power output and  $P_i$  is the power input.

The output voltage is usually read across the load resistor mentioned at the beginning of this article. The input voltage is fed into the regular input, which is usually a 5 megohm resistor.

It is this input resistor that can play havoc with the gain measurements. Although its value is 5 megohm, purposely a large value to prevent loading of the microphone, such a value is never encountered as an actual grid load. When shunted by the microphone or other input source the resultant impedance is much less. For this reason the secondary impedance of the usual transformer, 100,000 ohms, is the generally accepted figure used in gain computations. An actual input impedance of 5 megohms would obviously ruin the high frequency response of the stage involved. The calculated db gain will be less with 100,000 ohms but it will be more indicative of the usable gain. You will notice that in the technical data on each amplifier in this guide the figure of 100,000 ohms is given as the value used. Without this statement the db value would be meaningless. *Always state the constants used when speaking of db gain.* Although a higher db gain will be shown by using a value of 5 megohms rather than 100,000 ohms in the computations, the actual gain from microphone to speaker will be the same under either condition.

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*Radio Service Guide — No. 342, 15c.* Constructional data on improved condenser analyzer and impedance bridge, 32 volt DC power supply, two high fidelity phono amplifiers and adding an extra speaker to a receiver. Full of information you will use every day in the year.

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*Replacement Transformer Encyclopedia, No. 243, and Supplement, No. 243-S. Free* — Complete information regarding correct choke, audio and power transformer replacements. Covers almost 6000 receivers as listed in Rider's Manuals, Volumes I to VIII. Includes data on AC, AC-DC and battery models. This is the only complete listing available and will save valuable time for the serviceman. You cannot afford to be without a copy. Ask your distributor for a copy.

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*Transformer Catalog — No. 400. Free.* Descriptions and prices of the complete line of Thordarson Chokes, Audios and Power Transformers. The most comprehensive listing available to meet the needs of the Sound Man, Amateur, Service Man and Experimenter. May be obtained from your Parts Distributor or direct from the Factory.

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500 W. Huron Street

Chicago, Illinois



# Transformers by **THORDARSON**



COMPLETE TRANSFORMER CATALOG NO. 400E  
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# Index

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The letter separating the first two digits of the type number from the last two indicates the classification of the unit. The following legend will further explain:  
 A = Audio, D = Driver, K = Foundation Unit, P = Plate, S = Output or Speaker, W = Wired Amplifier.  
 C = Choke, F = Filament, M = Modulation, R = Power, V = Voltage Changer,

Type No.	Page No.	List Price	Type No.	Page No.	List Price	Type No.	Page No.	List Price	Type No.	Page No.	List Price	Type No.	Page No.	List Price	Type No.	Page No.	List Price
T-2A36	26	\$17.00	T-13S38	25	1.50	T-15R60	19	9.50	T-18C92	7	1.50	T-33A91	5	2.00	T-69R35	21	6.50
T-2A38	26	17.00	T-13S39	24	1.25	T-15R61	19	10.50	T-19D01	11	6.00	T-33S99	24	1.50	T-70R20	20	2.75
T-2A42	26	17.00	T-13S40	24	1.50	T-15R62	19	12.50	T-19D02	11	6.00	T-37C36	7	2.00	T-70R21	20	3.50
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T-2A68	26	17.00	T-13S42	25	1.50	T-15A66	6	7.25	T-19D04	11	6.00	T-43C92	8	1.65	T-70R62	21	5.50
T-2A80	26	17.00	T-13S43	24	1.35	T-15A67	6	8.00	T-19D05	11	6.00	T-44C02	8	1.50	T-70R78	21	3.25
T-2C82	26	12.50	T-14A29	5	2.25	T-15A68	6	8.00	T-19D06	10	2.75	T-47V01	27	6.00	T-70A82	6	3.50
T-2A97	26	17.00	T-14R32	11	6.50	T-15A69	6	7.25	T-19M13	17	4.00	T-47V02	27	9.75	T-70A83	6	3.50
T-3S07	26	17.00	T-14R33	20	2.75	T-15A70	6	7.50	T-19M14	17	7.00	T-47V03	27	21.75	T-72S58	24	1.65
T-3S20	26	18.00	T-14R34	20	3.25	T-15A71	6	7.25	T-19M15	17	10.00	T-47V04	27	35.00	T-72A59	6	1.65
T-3S21	26	18.00	T-14R35	20	3.75	T-15A72	6	7.25	T-19M16	17	15.00	T-47C07	8	1.65	T-73M52	17	18.00
T-3S22	26	19.00	T-14R36	20	4.25	T-15A73	5	6.50	T-19M17	17	24.00	T-47A25	5	1.75	T-73F60	14	3.75
T-3A30	26	17.00	T-14R37	20	4.75	T-15A74	5	6.50	T-19M21	16	7.00	T-49C91	8	1.50	T-74F23	14	5.00
T-3A32	26	17.00	T-14R38	20	5.25	T-15A75	5	7.00	T-19M22	16	10.00	T-50R03	20	2.75	T-74F24	14	7.50
T-9V30	18	40.00	T-14R39	20	2.75	T-15D76	11	8.25	T-19R30	21	7.75	T-50V11	27	7.50	T-74R28	21	6.50
T-9V31	18	65.00	T-14R40	20	6.75	T-15D77	11	8.25	T-19R31	19	5.50	T-50F61	14	1.50	T-74C29	8	3.75
T-9V32	18	100.00	T-14M49	6	16.50	T-15D78	11	8.25	T-19R32	19	7.25	T-52C98	7	1.75	T-74C30	7	1.50
T-9V33	18	175.00	T-14C61	8	1.00	T-15D79	11	8.25	T-19C35	9	4.00	T-53C19	8	1.50	T-74A31	5	3.25
R-1068	7	2.50	T-14C62	8	1.00	T-15D80	11	11.50	T-19C36	9	6.50	T-53S81	25	4.00	T-74D32	10	3.25
T-11F50	15	9.00	T-14C63	8	1.00	T-15D81	11	11.50	T-19C37	9	10.00	T-54D63	10	2.25	T-75D10	10	5.00
T-11F51	15	9.50	T-14C64	8	1.00	T-15D82	11	8.25	T-19C38	9	14.00	T-55A16	6	2.75	T-75R47	20	4.00
T-11F52	15	13.25	T-14C70	7	2.50	T-15D83	11	11.50	T-19C39	9	3.25	T-56R01	21	5.50	T-75C49	8	1.50
T-11F53	14	8.00	T-14A75	7	14.50	T-15D84	11	11.50	T-19C42	9	4.00	T-56R02	21	3.75	T-75R50	21	7.50
T-11F54	14	16.00	T-14A76	7	14.50	T-15D85	10	7.50	T-19C43	9	6.50	T-56R03	21	6.00	T-75C51	8	5.00
T-11F55	14	11.50	T-14S80	25	2.00	T-15D86	10	7.50	T-19C44	9	10.00	T-56R05	21	6.00	T-75A74	5	2.50
T-11F56	15	7.75	T-14S81	24	1.25	T-15D87	10	11.00	T-19C45	9	14.00	T-57S01	25	2.00	T-75S75	24	4.00
T-11F57	15	13.75	T-14S82	24	1.25	T-15S90	25	9.25	T-19C46	9	3.25	T-57S02	25	2.00	T-76S74	25	3.00
T-11F58	15	15.00	T-14S83	24	1.25	T-15S91	25	11.50	T-19P54	18	5.50	T-57A36	5	2.00	T-76D46	10	1.50
T-11F59	14	5.75	T-14S84	24	1.25	T-15S92	25	13.75	T-19P55	18	6.50	T-57A38	5	2.75	T-79F84	15	4.75
T-11F60	14	6.25	T-14A90	6	2.50	T-15S93	25	15.00	T-19P56	18	7.00	T-57A39	5	2.25	T-81S01	24	1.50
T-11F61	14	18.50	T-14A91	6	2.50	T-15S94	25	17.50	T-19P57	18	8.50	T-57A40	5	2.75	T-81C15	7	2.50
T-11F62	14	6.75	T-14A92	5	1.25	T-15S96	25	11.00	T-19P58	18	14.25	T-57A41	5	3.00	T-81D42	10	3.25
T-11F63	14	8.00	T-14D93	10	1.75	T-15S97	25	14.50	T-19P59	18	16.00	T-57A42	5	3.25	T-81D52	10	3.25
T-11F64	14	9.50	T-14A94	6	2.50	T-15S98	25	9.00	T-19P60	18	18.50	T-57C51	8	1.50	T-82V11	27	12.50
T-11M69	17	5.50	T-15R00	21	10.50	T-15S99	25	9.00	T-19P61	18	20.00	T-57C52	8	1.75	T-82V12	27	17.50
T-11M70	17	7.50	T-15R01	21	15.00	T-16C07	8	2.25	T-19P62	18	22.50	T-57C53	8	2.00	T-82V13	27	30.00
T-11M71	17	13.00	T-15R02	21	13.25	T-17C00-B	8	2.75	T-19P63	18	23.00	T-57C54	8	2.25	T-82M25	16	40.00
T-11M74	17	9.00	T-15R03	21	13.75	T-17D01	10	2.00	T-19P64	18	28.50	T-58A37	6	2.25	T-83D21	10	3.50
T-11M75	17	12.50	T-15R04	21	4.75	T-17A02	5	2.25	T-19P65	18	29.50	T-58A70	5	3.25	T-83M22	17	9.00
T-11M76	17	19.50	T-15R05	21	10.50	T-17D03	10	4.50	T-19P66	18	35.00	T-58S72	24	3.75	T-83A78	6	2.00
T-11M77	17	30.00	T-15R06	21	9.75	T-17D04	10	4.50	T-19P67	18	42.50	T-60S48	25	3.00	T-83R82	21	10.00
T-11M78	17	60.00	T-15R07	21	10.50	T-17S10	24	3.00	T-19P68	18	50.00	T-60R49	20	2.25	T-83R85	21	12.00
T-11M79	17	13.00	T-15R08	21	13.75	T-17S11	24	4.50	T-19P69	18	13.00	T-61S25	25	3.25	T-83S87	24	9.00
T-11M80	17	17.00	T-15P11	19	12.50	T-17S12	24	4.50	T-19P70	18	9.00	T-61S26	25	3.50	T-84S58	24	6.00
T-11M81	17	27.50	T-15P12	19	15.00	T-17S13	24	6.00	T-19P71	18	13.00	T-61F85	14	2.00	T-84D59	10	3.25
T-11K99	11	12.50	T-15P13	19	20.00	T-17S14	24	6.00	T-19F76	15	4.75	T-61A94	6	3.25	T-84P60	18	6.50
T-13R00	20	4.25	T-15P14	19	25.00	T-17S15	24	6.50	T-19F77	15	7.50	T-63R63	20	2.75	T-84M70	16	10.00
T-13R01	20	2.75	T-15P15	19	30.00	T-17S16	24	12.00	T-19F78	15	5.25	T-63A71	6	3.75	T-86A02	6	1.75
T-13R02	20	3.50	T-15P16	19	45.00	T-17S17	25	6.50	T-19F79	15	6.75	T-63A72	6	3.75	T-86A03	5	2.00
T-13R03	20	3.75	T-15P17	19	32.50	T-17S18	25	3.50	T-19F80	14	1.25	T-63F99	14	3.25	T-87R85	21	7.00
T-13R04	20	4.25	T-15P18	19	60.00	T-17R30	21	8.50	T-19F81	14	1.50	T-64F14	14	4.75	T-89R28	21	11.00
T-13R05	20	4.00	T-15P19	19	50.00	T-17R31	21	12.50	T-19F82	14	5.00	T-64M26	16	6.00	T-89S68	24	6.50
T-13R06	20	5.25	T-15P20	19	85.00	T-17R32	19	10.00	T-19F83	14	2.25	T-64F33	14	4.50	T-89S74	24	3.75
T-13R07	20	5.50	T-15P21	19	80.00	T-17R33	19	12.50	T-19F84	14	2.75	T-65A73	6	2.75	T-89S75	24	4.00
T-13R08	20	4.50	T-15P22	19	50.00	T-17C40	8	4.75	T-19F85	14	3.25	T-65S94	24	4.00	T-90A00	26	17.00
T-13R09	20	6.25	T-15C30	8	3.25	T-17A42	6-7	9.00	T-19F86	14	5.50	T-67C46	7	1.75	T-90A01	26	17.00
T-13R11	20	2.75	T-15C31	8	4.50	T-17A43	6-7	9.00	T-19F87	14	6.25	T-67D47	10	2.50	T-90A02	26	17.00
T-13R12	20	3.50	T-15C32	8	5.25	T-17S57	25	2.25	T-19F88	14	1.75	T-67S48	24	3.50	T-90A03	26	17.00
T-13R13	20	4.00	T-15C34	8	8.25	T-17M59	16	2.75	T-19F89	14	2.25	T-67C49	8	2.75	T-90A04	26	17.00
T-13R14	20	4.25	T-15C36	9	8.00	T-18V00	27	10.50	T-19F90	14	3.00	T-67D50	10	2.50	T-90A05	26	17.00
T-13R15	20	5.75	T-15C37	9	10.00	T-18V01	27	19.50	T-19F91	14	2.25	T-67S51	24	3.50	T-90A06	26	17.00
T-13R16	20	6.25	T-15C38	9	14.00	T-18V03	27	6.25	T-19F92	14	3.25	T-67S52	24	4.00	T-90S07	26	18.00
T-13R17	20	4.00	T-15C39	9	22.00	T-18V04	27	7.75	T-19F93	14	2.25	T-67S54	24	4.00	T-90S08	26	18.00
T-13R18	20	4.50	T-15C41	9	26.50	T-18V05	27	10.50	T-19F94	14	3.00	T-67M69	16	2.75	T-90C09	26	12.50
T-13R19	20	2.50	T-15C45	9	8.00	T-18V06	27	6.00	T-19F95	14	2.75	T-67M73	16	3.50	T-90A10	26	17.00
T-13C26	8	.90	T-15C46	9	10.00	T-18V07	27	13.50	T-19F96	14	3.50	T-67M74	16	4.50	T-90A11	26	17.00
T-13C27	8	1.10	T-15C47	9	14.00	T-18V10	21	3.00	T-19F97	14	1.75	T-67D78	10	3.00	T-90S12	26	17.00
T-13C28	8	1.20	T-15C48	9	22.00	T-18V20	27	5.00	T-19F98	14	2.75	T-67A91	5	3.00	T-90S13	26	20.00
T-13C29	8	1.60	T-15C50	9	26.50	T-18V21	27	6.00	T-19F99	14	3.50	T-67S92	24	4.00	T-92F20	14	4.75
T-13C30	8	2.00	T-15C52	7-9	5.00	T-18V22	27	7.50	T-23A57	6	2.50	T-67R97	21	4.25	T-92R21	21	7.50
T-13A34	5	1.35	T-15C53	7-9	5.50	T-18V23	27	12.00	T-26V04	27	4.50	T-68S06	24	2.50	T-92R25	11	2.25
T-13A35																	

Since 1895 Thordarson transformers have been designed and manufactured to the highest quality standards. Thordarson established enviable standards by which transformers are compared, resulting in world wide leadership and acceptance.

Thordarson transformers are produced by craftsmen thoroughly trained and highly skilled in transformer manufacture. Their average period of service with the company is over nine years!

Proper balance between mechanical, electrical and cost requirements is maintained. Unshielded types conserve space and offer substantial savings, while shielded types are preferred where the transformer is to be mounted above chassis or where it is advisable to protect the windings from mechanical injury.

Thordarson C.H.T. transformers offer such refinements as compound filled cases of uniform design,

adaptability to varying requirements through the use of multiple taps and conservative electrical design for continuous duty.

Thordarson Tru-Fidelity transformers are designed to a strict interpretation of broadcast station requirements. A partial listing of Tru-Fidelity Major audio components will be found on page 26.

Throughout this catalog a wide choice of transformers and chokes is offered. Sufficient physical and electrical data are presented to facilitate selection for various transformer requirements. This catalog presentation of Thordarson transformers is made in the following order: Audio (A), Chokes and Reactors (C), Driver (D), Filament (F), Modulation (M), Plate (P), Power or Plate and Filament (R), Output or Speaker (S), and Voltage Changers (V). The Oscilloscope Kit (K) is an exception and will be found in the driver transformer listing.

## Classified Index

(See Page 2 for Index by Type No.)

CLASSIFICATION	PAGE NO.	CLASSIFICATION	PAGE NO.
Amplifiers.....	10	Oscilloscope.....	11
Audio Transformers.....	5, 6, 7	Output Transformers.....	24, 25, 26
Audio Reactors.....	7	Plate Supply Transformers.....	18, 19
Autotransformers.....	15, 27	Power Transformers.....	19, 20, 21
Automatic Voltage Regulators.....	18	Power Transformers for Cathode Ray Tubes... .	10
Bias (Power) Transformers.....	19	Signalling Transformers.....	27
Cathode Modulation Transformers.....	17	Television Filter Reactor.....	8
Cathode Ray Power Transformers.....	11	Television Transformers.....	19
Chokes.....	7, 8, 9	Tropex Transformers.....	4
Choosing Output Transformers, Tables....	22, 23	Tru-Fidelity Broadcast Transformers.....	26
Crystal Recorder Transformers.....	25	Vibrator Transformers.....	20
Driver Transformers.....	10, 11	Voltage Changers.....	27
Driver and Modulator Combinations Table .	12, 13		
Dual Tone Control Choke and Potentiometer..	7	LITERATURE	
Fence Controller Transformer.....	21	Amateur Radio.....	16
Field Supply Transformer.....	21	(A Beginners Guide)	
Filament Transformers.....	14, 15	Amplifier Catalog.....	10
Isolation Transformers.....	27	Amplifier Guide.....	10
Line Regulating Autotransformers.....	27	Broadcast Catalog.....	16, 26
Magnetically Shielded Audio Transformers.....	7	Replacement Transformer Encyclopedia	
Microphone Cable Transformers.....	7	and Service Guide.....	5
Modulation Transformers.....	16, 17	Transformer Manual.....	15
		Transmitter Guide.....	15



**YOU MAY NOT  
WORK UNDER  
these conditions  
BUT---**

... even if you did, THORDARSON TROPEX transformers would give you complete protection against moisture, high humidity and salt air.

The TROPEX process was perfected for just that purpose. It thoroughly impregnates the coil against the corrosive effects of adverse weather conditions.

Since its introduction in March 1939, servicemen and experimenters in the Gulf States — Florida, Alabama, Mississippi, Louisiana and Texas — have turned to TROPEX in increasing numbers. That they have switched to TROPEX and forgotten transformer failure is best demonstrated by the record of only one TROPEX-treated transformer returned because of damage due to humidity.

TROPEX is a secret process that can be applied to practically any transformer in the THORDARSON line, though it is most efficient when used in open mounting types.

The additional cost for THORDARSON TROPEX transformers is surprisingly small. The following table has been compiled to enable you to easily determine this price increase by referring to the weight of the transformer as listed.

When ordering TROPEX add an "X" to the regular type number. For example, T-13S38-X is the TROPEX equivalent of T-13S38.

WEIGHT OF TRANSFORMER	ADD TO LIST PRICE
Up to $\frac{3}{8}$ lb.	20c
From 1 lb. to $1\frac{1}{8}$ lbs.	25c
From 2 lbs. to $2\frac{3}{8}$ lbs.	40c
From 3 lbs. to $4\frac{1}{8}$ lbs.	50c
From 5 lbs. to $6\frac{3}{8}$ lbs.	60c
Over 7 lbs.	10c per lb.

#### TROPEX REPLACEMENT AUDIO TRANSFORMERS

Type No.	Application	List Price
T-13A34-X	10,000 ohm plate to single grid	\$1.55
T-29A99-X	10,000 ohm plate to single grid	2.00
T-13A35-X	10,000 ohm plate to P.P. grids	1.70
T-33A91-X	10,000 ohm plate to P.P. grids	2.25
T-13A36-X	P.P. 10,000 ohm plates to P.P. grids	2.00
T-78D46-X	Single 30 to Class B 19, 1J6G, or 30's	1.70
T-17D01-X	Single 6F6 etc., to 2-6F6, etc.	2.25

#### TROPEX FILTER CHOKES

Type No.	Application	List Price
T-13C26-X	8 Hy at 40 M.A. 530 ohms D.C.	\$1.10
T-13C27-X	10 Hy at 40 M.A. 475 ohms D.C.	1.30
T-13C28-X	10 Hy at 65 M.A. 460 ohms D.C.	1.45
T-13C29-X	9 Hy at 85 M.A. 250 ohms D.C.	1.85
T-13C30-X	8 Hy at 150 M.A. 200 ohms D.C.	2.40
T-18C92-X	22 Hy at 35 M.A. 405 ohms D.C.	1.75
T-14C61-X	7 Hy at 55 M.A. 200 ohms D.C.	1.20
T-14C62-X	8 Hy at 55 M.A. 250 ohms D.C.	1.20
T-14C63-X	8 Hy at 55 M.A. 300 ohms D.C.	1.20
T-14C64-X	10 Hy at 55 M.A. 350 ohms D.C.	1.20

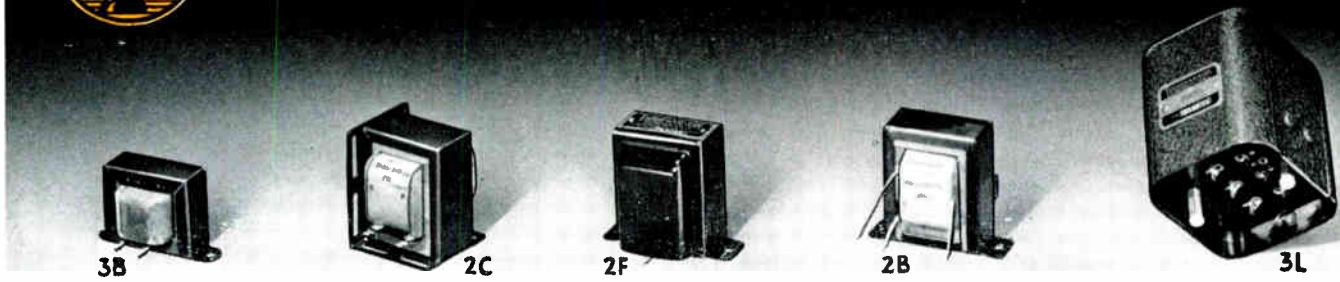
#### TROPEX OUTPUT TRANSFORMERS

Type No.	Application	List Price
T-13S37-X	Single 6F6, 42, 2A5 etc. to voice coil	\$1.45
T-13S39-X	Single 45, 1-2A5 etc. to voice coil	1.45
T-13S40-X	P.P. 6F6, 42, 2A5 etc. to voice coil	1.70
T-33S99-X	P.P. 45, 71A, 43 etc. to voice coil	1.75
T-81S01-X	Class B 19, 1J6G, 30's etc. to voice coil	1.70
T-13S43-X	Single 1F4, 1D4, 1F5G etc. to voice coil	1.55
T-14S81-X	Single 6F6, 2A5 etc. or P.P. 45, 71A etc. to voice coil	1.45
T-14S82-X	Single 25L6 etc. to voice coil	1.45

#### TROPEX UNIVERSAL OUTPUT TRANSFORMERS

Type No.	Application	List Price
T-13S38-X	Any single tube or P.P. tubes to voice coil	\$1.70
T-57S01-X		2.25
T-57S02-X		2.25
T-13S41-X		3.15
T-13S42-X	Any single tube to voice coil	1.70

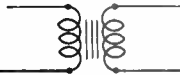





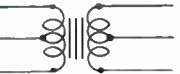
## AUDIO (A) INTERSTAGE TRANSFORMERS


For coupling the plate or plates of an amplifier stage to the grid or grids of the next stage where grid current is not drawn. RECEIVER types are designed for replacement use in radio receivers where the considerations are space, weight or cost. AMPLIFIER types are recommended for amplifier use or replacement in large receivers.

C. H. T. interstage audio transformers have hum-bucking coil construction and balanced windings. Frequency response, using parallel feed in the primary winding, is flat within  $\pm 1\frac{1}{2}$  db from 60 to 8,000 c.p.s. Compound filled cases fully protect the coils from adverse climatic conditions.

Type No.	List Price	Classification	Turns Ratio	Ohms Impedance		Pri. M.A.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.	
				Pri.	Sec.			Width	Depth	W.	D.	H.		
 <b>Single Plate To Single Grid</b>														
T-13A34	\$1.35	RECEIVER (midget)	3:1	10,000	90,000	8	3B	$2\frac{3}{8}$		$2\frac{1}{8}$	$1\frac{5}{8}$	$1\frac{5}{8}$	$\frac{3}{4}$	
T-29A99	1.75	RECEIVER	3:1	10,000	90,000	8	2B	$2\frac{3}{8}$		$2\frac{7}{8}$	2	$2\frac{3}{8}$	$1\frac{1}{4}$	
T-57A36	2.00							$2\frac{3}{8}$		$2\frac{7}{8}$	$2\frac{3}{8}$	$2\frac{3}{8}$	$1\frac{1}{2}$	
T-47A25	1.75						2C	$1\frac{3}{8}$	$1\frac{1}{2}$	2	$1\frac{15}{16}$	$2\frac{3}{8}$	1	
T-75A74	2.50	RECEIVER	2:1	10,000	40,000	8	2F	$2\frac{3}{8}$		$2\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{3}{8}$	$1\frac{1}{2}$	
For super-regenerative detector; has static shield between windings.														
T-57A38	2.75	AMPLIFIER	3:1	10,000	90,000	8	2F	$2\frac{15}{16}$		$3\frac{3}{8}$	$2\frac{1}{2}$	3	$2\frac{1}{4}$	
T-15A73	6.50	C.H.T.	2:1	10000	2500	40000	10000	10*	3L	$2\frac{1}{8}$	$2\frac{3}{4}$	3	$3\frac{1}{2}$	$2\frac{1}{2}$
Maximum Signal Level + 15 db *Parallel feed recommended.														

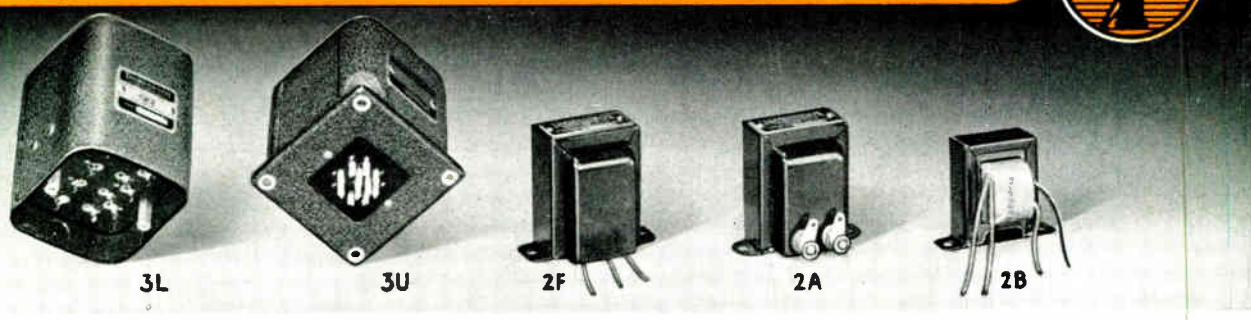
 <b>Single Plate To Push-Pull Grids</b>														
T-14A92	\$1.25	RECEIVER (midget)	3:1	10,000	90,000	8	3B	2		$2\frac{3}{8}$	$1\frac{3}{8}$	$1\frac{3}{8}$	$\frac{1}{2}$	
T-13A35	1.50	RECEIVER (midget)	3:1	10,000	90,000	8	3B	$2\frac{3}{8}$		$2\frac{15}{16}$	$1\frac{5}{8}$	$1\frac{5}{8}$	$\frac{3}{4}$	
T-33A91	2.00	RECEIVER	3:1	10,000	90,000	8	2B	$2\frac{3}{8}$		$2\frac{7}{8}$	2	$2\frac{3}{8}$	$1\frac{1}{4}$	
T-86A03	2.00							$2\frac{3}{8}$		$3\frac{3}{16}$	2	2	$1\frac{1}{2}$	
T-14A29	2.25						2C	$1\frac{1}{2}$	$1\frac{1}{2}$	2	$1\frac{15}{16}$	$2\frac{3}{8}$	$1\frac{1}{4}$	
T-57A39	2.25						2F	$2\frac{3}{8}$		$2\frac{3}{4}$	$2\frac{1}{8}$	$2\frac{3}{8}$	$1\frac{1}{2}$	
T-57A40	2.75	AMPLIFIER	3:1	10,000	90,000	8	2B	$2\frac{15}{16}$		$3\frac{3}{8}$	$2\frac{1}{8}$	3	2	
T-57A41	3.00							$2\frac{15}{16}$		$3\frac{3}{8}$	$2\frac{1}{2}$	3	$2\frac{1}{4}$	
T-74A31	3.25	AMPLIFIER	1:1	10,000	10,000	8	2F	$2\frac{15}{16}$		$3\frac{3}{8}$	$2\frac{1}{2}$	3	$2\frac{1}{4}$	
T-57A42	3.25	RECEIVER (large)	3:1	10,000	90,000	8	2B	$2\frac{15}{16}$		$3\frac{3}{8}$	$2\frac{1}{8}$	3	2	
For coupling screen grid or power detector (Clarion AC-60)														
T-15A74	6.50	C.H.T.	2:1	10,000	2,500	40,000	10,000	10*	3L	$2\frac{1}{8}$	$2\frac{3}{4}$	3	$3\frac{1}{2}$	$2\frac{1}{2}$
Max. signal level + 15 db *Parallel feed recommended.														

 <b>Push-Pull Plates To Push-Pull Grids</b>														
T-13A36	\$2.00	RECEIVER (midget)	1:1	20,000	20,000	8†	3B	$2\frac{11}{16}$		3	$1\frac{3}{4}$	2	1	
T-67A91	3.00	AMPLIFIER	1.5:1	20,000	45,000	10†	2B	$2\frac{15}{16}$		$3\frac{3}{8}$	$2\frac{1}{8}$	3	2	
T-58A70	3.25							$2\frac{15}{16}$		$3\frac{3}{8}$	$2\frac{1}{2}$	3	$2\frac{1}{4}$	
T-15A75	7.00	C.H.T.	1.5:1	20,000	5,000	45,000	11,500	10†	3L	$2\frac{1}{8}$	$2\frac{3}{4}$	3	$3\frac{1}{2}$	$2\frac{1}{2}$
Maximum signal level + 15 db														
†Each side.														

 <b>Universal Interstage Replacement Transformer</b>													
Will couple single plate to single grid, single plate to push-pull grids or push-pull plates to push-pull grids. Has split secondary.													
T-17A02	\$2.25	RECEIVER	3:1	Universal		10	2F	$2\frac{3}{8}$		$2\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{3}{8}$	$1\frac{1}{2}$

### No. 352 — Replacement Encyclopedia and Service Guide. Free

Thordarson Replacement Transformer Encyclopedia and Service Guide No. 352 recommends proper transformer and choke replacement for receivers listed in Rider's Manuals. This handy, useful time-saver, originated by Thordarson, is now used by good service engineers the world over. In addition, it contains a new edition of the popular Service Guide giving practical solutions to everyday service problems, including useful charts and tables.



**AUDIO (A) INPUT TRANSFORMERS**

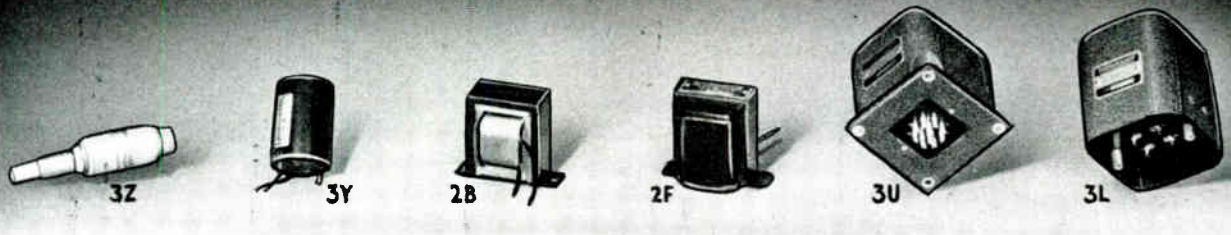
For coupling a signal source to the grid or grids of a Class A amplifier stage. Compact and inexpensive types, varying in size, style of mounting and application, are offered in this listing. C. H. T. input trans-

formers feature hum-bucking coil construction, balanced windings and compound filled cases which protect coils against unfavorable climatic conditions. Frequency range of C. H. T. types is flat within  $\pm 1\frac{1}{2}$  db from 60 to 8,000 c.p.s.

Type No.	List Price	Application	Ohms Impedance		Turns Ratio	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
			Pri.	Sec.			Width	Depth	W.	D.	H.	
<b>Low Impedance Source (Microphone, Line or Mixer) to Grid</b>												
T-65A73	\$2.75	DB mike to grid	200 / 50	100,000	1:22.2	2F	2 $\frac{5}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2
T-30A20	3.00					2A	2 $\frac{1}{16}$	2 $\frac{1}{16}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{7}{8}$	2
T-58A37	2.25	DB mike to grid	200 / 50	100,000	1:22.2	2F	2 $\frac{3}{8}$		2 $\frac{3}{4}$	2 $\frac{1}{8}$	2 $\frac{3}{8}$	1 $\frac{1}{2}$
T-83A78	2.00	Single button mike to single or P-P grids	100	400,000 Ct.	1:64	2F	2 $\frac{3}{8}$		2 $\frac{7}{8}$	1 $\frac{7}{8}$	2 $\frac{3}{4}$	1 $\frac{1}{4}$
T-86A02	1.75					2B	2 $\frac{3}{8}$		2 $\frac{7}{8}$	1 $\frac{3}{4}$	2 $\frac{3}{8}$	1
T-23A57	2.50	Single button mike to single grid	100	400,000	1:64	2A	2 $\frac{3}{8}$		2 $\frac{7}{8}$	2 $\frac{13}{16}$	2 $\frac{3}{8}$	1 $\frac{1}{4}$
T-55A16	2.75	Dyn. mike, line or mixer to single or P-P grids	200 / 50	100,000 Ct.	1:22.3	2F	2 $\frac{3}{8}$		2 $\frac{7}{8}$	2 $\frac{1}{8}$	2 $\frac{3}{8}$	1 $\frac{1}{2}$
T-63A72	3.75	Low impedance to grid	50 / 100 / 150 / 200	100,000	1:22.2	2F	2 $\frac{5}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$
T-63A71	3.75	Low impedance to grid	200 / 400 / 600 / 800	100,000	1:11	2F	2 $\frac{5}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$
T-61A94	3.25	Line to single or P-P C.I.A. grids	500 / 125	100,000 Ct.	1:14.1	2F	2 $\frac{5}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$
T-72A59	1.65	Plate and Single Button microphone to grid	5,000 / 200	100,000	1:3.25 / 1:35	2B	2 $\frac{1}{8}$		2 $\frac{9}{16}$	1 $\frac{5}{8}$	2	$\frac{3}{4}$
T-14A94	2.50	Voice Coil to grid	4-8	100,000	1:112	2B	2 $\frac{3}{8}$		2 $\frac{7}{8}$	1 $\frac{3}{4}$	2 $\frac{3}{8}$	1
T-15A66	7.25	C.H.T. Low Impedance to grid	500 / 333 / 250 / 200 / 125 / 50	60,000 / 15,000 Single Grid	1:10.95	3L	2 $\frac{1}{8}$		2 $\frac{3}{4}$	3	3 $\frac{1}{2}$	2 $\frac{1}{4}$
T-15A67	8.00	C.H.T. Low Impedance P-P grids	500 / 333 / 250 / 200 / 125 / 50	120,000 / 30,000 P-P Grids	1:15.5	3L	2 $\frac{1}{8}$		2 $\frac{3}{4}$	3	3 $\frac{1}{2}$	2 $\frac{1}{4}$
T-15A68	8.00	C.H.T. Low Impedance to single grid	60 / 38 / 30 / 22 / 15 / 10 / 5.5 / 2.5	60,000 / 15,000 Single Grid	1:31.6	3L	2 $\frac{1}{8}$		2 $\frac{3}{4}$	3	3 $\frac{1}{2}$	2 $\frac{1}{2}$
T-17A42	9.00	C. H. T. MAGNETICALLY SHIELDED	500† / 333 / 250 / 200† / 125 / 50	50,000 Single Grid	1:10	3U	2 $\frac{3}{8}$	2	2 $\frac{7}{8}$	2 $\frac{7}{16}$	3 $\frac{1}{8}$	1 $\frac{1}{4}$
T-15A65	10.50	C.H.T. Multiple Tap	500 / 333 / 250 / 200 / 125 / 50	50,000 / 12,500 / P-P C.I.A. 845	1:10	3K	3 $\frac{7}{32}$	2 $\frac{7}{8}$	4	4 $\frac{1}{2}$	4 $\frac{7}{8}$	8
<b>Microphone or Line to Mixer or Line</b>												
T-70A82	\$3.50	DB mike to line	200 / 50	500 / 125	1:1.68	2F	2 $\frac{5}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$
T-70A83	3.50	Crystal mike to line or mixer	100,000	200 / 50	1:22.4	2F	2 $\frac{5}{16}$		3 $\frac{3}{8}$	2 $\frac{1}{2}$	3	2 $\frac{1}{4}$
T-15A69	7.25	C.H.T. Low Impedance to mixer or line	500 / 333 / 250 / 200 / 125 / 50	500 / 333 / 250 / 200 / 125 / 50	1:1	3L	2 $\frac{1}{8}$		2 $\frac{3}{4}$	3	3 $\frac{1}{2}$	2
T-15A70	7.50	C.H.T. Dyn. mike to mixer or line	60 / 38 / 30 / 22 / 15 / 10 / 5.5 / 2.5	500 / 333 / 250 / 200 / 125 / 50	1:2.88	3L	2 $\frac{1}{8}$		2 $\frac{3}{4}$	3	3 $\frac{1}{2}$	2
<b>Tube to Line or Mixer (Low Level) *Indicates Primary M.A.</b>												
T-14A90	\$2.50	Sgl. or P-P Plates to line or mixer	20,000 Ct.	500 / 125	8*	2F	2 $\frac{3}{8}$		2 $\frac{3}{4}$	2 $\frac{1}{8}$	2 $\frac{3}{8}$	1 $\frac{1}{2}$
T-14A91	2.50	Sgl. or P-P Plates to line or mixer	20,000 Ct.	200 / 50	8*	2F	2 $\frac{3}{8}$		2 $\frac{3}{4}$	2 $\frac{1}{8}$	2 $\frac{3}{8}$	1 $\frac{1}{2}$
T-72A59	1.65	Plate and sgl. button mike to grid	5,000 and 200	100,000	10*	2B	2 $\frac{1}{8}$		2 $\frac{9}{16}$	1 $\frac{5}{8}$	2	$\frac{3}{4}$
T-15A71	7.25	C.H.T. single plate to line or mixer.	20,000 / 5,000 Single Plate	500 / 333 / 250 / 200 / 125 / 50	8*	3L	2 $\frac{1}{8}$		2 $\frac{3}{4}$	3	3 $\frac{1}{2}$	1 $\frac{3}{4}$
T-15A72	7.25	C.H.T. P-P plates to line or mixer.	20,000 / 5,000 P-P Plates	500 / 333 / 250 / 200 / 125 / 50	0*	3L	2 $\frac{1}{8}$		2 $\frac{3}{4}$	3	3 $\frac{1}{2}$	1 $\frac{3}{4}$
T-17A43	9.00	C.H.T. MAGNETICALLY SHIELDED	10,000 to 15,000	500† / 333 / 250 / 200† / 125 / 50	0	3U	2 $\frac{3}{8}$	2	2 $\frac{7}{8}$	2 $\frac{7}{16}$	3 $\frac{1}{8}$	1 $\frac{1}{4}$

† Balanced center tap.





### C. H. T. MAGNETICALLY SHIELDED TRANSFORMERS

Designed for airport and police transmitters, public address systems and amateur applications. Three telescopic high permeability shields and hum-bucking balanced coil construction result in extremely low hum pick-up. Frequency response is flat within  $\pm 2$  db from 60 to 10,000 c.p.s. and maximum level is  $+ 10$  db.

Complete isolation is assured through electrostatic shields between primary and secondary windings.

The C.H.T. case is filled with moisture-proof compounds for complete coil protection against humidity. Sturdy, tinned, machined brass lugs are staggered for accessibility and grouped in circular fashion to clear through a  $1\frac{1}{8}$ " socket-punch hole.

Type No.	List Price	Application	Ohms Impedance		Pri. M.A.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
			Pri.	Sec.			Width	Depth	W.	D.	H.	
T-17A42*	\$9.00	Multiple Line to Single Grid	500†/333/250/ 200†/125/ 50	50,000 Single Grid	75	3U	2 $\frac{3}{8}$	2	2 $\frac{7}{8}$	2 $\frac{7}{8}$	3 $\frac{1}{8}$	1 $\frac{1}{4}$
T-17A43	9.00	Single Plate to Multiple Line. No D.C. in Pri.	10,000 to 15,000	500†/333/250/ 200†/125/ 50	0	3U	2 $\frac{3}{8}$	2	2 $\frac{7}{8}$	2 $\frac{7}{8}$	3 $\frac{1}{8}$	1 $\frac{1}{4}$

\*Min. Level—20DB. † Indicates balanced center tap.

### MICROPHONE CABLE TRANSFORMERS

Permit quick and efficient change from high to low impedance microphone input on any amplifier. Hum pick-up is reduced to a minimum through the use of magnetic shielding. As the illustration shows, these Microphone Cable transformers, exclusively Thordarson, are connected in series with the microphone cable and the amplifier input connector and are small and inconspicuous. Frequency Response  $\pm 1\frac{1}{2}$  db from 30 to 15,000 c.p.s.

tion shows, these Microphone Cable transformers, exclusively Thordarson, are connected in series with the microphone cable and the amplifier input connector and are small and inconspicuous. Frequency Response  $\pm 1\frac{1}{2}$  db from 30 to 15,000 c.p.s.

Type No.	List Price	Ohms Impedance		Turns Ratio	Mtg. Fig.	Dimensions			Wt. Lbs.
		Pri.	Sec.			W.	D.	H.	
T-14A75	\$14.50	30-50	50,000	1:31.6	3Z	1	1	2 $\frac{11}{16}$	$\frac{3}{4}$
T-14A76	14.50	200-250	50,000	1:14.14	3Z	1	1	2 $\frac{9}{16}$	$\frac{3}{4}$



### CHOKES AND REACTORS (C)

#### Parallel Feed Audio Reactors

For supplying plate current to a vacuum tube where it is desirable to isolate plate current from the transformer primary or where the voltage drop caused by a resistor load is objectionable.

Type No.	List Price	Application	Typical Tubes	Induct. Hen.	Cur. M.A.	D.C. Ohms	R.M.S. Test Volts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
									Width	Depth	W.	D.	H.	
T-37C36	\$2.00	Plate Impedance	56-30-76-6C5-55-85, etc.	300	5	6470	1600	2F	2 $\frac{3}{8}$	2 $\frac{7}{8}$	2 $\frac{1}{8}$	2 $\frac{3}{8}$	1 $\frac{1}{2}$	
T-67C46	1.75							2B	2 $\frac{3}{8}$	2 $\frac{7}{8}$	2	2 $\frac{3}{8}$	1 $\frac{1}{4}$	
T-52C98	1.75	Plate Impedance for screen Grid detector or as grid impedance	24-57-56-76-6C5-6F5-6J7	700	.5	6150	1600	2F	2 $\frac{3}{8}$	2 $\frac{7}{8}$	1 $\frac{7}{8}$	2 $\frac{3}{8}$	1 $\frac{1}{4}$	
T-29C27	1.50							2B	2 $\frac{3}{8}$	2 $\frac{7}{8}$	1 $\frac{3}{4}$	2 $\frac{3}{8}$	1	
T-68C08	1.75	Plate Impedance or Filter	45-46-10, etc.	22	35	405	1600	2F	2 $\frac{3}{8}$	2 $\frac{3}{4}$	2 $\frac{1}{8}$	2 $\frac{3}{8}$	1 $\frac{1}{2}$	
T-18C92	1.50							3B	2 $\frac{7}{8}$	3 $\frac{3}{8}$	2	2	1 $\frac{1}{2}$	
T-15C52	5.00	C.H.T. Plate Impedance	6C5-6A6-6F8G 6U5-6L5G-7A4	30 Parallel 120 Series	35 17		1600	3L	2 $\frac{1}{8}$	2 $\frac{3}{4}$	3	3 $\frac{1}{2}$	3	
T-15C53	5.50	C.H.T. Plate Impedance	6V6-6F6-6E6 6AL6G-7C5	12 Parallel 50 Series	100 50		1600	3L	2 $\frac{1}{8}$	2 $\frac{3}{4}$	3	3 $\frac{1}{2}$	3 $\frac{1}{4}$	
T-15C54	5.50	C.H.T. Plate Impedance	2A3-6A3-6A5G 6B4G-6L6-6Y6G	8 Parallel 32 Series	150 75		1600	3L	2 $\frac{1}{8}$	2 $\frac{3}{4}$	3	3 $\frac{1}{2}$	3 $\frac{1}{2}$	

#### Tuned Audio Circuit Reactors

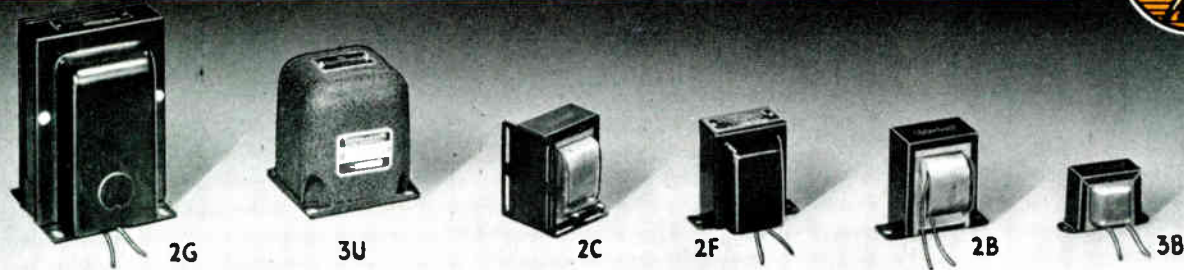
T-81C15	\$2.50	Tuned Audio Circuits	.75	.5	30			2B	2 $\frac{1}{8}$	2 $\frac{9}{16}$	1 $\frac{5}{8}$	2	$\frac{3}{4}$
T-93C20	3.00	Tuned Audio Circuits	250	.5	6400			2B	2 $\frac{3}{8}$	2 $\frac{7}{8}$	2	2 $\frac{3}{8}$	1 $\frac{1}{4}$
T-74C30	1.50	Tuned Audio Circuits or Filter	42	15	2100			2B		2	1 $\frac{1}{2}$	2 $\frac{3}{8}$	1

### DUAL TONE CONTROL COMPONENTS

As illustrated and described in Amplifier Guide 346D

T-14C70	2.50	Tone Control, hum-bucking type	22	0	220			3Y	1 $\frac{7}{16}$	1 $\frac{9}{16}$	1 $\frac{9}{16}$	2 $\frac{1}{4}$	1 $\frac{1}{2}$
R-1068	2.50	Dual tone control potentiometer											





**CHOKES AND REACTORS (C)**

**C. H. T. SPEECH FILTER**

This hi-pass filter with a cut-off below 200 c.p.s. provides a definite increase in effective side band power and corresponding reduction

of hum pick-up. It may be used instead of an interstage audio transformer to couple a single plate to single or push-pull grids.

Type No.	List Price	Application	Induct. Hen.	Cur. M.A.	D.C. Ohms	R.M.S. Test Volts	Mtg. Centers			Dimensions			Wt. Lbs.
							Fig.	Width	Depth	W.	D.	H.	
T-15C34	\$8.25	Plate to Single or P.P. tubes					3U	2 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	2 <sup>11</sup> / <sub>16</sub>	3 <sup>15</sup> / <sub>16</sub>	3

**C. H. T. SPLATTER CHOKES**

These tapped chokes are used between any Class B modulator and any Class C stage for eliminating objectionable side band splatter due to excessive audio distortion. Full instructions for operation are furnished.

Type No.	List Price	Application	Induct. Hen.	Cur. M.A.	D.C. Ohms	R.M.S. Test Volts	Mtg. Fig.	Width	Depth	W.	D.	H.	Wt. Lbs.
T-15C30	\$3.25	Elimination of side band Splatter	.025 to .8	150	54	3000	3U	2 <sup>3</sup> / <sub>8</sub>	1 <sup>15</sup> / <sub>16</sub>	2 <sup>7</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>4</sub>	2
T-15C31	4.50		.025 to .8	300	20	500C	3U	2 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	2 <sup>11</sup> / <sub>16</sub>	3 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>
T-15C32	5.25		.025 to .8	500	14	7500	3U	2 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	2 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>2</sub>

**FILTER CHOKES**

Thordarson filter reactors are rated in henries under actual working conditions. It is well known that as the D.C. current in a choke increases, there is a corresponding decrease in inductance. In selecting a filter choke from this listing, full assurance may be had that inductance rating has been measured under full operating load conditions.



**Replacement Filter Chokes**

Type No.	List Price	Inductance		Current Rating M.A.	D.C. Res. Ohms	R.M.S. Test Volts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
		At Zero D.C.	At Rated D.C.					Width	Depth	W.	D.	H.	
T-13C26	\$ .90	21	8	40	530	1600	3B	2		2 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-13C27	1.10	22	10	40	475	1600	3B	2 <sup>3</sup> / <sub>8</sub>		2 <sup>15</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>
T-13C28	1.20	20	10	65	460	1600	3B	2 <sup>11</sup> / <sub>16</sub>		3	1 <sup>3</sup> / <sub>4</sub>	2	1
T-43C92	1.65	24	10	75	260	1600	2C	1 <sup>9</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>2</sub>	2	1 <sup>5</sup> / <sub>16</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>
T-47C07	1.65	20	12	75	410	1600	3B	3 <sup>1</sup> / <sub>8</sub>		3 <sup>5</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>4</sub>
T-44C02	1.50	31	12	80	405	1600	3B	2 <sup>7</sup> / <sub>8</sub>		3 <sup>3</sup> / <sub>16</sub>	2	2	1 <sup>1</sup> / <sub>4</sub>
T-57C51	1.50	15	6	80	138	1600	2B	2 <sup>3</sup> / <sub>8</sub>		2 <sup>7</sup> / <sub>8</sub>	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>
T-13C29	1.60	20	9	85	250	1600	3B	2 <sup>3</sup> / <sub>4</sub>		3 <sup>3</sup> / <sub>16</sub>	2	2	1 <sup>1</sup> / <sub>2</sub>
T-68C07	2.00	32	15	85	375	1600	2B	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3	2
T-57C53	2.00	27	10	110	200	1600	2B	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3	2 <sup>1</sup> / <sub>4</sub>
T-75C49	1.50	22	8	120	290	1600	3B	2 <sup>3</sup> / <sub>4</sub>		3 <sup>3</sup> / <sub>16</sub>	2	2	1 <sup>1</sup> / <sub>2</sub>
T-53C19	1.50						2B	2 <sup>3</sup> / <sub>8</sub>		2 <sup>7</sup> / <sub>8</sub>	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-13C30	2.00	25	8	150	200	1600	2B	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3	2 <sup>1</sup> / <sub>4</sub>

**Filter Chokes for Replacement in AC-DC Receivers**

T-14C61	\$1.00	14	7	55	200	1600	3B	2 <sup>3</sup> / <sub>8</sub>		2 <sup>15</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>
T-14C62	1.00	16	8	55	250	1600	3B	2 <sup>3</sup> / <sub>8</sub>		2 <sup>15</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>
T-14C63	1.00	19	8	55	300	1600	3B	2 <sup>3</sup> / <sub>8</sub>		2 <sup>15</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>
T-14C64	1.00	21	10	55	350	1600	3B	2 <sup>3</sup> / <sub>8</sub>		2 <sup>15</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>

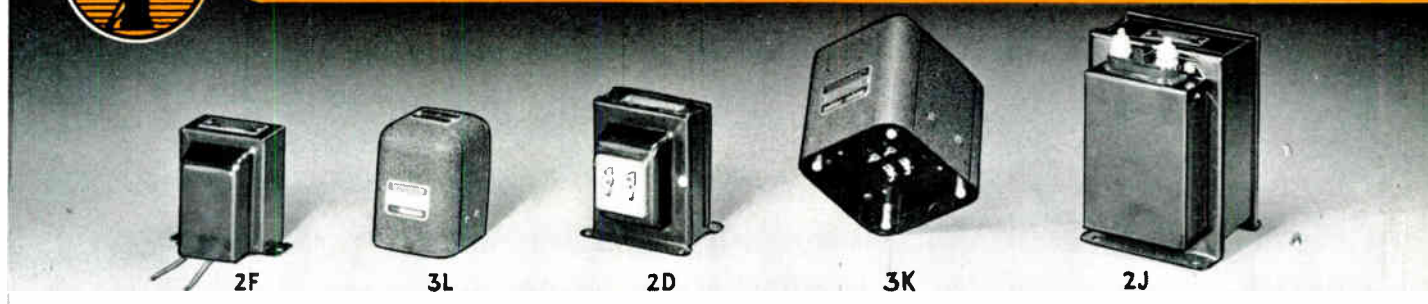
**Filter Chokes for Amplifiers and Small Transmitters**

T-57C52	\$1.75	15	6	80	138	1600	2F	2 <sup>3</sup> / <sub>8</sub>		2 <sup>7</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-16C07	2.25	32	15	85	375	1600	2F	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	3	2 <sup>1</sup> / <sub>4</sub>
T-57C54	2.25	27	10	110	200	1600	2F	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	3	2 <sup>1</sup> / <sub>4</sub>
T-49C91	1.50	12	4	120	160	1600	2F	2 <sup>3</sup> / <sub>8</sub>		2 <sup>7</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>
T-17C00-B	2.75	28	12	150	231	1600	2F	3 <sup>3</sup> / <sub>8</sub>		3 <sup>15</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>
T-74C29	3.75	29	15	150	200	2000	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>4</sub>
T-67C49	2.75	12	5	200	80	1600	2F	3 <sup>1</sup> / <sub>2</sub>		3 <sup>15</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>
T-75C51	5.00	24	13	250	121	1600	2G	3	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>11</sup> / <sub>16</sub>	4 <sup>15</sup> / <sub>16</sub>	8

**Television Filter Reactor**

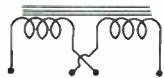
Type No.	List Price	Filter Reactor		R.M.S. Test Volts	D.C. Res.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
		Inductance Henries	Current M.A.				Width	Depth	W.	D.	H.	
T-17C40	\$4.75	1500	3	10,000	12,000	2F	3 <sup>3</sup> / <sub>8</sub>		3 <sup>15</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>2</sub>	2 <sup>1</sup> / <sub>4</sub>

See Page 19 for listing of Television Power Transformers.



## CHOKES (C)

### C.H.T. AMPLIFIER CHOKES



Two inductance ratings are shown, one for parallel connection of the two windings and the other for series connection. Cases are compound filled for complete coil protection.

Type No.	List Price	Inductance Henries	Current M.A.	R.M.S. Test Volts	D.C. Res.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
							Width	Depth	W.	D.	H.	
T-15C52	\$5.00	30 Parallel 120 Series	35 17	1,600	675 2700	3L	2 1/8		2 3/4	3	3 1/2	3
T-15C53	5.50	12 Parallel 50 Series	100 50	1,600	272 1090	3L	2 1/8		2 3/4	3	3 1/2	3 1/4
T-15C54	5.50	8 Parallel 32 Series	150 75	1,600	184 735	3L	2 1/8		2 3/4	3	3 1/2	3 1/2
T-15C55	7.00	2 Parallel 8 Series	500 250	1,600	32 130	3K	3 7/32	2 7/8	4	4 1/2	4 3/8	7 1/2
T-15C56	9.00	2 Parallel 8 Series	700 350	1,600	27 107	3K	3 7/32	2 7/8	4	4 1/2	4 7/8	9 3/4

### TRANSMITTER INPUT AND FILTER CHOKES

Matched input and smoothing chokes for amateur, amplifier or experimental applications. Inductance values are measured under full load conditions and adequate insulation is provided for recommended service.

Type No.	List Price	Current D.C. M.A.	Inductance Henries	D.C. Res. Ohms	R.M.S. Test Volts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
							Width	Depth	W.	D.	H.	
<b>Input Chokes "19" Series</b>												
T-19C39	\$3.25	150	5-20	215	3000	2F	3 3/8		3 13/16	3 3/2	3 1/2	3 3/4
T-19C35	4.00	200	5-20	130	3000	2D	3 1/4	2 1/16	3 3/4	3 3/8	4	5 1/2
T-19C36	6.50	300	5-20	105	5000	2D	2 3/4	3 1/16	3 13/16	4 7/8	4 5/8	10 3/4
T-19C37	10.00	400	5-20	90	5000	2J	3 1/4	3 7/8	4 1/4	5 3/8	6 1/16	19 1/2
T-19C38	14.00	500	5-20	75	5000	2J	3 7/8	3 3/4	5	5 1/2	6 5/8	25 1/4
<b>Smoothing Chokes "19" Series</b>												
T-19C46	\$3.25	150	12	215	3000	2F	3 3/8		3 13/16	3 3/2	3 1/2	3 3/4
T-19C42	4.00	200	12	130	3000	2D	3 1/4	2 1/16	3 3/4	3 3/8	4	5 1/2
T-19C43	6.50	300	12	105	5000	2D	2 3/4	3 1/16	3 13/16	4 7/8	4 5/8	10 3/4
T-19C44	10.00	400	12	90	5000	2J	3 1/4	3 7/8	4 1/4	5 3/8	6 1/16	19 3/4
T-19C45	14.00	500	12	75	5000	2J	3 7/8	3 3/4	5	5 7/8	6 5/8	25 1/4

### C.H.T. TRANSMITTER CHOKES



Conservatively designed for continuous and quiet operation. Cases are compound filled for complete coil protection.

#### C.H.T. Input Chokes

T-15C36	\$8.00	200-20	5-25	105	4,000	3L	2 7/8	3 7/32	4 1/16	4 1/2	4 7/8	10
T-15C37	10.00	300-30	5-25	78	4,000	3L	3 13/16	4 3/32	5 3/16	5 9/16	6 3/4	22
T-15C38	14.00	400-30	5-25	95	4,000	3L	3 13/16	4 3/32	5 3/16	5 9/16	6 3/4	24
T-15C39	22.00	500-30	5-25	86	10,000	3L	4 9/16	5 3/32	5 7/8	7 5/16	8 1/4	38 1/2
T-15C41	26.50	650-50	5-25	46	10,000	3L	5 1/16	6 3/32	7	7 9/16	8	51

#### C.H.T. Smoothing Chokes

T-15C45	\$8.00	200	12	105	4,000	3L	2 7/8	3 7/32	4 1/16	4 1/2	4 7/8	10
T-15C46	10.00	300	12	78	4,000	3L	3 13/16	4 3/32	5 3/16	5 9/16	6 3/4	22
T-15C47	14.00	400	12	95	4,000	3L	3 13/16	4 3/32	5 3/16	5 9/16	6 3/4	24
T-15C48	22.00	500	12	86	10,000	3L	4 9/16	5 3/32	5 7/8	7 5/16	8 1/4	38 1/2
T-15C50	26.50	650	12	46	10,000	3L	5 1/16	6 3/32	7	7 9/16	8	51





2D



3L



2F



2B



3B

**DRIVER (D) TRANSFORMERS**

For coupling the plate or plates of an amplifier stage to the grids of an amplifier stage in which grid current is drawn during a part of the audio cycle.

Type No.	List Price	Driver Tubes	Output Tubes	Class	Ratio Pri. to 1/2 Sec.	Pri. M.A.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
								Width	Depth	W.	D.	H.	

**DRIVER TRANSFORMERS FOR SPECIFIC APPLICATIONS**

These driver transformers have the correct primary to secondary ratio for the tubes specified, which assures good regulation and minimum driver distortion on the positive grid peaks. The first three types are specifically designed for replacement requirements.



<b>T-78D46</b>	<b>\$1.50</b>	1-30	1-1J6G, 19 2-30	B	2.4:1	7	2B	2 1/8	2 3/8	1 5/8	2	3/4	
<b>T-17D01</b>	<b>2.00</b>	1-6F6 Triode 1-42 Triode, 1-2A5 Triode	2-6F6, 6L6, etc.	AB	1.7:1 1.5:1, 1.3:1	31	3B	2 7/8	3 3/8	2	2	1 1/2	
<b>T-14D93</b>	<b>1.75</b>	1-76 Triode	1-6A6, 6N7	B	4:1	8	3B	2 3/8	2 5/8	1 5/8	1 5/8	3/4	
<b>T-19D06</b>	<b>2.75</b>	1-6A6, 1-6N7, 1-6C5	1-6A6, 6N7	B	5:1, 4:1, 3:1, 2.5:1	10	2F	2 3/8	2 7/8	2 1/8	2 3/8	1 1/2	
<b>T-54D63</b>	<b>2.25</b>	1-30, 1-49, 1-6C5	1-1J6G, 19, 2-49, 2-6V6	B, AB2	2.4:1	7	2F	2 3/8	2 7/8	1 7/8	2 3/8	1 1/4	
<b>T-67D50</b>	<b>2.50</b>	1-89 Triode	1-79	B	2:1	32	2F	2 3/8	2 3/4	2 1/8	2 3/4	1 1/2	
<b>T-67D47</b>	<b>2.50</b>	1-6N7, 6A6, 53	1-6N7, 6A6, 53	B	5.25:1	10	2F	2 3/8	2 3/4	2 1/8	2 3/4	1 1/2	
<b>T-81D52</b>	<b>3.25</b>	1-6C5, 76 1-56	2-6F6 Triode 2-42, 2A5 Triode	AB AB	1.82:1 1.67:1	8	2F	2 5/8	3 3/8	2 1/2	3	2 1/4	
<b>T-84D59*</b>	<b>3.25</b>	2-6C5, 6N7 2-6A6, 53	2-6L6, 6V6 2-6N7, 6A6, 53	AB2 B	5:1	10	2F	2 5/8	3 3/8	2 1/2	3	2 1/4	
<b>T-74D32</b>	<b>3.25</b>	2-6C5, 76, 56	2-6F6, 42, 2A5 4-2A3, 6B4G	AB2 AB	3:1	10	2F	2 5/8	3 3/8	2 1/2	3	2 1/4	
<b>T-81D42</b>	<b>3.25</b>	1-6F6 Triode 1-42 Triode 1-2A5 Triode	2-6F6 Triode 2-42 or 2-2A5 Pentode	AB2 AB2 AB2	1.7:1 1.5:1 1.3:1	31	2F	2 5/8	3 3/8	2 1/2	3	2 1/4	
<b>T-17D03*</b>	<b>4.50</b>	1-6F6 Triode	2-6L6	AB2	1.4:1	40	2F	3 3/8	3 9/8	3 1/8	3 1/2	3 1/2	
<b>T-17D04*</b>	<b>4.50</b>	2-6F6	4-6L6	AB2	2.6:1	32	2F	3 3/8	3 9/8	3 1/8	3 1/2	3 1/2	
<b>T-67D78</b>	<b>3.00</b>	1-46, 59, 6F6, 42, 2A5 Triode	2-46, 59 2-6L6	B AB2	2.2:1	32	2F	2 5/8	3 1/8	2 1/2	3	2 1/4	
<b>T-75D10*-</b>	<b>5.00</b>	2-2A3 P-P	2-838, 805, TZ-40	B	3.2:1	130	2D	3 1/4	2 1/8	3 3/4	3 3/8	4	5

\*Split secondary as required for inverse feedback and separate power tube bias.

**C.H.T. Driver Transformers**

With hum-bucking coil construction and other C. H. T. premium quality features including compound filled cases.

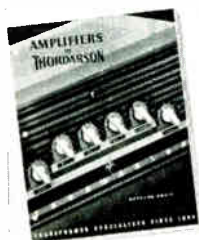
<b>T-15D85</b>	<b>\$7.50</b>	Sgl. 6F6, 42, 2A5 Triode	P.P. 6L6	AB2	1.4:1, 1.3:1 1.2:1	40	3L	2 1/8	2 3/4	3	3 1/2	2 1/2
<b>T-15D86</b>	<b>7.50</b>	P.P. 6F6, 42, 2A5 Triodes	P.P. Par. 6L6	AB2	2.6:1	32	3L	2 1/8	2 3/4	3	3 1/2	2 1/2

**Line-to-Grid Driver Transformers (High Level)**

<b>T-83D21</b>	<b>\$3.50</b>	Line 500 ohms	2-6L6, 50 12,500/5,100 Ohms	AB	1:32, 1:5		2F	2 5/8	3 3/8	2 1/2	3	2 1/4	
<b>T-15D87</b>	<b>11.00</b>	C. H. T. 500/333/250 200/125/50 Ohms	2-845 7,220 Ohms	AB	Variable		3K	2 7/8	3 7/2	4 1/8	4 1/2	4 7/8	8

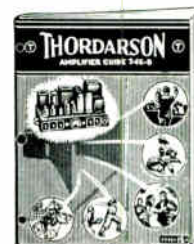
**THORDARSON AMPLIFIERS  
(Factory Wired and Tested)**

The finest amplifiers are built by Thordarson — pioneers in producing quality audio components. Absolute fidelity is assured by accurate laboratory design and rigid inspection during production. New models from 8 to 900 watts satisfy practically every sound requirement. Pre-amplifiers and boosters round out a truly complete line of equipment for sound technicians. Fully described in Catalog 600E.



**No. 346—Amplifier Guide 15c Postpaid**

P. A. men and experimenters interested in building high quality amplifiers find the Thordarson Amplifier Guide No. 346 a worthwhile source of information. It contains laboratory designed and tested circuits of amplifiers from 8 to 120 watts output. Complete parts list, mechanical chassis drawings, and comprehensive illustrations enable the constructor to obtain superior results with matched transformer and choke components. Data are included for pre-amplifiers, dual tone controls, speaker impedance matching and testing.







## UNIVERSAL AND MULTI-MATCH DRIVER (D) TRANSFORMERS

Versatility of application reduces to a minimum transformer obsolescence which is a costly problem to the amateur in these days of rapid tube development. Through the use of five ratios on each transformer, these transformers will handle all driver

requirements usually encountered in amateur transmitter circuits. See complete table of Driver and Modulator combinations on page 12 and 13.

Type No.	List Price	Cap. Watts	Max. Pri. M.A. Per Side	Ratio Pri. to 1/2 Sec.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
						Width	Depth	W.	D.	H.	
<b>Universal Driver Transformers "19" Series</b>											
T-19D01	\$6.00	15	60	1:1, 1.2:1, 1.4:1, 1.6:1, 1.8:1	4D	3 3/8	2 7/8	3 13/16	3 3/2	3 1/2	3 1/2
T-19D02	6.00	15	60	2:1, 2.2:1, 2.4:1, 2.6:1, 2.8:1	4D	3 3/8	2 7/8	3 13/16	3 3/2	3 1/2	3 1/2
T-19D03	6.00	15	60	3:1, 3.2:1, 3.4:1, 3.6:1, 3.8:1	4D	3 3/8	2 7/8	3 13/16	3 3/2	3 1/2	3 1/2
T-19D04	6.00	15	60	4:1, 4.5:1, 5:1, 5.5:1, 6:1	4D	3 3/8	2 7/8	3 13/16	3 3/2	3 1/2	3 1/2
T-19D05	6.00	15	Primary for 500 ohm line	1:3.15, 1:2.75, 1:2.5, 1:2.25, 1:2, 1:1.75, 1:1.4, 1:1.25, 1:1.85, 1:1.75	4D	3 3/8	2 7/8	3 13/16	3 3/2	3 1/2	3 1/2

## C.H.T. Multi-Match Driver Transformers

### Feature Convenient Switchboard Plug-In Terminal Board and Compound Filled Cases

T-15D76*	\$ 8.25	15	60	1:1, 1.2:1, 1.4:1, 1.6:1, 1.8:1	3H	3 7/32	2 7/8	4	4 1/2	4 3/8	7 1/2
T-15D77*-	8.25	15	60	2:1, 2.2:1, 2.4:1, 2.6:1, 2.8:1	3H	3 7/32	2 7/8	4	4 1/2	4 3/8	6
T-15D78*	8.25	15	60	3:1, 3.2:1, 3.4:1, 3.6:1, 3.8:1	3H	3 7/32	2 7/8	4	4 1/2	4 3/8	6
T-15D79*	8.25	15	60	4:1, 4.5:1, 5:1, 5.5:1, 6:1	3H	3 7/32	2 7/8	4	4 1/2	4 3/8	6
T-15D80†-	11.50	30	120	1:1, 1.25:1, 1.5:1, 1.75:1, 2:1	3H	3 7/32	2 7/8	4	4 1/2	4 7/8	8 3/4
T-15D81†-	11.50	30	120	2.25:1, 2.5:1, 2.75:1, 3:1, 3.25:1	3H	3 7/32	2 7/8	4	4 1/2	4 7/8	8
T-15D82	8.25	15	Primary for 500 ohm line	1:3.15, 1:2.75, 1:2.5, 1:2.25, 1:2, 1:1.75, 1:1.4, 1:1.25, 1:1.85, 1:1.75	3H	3 7/32	2 7/8	4	4 1/2	4 3/8	5 3/4
T-15D83	11.50	30	Primary for 500 ohm line	1:3.15, 1:2.75, 1:2.5, 1:2.25, 1:2, 1:1.75, 1:1.4, 1:1.25, 1:1.85, 1:1.75	3H	3 7/32	2 7/8	4	4 1/2	4 7/8	8 1/2
T-15D84§	11.50	30	80	1.5:1, 2:1, 2.5:1, 3:1, 3.5:1	3H	3 7/32	2 7/8	4	4 1/2	4 7/8	8 3/4

\*P.P. 45 or 2A3, 6B4G.

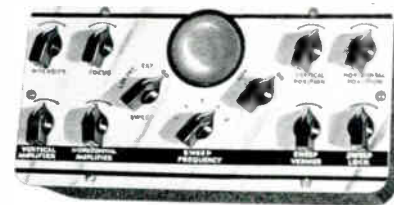
†P.P. Par. 2A3, or 6B4G.

§P.P. 6L6 with inverse feedback.

## THORDARSON OSCILLOSCOPE KIT

An accurately designed circuit using a 913 tube. Magnifying lens gives clear 2" image and small overall size of unit makes it ideal for relay rack of servicemen and for amateur and experimental uses.

Type No.	List Price	Description
T-11K99	\$12.50	Foundation Unit (Consists of punched chassis, panel, light shield, etched panel, ventilated cabinet and 2" magnifying lens with retainer ring, and complete circuit with constructional and operating data.) In addition to the foundation unit, one T-92R33 power transformer (see below) and one T-74C30 filter choke (see page 7) are required.



Circuit diagram, description and complete parts list given in cata

## POWER TRANSFORMERS FOR CATHODE RAY TUBES

Type No.	List Price	Volts D.C.	M.A.	Rect. Fil.	Fil. No. 1	Fil. No. 2	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
								Width	Depth	W.	D.	H.	
T-92R25 For 913 tube	\$2.25	500 tap-430	3	6.3V-.9A*			2F	2 3/8		2 3/4	2 1/8	2 3/8	1 1/2
T-92R33 For 913 tube	4.00	**500 tap-400	3	6.3V-.9A	6.3V-.6A	6.3V-.6A	2F	3 11/32		3 13/32	3 1/4	3 1/2	3 1/4
T-14R32-	6.50	400	15	5V-2A 5V-2A Ct.	6.3V-.6A	2.5V-2A (No. 3 6.3V-.6A)	2G	2 1/4	2 1/8	2 7/8	3 3/8	3 11/16	4

For Dumont 24-X11; RCA 902, 913; National 2002 Tubes.

\*\*With half wave rectification. \*For I-V rectifier and 913 filament.



MODULATOR STAGE					DRIVER STAGE					
P-P Class B Tubes	Power Output Watts	Plate Volts	Bias Volts	Pl. to Pl. Load Ohms	Use Mod. Trans. No.	P-P Driver Tubes	Trans. Ratio, Pri. to 1/2 Sec.	Use Driver Trans. No.	Trans. for 500 Ohm Line	%Ratio 500 Ohm Line to 1/2 Sec.
<b>R.C.A. TUBES</b>										
									Where T-15D82 appears T-19D05 may also be used.	
46	30	400	0	5,600	T-11M74 or T-19M14	*45	5:1	T-15D79 or T-19D04	T-15D82	1:85
46	40	500	0	8,000	T-11M75 or T-19M14	*45	5:1	T-15D79 or T-19D04	T-15D82	1:85
46	50	600	0	9,600	T-11M75 or T-19M15	*45	5:1	T-15D79 or T-19D04	T-15D82	1:85
4-46	56	400	0	2,800	T-11M75 or T-19M15	*45	5:1	T-15D79 or T-19D04	T-15D82	1:85
4-46	96	600	0	4,800	T-11M76 or T-19M16	*45	5:1	T-15D79 or T-19D04	T-15D82	1:85
203A	200	1000	-35	6,900	T-11M77 or T-19M17	†2A3	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.5
203A	200	1000	-35	6,900	T-11M77 or T-19M17	**6L6	3.5:1	T-15D84	T-15D82	1:1.25
203A	260	1250	-45	9,000	T-11M77 or T-19M17	†2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.5
203A	260	1250	-45	9,000	T-11M77 or T-19M17	**6L6	3.5:1	T-15D84	T-15D82	1:1.25
4-203A	400	1000	-35	3,450	T-11M78	†4-2A3	2.25:1	T-15D81	T-15D83	1:1.25
4-203A	400	1000	-35	4,500	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.25
4-203A	520	1250	-45	3,450	T-11M78	†4-2A3	2:1	T-15D80	T-15D83	1:1.25
4-203A	520	1250	-45	4,500	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.25
211	200	1000	-77	6,900	T-11M77 or T-19M17	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
211	260	1250	-100	9,000	T-11M77 or T-19M17	2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:2
800	90	750	-40	6,400	T-11M76 or T-19M16	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25
800	100	1000	-55	12,500	T-11M76 or T-19M16	2A3	2.8:1	T-15D77 or T-19D02	T-15D82	1:1.25
800	100	1000	-55	12,500	T-11M76 or T-19M16	45	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.2
801	45	600	-75	10,000	T-11M74 or T-19M14	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25
801	45	600	-75	10,000	T-11M74 or T-19M14	45	2:1	T-15D77 or T-19D02	T-15D82	1:2.25
801	75	750	-80	11,000	T-11M75 or T-19M16	45	1.8:1	T-15D76 or T-19D01	T-15D82	1:2.25
801	75	750	-80	11,000	T-11M75 or T-19M16	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
805	300	1250	0	6,700	T-11M77	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
805	370	1500	-16	8,200	T-11M78	2A3	3:1	T-15D78 or T-19D03	T-15D82	1:1.25
806	500	2000	-150	11,500	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2
806	500	2000	-150	11,500	T-11M78	**6L6	1.5:1	T-15D84	T-15D83	1:2.5
808	190	1250	-15	12,700	T-11M77 or T-19M17	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
809	60	500	0	5,200	T-11M75 or T-19M15	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75
809	60	500	0	5,200	T-11M75 or T-19M15	45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25
809	100	750	-5	8,400	T-11M76 or T-19M16	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75
809	100	750	-5	8,400	T-11M76 or T-19M16	45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25
810	510	1500	-30	6,600	T-11M78	4-2A3	2.25:1	T-15D81	T-15D83	1:1.25
811	175	1250	0	15,000	T-11M77 or T-19M17	2A3	5:1	T-15D79 or T-19D04	T-15D82	1:1.85
811	225	1500	-9	18,000	T-11M77 or T-19M17	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:1.25
830B	175	1000	-35	7,600	T-11M77 or T-19M17	2A3	3:1	T-15D78 or T-19D03	T-15D82	1:1.25
838	200	1000	0	6,900	T-11M77 or T-19M17	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
838	260	1250	0	9,000	T-11M77 or T-19M17	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
4-838	400	1000	0	3,450	T-11M78	4-2A3	3.25:1	T-15D81	T-15D83	1:1.75
4-838	400	1000	0	3,450	T-11M78	**6L6	3.5:1	T-15D84	T-15D83	1:1.25
4-838	520	1250	0	4,500	T-11M78	4-2A3	3.25:1	T-15D81	T-15D83	1:1.75
4-838	520	1250	0	4,500	T-11M78	**6L6	3.5:1	T-15D84	T-15D83	1:1.25
1608	50	425	-15	4,800	T-11M75 or T-19M15	*45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25
<b>TAYLOR TUBES</b>										
T-20	50	600	-30	8,100	T-11M75 or T-19M15	*45	2.2:1	T-15D77 or T-19D02	T-15D82	1:2
T-20	70	800	-40	12,000	T-11M75 or T-19M16	*45	2:1	T-15D77 or T-19D02	T-15D82	1:2.25
TZ-20	70	800	0	12,000	T-11M75 or T-19M16	*45	3.2:1	T-15D78 or T-19D03	T-15D82	1:1.4
T-55	175	1000	-40	6,900	T-11M77 or T-19M17	2A3	2.8:1	T-15D77 or T-19D02	T-15D82	1:1.25
T-55	225	1250	-50	9,400	T-11M77 or T-19M17	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.4
T-55	275	1500	-60	12,000	T-11M77	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
T-155	Same as HD-203-A									
203-A	Same as R.C.A. 203A									
4-203A	Same as R.C.A. 203A									
HD-203A	300	1500	-50	9,600	T-11M77	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25
HD-203A	300	1750	-67.5	13,000	T-11M77	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25
HD-203A	400	1750	-67.5	10,000	T-11M78	2A3	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HD-203A	400	2000	-75	12,500	T-11M78	2A3	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HD-203A	500	2000	-75	10,000	T-11M78	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HD-203A	500	1500	-50	6,400	T-11M78	4-2A3	2:1	T-15D80	T-15D83	1:1.25
HD-203A	500	1500	-50	6,400	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.4
HD-203A	600	1750	-67.5	7,600	T-11M78	4-2A3	1.75:1	T-15D80	T-15D83	1:1.4
HD-203A	600	1750	-67.5	7,600	T-11M78	**6L6	2.5:1	T-15D84	T-15D83	1:1.75
203B	300	1250	-45	7,900	T-11M77	†2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:2
4-203B	600	1250	-45	3,900	T-11M78	†4-2A3	1.75:1	T-15D80	T-15D83	1:1.4
4-203B	600	1250	-45	3,900	T-11M78	**6L6	2.5:1	T-15D84	T-15D83	1:1.75
203Z	200	1000	0	6,900	T-11M77 or T-19M17	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:1.75
203Z	260	1100	0	6,700	T-11M77	†2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
203Z	300	1250	0	7,900	T-11M77	†2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
211	Same as R.C.A. 211									
T-756	100	850	-25	9,400	T-11M76 or T-19M16	2A3	3:1	T-15D78 or T-19D03	T-15D82	1:1.25
T-756	125	850	-25	7,500	T-11M76 or T-19M17	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
T-814	500	2000	-150	11,500	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2
T-814	500	2000	-150	11,500	T-11M78	**6L6	1.5:1	T-15D80	T-15D82	1:3.15
T-822	Same as HD-203A									
TZ-40	175	1000	0	6,800	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
TZ-40	175	1000	0	6,800	T-11M77 or T-19M17	45	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.5
TZ-40	100	750	0	6,000	T-11M76 or T-19M16	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:1.75
TZ-40	100	750	0	6,000	T-11M76 or T-19M16	45	3:1	T-15D73 or T-19D03	T-15D82	1:1.4



MODULATOR STAGE					DRIVER STAGE					
P-P Class B Tubes	Power Output Watts	Plate Volts	Bias Volts	Pl. to Pl. Load Ohms	Use Mod. Trans. No.	P-P Driver Tubes	Trans. Ratio, Pri. to 1/2 Sec.	Use Driver Trans. No.	Trans. for 500 Ohm Line	§Ratio 500 Ohm Line to 1/2 Sec.
<b>EIMAC TUBES</b>										
35T	150	1000	-22	7,200	T-11M77 or T-19M17	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.4
35T	200	1250	-30	9,600	T-11M77 or T-19M17	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.5
100TH	210	1000	0	5,200	T-11M77 or T-19M17	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
100TH	260	1250	0	7,200	T-11M77	2A3	3.6:1	T-15D78 or T-19D03	T-15D82	1:1.25
100TH	300	1500	-10	9,600	T-11M77	2A3	3.6:1	T-15D78 or T-19D03	T-15D82	1:1.25
100TH	380	2000	-20	16,000	T-11M78	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
100TL	170	1000	-90	5,200	T-11M77 or T-19M17	**6L6	2:1	T-15D84	T-15D82	1:2
100TL	230	1250	-112	7,200	T-11M77	**6L6	1.5:1	T-15D84	T-15D82	1:2.5
100TL	270	1500	-140	9,600	T-11M77	**6L6	1.5:1	T-15D84	T-15D82	1:2.5
100TL	350	2000	-185	16,000	T-11M78	**6L6	1.5:1	T-15D84	T-15D82	1:2.5
150T	500	2000	-150	11,500	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2
150T	600	2500	-195	14,000	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2
150T	500	2000	-150	11,500	T-11M78	**6L6	1.5:1	T-15D84	T-15D83	1:2.5
150T	600	2500	-195	14,000	T-11M78	**6L6	1.5:1	T-15D84	T-15D83	1:2.5
250TH	300	1000	0	4,000	T-11M77	**6L6	3.5:1	T-15D84	T-15D83	1:1.25
250TH	400	1250	0	5,200	T-11M78	**6L6	3.5:1	T-15D84	T-15D83	1:1.25
250TH	500	1500	-22.5	6,400	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.4

Where T-15D82 appears T-19D05 may also be used.

<b>RAYTHEON TUBES</b>										
RK-12	100	750	0	8,700	T-11M76 or T-19M16	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75
RK-18	100	1000	-50	12,000	T-11M76 or T-19M16	*45	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.75
RK-18	100	1000	-50	12,000	T-11M76 or T-19M16	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
RK-31	110	1000	0	13,600	T-11M76 or T-19M17	*45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25
RK-31	140	1250	0	17,000	T-11M77 or T-19M17	*45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25
RK-31	110	1000	0	13,600	T-11M76 or T-19M17	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75
RK-31	140	1250	0	17,000	T-11M77 or T-19M17	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75
RK-52	200	1000	0	7,200	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
RK-52	250	1250	0	10,000	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
RK-57	300	1250	0	6,700	T-11M77	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
RK-57	370	1500	-16	8,200	T-11M78	2A3	3:1	T-15D78 or T-19D03	T-15D82	1:1.25
RK-58	200	1000	0	6,900	T-11M77 or T-19M17	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
RK-58	260	1250	0	9,000	T-11M77 or T-19M17	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85

<b>HYTRON TUBES</b>										
HY-25	75	800	-9	9,000	T-11M75 or T-19M16	2A3	5:1	T-15D79 or T-19D04	T-15D82	1:1.75
HY-40	140	800	-28	5,800	T-11M77 or T-19M17	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
HY-40	175	1000	-37.5	7,000	T-11M77 or T-19M17	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
HY-57	110	800	-9	9,000	T-11M76 or T-19M17	2A3	5:1	T-15D79 or T-19D04	T-15D82	1:1.75
HY-51A	180	1000	-35	7,000	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
HY-51B	180	1000	-35	7,000	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85

<b>AMPEREX TUBES</b>										
HF-100	260	1500	-52	12,000	T-11M77	2A3	3.2:1	T-15D78 or T-19D03	T-15D82	1:1.25
HF-100	350	1750	-62	16,000	T-11M78	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
ZB-120	150	750	0	4,800	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
ZB-120	200	1000	0	6,900	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
ZB-120	245	1250	0	9,000	T-11M77 or T-19M17	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:1.75
ZB-120	300	1500	-9	11,200	T-11M77	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
HF-200	500	2000	-100	11,200	T-11M78	2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:1.75
HF-200	500	2500	-130	16,000	T-11M78	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HF-200	600	2500	-130	16,000	T-11M78	2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:1.75
HF-200	500	2000	-100	11,200	T-11M78	**6L6	2.5:1	T-15D84	T-15D82	1:1.75
HF-200	600	2500	-130	16,000	T-11M78	**6L6	2.5:1	T-15D84	T-15D82	1:1.75

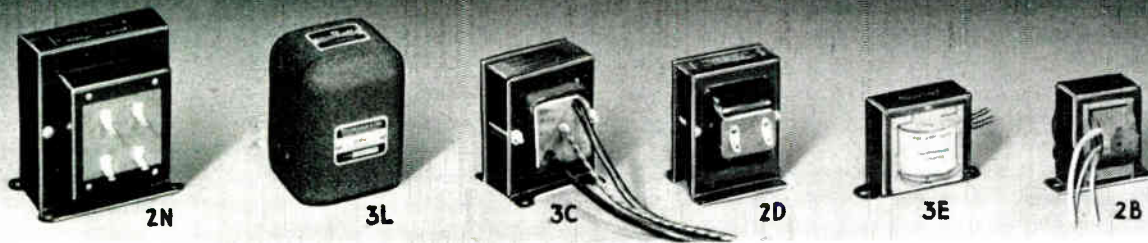
<b>HEINTZ &amp; KAUFMAN GAMMATRON TUBES</b>										
HK-24	45	500	0	6,400	T-11M75 or T-19M15	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:1.75
HK-24	105	1000	-29	15,000	T-11M76 or T-19M16	2A3	3.2:1	T-15D78 or T-19D03	T-15D82	1:1.25
HK-54	170	1250	-35	12,500	T-11M77 or T-19M17	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
HK-54	200	1500	-45	16,800	T-11M77 or T-19M17	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
HK-154	200	1000	-155	7,500	T-11M77 or T-19M17	2A3	1.4:1	T-15D76 or T-19D01	T-15D82	1:2.25
HK-154	223	1250	-210	11,400	T-11M77 or T-19M17	2A3	1.2:1	T-15D76 or T-19D01	T-15D82	1:2.75
HK-254	240	1500	-40	10,000	T-11M77 or T-19M17	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HK-254	328	2000	-65	16,000	T-11M78	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HK-254	418	2500	-80	22,000	T-11M78	2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:1.75
HK-354	100	1000	-60	15,000	T-11M76 or T-19M16	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25
HK-354	220	1500	-100	15,000	T-11M77 or T-19M17	2A3	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HK-354	400	2000	-150	15,000	T-11M78	2A3	1.4:1	T-15D76 or T-19D01	T-15D82	1:2.25
354E	319	1500	-25	10,000	T-11M77	4-2A3	2.25:1	T-15D81	T-15D83	1:1.25
354E	472	2000	-37.5	11,000	T-11M78	4-2A3	2:1	T-15D80	T-15D83	1:1.25
354F	595	2500	-50	16,000	T-11M78	4-2A3	1.75:1	T-15D80	T-15D83	1:1.4
354F	290	1500	-15	12,000	T-11M77	4-2A3	2.75:1	T-15D81	T-15D83	1:1.85
354F	445	2000	-22.5	12,000	T-11M78	4-2A3	2.5:1	T-15D81	T-15D83	1:1.85

### WESTERN ELECTRIC TUBES

242A, 261A, 276A Same as R.C.A. 211

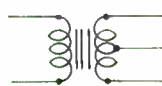
§NOTE: This ratio is correct only when the tubes supplying power to the 500 ohm line are of the same type and operated under the same conditions as the driver tubes listed under "P-P Driver Tubes." 2A3 driver tubes are operated with 300 plate volts, self biased, unless preceded by †. 45 driver tubes are operated with 275 plate volts, self biased, unless preceded by \*. †2A3 driver tubes are operated with 300 plate volts, fixed bias. \*45 driver tubes are operated with 250 plate volts, self biased. \*\*6L6's with 16.6N feed-back, 400 volts plate, 300 volts screen.

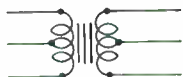




**FILAMENT (F) TRANSFORMERS**

The essentials of improved voltage regulation and minimum heat rise have been given prime consideration in the design of these units. Ratings given are for continuous operation at full load.

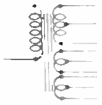
Type No.	List Price	Primary Volts	Secondary Volts	Sec. Amps.	Pri. V.A.	R.M.S. Test Volts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
								Width	Depth	W.	D.	H.	
													
<b>SINGLE SECONDARY — "19" SERIES</b>													
T-50F61	\$1.50	115	2.5 Ct.	3.5	10	1600	2B	2 3/8		2 7/8	1 3/4	2 3/8	1
T-19F88	1.75	115	2.5 Ct.	5.25	15	1600	2B	2 3/8		2 7/8	2	2 3/8	1 1/4
T-19F89	2.25	115	2.5 Ct.	10	25	1600	2B	2 15/16		3 3/8	2 1/4	3	2
T-19F90	3.00	115	2.5 Ct.	10	25	7500	3C	2	1 3/4	2 9/16	2 1/4	3 1/4	2 1/4
T-64F33	4.50	105/110/115	2.5 Ct.	10	25	7500	2N	3 1/4	2 1/16	3 3/4	3 1/4	4	4 1/2
T-19F82	5.00	115	2.5 Ct.	15	45	10000	3C	3 1/4	1 3/4	3 3/4	2 1/4	4	4
T-63F99	3.25	115	5 Ct.	4	20	1600	2D	2 1/8	1 9/16	2 7/16	3	3 1/2	2 1/4
T-19F83	2.25	115	5 Ct.	5	30	1600	2B	2 15/16		3 3/8	2 1/8	3	2
T-19F84	2.75	115	5 Ct.	8	45	1600	3C	2	1 3/4	2 9/16	2 1/4	3 1/4	2 3/4
T-19F85	3.25	115	5 Ct.	13	75	1600	3C	3 1/4	1 3/4	3 3/4	2 1/4	4	4
T-19F86	5.50	115	5 Ct.	21	120	1600	3C	3 1/4	2 1/4	3 3/4	2 3/4	4	4 1/2
T-74F23	5.00	105/110/115	5 Ct.	13	75	1600	2D	3 1/4	1 7/8	3 3/4	3 1/8	4	4 1/4
T-74F24	7.50	105/110/115	5 Ct.	21	125	1600	2D	2 3/4	1 9/16	3 3/4	3 9/16	4 5/8	5 1/4
T-19F91	2.25	115	5.25 Ct.	4	25	1600	3C	2	1 3/4	2 9/16	2 1/4	3 1/4	2 1/4
T-19F92	3.25	115	5.25 Ct.	13	75	1600	3C	3 1/4	1 3/4	3 3/4	2 1/4	4	4
T-19F80	1.25	115	6.3 Ct.	1	7	1600	2B	2		1 11/16	1 5/8	2	5/8
T-19F81	1.50	115	6.3 Ct.	2	14	1600	2B	2 3/8		2 7/8	1 3/4	2 3/8	3/4
T-19F97	1.75	115	6.3 Ct.	3	21	1600	2B	2 3/8		2 7/8	2	2 3/8	1 1/2
T-61F85	2.00	115	6.3, 5, 2.5	2.5	18	1600	3E	3 1/8		3 5/8	2	2 1/4	1 1/2
T-73F60	3.75	105/110/115	6.3 Ct.	5	36	1600	2D	2 1/8	1 3/2	2 7/8	2 13/16	3 1/16	3 1/4
T-19F98	2.75	115	6.3 Ct.	6	47	1600	3C	2	1 7/8	2 9/16	2 3/8	3 1/4	2 3/4
T-19F99	3.50	115	6.3 Ct.	10	73	1600	3C	3 1/4	1 3/4	3 3/4	2 1/4	4	4
T-19F93	2.25	115	7.5 Ct.	4	34	1600	3C	2	1 3/4	2 9/16	2 1/4	3 1/4	2 1/4
T-19F94	3.00	115	7.5 Ct.	8	67	1600	3C	2 1/4	2 1/4	3	2 7/8	3 3/4	4
T-92F20	4.75	115	7.5 Ct.	8	68	1600	2D	3 1/4	2	3 3/4	3 1/4	4	4 3/4
T-19F95	2.75	115	10 Ct.	4	48	1600	3C	2	1 3/4	2 9/16	2 1/4	3 1/4	2 3/4
T-19F96	3.50	115	10 Ct.	8	92	1600	3C	2 1/4	2 1/4	3	2 7/8	3 3/4	4
T-64F14	4.75	105/110/115	10 Ct.	8	90	1600	2D	3 1/4	2 1/16	3 3/4	3 3/8	4	5
T-19F87	6.25	115	10 Ct.	12	140	1600	3C	3 1/4	2 1/2	3 3/4	3	4	6 3/4



**SINGLE SECONDARY — C.H.T. SERIES**

C.H.T. filament transformers are conservatively designed to operate continuously at full rated load with superior voltage regulation and minimum temperature rise. Cases are filled with high melting point compound for complete coil protection.

T-11F59	\$5.75	105/115	5 Ct.	5	30	2000	3L	2 1/8		2 13/16	3	3 9/16	5
T-11F63	8.00	105/115	5 Ct.	13	70	2000	3K	2 7/16	3 7/32	4 1/16	4 1/2	4 3/8	7 1/2
T-11F55	11.50	105/115	5.25 Ct.	22	130	2000	3K	3 13/16	4 3/32	5 3/16	5 9/16	6	14
T-11F60	6.25	105/115	6.3 Ct.	5	35	2000	3L	2 1/8		2 13/16	3	3 9/16	5 3/4
T-11F62	6.75	105/115	7.5 Ct.	8	65	2000	3K	2 7/8	3 7/32	4 1/16	4 1/2	4 7/8	6 1/2
T-11F64	9.50	105/115	10 Ct.	10	110	2000	3K	2 7/8	3 7/32	4 1/16	4 1/2	4 7/8	9 3/4
T-11F53	8.00	105/115	2.5 Ct.	10	25	7500	3K	2 7/8	3 7/32	4 1/16	4 1/2	4 3/8	8 1/2
T-11F61	18.50	105/115	2.5 Ct.	20	55	15,000	3X	3 13/16	4 3/32	5 3/16	5 9/16	6	14
T-11F54	16.00	105/115	5 Ct.	20	110	10,000	3X	3 13/16	4 3/32	5 3/16	5 9/16	6	15



## FILAMENT (F) TRANSFORMERS

Recommended for complete filament requirements of transmitters or amplifiers. Improved appearance and protection of coils from mechanical injury are afforded by shielded mounting.

Type No.	List Price	Primary Volts	Sec. Volts	Sec. Amps.	Pri. V.A.	R.M.S. Test Volts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
								Width	Depth	W.	D.	H.	
<b>MULTIPLE SECONDARIES — "19" SERIES</b>													
T-19F76	\$4.75	115	Sec. 1-5 V. Sec. 2-7.5/6.3/5	3 6	67	1600 1600	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>5</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>
T-19F77	7.50	115	Sec. 1-5 V. Sec. 2-2.5 V. Ct. Sec. 3-10 7.5 6.3 5	3 10 8	133	1600 7500 1600	2G	3	2 <sup>7</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>5</sup> / <sub>8</sub>	4 <sup>15</sup> / <sub>16</sub>	7
T-19F78	5.25	115	Sec. 1-2.5 V. Ct. Sec. 2-5 V.	10 3	45	7500 1600	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	5
T-19F79	6.75	115	Sec. 1-6.3 V. Ct. Sec. 2-10/7.5/6.3/5	3 10	133	1600 1600	2G	2 <sup>11</sup> / <sub>16</sub>	3	3 <sup>3</sup> / <sub>8</sub>	3 <sup>5</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	6
T-79F84	4.75	115	Sec. 1-2.5 V. Ct. Sec. 2-5 V. Ct. Sec. 3-6.3 V. Ct.	3.5 3 3	48	1600 1600 1600	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>

## MULTIPLE SECONDARIES—C. H. T. SERIES

T-11F56	\$ 7.75	105 115	Sec. 1-6.3 Ct. Sec. 2-2.5 Ct. Sec. 3-5 Ct.	3 3.5 3	50	2000	3K	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	3 <sup>7</sup> / <sub>8</sub>	6
T-11F57	13.75	105 115	Sec. 1-10 Ct. Sec. 2-10 Ct. Sec. 3-6.3 Ct. Sec. 4-5 Ct.	8 4 3 3	170	2000	3K	3 <sup>13</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>2</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	6 <sup>3</sup> / <sub>4</sub>	15
T-11F58	15.00	105 115	Sec. 1-7.5 Ct. Sec. 2-7.5 Ct. Sec. 3-6.3 Ct. Sec. 4-5 Ct.	6.5 3.25 3 3	120	2000	3K	3 <sup>13</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>2</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	6	13 <sup>1</sup> / <sub>4</sub>

## TAPPED SECONDARIES C. H. T. SERIES

Designed for minimum temperature rise under continuous full load operation. Cases are compound filled for complete coil protection.

T-11F50	9.00	105 115	7.5/6.3/5*/2.5 Ct.	6.5	55	2000	3K	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>3</sup> / <sub>8</sub>	6 <sup>1</sup> / <sub>4</sub>
T-11F51	9.50	105 115	10/7.5/6.3 Ct.	8	90	2000	3K	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>7</sup> / <sub>8</sub>	7 <sup>3</sup> / <sub>4</sub>
T-11F52	13.25	105 115	11/10/7.5 Ct.	10	125	2000	3K	3 <sup>13</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>2</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	6	13 <sup>1</sup> / <sub>2</sub>

\*Not center tapped.

## FILAMENT CORRECTOR AUTOTRANSFORMERS

To compensate for variations in line voltage or for drop in filament leads. Correct filament voltage at the tube is made possible.

Type No.	List Price	Capacity Filament Power Watts	Primary Taps	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
					Width	Depth	W.	D.	H.	
T-18V24	\$2.00	60	105/110/115/120/125V.	2E	2 <sup>3</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	2	2 <sup>3</sup> / <sub>8</sub>	1
T-18V25	2.75	150	105/110/115/120/125V.	2E	2 <sup>15</sup> / <sub>16</sub>	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	2 <sup>15</sup> / <sub>16</sub>	1 <sup>3</sup> / <sub>4</sub>

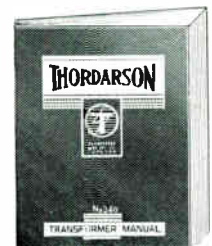
### No. 344E—Transmitter Guide 15c Postpaid



Another Thordarson publication produced for the amateur operator. Complete description and details on practical types of transmitters and short wave apparatus. Schematic diagrams, pictures and parts lists of 12 new, modern transmitters from 10 to 1000 watts including an all-band A.C.-battery, emergency portable unit and a 5-10 meter mobile transmitter.

### No. 340—Complete Transformer Manual . . . 35c Postpaid

The Thordarson Transformer Manual is a complete book, containing the Replacement Transformer Encyclopedia and Servicing Guide, the Transmitter Guide, and the Sound Amplifier Guide, plus current Thordarson catalogs. It is bound in a strong, attractive blue and orange cover with loose leaf arrangement, giving the user opportunity to keep the Manual up-to-date by adding later Thordarson releases. This book has proven to be most popular in the technical library.







**MODULATION (M) TRANSFORMERS**

To couple the plate or plates of an audio output stage to a Class C R.F. load.

Type No.	List Price	Tube Type	Class	Ohms Impedance		Max.D.C. Sec.M.A.	Max.Audio Pwr. Watts	Mtg. Centers			Dimensions			Wt. Lbs.
				Pri.	Sec.			Mtg. Fig.	Width	Depth	W.	D.	H.	

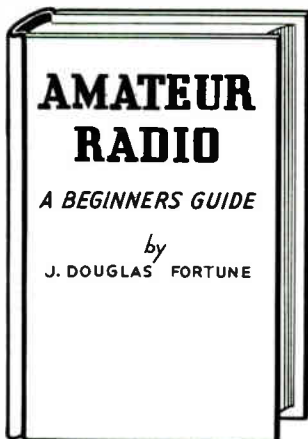
**MODULATION TRANSFORMERS FOR SPECIFIC APPLICATIONS**

High efficiency, quiet operation and good frequency characteristics have been attained in this series of transformers by thorough engineering and careful construction. These units are designed for specific tube types.

T-67M69	\$2.75	1-19	B	10,000	2,700	50	10	2F	2 3/8		2 3/4	2 1/8	2 3/8	1 1/2
T-17M59	2.75	1-6A6, 6N7 or 53	B	10,000	3,000	100	10	2F	2 5/16		3 3/8	2 1/2	3	2
					3,750/4,500									
T-64M26	6.00	2-46 or 59 2-250	B AB	5,800	5,000 10,000	100	40	2D	3 1/4	2 1/16	3 3/4	3 3/8	4	5
T-19M21	7.00	2-TZ-20	B	10,000	3,750 6,600	200 150	75	2N	3 1/4	2 3/16	3 3/4	4	4	7
T-19M22	10.00	2-809 2-RK-12	B B	8,400	5,000 7,850	200 160	100	2N	3 1/4	2 3/4	4 1/4	4 1/4	6 1/16	13 3/4
T-84M70	10.00	2-6L6 2-35T 4-210	AB B B	3,800	2,500 5,000 7,500	250 200 150	75	2D	2 3/4	2 3/16	3 3/4	4 1/16	4 5/8	10
T-14M49	16.50	2-TZ-40	B	6,900	2,850 4,500 6,500	350 300 235	175	2Q	6 3/4	3 3/16	7 1/2	5 5/8	6 3/8	20
T-82M25	40.00	2-805, HD-203A, 822	B	9,000	4,000 6,000/8,000	500	650	2Q	8 5/16	4 1/16	9 1/16	7 1/2	7 3/4	47

**GRID MODULATION TRANSFORMERS**

T-67M73	\$3.50	1-42, 46, 6F6, Triode	A	6,300	5,400	32	10	2D	2 1/8	1 9/16	2 7/16	3	3 1/8	2 1/4
T-67M74	4.50	P.P. 45-2A3	AB	5,000	5,000	60	20	2D	2 1/8	1 3/2	2 7/8	2 3/16	3 1/16	3 1/2



*Amateur Radio*

*A Beginners Guide*

By J. DOUGLAS FORTUNE

Mr. Fortune, Thordarson engineer and a prominent amateur radio enthusiast, spent over twelve months in preparing this text-book. There are approximately 160 pages, and matters covered include Learning the Code, Receiver Theory and Construction, Crystal Oscillator Transmitter, Two-stage Transmitter, Three-stage Transmitter, Construction of the Modulator and reference notes on receivers, inductance, capacity and many other electrical and radio terms. It is a book recommended to all experimenters, beginning amateurs and even to amateurs of long experience. Amateur net price 75c. Profusely illustrated with over 100 comprehensive photographs and drawings. Heavy cover finished in wear-resistant blue cloth, with attractive gold stamping. This is a cloth cover, case bound text-book.

**THORDARSON BROADCAST UNITS**

The same high quality transformers that have been made to the special requirements of discriminating engineers, broadcast stations and laboratories are now available as stock catalog items. Thordarson offers a complete line of transformers and chokes for broadcast use, each capable of meeting and surpassing the most rigid broadcast tolerances. These transformers are listed and described in the new Broadcast Catalog, No. 500-E. Broadcast stations, experimenters, laboratories or air craft stations are urged to secure a copy of this valuable listing.







4D



3G



3U



2Q

### UNIVERSAL AND MULTI-MATCH MODULATION (M) TRANSFORMERS

The radio amateur or experimenter regularly makes changes in equipment to take advantage of new circuits and tubes. To enable quick and accurate matching of various tube loads without changing transformers, and to assure peak transformer performance while

testing new tubes or making circuit changes, these Universal and Multi-Match transformers are made available. A complete table of driver and modulator combinations on pages 12 and 13 makes easy the selection of the proper driver or modulation transformer.

### "19" SERIES UNIVERSAL MODULATION TRANSFORMERS

Type No.	List Price	Capacity Watts	Pri. M.A. Each Side	Secondary M.A.		Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
				Series	Parallel		Width	Depth	W.	D.	H.	
T-19M13	\$4.00	15	50	50	100	4D	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>16</sub>	3	2
T-19M14	7.00	30	75	75	150	2N	3 <sup>1</sup> / <sub>4</sub>	1 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3	4	4 <sup>1</sup> / <sub>2</sub>
T-19M15	10.00	60	125	125	250	2N	3 <sup>1</sup> / <sub>4</sub>	2 <sup>9</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	4	6 <sup>1</sup> / <sub>2</sub>
T-19M16	15.00	100	175	175	350	2N	3 <sup>1</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	6 <sup>1</sup> / <sub>8</sub>	12 <sup>1</sup> / <sub>2</sub>
T-19M17	24.00	250	225	225	450	2Q	7 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>8</sub>	8 <sup>1</sup> / <sub>2</sub>	5 <sup>3</sup> / <sub>4</sub>	6 <sup>7</sup> / <sub>8</sub>	30 <sup>3</sup> / <sub>4</sub>

### C. H. T. MULTI-MATCH MODULATION TRANSFORMERS

A premium feature of this group is the exclusive Thordarson Switchboard Plug-in terminal board, enabling quick and accurate matching of tube loads without soldering.

Type No.	List Price	Capacity Watts	Pri. M.A.	Sec. M.A.	Mtg. Fig.	Width	Depth	W.	D.	H.	Wt. Lbs.
T-11M74	\$ 9.00	40	100	80	160	3G	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>3</sup> / <sub>8</sub> 7 <sup>3</sup> / <sub>4</sub>
T-11M75	12.50	75	145	145	290	3G	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>3</sup> / <sub>8</sub> 9
T-11M76	19.50	125	210	160	320	3G	3 <sup>3</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>32</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	6 18
T-11M77	30.00	300	250	250	500	3G	4 <sup>9</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>32</sub>	5 <sup>15</sup> / <sub>16</sub>	6 <sup>15</sup> / <sub>16</sub>	7 <sup>1</sup> / <sub>4</sub> 30
T-11M78	60.00	500	320	320	640	3G	5 <sup>11</sup> / <sub>16</sub>	7 <sup>7</sup> / <sub>32</sub>	7 <sup>1</sup> / <sub>16</sub>	8 <sup>11</sup> / <sub>16</sub>	7 <sup>1</sup> / <sub>2</sub> 51

### C. H. T. CATHODE MODULATION TRANSFORMERS

With the exclusive Thordarson Switchboard Plug-in Terminal Board.

Type No.	List Price	Capacity Watts	Ohms Impedance		Max. Sec. Current D.C. M.A.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
			Primary	Secondary			Width	Depth	W.	D.	H.	
<b>Conventional Multi-Match Cathode Modulation Transformers</b>												
Audio power is 10% of the Class C input. R.F. efficiency is 44%.												
T-11M69	\$5.50	15	5,000 7,000 10,000	80 to 2,000	300	3G	2 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	2 <sup>15</sup> / <sub>16</sub>	3	3 <sup>9</sup> / <sub>16</sub>	3
T-11M70	7.50	40	3,000 6,600 10,000	80 to 2,000	400	3G	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>7</sup> / <sub>8</sub>	7
T-11M71	13.00	100	6,000 8,000 10,000	80 to 2,000	600	3G	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>7</sup> / <sub>8</sub>	10

### High Efficiency Multi-Match Cathode Modulation Transformers

Audio power is 20% of the Class C input and R. F. efficiency is 55%.  
Special bulletin SD456 with circuit details is available. \*With switchboard terminal arrangement.

Type No.	List Price	Capacity Watts	Pri. Ohms	Secondary Ohms	Max. Sec. M.A.	Mtg. Fig.	Width	Depth	W.	D.	H.	Wt. Lbs.
T-11M79	\$13.00	40	Variable	Variable	300	3U*	3 <sup>3</sup> / <sub>4</sub>	3 <sup>15</sup> / <sub>16</sub>	4	4 <sup>1</sup> / <sub>4</sub>	5 <sup>1</sup> / <sub>8</sub>	10
T-11M80	17.00	100	Variable	Variable	400	3U*	3 <sup>11</sup> / <sub>16</sub>	4 <sup>9</sup> / <sub>16</sub>	4	5	5 <sup>1</sup> / <sub>2</sub>	15
T-11M81	27.50	200	Variable	Variable	600	3U*	4 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>8</sub>	5 <sup>3</sup> / <sub>8</sub>	6 <sup>1</sup> / <sub>4</sub>	6 <sup>1</sup> / <sub>4</sub>	28

### MATCHING LINE TO R. F. LOAD MODULATION TRANSFORMERS

This popular series is designed for direct connection to 500 ohm output terminals of a receiver or amplifier. 200 ohm tap is also provided on type T-83M22.

Type No.	List Price	Pri. Ohms	Secondary Ohms Load				Max. Sec. M.A.	Max. Watts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
			5,000/6,000	7,000/8,000	9,000/10,000	10,000				Width	Depth	W.	D.	H.	
T-73M52	\$18.00	500	5,000/6,000	7,000/8,000	9,000/10,000	215	80	2Q	6 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>16</sub>	7 <sup>1</sup> / <sub>2</sub>	5 <sup>5</sup> / <sub>8</sub>	6 <sup>3</sup> / <sub>4</sub>	21	
T-83M22	9.00	500/200	5,000/6,000	7,000/8,000	9,000/10,000	150	30	2N	2 <sup>3</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>16</sub>	3 <sup>15</sup> / <sub>16</sub>	3 <sup>15</sup> / <sub>16</sub>	4 <sup>5</sup> / <sub>8</sub>	8	



N2Q



S2N



2K



2G

**PLATE SUPPLY (P) TRANSFORMERS**

While ordinarily used to supply the voltage potential between cathode and anodes of vacuum tubes in a rectifier circuit, there are additional applications requiring relatively high voltages in which Thordarson plate transformers may be used to good advantage. Thordarson plate transformers are rated in D.C. voltages from a two section filter which includes the voltage drop through the rectifier tubes.



**PLATE SUPPLY TRANSFORMERS — "19" SERIES**

Designed especially for Amateur Short Wave or experimental equipment. Electrostatic shielding is provided between primary and secondary windings.

Type No.	List Price	Primary Volts	Sec. A.C. Load Volts	D.C. Volts	Bias Tap	D.C. M.A.	Pri. V.A.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
									Width	Depth	W.	D.	H.	
T-19P54	\$5.50	115	560-0-560	400		150	115	2G	3 1/8	2 5/8	3 3/4	3 3/8	4 15/16	7
T-19P55	6.50	115	660-0-660 550-0-550	500 400	30 V.	250	200	2G	3 1/8	3	3 3/4	3 3/4	4 15/16	8
T-84P60	6.50	115	515-0-515	400	30 V.	250	190	2G	3	4	3 9/16	4 3/4	4 15/16	11 3/4
T-19P70	9.00	115	900-0-900 605-0-605	750* 400		100 225	260	2G	3	3 7/8	3 7/8	4 5/8	4 15/16	11 1/2
T-19P56	7.00	115	900-0-900 800-0-800	750 600		225	260	2G	3 1/8	3 1/2	3 3/4	4 1/4	4 15/16	10
T-19P57	8.50	115	1075-0-1075 500-0-500	1000* 400		125 150	245	2G	3 1/8	3 3/4	3 3/4	4 1/2	4 15/16	10 1/2
T-19P58	14.25	115	1200-0-1200 900-0-900	1000* 750		200 150	500	2G	3 1/4	3 11/16	4 3/8	4 5/8	6 1/8	19
T-19P69	13.00	115	1180-0-1180 900-0-900	1000 750		300	430	2G	3 3/4	3 5/8	5 1/16	6 1/4	6 3/8	20
T-19P71	13.00	115	1325-0-1325 595-0-595	1250* 400		125 200	320	2G	3	4 3/4	3 7/8	5 1/2	4 15/16	15 1/2
T-19P59	16.00	115	1560-0-1560 1250-0-1250	1250 1000		300	550	2K	4 3/16	3 3/16	5 7/8	4	6 1/16	26 1/2
T-19P60	18.50	115	1875-0-1875 1560-0-1560	1500 1250		300	620	2K	5 3/4	4 3/8	6 11/16	6 1/4	6 9/16	29 1/4
T-19P61	20.00	115	2125-0-2125 1875-0-1875	1750 1500		300	745	2K	5 3/4	4 5/8	6 11/16	6 1/2	6 9/16	31 1/2
T-19P62	22.50	115	2420-0-2420 2125-0-2125	2000 1750		300	860	2K	5 3/4	5	6 11/16	6 7/8	6 9/16	34 1/2
T-19P65	29.50	115	3000-0-3000 2420-0-2420	2500 2000		300	1195	2K	5 3/4	6	6 11/16	7 7/8	6 9/16	44
T-19P63	23.00	115	1560-0-1560 1265-0-1265	1250 1000		500	925	2K	5 3/4	5 1/4	6 11/16	7 1/8	6 9/16	38
T-19P64	28.50	115	1875-0-1875 1560-0-1560	1500 1250		500	1130	2K	5 3/4	6	6 11/16	7 7/8	6 9/16	43 1/4
T-19P66	35.00	115	2125-0-2125 1875-0-1875	1750 1500		500	1185	2K	5 3/4	4 3/8	6 11/16	5 1/4	9 13/16	45 1/2
T-19P67	42.50	115	2450-0-2450 2125-0-2125	2000 1750		500	1380	2K	5 3/4	4 5/8	6 11/16	5 1/2	9 13/16	51
T-19P68	50.00	115	3000-0-3000 2450-0-2450	2500 2000		500	1760	2K	5 3/4	5 5/8	6 11/16	6 1/2	9 13/16	61

\*These transformers designed for double rectifiers and will deliver both secondary ratings simultaneously. If only the lower voltage taps are used the current rating is equal to the current rating of both windings.

**AUTOMATIC VOLTAGE REGULATORS**

Will deliver a constant voltage (within ± 1%) despite line variations from 90 to 130 volts and/or secondary loads from 1/3 to full load rating. Operation is fully automatic and instantaneous. Once installed no further adjustment is necessary. Supplies optional output voltages of 110, 115 or 120 volts — 60 cycles. Ideal for use with plate, filament or power transformers or for use in technical laboratories. Engineering Bulletin SD422A is available from all Thordarson distributors.

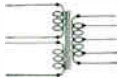
Type No.	List Price	Capacity V.A.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
				Width	Depth	W.	D.	H.	
T-9V30	\$ 40.00	100	S2N	11 5/8	2 5/8	12 7/8	5 1/4	6 3/4	48
T-9V31	65.00	250	S3N	11 5/8	3 1/8	12 7/8	6 1/8	8 1/2	68
T-9V32	100.00	500	N2Q	16	4	17	6 1/8	7 5/8	76
T-9V33	175.00	1000	N3Q	19	4	20	7 1/8	10 1/4	150





## PLATE SUPPLY (P) AND POWER (R) TRANSFORMERS

Type No.	List Price	Primary Volts	Sec. A.C. Load Volts	D.C. Volts	D.C. M.A.	Pri. V.A.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
								Width	Depth	W.	D.	H.	



### PLATE SUPPLY TRANSFORMERS — C. H. T. SERIES

Will operate continuously under full rated load conditions with excellent regulation and with minimum temperature rise. Cases are compound filled for complete coil protection.

T-15P11	\$12.50	115-230	665-0-665 535-0-535	500 400	200	160	3K	3 <sup>5</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>32</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	5 <sup>3</sup> / <sub>8</sub>	15 <sup>3</sup> / <sub>4</sub>
T-15P12	15.00	115-230	835-0-835 655-0-655	650 500	200	200	3K	3 <sup>5</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>32</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	6 <sup>3</sup> / <sub>4</sub>	19 <sup>1</sup> / <sub>2</sub>
T-15P13	20.00	115-230	945-0-945 770-0-770	750 600	300	315	3K	4 <sup>9</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>32</sub>	5 <sup>15</sup> / <sub>16</sub>	6 <sup>5</sup> / <sub>16</sub>	7 <sup>1</sup> / <sub>4</sub>	31 <sup>3</sup> / <sub>4</sub>
T-15P14	25.00	115-230	1225-0-1225 945-0-945	1000 750	300	427	3K	4 <sup>5</sup> / <sub>16</sub>	5 <sup>27</sup> / <sub>32</sub>	6	7 <sup>5</sup> / <sub>8</sub>	8 <sup>1</sup> / <sub>4</sub>	41
T-15P15	30.00	115-230	1450-0-1450 1190-0-1190	1250 1000	300	520	3K	5 <sup>11</sup> / <sub>16</sub>	6 <sup>13</sup> / <sub>32</sub>	7	8	8	51 <sup>1</sup> / <sub>4</sub>
T-15P16	45.00	115-230	1540-0-1540 1255-0-1255	1250 1000	500	875	3P	3 <sup>1</sup> / <sub>8</sub>	9 <sup>1</sup> / <sub>4</sub>	6 <sup>3</sup> / <sub>8</sub>	10 <sup>1</sup> / <sub>4</sub>	8 <sup>3</sup> / <sub>4</sub>	81
T-15P17	32.50	115-230	1815-0-1815 1535-0-1535	1500 1250	300	665	3K	5 <sup>11</sup> / <sub>16</sub>	6 <sup>13</sup> / <sub>32</sub>	7	8	8	55
T-15P18	60.00	115-230	2130-0-2130 1845-0-1845	1750 1500	500	1210	3P	3 <sup>1</sup> / <sub>8</sub>	10 <sup>1</sup> / <sub>2</sub>	6 <sup>3</sup> / <sub>8</sub>	11 <sup>1</sup> / <sub>2</sub>	8 <sup>3</sup> / <sub>4</sub>	96
T-15P19	50.00	115-230	2950-0-2950 2365-0-2365	2500 2000	300	1160	3P	3 <sup>1</sup> / <sub>8</sub>	9 <sup>3</sup> / <sub>4</sub>	6 <sup>3</sup> / <sub>8</sub>	10 <sup>3</sup> / <sub>4</sub>	8 <sup>3</sup> / <sub>4</sub>	85
T-15P20	85.00	115-230	2960-0-2960 2390-0-2390	2500 2000	650	2380	3P	4 <sup>5</sup> / <sub>16</sub>	11 <sup>5</sup> / <sub>8</sub>	7 <sup>5</sup> / <sub>8</sub>	12 <sup>5</sup> / <sub>8</sub>	9 <sup>5</sup> / <sub>8</sub>	140
T-15P21	80.00	115-230	3440-0-3440 2980-0-2980 2340-0-2340 1815-0-1815	3000 2500 2000 1500	500	2180	3P	4 <sup>5</sup> / <sub>16</sub>	10 <sup>7</sup> / <sub>8</sub>	7 <sup>5</sup> / <sub>8</sub>	11 <sup>7</sup> / <sub>8</sub>	9 <sup>5</sup> / <sub>8</sub>	129
T-15P22	50.00	115-230	2070-0-2070 1785-0-1785 1495-0-1495 1210-0-1210	1750 1500 1250 1000	300	745	3P	3 <sup>1</sup> / <sub>8</sub>	8 <sup>3</sup> / <sub>4</sub>	6 <sup>3</sup> / <sub>8</sub>	9 <sup>3</sup> / <sub>4</sub>	8 <sup>3</sup> / <sub>4</sub>	76

### POWER (R) TRANSFORMERS BIAS TRANSFORMERS

Type No.	List Price	Pri. V.A.	Secondary D.C. Volts	Filament		Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
				Secondary M.A.	V. A.		Width	Depth	W.	D.	H.	

#### Universal Bias Transformers — "19" Series

T-19R31	\$5.50	10 to 100 in app.	5 volt steps	200		2N	3 <sup>1</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>4</sub>	4	4
T-19R32	7.25	100 to 400 in app.	15 volt steps	200		2N	2 <sup>3</sup> / <sub>4</sub>	2 <sup>11</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	9 <sup>1</sup> / <sub>4</sub>

#### C. H. T. Multi-Volt Bias Transformers

Have the convenient feature of Switchboard plug-in terminal board facilitating changes of voltage.

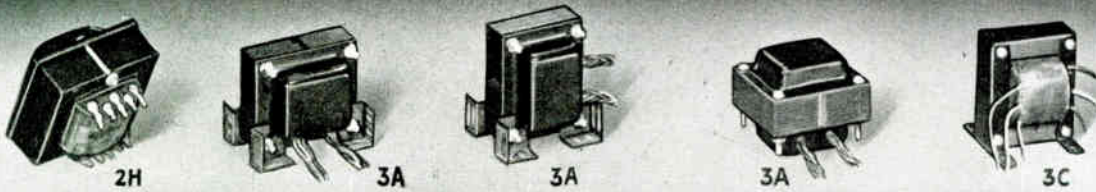
T-15R60	\$9.50	65	150/135/120/110/100/90	200	5	3	3N	3 <sup>7</sup> / <sub>32</sub>	2 <sup>7</sup> / <sub>8</sub>	4	4 <sup>1</sup> / <sub>2</sub>	4 <sup>7</sup> / <sub>8</sub>	6 <sup>3</sup> / <sub>4</sub>
T-15R61	10.50	100	275/250/225/200/175/150	200	5	3	3N	3 <sup>7</sup> / <sub>32</sub>	2 <sup>7</sup> / <sub>8</sub>	4	4 <sup>1</sup> / <sub>2</sub>	4 <sup>7</sup> / <sub>8</sub>	8 <sup>1</sup> / <sub>2</sub>
T-15R62	12.50	155	500/450/400/350/300/275	200	5	3	3N	4 <sup>3</sup> / <sub>32</sub>	3 <sup>5</sup> / <sub>16</sub>	5 <sup>1</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>2</sub>	5 <sup>3</sup> / <sub>8</sub>	15 <sup>1</sup> / <sub>4</sub>

#### TELEVISION POWER TRANSFORMERS

Type No.	List Price	Kinescope Tubes	Secondary	R.M.S. Test Volts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.	
						Width	Depth	W.	D.	H.		
T-17R32	\$10.00	5"	No. 1 — 2300V. A.C. No. 2 — 2.5V at 2A No. 3 — 2.5V at 2A	3000V. D.C.	7500	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>5</sup> / <sub>8</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>2</sub>
T-17R33	12.50	9"	No. 1 — 4500V. A.C. No. 2 — 2.5V at 5A No. 3 — 2.5V at 2A	6000V. D.C.	10,000	2G	2 <sup>11</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>8</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>7</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	6 <sup>1</sup> / <sub>2</sub>

For suitable filter reactor, see listing of chokes on page 8.





**POWER (R) TRANSFORMERS**

Designed to furnish plate and filament voltage requirements of amplifiers, receivers and exciter stages of transmitters.

**UNIVERSAL REPLACEMENT POWER TRANSFORMERS — "13R" SERIES**

The choice of servicemen in all parts of the world because of the universal adaptability to receiver replacement, from both electrical and mechanical considerations. Adjustable mounting brackets permit flush, vertical or horizontal mounting. Replacement recommendations are given in Thordarson Replacement Transformer Encyclopedia and Service Guide No. 352.

Type No.	List Price	Pri. V.A.	Secondary		Filament Windings			Mtg. Centers		Dimensions			Wt. Lbs.		
			A.C. Load Volts	D.C. M.A.	Rect. Fil.	Fil. No. 1	Fil. No. 2	Fil. No. 3	Mtg.	Width	Depth	W.		D.	H.
T-13R19	\$2.50	45	240-0-240	40	5V-2A	6.3V-2A Ct.			3A	2 1/16	2 1/2	2 1/2	2 3/4	3	2 1/2
T-13R11	2.75	60	290-0-290	50	5V-3A	6.3V-2A Ct.			3A	2 1/16	2 1/2	2 1/2	2 3/4	3	3 1/4
T-13R12	3.50	65	350-0-350	70	5V-3A	6.3V-2.5A Ct.			3A	2 1/16	2 1/2	2 1/2	3 5/16	3	3 1/4
T-13R13	4.00	90	350-0-350	90	5V-3A	6.3V-3.5A Ct.			3A	2 1/2	3 1/8	3 1/8	3 3/8	3 3/4	5 1/4
T-13R14	4.25	115	350-0-350	120	5V-4A	6.3V-4.7A Ct.			3A	2 1/2	3 1/8	3 1/8	3 1/2	3 3/4	5 1/4
T-13R15	5.75	140	375-0-375	150	5V-4A	6.3V-5A Ct.			3A	3	3 3/4	3 3/4	3 3/8	4 1/2	6 1/2
T-13R16	6.25	180	400-0-400	200	5V-4A	6.3V-5.14A Ct.			3A	3	3 3/4	3 3/4	3 3/8	4 1/2	7 3/4
T-13R17	4.00	85	300-0-300	60	5V-3A	6.3V-2.5A Ct.	2.5V-7.5A Ct.		3A	2 1/4	2 3/16	2 3/16	3 3/8	3 3/8	4 1/2
T-13R18	4.50	115	350-0-350	90	5V-3A	6.3/2.5-3.5A Ct.	2.5V-9A Ct.		3A	3	3 3/4	3 3/4	3 1/4	4 1/2	5 3/4
T-13R08	4.50	105	350-0-350	90	5V-3A	6.3V-3.3A Ct.	2.5V-6A Ct.		3A	2 1/2	3 1/8	3 1/8	3 1/2	3 3/4	5 1/4
T-13R09	6.25	160	375-0-375	180	5V-3A	6.3V-3.3A Ct.	2.5V-6A Ct.		3A	3	3 3/4	3 3/4	3 3/8	4 1/2	7 1/2
T-13R00	4.25	70	275-0-275	70	5V-3A	5V-.5A Ct.	2.5V-10.5A Ct.		3A	2 1/4	2 3/16	2 3/16	3 3/8	3 3/8	4
T-13R01	2.75	60	325-0-325	40	5V-3A	2.5V-4A Ct.			3A	2 1/16	2 1/2	2 1/2	2 3/4	3	3 1/4
T-13R02	3.50	60	350-0-350	50	5V-3A	2.5V-7.25A Ct.			3A	2 1/16	2 1/2	2 1/2	2 5/16	3	3 1/4
T-13R03	3.75	75	350-0-350	70	5V-3A	2.5V-9A Ct.			3A	2 1/4	2 3/16	2 3/16	3 3/8	3 3/8	4
T-13R04	4.25	115	350-0-350	100	5V-3A	2.5V-12.5A Ct.			3A	2 1/2	3 1/8	3 1/8	3 3/4	3 3/4	5 1/4
T-13R05	4.00	110	350-0-350	70	5V-3A	2.5V-9A Ct.	2.5V-3.5A Ct.		3A	2 1/2	3 1/8	3 1/8	3 1/2	3 3/4	5 1/4
T-13R06	5.25	130	350-0-350	120	5V-3A	2.5V-12.5A Ct.	2.5V-3.5A Ct.		3A	3	3 3/4	3 3/4	3 3/8	4 1/2	6 1/2
T-13R07	5.50	140	400-0-400	110	5V-3A	2.5V-15A Ct.	2.5V-3.5A Ct.		3A	3	3 3/4	3 3/4	3 1/2	4 1/2	6 1/4

**POWER TRANSFORMERS — AMPLIFIER, TRANSMITTER AND REPLACEMENT Half Shell or Flush Mounting**

Lugs are brought out through solder terminals facilitating circuit changes for the experimenter.

T-60R49	\$2.25	30	280-0-280	30	5V-2A	2.5V-3.5A Ct.			2H	2 3/16		2 3/16	2 1/2	2	2
T-50R03	2.75	75	350-0-350	80	5V-2A	2.5V-12A Ct.			2H	3 1/8	2 1/2	3 5/16	3 5/16	3 1/16	5 1/2
T-63R63	2.75	75	350-0-350	80	5V-2A	2.5V-9A Ct.	2.5V-3A Ct.		2H	3 1/8	2 1/2	3 5/16	3 5/16	3 1/16	5 1/2
T-70R20	2.75	45	300-0-300	50	5V-2A	6.3V-2A Ct.			2H	2 9/16		2 5/16	3 7/16	1 7/8	3
T-70R21	3.50	70	300-0-300	70	5V-2A	2.5V-4A Ct.	6.3V-3A Ct.		2H	3 1/8	2 1/2	3 5/16	3 5/16	2 5/16	4 1/4
T-75R47	4.00	75	305-0-305	125	5V-2A	6.3V-2A Ct.			2H	3 1/8	2 1/2	3 5/16	3 5/16	2 5/16	6

**VIBRATOR POWER TRANSFORMERS**

For operation with a vibrator from a six volt battery source.

Type No.	List Price	Secondary		Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
		D.C. Volts to Filter	M.A.		Width	Depth	W.	D.	H.	
T-14R33	\$2.75	225	40	3C	2 1/16	1 15/16	2 1/2	2 5/8	3 1/8	2
T-14R34	3.25	250	50	3C	2 1/16	1 15/16	2 1/2	2 3/4	3 1/4	2 1/4
T-14R35	3.75	260	60	3C	2 1/16	2 1/16	2 1/2	2 7/8	3 1/8	2 1/2
T-14R36	4.25	285	75	3C	2 1/16	2 5/16	2 1/2	3 1/8	3 1/8	3
T-14R37	4.75	350	75	3C	2 1/16	2 9/16	2 1/2	3 3/8	3 1/8	3 1/2
T-14R38	5.25	320	100	2G	2 1/16	2 1/2	3 3/8	3 1/4	4 5/8	5
T-14R39	2.75	150	40	2B	2 3/8		2 7/8	2	2 3/8	1 1/4

**UNIVERSAL 115 VOLT A. C. OR 6 VOLT D. C. VIBRATOR POWER TRANSFORMER**

T-14R40	\$6.75	350	135	2G	3	3 1/4	3 3/4	4	4 15/16	8 1/2
		Fil.-6.3 Ct.	4.75 Amp.							



## POWER (R) TRANSFORMERS—Amplifier, Transmitter and Replacement

Type No.	List Price	Pri. V.A.	Secondary			Filament Windings			Mtg. Centers		Dimensions			Wt. Lbs.		
			A.C. Load	D.C. Volts	Bias M.A.	Rect.	Fil. No. 1	Fil. No. 2	Fil. No. 3	Fig.	Width	Depth	W.		D.	H.
<b>FULLY SHIELDED — UPRIGHT MOUNTING</b>																
Leads are brought out through an opening in the base. Knock-out holes on the sides of the shields provide optional above-panel connection of leads.																
T-56R01	\$5.50	60	325-0-325	70		5V-2A	2.5V-3A Ct.	1.5V-1A 1.5V-4A	5V-5A Ct.	2G	2 <sup>1</sup> / <sub>16</sub>	3	3 <sup>5</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	5 <sup>3</sup> / <sub>4</sub>
T-56R02	3.75	70	350-0-350	70		5V-2A	2.5V-9A Ct.	2.5V-1.5A Ct.		2G	2 <sup>1</sup> / <sub>16</sub>	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	6
T-56R03	6.00	85	350-0-350	105		5V-3A	2.5V-3A Ct.	2.5V-1.75A Ct.	1.5V-5A 1.5V-1A	2G	3	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>9</sup> / <sub>16</sub>	4 <sup>15</sup> / <sub>16</sub>	7 <sup>1</sup> / <sub>4</sub>
T-56R05	6.00	115	350-0-350	110		5V-3A	2.5V-9A Ct.	2.5V-3A Ct.	2.5V-3A Ct.	2G	3	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>11</sup> / <sub>16</sub>	4 <sup>15</sup> / <sub>16</sub>	7 <sup>3</sup> / <sub>4</sub>
T-37R70-C	7.50	95	350-0-350	80		5V-2A Ct.	3V-10A Ct.	5V-2.5A Ct.		2G	2 <sup>1</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>7</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	6 <sup>3</sup> / <sub>4</sub>
For Sparton Models 235, 589, 593, 600 Series, 737, 931 and other receivers using Kellogg and other 3V tubes.																
T-70R78	3.25	60	340-0-340	55		5V-2A	6.3V-1.5A Ct.			2G	2 <sup>1</sup> / <sub>16</sub>	1 <sup>3</sup> / <sub>4</sub>	3 <sup>5</sup> / <sub>16</sub>	2 <sup>5</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	4
T-70R61	4.00	60	385-0-385	70		5V-2A	6.3V-2.5A Ct.			2G	2 <sup>1</sup> / <sub>16</sub>	2 <sup>5</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>
T-70R62	5.50	110	350-0-350	145		5V-3A	6.3V-4.5A Ct.			2G	3	3 <sup>1</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>7</sup> / <sub>8</sub>	4 <sup>15</sup> / <sub>16</sub>	8 <sup>1</sup> / <sub>2</sub>
T-92R21	7.50	150	400-0-400	200		5V-3A	400-0-400	6.3V-5A Ct.		2G	3	3 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	4 <sup>15</sup> / <sub>16</sub>	9
T-17R30	8.50	200	370-0-370	280		5V-3A	6.3V-7A Ct.			2G	3	3 <sup>5</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	4 <sup>3</sup> / <sub>8</sub>	4 <sup>15</sup> / <sub>16</sub>	9 <sup>1</sup> / <sub>2</sub>
T-17R31	12.50	300	430-0-430	325		5V-6A	6.3V-8A Ct.			2G	3	4 <sup>7</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	5 <sup>5</sup> / <sub>8</sub>	4 <sup>15</sup> / <sub>16</sub>	13 <sup>1</sup> / <sub>2</sub>
T-74R28	6.50	105	440-0-440	125	38V	5V-3A 2.5V-3A	6.3V-3.3A Ct.			2G	3	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>11</sup> / <sub>16</sub>	4 <sup>15</sup> / <sub>16</sub>	8
T-87R85	7.00	145	330-0-330	160	77V	5V-3A 5V-2A	6.3V-2A Ct.	2.5V-5A Ct.		2G	3	3 <sup>1</sup> / <sub>8</sub>	3 <sup>11</sup> / <sub>16</sub>	3 <sup>7</sup> / <sub>8</sub>	4 <sup>15</sup> / <sub>16</sub>	8 <sup>1</sup> / <sub>2</sub>
T-68R26	6.75	160	550-0-550	150		5V-3A	7.5V-2.5A Ct.	2.5V-5A Ct.		2G	3	3 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	4 <sup>15</sup> / <sub>16</sub>	10 <sup>1</sup> / <sub>8</sub>
T-69R35	6.50	135	387.5-0-387.5	200		5V-3A	6.3V-3A Ct.			2G	3	3 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	4 <sup>15</sup> / <sub>16</sub>	9 <sup>1</sup> / <sub>2</sub>
T-75R50	7.50	160	435-0-435	250	80V	5V-3A 2.5V-3A	6.3V-1.5A Ct.	2.5V-10A Ct.		2G	3	3 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	4 <sup>15</sup> / <sub>16</sub>	10 <sup>1</sup> / <sub>2</sub>
T-83R82	10.00	200	740-0-740	140	150V	5V-3A 2.5V-3A	7.5V-2.5A Ct.			2G	3	4	3 <sup>3</sup> / <sub>4</sub>	4 <sup>3</sup> / <sub>4</sub>	4 <sup>15</sup> / <sub>16</sub>	11 <sup>1</sup> / <sub>2</sub>
T-83R85	12.00	290	740-0-740	200	150V	5V-3A 2.5V-3A	7.5V-5A Ct.			2G	3 <sup>1</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	5 <sup>1</sup> / <sub>4</sub>	4 <sup>15</sup> / <sub>16</sub>	13 <sup>1</sup> / <sub>2</sub>
T-89R28	11.00	250	550-0-550	275		5V-3A Ct.	6.3V-6A Ct.			2G	3	4 <sup>1</sup> / <sub>2</sub>	3 <sup>11</sup> / <sub>16</sub>	5 <sup>1</sup> / <sub>4</sub>	4 <sup>15</sup> / <sub>16</sub>	15
T-19R30	7.75	170	560-0-560	150		5V-3A	6.3V-3A Ct.	7.5V-2.5A Ct.		2G	3	3 <sup>1</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	4	4 <sup>15</sup> / <sub>16</sub>	8 <sup>3</sup> / <sub>4</sub>

### C. H. T. POWER TRANSFORMERS

For amplifiers, transmitters, or deluxe receivers. Designed to operate continuously at full rated load. Cases compound filled for complete coil protection.

T-15R00	\$10.50	140	500-0-500	150		5V-3A	7.5V/6.3-5A			3K	3 <sup>15</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>8</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	6	15
T-15R01	15.00	310	500-0-500	400		5V-6A	6.3V-6A			3K	5 <sup>3</sup> / <sub>2</sub>	4 <sup>9</sup> / <sub>16</sub>	5 <sup>15</sup> / <sub>16</sub>	6 <sup>15</sup> / <sub>16</sub>	6	24 <sup>1</sup> / <sub>2</sub>
T-15R02	13.25	220	750-0-750	200		2.5V-10A	7.5V/6.3-3A			3K	3 <sup>15</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>8</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	6	17
T-15R03	13.75	205	400-0-400	200		5V-3A	6.3V-3A	2.5V-4A		3K	3 <sup>15</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>8</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	6	19
T-15R04	4.75	30	255-0-255	25			6.3V-2.1A Ct.			3L	2 <sup>1</sup> / <sub>8</sub>		2 <sup>9</sup> / <sub>16</sub>	3	3 <sup>9</sup> / <sub>16</sub>	3
T-15R05	10.50	150	340-0-340	135	77V	5V-3A 5V-2A	6.3V-4A Ct.	*6.3V-2A Ct. *2.5V-5A Ct.		3K	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>2</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	5 <sup>5</sup> / <sub>8</sub>	10
T-15R06	9.75	155	362.5-0-362.5	175		5V-3A	6.3V-5A Ct.			3K	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>2</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	5 <sup>5</sup> / <sub>8</sub>	11
T-15R07	10.50	238	380-0-380	280		5V-3A	6.3V-7A Ct.			3K	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>2</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	5 <sup>5</sup> / <sub>8</sub>	12
T-15R08	13.75	253	450-0-450	325		5V-6A	6.3V-8A Ct.			3K	3 <sup>15</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>2</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>7</sup> / <sub>16</sub>	5 <sup>5</sup> / <sub>8</sub>	22

### SPEAKER FIELD SUPPLY TRANSFORMERS

T-67R97	4.25	55	115 V.D.C. @ 50 to 250			5V-3A				2G	3 <sup>1</sup> / <sub>4</sub>	1 <sup>11</sup> / <sub>16</sub>	3 <sup>7</sup> / <sub>8</sub>	3 <sup>5</sup> / <sub>8</sub>	3 <sup>5</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>4</sub>
T-92R53	5.75	120	300 V.D.C. @ 200			5V-3A				2G	3 <sup>1</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>4</sub>	3 <sup>5</sup> / <sub>16</sub>	4	3 <sup>1</sup> / <sub>4</sub>	6 <sup>1</sup> / <sub>4</sub>

\*Not simultaneous—for 2A3's or 6A3's Fil.

### FENCE CONTROLLER TRANSFORMER

Note: For 6 volt D.C. operation, with suitable relays. Open horizontal mounting.

Type No.	List Price	Primary	Sec.	Mtg. Centers		Dimensions			Wt. Lbs.	
				Width	Depth	W.	D.	H.		
T-18V10-	\$3.00	6 V. D.C.	8,000 V. (37 M.A. Peak) 9,000 V. (25 M.A. Peak)	Open circuit Open circuit	2 <sup>15</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	3	1



This accurate and convenient table has been compiled to facilitate choosing the correct output transformer. Two types are offered for most tubes: the

universal type, which is designed to accommodate a wide range of tube and voice coil impedances, and the specific duty type.

TUBE	PLATE VOLTS	BIAS VOLTS	PLATE M. A.	PLATE LOAD OHMS	WATTS OUTPUT	UNIVERSAL TYPE TRANSFORMER	SPECIFIC DUTY TRANSFORMER
1A5G	90	-4.5	4.0	25,000	.115		T-14S83
1C5G	90	-7.5	7.5	8,000	.240	T-13S38	T-14S84
1D8GT	90	-9.0	5.0	12,000	.200	T-13S38	
1E7G (1 section)	135	-4.5	7.5	16,000	.290	T-13S38	T-13S43
(2 sections, P-P)	135	-7.5	*3.5	24,000	.575		T-14S83
1F4, 1F5G	135	4.5	8.0	16,000	.310	T-13S38	T-13S43
1G5G	90	-6.0	8.5	8,500	.250	T-13S38	T-14S84
1G6G	90	0	*1.0	12,000	.675	T-13S38	
1J5G	135	-16.5	7.0	13,500	.450	T-13S38	
1J6G	135	0	*5.0	10,000	2.1	T-13S38	T-81S01
1N6G	90	-4.5	3.1	25,000	.100		T-14S83
1Q5G, 1Q5GT	90	-4.5	9.5	8,000	.270	T-13S38	T-14S84
1S4	45	-4.5	3.8	8,000	.065	T-13S38	T-14S84
1T5GT	90	-6.0	6.5	14,000	.170	T-13S38	T-13S43
2A3 (Single Cl. A)	250	-45.0	60.0	2,500	3.5	T-13S42	T-17S10
(P-P AB fixed bias)	300	-62.0	*40.0	3,000	15.0	T-13S41	T-58S72
(P-P AB self bias)	300	-62.0	*40.0	5,000	10.0	T-13S41	(C.H.T., T-15S91) T-67S54 (C.H.T., T-15S90)
2A5 (Single Cl. A)	250	-16.5	34.0	7,000	3.1	T-13S42	T-13S37
(Single Cl. A)	285	-20.0	38.0	7,000	4.5	T-13S42	T-13S37
(P-P Cl. A)	250	-16.5	*34.0	14,000	6.2	T-57S01	T-67S51
(P-P Cl. AB <sub>1</sub> )	315	-24.0	*31.0	10,000	11.0	T-13S41	T-75S75
(P-P Cl. AB <sub>2</sub> )	375	-21.0	*27.0	10,000	19.0	T-13S41	T-75S75
3Q5GT (Fil. par.)	90	-4.5	9.5	8,000	.270	T-13S38	T-14S84
(Fil. series)	90	-4.5	7.5	8,000	.230	T-13S38	T-14S84
4A6G	90	-1.5	*1.1	8,000	1.0	T-13S38	T-14S81
6A3	250	-45.0	60.0	2,500	3.2	T-13S42	T-17S10
6A4	180	-12.0	22.0	8,000	1.4	T-13S38	T-13S37
6A5G	250	-45.0	60.0	2,500	3.2	T-13S42	T-17S10
6A6	300	0	*17.5	8,000	10.0	T-13S41	T-67S48
6AC5G	250	self	32.0	7,000	3.7	T-13S42	T-13S37
(P-P Cl. B)	250	0	*2.5	10,000	8.0	T-13S41	T-75S75
6AL6G	250	-14.0	72.0	2,500	6.5	T-13S42	T-17S10
6B4G (Single Cl. A)	250	-45.0	60.0	2,500	3.2	T-13S42	T-17S10
(P-P AB fixed bias)	325	-68.0	*40.0	3,000	15.0	T-13S41	T-58S72
(P-P AB self bias)	325	-68.0	*40.0	5,000	10.0	T-13S41	(C.H.T., T-15S91) T-67S54 (C.H.T., T-15S90)
6B5	300	0	42.0	7,000	4.0	T-13S42	T-13S37
6E6	250	-27.5	*18.0	14,000	1.6	T-57S01	T-13S40
6F6	250	-16.5	34.0	7,000	3.1	T-13S42	T-13S37
6G6G	180	-9.0	15.0	10,000	1.1	T-13S38	
6G6G	135	-6.0	11.5	12,000	.6	T-13S38	
6K6G	315	-21.0	25.5	9,000	4.5	T-57S01	
6K6G	250	-18.0	32.0	7,600	3.4	T-13S42	T-13S37
6L6 (Single Cl. A)	250	-14.0	72.0	2,500	6.5	T-13S42	T-17S10
(Single Cl. A)	320	-20.0	76.0	2,500	8.0		T-17S10
(P-P Cl. A <sub>1</sub> )	270	-16.5	*67.5	5,000	18.5		T-67S54
(P-P Cl. AB <sub>1</sub> )	319	-23.0	*50.0	4,300	25.0		(C.H.T., T-15S90) T-17S12
(P-P Cl. AB <sub>1</sub> )	400	-25.0	*51.0	6,600	34.0		(C.H.T., T-15S91) T-17S13
(P-P Cl. AB <sub>2</sub> )	430	-20.0	*47.0	5,500	40.0		(C.H.T., T-15S92) T-17S14
(P-P-Par. Cl. AB <sub>1</sub> )	410	-28.0	*50.0	3,300	60.0		(C.H.T., T-15S92) T-17S15
(P-P-Par. Cl. AB <sub>2</sub> )	430	-24.5	*52.0	1,900	120.0		(C.H.T., T-15S93) T-17S16 (C.H.T., T-15S94)

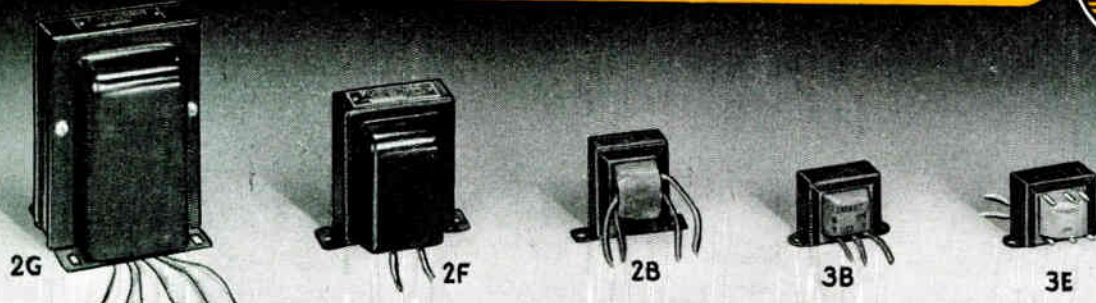
\* Zero signal per plate.





TUBE	PLATE VOLTS	BIAS VOLTS	PLATE M. A.	PLATE LOAD OHMS	WATTS OUTPUT	UNIVERSAL TYPE TRANSFORMER	SPECIFIC DUTY TRANSFORMER
6N6G	300	0	42.0	7,000	4.0	T-13S42	T-13S37
6N7	300	0	*17.5	8,000	10.0	T-57S01	T-67S48
6V6 (Single Cl. A)	250	-12.5	44.5	5,000	4.5	T-13S42	
(Single Cl. A)	315	-13.0	34.0	8,500	5.5	T-57S01	
(P-P Cl. AB <sub>1</sub> )	250	-15.0	*35.0	10,000	10.0	T-13S41	T-75S75
(P-P Cl. AB <sub>2</sub> )	306	-20.0	*50.0	8,000	15.0	T-13S41	T-17S11
							(C.H.T., T-15S90)
6Y6G	135	-13.5	58.0	2,000	3.6	T-13S42	T-17S10
6Y6G	200	-14.0	61.0	2,600	6.0	T-13S42	T-17S10
6Y7G	180	0	*3.8	7,000	5.5	T-13S42	T-67S48
6Y7G	250	0	*5.3	14,000	8.0	T-57S01	T-13S40
6Z7G	135	0	*3.0	9,000	2.5	T-13S38	T-81S01
6Z7G	180	0	*4.2	12,000	4.2	T-13S38	T-13S40
7A5	110	-7.5	35.0	2,500	1.4	T-13S42	T-17S10
7B5	100	-7.0	9.0	12,000	.35	T-13S38	
7B5	250	-18.0	32.0	7,600	3.4	T-13S42	T-13S37
7C5	250	-12.5	45.0	5,000	4.5	T-13S42	T-89S74
(P-P Cl. AB <sub>1</sub> )	250	-15.0	*35.0	10,000	10.0	T-13S41	T-75S75
10	425	-50.0	18.0	10,000	1.6	T-57S01	
12A5	100	-15.0	17.0	4,500	.8	T-13S42	T-13S39
12A5	180	-25.0	45.0	3,300	3.4	T-13S42	T-13S39
12A7	135	-13.5	9.0	13,500	.55	T-13S38	T-13S43
18	250	-16.5	34.0	7,000	3.0	T-13S42	T-13S37
19	135	0	*5.0	10,000	2.1	T-13S38	T-81S01
25A6	95	-15.0	20.0	4,500	.9	T-13S42	T-13S39
25A7G	100	-15.0	20.5	4,500	.770	T-13S42	T-13S39
25AC5GT	180	0	27.0	8,000	2.0	T-13S38	T-13S37
(P-P Cl. B)	180	0	*2.0	4,800	6.0	T-13S41	T-67S54
25B6G	105	-16.0	48.0	1,700	2.4	T-13S42	T-14S82
25L6	110	-7.5	49.0	1,500	2.1	T-13S42	T-14S82
31	135	-22.5	8.0	7,000	.185	T-13S42	T-13S37
32L7GT	110	-7.5	40.0	2,500	1.5	T-13S42	T-17S10
33	135	-13.5	14.5	7,000	.7	T-13S42	T-13S37
35A5-LT	110	-7.5	40.0	2,500	1.5	T-13S42	T-17S10
35L6GT	110	-7.5	40.0	2,500	1.5	T-13S42	T-17S10
38	135	-13.5	9.0	13,500	.55	T-13S38	
38	250	-25.0	22.0	10,000	2.5	T-13S38	
41	250	-18.0	32.0	7,600	3.4	T-13S42	T-13S37
42	250	-16.5	34.0	7,000	3.1	T-13S42	T-13S37
43	95	-15.0	20.0	4,500	.9	T-13S42	T-13S39
45 (Single Cl. A)	250	-50.0	34.0	3,900	1.6	T-13S42	T-89S74
(P-P Cl. AB <sub>2</sub> )	275	-56.0	*36.0	5,060	12.0	T-13S41	T-67S54
46 (Single Cl. A Triode)	250	-33.0	22.0	6,400	1.25	T-13S42	T-13S37
(P-P Cl. B)	400	0	*6.0	5,800	20.0	T-13S41	T-67S52
47	250	-16.5	31.0	7,000	2.7	T-13S42	T-13S37
(P-P Cl. A)	250	-16.5	*31.0	14,000	5.4	T-57S01	T-67S51
48	96	-19.0	52.0	1,500	2.0	T-13S42	T-14S82
(P-P Cl. A <sub>1</sub> Pent.)	125	-20.0	*50.0	3,000	5.0	T-13S41	T-58S72
49 (P-P Cl. B)	135	0	*1.3	8,000	2.3	T-13S38	T-14S81
50 (P-P Cl. A)	450	-84.0	*55.0	8,000	9.2	T-13S41	T-65S94
50C6G	135	-13.5	58.0	2,000	3.6	T-13S42	T-17S10
50L6GT	110	-7.5	49.0	1,500	2.1	T-13S42	T-14S82
52	110	0	43.0	2,000	1.5	T-13S42	T-17S10
(P-P Cl. B)	180	0	*1.5	10,000	5.0	T-57S01	T-81S01
53	300	0	*17.5	8,000	10.0	T-13S41	T-67S48
59 (Single Cl. A Triode)	250	-28.0	26.0	5,000	1.25	T-13S42	T-13S39
(Single Cl. A Pent.)	250	-18.0	35.0	6,000	3.0	T-13S42	T-13S37
(P-P Cl. B)	400	0	*13.0	6,000	20.0	T-13S41	T-67S52
70L7-GT	110	-7.5	40.0	2,000	1.8	T-13S42	T-17S10
71-A	180	-40.5	20.0	4,800	.79	T-13S42	T-13S39
(P-P Cl. A)	180	-40.5	*20.0	8,000	1.6	T-13S38	T-33S99
79	180	0	*3.8	7,000	5.5	T-13S42	T-67S48
89	250	-25.0	32.0	6,750	3.4	T-13S42	T-13S37
182B/482B	250	-35.0	20.0	4,500	1.35	T-13S42	T-13S39
183/483	250	-65.0	20.0	4,500	1.8	T-13S42	T-13S39
950	135	-16.5	7.0	13,500	.450	T-13S38	

\* Zero signal per plate.



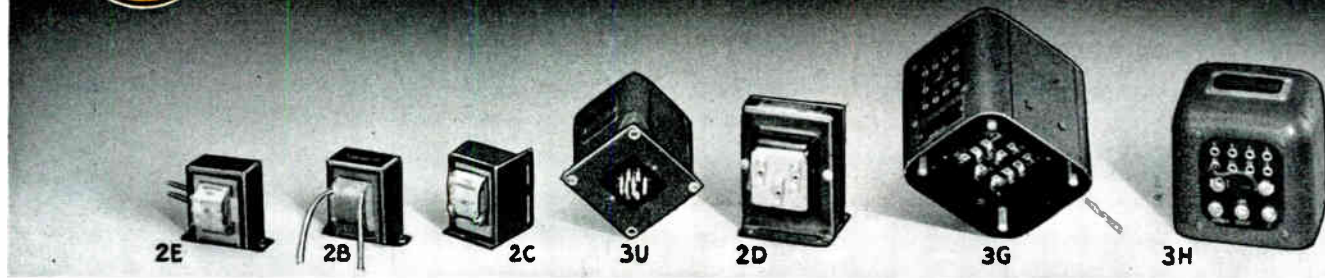
**OUTPUT (S) TRANSFORMERS**

For coupling audio power amplifier tubes to a loud speaker voice coil or line. Correctly matching the output tubes to a speaker load is important. Efficiency, frequency response and distortion are affected by this matching. Small, unshielded types are listed for use with receivers where the transformer is usually mounted on the loud speaker frame. Larger shielded types have multiple secondary impedances as required in sound amplifiers. C.H.T. output transformers have a greater selection of output impedances, meeting practically all speaker requirements. These units are compound filled and are provided with jacks and plugs to facilitate speaker matching. Tertiary winding included on some types for inverse feed-back connections. Refer to pages 22-23 for complete listing of tubes with recommended output transformers.

Type No.	List Price	Tube Type	Class	Ohms Impedance		Pri. M.A. Per Side	Max. Watts	Mtg. Centers Fig.	Mtg. Centers		Dimensions		Wt. Lbs.
				Pri.	Sec.				Width	Depth	W.	D.	
<b>REPLACEMENT OUTPUT TRANSFORMERS</b>													
T-14S81	\$1.25	1-42, 2A5, 6F6 or P-P45, 71	A	7,000 Ct.	3 to 6	40	5	3B	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-14S82	1.25	1-25L6	A	1,500	3 to 6	55	5	3B	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-14S83	1.25	1A5-G, 1E7-G	A	25,000 Ct.	3 to 6	8	5	3B	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-14S84	1.25	1-1C5G, 1Q5G	A	8,000	3 to 6	10	5	3B	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-13S37	1.25	1-6F6, 42, 2A5, 47	A	7,000	1/2 4	36	5	3E	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-13S39	1.25	1-45, 12A5, 43, 71A	A	4,000	1/2 4	36	5	3E	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-13S43	1.35	1-1F4, 1D4, 1F5G	A	16,000	1/2 4	10	5	3E	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-33S99	1.50	2-45, 71, 43, 25A6 P-P	A	8,000 Ct.	6 to 12	36	10	2B	2 <sup>3</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>
T-13S40	1.50	2-6F6, 42 P-P, 2-2A5, 47 P-P	A, A	14,000 Ct.	1/2 4	40	10	3E	2 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	3/4
T-81S01	1.50	1-19, 1J6G, 1G6G P-P 2-30, 49 P-P	B B	10,000 Ct.	2/4 8	15	8	2B	2 <sup>1</sup> / <sub>8</sub>	2 <sup>9</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	2	3/4
<b>HEAVY DUTY OUTPUT TRANSFORMERS TO LINE OR SPEAKER (High Level)</b>													
T-72S58	\$1.65	Pentode Plate to phones or oscillator		10,000	2,000 50	30	5	2B	2 <sup>1</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	2	3/4
T-17S10	3.00	1-6L6	A	2,500	2 4/8 500	80	8	2F	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	3	2 <sup>1</sup> / <sub>4</sub>
T-17S11	4.50	2-6V6 P-P	AB1	8,000*	4/8/15/250/500	52	15	2F	3 <sup>1</sup> / <sub>2</sub>	3 <sup>15</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>2</sub>
T-17S12	4.50	2-6L6 P-P	AB1	4,300*	4/8/15/250/500	95	25	2F	3 <sup>1</sup> / <sub>2</sub>	3 <sup>15</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>2</sub>
(with 300 V. on plate and screen)													
T-17S13	6.00	2-6L6 P-P	AB1	6,600*	4/8/15/250/500	80	34	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub> 5 <sup>1</sup> / <sub>2</sub>
T-17S14	6.00	2-6L6 P-P	AB2	5,500*	4/8/15/250/500	90	40	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub> 5 <sup>1</sup> / <sub>4</sub>
T-17S15	6.50	4-6L6 P-P Par.	AB1	3,300*	4/8/15/250/500	155	60	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>13</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub> 5 <sup>3</sup> / <sub>4</sub>
T-17S16	12.00	4-6L6 P-P Par.	AB2	1,900*	84/100/125/166.250/500	230	120	2G	3	4 <sup>1</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	5	4 <sup>15</sup> / <sub>16</sub> 14 <sup>1</sup> / <sub>4</sub>
T-68S06	2.50	1-6F6, 42, 2A5, 1-47	A, A	7,000	10 or 2,000	36	5	2F	2 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	1 <sup>7</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	1
T-67S51	3.50	2-6F6, 42, 2A5, 47 P-P	A	14,000	4/8/15/500	40	20	2F	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	3	2 <sup>1</sup> / <sub>4</sub>
T-67S48	3.50	2-45, 71, 43, 25A6 P-P 1-6N7, 6A6, 53 P-P	A B	8,000	4/8/15/500	36	25	2F	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	3	2 <sup>1</sup> / <sub>4</sub>
T-67S52	4.00	2-46, 59 P-P 2-6F6, 42, 2A5 P-P 2-6N7, 6A6, 53 P-P Par.	B AB2 B	5,800	4/8/15/500	60	30	2F	3 <sup>1</sup> / <sub>2</sub>	3 <sup>15</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>2</sub>
T-58S72	3.75	2-2A3, 6B4G P-P 2-48, 25L6 P-P	AB A	3,000	4/8/15/500	60	30	2F	3 <sup>1</sup> / <sub>2</sub>	3 <sup>15</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>4</sub>
T-67S54	4.00	2-6L6 P-P 2-2A3, 6B4G, 45 P-P	A AB	5,000	4/8/15/500	60	30	2F	3 <sup>1</sup> / <sub>2</sub>	3 <sup>15</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>2</sub>
T-67S92	4.00	4-2A3, 6B4G, 45 P-P Par. 4-48, 25L6, P-P Par.	AB A	1,500	4/8 15/500	80	40	2F	3 <sup>1</sup> / <sub>2</sub>	3 <sup>15</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>2</sub>
T-65S94	4.00	2-50 P-P 2-6F6, 42, 2A5 P-P	A AB2	8,000	4/8/15/500	55	40	2F	3 <sup>1</sup> / <sub>2</sub>	3 <sup>15</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>2</sub>
T-75S75	4.00	2-6F6, 42 or 2A5 1-6N7, 6A6, 53 P-P 2-6N6G, 6B5, 2B6, 6AC5 P-P	AB2 B A	10,000	4/8/15/500	45	40	2F	3 <sup>1</sup> / <sub>2</sub>	3 <sup>15</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>2</sub>
T-84S58	6.00	2-6L6 P-P	AB2	3,800	4/8 15/500	115	60	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>15</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub> 6
T-89S75	4.00	2-6L6 P-P	AB1	6,600	4/8/15/500	80	40	2F	3 <sup>1</sup> / <sub>2</sub>	3 <sup>15</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>2</sub>
T-89S74	3.75	1-6L6	A	4,000	4/8/15/500	70	15	2F	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	3	2 <sup>1</sup> / <sub>4</sub>
T-89S68	6.50	4-6L6 P-P Par.	AB1	3,300	50/125/200/250/333/500	150	75	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>15</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub> 5 <sup>3</sup> / <sub>4</sub>
T-83S87-	9.00	4-50 P-P Par.	AB2	3,000	4/8/15/500	160	90	2G	3	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>11</sup> / <sub>16</sub>	4 <sup>15</sup> / <sub>16</sub> 7 <sup>3</sup> / <sub>4</sub>

\*10% feed-back winding.





## OUTPUT (S) TRANSFORMERS

Type No.	List Price	Tube Type	Class	Ohms Impedance		Pri. M.A. Per Side	Max. Watts	Mtg. Centers			Dimensions			Wt. Lbs.
				Pri.	Sec.			Mtg. Fig.	Width	Depth	W.	D.	H.	



### UNIVERSAL REPLACEMENT TUBE TO VOICE COIL

Preferred by many because of their wide plate impedance and voice coil coverage. Proper matching of load impedances to speaker voice coils is accomplished by using taps as specified in the instruction sheets.

T-13S38	\$1.50	Universal Single or P-P Tubes	A	4,000/7,000	Adjustable .1 to 29	36	8	3E	2 <sup>3</sup> / <sub>8</sub>	1 1/2	2 <sup>13</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>4</sub>	
T-57S01*	2.00			8,000/10,000					2E		2 <sup>3</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	2	2 <sup>3</sup> / <sub>8</sub>	1 1/4
T-57S02†	2.00			14,000 Ct.					2B		2 <sup>3</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	2	2 <sup>3</sup> / <sub>8</sub>	1 1/4
T-17S57	2.25								2C		1 <sup>9</sup> / <sub>16</sub>	2	1 <sup>15</sup> / <sub>16</sub>	2 <sup>3</sup> / <sub>8</sub>	1 1/4
T-13S42	1.50	Universal Single Tube	A	1,500/2,000 4,000/5,000 7,000	Adjustable .1 to 29	55	10	3E	2 <sup>3</sup> / <sub>8</sub>	2 <sup>13</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>4</sub>		
T-13S41	2.75	Universal P-P Tubes	A	3,000/5,000 6,600/7,000 8,000/10,000	Adjustable .1 to 29	60	20	2E	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3	2 <sup>1</sup> / <sub>4</sub>		

\*Solder terminals for voice coil connections. †Color coded leads for voice coil connections.

### UNIVERSAL TUBE TO LINE

T-61S25	\$3.25	Univ. Single Tube	A	2,500/4,000 5,000/6,000/7,000	500	60	10	2E	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>4</sub>	3	2 <sup>1</sup> / <sub>4</sub>
T-61S26	3.50	Univ. P-P Tubes	A	8,000/10,000 12,000/14,000 Ct.	500	55	10	2E	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3	2 <sup>1</sup> / <sub>4</sub>

### C. H. T. MULTIPLE TAP OUTPUT TRANSFORMERS

Include these C. H. T. premium quality features: Switchboard plug-in terminal board for quick and accurate selection of secondary impedances, conservative design for exceptional performance, and complete coil protection against humidity. Tertiary winding to give a feedback voltage 10% of full primary. Split Primaries.

T-15S90	\$9.25	2-6V6 P-P 2-6L6 P-P 2-2A3 P-P (self bias)	AB1 AB1 AB	8,000 5,000 5,000	2/3/4/6/- 8/16/125/- 250/500	70	15	3H	2 <sup>7</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>3</sup> / <sub>8</sub>	7 <sup>1</sup> / <sub>4</sub>
T-15S91	11.50	2-6L6 P-P (300 V. P. & Sc.) 2-2A3 P-P (fixed bias)	AB AB	4,300 3,000	Same as above	95	25	3H	2 <sup>7</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>7</sup> / <sub>8</sub>	8
T-15S92	13.75	2-6L6 P-P 2-6L6 P-P	AB1 AB2	6,600 5,500	Same as above	90	40	3H	2 <sup>7</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	5 <sup>5</sup> / <sub>8</sub>	8 <sup>3</sup> / <sub>4</sub>
T-15S93	15.00	4-6L6 P-P Par. 2-6L6 P-P	AB1 AB2	3,300 3,800	Same as above	155	60	3H	2 <sup>7</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	5 <sup>5</sup> / <sub>8</sub>	15 <sup>1</sup> / <sub>2</sub>
T-15S94	17.50	4-6L6 P-P Par.	AB2	1,900	500/250/166 /125/100/84	230	120	3H	3 <sup>15</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>32</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	5 <sup>5</sup> / <sub>8</sub>	18

### UNIVERSAL LINE TO VOICE COIL

T-53S81	\$4.00	Line to Voice Coil		500/250	4-8-15	35		2D	2 <sup>1</sup> / <sub>8</sub>	1 <sup>21</sup> / <sub>32</sub>	2 <sup>7</sup> / <sub>8</sub>	2 <sup>13</sup> / <sub>16</sub>	3 <sup>11</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>2</sub>
T-60S48	3.00	Line to Voice Coil 1 to 6 may be con. in par. to 500 ohm line		500/1,000 1,500/2,000	Pri as 500 ohm- .06 to 8.; pri. as 1,000 ohm .12 to 16, etc.	10		2E	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3	2
T-17S18	3.50		2,500/3,000											
T-14S80	2.00	Line to Voice Coil		500	2/4/6/8	12		2E	2 <sup>3</sup> / <sub>8</sub>		2 <sup>7</sup> / <sub>8</sub>	2	2 <sup>3</sup> / <sub>8</sub>	1 1/2
T-17S17	6.50	Line to Voice Coil		500	4/8/16/25/50	75		3C	3 <sup>1</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	3	4	6 1/2
T-76S74	3.00	Line to multiple spkrs. (autotransformer)		500	250/166/125/ 100/84	30		2E	2 <sup>1</sup> / <sub>16</sub>	1 <sup>13</sup> / <sub>16</sub>	3	2 <sup>3</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>

### C. H. T. MULTIPLE LINE TO VOICE COIL

With Switchboard plug-in terminal board and other C. H. T. quality features.

T-15S96	\$11.00	Line to Voice Coil		1000/500	50/24/16/8/6/4/3/2	25		3G	2 <sup>13</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	3 <sup>7</sup> / <sub>8</sub>	7 <sup>1</sup> / <sub>4</sub>
T-15S97	14.50	Line to Voice Coil		1000/500	50/24/16/8/6/4/3/2	60		3G	2 <sup>13</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	3 <sup>7</sup> / <sub>4</sub>	9

### C. H. T. CRYSTAL RECORDER TRANSFORMERS

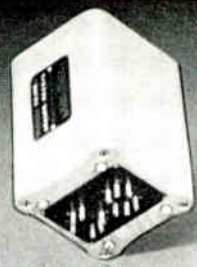
The wave of interest in recording radio programs, speech and other audio happenings has created the desire to build recording equipment. These two transformers are offered to meet the requirements for coupling to a crystal recording head. Designed for constant velocity recording.

T-15S98	\$9.00	Line to crystal cutting head		500	30,000	10		3U	2 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	2 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	5
T-15S99	9.00	Push-pull 2A3 to crystal head		3000/5000	30,000	10		3U	2 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	2 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	5





C10



C7



3T



C5

**TRU-FIDELITY BY THORDARSON**

Broadcast station and other exacting requirements have necessitated the design of Thordarson Tru-Fidelity Transformers. See page 16. This presentation is limited to the 9000 series and equivalent units of the Major audio group. A full listing of the Major group and other Tru-Fidelity audio, modulation, output, reactors and power components is made in Catalog 500-E.

**CRYSTAL MICROPHONE OR PHOTO CELL TO LINE**

Type No.	List Price	Ohms Impedance		Max. D.C. un-per side M.A.	Max. D.C. balance M.A.	Max. Sig. Level db	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
		Primary	Secondary					Width	Depth	W.	D.	H.	
T-90A06	\$17.00	250,000/62,500	500*/125/	0	0	+10	3T	2 <sup>3</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>
T-2A80	17.00		200*/50				C5	2 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>4</sub>

**PLATE TO LINE (LOW LEVEL)**

T-90A02	17.00	20,000/5000	500*/125/	8	8	+15	3T	2 <sup>3</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>8</sub>	5
T-3A30	17.00	Single Plate	200*/50				C5	2 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>16</sub>	5
T-90A01	17.00	20,000/5000	500*/125/	10	0	+20	3T	2 <sup>3</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>
T-3A32	17.00	Single † or P-P Plates	200*/50				C5	2 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>4</sub>

†With single tube use parallel feed with resistor or T-90C09

**MIXER**

T-90A10	17.00	500*/125/	500*/125/	100	.5	+10	3T	2 <sup>3</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>
T-2A97	17.00	200*/50	200*/50				C5	2 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>4</sub>

**LINE TO GRID**

T-90A00	17.00	500*/125/	75,000/18,750	100	.5	+10	3T	2 <sup>3</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>
T-2A66	17.00	200*/50	Single Grid				C5	2 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>4</sub>
T-90A11	17.00	500*/125/	150,000*37,500	100	.5	+20	3T	2 <sup>3</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>
T-2A68	17.00	200*/50	P-P Grids‡				C5	2 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>4</sub>

‡Secondary ohms T-2A68 100,000, 25,000.

**INTERSTAGE**

T-90A03	17.00	10,000/2500	Ratio-overall	40,000/10,000	0	0	+15	3T	2 <sup>3</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>
T-2A38	17.00	Single Plate	1 to 2	Single Grid				C5	2 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>4</sub>
T-90A04	17.00	10,000/2500	Ratio-overall	40,000/10,000	0	0	+15	3T	2 <sup>3</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>
T-2A36	17.00	Single Plate	1 to 2	P-P Grids				C5	2 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>4</sub>
T-90A05	17.00	20,000/5000	Ratio-overall	45,000/11,250	10	0	+20	3T	2 <sup>3</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>
T-2A42	17.00	P-P Plates	1 to 1.5‡	P-P Grids				C5	2 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>4</sub>

‡Ratio-overall T-2A42 1:2.25.

**OUTPUT**

T-90S07	18.00	5000/3000/1250/750		500*/125/	60	5	+32	3T	2 <sup>3</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>
T-3S20	18.00	P-P 2A3, etc.		200*/50				C7	1 <sup>7</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>4</sub>	3 <sup>5</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	
T-90S08	18.00	5000/3000/1250/750		15/10/7.5/	60	5	+32	3T	2 <sup>3</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>
T-3S21	18.00	P-P 2A3, etc.		5/3.75/1.25				C7	1 <sup>7</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>4</sub>	3 <sup>5</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	
T-90S13	20.00	5000/3000/1250/750		500*/125/	60	5	+34	3S	2 <sup>3</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	4	4	4 <sup>7</sup> / <sub>8</sub>	11
T-3S22	19.00	P-P 2A3, etc.		200*/50				C10	1 <sup>7</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>8</sub>	4	5 <sup>7</sup> / <sub>16</sub>	11

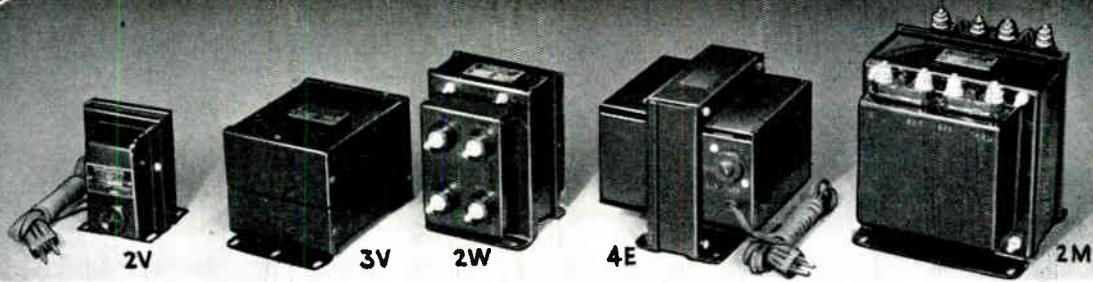
**LINE TO VOICE COIL**

T-90S12	17.00	500*/125/		15/10/7.5/	0	0	+32	3T	2 <sup>3</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>
T-3S07	17.00	200*/50		5/3.75/1.25				C5	2 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>4</sub>

**PLATE REACTOR**

Type No.	List Price	Connection	Henries	M.A.	D.C. Ohms	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
							Width	Depth	W.	D.	H.	
T-90C09	\$12.50	Series	300	8	4,000	3T	2 <sup>3</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>
T-2C82	12.50	Parallel	75	16	1,000	C5	2 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>4</sub>

\*Indicates inductive and capacitive balance to center tap for use on balanced transmission lines.



## VOLTAGE CHANGER (V) TRANSFORMERS

### AUTOTRANSFORMERS



Autotransformers consist of a single winding on an iron core. Voltage variation is accomplished by means of taps.

#### Step Down — Convenience Outlet Type

Input side equipped with cord and plug. Output side has standard receptacle.

Type No.	List Price	Input Volts	Output Volts	Output Load		Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
				V.A.	Amps.		Width	Depth	W.	D.	H.	
T-26V04	\$ 4.50	220-250	110-125	80	0.725	2V	2 $\frac{1}{16}$	2 $\frac{1}{4}$	3 $\frac{3}{8}$	2 $\frac{7}{8}$	4 $\frac{5}{8}$	4 $\frac{1}{2}$
T-18V06	6.00	220-250	110-125	150	1.35	2V	2 $\frac{1}{16}$	3	3 $\frac{5}{16}$	3 $\frac{5}{8}$	4 $\frac{5}{8}$	6 $\frac{1}{4}$
T-50V11	7.50	220-250	110-125	250	2.25	2V	3	3 $\frac{1}{2}$	3 $\frac{3}{4}$	4 $\frac{1}{4}$	4 $\frac{15}{16}$	10 $\frac{1}{4}$
T-18V07	13.50	220-250	110-125	500	4.5	2V	3	4 $\frac{1}{8}$	3 $\frac{3}{4}$	2 $\frac{7}{8}$	4 $\frac{15}{16}$	13

#### Line Voltage Adjusting — Convenience Outlet Type

For boosting or lowering line voltage. Input taps may be selected by means of a convenient plug arrangement as illustrated (Fig. 4E).

T-18V20	\$ 5.00	95/105/125	115	100	0.9	2V	2 $\frac{1}{16}$	2 $\frac{1}{8}$	3 $\frac{3}{8}$	2 $\frac{7}{8}$	4 $\frac{5}{8}$	4 $\frac{1}{2}$
T-18V21	6.00	95/105/125	115	150	1.3	2V	2 $\frac{1}{16}$	2 $\frac{5}{16}$	3 $\frac{3}{8}$	3 $\frac{1}{8}$	4 $\frac{5}{8}$	5
T-18V22	7.50	95/105/125	115	250	2.2	2V	3	2 $\frac{5}{8}$	3 $\frac{1}{16}$	3 $\frac{3}{8}$	4 $\frac{15}{16}$	6 $\frac{1}{2}$
T-18V23	12.00	95/105/125	115	500	4.5	2V	3	3 $\frac{1}{8}$	3 $\frac{1}{16}$	3 $\frac{7}{8}$	4 $\frac{15}{16}$	9

#### Primary Regulating Types

For increasing or decreasing line voltage. Taps for 60, 80, 90, 100, 110, 120, and 125 volts. 50-60 cycles. Complete with instructions.

T-82V11	\$12.50	60/80/90/100/ 110/120/125	Variable	500	4.5	2W	3 $\frac{1}{4}$	3 $\frac{1}{8}$	4 $\frac{1}{4}$	4 $\frac{5}{8}$	6 $\frac{1}{16}$	16 $\frac{3}{4}$
T-82V12	17.50	60/80/90/100/ 110/120/125	Variable	1000	9.0	2W	3 $\frac{7}{8}$	3	5	4 $\frac{15}{16}$	6 $\frac{5}{8}$	22 $\frac{1}{2}$
T-82V13	30.00	60/80/90/100/ 110/120/125	Variable	2000	18.0	2M	5 $\frac{3}{4}$	5 $\frac{3}{4}$	6 $\frac{9}{16}$	7 $\frac{9}{16}$	6 $\frac{3}{4}$	39 $\frac{1}{2}$

#### Line Voltage—Solder Lug Taps

Provide means of increasing or decreasing line voltages from 0 to 135 volts in 5 volt steps, when operated from 100 to 135 volt line.

T-18V03	\$ 6.25	0-135	Variable	150	1.35	3C	2 $\frac{1}{4}$	1 $\frac{15}{16}$	2 $\frac{15}{16}$	2 $\frac{7}{8}$	3 $\frac{3}{4}$	3 $\frac{1}{2}$
T-18V04	7.75	0-135	Variable	250	2.25	3C	3 $\frac{1}{4}$	2 $\frac{3}{16}$	3 $\frac{5}{16}$	3 $\frac{1}{16}$	4	5 $\frac{1}{4}$
T-18V05	10.50	0-135	Variable	500	4.5	3C	3 $\frac{1}{4}$	2 $\frac{9}{16}$	4 $\frac{3}{8}$	4 $\frac{5}{8}$	6 $\frac{1}{16}$	14 $\frac{1}{4}$

### LINE REGULATING AUTOTRANSFORMER

Provides for an increase or decrease of 7.5 volts. May be used on any A.C. line of 50-60 cycle frequency from 90V to 125V as a step-up or step-down transformer. Especially suitable for boosting line voltage for fluorescent lighting units. Fully enclosed (similar to 2H) and mounted on a 4" outlet box cover, allowing for complete enclosure of all wiring in a conduit or BX system.

T-18V26	\$ 5.25	90-125	7.5 Variation	1150	10		4		4 $\frac{1}{8}$	3 $\frac{1}{2}$	4 $\frac{1}{8}$	5
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### ISOLATION TRANSFORMERS

Electrostatic shield between primary and secondary. Feature unique plug-in primary voltage adjustment — no changing of connections.

T-18V00	\$10.50	105/115/125	115	100		2V	3	2 $\frac{7}{8}$	3 $\frac{3}{4}$	3 $\frac{5}{8}$	4	8
T-18V01	19.50	105/115/125	115	250		4E	4 $\frac{3}{16}$	2 $\frac{9}{16}$	5 $\frac{7}{8}$	6 $\frac{1}{8}$	6 $\frac{1}{16}$	20

### SIGNALING TRANSFORMERS — Listed by Underwriters' Laboratories

Cases are compound filled and have separate primary and secondary wiring compartments. Knock-outs permit attachment of rigid or flexible conduit without exposing the wiring. Four secondary leads provide these output voltages — 4, 8, 12, 16, 20 and 24 volts.

Type No.	List Price	Intermittent Duty	Constant Duty	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
					Width	Depth	W.	D.	H.	
T-47V01	\$ 6.00	50 V. A.	35 V. A.	3V	6 $\frac{1}{4}$	1 $\frac{7}{8}$	7	4 $\frac{1}{2}$	4 $\frac{1}{4}$	6 $\frac{1}{4}$
T-47V02	9.75	100 V. A.	85 V. A.	3V	7	1 $\frac{7}{8}$	7 $\frac{3}{4}$	4 $\frac{1}{2}$	4 $\frac{1}{4}$	8
T-47V03	21.75	250 V. A.	190 V. A.	3V	8 $\frac{1}{4}$	1 $\frac{7}{8}$	9	4 $\frac{1}{2}$	4 $\frac{1}{4}$	14 $\frac{1}{4}$
T-47V04	35.00	500 V. A.	475 V. A.	3V	9 $\frac{3}{16}$	1 $\frac{7}{8}$	10	5 $\frac{1}{4}$	5 $\frac{3}{4}$	22 $\frac{1}{2}$

• FILAMENT, POWER AND • AUDIO TRANSFORMERS FOR •  
• COMPLETE SELECTION OF •  
• EVERY APPLICATION •



**THORPARSON**

**THORPARSON**

500 THORPARSON ST. NEW YORK 17, N.Y.  
RADIO ELECTRIC CO. INC.  
100 W. 42nd St. New York 18, N.Y.



# Transformers by **THORDARSON**



COMPLETE TRANSFORMER CATALOG NO. 400 E  
1940 • FALL - WINTER • 1941

**THORDARSON ELECTRIC MFG. CO.**

**500 W. Huron St.**

**Chicago, Ill.**

# Index

EFFECTIVE AUGUST 1, 1940

Catalog prices are list, subject to trade discount. Add 60% for 25 cycle 115 v. primary; 30% for 230 v. 60 cycle primary; 75% for 230 v. 25 cycle primary.

The letter separating the first two digits of the type number from the last two indicates the classification of the unit. The following legend will further explain:

A = Audio, D = Driver, K = Foundation Unit, P = Plate, S = Output or Speaker, W = Wired Amplifier,  
C = Choke, F = Filament, M = Modulation, R = Power, V = Voltage Changer,

Type No.	Page No.	List Price	Type No.	Page No.	List Price	Type No.	Page No.	List Price	Type No.	Page No.	List Price	Type No.	Page No.	List Price	Type No.	Page No.	List Price
T-2A36	26	\$17.00	T-13S38	25	1.50	T-15R60	19	9.50	T-18C92	7	1.50	T-33A91	5	2.00	T-69R35	21	6.50
T-2A38	26	17.00	T-13S39	24	1.25	T-15R61	19	10.50	T-19D01	11	6.00	T-33S99	24	1.50	T-70R20	20	2.75
T-2A42	26	17.00	T-13S40	24	1.50	T-15R62	19	12.50	T-19D02	11	6.00	T-37C36	7	2.00	T-70R21	20	3.50
T-2A66	26	17.00	T-13S41	25	2.75	T-15A65	6	10.50	T-19D03	11	6.00	T-37R70-C	21	7.50	T-70R61	21	4.00
T-2A68	26	17.00	T-13S42	25	1.50	T-15A66	6	7.25	T-19D04	11	6.00	T-43C92	8	1.65	T-70R62	21	5.50
T-2A80	26	17.00	T-13S43	24	1.35	T-15A67	6	8.00	T-19D05	11	6.00	T-44C02	8	1.50	T-70R78	21	3.25
T-2C82	26	12.50	T-14A29	5	2.25	T-15A68	6	8.00	T-19D06	10	2.75	T-47V01	27	6.00	T-70A82	6	3.50
T-2A97	26	17.00	T-14R32	11	6.50	T-15A69	6	7.25	T-19M13	17	4.00	T-47V02	27	9.75	T-70A83	6	3.50
T-3S07	26	17.00	T-14R33	20	2.75	T-15A70	6	7.50	T-19M14	17	7.00	T-47V03	27	21.75	T-72S58	24	1.65
T-3S20	26	18.00	T-14R34	20	3.25	T-15A71	6	7.25	T-19M15	17	10.00	T-47V04	27	35.00	T-72A59	6	1.65
T-3S21	26	18.00	T-14R35	20	3.75	T-15A72	6	7.25	T-19M16	17	15.00	T-47C07	8	1.65	T-73M52	17	18.00
T-3S22	26	19.00	T-14R36	20	4.25	T-15A73	5	6.50	T-19M17	17	24.00	T-47A25	5	1.75	T-73F60	14	3.75
T-3A30	26	17.00	T-14R37	20	4.75	T-15A74	5	6.50	T-19M21	16	7.00	T-49C91	8	1.50	T-74F23	14	5.00
T-3A32	26	17.00	T-14R38	20	5.25	T-15A75	5	7.00	T-19M22	16	10.00	T-50R03	20	2.75	T-74F24	14	7.50
T-9V30	18	40.00	T-14R39	20	2.75	T-15D76	11	8.25	T-19R30	21	7.75	T-50V11	27	7.50	T-74R28	21	6.50
T-9V31	18	65.00	T-14R40	20	6.75	T-15D77	11	8.25	T-19R31	19	5.50	T-50F61	14	1.50	T-74C29	8	3.75
T-9V32	18	100.00	T-14M49	16	16.50	T-15D78	11	8.25	T-19R32	19	7.25	T-52C98	7	1.75	T-74C30	7	1.50
T-9V33	18	175.00	T-14C61	8	1.00	T-15D79	11	8.25	T-19C35	9	4.00	T-53C19	8	1.50	T-74A31	5	3.25
R-1068	7	2.50	T-14C62	8	1.00	T-15D80	11	11.50	T-19C36	9	6.50	T-53S81	25	4.00	T-74D32	10	3.25
T-11F50	15	9.00	T-14C63	8	1.00	T-15D81	11	11.50	T-19C37	9	10.00	T-54D63	10	2.25	T-75D10	10	5.00
T-11F51	15	9.50	T-14C64	8	1.00	T-15D82	11	8.25	T-19C38	9	14.00	T-55A16	6	2.75	T-75R47	20	4.00
T-11F52	15	13.25	T-14C70	7	2.50	T-15D83	11	11.50	T-19C39	9	3.25	T-56R01	21	5.50	T-75C49	8	1.50
T-11F53	14	8.00	T-14A75	7	14.50	T-15D84	11	11.50	T-19C42	9	4.00	T-56R02	21	3.75	T-75R50	21	7.50
T-11F54	14	16.00	T-14A76	7	14.50	T-15D85	10	7.50	T-19C43	9	6.50	T-56R03	21	6.00	T-75C51	8	5.00
T-11F55	14	11.50	T-14S80	25	2.00	T-15D86	10	7.50	T-19C44	9	10.00	T-56R05	21	6.00	T-75A74	5	2.50
T-11F56	15	7.75	T-14S81	24	1.25	T-15D87	10	11.00	T-19C45	9	14.00	T-57S01	25	2.00	T-75S75	24	4.00
T-11F57	15	13.75	T-14S82	24	1.25	T-15S90	25	9.25	T-19C46	9	3.25	T-57S02	25	2.00	T-76S74	25	3.00
T-11F58	15	15.00	T-14S83	24	1.25	T-15S91	25	11.50	T-19P54	18	5.50	T-57A36	5	2.00	T-78D46	10	1.50
T-11F59	14	5.75	T-14S84	24	1.25	T-15S92	25	13.75	T-19P55	18	6.50	T-57A38	5	2.75	T-79F84	15	4.75
T-11F60	14	6.25	T-14A90	6	2.50	T-15S93	25	15.00	T-19P56	18	7.00	T-57A39	5	2.25	T-81S01	24	1.50
T-11F61	14	18.50	T-14A91	6	2.50	T-15S94	25	17.50	T-19P57	18	8.50	T-57A40	5	2.75	T-81C15	7	2.50
T-11F62	14	6.75	T-14A92	5	1.25	T-15S96	25	11.00	T-19P58	18	14.25	T-57A41	5	3.00	T-81D42	10	3.25
T-11F63	14	8.00	T-14D93	10	1.75	T-15S97	25	14.50	T-19P59	18	16.00	T-57A42	5	3.25	T-81D52	10	3.25
T-11F64	14	9.50	T-14A94	6	2.50	T-15S98	25	9.00	T-19P60	18	18.50	T-57C51	8	1.50	T-82V11	27	12.50
T-11M69	17	5.50	T-15R00	21	10.50	T-15S99	25	9.00	T-19P61	18	20.00	T-57C52	8	1.75	T-82V12	27	17.50
T-11M70	17	7.50	T-15R01	21	15.00	T-16C07	8	2.25	T-19P62	18	22.50	T-57C53	8	2.00	T-82V13	27	30.00
T-11M71	17	13.00	T-15R02	21	13.25	T-17C00-B	8	2.75	T-19P63	18	23.00	T-57C54	8	2.25	T-82M25	16	40.00
T-11M74	17	9.00	T-15R03	21	13.75	T-17D01	10	2.00	T-19P64	18	28.50	T-58A37	6	2.25	T-83D21	10	3.50
T-11M75	17	12.50	T-15R04	21	4.75	T-17A02	5	2.25	T-19P65	18	29.50	T-58A70	5	3.25	T-83M22	17	9.00
T-11M76	17	19.50	T-15R05	21	10.50	T-17D03	10	4.50	T-19P66	18	35.00	T-58S72	24	3.75	T-83A78	6	2.00
T-11M77	17	30.00	T-15R06	21	9.75	T-17D04	10	4.50	T-19P67	18	42.50	T-60S48	25	3.00	T-83R82	21	10.00
T-11M78	17	60.00	T-15R07	21	10.50	T-17S10	24	3.00	T-19P68	18	50.00	T-60R49	20	2.25	T-83R85	21	12.00
T-11M79	17	13.00	T-15R08	21	13.75	T-17S11	24	4.50	T-19P69	18	13.00	T-61S25	25	3.25	T-83S87	24	9.00
T-11M80	17	17.00	T-15P11	19	12.50	T-17S12	24	4.50	T-19P70	18	9.00	T-61S26	25	3.50	T-84S58	24	6.00
T-11M81	17	27.50	T-15P12	19	15.00	T-17S13	24	6.00	T-19P71	18	13.00	T-61F85	14	2.00	T-84D59	10	3.25
T-11K99	11	12.50	T-15P13	19	20.00	T-17S14	24	6.00	T-19F76	15	4.75	T-61A94	6	3.25	T-84P60	18	6.50
T-13R00	20	4.25	T-15P14	19	25.00	T-17S15	24	6.50	T-19F77	15	7.50	T-63R63	20	2.75	T-84M70	16	10.00
T-13R01	20	2.75	T-15P15	19	30.00	T-17S16	24	12.00	T-19F78	15	5.25	T-63A71	6	3.75	T-86A02	6	1.75
T-13R02	20	3.50	T-15P16	19	45.00	T-17S17	25	6.50	T-19F79	15	6.75	T-63A72	6	3.75	T-86A03	5	2.00
T-13R03	20	3.75	T-15P17	19	32.50	T-17S18	25	3.50	T-19F80	14	1.25	T-63F99	14	3.25	T-87R85	21	7.00
T-13R04	20	4.25	T-15P18	19	60.00	T-17R30	21	8.50	T-19F81	14	1.50	T-64F14	14	4.75	T-89R28	21	11.00
T-13R05	20	4.00	T-15P19	19	50.00	T-17R31	21	12.50	T-19F82	14	5.00	T-64M26	16	6.00	T-89S68	24	6.50
T-13R06	20	5.25	T-15P20	19	85.00	T-17R32	19	10.00	T-19F83	14	2.25	T-64F33	14	4.50	T-89S74	24	3.75
T-13R07	20	5.50	T-15P21	19	80.00	T-17R33	19	12.50	T-19F84	14	2.75	T-65A73	6	2.75	T-89S75	24	4.00
T-13R08	20	4.50	T-15P22	19	50.00	T-17C40	8	4.75	T-19F85	14	3.25	T-65S94	24	4.00	T-90A00	26	17.00
T-13R09	20	6.25	T-15C30	8	3.25	T-17A42	6-7	9.00	T-19F86	14	5.50	T-67C46	7	1.75	T-90A01	26	17.00
T-13R11	20	2.75	T-15C31	8	4.50	T-17A43	6-7	9.00	T-19F87	14	6.25	T-67D47	10	2.50	T-90A02	26	17.00
T-13R12	20	3.50	T-15C32	8	5.25	T-17S57	25	2.25	T-19F88	14	1.75	T-67S48	24	3.50	T-90A03	26	17.00
T-13R13	20	4.00	T-15C34	8	8.25	T-17M59	16	2.75	T-19F89	14	2.25	T-67C49	8	2.75	T-90A04	26	17.00
T-13R14	20	4.25	T-15C36	9	8.00	T-18V00	27	10.50	T-19F90	14	3.00	T-67D50	10	2.50	T-90A05	26	17.00
T-13R15	20	5.75	T-15C37	9	10.00	T-18V01	27	19.50	T-19F91	14	2.25	T-67S51	24	3.50	T-90A06	26	17.00
T-13R16	20	6.25	T-15C38	9	14.00	T-18V03	27	6.25	T-19F92	14	3.25	T-67S52	24	4.00	T-90S07	26	18.00
T-13R17	20	4.00	T-15C39	9	22.00	T-18V04	27	7.75	T-19F93	14	2.25	T-67S54	24	4.00	T-90S08	26	18.00
T-13R18	20	4.50	T-15C41	9	26.50	T-18V05	27	10.50	T-19F94	14	3.00	T-67M69	16	2.75	T-90C09	26	12.50
T-13R19	20	2.50	T-15C45	9	8.00	T-18V06	27	6.00	T-19F95	14	2.75	T-67M73	16	3.50	T-90A10	26	17.00
T-13C26	8	.90	T-15C46	9	10.00	T-18V07	27	13.50	T-19F96	14	3.50	T-67M74	16	4.50	T-90A11	26	17.00
T-13C27	8	1.10	T-15C47	9	14.00	T-18V10	21	3.00	T-19F97	14	1.75	T-67D78	10	3.00	T-90S12	26	17.00
T-13C28	8	1.20	T-15C48	9	22.00	T-18V20	27	5.00	T-19F98	14	2.75	T-67A91	5	3.00	T-90S13	26	20.00
T-13C29	8	1.60	T-15C50	9	26.50	T-18V21	27	6.00	T-19F99	14	3.50	T-67S92	24	4.00	T-92F20	14	4.75
T-13C30	8	2.00	T-15C52	7-9	5.00	T-18V22	27	7.50	T-23A57	6	2.50	T-67R97	21	4.25	T-92R21	21	7.50
T-13A34	5	1.35	T-15C53	7-9	5.50	T-18V23	27	12.00	T-26V04	27	4.50	T-68S06	24	2.50	T-92R25	11	

Since 1895 Thordarson transformers have been designed and manufactured to the highest quality standards. Thordarson established enviable standards by which transformers are compared, resulting in world wide leadership and acceptance.

Thordarson transformers are produced by craftsmen thoroughly trained and highly skilled in transformer manufacture. Their average period of service with the company is over nine years!

Proper balance between mechanical, electrical and cost requirements is maintained. Unshielded types conserve space and offer substantial savings, while shielded types are preferred where the transformer is to be mounted above chassis or where it is advisable to protect the windings from mechanical injury.

Thordarson C.H.T. transformers offer such refinements as compound filled cases of uniform design,

adaptability to varying requirements through the use of multiple taps and conservative electrical design for continuous duty.

Thordarson Tru-Fidelity transformers are designed to a strict interpretation of broadcast station requirements. A partial listing of Tru-Fidelity Major audio components will be found on page 26.

Throughout this catalog a wide choice of transformers and chokes is offered. Sufficient physical and electrical data are presented to facilitate selection for various transformer requirements. This catalog presentation of Thordarson transformers is made in the following order: Audio (A), Chokes and Reactors (C), Driver (D), Filament (F), Modulation (M), Plate (P), Power or Plate and Filament (R), Output or Speaker (S), and Voltage Changers (V). The Oscilloscope Kit (K) is an exception and will be found in the driver transformer listing.

## Classified Index

(See Page 2 for Index by Type No.)

CLASSIFICATION	PAGE NO.	CLASSIFICATION	PAGE NO.
Amplifiers.....	10	Oscilloscope.....	11
Audio Transformers.....	5, 6, 7	Output Transformers.....	24, 25, 26
Audio Reactors.....	7	Plate Supply Transformers.....	18, 19
Autotransformers.....	15, 27	Power Transformers.....	19, 20, 21
Automatic Voltage Regulators.....	18	Power Transformers for Cathode Ray Tubes... .	10
Bias (Power) Transformers.....	19	Signalling Transformers.....	27
Cathode Modulation Transformers.....	17	Television Filter Reactor.....	8
Cathode Ray Power Transformers.....	11	Television Transformers.....	19
Chokes.....	7, 8, 9	Tropex Transformers.....	4
Choosing Output Transformers, Tables... .	22, 23	Tru-Fidelity Broadcast Transformers.....	26
Crystal Recorder Transformers.....	25	Vibrator Transformers.....	20
Driver Transformers.....	10, 11	Voltage Changers.....	27
Driver and Modulator Combinations Table .	12, 13		
Dual Tone Control Choke and Potentiometer . .	7	LITERATURE	
Fence Controller Transformer.....	21	Amateur Radio.....	16
Field Supply Transformer.....	21	(A Beginners Guide)	
Filament Transformers.....	14, 15	Amplifier Catalog.....	10
Isolation Transformers.....	27	Amplifier Guide.....	10
Line Regulating Autotransformers.....	27	Broadcast Catalog.....	16, 26
Magnetically Shielded Audio Transformers.....	7	Replacement Transformer Encyclopedia and Service Guide.....	5
Microphone Cable Transformers.....	7	Transformer Manual.....	15
Modulation Transformers.....	16, 17	Transmitter Guide.....	15





**YOU MAY NOT  
WORK UNDER  
these conditions  
BUT---**

**TROPEX REPLACEMENT AUDIO TRANSFORMERS**

Type No.	Application	List Price
T-13A34-X	10,000 ohm plate to single grid	\$1.55
T-29A99-X	10,000 ohm plate to single grid	2.00
T-13A35-X	10,000 ohm plate to P.P. grids	1.70
T-33A91-X	10,000 ohm plate to P.P. grids	2.25
T-13A36-X	P.P. 10,000 ohm plates to P.P. grids	2.00
T-78D46-X	Single 30 to Class B 19, 1J6G, or 30's	1.70
T-17D01-X	Single 6F6 etc., to 2-6F6, etc.	2.25

**TROPEX FILTER CHOKES**

Type No.	Application	List Price
T-13C26-X	8 Hy at 40 M.A. 530 ohms D.C.	\$1.10
T-13C27-X	10 Hy at 40 M.A. 475 ohms D.C.	1.30
T-13C28-X	10 Hy at 65 M.A. 460 ohms D.C.	1.45
T-13C29-X	9 Hy at 85 M.A. 250 ohms D.C.	1.85
T-13C30-X	8 Hy at 150 M.A. 200 ohms D.C.	2.40
T-18C92-X	22 Hy at 35 M.A. 405 ohms D.C.	1.75
T-14C61-X	7 Hy at 55 M.A. 200 ohms D.C.	1.20
T-14C62-X	8 Hy at 55 M.A. 250 ohms D.C.	1.20
T-14C63-X	8 Hy at 55 M.A. 300 ohms D.C.	1.20
T-14C64-X	10 Hy at 55 M.A. 350 ohms D.C.	1.20

**TROPEX OUTPUT TRANSFORMERS**

Type No.	Application	List Price
T-13S37-X	Single 6F6, 42, 2A5 etc. to voice coil	\$1.45
T-13S39-X	Single 45, 1-2A5 etc. to voice coil	1.45
T-13S40-X	P.P. 6F6, 42, 2A5 etc. to voice coil	1.70
T-33S99-X	P.P. 45, 71A, 43 etc. to voice coil	1.75
T-81S01-X	Class B 19, 1J6G, 30's etc. to voice coil	1.70
T-13S43-X	Single 1F4, 1D4, 1F5G etc. to voice coil	1.55
T-14S81-X	Single 6F6, 2A5 etc. or P.P. 45, 71A etc. to voice coil	1.45
T-14S82-X	Single 25L6 etc. to voice coil	1.45

**TROPEX UNIVERSAL OUTPUT TRANSFORMERS**

Type No.	Application	List Price
T-13S38-X	Any single tube or P.P. tubes to voice coil	\$1.70
T-57S01-X		2.25
T-57S02-X		2.25
T-13S41-X	Any P.P. tubes to voice coil	3.15
T-13S42-X	Any single tube to voice coil	1.70

... even if you did, THORDARSON TROPEX transformers would give you complete protection against moisture, high humidity and salt air.

The TROPEX process was perfected for just that purpose. It thoroughly impregnates the coil against the corrosive effects of adverse weather conditions.

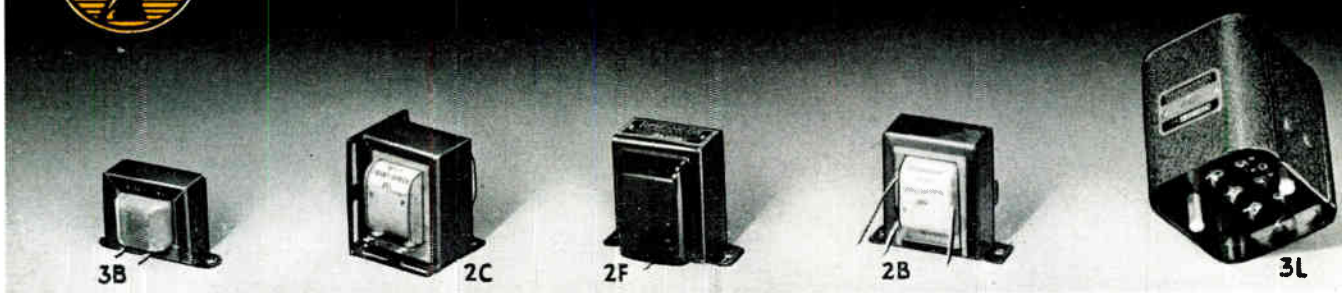
Since its introduction in March 1939, servicemen and experimenters in the Gulf States — Florida, Alabama, Mississippi, Louisiana and Texas — have turned to TROPEX in increasing numbers. That they have switched to TROPEX and forgotten transformer failure is best demonstrated by the record of only one TROPEX-treated transformer returned because of damage due to humidity.

TROPEX is a secret process that can be applied to practically any transformer in the THORDARSON line, though it is most efficient when used in open mounting types.

The additional cost for THORDARSON TROPEX transformers is surprisingly small. The following table has been compiled to enable you to easily determine this price increase by referring to the weight of the transformer as listed.

When ordering TROPEX add an "X" to the regular type number. For example, T-13S38-X is the TROPEX equivalent of T-13S38.

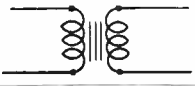
WEIGHT OF TRANSFORMER	ADD TO LIST PRICE
Up to 3/8 lb.	20c
From 1 lb. to 1 1/8 lbs.	25c
From 2 lbs. to 2 7/8 lbs.	40c
From 3 lbs. to 4 1/8 lbs.	50c
From 5 lbs. to 6 7/8 lbs.	60c
Over 7 lbs.	10c per lb.




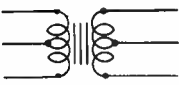
## AUDIO (A) INTERSTAGE TRANSFORMERS

For coupling the plate or plates of an amplifier stage to the grid or grids of the next stage where grid current is not drawn. RECEIVER types are designed for replacement use in radio receivers where the considerations are space, weight or cost. AMPLIFIER types are recommended for amplifier use or replacement in large receivers.

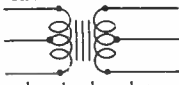
C. H. T. interstage audio transformers have hum-bucking coil construction and balanced windings. Frequency response, using parallel feed in the primary winding, is flat within  $\pm 1\frac{1}{2}$  db from 60 to 8,000 c.p.s. Compound filled cases fully protect the coils from adverse climatic conditions.

Type No.	List Price	Classification	Turns Ratio	Ohms Impedance		Pri. M.A.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
				Pri.	Sec.			Width	Depth	W.	D.	H.	
													
<b>Single Plate To Single Grid</b>													
T-13A34	\$1.35	RECEIVER (midget)	3:1	10,000	90,000	8	3B	$2\frac{3}{8}$	$2\frac{3}{8}$	$1\frac{5}{8}$	$1\frac{5}{8}$	$1\frac{5}{8}$	$\frac{3}{4}$
T-29A99	1.75	RECEIVER	3:1	10,000	90,000	8	2B	$2\frac{3}{8}$	$2\frac{3}{8}$	2	$2\frac{3}{8}$	$1\frac{1}{4}$	$1\frac{1}{4}$
T-57A36	2.00	RECEIVER	3:1	10,000	90,000	8	2F	$2\frac{3}{8}$	$2\frac{3}{8}$	$2\frac{1}{8}$	$2\frac{3}{8}$	$2\frac{3}{8}$	$1\frac{1}{2}$
T-47A25	1.75						2C	$1\frac{9}{16}$	$1\frac{1}{2}$	2	$1\frac{15}{16}$	$2\frac{3}{8}$	1
T-75A74	2.50	RECEIVER	2:1	10,000	40,000	8	2F	$2\frac{3}{8}$	$2\frac{3}{8}$	$2\frac{3}{4}$	$2\frac{1}{8}$	$2\frac{3}{8}$	$1\frac{1}{2}$
For super-regenerative detector; has static shield between windings.													
T-57A38	2.75	AMPLIFIER	3:1	10,000	90,000	8	2F	$2\frac{15}{16}$	$3\frac{3}{8}$	$2\frac{1}{2}$	3	$2\frac{1}{4}$	$2\frac{1}{4}$
T-15A73	6.50	C.H.T.	2:1	10000	2500 40000/10000	10*	3L	$2\frac{1}{8}$	$2\frac{3}{4}$	3	$3\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$
Maximum Signal Level + 15 db *Parallel feed recommended.													

													
<b>Single Plate To Push-Pull Grids</b>													
T-14A92	\$1.25	RECEIVER (midget)	3:1	10,000	90,000	8	3B	2	$2\frac{3}{8}$	$1\frac{3}{8}$	$1\frac{3}{8}$	$1\frac{3}{8}$	$\frac{1}{2}$
T-13A35	1.50	RECEIVER (midget)	3:1	10,000	90,000	8	3B	$2\frac{3}{8}$	$2\frac{15}{16}$	$1\frac{5}{8}$	$1\frac{5}{8}$	$1\frac{5}{8}$	$\frac{3}{4}$
T-33A91	2.00	RECEIVER	3:1	10,000	90,000	8	2B	$2\frac{3}{8}$	$2\frac{7}{8}$	2	$2\frac{3}{8}$	$1\frac{1}{4}$	$1\frac{1}{4}$
T-86A03	2.00						3B	$2\frac{3}{4}$	$3\frac{3}{16}$	2	2	$1\frac{1}{2}$	$1\frac{1}{2}$
T-14A29	2.25						2C	$1\frac{1}{2}$	$1\frac{15}{16}$	$2\frac{3}{8}$	$1\frac{1}{4}$	$1\frac{1}{4}$	
T-57A39	2.25						2F	$2\frac{3}{8}$	$2\frac{3}{4}$	$2\frac{1}{8}$	$2\frac{3}{8}$	$1\frac{1}{2}$	
T-57A40	2.75						AMPLIFIER	3:1	10,000	90,000	8	2B	$2\frac{15}{16}$
T-57A41	3.00	2F	$2\frac{15}{16}$	$3\frac{3}{8}$	$2\frac{1}{2}$	3						$2\frac{1}{4}$	
T-74A31	3.25	AMPLIFIER	1:1	10,000	10,000	8	2F	$2\frac{15}{16}$	$3\frac{3}{8}$	$2\frac{1}{2}$	3	$2\frac{1}{4}$	
T-57A42	3.25	RECEIVER (large)	3:1	10,000	90,000	8	2B	$2\frac{15}{16}$	$3\frac{3}{8}$	$2\frac{1}{8}$	3	2	
For coupling screen grid or power detector (Clarion AC-60)													
T-15A74	6.50	C.H.T.	2:1	10,000	2,500 40,000 / 10,000	10*	3L	$2\frac{1}{8}$	$2\frac{3}{4}$	3	$3\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$
Max. signal level + 15 db *Parallel feed recommended.													

													
<b>Push-Pull Plates To Push-Pull Grids</b>													
T-13A36	\$2.00	RECEIVER (midget)	1:1	20,000	20,000	8†	3B	$2\frac{11}{16}$	3	$1\frac{3}{4}$	2	1	1
T-67A91	3.00	AMPLIFIER	1.5:1	20,000	45,000	10†	2B	$2\frac{15}{16}$	$3\frac{3}{8}$	$2\frac{1}{8}$	3	2	2
T-58A70	3.25						2F	$2\frac{15}{16}$	$3\frac{3}{8}$	$2\frac{1}{2}$	3	$2\frac{1}{4}$	
T-15A75	7.00	C.H.T.	1.5:1	20,000	5,000 45,000 / 11,500	10†	3L	$2\frac{1}{8}$	$2\frac{3}{4}$	3	$3\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$
Maximum signal level + 15 db													

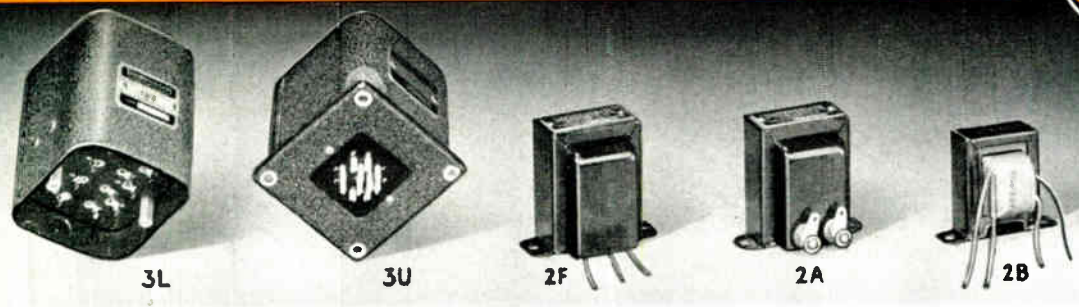
†Each side.

													
<b>Universal Interstage Replacement Transformer</b>													
Will couple single plate to single grid, single plate to push-pull grids or push-pull plates to push-pull grids. Has split secondary.													
T-17A02	\$2.25	RECEIVER	3:1	Universal		10	2F	$2\frac{3}{8}$	$2\frac{3}{4}$	$2\frac{1}{8}$	$2\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{1}{2}$

### No. 352—Replacement Encyclopedia and Service Guide. Free

Thordarson Replacement Transformer Encyclopedia and Service Guide No. 352 recommends proper transformer and choke replacement for receivers listed in Rider's Manuals. This handy, useful time-saver, originated by Thordarson, is now used by good service engineers the world over. In addition, it contains a new edition of the popular Service Guide giving practical solutions to everyday service problems, including useful charts and tables.





**AUDIO (A) INPUT TRANSFORMERS**

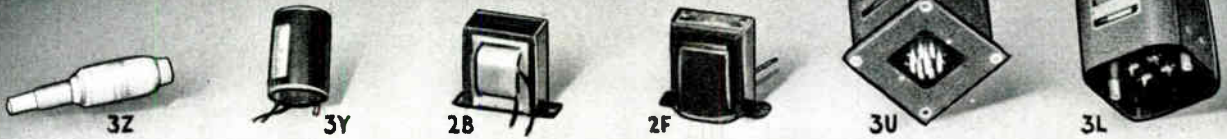
For coupling a signal source to the grid or grids of a Class A amplifier stage. Compact and inexpensive types, varying in size, style of mounting and application, are offered in this listing. C. H. T. input trans-

formers feature hum-bucking coil construction, balanced windings and compound filled cases which protect coils against unfavorable climatic conditions. Frequency range of C. H. T. types is flat within  $\pm 1\frac{1}{2}$  db from 60 to 8,000 c.p.s.

Type No.	List Price	Application	Ohms Impedance		Turns Ratio	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
			Pri.	Sec.			Width	Depth	W.	D.	H.	
<b>Low Impedance Source (Microphone, Line or Mixer) to Grid</b>												
T-65A73	\$2.75	DB mike to grid	200	50	1:22.2	2F	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	3	2
T-30A20	3.00					2A	2 <sup>1</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	2 <sup>1</sup> / <sub>2</sub>	2 <sup>7</sup> / <sub>8</sub>	2
T-58A37	2.25	DB mike to grid	200	50	1:22.2	2F	2 <sup>3</sup> / <sub>8</sub>		2 <sup>3</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-83A78	2.00	Single button mike to single or P-P grids	100		1:64	2F	2 <sup>3</sup> / <sub>8</sub>		2 <sup>7</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>
T-86A02	1.75					2B	2 <sup>3</sup> / <sub>8</sub>		2 <sup>7</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>8</sub>	1
T-23A57	2.50	Single button mike to single grid	100		1:64	2A	2 <sup>3</sup> / <sub>8</sub>		2 <sup>7</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>
T-55A16	2.75	Dyn. mike, line or mixer to single or P-P grids	200	50	1:22.3	2F	2 <sup>3</sup> / <sub>8</sub>		2 <sup>7</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-63A72	3.75	Low impedance to grid	50	100/150/200	1:22.2	2F	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	3	2 <sup>1</sup> / <sub>4</sub>
T-63A71	3.75	Low impedance to grid	200	400/600/800	1:11	2F	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	3	2 <sup>1</sup> / <sub>4</sub>
T-61A94	3.25	Line to single or P-P C.I.A grids	500	125	1:14.1	2F	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	3	2 <sup>1</sup> / <sub>4</sub>
T-72A59	1.65	Plate and Single Button microphone to grid	5,000	200	1:3.25 1:35	2B	2 <sup>1</sup> / <sub>8</sub>		2 <sup>9</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	2	3 <sup>1</sup> / <sub>4</sub>
T-14A94	2.50	Voice Coil to grid	4-8		1:112	2B	2 <sup>3</sup> / <sub>8</sub>		2 <sup>7</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>8</sub>	1
T-15A66	7.25	C.H.T. Low Impedance to grid	500/333/250/ 200/125/50		60,000/15,000 Single Grid	1:10.95	3L	2 <sup>1</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	3	3 <sup>1</sup> / <sub>2</sub>	2 <sup>1</sup> / <sub>4</sub>
T-15A67	8.00	C.H.T. Low Impedance P-P grids	500/333/250/ 200/125/50		120,000/30,000 P-P Grids	1:15.5	3L	2 <sup>1</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	3	3 <sup>1</sup> / <sub>2</sub>	2 <sup>1</sup> / <sub>4</sub>
T-15A68	8.00	C.H.T. Low Impedance to single grid	60/38/30/22/ 15/10/5.5/2.5		60,000/15,000 Single Grid	1:31.6	3L	2 <sup>1</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	3	3 <sup>1</sup> / <sub>2</sub>	2 <sup>1</sup> / <sub>4</sub>
T-17A42	9.00	C. H. T. MAGNETICALLY SHIELDED	500† 333/250/ 200† 125/50		50,000 Single Grid	1:10	3U	2 <sup>3</sup> / <sub>8</sub>	2	2 <sup>7</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>8</sub> , 1 <sup>1</sup> / <sub>4</sub>
T-15A65	10.50	C.H.T. Multiple Tap	500/333/250/ 200/125/50		50,000/12,500, P-P.C.I.A 845	1:10	3K	3 <sup>7</sup> / <sub>32</sub>	2 <sup>7</sup> / <sub>8</sub>	4	4 <sup>1</sup> / <sub>2</sub>	4 <sup>7</sup> / <sub>8</sub> 8
<b>Microphone or Line to Mixer or Line</b>												
T-70A82	\$3.50	DB mike to line	200	50	500/125	1:1.68	2F	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	3	2 <sup>1</sup> / <sub>4</sub>
T-70A83	3.50	Crystal mike to line or mixer	100,000		200/50	1:22.4	2F	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	3	2 <sup>1</sup> / <sub>4</sub>
T-15A69	7.25	C.H.T. Low Impedance to mixer or line	500/333/250/ 200/125/50		500/333/250/ 200/125/50	1:1	3L	2 <sup>1</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	3	3 <sup>1</sup> / <sub>2</sub>	2
T-15A70	7.50	C.H.T. Dyn. mike to mixer or line	60/38/30/22/ 15/10/5.5/2.5		500/333/250/ 200/125/50	1:2.88	3L	2 <sup>1</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	3	3 <sup>1</sup> / <sub>2</sub>	2
<b>Tube to Line or Mixer (Low Level) *Indicates Primary M.A.</b>												
T-14A90	\$2.50	Sgl. or P-P Plates to line or mixer	20,000 Ct.		500/125	8*	2F	2 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-14A91	2.50	Sgl. or P-P Plates to line or mixer	20,000 Ct.		200/50	8*	2F	2 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-72A59	1.65	Plate and sgl. button mike to grid	5,000 and 200		100,000	10*	2B	2 <sup>1</sup> / <sub>4</sub>	2 <sup>9</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	2	3 <sup>1</sup> / <sub>4</sub>
T-15A71	7.25	C.H.T. single plate to line or mixer.	20,000/5,000 Single Plate		500/333/250/ 200/125/50	8*	3L	2 <sup>1</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	3	3 <sup>1</sup> / <sub>2</sub>	1 <sup>3</sup> / <sub>4</sub>
T-15A72	7.25	C.H.T. P-P plates to line or mixer.	20,000/5,000 P-P Plates		500/333/250/ 200/125/50	0*	3L	2 <sup>1</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	3	3 <sup>1</sup> / <sub>2</sub>	1 <sup>3</sup> / <sub>4</sub>
T-17A43	9.00	C.H.T. MAGNETICALLY SHIELDED	10,000 to 15,000		500† 333/250/ 200†/125/50	0	3U	2 <sup>3</sup> / <sub>8</sub>	2	2 <sup>7</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>8</sub> 1 <sup>1</sup> / <sub>4</sub>

† Balanced center tap.





### C. H. T. MAGNETICALLY SHIELDED TRANSFORMERS

Designed for airport and police transmitters, public address systems and amateur applications. Three telescopic high permeability shields and hum-bucking balanced coil construction result in extremely low hum pick-up. Frequency response is flat within  $\pm 2$  db from 60 to 10,000 c.p.s. and maximum level is  $+ 10$  db.

Complete isolation is assured through electrostatic shields between primary and secondary windings.

The C.H.T. case is filled with moisture-proof compounds for complete coil protection against humidity. Sturdy, tinned, machined brass lugs are staggered for accessibility and grouped in circular fashion to clear through a  $1\frac{3}{16}$ " socket-punch hole.

Type No.	List Price	Application	Ohms Impedance		Pri. M.A.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
			Pri.	Sec.			Width	Depth	W.	D.	H.	
T-17A42*	\$9.00	Multiple Line to Single Grid	500†/333/250/ 200†/125/50	50,000 Single Grid	75	3U	2 $\frac{3}{8}$	2	2 $\frac{7}{8}$	2 $\frac{7}{16}$	3 $\frac{1}{8}$	1 $\frac{1}{4}$
T-17A43	9.00	Single Plate to Multiple Line. No D.C. in Pri.	10,000 to 15,000	500†/333/250/ 200†/125/50	0	3U	2 $\frac{3}{8}$	2	2 $\frac{7}{8}$	2 $\frac{7}{16}$	3 $\frac{1}{8}$	1 $\frac{1}{4}$

\*Min. Level—20DB. † Indicates balanced center tap.

### MICROPHONE CABLE TRANSFORMERS

Permit quick and efficient change from high to low impedance microphone input on any amplifier. Hum pick-up is reduced to a minimum through the use of magnetic shielding. As the illustration shows, these Microphone Cable transformers, exclusively Thordarson, are connected in series with the microphone cable and the amplifier input connector and are small and inconspicuous.

Frequency Response  $\pm 1\frac{1}{2}$  db from 30 to 15,000 c.p.s.

Type No.	List Price	Ohms Impedance		Turns Ratio	Mtg. Fig.	Dimensions			Wt. Lbs.
		Pri.	Sec.			W.	D.	H.	
T-14A75	\$14.50	30-50	50,000	1:31.6	3Z	1	1	2 $\frac{9}{16}$	$\frac{3}{4}$
T-14A76	14.50	200-250	50,000	1:14.14	3Z	1	1	2 $\frac{9}{16}$	$\frac{3}{4}$



### CHOKES AND REACTORS (C) Parallel Feed Audio Reactors

For supplying plate current to a vacuum tube where it is desirable to isolate plate current from the transformer primary or where the voltage drop caused by a resistor load is objectionable.

Type No.	List Price	Application	Typical Tubes	Induct. Hen.	Cur. M.A.	D.C. Ohms	R.M.S. Test Volts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
									Width	Depth	W.	D.	H.	
T-37C36	\$2.00	Plate Impedance	56-30-76-6C5-55-85, etc.	300	5	6470	1600	2F	2 $\frac{3}{8}$	2 $\frac{7}{8}$	2 $\frac{1}{8}$	2 $\frac{3}{8}$	1 $\frac{1}{2}$	
T-67C46	1.75							2B	2 $\frac{3}{8}$	2 $\frac{7}{8}$	2	2 $\frac{3}{8}$	1 $\frac{1}{4}$	
T-52C98	1.75	Plate Impedance for screen Grid detector or as grid impedance	24-57-56-76-6C5-6F5-6J7	700	.5	6150	1600	2F	2 $\frac{3}{8}$	2 $\frac{7}{8}$	1 $\frac{7}{8}$	2 $\frac{3}{8}$	1 $\frac{1}{4}$	
T-29C27	1.50							2B	2 $\frac{3}{8}$	2 $\frac{7}{8}$	1 $\frac{3}{4}$	2 $\frac{3}{8}$	1	
T-68C08	1.75	Plate Impedance or Filter	45-46-10, etc.	22	35	405	1600	2F	2 $\frac{3}{8}$	2 $\frac{3}{4}$	2 $\frac{1}{8}$	2 $\frac{3}{8}$	1 $\frac{1}{2}$	
T-18C92	1.50							3B	2 $\frac{7}{8}$	3 $\frac{3}{16}$	2	2	1 $\frac{1}{2}$	
T-15C52	5.00	C.H.T. Plate Impedance	6C5-6A6-6F8G 6U5-6L5G-7A4	30 Parallel	35	1600	1600	3L	2 $\frac{1}{8}$	2 $\frac{3}{4}$	3	3 $\frac{1}{2}$	.3	
T-15C53	5.50			12 Parallel	100							3 $\frac{1}{2}$	3 $\frac{1}{2}$	3 $\frac{1}{2}$
T-15C54	5.50	C.H.T. Plate Impedance	2A3-6A3-6A5G 6B4G-6L6-6Y6G	8 Parallel	150	1600	1600	3L	2 $\frac{1}{8}$	2 $\frac{3}{4}$	3	3 $\frac{1}{2}$	3 $\frac{1}{2}$	
				32 Series	75							3 $\frac{1}{2}$	3 $\frac{1}{2}$	3 $\frac{1}{2}$

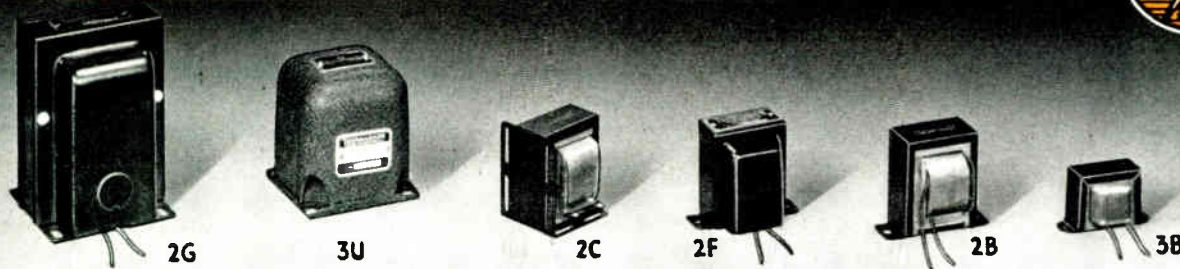
### Tuned Audio Circuit Reactors

T-81C15	\$2.50	Tuned Audio Circuits	.75	.5	30	2B	2 $\frac{1}{8}$	2 $\frac{9}{16}$	1 $\frac{3}{8}$	2	$\frac{3}{4}$
T-93C20	3.00	Tuned Audio Circuits	250	.5	6400	2B	2 $\frac{3}{8}$	2 $\frac{7}{8}$	2	2 $\frac{3}{8}$	1 $\frac{1}{4}$
T-74C30	1.50	Tuned Audio Circuits or Filter	42	15	2100	2B		2	1 $\frac{1}{2}$	2 $\frac{3}{8}$	1

### DUAL TONE CONTROL COMPONENTS

As illustrated and described in Amplifier Guide 346D

T-14C70	2.50	Tone Control, hum-bucking type	22	0	220	3Y	1 $\frac{7}{16}$	1 $\frac{9}{16}$	1 $\frac{9}{16}$	2 $\frac{1}{4}$	1 $\frac{1}{2}$
R-1068	2.50	Dual tone control potentiometer									



**CHOKES AND REACTORS (C)**

**C. H. T. SPEECH FILTER**

This hi-pass filter with a cut-off below 200 c.p.s. provides a definite increase in effective side band power and corresponding reduction

of hum pick-up. It may be used instead of an interstage audio transformer to couple a single plate to single or push-pull grids.

Type No.	List Price	Application	Induct. Hen.	Cur. M.A.	D.C. Ohms	R.M.S. Test Volts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
							Width	Depth	W.	D.	H.		
T-15C34	\$8.25	Plate to Single or P.P. tubes					3U	2 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>16</sub>	3 <sup>15</sup> / <sub>16</sub>	3

**C. H. T. SPLATTER CHOKES**

These tapped chokes are used between any Class B modulator and any Class C stage for eliminating objectionable side band splatter due to excessive audio distortion. Full instructions for operation are furnished.

Type No.	List Price	Application	Induct. Hen.	Cur. M.A.	D.C. Ohms	R.M.S. Test Volts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
							Width	Depth	W.	D.	H.		
T-15C30	\$3.25	Elimination of side band Splatter	.025 to .8	150	54	3000	3U	2 <sup>3</sup> / <sub>8</sub>	1 <sup>15</sup> / <sub>16</sub>	2 <sup>7</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	2
T-15C31	4.50		.025 to .8	300	20	5000	3U	2 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>16</sub>	3 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>
T-15C32	5.25		.025 to .8	500	14	7500	3U	2 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	2 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>2</sub>

**FILTER CHOKES**

Thordarson filter reactors are rated in henries under actual working conditions. It is well known that as the D.C. current in a choke increases, there is a corresponding decrease in inductance. In selecting a filter choke from this listing, full assurance may be had that inductance rating has been measured under full operating load conditions.



**Replacement Filter Chokes**

Type No.	List Price	Inductance		Current Rating	D.C. Res.	R.M.S. Test	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
		At Zero D.C.	At Rated D.C.	M.A.	Ohms	Volts		Width	Depth	W.	D.	H.	
T-13C26	\$ .90	21	8	40	530	1600	3B	2		2 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-13C27	1.10	22	10	40	475	1600	3B	2 <sup>3</sup> / <sub>8</sub>		2 <sup>15</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>
T-13C28	1.20	20	10	65	460	1600	3B	2 <sup>1</sup> / <sub>16</sub>		3	1 <sup>3</sup> / <sub>4</sub>	2	1
T-43C92	1.65	24	10	75	260	1600	2C	1 <sup>9</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>2</sub>	2	1 <sup>15</sup> / <sub>16</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>
T-47C07	1.65	20	12	75	410	1600	3B	3 <sup>1</sup> / <sub>8</sub>		3 <sup>5</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>4</sub>
T-44C02	1.50	31	12	80	405	1600	3B	2 <sup>7</sup> / <sub>8</sub>		3 <sup>3</sup> / <sub>16</sub>	2	2	1 <sup>1</sup> / <sub>4</sub>
T-57C51	1.50	15	6	80	138	1600	2B	2 <sup>3</sup> / <sub>8</sub>		2 <sup>7</sup> / <sub>8</sub>	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>
T-13C29	1.60	20	9	85	250	1600	3B	2 <sup>3</sup> / <sub>4</sub>		3 <sup>3</sup> / <sub>16</sub>	2	2	1 <sup>1</sup> / <sub>2</sub>
T-68C07	2.00	32	15	85	375	1600	2B	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>4</sub>	3	2
T-57C53	2.00	27	10	110	200	1600	2B	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3	2 <sup>1</sup> / <sub>4</sub>
T-75C49	1.50	22	8	120	290	1600	3B	2 <sup>3</sup> / <sub>4</sub>		3 <sup>3</sup> / <sub>16</sub>	2	2	1 <sup>1</sup> / <sub>2</sub>
T-53C19	1.50						2B	2 <sup>3</sup> / <sub>8</sub>		2 <sup>7</sup> / <sub>8</sub>	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-13C30	2.00	25	8	150	200	1600	2B	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>4</sub>	3	2 <sup>1</sup> / <sub>4</sub>

**Filter Chokes for Replacement in AC-DC Receivers**

T-14C61	\$1.00	14	7	55	200	1600	3B	2 <sup>3</sup> / <sub>8</sub>		2 <sup>13</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>
T-14C62	1.00	16	8	55	250	1600	3B	2 <sup>3</sup> / <sub>8</sub>		2 <sup>13</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>
T-14C63	1.00	19	8	55	300	1600	3B	2 <sup>3</sup> / <sub>8</sub>		2 <sup>13</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>
T-14C64	1.00	21	10	55	350	1600	3B	2 <sup>3</sup> / <sub>8</sub>		2 <sup>13</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>

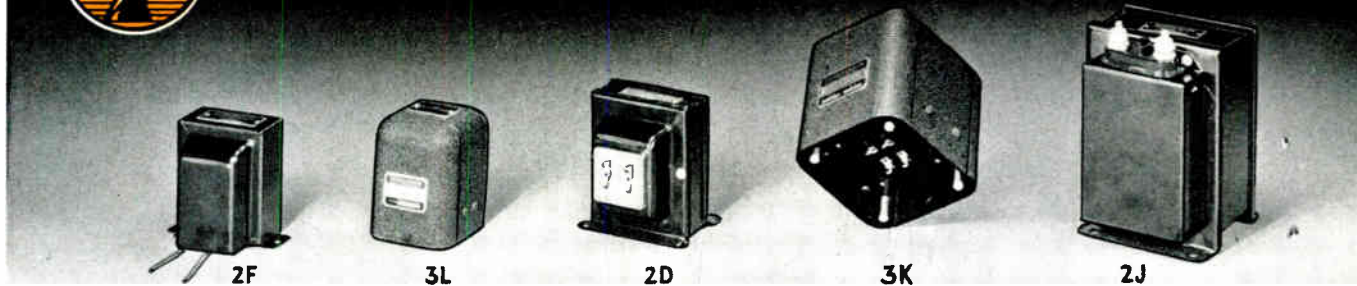
**Filter Chokes for Amplifiers and Small Transmitters**

T-57C52	\$1.75	15	6	80	138	1600	2F	2 <sup>3</sup> / <sub>8</sub>		2 <sup>7</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-16C07	2.25	32	15	85	375	1600	2F	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	3	2 <sup>1</sup> / <sub>4</sub>
T-57C54	2.25	27	10	110	200	1600	2F	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	3	2 <sup>1</sup> / <sub>4</sub>
T-49C91	1.50	12	4	120	160	1600	2F	2 <sup>3</sup> / <sub>8</sub>		2 <sup>7</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>
T-17C00-B	2.75	28	12	150	231	1600	2F	3 <sup>3</sup> / <sub>8</sub>		3 <sup>1</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>
T-74C29	3.75	29	15	150	200	2000	2G	2 <sup>1</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>4</sub>
T-67C49	2.75	12	5	200	80	1600	2F	3 <sup>1</sup> / <sub>2</sub>		3 <sup>9</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>
T-75C51	5.00	24	13	250	121	1600	2G	3	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>16</sub>	4 <sup>15</sup> / <sub>16</sub>	8

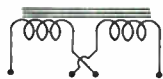
**Television Filter Reactor**

Type No.	List Price	Inductance Henries	Current M.A.	R.M.S. Test Volts	D.C. Res.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt Lbs
							Width	Depth	W.	D.	H.	
T-17C40	\$4.75	1500	3	10,000	12,000	2F	3 <sup>3</sup> / <sub>8</sub>		3 <sup>13</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>2</sub>	2 <sup>1</sup> / <sub>4</sub>

See Page 19 for listing of Television Power Transformers.



## CHOKES (C) C.H.T. AMPLIFIER CHOKES



Two inductance ratings are shown, one for parallel connection of the two windings and the other for series connection. Cases are compound filled for complete coil protection.

Type No.	List Price	Inductance Henries	Current M.A.	R.M.S. Test Volts	D.C. Res.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
							Width	Depth	W.	D.	H.	
T-15C52	\$5.00	30 Parallel 120 Series	35 17	1,600	675 2700	3L	2 1/8		2 3/4	3	3 1/2	3
T-15C53	5.50	12 Parallel 50 Series	100 50	1,600	272 1090	3L	2 1/8		2 3/4	3	3 1/2	3 1/4
T-15C54	5.50	8 Parallel 32 Series	150 75	1,600	184 735	3L	2 1/8		2 3/4	3	3 1/2	3 1/2
T-15C55	7.00	2 Parallel 8 Series	500 250	1,600	32 130	3K	3 3/2	2 7/8	4	4 1/2	4 3/8	7 1/2
T-15C56	9.00	2 Parallel 8 Series	700 350	1,600	27 107	3K	3 3/2	2 7/8	4	4 1/2	4 7/8	9 3/4

## TRANSMITTER INPUT AND FILTER CHOKES

Matched input and smoothing chokes for amateur, amplifier or experimental applications. Inductance values are measured under full load conditions and adequate insulation is provided for recommended service.

Type No.	List Price	Current D.C. M.A.	Inductance Henries	D.C. Res. Ohms	R.M.S. Test Volts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
							Width	Depth	W.	D.	H.	
<b>Input Chokes "19" Series</b>												
T-19C39	\$3.25	150	5-20	215	3000	2F	3 3/8		3 1/8	3 3/2	3 1/2	3 3/4
T-19C35	4.00	200	5-20	130	3000	2D	3 1/4	2 1/16	3 3/4	3 3/8	4	5 1/2
T-19C36	6.50	300	5-20	105	5000	2D	2 3/4	3 1/16	3 1/8	4 7/8	4 5/8	10 3/4
T-19C37	10.00	400	5-20	90	5000	2J	3 1/4	3 7/8	4 1/4	5 3/8	6 1/16	19 1/2
T-19C38	14.00	500	5-20	75	5000	2J	3 7/8	3 3/4	5	5 1/2	6 5/8	25 1/4

## Smoothing Chokes "19" Series

T-19C46	\$3.25	150	12	215	3000	2F	3 3/8		3 1/8	3 3/2	3 1/2	3 3/4
T-19C42	4.00	200	12	130	3000	2D	3 1/4	2 1/16	3 3/4	3 3/8	4	5 1/2
T-19C43	6.50	300	12	105	5000	2D	2 3/4	3 1/16	3 1/8	4 7/8	4 5/8	10 3/4
T-19C44	10.00	400	12	90	5000	2J	3 1/4	3 7/8	4 1/4	5 3/8	6 1/16	19 3/4
T-19C45	14.00	500	12	75	5000	2J	3 7/8	3 3/4	5	5 1/2	6 5/8	25 1/4

## C.H.T. TRANSMITTER CHOKES



Conservatively designed for continuous and quiet operation. Cases are compound filled for complete coil protection.

### C.H.T. Input Chokes

T-15C36	\$8.00	200-20	5-25	105	4,000	3L	2 7/8	3 3/2	4 1/16	4 1/2	4 7/8	10
T-15C37	10.00	300-30	5-25	78	4,000	3L	3 1/16	4 3/2	5 3/16	5 9/16	6 3/4	22
T-15C38	14.00	400-30	5-25	95	4,000	3L	3 13/16	4 3/2	5 3/16	5 9/16	6 3/4	24
T-15C39	22.00	500-30	5-25	86	10,000	3L	4 9/16	5 3/2	5 7/8	7 5/16	8 1/4	38 1/2
T-15C41	26.50	650-50	5-25	46	10,000	3L	5 11/16	6 3/2	7	7 9/16	8	51

### C.H.T. Smoothing Chokes

T-15C45	\$8.00	200	12	105	4,000	3L	2 7/8	3 3/2	4 1/16	4 1/2	4 7/8	10
T-15C46	10.00	300	12	78	4,000	3L	3 13/16	4 3/2	5 3/16	5 9/16	6 3/4	22
T-15C47	14.00	400	12	95	4,000	3L	3 13/16	4 3/2	5 3/16	5 9/16	6 3/4	24
T-15C48	22.00	500	12	86	10,000	3L	4 9/16	5 3/2	5 7/8	7 5/16	8 1/4	38 1/2
T-15C50	26.50	650	12	46	10,000	3L	5 11/16	6 3/2	7	7 9/16	8	51





2D



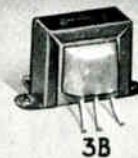
3L



2F




2B



3B

**DRIVER (D) TRANSFORMERS**

For coupling the plate or plates of an amplifier stage to the grids of an amplifier stage in which grid current is drawn during a part of the audio cycle.

Type No.	List Price	Driver Tubes	Output Tubes	Class	Ratio Pri. to 1/2 Sec.	Pri. Mtg. M.A.	Mtg. Centers		Dimensions			Wt. Lbs.	
							Fig.	Width	Depth	W.	D.		H.
<b>DRIVER TRANSFORMERS FOR SPECIFIC APPLICATIONS</b>													
 <p>These driver transformers have the correct primary to secondary ratio for the tubes specified, which assures good regulation and minimum driver distortion on the positive grid peaks. The first three types are specifically designed for replacement requirements.</p>													
T-78D46	\$1.50	1-30	1-1J6G, 19 2-30	B	2.4:1	7	2B	2 1/8	2 9/16	1 5/8	2	3 1/4	
T-17D01	2.00	1-6F6 Triode 1-42 Triode, 1-2A5 Triode	2-6F6, 6L6, etc.	AB	1.7:1 1.5:1, 1.3:1	31	3B	2 7/8	3 3/16	2	2	1 1/2	
T-14D93	1.75	1-76 Triode	1-6A6, 6N7	B	4:1	8	3B	2 3/8	2 13/16	1 5/8	1 5/8	3 1/4	
T-19D06	2.75	1-6A6, 1-6N7, 1-6C5	1-6A6, 6N7	B	5:1, 4:1, 3:1, 2.5:1	10	2F	2 3/8	2 7/8	2 1/8	2 3/8	1 1/2	
T-54D63	2.25	1-30, 1-49, 1-6C5	1-1J6G, 19, 2-49, 2-6V6 B, AB2	B	2.4:1	7	2F	2 3/8	2 7/8	1 7/8	2 3/8	1 1/4	
T-67D50	2.50	1-89 Triode	1-79	B	2:1	32	2F	2 3/8	2 3/4	2 1/8	2 3/8	1 1/2	
T-67D47	2.50	1-6N7, 6A6, 53	1-6N7, 6A6, 53	B	5.25:1	10	2F	2 3/8	2 3/4	2 1/8	2 3/8	1 1/2	
T-81D52	3.25	1-6C5, 76 1-56	2-6F6 Triode 2-42, 2A5 Triode	AB AB	1.82:1 1.67:1	8	2F	2 15/16	3 3/8	2 1/2	3	2 1/4	
T-84D59*	3.25	2-6C5, 6N7 2-6A6, 53	2-6L6, 6V6 2-6N7, 6A6, 53	AB2 B	5:1	10	2F	2 15/16	3 3/8	2 1/2	3	2 1/4	
T-74D32	3.25	2-6C5, 76, 56	2-6F6, 42, 2A5 4-2A3, 6B4G	AB2 AB	3:1	10	2F	2 15/16	3 3/8	2 1/2	3	2 1/4	
T-81D42	3.25	1-6F6 Triode 1-42 Triode 1-2A5 Triode	2-6F6 Triode 2-42 or 2-2A5 Pentode	AB2 AB2 AB2	1.7:1 1.5:1 1.3:1	31	2F	2 15/16	3 3/8	2 1/2	3	2 1/4	
T-17D03*	4.50	1-6F6 Triode	2-6L6	AB2	1.4:1	40	2F	3 3/8	3 5/16	3 1/8	3 1/2	3 1/2	
T-17D04*	4.50	2-6F6	4-6L6	AB2	2.6:1	32	2F	3 3/8	3 5/16	3 1/8	3 1/2	3 1/2	
T-67D78	3.00	1-46, 59, 6F6, 42, 2A5 Triode	2-46, 59 2-6L6	B AB2	2.2:1	32	2F	2 15/16	3 1/8	2 1/2	3	2 1/4	
T-75D10*-	5.00	2-2A3 P-P	2-838, 805, TZ-40	B	3.2:1	130	2D	3 1/4	2 1/16	3 3/4	3 3/8	4	5

\*Split secondary as required for inverse feedback and separate power tube bias.

**C.H.T. Driver Transformers**

With hum-bucking coil construction and other C. H. T. premium quality features including compound filled cases.

T-15D85	\$7.50	Sgl. 6F6, 42, 2A5 Triode	P.P. 6L6	AB2	1.4:1, 1.3:1 1.2:1	40	3L	2 1/8	2 3/4	3	3 1/2	2 1/2
T-15D86	7.50	P.P. 6F6, 42, 2A5 Triodes	P.P. Par. 6L6	AB2	2.6:1	32	3L	2 1/8	2 3/4	3	3 1/2	2 1/2

**Line-to-Grid Driver Transformers (High Level)**

T-83D21	\$3.50	Line 500 ohms	2-6L6, 50 12,500/5,100 Ohms	AB	1.32, 1:5	2F	2 15/16	3 3/8	2 1/2	3	2 1/4	
T-15D87	11.00	C.H.T. 500 333/250 200/125/50 Ohms	2-845 7,220 Ohms	AB	Variable	3K	2 7/8	3 7/32	4 1/16	4 1/2	4 7/8	8

**THORDARSON AMPLIFIERS  
(Factory Wired and Tested)**



The finest amplifiers are built by Thordarson — pioneers in producing quality audio components. Absolute fidelity is assured by accurate laboratory design and rigid inspection during production. New models from 8 to 900 watts satisfy practically every sound requirement. Pre-amplifiers and boosters round out a truly complete line of equipment for sound technicians. Fully described in Catalog 600E.

**No. 346—Amplifier Guide 15c Postpaid**

P. A. men and experimenters interested in building high quality amplifiers find the Thordarson Amplifier Guide No. 346 a worthwhile source of information. It contains laboratory designed and tested circuits of amplifiers from 8 to 120 watts output. Complete parts list, mechanical chassis drawings, and comprehensive illustrations enable the constructor to obtain superior results with matched transformer and choke components. Data are included for pre-amplifiers, dual tone controls, speaker impedance matching and testing.





### UNIVERSAL AND MULTI-MATCH DRIVER (D) TRANSFORMERS

Versatility of application reduces to a minimum transformer obsolescence which is a costly problem to the amateur in these days of rapid tube development. Through the use of five ratios on each transformer, these transformers will handle all driver

requirements usually encountered in amateur transmitter circuits. See complete table of Driver and Modulator combinations on page 12 and 13.

Type No.	List Price	Cap. Watts	Max. Pri. M.A. Per Side	Ratio Pri. to 1/2 Sec.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
						Width	Depth	W.	D.	H.	
<b>Universal Driver Transformers "19" Series</b>											
T-19D01	\$6.00	15	60	1:1, 1.2:1, 1.4:1, 1.6:1, 1.8:1	4D	3 3/8	3 15/16	3 3/2	3 1/2	3 1/2	3 1/2
T-19D02	6.00	15	60	2:1, 2.2:1, 2.4:1, 2.6:1, 2.8:1	4D	3 3/8	3 15/16	3 3/2	3 1/2	3 1/2	3 1/2
T-19D03	6.00	15	60	3:1, 3.2:1, 3.4:1, 3.6:1, 3.8:1	4D	3 3/8	3 15/16	3 3/2	3 1/2	3 1/2	3 1/2
T-19D04	6.00	15	60	4:1, 4.5:1, 5:1, 5.5:1, 6:1	4D	3 3/8	3 15/16	3 3/2	3 1/2	3 1/2	3 1/2
T-19D05	6.00	15	Primary for 500 ohm line	1:3.15, 1:2.75, 1:2.5, 1:2.25, 1:2, 1:1.75, 1:1.4, 1:1.25, 1:1.85, 1:1.75	4D	3 3/8	3 15/16	3 3/2	3 1/2	3 1/2	3 1/2

### C.H.T. Multi-Match Driver Transformers Feature Convenient Switchboard Plug-In Terminal Board and Compound Filled Cases

T-15D76*-	\$ 8.25	15	60	1:1, 1.2:1, 1.4:1, 1.6:1, 1.8:1	3H	3 3/2	2 7/8	4	4 1/2	4 3/8	7 1/2
T-15D77*-	8.25	15	60	2:1, 2.2:1, 2.4:1, 2.6:1, 2.8:1	3H	3 3/2	2 7/8	4	4 1/2	4 3/8	6
T-15D78*	8.25	15	60	3:1, 3.2:1, 3.4:1, 3.6:1, 3.8:1	3H	3 3/2	2 7/8	4	4 1/2	4 3/8	6
T-15D79*	8.25	15	60	4:1, 4.5:1, 5:1, 5.5:1, 6:1	3H	3 3/2	2 7/8	4	4 1/2	4 3/8	6
T-15D80†-	11.50	30	120	1:1, 1.25:1, 1.5:1, 1.75:1, 2:1	3H	3 3/2	2 7/8	4	4 1/2	4 7/8	8 3/4
T-15D81†-	11.50	30	120	2.25:1, 2.5:1, 2.75:1, 3:1, 3.25:1	3H	3 3/2	2 7/8	4	4 1/2	4 7/8	8
T-15D82	8.25	15	Primary for 500 ohm line	1:3.15, 1:2.75, 1:2.5, 1:2.25, 1:2, 1:1.75, 1:1.4, 1:1.25, 1:1.85, 1:1.75	3H	3 3/2	2 7/8	4	4 1/2	4 3/8	5 3/4
T-15D83	11.50	30	Primary for 500 ohm line	1:3.15, 1:2.75, 1:2.5, 1:2.25, 1:2, 1:1.75, 1:1.4, 1:1.25, 1:1.85, 1:1.75	3H	3 3/2	2 7/8	4	4 1/2	4 7/8	8 1/2
T-15D84§	11.50	30	80	1.5:1, 2:1, 2.5:1, 3:1, 3.5:1	3H	3 3/2	2 7/8	4	4 1/2	4 7/8	8 3/4

\*P.P. 45 or 2A3, 6B4G. †P.P. Par. 2A3. or 6B4G. §P.P. 6L6 with inverse feedback.

### THORDARSON OSCILLOSCOPE KIT

An accurately designed circuit using a 913 tube. Magnifying lens gives clear 2" image and small overall size of unit makes it ideal for relay rack of servicemen and for amateur and experimental uses.

Type No.	List Price	Description
T-11K99	\$12.50	Foundation Unit (Consists of punched chassis, panel, light shield, etched panel, ventilated cabinet and 2" magnifying lens with retainer ring, and complete circuit with construction and operating data.) In addition to the foundation unit, one T-92R33 power transformer (see below) and one T-74C30 filter choke (see page 7) are required.



Circuit diagram, description and complete parts list given in cata

### POWER TRANSFORMERS FOR CATHODE RAY TUBES

Type No.	List Price	Volts D.C.	M.A.	Rect. Fil.	Fil. No. 1	Fil. No. 2	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
								Width	Depth	W.	D.	H.	
T-92R25 For 913 tube	\$2.25	500 tap-430	3	6.3V-.9A*			2F	2 3/8		2 3/4	2 1/8	2 3/8	1 1/2
T-92R33 For 913 tube	4.00	**500 tap-400	3	6.3V-.9A	6.3V-.6A	6.3V-.6A	2F	3 1/2		3 1/2	3 1/8	3 1/2	3 1/4
T-14R32-	6.50	400	15	5V-2A 5V-2A Ct.	6.3V-.6A	2.5V-2A (No. 3 6.3V-.6A)	2G	2 1/4	2 1/4	2 7/8	3 3/8	3 1/16	4

For Dumont 24-XH; RCA 902, 913; National 2002 Tubes.

\*\*With half wave rectification. \*For I-V rectifier and 913 filament.





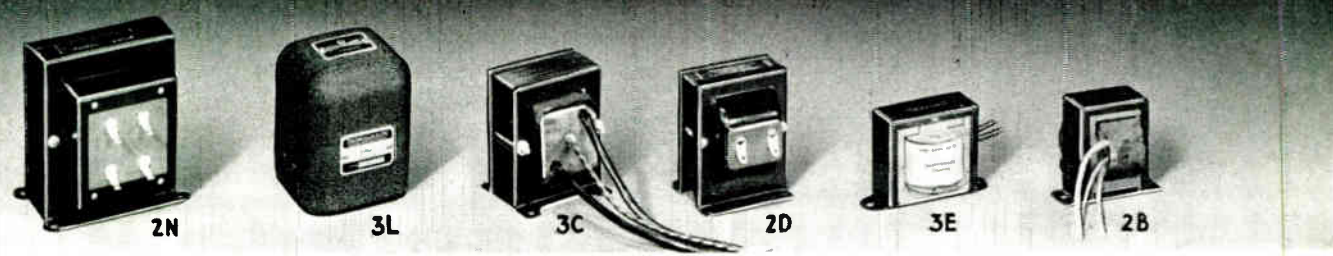
MODULATOR STAGE						DRIVER STAGE					
P-P Class B Tubes	Power Output Watts	Plate Volts	Bias Volts	Pl. to Pl. Load Ohms	Use Mod. Trans. No.	P-P Driver Tubes	Trans. Ratio, Pri. to 1/2 Sec.	Use Driver Trans. No.	Trans. for 500 Ohm Line	Ratio 500 Ohm Line to 1/2 Sec.	
<b>R.C.A. TUBES</b>											
46	30	400	0	5,600	T-11M74 or T-19M14	*45	5:1	T-15D79 or T-19D04	T-15D82	1:85	
46	40	500	0	8,000	T-11M75 or T-19M14	*45	5:1	T-15D79 or T-19D04	T-15D82	1:85	
46	50	600	0	9,600	T-11M75 or T-19M15	*45	5:1	T-15D79 or T-19D04	T-15D82	1:85	
4-46	56	400	0	2,800	T-11M75 or T-19M15	*45	5:1	T-15D79 or T-19D04	T-15D82	1:85	
4-46	96	600	0	4,800	T-11M76 or T-19M16	*45	5:1	T-15D79 or T-19D04	T-15D82	1:85	
203A	200	1000	-35	6,900	T-11M77 or T-19M17	†2A3	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.5	
203A	200	1000	-35	6,900	T-11M77 or T-19M17	**6L6	3.5:1	T-15D84	T-15D82	1:1.25	
203A	260	1250	-45	9,000	T-11M77 or T-19M17	†2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.5	
203A	260	1250	-45	9,000	T-11M77 or T-19M17	**6L6	3.5:1	T-15D84	T-15D82	1:1.25	
4-203A	400	1000	-35	3,450	T-11M78	†4-2A3	2.25:1	T-15D81	T-15D83	1:1.25	
4-203A	400	1000	-35	4,500	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.25	
4-203A	520	1250	-45	3,450	T-11M78	†4-2A3	2:1	T-15D80	T-15D83	1:1.25	
4-203A	520	1250	-45	4,500	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.25	
211	200	1000	-77	6,900	T-11M77 or T-19M17	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75	
211	260	1250	-100	9,000	T-11M77 or T-19M17	2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:2	
800	90	750	-40	6,400	T-11M76 or T-19M16	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25	
800	100	1000	-55	12,500	T-11M76 or T-19M16	2A3	2.8:1	T-15D77 or T-19D02	T-15D82	1:1.25	
800	100	1000	-55	12,500	T-11M76 or T-19M16	45	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.2	
801	45	600	-75	10,000	T-11M74 or T-19M14	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25	
801	45	600	-75	10,000	T-11M74 or T-19M14	45	2:1	T-15D77 or T-19D02	T-15D82	1:2.25	
801	75	750	-80	11,000	T-11M75 or T-19M16	45	1.8:1	T-15D76 or T-19D01	T-15D82	1:2.25	
801	75	750	-80	11,000	T-11M75 or T-19M16	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4	
805	300	1250	0	6,700	T-11M77	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25	
805	370	1500	-16	8,200	T-11M78	2A3	3:1	T-15D78 or T-19D03	T-15D82	1:1.25	
806	500	2000	-150	11,500	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2	
806	500	2000	-150	11,500	T-11M78	**6L6	1.5:1	T-15D84	T-15D83	1:2.5	
808	190	1250	-15	12,700	T-11M77 or T-19M17	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25	
809	60	500	0	5,200	T-11M75 or T-19M15	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75	
809	60	500	0	5,200	T-11M75 or T-19M15	45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25	
809	100	750	-5	8,400	T-11M76 or T-19M16	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75	
809	100	750	-5	8,400	T-11M76 or T-19M16	45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25	
810	510	1500	-30	6,600	T-11M78	4-2A3	2.25:1	T-15D81	T-15D83	1:1.25	
811	175	1250	0	15,000	T-11M77 or T-19M17	2A3	5:1	T-15D79 or T-19D04	T-15D82	1:1.85	
811	225	1500	-9	18,000	T-11M77 or T-19M17	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:1.25	
880B	175	1000	-35	7,600	T-11M77 or T-19M17	2A3	3:1	T-15D78 or T-19D03	T-15D82	1:1.25	
888	200	1000	0	6,900	T-11M77 or T-19M17	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85	
888	260	1250	0	9,000	T-11M77 or T-19M17	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85	
4-888	400	1000	0	3,450	T-11M78	4-2A3	3.25:1	T-15D81	T-15D83	1:1.75	
4-888	400	1000	0	3,450	T-11M78	**6L6	3.5:1	T-15D84	T-15D83	1:1.25	
4-888	520	1250	0	4,500	T-11M78	4-2A3	3.25:1	T-15D81	T-15D83	1:1.75	
4-888	520	1250	0	4,500	T-11M78	**6L6	3.5:1	T-15D84	T-15D83	1:1.25	
1608	50	425	-15	4,800	T-11M75 or T-19M15	*45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25	
<b>TAYLOR TUBES</b>											
T-20	50	600	-30	8,100	T-11M75 or T-19M15	*45	2.2:1	T-15D77 or T-19D02	T-15D82	1:2	
T-20	70	800	-40	12,000	T-11M75 or T-19M16	*45	2:1	T-15D77 or T-19D02	T-15D82	1:2.25	
TZ-20	70	800	0	12,000	T-11M75 or T-19M16	*45	3.2:1	T-15D78 or T-19D03	T-15D82	1:1.4	
T-55	175	1000	-40	6,900	T-11M77 or T-19M17	2A3	2.8:1	T-15D77 or T-19D02	T-15D82	1:1.25	
T-55	225	1250	-50	9,400	T-11M77 or T-19M17	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.4	
T-55	275	1500	-60	12,000	T-11M77	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4	
T-155	Same as HD-203-A										
203-A	Same as R.C.A. 203A										
4-203A	Same as R.C.A. 203A										
HD-203A	300	1500	-50	9,600	T-11M77	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25	
HD-203A	300	1750	-67.5	13,000	T-11M77	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25	
HD-203A	400	1750	-67.5	10,000	T-11M78	2A3	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.75	
HD-203A	400	2000	-75	12,500	T-11M78	2A3	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.75	
HD-203A	500	2000	-75	10,000	T-11M78	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75	
HD-203A	500	1500	-50	6,400	T-11M78	4-2A3	2:1	T-15D80	T-15D83	1:1.25	
HD-203A	500	1500	-50	6,400	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.4	
HD-203A	600	1750	-67.5	7,600	T-11M78	4-2A3	1.75:1	T-15D80	T-15D83	1:1.4	
HD-203A	600	1750	-67.5	7,600	T-11M78	**6L6	2.5:1	T-15D84	T-15D83	1:1.75	
203B	300	1250	-45	7,900	T-11M77	†2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:2	
4-203B	600	1250	-45	3,900	T-11M78	†4-2A3	1.75:1	T-15D80	T-15D83	1:1.4	
4-203B	600	1250	-45	3,900	T-11M78	**6L6	2.5:1	T-15D84	T-15D83	1:1.75	
203Z	200	1000	0	6,900	T-11M77 or T-19M17	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:1.75	
203Z	260	1100	0	6,700	T-11M77	†2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85	
203Z	300	1250	0	7,900	T-11M77	†2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85	
211	Same as R.C.A. 211										
T-756	100	850	-25	9,400	T-11M76 or T-19M16	2A3	3:1	T-15D78 or T-19D03	T-15D82	1:1.25	
T-756	125	850	-25	7,500	T-11M76 or T-19M17	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75	
T-814	500	2000	-150	11,500	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2	
T-814	500	2000	-150	11,500	T-11M78	**6L6	1.5:1	T-15D80	T-15D82	1:3.15	
T-822	Same as HD-203A										
TZ-40	175	1000	0	6,800	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85	
TZ-40	175	1000	0	6,800	T-11M77 or T-19M17	45	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.5	
TZ-40	100	750	0	6,000	T-11M76 or T-19M16	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:1.75	
TZ-40	100	750	0	6,000	T-11M76 or T-19M16	45	3:1	T-15D78 or T-19D03	T-15D82	1:1.4	





MODULATOR STAGE					DRIVER STAGE					
P-P Class B Tubes	Power Output Watts	Plate Volts	Bias Volts	Pl. to Pl. Load Ohms	Use Mod. Trans. No.	P-P Driver Tubes	Trans. Ratio, Pri. to 1/2 Sec.	Use Driver Trans. No.	Trans. for 500 Ohm Line	§Ratio 500 Ohm Line to 1/2 Sec.
<b>EIMAC TUBES</b>										
35T	150	1000	-22	7,200	T-11M77 or T-19M17	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.4
35T	200	1250	-30	9,600	T-11M77 or T-19M17	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.5
100TH	210	1000	0	5,200	T-11M77 or T-19M17	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
100TH	260	1250	0	7,200	T-11M77	2A3	3.6:1	T-15D78 or T-19D03	T-15D82	1:1.25
100TH	300	1500	-10	9,600	T-11M77	2A3	3.6:1	T-15D78 or T-19D03	T-15D82	1:1.25
100TH	380	2000	-20	16,000	T-11M78	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
100TL	170	1000	-90	5,200	T-11M77 or T-19M17	**6L6	2:1	T-15D84	T-15D82	1:2
100TL	230	1250	-112	7,200	T-11M77	**6L6	1.5:1	T-15D84	T-15D82	1:2.5
100TL	270	1500	-140	9,600	T-11M77	**6L6	1.5:1	T-15D84	T-15D82	1:2.5
100TL	350	2000	-185	16,000	T-11M78	**6L6	1.5:1	T-15D84	T-15D82	1:2.5
150T	500	2000	-150	11,500	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2
150T	600	2500	-195	14,000	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2
150T	500	2000	-150	11,500	T-11M78	**6L6	1.5:1	T-15D84	T-15D83	1:2.5
150T	600	2500	-195	14,000	T-11M78	**6L6	1.5:1	T-15D84	T-15D83	1:2.5
250TH	300	1000	0	4,000	T-11M77	**6L6	3.5:1	T-15D84	T-15D83	1:1.25
250TH	400	1250	0	5,200	T-11M78	**6L6	3.5:1	T-15D84	T-15D83	1:1.25
250TH	500	1500	-22.5	6,400	T-11M78	**6L6	8:1	T-15D84	T-15D83	1:1.4
<b>RAYTHEON TUBES</b>										
RK-12	100	750	0	8,700	T-11M76 or T-19M16	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75
RK-18	100	1000	-50	12,000	T-11M76 or T-19M16	*45	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.75
RK-18	100	1000	-50	12,000	T-11M76 or T-19M16	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
RK-31	110	1000	0	13,600	T-11M76 or T-19M17	*45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25
RK-31	140	1250	0	17,000	T-11M77 or T-19M17	*45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25
RK-31	110	1000	0	13,600	T-11M76 or T-19M17	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75
RK-31	140	1250	0	17,000	T-11M77 or T-19M17	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75
RK-52	200	1000	0	7,200	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
RK-52	250	1250	0	10,000	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
RK-57	300	1250	0	6,700	T-11M77	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
RK-57	370	1500	-16	8,200	T-11M78	2A3	3:1	T-15D78 or T-19D03	T-15D82	1:1.25
RK-58	200	1000	0	6,900	T-11M77 or T-19M17	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
RK-58	260	1250	0	9,000	T-11M77 or T-19M17	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
<b>HYTRON TUBES</b>										
HY-25	75	800	-9	9,000	T-11M75 or T-19M16	2A3	5:1	T-15D79 or T-19D04	T-15D82	1:1.75
HY-40	140	800	-28	5,800	T-11M77 or T-19M17	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
HY-40	175	1000	-37.5	7,000	T-11M77 or T-19M17	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
HY-57	110	800	-9	9,000	T-11M76 or T-19M17	2A3	5:1	T-15D79 or T-19D04	T-15D82	1:1.75
HY-51A	180	1000	-35	7,000	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
HY-51B	180	1000	-35	7,000	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
<b>AMPEREX TUBES</b>										
HF-100	260	1500	-52	12,000	T-11M77	2A3	3.2:1	T-15D78 or T-19D03	T-15D82	1:1.25
HF-100	350	1750	-62	16,000	T-11M78	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
ZB-120	150	750	0	4,800	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
ZB-120	200	1000	0	6,900	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
ZB-120	245	1250	0	9,000	T-11M77 or T-19M17	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:1.75
ZB-120	300	1500	-9	11,200	T-11M77	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
HF-200	500	2000	-100	11,200	T-11M78	2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:1.75
HF-200	500	2500	-130	16,000	T-11M78	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HF-200	600	2500	-130	16,000	T-11M78	2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:1.75
HF-200	500	2000	-100	11,200	T-11M78	**6L6	2.5:1	T-15D84	T-15D82	1:1.75
HF-200	600	2500	-130	16,000	T-11M78	**6L6	2.5:1	T-15D84	T-15D82	1:1.75
<b>HEINTZ &amp; KAUFMAN GAMMATRON TUBES</b>										
HK-24	45	500	0	6,400	T-11M75 or T-19M15	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:1.75
HK-24	105	1000	-29	15,000	T-11M76 or T-19M16	2A3	3.2:1	T-15D78 or T-19D03	T-15D82	1:1.25
HK-54	170	1250	-35	12,500	T-11M77 or T-19M17	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
HK-54	200	1500	-45	16,800	T-11M77 or T-19M17	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
HK-154	200	1000	-155	7,500	T-11M77 or T-19M17	2A3	1.4:1	T-15D76 or T-19D01	T-15D82	1:2.25
HK-154	223	1250	-210	11,400	T-11M77 or T-19M17	2A3	1.2:1	T-15D76 or T-19D01	T-15D82	1:2.75
HK-254	240	1500	-40	10,000	T-11M77 or T-19M17	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HK-254	328	2000	-65	16,000	T-11M78	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HK-254	418	2500	-80	22,000	T-11M78	2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:1.75
HK-354	100	1000	-60	15,000	T-11M76 or T-19M16	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25
HK-354	220	1500	-100	15,000	T-11M77 or T-19M17	2A3	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HK-354	400	2000	-150	15,000	T-11M78	2A3	1.4:1	T-15D76 or T-19D01	T-15D82	1:2.25
354E	319	1500	-25	10,000	T-11M77	4-2A3	2.25:1	T-15D81	T-15D83	1:1.25
354E	472	2000	-37.5	11,000	T-11M78	1-2A3	2:1	T-15D80	T-15D83	1:1.25
354F	595	2500	-50	16,000	T-11M78	4-2A3	1.75:1	T-15D80	T-15D83	1:1.4
354F	290	1500	-15	12,000	T-11M77	4-2A3	2.75:1	T-15D81	T-15D83	1:1.85
354F	445	2000	-22.5	12,000	T-11M78	4-2A3	2.5:1	T-15D81	T-15D83	1:1.85
<b>WESTERN ELECTRIC TUBES</b>										
242A, 261A, 276A	Same as R.C.A. 211									

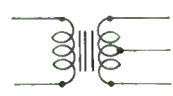
§NOTE: This ratio is correct only when the tubes supplying power to the 500 ohm line are of the same type and operated under the same conditions as the driver tubes listed under "P-P Driver Tubes." 2A3 driver tubes are operated with 300 plate volts, self biased, unless preceded by †. 45 driver tubes are operated with 275 plate volts, self biased, unless preceded by \*. †2A3 driver tubes are operated with 300 plate volts, fixed bias. \*45 driver tubes are operated with 250 plate volts, self biased. \*\*6L6's with 16.6N feed-back, 400 volts plate, 300 volts screen.



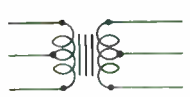
**FILAMENT (F) TRANSFORMERS**

The essentials of improved voltage regulation and minimum heat rise have been given prime consideration in the design of these units. Ratings given are for continuous operation at full load.

Type No.	List Price	Primary Volts	Secondary Volts	Sec. Amps.	Pri. V.A.	R.M.S. Test Volts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
								Width	Depth	W.	D.	H.	
<b>T-50F61</b>	<b>\$1.50</b>	115	2.5 Ct.	3.5	10	1600	2B	2 <sup>3</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>8</sub>	1	
<b>T-19F88</b>	<b>1.75</b>	115	2.5 Ct.	5.25	15	1600	2B	2 <sup>3</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>	
<b>T-19F89</b>	<b>2.25</b>	115	2.5 Ct.	10	25	1600	2B	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3	2	
<b>T-19F90</b>	<b>3.00</b>	115	2.5 Ct.	10	25	7500	3C	2	1 <sup>3</sup> / <sub>4</sub>	2 <sup>9</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>4</sub>
<b>T-64F33</b>	<b>4.50</b>	105 110 115	2.5 Ct.	10	25	7500	2N	3 <sup>1</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>4</sub>	4	4 <sup>1</sup> / <sub>2</sub>
<b>T-19F82</b>	<b>5.00</b>	115	2.5 Ct.	15	45	10000	3C	3 <sup>1</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>4</sub>	4	4
<b>T-63F99</b>	<b>3.25</b>	115	5 Ct.	4	20	1600	2D	2 <sup>1</sup> / <sub>8</sub>	1 <sup>9</sup> / <sub>16</sub>	2 <sup>7</sup> / <sub>16</sub>	3	3 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>4</sub>
<b>T-19F83</b>	<b>2.25</b>	115	5 Ct.	5	30	1600	2B	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3	2	
<b>T-19F84</b>	<b>2.75</b>	115	5 Ct.	8	45	1600	3C	2	1 <sup>3</sup> / <sub>4</sub>	2 <sup>9</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>4</sub>
<b>T-19F85</b>	<b>3.25</b>	115	5 Ct.	13	75	1600	3C	3 <sup>1</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>4</sub>	4	4
<b>T-19F86</b>	<b>5.50</b>	115	5 Ct.	21	120	1600	3C	3 <sup>1</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>4</sub>	4	4 <sup>1</sup> / <sub>2</sub>
<b>T-74F23</b>	<b>5.00</b>	105 110 115	5 Ct.	13	75	1600	2D	3 <sup>1</sup> / <sub>4</sub>	1 <sup>7</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>8</sub>	4	4 <sup>1</sup> / <sub>4</sub>
<b>T-74F24</b>	<b>7.50</b>	105 110 115	5 Ct.	21	125	1600	2D	2 <sup>3</sup> / <sub>4</sub>	1 <sup>9</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>16</sub>	4 <sup>5</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>4</sub>
<b>T-19F91</b>	<b>2.25</b>	115	5.25 Ct.	4	25	1600	3C	2	1 <sup>3</sup> / <sub>4</sub>	2 <sup>9</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>4</sub>
<b>T-19F92</b>	<b>3.25</b>	115	5.25 Ct.	13	75	1600	3C	3 <sup>1</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>4</sub>	4	4
<b>T-19F80</b>	<b>1.25</b>	115	6.3 Ct.	1	7	1600	2B	2	1 <sup>15</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	2	5 <sup>5</sup> / <sub>8</sub>	
<b>T-19F81</b>	<b>1.50</b>	115	6.3 Ct.	2	14	1600	2B	2 <sup>5</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>4</sub>	
<b>T-19F97</b>	<b>1.75</b>	115	6.3 Ct.	3	21	1600	2B	2 <sup>5</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>	
<b>T-61F85</b>	<b>2.00</b>	115	6.3, 5, 2.5	2.5	18	1600	3E	3 <sup>1</sup> / <sub>8</sub>	3 <sup>5</sup> / <sub>8</sub>	2	2 <sup>1</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>2</sub>	
<b>T-73F60</b>	<b>3.75</b>	105 110 115	6.3 Ct.	5	36	1600	2D	2 <sup>1</sup> / <sub>8</sub>	1 <sup>21</sup> / <sub>32</sub>	2 <sup>7</sup> / <sub>8</sub>	2 <sup>13</sup> / <sub>16</sub>	3 <sup>11</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>4</sub>
<b>T-19F98</b>	<b>2.75</b>	115	6.3 Ct.	6	47	1600	3C	2	1 <sup>7</sup> / <sub>8</sub>	2 <sup>9</sup> / <sub>16</sub>	2 <sup>3</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>4</sub>
<b>T-19F99</b>	<b>3.50</b>	115	6.3 Ct.	10	73	1600	3C	3 <sup>1</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>4</sub>	4	4
<b>T-19F93</b>	<b>2.25</b>	115	7.5 Ct.	4	34	1600	3C	2	1 <sup>3</sup> / <sub>4</sub>	2 <sup>9</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>4</sub>
<b>T-19F94</b>	<b>3.00</b>	115	7.5 Ct.	8	67	1600	3C	2 <sup>1</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>4</sub>	3	2 <sup>7</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	4
<b>T-92F20</b>	<b>4.75</b>	115	7.5 Ct.	8	68	1600	2D	3 <sup>1</sup> / <sub>4</sub>	2	3 <sup>3</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>4</sub>	4	4 <sup>3</sup> / <sub>4</sub>
<b>T-19F95</b>	<b>2.75</b>	115	10 Ct.	4	48	1600	3C	2	1 <sup>3</sup> / <sub>4</sub>	2 <sup>9</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>4</sub>
<b>T-19F96</b>	<b>3.50</b>	115	10 Ct.	8	92	1600	3C	2 <sup>1</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>4</sub>	3	2 <sup>7</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	4
<b>T-64F14</b>	<b>4.75</b>	105 110/115	10 Ct.	8	90	1600	2D	3 <sup>1</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>8</sub>	4	5
<b>T-19F87</b>	<b>6.25</b>	115	10 Ct.	12	140	1600	3C	3 <sup>1</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	3	4	6 <sup>3</sup> / <sub>4</sub>



**SINGLE SECONDARY — "19" SERIES**

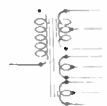
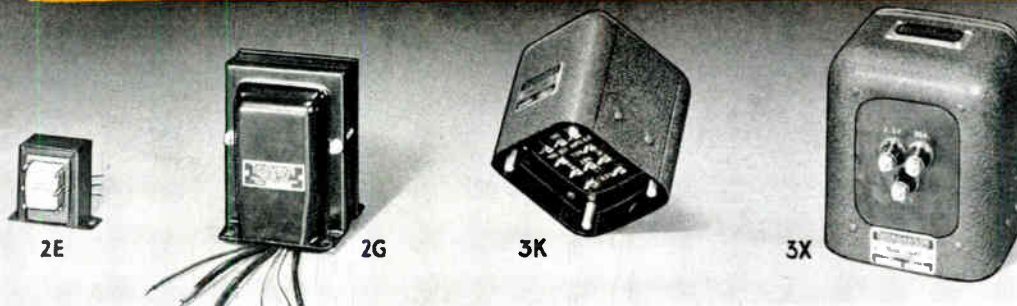


**SINGLE SECONDARY — C.H.T. SERIES**

C.H.T. filament transformers are conservatively designed to operate continuously at full rated load with superior voltage regulation and minimum temperature rise. Cases are filled with high melting point compound for complete coil protection.

<b>T-11F59</b>	<b>\$5.75</b>	105 115	5 Ct.	5	30	2000	3L	2 <sup>1</sup> / <sub>8</sub>	2 <sup>13</sup> / <sub>16</sub>	3	3 <sup>9</sup> / <sub>16</sub>	5	
<b>T-11F63</b>	<b>8.00</b>	105 115	5 Ct.	13	70	2000	3K	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>3</sup> / <sub>8</sub>	7 <sup>1</sup> / <sub>2</sub>
<b>T-11F55</b>	<b>11.50</b>	105/115	5.25 Ct.	22	130	2000	3K	3 <sup>13</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>32</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	6	14
<b>T-11F60</b>	<b>6.25</b>	105/115	6.3 Ct.	5	35	2000	3L	2 <sup>1</sup> / <sub>8</sub>	2 <sup>13</sup> / <sub>16</sub>	3	3 <sup>9</sup> / <sub>16</sub>	5 <sup>3</sup> / <sub>4</sub>	
<b>T-11F62</b>	<b>6.75</b>	105 115	7.5 Ct.	8	65	2000	3K	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	3 <sup>7</sup> / <sub>8</sub>	6 <sup>1</sup> / <sub>2</sub>
<b>T-11F64</b>	<b>9.50</b>	105 115	10 Ct.	10	110	2000	3K	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>7</sup> / <sub>8</sub>	9 <sup>3</sup> / <sub>4</sub>
<b>T-11F53</b>	<b>8.00</b>	105/115	2.5 Ct.	10	25	7500	3K	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>3</sup> / <sub>8</sub>	8 <sup>1</sup> / <sub>2</sub>
<b>T-11F61</b>	<b>18.50</b>	105/115	2.5 Ct.	20	55	15,000	3X	3 <sup>13</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>32</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	6	14
<b>T-11F54</b>	<b>16.00</b>	105/115	5 Ct.	20	110	10,000	3X	3 <sup>13</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>32</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	6	15





## FILAMENT (F) TRANSFORMERS

Recommended for complete filament requirements of transmitters or amplifiers. Improved appearance and protection of coils from mechanical injury are afforded by shielded mounting.

Type No.	List Price	Primary Volts	Sec. Volts	Sec. Amps.	Pri. V.A.	R.M.S. Test Volts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
								Width	Depth	W.	D.	H.	
<b>MULTIPLE SECONDARIES — "19" SERIES</b>													
T-19F76	\$4.75	115	Sec. 1-5 V. Sec. 2-7.5/6.3/5	3 6	67	1600 1600	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>5</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>
T-19F77	7.50	115	Sec. 1-5 V. Sec. 2-2.5 V. Ct. Sec. 3-10/7.5/6.3/5	3 10 8	133	1600 7500 1600	2G	3	2 <sup>7</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>5</sup> / <sub>8</sub>	4 <sup>15</sup> / <sub>16</sub>	7
T-19F78	5.25	115	Sec. 1-2.5 V. Ct. Sec. 2-5 V.	10 3	45	7500 1600	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	5
T-19F79	6.75	115	Sec. 1-6.3 V. Ct. Sec. 2-10/7.5/6.3/5	3 10	133	1600 1600	2G	2 <sup>11</sup> / <sub>16</sub>	3	3 <sup>3</sup> / <sub>8</sub>	3 <sup>5</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	6
T-79F84	4.75	115	Sec. 1-2.5 V. Ct. Sec. 2-5 V. Ct. Sec. 3-6.3 V. Ct.	3.5 3 3	48	1600 1600 1600	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>

<b>MULTIPLE SECONDARIES—C. H. T. SERIES</b>													
T-11F56	\$ 7.75	105 115	Sec. 1-6.3 Ct. Sec. 2-2.5 Ct. Sec. 3-5 Ct.	3 3.5 3	50	2000	3K	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	3 <sup>7</sup> / <sub>8</sub>	6
T-11F57	13.75	105/115	Sec. 1-10 Ct. Sec. 2-10 Ct. Sec. 3-6.3 Ct. Sec. 4-5 Ct.	8 4 3 3	170	2000	3K	3 <sup>13</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>32</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	6 <sup>3</sup> / <sub>4</sub>	15
T-11F58	15.00	105 115	Sec. 1-7.5 Ct. Sec. 2-7.5 Ct. Sec. 3-6.3 Ct. Sec. 4-5 Ct.	6.5 3.25 3 3	120	2000	3K	3 <sup>13</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>32</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	6	13 <sup>1</sup> / <sub>4</sub>

### TAPPED SECONDARIES C. H. T. SERIES

Designed for minimum temperature rise under continuous full load operation. Cases are compound filled for complete coil protection.

T-11F50	9.00	105 115	7.5 6.3/5* 2.5 Ct.	6.5	55	2000	3K	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>3</sup> / <sub>8</sub>	6 <sup>1</sup> / <sub>4</sub>
T-11F51	9.50	105 115	10/7.5/6.3 Ct.	8	90	2000	3K	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>7</sup> / <sub>8</sub>	7 <sup>3</sup> / <sub>4</sub>
T-11F52	13.25	105 115	11/10/7.5 Ct.	10	125	2000	3K	3 <sup>13</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>32</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	6	13 <sup>1</sup> / <sub>2</sub>

\*Not center tapped.

### FILAMENT CORRECTOR AUTOTRANSFORMERS

To compensate for variations in line voltage or for drop in filament leads. Correct filament voltage at the tube is made possible.

Type No.	List Price	Capacity Filament Power Watts	Primary Taps	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
					Width	Depth	W.	D.	H.	
T-18V24	\$2.00	60	105/110/115/120/125V.	2E	2 <sup>3</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	2	2 <sup>3</sup> / <sub>4</sub>	1	
T-18V25	2.75	150	105/110/115/120/125V.	2E	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	2 <sup>15</sup> / <sub>16</sub>	1 <sup>3</sup> / <sub>4</sub>	

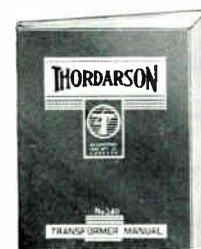
#### No. 344E—Transmitter Guide 15c Postpaid



Another Thordarson publication produced for the amateur operator. Complete description and details on practical types of transmitters and short wave apparatus. Schematic diagrams, pictures and parts lists of 12 new, modern transmitters from 10 to 1000 watts including an all-band A.C.-battery, emergency portable unit and a 5-10 meter mobile transmitter.

#### No. 340—Complete Transformer Manual . . . 35c Postpaid

The Thordarson Transformer Manual is a complete book, containing the Replacement Transformer Encyclopedia and Servicing Guide, the Transmitter Guide, and the Sound Amplifier Guide, plus current Thordarson catalogs. It is bound in a strong, attractive blue and orange cover with loose leaf arrangement, giving the user opportunity to keep the Manual up-to-date by adding later Thordarson releases. This book has proven to be most popular in the technical library.







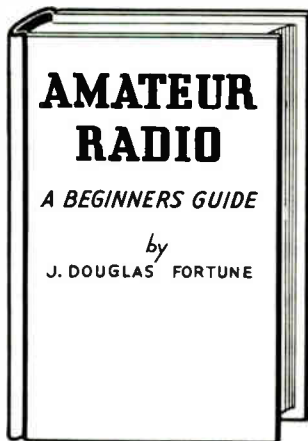
**MODULATION (M) TRANSFORMERS**

To couple the plate or plates of an audio output stage to a Class C R.F. load.

Type No.	List Price	Tube Type	Class	Ohms Impedance		Max.D.C. Sec.M.A.	Max.Audio Pwr. Watts	Mtg. Centers		Dimensions			Wt. Lbs.
				Pri.	Sec.			Mtg. Fig.	Width	Depth	W.	D.	
<b>MODULATION TRANSFORMERS FOR SPECIFIC APPLICATIONS</b>													
High efficiency, quiet operation and good frequency characteristics have been attained in this series of transformers by thorough engineering and careful construction. These units are designed for specific tube types.													
T-67M69	\$2.75	1-19	B	10,000	2,700	50	10	2F	2 3/4	2 3/4	2 3/4	1 1/2	
T-17M59	2.75	1-6A6, 6N7 or 53	B	10,000	3,000	100	10	2F	2 15/16	3 3/8	2 1/2	3	2
T-64M26	6.00	2-46 or 59 2-250	B AB	5,800	5,000 10,000	100	40	2D	3 1/4	2 1/16	3 3/4	3 3/8	4
T-19M21	7.00	2-TZ-20	B	10,000	3,750 6,600	200 150	75	2N	3 1/4	2 13/16	3 3/4	4	4
T-19M22	10.00	2-809 2-RK-12	B B	8,400	5,000 7,850	200 160	100	2N	3 1/4	2 3/4	4 1/4	4 1/4	6 1/16
T-84M70	10.00	2-6L6 2-35T 4-210	AB B B	3,800	2,500 5,000 7,500	250 200 150	75	2D	2 3/4	2 13/16	3 3/4	4 1/16	4 5/8
T-14M49	16.50	2-TZ-40	B	6,900	2,850 4,500 6,500	350 300 235	175	2Q	6 3/4	3 3/16	7 1/2	5 5/8	6 3/8
T-82M25	40.00	2-805, HD-203A, 822	B	9,000	4,000 6,000/8,000	500	650	2Q	8 5/16	4 1/16	9 1/16	7 1/2	7 3/4

**GRID MODULATION TRANSFORMERS**

T-67M73	\$3.50	1-42, 46, 6F6, Triode	A	6,300	5,400	32	10	2D	2 1/8	1 9/16	2 7/16	3	3 1/8	2 1/4
T-67M74	4.50	P.P. 45-2A3	AB	5,000	5,000	60	20	2D	2 1/8	1 3/2	2 7/8	2 9/16	3 1/16	3 1/2



*Amateur Radio*

*A Beginners Guide*

By J. DOUGLAS FORTUNE

Mr. Fortune, Thordarson engineer and a prominent amateur radio enthusiast, spent over twelve months in preparing this text-book. There are approximately 160 pages, and matters covered include Learning the Code, Receiver Theory and Construction, Crystal Oscillator Transmitter, Two-stage Transmitter, Three-stage Transmitter, Construction of the Modulator and reference notes on receivers, inductance, capacity and many other electrical and radio terms. It is a book recommended to all experimenters, beginning amateurs and even to amateurs of long experience. Amateur net price 75c. Profusely illustrated with over 100 comprehensive photographs and drawings. Heavy cover finished in wear-resistant blue cloth, with attractive gold stamping. This is a cloth cover, case bound text-book.



**THORDARSON BROADCAST UNITS**

The same high quality transformers that have been made to the special requirements of discriminating engineers, broadcast stations and laboratories are now available as stock catalog items. Thordarson offers a complete line of transformers and chokes for broadcast use, each capable of meeting and surpassing the most rigid broadcast tolerances. These transformers are listed and described in the new Broadcast Catalog, No. 500-E. Broadcast stations, experimenters, laboratories or air craft stations are urged to secure a copy of this valuable listing.



4D



3G



3U



2Q

## UNIVERSAL AND MULTI-MATCH MODULATION (M) TRANSFORMERS

The radio amateur or experimenter regularly makes changes in equipment to take advantage of new circuits and tubes. To enable quick and accurate matching of various tube loads without changing transformers, and to assure peak transformer performance while

testing new tubes or making circuit changes, these Universal and Multi-Match transformers are made available. A complete table of driver and modulator combinations on pages 12 and 13 makes easy the selection of the proper driver or modulation transformer.

### "19" SERIES UNIVERSAL MODULATION TRANSFORMERS

Type No.	List Price	Capacity Watts	Pri. M.A. Each Side	Secondary M.A.		Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
				Series	Parallel		Width	Depth	W.	D.	H.	
T-19M13	\$4.00	15	50	50	100	4D	2 <sup>5</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>4</sub>	2 <sup>7</sup> / <sub>16</sub>	3	2
T-19M14	7.00	30	75	75	150	2N	3 <sup>1</sup> / <sub>4</sub>	1 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3	4	4 <sup>1</sup> / <sub>2</sub>
T-19M15	10.00	60	125	125	250	2N	3 <sup>1</sup> / <sub>4</sub>	2 <sup>9</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	4	6 <sup>1</sup> / <sub>2</sub>
T-19M16	15.00	100	175	175	350	2N	3 <sup>1</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	6 <sup>1</sup> / <sub>16</sub>	12 <sup>1</sup> / <sub>2</sub>
T-19M17	24.00	250	225	225	450	2Q	7 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>16</sub>	8 <sup>1</sup> / <sub>2</sub>	5 <sup>3</sup> / <sub>4</sub>	6 <sup>7</sup> / <sub>8</sub>	30 <sup>3</sup> / <sub>4</sub>

### C. H. T. MULTI-MATCH MODULATION TRANSFORMERS

A premium feature of this group is the exclusive Thordarson Switchboard Plug-in terminal board, enabling quick and accurate matching of tube loads without soldering.

Type No.	List Price	Capacity Watts	Pri. M.A.	Sec. M.A.	Mtg. Fig.	Width	Depth	W.	D.	H.	Wt. Lbs.	
T-11M74	\$ 9.00	40	100	80	160	3G	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>3</sup> / <sub>8</sub>	7 <sup>3</sup> / <sub>4</sub>
T-11M75	12.50	75	145	145	290	3G	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>3</sup> / <sub>8</sub>	9
T-11M76	19.50	125	210	160	320	3G	3 <sup>3</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>32</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	6	18
T-11M77	30.00	300	250	250	500	3G	4 <sup>9</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>32</sub>	5 <sup>15</sup> / <sub>16</sub>	6 <sup>15</sup> / <sub>16</sub>	7 <sup>1</sup> / <sub>4</sub>	30
T-11M78	60.00	500	320	320	640	3G	5 <sup>11</sup> / <sub>16</sub>	7 <sup>7</sup> / <sub>32</sub>	7 <sup>1</sup> / <sub>16</sub>	8 <sup>11</sup> / <sub>16</sub>	7 <sup>1</sup> / <sub>2</sub>	51

### C. H. T. CATHODE MODULATION TRANSFORMERS

With the exclusive Thordarson Switchboard Plug-in Terminal Board.

Type No.	List Price	Capacity Watts	Ohms Impedance		Max. Sec. Current D.C. M.A.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
			Primary	Secondary			Width	Depth	W.	D.	H.	

#### Conventional Multi-Match Cathode Modulation Transformers

Audio power is 10% of the Class C input. R.F. efficiency is 44%.

T-11M69	\$5.50	15	5,000 7,000 10,000	80 to 2,000	300	3G	2 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	2 <sup>15</sup> / <sub>16</sub>	3	3 <sup>9</sup> / <sub>16</sub>	3
T-11M70	7.50	40	3,000 6,600 10,000	80 to 2,000	400	3G	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>7</sup> / <sub>8</sub>	7
T-11M71	13.00	100	6,000 8,000 10,000	80 to 2,000	600	3G	2 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>7</sup> / <sub>8</sub>	10

#### High Efficiency Multi-Match Cathode Modulation Transformers

Audio power is 20% of the Class C input and R. F. efficiency is 55%.

Special bulletin SD456 with circuit details is available. \*With switchboard terminal arrangement.

T-11M79	\$13.00	40	Variable	Variable	300	3U*	3 <sup>3</sup> / <sub>4</sub>	3 <sup>15</sup> / <sub>16</sub>	4	4 <sup>1</sup> / <sub>4</sub>	5 <sup>1</sup> / <sub>8</sub>	10
T-11M80	17.00	100	Variable	Variable	400	3U*	3 <sup>11</sup> / <sub>16</sub>	4 <sup>9</sup> / <sub>16</sub>	4	5	5 <sup>1</sup> / <sub>2</sub>	15
T-11M81	27.50	200	Variable	Variable	600	3U*	4 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>8</sub>	5 <sup>3</sup> / <sub>8</sub>	6 <sup>1</sup> / <sub>4</sub>	6 <sup>1</sup> / <sub>4</sub>	28

### MATCHING LINE TO R. F. LOAD MODULATION TRANSFORMERS

This popular series is designed for direct connection to 500 ohm output terminals of a receiver or amplifier. 200 ohm tap is also provided on type T-83M22.

Type No.	List Price	Pri. Ohms	Secondary Ohms Load	Max. Sec. M.A.	D.C. Watts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
							Width	Depth	W.	D.	H.	
T-73M52	\$18.00	500	5,000/6,000/7,000/8,000/9,000/10,000	215	80	2Q	6 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>16</sub>	7 <sup>1</sup> / <sub>2</sub>	5 <sup>5</sup> / <sub>8</sub>	6 <sup>3</sup> / <sub>8</sub>	21
T-83M22	9.00	500/200	5,000/6,000/7,000/8,000/9,000/10,000	150	30	2N	2 <sup>3</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>16</sub>	3 <sup>15</sup> / <sub>16</sub>	3 <sup>15</sup> / <sub>16</sub>	4 <sup>5</sup> / <sub>8</sub>	8





N2Q



S2N



2K



2G

**PLATE SUPPLY (P) TRANSFORMERS**

While ordinarily used to supply the voltage potential between cathode and anodes of vacuum tubes in a rectifier circuit, there are additional applications requiring relatively high voltages in which Thordarson plate transformers may be used to good advantage. Thordarson plate transformers are rated in D.C. voltages from a two section filter which includes the voltage drop through the rectifier tubes



**PLATE SUPPLY TRANSFORMERS — "19" SERIES**

Designed especially for Amateur Short Wave or experimental equipment. Electrostatic shielding is provided between primary and secondary windings.

Type No.	List Price	Primary Volts	Sec. A.C. Load Volts	D.C. Volts	Bias Tap	D.C. M.A.	Pri. V.A.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
									Width	Depth	W.	D.	H.	
T-19P54	\$5.50	115	560-0-560	400		150	115	2G	3 1/8	2 5/8	3 3/4	3 3/8	4 5/16	7
T-19P55	6.50	115	660-0-660 550-0-550	500 400	30 V.	250	200	2G	3 1/8	3	3 3/4	3 3/4	4 5/16	8
T-84P60	6.50	115	515-0-515	400	30 V.	250	190	2G	3	4	3 11/16	4 3/4	4 5/16	11 3/4
T-19P70	9.00	115	900-0-900 605-0-605	750* 400		100 225	260	2G	3	3 7/8	3 7/8	4 5/8	4 5/16	11 1/2
T-19P56	7.00	115	900-0-900 800-0-800	750 600		225	260	2G	3 1/8	3 1/2	3 3/4	4 1/4	4 5/16	10
T-19P57	8.50	115	1075-0-1075 500-0-500	1000* 400		125 150	245	2G	3 1/8	3 3/4	3 3/4	4 1/2	4 5/16	10 1/2
T-19P58	14.25	115	1200-0-1200 900-0-900	1000* 750		200 150	500	2G	3 1/4	3 11/16	4 3/8	4 5/8	6 1/8	19
T-19P69	13.00	115	1180-0-1180 900-0-900	1000 750		300	430	2G	3 3/4	3 5/8	5 1/16	6 1/4	6 3/4	20
T-19P71	13.00	115	1325-0-1325 595-0-595	1250* 400		125 200	320	2G	3	4 3/4	3 7/8	5 1/2	4 5/16	15 1/2
T-19P59	16.00	115	1560-0-1560 1250-0-1250	1250 1000		300	550	2K	4 3/16	3 5/16	5 7/8	4	6 1/16	26 1/2
T-19P60	18.50	115	1875-0-1875 1560-0-1560	1500 1250		300	620	2K	5 3/4	4 3/8	6 11/16	6 1/4	6 9/16	29 1/4
T-19P61	20.00	115	2125-0-2125 1875-0-1875	1750 1500		300	745	2K	5 3/4	4 5/8	6 11/16	6 1/2	6 9/16	31 1/2
T-19P62	22.50	115	2420-0-2420 2125-0-2125	2000 1750		300	860	2K	5 3/4	5	6 11/16	6 7/8	6 9/16	34 1/2
T-19P65	29.50	115	3000-0-3000 2420-0-2420	2500 2000		300	1195	2K	5 3/4	6	6 11/16	7 7/8	6 9/16	44
T-19P63	23.00	115	1560-0-1560 1265-0-1265	1250 1000		500	925	2K	5 3/4	5 1/4	6 11/16	7 1/8	6 9/16	38
T-19P64	28.50	115	1875-0-1875 1560-0-1560	1500 1250		500	1130	2K	5 3/4	6	6 11/16	7 7/8	6 9/16	43 1/4
T-19P66	35.00	115	2125-0-2125 1875-0-1875	1750 1500		500	1185	2K	5 3/4	4 3/8	6 11/16	5 1/4	9 13/16	45 1/2
T-19P67	42.50	115	2450-0-2450 2125-0-2125	2000 1750		500	1380	2K	5 3/4	4 5/8	6 11/16	5 1/2	9 13/16	51
T-19P68	50.00	115	3000-0-3000 2450-0-2450	2500 2000		500	1760	2K	5 3/4	5 5/8	6 11/16	6 1/2	9 13/16	61

\*These transformers designed for double rectifiers and will deliver both secondary ratings simultaneously. If only the lower voltage taps are used the current rating is equal to the current rating of both windings.

**AUTOMATIC VOLTAGE REGULATORS**

Will deliver a constant voltage (within ± 1%) despite line fluctuations from 90 to 130 volts and or secondary loads from 1/3 to full load rating. Operation is fully automatic and instantaneous. Once installed no further adjustment is necessary. Supplies optional output voltages of 110, 115 or 120 volts — 60 cycles. Ideal for use with plate, filament or power transformers or for use in technical laboratories. Engineering Bulletin SD422A is available from all Thordarson distributors.

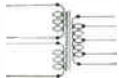
Type No.	List Price	Capacity V.A.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
				Width	Depth	W.	D.	H.	
T-9V30	\$ 40.00	100	S2N	11 5/8	2 5/8	12 7/8	5 1/4	6 3/4	48
T-9V31	65.00	250	S3N	11 5/8	3 1/4	12 7/8	6 1/8	8 1/2	68
T-9V32	100.00	500	N2Q	16	4	17	6 1/8	7 5/8	76
T-9V33	175.00	1000	N3Q	19	4	20	7 1/8	10 1/4	150





**PLATE SUPPLY (P) AND POWER (R) TRANSFORMERS**

Type No.	List Price	Primary Volts	Sec. A.C. Load Volts	D.C. Volts	D.C. M.A.	Pri. V.A.	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
								Width	Depth	W.	D.	H.	



**PLATE SUPPLY TRANSFORMERS — C. H. T. SERIES**

Will operate continuously under full rated load conditions with excellent regulation and with minimum temperature rise. Cases are compound filled for complete coil protection.

T-15P11	\$12.50	115-230	665-0-665 535-0-535	500 400	200	160	3K	3 <sup>11</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>32</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	5 <sup>3</sup> / <sub>8</sub>	15 <sup>3</sup> / <sub>4</sub>
T-15P12	15.00	115-230	835-0-835 655-0-655	650 500	200	200	3K	3 <sup>11</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>32</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	6 <sup>3</sup> / <sub>4</sub>	19 <sup>1</sup> / <sub>2</sub>
T-15P13	20.00	115-230	945-0-945 770-0-770	750 600	300	315	3K	4 <sup>9</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>32</sub>	5 <sup>15</sup> / <sub>16</sub>	6 <sup>15</sup> / <sub>16</sub>	7 <sup>1</sup> / <sub>4</sub>	31 <sup>3</sup> / <sub>4</sub>
T-15P14	25.00	115-230	1225-0-1225 945-0-945	1000 750	300	427	3K	4 <sup>9</sup> / <sub>16</sub>	5 <sup>27</sup> / <sub>32</sub>	6	7 <sup>3</sup> / <sub>16</sub>	8 <sup>1</sup> / <sub>4</sub>	41
T-15P15	30.00	115-230	1450-0-1450 1190-0-1190	1250 1000	300	520	3K	5 <sup>11</sup> / <sub>16</sub>	6 <sup>13</sup> / <sub>32</sub>	7	8	8	51 <sup>1</sup> / <sub>4</sub>
T-15P16	45.00	115-230	1540-0-1540 1255-0-1255	1250 1000	500	875	3P	3 <sup>1</sup> / <sub>8</sub>	9 <sup>1</sup> / <sub>4</sub>	6 <sup>3</sup> / <sub>8</sub>	10 <sup>1</sup> / <sub>4</sub>	8 <sup>3</sup> / <sub>4</sub>	81
T-15P17	32.50	115-230	1815-0-1815 1535-0-1535	1500 1250	300	665	3K	5 <sup>11</sup> / <sub>16</sub>	6 <sup>13</sup> / <sub>32</sub>	7	8	8	55
T-15P18	60.00	115-230	2130-0-2130 1845-0-1845	1750 1500	500	1210	3P	3 <sup>1</sup> / <sub>8</sub>	10 <sup>1</sup> / <sub>2</sub>	6 <sup>3</sup> / <sub>8</sub>	11 <sup>1</sup> / <sub>2</sub>	8 <sup>3</sup> / <sub>4</sub>	96
T-15P19	50.00	115-230	2950-0-2950 2365-0-2365	2500 2000	300	1160	3P	3 <sup>1</sup> / <sub>8</sub>	9 <sup>3</sup> / <sub>4</sub>	6 <sup>3</sup> / <sub>8</sub>	10 <sup>3</sup> / <sub>4</sub>	8 <sup>3</sup> / <sub>4</sub>	85
T-15P20	85.00	115-230	2960-0-2960 2390-0-2390	2500 2000	650	2380	3P	4 <sup>5</sup> / <sub>16</sub>	11 <sup>5</sup> / <sub>8</sub>	7 <sup>5</sup> / <sub>8</sub>	12 <sup>5</sup> / <sub>8</sub>	9 <sup>5</sup> / <sub>8</sub>	140
T-15P21	80.00	115-230	3440-0-3440 2980-0-2980 2340-0-2340 1815-0-1815	3000 2500 2000 1500	500	2180	3P	4 <sup>5</sup> / <sub>16</sub>	10 <sup>7</sup> / <sub>8</sub>	7 <sup>5</sup> / <sub>8</sub>	11 <sup>7</sup> / <sub>8</sub>	9 <sup>5</sup> / <sub>8</sub>	129
T-15P22	50.00	115-230	2070-0-2070 1785-0-1785 1495-0-1495 1210-0-1210	1750 1500 1250 1000	300	745	3P	3 <sup>1</sup> / <sub>8</sub>	8 <sup>3</sup> / <sub>4</sub>	6 <sup>3</sup> / <sub>8</sub>	9 <sup>3</sup> / <sub>4</sub>	8 <sup>3</sup> / <sub>4</sub>	76

**POWER (R) TRANSFORMERS  
BIAS TRANSFORMERS**

Type No.	List Price	Pri. V.A.	Secondary D.C. Volts	Filament		Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
				Secondary M.A.	V. A.		Width	Depth	W.	D.	H.	

**Universal Bias Transformers — "19" Series**

T-19R31	\$5.50		10 to 100 in app. 5 volt steps	200		2N	3 <sup>1</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>4</sub>	4	4
T-19R32	7.25		100 to 400 in app. 15 volt steps	200		2N	2 <sup>3</sup> / <sub>4</sub>	2 <sup>11</sup> / <sub>16</sub>	3 <sup>13</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>4</sub>	4 <sup>5</sup> / <sub>8</sub>	9 <sup>1</sup> / <sub>4</sub>

**C. H. T. Multi-Volt Bias Transformers**

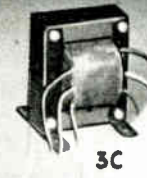
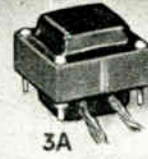
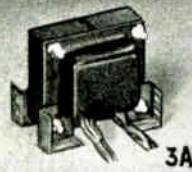
Have the convenient feature of Switchboard plug-in terminal board facilitating changes of voltage.

T-15R60	\$9.50	65	150 / 135 / 120 / 110 / 100 / 90	200	5	3	3N	3 <sup>7</sup> / <sub>32</sub>	2 <sup>7</sup> / <sub>8</sub>	4	4 <sup>1</sup> / <sub>2</sub>	4 <sup>7</sup> / <sub>8</sub>	6 <sup>3</sup> / <sub>4</sub>
T-15R61	10.50	100	275 / 250 / 225 / 200 / 175 / 150	200	5	3	3N	3 <sup>7</sup> / <sub>32</sub>	2 <sup>7</sup> / <sub>8</sub>	4	4 <sup>1</sup> / <sub>2</sub>	4 <sup>7</sup> / <sub>8</sub>	8 <sup>1</sup> / <sub>2</sub>
T-15R62	12.50	155	500 / 450 / 400 / 350 / 300 / 275	200	5	3	3N	4 <sup>3</sup> / <sub>32</sub>	3 <sup>13</sup> / <sub>16</sub>	5 <sup>1</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>2</sub>	5 <sup>3</sup> / <sub>4</sub>	15 <sup>1</sup> / <sub>4</sub>

**TELEVISION POWER TRANSFORMERS**

Type No.	List Price	Kinescope Tubes	Secondary	R.M.S. Test Volts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.	
						Width	Depth	W.	D.	H.		
T-17R32	\$10.00	5"	No. 1 — 2300V. A.C. No. 2 — 2.5V at 2A No. 3 — 2.5V at 2A	3000V. D.C.	7500	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>3</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>2</sub>
T-17R33	12.50	9"	No. 1 — 4500V. A.C. No. 2 — 2.5V at 5A No. 3 — 2.5V at 2A	6000V. D.C.	10,000	2G	2 <sup>11</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>7</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	6 <sup>1</sup> / <sub>2</sub>

For suitable filter reactor, see listing of chokes on page 8.



**POWER (R) TRANSFORMERS**

Designed to furnish plate and filament voltage requirements of amplifiers, receivers and exciter stages of transmitters.

**UNIVERSAL REPLACEMENT POWER TRANSFORMERS — "13R" SERIES**

The choice of servicemen in all parts of the world because of the universal adaptability to receiver replacement, from both electrical and mechanical considerations. Adjustable mounting brackets permit flush, vertical or horizontal mounting. Replacement recommendations are given in Thordarson Replacement Transformer Encyclopedia and Service Guide No. 352.

Type No.	List Price	Pri. V.A.	Secondary		Filament Windings			Mtg. Centers			Dimensions			Wt. Lbs.	
			A.C. Load Volts	D.C. M.A.	Rect. Fil.	Fil. No. 1	Fil. No. 2	Fil. No. 3	Mtg.	Width	Depth	W.	D.		H.
T-13R19	\$2.50	45	240-0-240	40	5V-2A	6.3V-2A Ct.			3A	2 <sup>1</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	2 <sup>1</sup> / <sub>2</sub>	2 <sup>1</sup> / <sub>2</sub>	3	2 <sup>1</sup> / <sub>2</sub>
T-13R11	2.75	60	290-0-290	50	5V-3A	6.3V-2A Ct.			3A	2 <sup>1</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	2 <sup>1</sup> / <sub>2</sub>	2 <sup>3</sup> / <sub>4</sub>	3	3 <sup>1</sup> / <sub>4</sub>
T-13R12	3.50	65	350-0-350	70	5V-3A	6.3V-2.5A Ct.			3A	2 <sup>1</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	2 <sup>1</sup> / <sub>2</sub>	3 <sup>5</sup> / <sub>16</sub>	3	3 <sup>1</sup> / <sub>4</sub>
T-13R13	4.00	90	350-0-350	90	5V-3A	6.3V-3.5A Ct.			3A	2 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>4</sub>	3 <sup>5</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	5 <sup>1</sup> / <sub>4</sub>
T-13R14	4.25	115	350-0-350	120	5V-4A	6.3V-4.7A Ct.			3A	2 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	5 <sup>1</sup> / <sub>4</sub>
T-13R15	5.75	140	375-0-375	150	5V-4A	6.3V-5A Ct.			3A	3	3 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>2</sub>	6 <sup>1</sup> / <sub>2</sub>
T-13R16	6.25	180	400-0-400	200	5V-4A	6.3V-5.14A Ct.			3A	3	3 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>11</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	7 <sup>3</sup> / <sub>4</sub>
T-13R17	4.00	85	300-0-300	60	5V-3A	6.3V-2.5A Ct.	2.5V-7.5A Ct.		3A	2 <sup>1</sup> / <sub>4</sub>	2 <sup>15</sup> / <sub>16</sub>	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>2</sub>
T-13R18	4.50	115	350-0-350	90	5V-3A	6.3 2.5 3.5A Ct.	2.5V-9A Ct.		3A	3	3 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>2</sub>	5 <sup>3</sup> / <sub>4</sub>
T-13R08	4.50	105	350-0-350	90	5V-3A	6.3V-3.3A Ct.	2.5V-6A Ct.		3A	2 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	5 <sup>1</sup> / <sub>4</sub>
T-13R09	6.25	160	375-0-375	180	5V-3A	6.3V-3.3A Ct.	2.5V-6A Ct.		3A	3	3 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>9</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	7 <sup>1</sup> / <sub>2</sub>
T-13R00	4.25	70	275-0-275	70	5V-3A	5V-5A Ct.	2.5V-10.5A Ct.		3A	2 <sup>1</sup> / <sub>4</sub>	2 <sup>15</sup> / <sub>16</sub>	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	4
T-13R01	2.75	60	325-0-325	40	5V-3A	2.5V-4A Ct.			3A	2 <sup>1</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	2 <sup>1</sup> / <sub>2</sub>	2 <sup>3</sup> / <sub>4</sub>	3	3 <sup>1</sup> / <sub>4</sub>
T-13R02	3.50	60	350-0-350	50	5V-3A	2.5V-7.25A Ct.			3A	2 <sup>1</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	2 <sup>1</sup> / <sub>2</sub>	2 <sup>15</sup> / <sub>16</sub>	3	3 <sup>1</sup> / <sub>4</sub>
T-13R03	3.75	75	350-0-350	70	5V-3A	2.5V-9A Ct.			3A	2 <sup>1</sup> / <sub>4</sub>	2 <sup>15</sup> / <sub>16</sub>	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	4
T-13R04	4.25	115	350-0-350	100	5V-3A	2.5V-12.5A Ct.			3A	2 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	5 <sup>1</sup> / <sub>4</sub>
T-13R05	4.00	110	350-0-350	70	5V-3A	2.5V-9A Ct.	2.5V-3.5A Ct.		3A	2 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	5 <sup>1</sup> / <sub>4</sub>
T-13R06	5.25	130	350-0-350	120	5V-3A	2.5V-12.5A Ct.	2.5V-3.5A Ct.		3A	3	3 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>2</sub>	6 <sup>1</sup> / <sub>2</sub>
T-13R07	5.50	140	400-0-400	110	5V-3A	2.5V-15A Ct.	2.5V-3.5A Ct.		3A	3	3 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>2</sub>	4 <sup>1</sup> / <sub>2</sub>	6 <sup>3</sup> / <sub>4</sub>

**POWER TRANSFORMERS — AMPLIFIER, TRANSMITTER AND REPLACEMENT Half Shell or Flush Mounting**

Lugs are brought out through solder terminals facilitating circuit changes for the experimenter.

T-60R49	\$2.25	30	280-0-280	30	5V-2A	2.5V-3.5A Ct.			2H	2 <sup>3</sup> / <sub>16</sub>	2 <sup>15</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	2	2	
T-50R03	2.75	75	350-0-350	80	5V-2A	2.5V-12A Ct.			2H	3 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	3 <sup>9</sup> / <sub>16</sub>	3 <sup>15</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>16</sub>	5 <sup>1</sup> / <sub>2</sub>
T-63R63	2.75	75	350-0-350	80	5V-2A	2.5V-9A Ct.	2.5V-3A Ct.		2H	3 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>15</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>16</sub>	5 <sup>1</sup> / <sub>2</sub>
T-70R20	2.75	45	300-0-300	50	5V-2A	6.3V-2A Ct.			2H	2 <sup>9</sup> / <sub>16</sub>		2 <sup>15</sup> / <sub>16</sub>	3 <sup>7</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>8</sub>	3
T-70R21	3.50	70	300-0-300	70	5V-2A	2.5V-4A Ct.	6.3V-3A Ct.		2H	3 <sup>1</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>2</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>15</sup> / <sub>16</sub>	2 <sup>5</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>4</sub>
T-75R47	4.00	75	305-0-305	125	5V-2A	6.3V-2A Ct.			2H	3 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>15</sup> / <sub>16</sub>	2 <sup>15</sup> / <sub>16</sub>	6

**VIBRATOR POWER TRANSFORMERS**

For operation with a vibrator from a six volt battery source.

Type No.	List Price	Secondary		Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
		D.C. Volts to Filter	M.A.		Width	Depth	W.	D.	H.	
T-14R33	\$2.75	225	40	3C	2 <sup>1</sup> / <sub>16</sub>	1 <sup>13</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	2 <sup>5</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	2
T-14R34	3.25	250	50	3C	2 <sup>1</sup> / <sub>16</sub>	1 <sup>15</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	2 <sup>3</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>4</sub>
T-14R35	3.75	260	60	3C	2 <sup>1</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	2 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>
T-14R36	4.25	285	75	3C	2 <sup>1</sup> / <sub>16</sub>	2 <sup>5</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>4</sub>	3
T-14R37	4.75	350	75	3C	2 <sup>1</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>2</sub>
T-14R38	5.25	320	100	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>4</sub>	4 <sup>5</sup> / <sub>8</sub>	5
T-14R39	2.75	150	40	2B	2 <sup>3</sup> / <sub>8</sub>		2 <sup>7</sup> / <sub>8</sub>	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>

**UNIVERSAL 115 VOLT A. C. OR 6 VOLT D. C. VIBRATOR POWER TRANSFORMER**

T-14R40	\$6.75	350	135	2G	3	3 <sup>1</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	4	4 <sup>15</sup> / <sub>16</sub>	8 <sup>1</sup> / <sub>2</sub>
		Fil.-6.3 Ct.	4.75 Amp.							





## POWER (R) TRANSFORMERS — Amplifier, Transmitter and Replacement

Type No.	List Price	Pri. V.A.	Secondary		Bias Tap	Filament Windings			Mtg. Centers		Dimensions			Wt. Lbs.			
			A.C. Load Volts	D.C. M.A.		Rect. Fil.	Fil. No. 1	Fil. No. 2	Fil. No. 3	Mtg. Fig.	Width	Depth	W.		D.	H.	
<b>FULLY SHIELDED — UPRIGHT MOUNTING</b>																	
Leads are brought out through an opening in the base. Knock-out holes on the sides of the shields provide optional above-panel connection of leads.																	
T-56R01	\$5.50	60	325-0-325	70		5V-2A	2.5V-3A Ct.	1.5V-1A 1.5V-4A	5V-.5A Ct.	2G	2 <sup>1</sup> / <sub>16</sub>	3	3 <sup>5</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	5 <sup>3</sup> / <sub>4</sub>	
T-56R02	3.75	70	350-0-350	70		5V-2A	2.5V-9A Ct.	2.5V-1.5A Ct.		2G	2 <sup>1</sup> / <sub>16</sub>		2 <sup>13</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	6
T-56R03	6.00	85	350-0-350	165		5V-3A	2.5V-3A Ct.	2.5V-1.75A Ct.	1.5V-5A 1.5V-1A	2G	3		2 <sup>13</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>9</sup> / <sub>16</sub>	4 <sup>15</sup> / <sub>16</sub>	7 <sup>1</sup> / <sub>4</sub>
T-56R05	6.00	115	350-0-350	110		5V-3A	2.5V-9A Ct.	2.5V-3A Ct.	2.5V-3A Ct.	2G	3		2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>11</sup> / <sub>16</sub>	4 <sup>15</sup> / <sub>16</sub>	7 <sup>3</sup> / <sub>4</sub>
T-37R70-C	7.50	95	350-0-350	80		5V-2A Ct.	3V-10A Ct.	5V-2.5A Ct.		2G	2 <sup>1</sup> / <sub>16</sub>		3 <sup>1</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>7</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	6 <sup>3</sup> / <sub>4</sub>
For Sparton Models 235, 589, 593, 600 Series, 737, 931 and other receivers using Kellogg and other 3V tubes.																	
T-70R78	3.25	60	340-0-340	55		5V-2A	6.3V-1.5A Ct.			2G	2 <sup>1</sup> / <sub>16</sub>		1 <sup>3</sup> / <sub>4</sub>	3 <sup>5</sup> / <sub>16</sub>	2 <sup>5</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	4
T-70R61	4.00	60	385-0-385	70		5V-2A	6.3V-2.5A Ct.			2G	2 <sup>1</sup> / <sub>16</sub>		2 <sup>5</sup> / <sub>16</sub>	3 <sup>15</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>4</sub>	4 <sup>5</sup> / <sub>8</sub>	4 <sup>3</sup> / <sub>4</sub>
T-70R62	5.50	110	350-0-350	145		5V-3A	6.3V-4.5A Ct.			2G	3		3 <sup>1</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>7</sup> / <sub>8</sub>	4 <sup>15</sup> / <sub>16</sub>	8 <sup>1</sup> / <sub>2</sub>
T-92R21	7.50	150	400-0-400	200		5V-3A	6.3V-5A Ct.			2G	3		3 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	4 <sup>15</sup> / <sub>16</sub>	9
T-17R30	8.50	200	370-0-370	280		5V-3A	6.3V-7A Ct.			2G	3		3 <sup>5</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	4 <sup>3</sup> / <sub>8</sub>	4 <sup>15</sup> / <sub>16</sub>	9 <sup>1</sup> / <sub>2</sub>
T-17R31	12.50	300	430-0-430	325		5V-6A	6.3V-8A Ct.			2G	3		4 <sup>7</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	5 <sup>5</sup> / <sub>8</sub>	4 <sup>15</sup> / <sub>16</sub>	13 <sup>1</sup> / <sub>2</sub>
T-74R28	6.50	105	440-0-440	125	38V	5V-3A 2.5V-3A	6.3V-3.3A Ct.			2G	3		2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>11</sup> / <sub>16</sub>	4 <sup>15</sup> / <sub>16</sub>	8
T-87R85	7.00	145	330-0-330	160	77V	5V-3A 5V-2A	6.3V-2A Ct.	2.5V-5A Ct.		2G	3		3 <sup>1</sup> / <sub>8</sub>	3 <sup>11</sup> / <sub>16</sub>	3 <sup>7</sup> / <sub>8</sub>	4 <sup>15</sup> / <sub>16</sub>	8 <sup>1</sup> / <sub>2</sub>
T-68R26	6.75	160	550-0-550	150		5V-3A	7.5V-2.5A Ct.	2.5V-5A Ct.		2G	3		3 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	4 <sup>15</sup> / <sub>16</sub>	10 <sup>1</sup> / <sub>4</sub>
T-69R35	6.50	135	387.5-0-387.5	200		5V-3A	6.3V-3A Ct.			2G	3		3 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	4 <sup>15</sup> / <sub>16</sub>	9 <sup>1</sup> / <sub>2</sub>
T-75R50	7.50	160	435-0-435	250	80V	5V-3A 2.5V-3A	6.3V-1.5A Ct.	2.5V-10A Ct.		2G	3		3 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	4 <sup>15</sup> / <sub>16</sub>	10 <sup>1</sup> / <sub>2</sub>
T-83R82	10.00	200	740-0-740	140	150V	5V-3A 2.5V-3A	7.5V-2.5A Ct.			2G	3		4	3 <sup>3</sup> / <sub>4</sub>	4 <sup>3</sup> / <sub>4</sub>	4 <sup>15</sup> / <sub>16</sub>	11 <sup>1</sup> / <sub>2</sub>
T-83R85	12.00	290	740-0-740	200	150V	5V-3A 2.5V-3A	7.5V-5A Ct.			2G	3 <sup>1</sup> / <sub>8</sub>		4 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	5 <sup>1</sup> / <sub>4</sub>	4 <sup>15</sup> / <sub>16</sub>	13 <sup>1</sup> / <sub>2</sub>
T-89R28	11.00	250	550-0-550	275 75		5V-3A Ct. 5V-2A Ct.	6.3V-6A Ct.			2G	3		4 <sup>1</sup> / <sub>2</sub>	3 <sup>11</sup> / <sub>16</sub>	5 <sup>1</sup> / <sub>4</sub>	4 <sup>15</sup> / <sub>16</sub>	15
T-19R30	7.75	170	560-0-560	150		5V-3A	6.3V-3A Ct.	7.5V-2.5A Ct.		2G	3		3 <sup>1</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	4	4 <sup>15</sup> / <sub>16</sub>	8 <sup>3</sup> / <sub>4</sub>
<b>C. H. T. POWER TRANSFORMERS</b>																	
For amplifiers, transmitters, or deluxe receivers. Designed to operate continuously at full rated load. Cases compound filled for complete coil protection.																	
T-15R00	\$10.50	140	500-0-500	150		5V-3A	7.5V/6.3-5A			3K	3 <sup>13</sup> / <sub>16</sub>		4 <sup>1</sup> / <sub>8</sub>	5 <sup>3</sup> / <sub>8</sub>	5 <sup>9</sup> / <sub>16</sub>	6	15
T-15R01	15.00	310	500-0-500	400		5V-6A	6.3V-6A			3K	5 <sup>9</sup> / <sub>16</sub>		4 <sup>9</sup> / <sub>16</sub>	5 <sup>11</sup> / <sub>16</sub>	6 <sup>11</sup> / <sub>16</sub>	6	24 <sup>1</sup> / <sub>2</sub>
T-15R02	13.25	220	750-0-750	200		2.5V-10A	7.5V/6.3-3A			3K	3 <sup>13</sup> / <sub>16</sub>		4 <sup>1</sup> / <sub>8</sub>	5 <sup>3</sup> / <sub>8</sub>	5 <sup>9</sup> / <sub>16</sub>	6	17
T-15R03	13.75	205	400-0-400	200		5V-3A	6.3V-3A	2.5V-4A		3K	3 <sup>13</sup> / <sub>16</sub>		4 <sup>1</sup> / <sub>8</sub>	5 <sup>3</sup> / <sub>8</sub>	5 <sup>9</sup> / <sub>16</sub>	6	19
T-15R04	4.75	30	255-0-255	25			6.3V-2.1A Ct.			3L	2 <sup>1</sup> / <sub>8</sub>		2 <sup>15</sup> / <sub>16</sub>	3	3 <sup>9</sup> / <sub>16</sub>	3	
T-15R05	10.50	150	340-0-340	145	77V	5V-3A 5V-2A	6.3V-4A Ct.	*6.3V-2A Ct. *2.5V-5A Ct.		3K	2 <sup>7</sup> / <sub>8</sub>		3 <sup>7</sup> / <sub>2</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	5 <sup>5</sup> / <sub>8</sub>	10
T-15R06	9.75	155	362.5-0-362.5	175		5V-3A	6.3V-5A Ct.			3K	2 <sup>7</sup> / <sub>8</sub>		3 <sup>7</sup> / <sub>2</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	5 <sup>5</sup> / <sub>8</sub>	11
T-15R07	10.50	238	380-0-380	280		5V-3A	6.3V-7A Ct.			3K	2 <sup>7</sup> / <sub>8</sub>		3 <sup>7</sup> / <sub>2</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	5 <sup>5</sup> / <sub>8</sub>	12
T-15R08	13.75	253	450-0-450	325		5V-6A	6.3V-8A Ct.			3K	3 <sup>13</sup> / <sub>16</sub>		4 <sup>3</sup> / <sub>2</sub>	5 <sup>1</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>16</sub>	5 <sup>5</sup> / <sub>8</sub>	22
<b>SPEAKER FIELD SUPPLY TRANSFORMERS</b>																	
T-67R97	4.25	55	115 V.D.C. @ 50 to 250			5V-3A				2G	3 <sup>1</sup> / <sub>4</sub>		1 <sup>1</sup> / <sub>16</sub>	3 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>8</sub>	3 <sup>5</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>4</sub>
T-92R53	5.75	120	300 V.D.C. @ 200			5V-3A				2G	3 <sup>1</sup> / <sub>4</sub>		2 <sup>3</sup> / <sub>8</sub>	3 <sup>15</sup> / <sub>16</sub>	4	3 <sup>1</sup> / <sub>4</sub>	6 <sup>1</sup> / <sub>4</sub>
*Not simultaneous—for 2A3's or 6A3's Fil.																	
<b>FENCE CONTROLLER TRANSFORMER</b>																	
Note: For 6 volt D.C. operation, with suitable relays. Open horizontal mounting.																	
Type No.	List Price	Primary	Sec.	Mtg. Centers		Dimensions			Wt. Lbs.								
T-18V10	\$3.00	6 V. D.C.	8,000 V. (37 M.A. Peak) 9,000 V. (25 M.A. Peak)	Open circuit Open circuit	Width	Depth	W.	D.	H.	Lbs.							
					2 <sup>15</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	3	1							





This accurate and convenient table has been compiled to facilitate choosing the correct output transformer. Two types are offered for most tubes: the

universal type, which is designed to accommodate a wide range of tube and voice coil impedances, and the specific duty type.

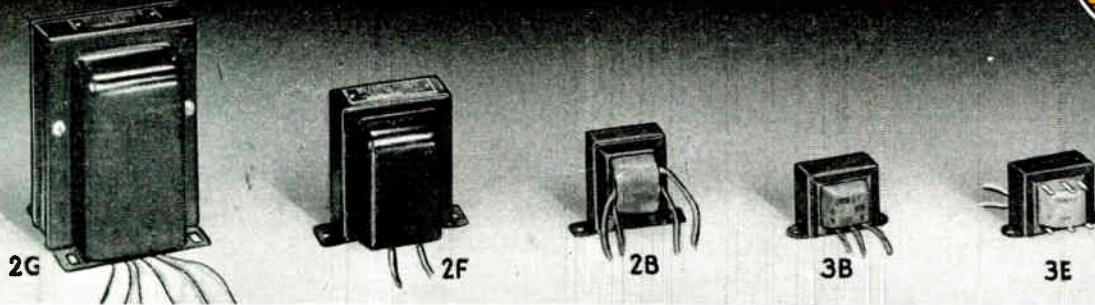
TUBE	PLATE VOLTS	BIAS VOLTS	PLATE M. A.	PLATE LOAD OHMS	WATTS OUTPUT	UNIVERSAL TYPE TRANSFORMER	SPECIFIC DUTY TRANSFORMER
1A5G	90	-4.5	4.0	25,000	.115		T-14S83
1C5G	90	-7.5	7.5	8,000	.240	T-13S38	T-14S84
1D8GT	90	-9.0	5.0	12,000	.200	T-13S38	
1E7G (1 section)	135	-4.5	7.5	16,000	.290	T-13S38	T-13S43
(2 sections, P-P)	135	-7.5	*3.5	24,000	.575		T-14S83
1F4, 1F5G	135	-4.5	8.0	16,000	.310	T-13S38	T-13S43
1G5G	90	-6.0	8.5	8,500	.250	T-13S38	T-14S84
1G6G	90	0	*1.0	12,000	.675	T-13S38	
1J5G	135	-16.5	7.0	13,500	.450	T-13S38	
1J6G	135	0	*5.0	10,000	2.1	T-13S38	T-81S01
1N6G	90	-4.5	3.1	25,000	.100		T-14S83
1Q5G, 1Q5GT	90	-4.5	9.5	8,000	.270	T-13S38	T-14S84
1S4	45	-4.5	3.8	8,000	.065	T-13S38	T-14S84
1T5GT	90	-6.0	6.5	14,000	.170	T-13S38	T-13S43
2A3 (Single Cl. A)	250	-45.0	60.0	2,500	3.5	T-13S42	T-17S10
(P-P AB fixed bias)	300	-62.0	*40.0	3,000	15.0	T-13S41	T-58S72
(P-P AB self bias)	300	-62.0	*40.0	5,000	10.0	T-13S41	(C.H.T., T-15S91) T-67S54 (C.H.T., T-15S90)
2A5 (Single Cl. A)	250	-16.5	34.0	7,000	3.1	T-13S42	T-13S37
(Single Cl. A)	285	-20.0	38.0	7,000	4.5	T-13S42	T-13S37
(P-P Cl. A)	250	-16.5	*34.0	14,000	6.2	T-57S01	T-67S51
(P-P Cl. AB <sub>1</sub> )	315	-24.0	*31.0	10,000	11.0	T-13S41	T-75S75
(P-P Cl. AB <sub>2</sub> )	375	-21.0	*27.0	10,000	19.0	T-13S41	T-75S75
3Q5GT (Fil. par.)	90	-4.5	9.5	8,000	.270	T-13S38	T-14S84
(Fil. series)	90	-4.5	7.5	8,000	.230	T-13S38	T-14S84
4A6G	90	-1.5	*1.1	8,000	1.0	T-13S38	T-14S81
6A3	250	-45.0	60.0	2,500	3.2	T-13S42	T-17S10
6A4	180	-12.0	22.0	8,000	1.4	T-13S38	T-13S37
6A5G	250	-45.0	60.0	2,500	3.2	T-13S42	T-17S10
6A6	300	0	*17.5	8,000	10.0	T-13S41	T-67S48
6AC5G	250	self	32.0	7,000	3.7	T-13S42	T-13S37
(P-P Cl. B)	250	0	*2.5	10,000	8.0	T-13S41	T-75S75
6AL6G	250	-14.0	72.0	2,500	6.5	T-13S42	T-17S10
6B4G (Single Cl. A)	250	-45.0	60.0	2,500	3.2	T-13S42	T-17S10
(P-P AB fixed bias)	325	-68.0	*40.0	3,000	15.0	T-13S41	T-58S72
(P-P AB self bias)	325	-68.0	*40.0	5,000	10.0	T-13S41	(C.H.T., T-15S91) T-67S54 (C.H.T., T-15S90)
6B5	300	0	42.0	7,000	4.0	T-13S42	T-13S37
6E6	250	-27.5	*18.0	14,000	1.6	T-57S01	T-13S40
6F6	250	-16.5	34.0	7,000	3.1	T-13S42	T-13S37
6G6G	180	-9.0	15.0	10,000	1.1	T-13S38	
6G6G	135	-6.0	11.5	12,000	.6	T-13S38	
6K6G	315	-21.0	25.5	9,000	4.5	T-57S01	
6K6G	250	-18.0	32.0	7,600	3.4	T-13S42	T-13S37
6L6 (Single Cl. A)	250	-14.0	72.0	2,500	6.5	T-13S42	T-17S10
(Single Cl. A)	320	-20.0	76.0	2,500	8.0		T-17S10
(P-P Cl. A <sub>1</sub> )	270	-16.5	*67.5	5,000	18.5		T-67S54
(P-P Cl. AB <sub>1</sub> )	319	-23.0	*50.0	4,300	25.0		(C.H.T., T-15S90) T-17S12
(P-P Cl. AB <sub>1</sub> )	400	-25.0	*51.0	6,600	34.0		(C.H.T., T-15S91) T-17S13
(P-P Cl. AB <sub>2</sub> )	430	-20.0	*47.0	5,500	40.0		(C.H.T., T-15S92) T-17S14
(P-P-Par. Cl. AB <sub>1</sub> )	410	-28.0	*50.0	3,300	60.0		(C.H.T., T-15S92) T-17S15
(P-P-Par. Cl. AB <sub>2</sub> )	430	-24.5	*52.0	1,900	120.0		(C.H.T., T-15S93) T-17S16 (C.H.T., T-15S94)

\* Zero signal per plate.



TUBE	PLATE VOLTS	BIAS VOLTS	PLATE M. A.	PLATE LOAD OHMS	WATTS OUTPUT	UNIVERSAL TYPE TRANSFORMER	SPECIFIC DUTY TRANSFORMER
6N6G	300	0	42.0	7,000	4.0	T-13S42	T-13S37
6N7	300	0	*17.5	8,000	10.0	T-57S01	T-67S48
6V6 (Single Cl. A)	250	-12.5	44.5	5,000	4.5	T-13S42	
(Single Cl. A <sub>1</sub> )	315	-13.0	34.0	8,500	5.5	T-57S01	
(P-P Cl. AB <sub>1</sub> )	250	-15.0	*35.0	10,000	10.0	T-13S41	T-75S75
(P-P Cl. AB <sub>2</sub> )	306	-20.0	*50.0	8,000	15.0	T-13S41	T-17S11
							(C.H.T., T-15S90)
6Y6G	135	-13.5	58.0	2,000	3.6	T-13S42	T-17S10
6Y6G	200	-14.0	61.0	2,600	6.0	T-13S42	T-17S10
6Y7G	180	0	*3.8	7,000	5.5	T-13S42	T-67S48
6Y7G	250	0	*5.3	14,000	8.0	T-57S01	T-13S40
6Z7G	135	0	*3.0	9,000	2.5	T-13S38	T-81S01
6Z7G	180	0	*4.2	12,000	4.2	T-13S38	T-13S40
7A5	110	-7.5	35.0	2,500	1.4	T-13S42	T-17S10
7B5	100	-7.0	9.0	12,000	.35	T-13S38	
7B5	250	-18.0	32.0	7,600	3.4	T-13S42	T-13S37
7C5	250	-12.5	45.0	5,000	4.5	T-13S42	T-89S74
(P-P Cl. AB <sub>1</sub> )	250	-15.0	*35.0	10,000	10.0	T-13S41	T-75S75
10	425	-50.0	18.0	10,000	1.6	T-57S01	
12A5	100	-15.0	17.0	4,500	.8	T-13S42	T-13S39
12A5	180	-25.0	45.0	3,300	3.4	T-13S42	T-13S39
12A7	135	-13.5	9.0	13,500	.55	T-13S38	T-13S43
18	250	-16.5	34.0	7,000	3.0	T-13S42	T-13S37
19	135	0	*5.0	10,000	2.1	T-13S38	T-81S01
25A6	95	-15.0	20.0	4,500	.9	T-13S42	T-13S39
25A7G	100	-15.0	20.5	4,500	.770	T-13S42	T-13S39
25AC5GT	180	0	27.0	8,000	2.0	T-13S38	T-13S37
(P-P Cl. B)	180	0	*2.0	4,800	6.0	T-13S41	T-67S54
25B6G	105	-16.0	48.0	1,700	2.4	T-13S42	T-14S82
25L6	110	-7.5	49.0	1,500	2.1	T-13S42	T-14S82
31	135	-22.5	8.0	7,000	.185	T-13S42	T-13S37
32L7GT	110	-7.5	40.0	2,500	1.5	T-13S42	T-17S10
33	135	-13.5	14.5	7,000	.7	T-13S42	T-13S37
35A5-LT	110	-7.5	40.0	2,500	1.5	T-13S42	T-17S10
35L6GT	110	-7.5	40.0	2,500	1.5	T-13S42	T-17S10
38	135	-13.5	9.0	13,500	.55	T-13S38	
38	250	-25.0	22.0	10,000	2.5	T-13S38	
41	250	-18.0	32.0	7,600	3.4	T-13S42	T-13S37
42	250	-16.5	34.0	7,000	3.1	T-13S42	T-13S37
43	95	-15.0	20.0	4,500	.9	T-13S42	T-13S39
45 (Single Cl. A)	250	-50.0	34.0	3,900	1.6	T-13S42	T-89S74
(P-P Cl. AB <sub>2</sub> )	275	-56.0	*36.0	5,060	12.0	T-13S41	T-67S54
46 (Single Cl. A Triode)	250	-33.0	22.0	6,400	1.25	T-13S42	T-13S37
(P-P Cl. B)	400	0	*6.0	5,800	20.0	T-13S41	T-67S52
47	250	-16.5	31.0	7,000	2.7	T-13S42	T-13S37
(P-P Cl. A)	250	-16.5	*31.0	14,000	5.4	T-57S01	T-67S51
48	96	-19.0	52.0	1,500	2.0	T-13S42	T-14S82
(P-P Cl. A <sub>1</sub> Pent.)	125	-20.0	*50.0	3,000	5.0	T-13S41	T-58S72
49 (P-P Cl. B)	135	0	*1.3	8,000	2.3	T-13S38	T-14S81
50 (P-P Cl. A)	450	-84.0	*55.0	8,000	9.2	T-13S41	T-65S94
50C6G	135	-13.5	58.0	2,000	3.6	T-13S42	T-17S10
50L6GT	110	-7.5	49.0	1,500	2.1	T-13S42	T-14S82
52	110	0	43.0	2,000	1.5	T-13S42	T-17S10
(P-P Cl. B)	180	0	*1.5	10,000	5.0	T-57S01	T-81S01
53	300	0	*17.5	8,000	10.0	T-13S41	T-67S48
59 (Single Cl. A Triode)	250	-28.0	26.0	5,000	1.25	T-13S42	T-13S39
(Single Cl. A. Pent.)	250	-18.0	35.0	6,000	3.0	T-13S42	T-13S37
(P-P Cl. B)	400	0	*13.0	6,000	20.0	T-13S41	T-67S52
70L7-GT	110	-7.5	40.0	2,000	1.8	T-13S42	T-17S10
71-A	180	-40.5	20.0	4,800	.79	T-13S42	T-13S39
(P-P Cl. A)	180	-40.5	*20.0	8,000	1.6	T-13S38	T-33S99
79	180	0	*3.8	7,000	5.5	T-13S42	T-67S48
89	250	-25.0	32.0	6,750	3.4	T-13S42	T-13S37
182B/482B	250	-35.0	20.0	4,500	1.35	T-13S42	T-13S39
183/483	250	-65.0	20.0	4,500	1.8	T-13S42	T-13S39
950	135	-16.5	7.0	13,500	.450	T-13S38	

\* Zero signal per plate.



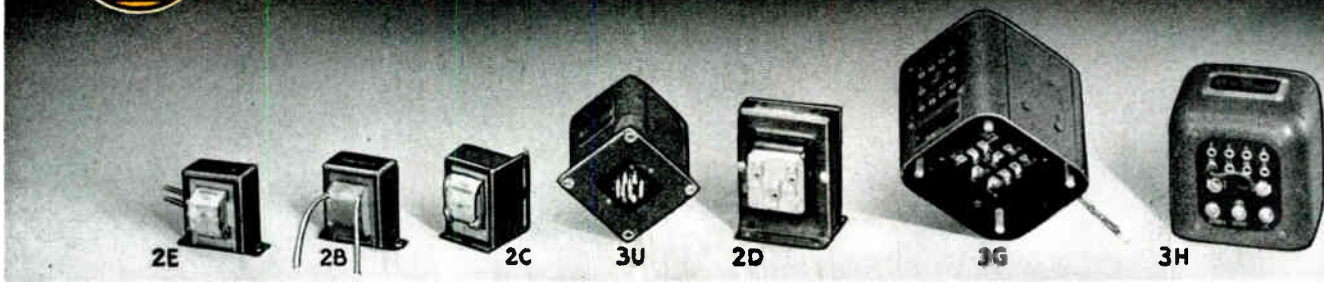
**OUTPUT (S) TRANSFORMERS**

For coupling audio power amplifier tubes to a loud speaker voice coil or line. Correctly matching the output tubes to a speaker load is important. Efficiency, frequency response and distortion are affected by this matching. Small, unshielded types are listed for use with receivers where the transformer is usually mounted on the loud speaker frame. Larger shielded types have multiple secondary impedances as required in sound amplifiers. C.H.T. output transformers have a greater selection of output impedances, meeting practically all speaker requirements. These units are compound filled and are provided with jacks and plugs to facilitate speaker matching. Tertiary winding included on some types for inverse feed-back connections. Refer to pages 22-23 for complete listing of tubes with recommended output transformers.

Type No.	List Price	Tube Type	Class	Ohms Impedance		Pri. M.A. Per Side	Max. Watts	Mtg. Centers	Dimensions		Wt. Lbs.			
				Pri.	Sec.				Width	Depth		W.	D.	H.
<b>REPLACEMENT OUTPUT TRANSFORMERS</b>														
T-14S81	\$1.25	1-42, 2A5, 6F6 or P-P45, 71	A	7,000 Ct.	3 to 6	40	5	3B	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1/2	
T-14S82	1.25	1-25L6	A	1,500	3 to 6	55	5	3B	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1/2	
T-14S83	1.25	1A5-G, 1E7-G	A	25,000 Ct.	3 to 6	8	5	3B	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1/2	
T-14S84	1.25	1-1C5G, 1Q5G	A	8,000	3 to 6	10	5	3B	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1/2	
T-13S37	1.25	1-6F6, 42, 2A5, 47	A	7,000	1/2 4	36	5	3E	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1/2	
T-13S39	1.25	1-45, 12A5, 43, 71A	A	4,000	1/2 4	36	5	3E	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	1/2	
T-13S43	1.35	1-1F4, 1D4, 1F5G	A	16,000	1/2 4	10	5	3E	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>8</sub>	1/2	
T-33S99	1.50	2-45, 71, 43, 25A6 P-P	A	8,000 Ct.	6 to 12	36	10	2B	2 <sup>3</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	2	2 <sup>3</sup> / <sub>8</sub>	1 1/4	
T-13S40	1.50	2-6F6, 42 P-P, 2-2A5, 47 P-P	A, A	14,000 Ct.	1/2 4	40	10	3E	2 <sup>3</sup> / <sub>8</sub>	2 <sup>13</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	3/4	
T-81S01	1.50	1-19, 1J6G, 1G6G P-P 2-30, 49 P-P	B B	10,000 Ct.	2 4 8	15	8	2B	2 1/4	2 <sup>9</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	2	3/4	
<b>HEAVY DUTY OUTPUT TRANSFORMERS TO LINE OR SPEAKER (High Level)</b>														
T-72S58	\$1.65	Pentode Plate to phones or oscillator		10,000	2,000 50	30	5	2B	2 1/4	2 <sup>9</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	2	3/4	
T-17S10	3.00	1-6L6	A	2,500	2 4 8 500	80	8	2F	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	2 1/2	3	2 1/4	
T-17S11	4.50	2-6V6 P-P	AB1	8,000*	4 8 15 250 500	52	15	2F	3 1/2	3 <sup>13</sup> / <sub>16</sub>	3 1/16	3 1/2	3 1/2	
T-17S12	4.50	2-6L6 P-P	AB1	4,300*	4 8 15 250 500	95	25	2F	3 1/2	3 <sup>13</sup> / <sub>16</sub>	3 1/16	3 1/2	3 1/2	
(with 300 V. on plate and screen)														
T-17S13	6.00	2-6L6 P-P	AB1	6,600*	4 8 15 250 500	80	34	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	5 1/2
T-17S14	6.00	2-6L6 P-P	AB2	5,500*	4 8 15 250 500	90	40	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	5 1/4
T-17S15	6.50	4-6L6 P-P Par.	AB1	3,300*	4 8 15 250 500	155	60	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>13</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	5 3/4
T-17S16	12.00	4-6L6 P-P Par.	AB2	1,900*	84 100 125 / 166 250 500	230	120	2G	3	4 1/4	3 <sup>3</sup> / <sub>4</sub>	5	4 <sup>15</sup> / <sub>16</sub>	14 1/4
T-68S06	2.50	1-6F6, 42, 2A5, 1-47	A, A	7,000	10 or 2,000	36	5	2F	2 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	1 <sup>7</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	1	
T-67S51	3.50	2-6F6, 42, 2A5, 47 P-P	A	14,000	4 8 15 500	40	20	2F	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	2 1/2	3	2 1/4	
T-67S48	3.50	2-45, 71, 43, 25A6 P-P 1-6N7, 6A6, 53 P-P	A B	8,000	4 8 15 500	36	25	2F	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	2 1/2	3	2 1/4	
T-67S52	4.00	2-46, 59 P-P 2-6F6, 42, 2A5 P-P 2-6N7, 6A6, 53 P-P Par.	B AB2 B	5,800	4 8 15 500	60	30	2F	3 1/2	3 <sup>13</sup> / <sub>16</sub>	3 1/16	3 1/2	3 1/2	
T-58S72	3.75	2-2A3, 6B4G P-P 2-48, 25L6 P-P	AB A	3,000	4 8 15 500	60	30	2F	3 1/2	3 <sup>13</sup> / <sub>16</sub>	3 1/16	3 1/2	3 1/4	
T-67S54	4.00	2-6L6 P-P 2-2A3, 6B4G, 45 P-P	A AB	5,000	4 8 15 500	60	30	2F	3 1/2	3 <sup>13</sup> / <sub>16</sub>	3 1/16	3 1/2	3 1/2	
T-67S92	4.00	4-2A3, 6B4G, 45 P-P Par. 4-48, 25L6, P-P Par.	AB A	1,500	4 8 15 500	80	40	2F	3 1/2	3 <sup>13</sup> / <sub>16</sub>	3 1/16	3 1/2	3 1/2	
T-65S94	4.00	2-50 P-P 2-6F6, 42, 2A5 P-P	A AB2	8,000	4 8 15 500	55	40	2F	3 1/2	3 <sup>13</sup> / <sub>16</sub>	3 1/16	3 1/2	3 1/2	
T-75S75	4.00	2-6F6, 42 or 2A5 1-6N7, 6A6, 53 P-P 2-6N6G, 6B5, 2B6, 6AC5 P-P	AB2 B A	10,000	4 8 15 500	45	40	2F	3 1/2	3 <sup>13</sup> / <sub>16</sub>	3 1/16	3 1/2	3 1/2	
T-84S58	6.00	2-6L6 P-P	AB2	3,800	4 8 15 500	115	60	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>15</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	6
T-89S75	4.00	2-6L6 P-P	AB1	6,600	4 8 15 500	80	40	2F	3 1/2	3 <sup>13</sup> / <sub>16</sub>	3 1/16	3 1/2	3 1/2	
T-89S74	3.75	1-6L6	A	4,000	4 8 15 500	70	15	2F	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	2 1/2	3	2 1/4	
T-89S68	6.50	4-6L6 P-P Par.	AB1	3,300	50 125 200 / 250 333 500	150	75	2G	2 <sup>11</sup> / <sub>16</sub>	2 <sup>15</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	5 3/4
T-83S87-	9.00	4-50 P-P Par.	AB2	3,000	4 8 15 500	160	90	2G	3	2 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>11</sup> / <sub>16</sub>	4 <sup>15</sup> / <sub>16</sub>	7 3/4

\*10% feed-back winding.





## OUTPUT (S) TRANSFORMERS

Type No.	List Price	Tube Type	Class	Ohms Impedance		Pri. M.A. Per Side	Max. Watts	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
				Pri.	Sec.				Width	Depth	W.	D.	H.	



### UNIVERSAL REPLACEMENT TUBE TO VOICE COIL

Preferred by many because of their wide plate impedance and voice coil coverage. Proper matching of load impedances to speaker voice coils is accomplished by using taps as specified in the instruction sheets.

T-13S38	\$1.50	Universal Single or P-P Tubes	A	4,000/7,000	Adjustable	36	8	3E	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>	2 <sup>5</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	
T-57S01*	2.00			8,000/10,000	.1 to 29				2E		2 <sup>3</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>
T-57S02†	2.00			14,000 Ct.					2B		2 <sup>3</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>
T-17S57	2.25								2C		1 <sup>9</sup> / <sub>16</sub>	2	1 <sup>15</sup> / <sub>16</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>
T-13S42	1.50	Universal Single Tube	A	1,500/2,000 4,000/5,000 7,000	Adjustable .1 to 29	55	10	3E	2 <sup>3</sup> / <sub>8</sub>		2 <sup>5</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	
T-13S41	2.75	Universal P-P Tubes	A	3,000/5,000 6,600/7,000 8,000/10,000	Adjustable .1 to 29	60	20	2E	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3	2 <sup>1</sup> / <sub>4</sub>	

\*Solder terminals for voice coil connections. †Color coded leads for voice coil connections.

### UNIVERSAL TUBE TO LINE

T-61S25	\$3.25	Univ. Single Tube	A	2,500/4,000 5,000/6,000/7,000	500	60	10	2E	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3	2 <sup>1</sup> / <sub>4</sub>
T-61S26	3.50	Univ. P-P Tubes	A	8,000/10,000 12,000/14,000 Ct.	500	55	10	2E	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3	2 <sup>1</sup> / <sub>4</sub>

### C. H. T. MULTIPLE TAP OUTPUT TRANSFORMERS

Include these C. H. T. premium quality features: Switchboard plug-in terminal board for quick and accurate selection of secondary impedances, conservative design for exceptional performance, and complete coil protection against humidity. Tertiary winding to give a feedback voltage 10% of full primary. Split Primaries.

T-15S90	\$9.25	2-6V6 P-P 2-6L6 P-P 2-2A3 P-P (self bias)	AB1 AB1 AB	8,000 5,000 5,000	2/3/4/6/- 8/16/125/- 250/500	70	15	3H	2 <sup>7</sup> / <sub>8</sub> 3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>3</sup> / <sub>8</sub>	7 <sup>1</sup> / <sub>4</sub>
T-15S91	11.50	2-6L6 P-P(300 V. P. & Sc.) 2-2A3 P-P(fixed bias)	AB AB	4,300 3,000	Same as above	95	25	3H	2 <sup>7</sup> / <sub>8</sub> 3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>7</sup> / <sub>8</sub>	8
T-15S92	13.75	2-6L6 P-P 2-6L6 P-P	AB1 AB2	6,600 5,500	Same as above	90	40	3H	2 <sup>7</sup> / <sub>8</sub> 3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	5 <sup>5</sup> / <sub>8</sub>	8 <sup>3</sup> / <sub>4</sub>
T-15S93	15.00	4-6L6 P-P Par. 2-6L6 P-P	AB1 AB2	3,300 3,800	Same as above	155	60	3H	2 <sup>7</sup> / <sub>8</sub> 3 <sup>7</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	5 <sup>5</sup> / <sub>8</sub>	15 <sup>1</sup> / <sub>2</sub>
T-15S94	17.50	4-6L6 P-P Par.	AB2	1,900	500/250/166 /125/100/84	230	120	3H	3 <sup>13</sup> / <sub>16</sub> 4 <sup>3</sup> / <sub>32</sub>	5 <sup>3</sup> / <sub>16</sub>	5 <sup>9</sup> / <sub>16</sub>	5 <sup>5</sup> / <sub>8</sub>	18

### UNIVERSAL LINE TO VOICE COIL

T-53S81	\$4.00	Line to Voice Coil		500/250	4-8-15	35		2D	2 <sup>1</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>2</sub>	2 <sup>7</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>16</sub>	3 <sup>11</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>2</sub>
T-60S48	3.00	Line to Voice Coil 1 to 6 may be con. in par. to 500 ohm line		500/1,000 1,500/2,000	Pri as 500 ohm- .06 to 8.; pri. as 1,000 ohm .12 to 16, etc.)	10		2E	2 <sup>15</sup> / <sub>16</sub>		3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>8</sub>	3	2
T-17S18	3.50		2,500/3,000											
T-14S80	2.00	Line to Voice Coil		500	2/4/6/8	12		2E	2 <sup>3</sup> / <sub>8</sub>		2 <sup>1</sup> / <sub>8</sub>	2	2 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>
T-17S17	6.50	Line to Voice Coil		500	4/8/16/25/50	75		3C	3 <sup>1</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	3	4	6 <sup>1</sup> / <sub>2</sub>
T-76S74	3.00	Line to multiple spkrs. (autotransformer)		500	250/166/125/ 100/84	30		2E	2 <sup>1</sup> / <sub>16</sub>	1 <sup>9</sup> / <sub>16</sub>	3	2 <sup>3</sup> / <sub>8</sub>	2 <sup>5</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>

### C. H. T. MULTIPLE LINE TO VOICE COIL

With Switchboard plug-in terminal board and other C. H. T. quality features.

T-15S96	\$11.00	Line to Voice Coil		1000/500	50/24/16/8/6/4/3/2	25		3G	2 <sup>5</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	3 <sup>7</sup> / <sub>8</sub>	7 <sup>1</sup> / <sub>4</sub>
T-15S97	14.50	Line to Voice Coil		1000/500	50/24/16/8/6/4/3/2	60		3G	2 <sup>5</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>16</sub>	4 <sup>1</sup> / <sub>2</sub>	3 <sup>7</sup> / <sub>8</sub>	9

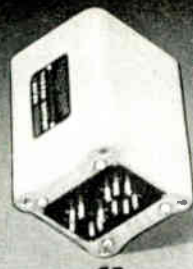
### C. H. T. CRYSTAL RECORDER TRANSFORMERS

The wave of interest in recording radio programs, speech and other audio happenings has created the desire to build recording equipment. These two transformers are offered to meet the requirements for coupling to a crystal recording head. Designed for constant velocity recording.

T-15S98	\$9.00	Line to crystal cutting head		500	30,000	10		3U	2 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	2 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	5
T-15S99	9.00	Push-pull 2A3 to crystal head		3000/5000	30,000	10		3U	2 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	2 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	5



C10



C7



3T



C5

**TRU-FIDELITY BY THORDARSON**

Broadcast station and other exacting requirements have necessitated the design of Thordarson Tru-Fidelity Transformers. See page 16. This presentation is limited to the 9000 series and equivalent units of the Major audio group. A full listing of the Major group and other Tru-Fidelity audio, modulation, output, reactors and power components is made in Catalog 500-E.

**CRYSTAL MICROPHONE OR PHOTO CELL TO LINE**

Type No.	List Price	Ohms Impedance		Max. D.C. per side M.A.	Max. D.C. unbalance M.A.	Max. Sig. Level db	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
		Primary	Secondary					Width	Depth	W.	D.	H.	
T-90A06-	\$17.00	250,000/62,500	500* / 125/	0	0	+10	3T	2 3/8	1 7/8	3 1/16	2 9/16	4 1/8	4 3/4
T-2A80	17.00		200* / 50				C5	2 1/8	2 1/8	3 1/8	2 5/8	4 3/16	4 3/4

**PLATE TO LINE (LOW LEVEL)**

T-90A02-	17.00	20,000 / 5000	500* / 125/	8	8	+15	3T	2 3/8	1 7/8	3 1/16	2 9/16	4 1/8	5
T-3A30	17.00	Single Plate	200* / 50				C5	2 1/8	2 1/8	3 1/8	2 5/8	4 3/16	5
T-90A01-	17.00	20,000 / 5000	500* / 125/	10	0	+20	3T	2 3/8	1 7/8	3 1/16	2 9/16	4 1/8	4 3/4
T-3A32	17.00	Single † or P-P Plates	200* / 50				C5	2 1/8	2 1/8	3 1/8	2 5/8	4 3/16	4 3/4

†With single tube use parallel teed with resistor or T-90C09

**MIXER**

T-90A10-	17.00	500* / 125/	500* / 125/	100	5	+10	3T	2 3/8	1 7/8	3 1/16	2 9/16	4 1/8	4 3/4
T-2A97	17.00	200* / 50	200* / 50				C5	2 1/8	2 1/8	3 1/8	2 5/8	4 3/16	4 3/4

**LINE TO GRID**

T-90A00-	17.00	500* / 125/	75,000 / 18,750	100	5	+10	3T	2 3/8	1 7/8	3 1/16	2 9/16	4 1/8	4 3/4
T-2A66	17.00	200* / 50	Single Grid				C5	2 1/8	2 1/8	3 1/8	2 5/8	4 3/16	4 3/4
T-90A11-	17.00	500* / 125/	150,000* / 37,500	100	5	+20	3T	2 3/8	1 7/8	3 1/16	2 9/16	4 1/8	4 3/4
T-2A68	17.00	200* / 50	P-P Grids§				C5	2 1/8	2 1/8	3 1/8	2 5/8	4 3/16	4 3/4

§Secondary ohms T-2A68 100,000 / 25,000.

**INTERSTAGE**

T-90A03-	17.00	10,000 / 2500	Ratio-overall	40,000 / 10,000	0	0	+15	3T	2 3/8	1 7/8	3 1/16	2 9/16	4 1/8	4 3/4
T-2A38	17.00	Single Plate	1 to 2	Single Grid			C5	2 1/8	2 1/8	3 1/8	2 5/8	4 3/16	4 3/4	
T-90A04-	17.00	10,000 / 2500	Ratio-overall	40,000 / 10,000	0	0	+15	3T	2 3/8	1 7/8	3 1/16	2 9/16	4 1/8	4 3/4
T-2A36	17.00	Single Plate	1 to 2	P-P Grids			C5	2 1/8	2 1/8	3 1/8	2 5/8	4 3/16	4 3/4	
T-90A05-	17.00	20,000 / 5000	Ratio-overall	45,000 / 11,250	10	0	+20	3T	2 3/8	1 7/8	3 1/16	2 9/16	4 1/8	4 3/4
T-2A42	17.00	P-P Plates	1 to 1.5 ‡	P-P Grids			C5	2 1/8	2 1/8	3 1/8	2 5/8	4 3/16	4 3/4	

‡Ratio-overall T-2A42 1:2.25.

**OUTPUT**

T-90S07-	18.00	5000 / 3000 / 1250 / 750	500* / 125/	60	5	+32	3T	2 3/8	1 7/8	3 1/16	2 9/16	4 1/8	4 3/4
T-3S20	18.00	P-P 2A3, etc.	200* / 50				C7	1 7/8	2 3/8	3 1/4	3 3/8	4 5/8	
T-90S08-	18.00	5000 / 3000 / 1250 / 750	15 / 10 / 7.5	60	5	+32	3T	2 3/8	1 7/8	3 1/16	2 9/16	4 1/8	4 3/4
T-3S21	18.00	P-P 2A3, etc.	5 3.75 / 1.25				C7	1 7/8	2 3/8	3 1/4	3 3/8	4 5/8	
T-90S13-	20.00	5000 / 3000 / 1250 / 750	500* / 125/	60	5	+34	3S	2 3/8	1 7/8	4	4	4 7/8	11
T-3S22	19.00	P-P 2A3, etc.	200* / 50				C10	1 7/8	2 3/8	3 7/8	4	5 7/8	11

or  
15 / 10 / 7.5 /  
5 3.75 / 1.25

**LINE TO VOICE COIL**

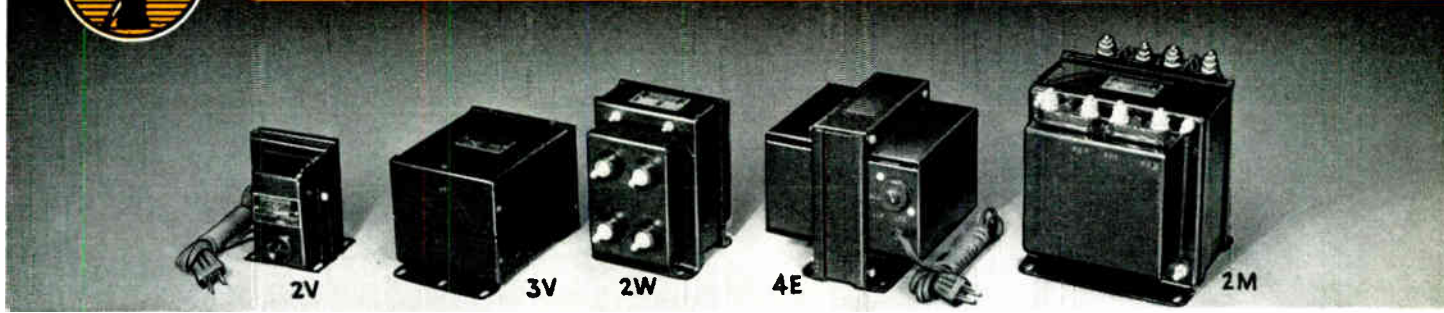
T-90S12-	17.00	500* / 125/	15 / 10 / 7.5/	0	0	+32	3T	2 3/8	1 7/8	3 1/16	2 9/16	4 1/8	4 3/4
T-3S07	17.00	200* / 50	5 3.75 / 1.25				C5	2 1/8	2 1/8	3 1/8	2 5/8	4 3/16	4 3/4

**PLATE REACTOR**

Type No.	List Price	Connection	Henries	M.A.	D.C. Ohms	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
							Width	Depth	W.	D.	H.	
T-90C09-	\$12.50	Series	300	8	4,000	3T	2 3/8	1 7/8	3 1/16	2 9/16	4 1/8	4 3/4
T-2C82	12.50	Parallel	75	16	1,000	C5	2 1/8	2 1/8	3 1/8	2 5/8	4 3/16	4 3/4

\*Indicates inductive and capacitive balance to center tap for use on balanced transmission lines.





## VOLTAGE CHANGER (V) TRANSFORMERS

### AUTOTRANSFORMERS

Autotransformers consist of a single winding on an iron core. Voltage variation is accomplished by means of taps.



#### Step Down — Convenience Outlet Type

Input side equipped with cord and plug. Output side has standard receptacle.

Type No.	List Price	Input Volts	Output Volts	Output Load		Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
				V.A.	Amps.		Width	Depth	W.	D.	H.	
T-26V04	\$ 4.50	220-250	110-125	80	0.725	2V	2 <sup>11</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>2</sub>
T-18V06	6.00	220-250	110-125	150	1.35	2V	2 <sup>11</sup> / <sub>16</sub>	3	3 <sup>5</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	6 <sup>1</sup> / <sub>4</sub>
T-50V11	7.50	220-250	110-125	250	2.25	2V	3	3 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>4</sub>	4 <sup>15</sup> / <sub>16</sub>	10 <sup>1</sup> / <sub>4</sub>
T-18V07	13.50	220-250	110-125	500	4.5	2V	3	4 <sup>1</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	2 <sup>7</sup> / <sub>8</sub>	4 <sup>15</sup> / <sub>16</sub>	13

#### Line Voltage Adjusting — Convenience Outlet Type

For boosting or lowering line voltage. Input taps may be selected by means of a convenient plug arrangement as illustrated (Fig. 4E).

T-18V20	\$ 5.00	95/105/125	115	100	0.9	2V	2 <sup>9</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>8</sub>	2 <sup>7</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>2</sub>
T-18V21	6.00	95/105/125	115	150	1.3	2V	2 <sup>9</sup> / <sub>16</sub>	2 <sup>5</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	5
T-18V22	7.50	95/105/125	115	250	2.2	2V	3	2 <sup>5</sup> / <sub>8</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>8</sub>	4 <sup>15</sup> / <sub>16</sub>	6 <sup>1</sup> / <sub>2</sub>
T-18V23	12.00	95/105/125	115	500	4.5	2V	3	3 <sup>1</sup> / <sub>8</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>7</sup> / <sub>8</sub>	4 <sup>15</sup> / <sub>16</sub>	9

#### Primary Regulating Types

For increasing or decreasing line voltage. Taps for 60, 80, 90, 100, 110, 120, and 125 volts. 50-60 cycles. Complete with instructions.

T-82V11	\$12.50	60/80/90/100/ 110/120/125	Variable	500	4.5	2W	3 <sup>1</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>4</sub>	4 <sup>5</sup> / <sub>8</sub>	6 <sup>1</sup> / <sub>16</sub>	16 <sup>3</sup> / <sub>4</sub>
T-82V12	17.50	60/80/90/100/ 110/120/125	Variable	1000	9.0	2W	3 <sup>7</sup> / <sub>8</sub>	3	5	4 <sup>15</sup> / <sub>16</sub>	6 <sup>5</sup> / <sub>8</sub>	22 <sup>1</sup> / <sub>2</sub>
T-82V13	30.00	60/80/90/100/ 110/120/125	Variable	2000	18.0	2M	5 <sup>3</sup> / <sub>4</sub>	5 <sup>3</sup> / <sub>4</sub>	6 <sup>9</sup> / <sub>16</sub>	7 <sup>9</sup> / <sub>16</sub>	6 <sup>3</sup> / <sub>4</sub>	39 <sup>1</sup> / <sub>2</sub>

#### Line Voltage — Solder Lug Taps

Provide means of increasing or decreasing line voltages from 0 to 135 volts in 5 volt steps, when operated from 100 to 135 volt line.

T-18V03	\$ 6.25	0-135	Variable	150	1.35	3C	2 <sup>1</sup> / <sub>4</sub>	1 <sup>15</sup> / <sub>16</sub>	2 <sup>5</sup> / <sub>16</sub>	2 <sup>7</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>2</sub>
T-18V04	7.75	0-135	Variable	250	2.25	3C	3 <sup>1</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>16</sub>	3 <sup>5</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>10</sub>	4	5 <sup>1</sup> / <sub>4</sub>
T-18V05	10.50	0-135	Variable	500	4.5	3C	3 <sup>1</sup> / <sub>4</sub>	2 <sup>11</sup> / <sub>16</sub>	4 <sup>3</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	6 <sup>1</sup> / <sub>16</sub>	14 <sup>1</sup> / <sub>4</sub>

### LINE REGULATING AUTOTRANSFORMER

Provides for an increase or decrease of 7.5 volts. May be used on any A.C. line of 50-60 cycle frequency from 90V to 125V as a step-up or step-down transformer. Especially suitable for boosting line voltage for fluorescent lighting units. Fully enclosed (similar to 2H) and mounted on a 4" outlet box cover, allowing for complete enclosure of all wiring in a conduit or BX system.

T-18V26	\$ 5.25	90-125	7.5 Variation	1150	10		4		4 <sup>1</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>2</sub>	4 <sup>1</sup> / <sub>8</sub>	5
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### ISOLATION TRANSFORMERS

Electrostatic shield between primary and secondary. Feature unique plug-in primary voltage adjustment — no changing of connections.

T-18V00	\$10.50	105/115/125	115	100		2V	3	2 <sup>7</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>4</sub>	3 <sup>5</sup> / <sub>8</sub>	4	8
T-18V01	19.50	105/115/125	115	250		4E	4 <sup>3</sup> / <sub>16</sub>	2 <sup>9</sup> / <sub>16</sub>	5 <sup>7</sup> / <sub>8</sub>	6 <sup>1</sup> / <sub>8</sub>	6 <sup>1</sup> / <sub>16</sub>	20

### SIGNALING TRANSFORMERS — Listed by Underwriters' Laboratories

Cases are compound filled and have separate primary and secondary wiring compartments. Knock-outs permit attachment of rigid or flexible conduit without exposing the wiring. Four secondary leads provide these output voltages — 4, 8, 12, 16, 20 and 24 volts.

Type No.	List Price	Intermittent Duty	Constant Duty	Mtg. Fig.	Mtg. Centers		Dimensions			Wt. Lbs.
					Width	Depth	W.	D.	H.	
T-47V01	\$ 6.00	50 V. A.	35 V. A.	3V	6 <sup>1</sup> / <sub>4</sub>	1 <sup>7</sup> / <sub>8</sub>	7	4 <sup>1</sup> / <sub>2</sub>	4 <sup>1</sup> / <sub>4</sub>	6 <sup>1</sup> / <sub>4</sub>
T-47V02	9.75	100 V. A.	85 V. A.	3V	7	1 <sup>7</sup> / <sub>8</sub>	7 <sup>3</sup> / <sub>4</sub>	4 <sup>1</sup> / <sub>2</sub>	4 <sup>1</sup> / <sub>4</sub>	8
T-47V03	21.75	250 V. A.	190 V. A.	3V	8 <sup>1</sup> / <sub>4</sub>	1 <sup>7</sup> / <sub>8</sub>	9	4 <sup>1</sup> / <sub>2</sub>	4 <sup>1</sup> / <sub>4</sub>	14 <sup>1</sup> / <sub>4</sub>
T-47V04	35.00	500 V. A.	475 V. A.	3V	9 <sup>3</sup> / <sub>16</sub>	1 <sup>7</sup> / <sub>8</sub>	10	5 <sup>1</sup> / <sub>4</sub>	5 <sup>3</sup> / <sub>4</sub>	22 <sup>1</sup> / <sub>2</sub>





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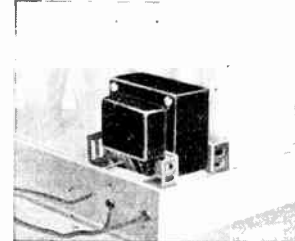
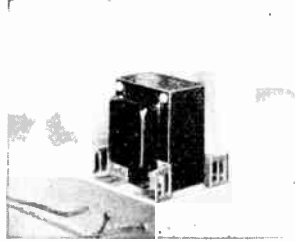
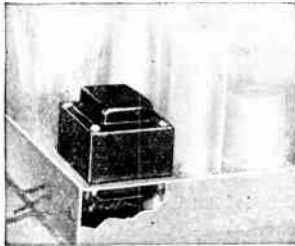


# REPLACEMENT POWER TRANSFORMERS



## UNIVERSAL DUPLICATE POWER TRANSFORMERS — "13R" Series

Thordarson "13R" Series Power Transformers are favored by servicemen in all parts of the world. There is a type for practically every receiver listed in Riders Manuals. Specific recommendations are shown in Thordarson Replacement Transformer Encyclopedia No. 243 and supplements, as described on the following page.



MOUNTING FIGURE 3A permits mounting in flush, vertical or horizontal position as shown in these photographs. Adjustable mounting brackets are furnished.

Other quality features include: Electrostatic shields between primary and secondary windings; Double shells to protect the coil from mechanical injury and to provide magnetic shielding; 10-inch RMA Color Coded Leads. Primary 110-120 volts 50-60 cycles.

Type No.	List Price	Pri. V.A.	Secondary		Filament Windings			Dimensions			Wt. Lbs.
			A.C. Volts	D.C. M.A.	Rect. Fil.	Fil. No. 1	Fil. No. 2	W.	D.	H.	
T-13R19	\$2.35	45	480 Ct.	40	5V-2A	6.3V-2A Ct.		2 1/2	2 5/8	2 1/8	2 1/4
T-13R11	2.50	60	580 Ct.	50	5V-3A	6.3V-2A Ct.		2 1/2	2 5/8	3	3 1/4
T-13R12	3.25	65	700 Ct.	70	5V-3A	6.3V-2.5A Ct.		2 1/2	3 1/8	3	3 1/4
T-13R13	4.00	90	700 Ct.	90	5V-3A	6.3V-3.5A Ct.		3 1/8	3 3/8	3 3/4	5 1/4
T-13R14	4.25	115	700 Ct.	120	5V-4A	6.3V-4.7A Ct.		3 1/8	3 1/2	3 3/4	5 1/4
T-13R15	5.75	140	750 Ct.	150	5V-4A	6.3V-5A Ct.		3 3/4	3 3/8	4 1/2	6 1/2
T-13R16	6.50	180	800 Ct.	200	5V-4A	6.3V-5.14A Ct.		3 3/4	3 5/8	4 1/2	7 3/4
T-13R17	4.00	85	600 Ct.	60	5V-3A	6.3V-2.5A Ct.	2.5V-7.5A Ct.	2 5/8	3 5/8	3 3/8	4 1/2
T-13R18	4.50	115	700 Ct.	90	5V-3A	6.3 tapped at 2.5V-3.5A Ct.	2.5V-9A Ct.	3 3/4	3 1/4	4 1/2	5 3/4
T-13R08	4.50	105	700 Ct.	90	5V-3A	6.3V-3.3A Ct.	2.5V-6A Ct.	3 1/4	3 1/2	3 3/4	5 1/4
T-13R09	6.50	160	750 Ct.	180	5V-3A	6.3V-3.3A Ct.	2.5V-6A Ct.	3 3/4	3 9/16	4 1/2	7 1/2
T-13R00	4.00	70	550 Ct.	70	5V-3A	5V-.5A Ct.	2.5V-10.5A Ct.	2 5/8	3 3/8	3 3/8	4
T-13R01	2.50	60	650 Ct.	40	5V-3A	2.5V-4A Ct.		2 1/2	2 5/8	3	3 1/4
T-13R02	3.25	60	700 Ct.	50	5V-3A	2.5V-7.25A Ct.		2 1/2	2 5/8	3	3 1/4
T-13R03	3.50	75	700 Ct.	70	5V-3A	2.5V-9A Ct.		2 5/8	3 5/8	3 3/8	4
T-13R04	4.25	115	700 Ct.	100	5V-3A	2.5V-12.5A Ct.		3 1/8	3 1/2	3 3/4	5 1/4
T-13R05	4.00	110	700 Ct.	70	5V-3A	2.5V-9A Ct.	2.5V-3.5A Ct.	3 1/8	3 1/2	3 3/4	5 1/4
T-13R06	5.25	130	700 Ct.	120	5V-3A	2.5V-12.5A Ct.	2.5V-3.5A Ct.	3 3/4	3 3/8	4 1/2	6 1/2
T-13R07	5.50	140	800 Ct.	110	5V-3A	2.5V-15A Ct.	2.5V-3.5A Ct.	3 3/4	3 1/2	4 1/2	6 3/4

## OTHER REPLACEMENT POWER TRANSFORMERS

Case style 2H — Half shell or flush mounting. Terminal lug identification printed on coil label.

T-60R49	\$2.25	30	560 Ct.	30	5V-2A	2.5V-3.5A Ct.		3	2 1/2	2 3/8	2
T-49R00	3.00	65	700 Ct.	70	5V-2A	2.5V-8.5A Ct.		3 7/8	3 1/4	3 3/8	4 1/2
T-50R03	3.50	75	700 Ct.	80	5V-2A	2.5V-12A Ct.		3 7/8	3 1/4	3 5/8	5 1/2
T-63R63	3.50	75	700 Ct.	80	5V-2A	2.5V-9A Ct.	2.5V-3A Ct.	3 7/8	3 1/4	3 5/8	5 1/4
T-70R20	2.75	45	600 Ct.	50	5V-2A	6.3V-2A Ct.		3 3/8	2 7/8	3	3
T-70R21	3.50	70	700 Ct.	70	5V-2A	2.5V-4A Ct.	6.3V-3A Ct.	3 7/8	3 1/4	3 3/8	4 1/4

Case style 2C — Fully shielded upright mounting with leads brought out through base. Knock out holes provide optional above panel connection.

T-56R01	\$5.50	60	650 Ct.	70	5V-2A	2.5V-3A Ct.	1.5V-1A	5V-.5A Ct.	3 3/8	3 3/4	4 5/8	5 3/4
		(Primary — 110 volts					1.5V-4A					
T-56R03	5.50	85	700 Ct.	105	5V-3A	2.5V-3A Ct.	2.5V-1.75A Ct.	1.5V-5A	3 3/4	3 3/4	4 7/8	7 1/4
								1.5V-1A				
T-56R05	5.75	115	700 Ct.	110	5V-3A	2.5V-9A Ct.	2.5V-3A Ct.	2.5V-3A Ct.	3 3/4	3 3/4	4 7/8	7 3/4
T-37R70-C	7.50	95	700 Ct.	80	5V-2A Ct.	3V-10A Ct.	5V-2.5A Ct.		3 3/8	4	4 5/8	6 3/4
<i>For Sparton Models 235, 589, 593, 600 Series, 737, 931.</i>												
T-70R78	3.25	60	680 Ct.	55	5V-2A	6.3V-1.5A Ct.			3 3/8	3	4 5/8	4
T-70R61	4.00	60	770 Ct.	70	5V-2A	6.3V-2.5A Ct.			3 3/8	3 1/4	4 5/8	4 3/4
T-70R62	5.50	110	700 Ct.	145	5V-3A	6.3V-4.5A Ct.			3 3/4	3 7/8	4 7/8	8 1/2

Other Power Transformers are listed on pages 4 and 19.



## POWER TRANSFORMERS — AMPLIFIER, TRANSMITTER AND GENERAL PURPOSE

For continuous duty applications in high quality receivers, amplifiers or for low power stages of transmitters and many similar applications. Primary 115 volts 50-60 cycles.



Fig. 2G

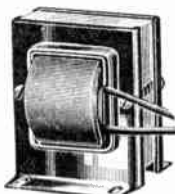


Fig. 3C

Type No.	List Price	Pri. V.A.	Secondary		Bias Tap	Rect. Fil.	Fil. No. 1	Fil. No. 2	Mtg. Fig.	Dimensions			Wt. Lbs.
			A.C. Volts	D.C. M.A.						W.	D.	H.	
T-75R47	\$3.75	75	610 Ct.	125		5V-2A	6.3V-2A Ct.		2H	3 7/8	3 1/4	3 3/8	6
T-84R81-C	3.50	70	720 Ct.	70		5V-2A	6.3V at 2.65A		2G	3 1/4	3 1/4	3 3/8	4 3/8
T-77R63-A	3.75	75	750 Ct.	75		5V-2A	6.3V at 2.2A		2G	3 1/4	3 1/2	4 5/8	4 7/8
T-83R77-A	3.25	65	660 Ct.	70		5V-2A Ct.	6.3V at 2.2A		2G	2 3/4	3 1/2	3 1/2	4
T-80R92-C	7.50	160	840 Ct.	200		5V-3A	2.5V at 3A Ct.	2.5V at 1.5A	2G	3 3/4	4 5/8	4 3/4	9 1/4
T-92R21	7.50	150	800 Ct.	200		5V-3A	6.3V-5A Ct.		2G	3 3/4	4 1/4	4 7/8	9
T-17R30	8.50	200	740 Ct.	280		5V-3A	6.3V-6A Ct.		2G	3 3/4	3 1/2	4 7/8	9 1/2
T-17R31	12.50	300	860 Ct.	325		5V-6A	6.3V-7A Ct.		2G	3 3/4	5 1/4	4 7/8	13 1/2
T-74R28	6.50	105	880 Ct.	125	38V	5V-3A 2.5V-3A	6.3V-3.3A Ct.		2G	3 3/4	3 3/4	4 7/8	8
T-87R85	7.00	105	660 Ct.	160	77V	5V-3A 5V-2A	6.3V-2A Ct.	2.5V-5A Ct.	2G	3 3/4	3 7/8	4 7/8	8 1/2
T-68R26	6.75	160	1100 Ct.	150		5V-3A	7.5V-2.5A Ct.	2.5V-5A Ct.	2G	3 3/4	4 3/8	4 7/8	10 1/8
T-69R35	6.50	135	775 Ct.	200		5V-3A	6.3V-3A Ct.		2G	3 3/4	4 3/8	4 7/8	9 1/2
T-75R50	7.50	160	870 Ct.	250	80V	5V-3A 2.5V-3A	6.3V-1.5A Ct.	2.5V-10A Ct.	2G	3 3/4	4 3/8	4 7/8	10 1/2
T-83R82	10.00	200	1480 Ct.	140	150V	5V-3A 2.5V-3A	7.5V-2.5A Ct.		2G	3 3/4	4 3/4	4 7/8	11 1/2
T-83R85	12.00	290	1480 Ct.	200	150V	5V-3A 2.5V-3A	7.5V-5A Ct.		2G	3 3/4	5 1/4	4 7/8	13 1/2
T-89R28	11.00	250	1100 Ct. 650 Ct.	275 75		5V-3A Ct. 5V-2A Ct.	6.3V-6A Ct.		2G	3 3/4	5 1/4	4 7/8	15

## SPEAKER-FIELD SUPPLY TRANSFORMERS

T-67R97	4.25	55	115 V.D.C.	50 to 250	5V-3A	2G	3 7/8	3 1/4	3 1/4	4 3/4
T-92R53	5.75	120	300 V.D.C.	200	5V-3A	2G	3 7/8	3 7/8	3 1/4	6 1/4

## SIX VOLT VIBRATOR TRANSFORMERS

These transformers, while primarily designed for replacements using original mounting brackets, are equipped with mounting feet for use in experimental or original equipment.

Type No.	List Price	Secondary		Mtg. Fig.	Dimensions			Wt. Lbs.
		D.C. Volts to Filter	M.A.		W.	D.	H.	
T-14R33	\$2.75	225	40	3C	2 1/2	2 3/8	3 1/8	2
T-14R34	3.25	250	50	3C	2 1/2	2 1/2	3 1/8	2 1/4
T-14R35	3.75	260	60	3C	2 1/2	2 5/8	3 1/8	2 1/2
T-14R36	4.25	285	75	3C	2 1/2	2 7/8	3 1/8	3
T-14R37	4.75	350	75	3C	2 1/2	3 1/8	3 1/8	3 1/2
T-14R38	5.25	320	100	2G	3 3/4	3 1/4	4 5/8	5
T-14R39	2.75	150	40	2B	2	2	2 3/8	1 1/4

## 115 V. 50-60 CYCLE OR 6 V. D. C. VIBRATOR TRANSFORMER

T-14R40	6.50	350 Fil.-6.3 Ct.	135 4.75 Amp.	2G	3 3/4	4	5	8 1/2
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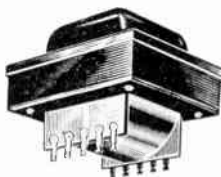
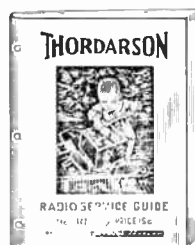


Fig. 2H

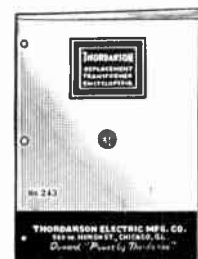


Fig. 2B

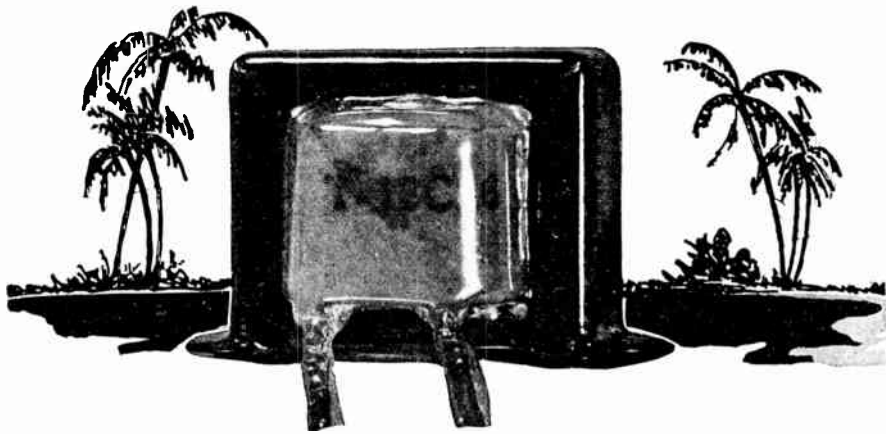


**Thordarson Radio Service Guide — No. 342-C, 15c List**—A book full of practical, accurate information for the Serviceman. Gives complete schematics, photos and parts lists for building such needed equipment as a 32 volt DC power supply, an improved condenser analyzer and impedance bridge and details on two high fidelity audio amplifiers. Has charts, tables and shortcuts that are needed every day in the year. Written for Servicemen by Servicemen.

**Replacement Transformer Encyclopedia, No. 243, and Supplement, No. 243-D. Free** — Complete information regarding correct choke, audio and power transformer replacements. Covers almost 6000 receivers as listed in Rider's Manuals, Volumes 1 to IX. Includes data on AC, AC-DC and battery models. This is the only complete listing available and will save valuable time for the serviceman. You cannot afford to be without a copy. Ask your distributor for a copy.







# THORDARSON TROPEX TRANSFORMERS

## Protected Against Excessive Moisture, Salt Air, Tropical Climates

**I**N THE new Thordarson TROPEX Transformers Thordarson engineers have won the battle against the corrosive and destructive effects of moisture, high humidity and salt air as found in tropical or coastal countries and regions with heavy rainfall. The Troplex process encloses the entire transformer, fully protecting the fine wire windings against the elements that shorten the life of a transformer through electrolysis.

Tropex finish is practically colorless, neat appearing and clean to handle. It is the answer to the transformer problems of servicemen in territories affected by adverse climatic conditions, especially excessive moisture.

The Troplex process can be applied to practically any open mounting type transformer. Listed on this page are the popular replacement audios and chokes in Troplex finish. You will recognize the type numbers as being standard Thordarson items with the suffix "X" which designates Troplex finish. When ordering, be sure to include this suffix "X" on each item where you desire Troplex finish. Write factory for information and prices on types not shown in this listing.

The additional cost for Thordarson Troplex Transformers is surprisingly small, averaging 20¢ to 25¢ added to the list price of the corresponding regular type as listed.

For more complete data see duplicate listings on other pages.

### TROPEX REPLACEMENT AUDIO TRANSFORMERS

Type No.	Application	List Price
T-13A34-X	10,000 ohm plate to single grid	\$1.55
T-29A99-X	10,000 ohm plate to single grid	2.00
T-13A35-X	10,000 ohm plate to P.P. grids	1.70
T-33A91-X	10,000 ohm plate to P.P. grids	2.25
T-13A36-X	P.P. 10,000 ohm plates to P.P. grids	1.95
T-78D46-X	Single 30 to class B 19, 1J6G, or 30's	1.70
T-17D01-X	Single 6F6 etc., to 2-6F6, etc.	2.25

### TROPEX OUTPUT TRANSFORMERS

Type No.	Application	List Price
T-13S37-X	Single 6F6, 42, 2A5 etc. to voice coil	\$1.45
T-13S39-X	Single 45, 1-2A5 etc. to voice coil	1.45
T-13S40-X	P.P. 6F6, 42, 2A5 etc. to voice coil	1.70
T-33S99-X	P.P. 45, 71A, 43 etc. to voice coil	1.75
T-81S01-X	Class B 19, 1J6G, 30's etc. to voice coil	1.70
T-13S43-X	Single 1F4, 1D4, 1F5G etc. to voice coil	1.55
T-14S81-X	Single 6F6, 2A5 etc. or P.P. 45, 71A etc. to voice coil	1.45
T-14S82-X	Single 25L6 etc. to voice coil	1.45

### TROPEX UNIVERSAL OUTPUT TRANSFORMERS

Type No.	Application	List Price
T-13S38-X	Any single or P.P. tubes to voice coil	2.25
T-57S01-X		2.25
T-57S02-X	Any P.P. tubes to voice coil	3.25
T-13S41-X		3.25
T-13S42-X	Any single tube to voice coil	1.70

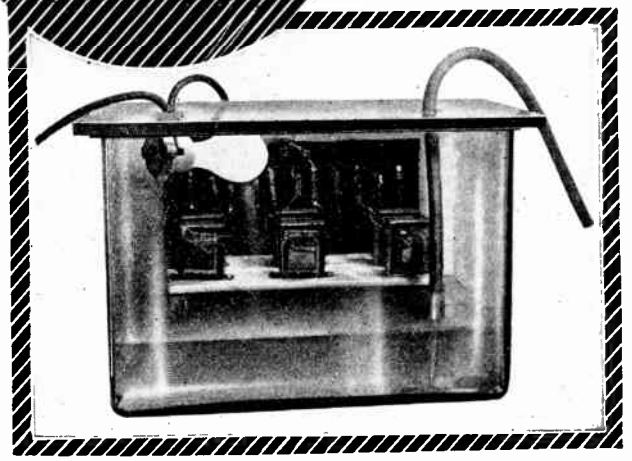
### TROPEX FILTER CHOKES

Type No.	Application	List Price
T-13C26-X	8 Hy at 40 MA 530 ohms DC	\$1.10
T-13C27-X	10 Hy at 40 MA 475 ohms DC	1.30
T-13C28-X	10 Hy at 65 MA 460 ohms DC	1.45
T-13C29-X	9 Hy at 85 MA 250 ohms DC	1.85
T-13C30-X	8 Hy at 150 MA 200 ohms DC	2.50
T-18C92-X	22 Hy at 35 MA 405 ohms DC	1.75
T-14C61-X	7 Hy at 55 MA 200 ohms DC	1.25
T-14C62-X	8 Hy at 55 MA 250 ohms DC	1.25
T-14C63-X	8 Hy at 55 MA 300 ohms DC	1.25
T-14C64-X	10 Hy at 55 MA 350 ohms DC	1.25



**Grueling test applied to TROPEX Transformers — three months . . . and still O. K.! Another Proof of Thordarson Stamina.**

*Test Conditions: 120 F., 85% Humidity; Saturated salt solution constantly agitated; 300V @ 5MA through primary and 300V between primary and ground.*





## REPLACEMENT FILTER CHOKES

Inductance and current ratings suitable for any receiver. Black enamel strap mounting. Inductance ratings given for high inductance no current as well as actual operating conditions. The A.C. D.C. Chokes are designed for use in circuits where the D.C. resistance of the winding is the important factor.

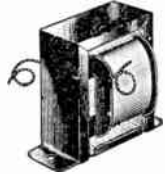


Fig. 2B

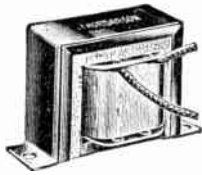


Fig. 3B

Type No.	List Price	Inductance		Current Rating M.A.	D.C. Res. Ohms	Volts Ins.	Mtg. Fig.	Dimensions			Wt. Lbs.
		At Zero D.C.	At Rated D.C.					W.	D.	H.	
T-13C26	\$ .90	21	8	40	530	1600	3B	1 3/4	1 3/8	1 3/8	1/2
T-13C27	1.10	22	10	40	475	1600	3B	2	1 5/8	1 5/8	3/4
T-13C28	1.20	20	10	65	460	1600	3B	2 3/8	1 3/4	2	1
T-43C92	1.65	24	10	75	260	1600	2C	1 7/8	2 1/8	2 1/2	1 1/4
T-47C07	1.65	20	12	75	410	1600	3B	2	2 5/8	2 1/4	1 1/4
T-44C02	1.50	31	12	80	405	1600	3B	1 1/2	2 3/8	2	1 1/4
T-57C51	1.50	15	6	80	138	1600	2B	2	2	2 3/8	1 1/4
T-13C29	1.60	20	9	85	250	1600	3B	2 3/8	2	2	1 1/2
T-68C07	2.00	32	15	85	375	1600	2B	2	2 1/2	3	2
T-57C53	2.00	27	10	110	200	1600	2B	2	2 1/2	3	2 1/4
T-75C49	1.50	22	8	120	290	1600	3B	2	2 3/8	2	1 1/2
T-53C19	1.50	...	...	...	...	...	2B	2	2	2 3/8	1 1/4
T-13C30	2.00	25	8	150	200	1600	2B	2 1/2	2	2 5/8	2 1/4

### Chokes for A.C.-D.C. Sets

T-14C61	\$1.05	14	7	55	200	1600	3B	2	1 5/8	1 5/8	3/4
T-14C62	1.05	16	8	55	250	1600	3B	2	1 5/8	1 5/8	3/4
T-14C63	1.05	19	8	55	300	1600	3B	2	1 5/8	1 5/8	3/4
T-14C64	1.05	21	10	55	350	1600	3B	2	1 5/8	1 5/8	3/4

## FILTER CHOKES (General Purpose)

For use in amplifiers, transmitters, etc. These chokes are rated in actual inductance as measured under full rated load.



Fig. 2C



Fig. 2F

Type No.	List Price	Current Rating M.A.	Inductance Henries	D.C. Res. Ohms	Volts Ins.	Mtg. Fig.	Dimensions			Wt. Lbs.
							W.	D.	H.	
T-57C52	\$1.75	80	5	138	1600	2F	2	2	2 3/8	1 1/2
T-16C07	2.25	85	15	375	1600	2F	3 3/8	2 1/2	3	2 1/4
T-57C54	2.25	110	10	200	1600	2F	2 1/2	2 1/2	3	2 1/4
T-49C91	1.50	120	4	160	1600	2F	2	2	2 1/2	1 1/4
T-17C00-B	2.75	150	12	231	1600	2F	2 7/8	3	3 1/2	3 3/4
T-74C29	3.75	150	15	200	2000	2G	3 1/2	3 3/8	4 5/8	5 1/4
T-67C49	2.75	200	5	80	1600	2F	3	2 7/8	3 1/2	3 3/4
T-75C51	5.00	250	13	121	1600	2G	3 7/8	3 3/4	5	8

## AUDIO REACTORS

For use in circuits where the voltage drop caused by a resistor load is objectionable, also for isolating plate current from transformer primaries. \*Types T-81C15 and T-93C20 are for use in tuned circuits to accentuate a pre-determined band of frequencies. (Amplifier Guide No. 346-B). †T-14C70 is designed primarily for use with two special Thordarson Tone Control dual potentiometers R-1068 @ \$2.50 list. (Amplifier Guide No. 364-D).

Type No.	List Price	Application	Type Tubes	Induct. Hen.	At M.A.	Max. M.A.	D.C. Ohms	Mtg. Fig.	Dimensions			Wt. Lbs.
									W.	D.	H.	
T-37C36	\$2.00	Plate Impedance	{56-30-76-6C5-55-85, etc.	300	5	10	6470	2F	2	2 1/8	2 3/8	1 1/2
T-67C46	1.75							2B	2	2	2 3/8	1 1/4
T-52C98	1.75	{Plate Impedance for S.G. Detector or grid impedance	24-57-56-76-6C5-6F5-6J7	700	.5	8	6150	2F	2	1 7/8	2 3/8	1 1/4
T-29C27	1.50							2B	2	1 1/2	2 3/8	1
T-68C08	1.75	Plate Impedance or Filter	45-46-10, etc.	22	35	35	405	2F	2	2 1/8	2 3/8	1 1/2
T-18C92	1.50							2B	2	1 3/4	2 3/8	1 1/2
T-74A31	3.25	Center tapped impedance		2220	0	8	12210	2F	2 1/2	2 1/2	3	2 1/4
T-81C15*	2.50	Tuned Audio Circuits		.75	.5	100	30	2B	1 5/8	1 5/8	2	3/4
T-93C20*	3.00	Tuned Audio Circuits		250	.5	8.0	6400	2B	2	2	2 3/8	1 1/4
T-74C30	1.50	Tuned Audio Circuits or Filter		42	15	15	2100	2B	2	1 1/2	2 3/8	1
T-14C70†	2.50	Tone Control, Hum Bucking Type		22	0	5	220	3Y	1 1/2	1 1/2	2 1/2	1/2

Amplifier and transmitting type chokes are listed on pages 12, 17 and 19.



# AUDIO TRANSFORMERS

Receiver and Amplifier



Fig. 3B

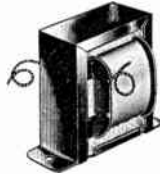


Fig. 2B

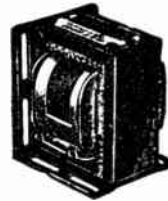


Fig. 2C

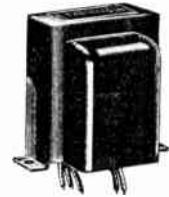


Fig. 2F

## PLATE TO GRID INTERSTAGE TRANSFORMERS

Here is a variety of units designed for the same general application but varying in size, frequency response and style of mounting.\* Type T-75A74 will couple a super-regenerative detector to an audio stage; any tendency toward outside noise is reduced by the static shield between windings.

Type No.	List Price	Application	Ratio	Imped. in Ohms		Pri. M.A.	Mtg. Fig.	Dimensions			Wt. Lbs.
				Pri.	Sec.			W.	D.	H.	
T-13A34	\$1.35	Midget 10,000 ohm plate to grid	3:1	10,000	90,000	8	3B	2	1 5/8	1 3/8	3/4
T-29A99	1.75	Medium 10,000 ohm plate to grid	3.26:1	10,000	106,300	8	2B	2	2	2 3/8	1 1/4
T-57A36	2.00						2F	2	2 1/8	2 3/8	1 1/2
T-47A25	1.75		3:1	10,000	90,000	8	2C	2	1 5/8	2 3/8	1
T-57A38	2.75	Large 10,000 ohm plate to grid	3:1	10,000	90,000	8	2F	2 1/2	2 1/2	3	2 1/4
T-75A74*	2.50	10,000 ohm plate to grid Static Shield between primary and secondary.	2:1	10,000	40,000	8	2F	2	2 1/8	2 3/8	1 1/2

## PUSH-PULL INPUT TRANSFORMERS

Each unit serves similar applications, varying in size, frequency response and style of mounting.\* T-74A31, ordinarily a push-pull input transformer, may also be used as a tapped push-pull grid impedance with ratios of 1:1, 1:2 or 1:4 by connecting the primary and secondary in series, according to instructions furnished.

T-14A92	\$1.25	Midget 10,000 ohm plate to P.P. grids	3:1	10,000	90,000	8	3B	1 3/4	1 3/8	1 3/8	1/2
T-13A35	1.50	Midget 10,000 ohm plate to P.P. grids	3:1	10,000	90,000	8	3B	1 3/8	2	1 5/8	3/4
T-33A91	2.00	Medium 10,000 ohm plate to P.P. grids	3.26:1	10,000	106,300	8	2B	2	2	2 3/8	1 1/4
T-86A03	2.00						3B	2 3/8	2	2	1 1/2
T-14A29	2.25						2C	2 1/8	1 7/8	2 1/2	1 1/4
T-57A39	2.25						2F	2	2 1/8	2 3/8	1 1/2
T-57A40	2.75	Large 10,000 ohm plate to P.P. grids	3:1	10,000	90,000	8	2B	2 1/2	2	3	2
T-57A41	3.00						2F	2 1/2	2 1/2	3	2 1/4
T-74A31*	3.25	10,000 ohm plate to P.P. grids	1:1	10,000	10,000	8	2F	2 1/2	2 1/2	3	2 1/4
T-57A42	3.25	10,000 ohm plate to P.P. grids	3:1	10,000	90,000	8	2B	2 1/2	2	3	2

For Coupling screen grid or power detector to P.P. output — Clarion AC60, etc.

## PUSH-PULL INTERSTAGE TRANSFORMERS

For connecting push-pull plates to push-pull grids, these types offer a choice of size and ratio. Suitable for replacement or amplifier circuits.

T-13A36	\$1.75	Midget P.P. 10,000 ohm plates to P.P. power tube grids	1:1	20,000	20,000	8*	3B	2	2 3/8	1 3/4	1
T-58A70	3.25	} Large P.P. 10,000 ohm plates to P.P. or P.P. par. power tube grids.	1.5:1 Split sec.	20,000	45,000	10*	2F	2 1/2	2 1/2	3	2 1/4
T-67A91	3.00						2B	2 1/2	2 1/2	3	2

\*Per side.

## UNIVERSAL AUDIO REPLACEMENT TRANSFORMER

To couple single plate to single grid; single plate to push-pull grids; push-pull plates to push-pull grids. Has split secondary.

T-17A02	\$2.25	Universal	3:1	Universal	10	2F	2	2 1/8	2 3/8	1 1/2
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## REPLACEMENT DRIVER TRANSFORMERS

Their compact open mounting style facilitates installation.

Type No.	List Price	Driver Tubes	Output Tubes	Class	Ratio Pri. to 1/2 Sec.	Ohms Imped.		Pri. M.A.	Mtg. Fig.	Dimensions			Wt. Lbs.
						Pri.	1/2 Sec.			W.	D.	H.	
T-78D46	\$1.50	1-30	1-1J6G, 19 2-30	B	2.4:1	20,000	3,500	7	2B	1 5/8	1 5/8	2	3/4
T-17D01	2.00	1-6F6 Triode 1-42 Triode 1-2A5 Triode	2-6F6, 6L6, etc.	AB	1.7:1 1.5:1 1.3:1	10,000	3,300 4,500 5,800	31	3B	2 3/8	2	2	1 1/2
T-14D93	1.75	1-76 Triode	1-6A6, 6N7	B	4:1	20,000	1,250	8	3B	1 5/8	2	1 5/8	3/4

Other audio Transformers are listed on pages 15, 19 and 22.





# OUTPUT TRANSFORMERS



## REPLACEMENT OUTPUT TRANSFORMERS

Small strap mounting types easily attached to the speaker or mounted on the chassis. Plate load and voice coil combinations for all popular receivers.

Type No.	List Price	Tube Type	Class	Ohms Impedance		Pri. Per Side	M.A. Watts	Max. Watts	Mtg. Fig.	Dimensions			Wt. Lbs.
				Pri.	Sec.					W.	D.	H.	
T-14S81	\$1.25	1-42, 2A5, 6F6 or P-P45, 71	A	7,000	3 to 6	40	5	3B	1 3/4	1 3/8	1 3/8	1/2	
T-14S82	1.25	1-25L6	A	1,500	3 to 6	55	5	3B	1 3/4	1 3/8	1 3/8	1/2	
T-14S83	1.25	1A5-G, 1E7-G	A	25,000	3 to 6	8	5	3B	1 3/4	1 3/8	1 3/8	1/2	
T-14S84	1.25	1-1C5G, 1Q5G	A	8,000	3 to 6	10	5	3B	1 3/4	1 3/8	1 3/8	1/2	
T-13S37	1.25	1-6F6, 42, 2A5, 47	A	7,000	1-2-4	36	5	3E	1 3/4	1 3/8	1 3/8	1/2	
T-13S39	1.25	1-45, 12A5 1-31, 43, 71A	A	4,000	1-2-4	36	5	3E	1 3/4	1 3/8	1 3/8	1/2	
T-13S43	1.35	1-1F4, 1D4, 1F5G	A	16,000	1-2-4	10	5	3E	1 3/4	1 3/8	1 3/8	1/2	
T-33S99	1.50	2-45, 71, 43, 25A6 P-P 1-6N7, 6A6, 1C5G, 53 P-P	A B	8,000	6 to 12	36	10	2B	2	2	2 3/8	1 1/4	
T-13S40	1.50	2-6F6, 42 P-P 2-2A5, 47 P-P	A A	14,000	1-2-4	40	10	3E	2	1 5/8	1 5/8	3/4	
T-81S01	1.50	1-19, 1J6G, 1G6G P-P 2-30, 49 P-P 2-31 P-P	B B A	10,000	2-4-8	15	8	2B	1 5/8	1 5/8	2	3/4	

## HEAVY DUTY OUTPUT TRANSFORMERS TO LINE OR SPEAKER (High Level)

Thordarson output transformers will satisfy the plate requirements of tubes as used in amplifiers, radio receivers and amateur equipment. Several secondary impedances are incorporated to accommodate various speaker combinations.

Type No.	List Price	Tube Type	Class	Ohms Impedance		Pri. Per Side	M.A. Watts	Max. Watts	Mtg. Fig.	Dimensions			Wt. Lbs.
				Pri.	Sec.					W.	D.	H.	
T-17S10	\$3.00	1-6L6	A	2,500	2-4-8-500	80	8	2F	2 1/2	2 1/2	3	2 1/4	
T-17S11	4.50	2-6V6 P-P	AB1	8,000*	4-8-15-250-500	52	15	2F	2 7/8	3	3 1/2	3 1/2	
T-17S12	4.50	2-6L6 P-P	AB1	4,300*	4-8-15-250-500 (with 300 V. on plate and screen)	95	25	2F	2 7/8	3	3 1/2	3 1/2	
T-17S13	6.00	2-6L6 P-P	AB1	6,600*	4-8-15-250-500	80	34	2G	3 3/8	3 5/8	4 5/8	5 1/2	
T-17S14	6.00	2-6L6 P-P	AB2	5,500*	4-8-15-250-500	90	40	2G	3 3/8	3 5/8	4 5/8	5 1/4	
T-17S15	6.50	4-6L6 P-P Par.	AB1	3,300*	4-8-15-250-500	155	60	2G	3 3/8	3 7/8	4 5/8	5 3/4	
T-17S16	12.00	4-6L6 P-P Par.	AB2	1,900*	84-100-125- 166-250-500	230	120	2G	3 3/4	5	4 5/8	11 1/2	
T-68S06	2.50	1-6F6, 42, 2A5 1-47, 31, 33	A A	7,000	10 or 2,000	36	5	2F	2	1 7/8	2 3/8	1	
T-67S51	3.50	2-6F6, 42, 2A5, 47 P-P 1-79 P-P	A B	14,000	4-8-15-500	40	20	2F	2 1/2	2 1/2	3	2 1/4	
T-67S48	3.50	2-45, 71, 43, 25A6 P-P 1-6N7, 6A6, 53 P-P	A B	8,000	4-8-15-500	36	25	2F	2 1/2	2 1/2	3	2 1/4	
T-67S52	4.00	2-46, 59 P-P 2-6F6, 42, 2A5 P-P 2-6N7, 6A6, 53 P-P Par.	B AB2 B	5,800	4-8-15-500	60	30	2F	2 7/8	3	3 1/2	3 1/2	
T-58S72	3.75	2-2A3, 6B4G P-P 2-48, 25L6 P-P	AB A	3,000	4-8-15-500	60	30	2F	2 7/8	3	3 1/2	3 1/4	
T-67S54	4.00	2-6L6 P-P 2-2A3, 6B4G, 45 P-P 2-19 P-P Par.	A AB B	5,000	4-8-15-500	60	30	2F	2 7/8	3	3 1/2	3 1/2	
T-67S92	4.00	4-2A3, 6B4G, 45 P-P Par. 4-48, 25L6 P-P Par.	AB A	1,500	4-8-15-500	80	40	2F	2 7/8	3	3 1/2	3 1/2	
T-65S94	4.00	2-50 P-P 2-6F6, 42, 2A5 P-P 1-79 P-P	A AB2 B	8,000	4-8-15-500	55	40	2F	2 7/8	3	3 1/2	3 1/2	
T-75S75	4.00	2-6F6, 42 or 2A5 1-6N7, 6A6, 53 P-P 2-6N6G, 6B5, 2B6, 6AC5 P-P	AB2 B A	10,000	4-8-15-500	45	40	2F	2 7/8	3	3 1/2	3 1/2	
T-84S58	6.00	2-6L6 P-P	AB2	3,800	4-8-15-500	115	60	2G	3 3/8	3 3/4	4 5/8	6	
T-89S75	4.00	2-6L6 P-P	AB1	6,600	4-8-15-500	80	40	2F	2 7/8	3	3 1/2	3 1/2	
T-89S74	3.75	1-6L6	A	4,000	4-8-15-500	70	15	2F	2 1/2	2 1/2	3	2 1/4	
T-89S68	6.50	4-6L6 P-P Par.	AB1	3,300	50-125-200 250-333-500	150	75	2G	3 3/8	3 3/8	4 5/8	5 3/4	
T-83S84	6.00	2-50 P-P or P-P 2A3	AB2	5,000	4-8-15-500	80	45	2G	3 3/8	3 1/2	4 5/8	5 1/4	
T-83S87	9.00	4-50 P-P Par.	AB2	3,000	4-8-15-500	160	90	2G	3 7/8	3 3/8	5	7 3/4	

\*10% feed back winding.

See pages 11 and 16 for modulation transformers and page 18 for other output transformers.



# UNIVERSAL OUTPUT TRANSFORMERS

## TRANSCEIVER TRANSFORMERS

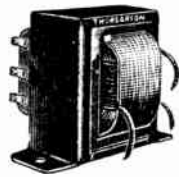


Fig. 2E

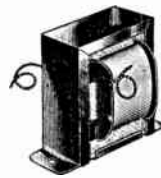


Fig. 2B



Fig. 2F



Fig. 2A

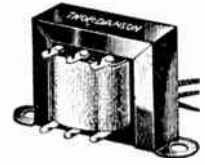


Fig. 3E

### UNIVERSAL REPLACEMENT TUBE TO VOICE COIL

Preferred by many because of their wide plate impedance and voice coil coverage. Proper matching of load impedances to speaker voice coils is accomplished by using taps as specified in the instruction sheets.

Type No.	List Price	Tube Type	Class	Ohms Impedance		Pri. M.A. Per Side	Max. Watts	Mtg. Fig.	Dimensions			Wt. Lbs.
				Pri.	Sec.				W.	D.	H.	
T-13S38	\$1.50	Universal Single or P-P Tubes	A	4,000/7,000	Adjustable .1 to 29	36	8	3E	2	1 5/8	1 5/8	3/4
T-57S01*	2.00			8,000/10,000					2E	2	2 3/8	1 1/4
T-57S02†	2.00			14,000 Ct.					2B	2	2 3/8	1 1/4
T-17S57	2.25			2C					2 1/8	1 7/8	2 1/2	1 1/4
T-13S42	1.50	Universal Single Tube	A	1,500/2,000 4,000/5,000 7,000	Adjustable .1 to 29	55	10	3E	2	1 5/8	1 5/8	3/4
T-13S41	2.75	Universal P-P Tubes	A	3,000/5,000 6,600/7,000 8,000/10,000	Adjustable .1 to 29	60	20	2E	2 1/2	2	3	2 1/4

\*Solder terminals for voice coil connections. †Color coded leads for voice coil connections.

### UNIVERSAL TUBE TO LINE

T-61S25	3.25	Univ. Single Tube	2,500/4,000 5,000/6,000/7,000	500	60	10	2E	2 1/2	2	3	2 1/4
T-61S26	3.50	Univ. P-P Tubes	8,000/10,000 12,000/14,000 Ct.	500	55	10	2E	2 1/2	2	3	2 1/4

### UNIVERSAL LINE TO SPEAKER

Type No.	List Price	Application	Pri.	Sec.	Max. Watts	Mtg. Fig.	Dimensions			Wt. Lbs.
							W.	D.	H.	
T-53S81	\$4.00	Line to Voice Coil	500/250	4-8-15	35	2D	2 7/8	3	3 3/4	3 1/2
T-60S48	3.00	Line to Voice Coil 1 to 6 may be con. in par. to 500 ohm line	500/1,000 1,500/2,000 2,500/3,000	Pri. as 500 ohm- .06 to 8.; pri. as 1,000 ohm .12 to 16, etc.	10	2E	2 1/2	2	3	2
T-14S80	2.00	Line to Voice Coil	500	2-4-6-8	12	2E	2	2	2 3/8	1 1/2
T-17S17	6.50	Line to Voice Coil	500	4/8/16/25/50	75	2E	3 5/8	4	4	6 1/2
T-76S74	3.00	Line to multiple spkrs. (autotransformer)	500	250/166/125/ 100/84	30	2E	2 1/2	2	3	2 1/2

### TRANSFORMER AND CHOKE FOR 32 VOLT D.C. SUPPLY

These units are specified for the excellent 32 volt D.C. supply presented in Thoradson Service Guide No. 342-C.

Type No.	List Price	D.C.* Volts	Max. D.C. Amps.	Mtg. Fig.	Dimensions			Wt. Lbs.
					W.	D.	H.	
T-14R50-	\$15.00	32	3	3C	4 7/8	4 1/2	6 5/8	18 1/4
*Tapped primary. For use with type 83 or Raytheon RX-203 tubes.								
T-14C51-	8.00	Choke .18 H @ 3 A. D.C. D.C. Resistance 1.3 ohms		3C	4 7/8	3 1/2	6 1/8	13 1/2

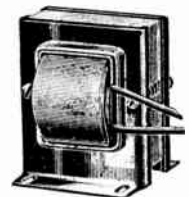


Fig. 8C

### TRANSCEIVER TRANSFORMERS

Smallest practical size—Light weight—Easy to mount—Efficient

Type No.	List Price	Application	Ohms Impedance		Max. D.C. Pri.	Max. Power Watts	Mtg. Fig.	Dimensions			Wt. Lbs.
			Pri.	Sec.				W.	D.	H.	
T-72A59	\$1.65	Plate and Single Button micro. to grid	5,000 200	100,000	10	5	2B	1 5/8	1 5/8	2	3/4
T-72S58	1.65	Pent. Plate to low or high imp. phones or osc.	10,000	2,000 50	30	5	2B	1 5/8	1 5/8	2	3/4

See pages 11 and 16 for modulation transformers and page 18 for other output transformers.



# DRIVER TRANSFORMERS

## TELEVISION TRANSFORMERS



### UNIVERSAL DRIVER TRANSFORMERS — "19" SERIES

Through the use of five ratios on each transformer, this series will handle all driver transformer requirements usually encountered in amateur transmitter circuits. See pages 20 and 21 for complete table of Driver and Modulator combinations.

Type No.	List Price	Cap. Watts	Max. Pri. M.A. Per Side	Ratio Pri. to 1/2 Sec.	Mtg. Fig.	Dimensions			Wt. Lbs.
						W.	D.	H.	
T-19D01	\$6.00	15	60	1:1, 1.2:1, 1.4:1, 1.6:1, 1.8:1	4D	2 7/8	3	3 1/2	3 1/2
T-19D02	6.00	15	60	2:1, 2.2:1, 2.4:1, 2.6:1, 2.8:1	4D	2 7/8	3	3 1/2	3 1/2
T-19D03	6.00	15	60	3:1, 3.2:1, 3.4:1, 3.6:1, 3.8:1	4D	2 7/8	3	3 1/2	3 1/2
T-19D04	6.00	15	60	4:1, 4.5:1, 5:1, 5.5:1, 6:1	4D	2 7/8	3	3 1/2	3 1/2
T-19D05	6.00	15	Primary for 500 ohm line	1:3.15, 1:2.75, 1:2.5, 1:2.25, 1:2, 1:1.75, 1:1.4, 1:1.25, 1:1.85, 1:1.75	4D	2 7/8	3	3 1/2	3 1/2

### DRIVER TRANSFORMERS (FOR SPECIFIC APPLICATIONS)

Thordarson driver transformers have the correct primary to secondary ratio for the tubes specified, insuring good regulation and minimum driver distortion on the positive grid peaks.

Type No.	List Price	Driver Tubes	Output Tubes	Class	Ratio Pri. to 1/2 Sec.	Pri. M.A.	Mtg. Fig.	Dimensions			Wt. Lbs.
								W.	D.	H.	
T-19D06	\$3.00	1-6A6, 1-6N7, 1-6C5	1-6A6, 6N7	B	5:1, 4:1, 3:1, 2.5:1	10	2F	2	2 1/8	2 3/8	1 1/2
T-54D63	2.25	1-30, 1-49, 1-6C5	1-1J6G, 19, 2-49, 2-6V6	B, B, AB2	2.4:1	7	2F	2	1 7/8	2 3/8	1 1/4
T-67D50	2.75	1-89 Triode	1-79	B	2:1	32	2F	2	2 1/8	2 3/8	1 1/2
T-67D89	3.00	1-89, 6F6, 42 Triode	2-79, 6A6, 6N7	B	3:1	32	2F	2 1/2	2 1/2	3	2 1/4
T-67D47	2.50	1-6N7, 6A6, 53	1-6N7, 6A6, 53	B	5.25:1	10	2F	2	2 1/8	2 3/8	1 1/2
T-81D52	3.50	1-6C5, 76, 1-56	2-6F6 Triode, 2-42, 2A5 Triode	AB, AB	1.82:1, 1.67:1	8	2F	2 1/2	2 1/2	3	2 1/4
T-84D59*	3.50	2-6C5, 6N7, 2-6A6, 53	2-6L6, 6V6, 2-6N7, 6A6, 53	AB2, B	5:1	10	2F	2 1/2	2 1/2	3	2 1/4
T-74D32	3.50	2-6C5, 76, 56	2-6F6, 42, 2A5, 4-2A3, 6B4G	AB2, AB	3:1	10	2F	2 1/2	2 1/2	3	2 1/4
T-81D42	3.25	1-6F6 Triode, 1-42 Triode, 1-2A5 Triode	2-6F6 Triode, 2-42 or 2-2A5 Pentode	AB2, AB2, AB2	1.7:1, 1.5:1, 1.3:1	31	2F	2 1/2	2 1/2	3	2 1/4
T-17D03*	4.50	1-6F6 Triode	2-6L6	AB2	1.4:1	40	2F	2 7/8	3	3 1/2	3 1/2
T-17D04*	4.50	2-6F6	2-6L6	AB2	2.6:1	32	2F	2 7/8	3	3 1/2	3 1/2
T-67D78	3.00	1-46, 59, 6F6, 42, 2A5 Triode	2-46, 59, 2-6L6	B, AB2	2.2:1	32	2F	2 1/2	2 1/2	3	2 1/4
T-83D83	3.75	2-45 P-P, 6F6 Triodes	2-250	AB2	1.6:1	40	2F	2 1/2	2 1/2	3	2 1/4
T-51D00*	4.50	2-6F6, 42, 45, 2A5 P-P	2-210, 801, 35T	B	2:1	40	2A	2 7/8	3	3 1/2	3 1/4
T-61D40*	5.50	2-2A3 P-P	2-50T, 150T, 2-203A, 801	B, B	1.67:1	130	2D	3 3/8	3 5/8	4	5
T-75D10*	5.50	2-2A3 P-P	2-838, 805, TZ-40	B, B	3.2:1	130	2D	3 3/8	3 5/8	4	5

\*Split secondary as required for inverse feedback and separate power tube bias.

### UNIVERSAL BIAS TRANSFORMERS

Primary 115 Volts, 50-60 Cycles. Mounting Figure 2N — No Filament Winding.



Fig. 2N

Type No.	List Price	Application	Current M.A.	Dimensions			Wt. Lbs.
				W.	D.	H.	
T-19R31	\$5.50	Will supply D.C. voltages of 10 to 100 in app. 5 volt steps	200	3 3/8	3 1/4	4	5 1/2
T-19R32	7.25	Will supply D.C. voltages of 100 to 400 in app. 15 volt steps	200	3 3/4	4	4 5/8	8 3/4

### TELEVISION TRANSFORMERS (Plate and Filament)

Electrostatically Shielded. Primary 115 Volts — 60 Cycles. Mounting Figure 2G.



Fig. 2G

Type No.	List Price	Kinescope Tubes	Secondary	Volts Insulation	Dimensions			Wt. Lbs.
					W.	D.	H.	
T-17R32	\$10.00	5"	No. 1 — 2300V. A.C. No. 2 — 2.5V at 2A No. 3 — 2.5V at 2A	7500	3 3/8	3 1/8	4 5/8	3 3/4
T-17R33	12.50	9"	No. 1 — 4500V. A.C. No. 2 — 2.5V at 5A No. 3 — 2.5V at 2A	10,000	3 3/8	3 7/8	4 5/8	6 1/2

### Filter Reactor

Type No.	List Price	Filter Reactor			D.C. Res.	Mtg. Fig.	Dimensions			Wt. Lbs.
		Inductance Henries	Current M.A.	Volts Insulation			W.	D.	H.	
T-17C40	\$4.75	1500	3	10,000	12,000	2F	2 7/8	3	3 1/2	3 3/4

Multi-match driver transformers are listed on page 16.





# MODULATION TRANSFORMERS

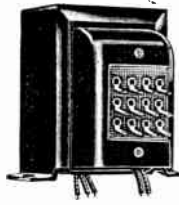


Fig. 4D

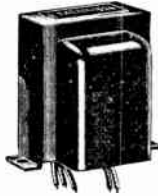


Fig. 2F

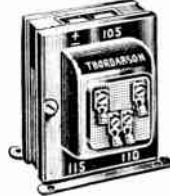


Fig. 2D

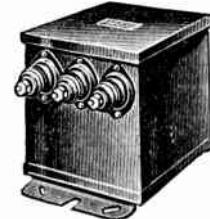


Fig. 2Q

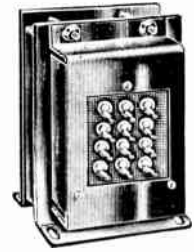


Fig. 2N

## UNIVERSAL MODULATION TRANSFORMERS "19" SERIES

Tapped coils enable the experimenter to match any modulator tubes to any class C R.F. load. See pages 20 and 21 for complete table of Driver and Modulator combinations.

Type No.	List Price	Cap. Watts	Pri. M.A. Per Side	Secondary M.A. Series	M.A. Par.	Mtg. Fig.	Dimensions			Wt. Lbs.
							W.	D.	H.	
T-19M13	\$ 4.00	15	50	50	100	2N	2½	2¾	3	2
T-19M14	7.00	30	75	75	150	2N	3¾	3¾	4	4½
T-19M15	10.00	60	125	125	250	2N	3¾	4½	4	6½
T-19M16	15.00	100	175	175	350	2N	4½	5	6	12½
T-19M17	24.00	250	225	225	450	2Q	5¾	8½	7¼	30¾

## MODULATION TRANSFORMERS (FOR SPECIFIC APPLICATIONS)

This series of modulation transformers meets the need for efficient, quiet, long life units at reasonable costs. Engineered and constructed for specific tube types, their efficiency is high and the frequency characteristics are good.

Type No.	List Price	Tube Type	Class	Ohms Impedance		Max. D.C. Sec. M.A.	Max. Audio Pwr.	Mtg. Fig.	Dimensions			Wt. Lbs.
				Pri.	Sec.				W.	D.	H.	
T-67M69	\$ 2.75	1-19	B	10,000	2,700	50	10	2F	2	2	2¾	1½
T-17M59	3.00	1-6A6, 6N7 or 53	B	10,000	3,000, 3,750, 4,500	100	10	2F	2½	2½	3	2
T-64M26	6.00	2-46 or 59 2-250	B AB	5,800	5,000 10,000	100	40	2D	3¾	3¾	4	5
T-19M21	7.00	2-TZ-20	B	10,000	3,750 6,600	200 150	75	2D	3½	4¼	4	7
T-19M22	10.00	2-809 2-RK-12	B B	8,400	5,000 7,850	200 160	100	2D	4½	4½	6	13¼
T-84M70	10.00	2-6L6 2-35T 4-210	AB B B	3,800	2,500 5,000 7,500	250 200 150	75	2D	3¾	3¾	4⅞	9
T-14M49	16.50	2-TZ-40	B	6,900	2,850 4,500 6,500	350 300 235	175	2Q	5⅞	7¾	6¼	20
T-64M25-	6.00	2-TZ-20, 210, 46	B	8,000	5,000, 10,000	200	40	2D	3⅞	4¼	4⅞	8
T-75M11-	20.00	2-ZB-120, HK-154 838, 35T, RK-52	B	10,000	2,500, 10,000	400 200	300	2Q	5⅞	8½	7¼	30
T-82M09-	20.00	2-35T, RK-52, ZB-120	B	10,000	1,250, 5,000	500 250	300	2Q	5¾	9½	7¼	29½
T-82M25	40.00	2-805, HD-203A, 822	B	9,000	4,000, 6,000, 8,000	500	650	2Q	8	6¾	8	47

## GRID MODULATION TRANSFORMERS

T-67M73	3.50	1-42, 6F6, 46 Triode	A	6,300	5,400	32	10	2D	2½	2½	3	2¼
T-67M74	4.50	P.P. 45-2A3	AB	5,000	5,000	60	20	2D	2⅞	3	3½	3½

## MODULATION TRANSFORMERS FOR MATCHING LINES TO R. F. LOADS

Primaries of these transformers may be connected directly to the 500 ohm output terminals of any amplifier or receiver. \*Type T-83M22 is equipped with a tap at 200 ohms for use with "Breting 14" receivers.

Type No.	List Price	Pri. Ohms	Secondary Ohms Load	Max. D.C. Sec. M.A.	Max. Watts	Mtg. Fig.	Dimensions			Wt. Lbs.
							W.	D.	H.	
T-73M52	\$18.00	500	5,000-6,000-7,000-8,000-9,000-10,000	215	80	2Q	5⅞	8	6¼	21
T-83M22*	9.00	500-200	5,000-6,000-7,000-8,000-9,000-10,000	150	30	2N	3⅞	4¼	4⅞	8

Multi-match modulation transformers are listed on page 16.



**PLATE SUPPLY TRANSFORMERS — "19" SERIES**

These plate transformers are rated in D.C. voltages from a two section filter, including the voltage drop through the rectifier tubes. Designed especially for Amateur Short Wave or experimental equipment. Electrostatic shield between primary and secondary. Primary 115 volts 50-60 cycles.



Fig. 2G

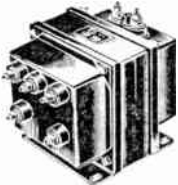


Fig. 2K



Fig. 2F

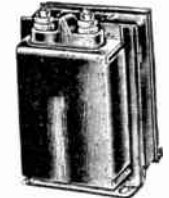


Fig. 2J



Fig. 2D

Type No.	List Price	Sec. A.C. Load Volts	D.C. Volts	Bias Tap	D.C. M.A.	Pri. V.A.	Mtg. Fig.	Dimensions			Wt. Lbs.
								W.	D.	H.	
T-19P54	\$ 5.75	560-0-560	400		150	115	2G	3 3/4	3 1/2	5	7
T-19P55	7.50	660-0-660 550-0-550	500 400	30 V.	250	200	2G	3 7/8	3 1/2	4 7/8	8
T-84P60	7.75	515-0-515	400	30V.	250	190	2G	3 7/8	4 3/4	4 7/8	11 3/4
T-19P56	8.00	900-0-900 800-0-800	750 600		225	260	2G	3 7/8	4	4 7/8	10
T-19P57	10.00	1075-0-1075 507-0-507	1000* 400		125 150	245	2G	3 7/8	4 1/4	4 7/8	10 1/2
T-19P58	13.00	1200-0-1200 900-0-900	1000* 750		200 150	500	2G	4 1/2	5 1/2	6 1/8	19
T-19P69	13.00	1180-0-1180 900-0-900	1000 750		300	430	2G	4 7/8	6 1/8	6 5/8	20
T-19P59	16.00	1560-0-1560 1250-0-1250	1250 1000		300	550	2K	5 7/8	7	7	26 1/2
T-19P60	18.50	1875-0-1875 1560-0-1560	1500 1250		300	620	2K	6 3/4	4 1/8	7	29 1/4
T-19P61	20.00	2125-0-2125 1875-0-1875	1750 1500		300	745	2K	6 3/4	4 1/2	7	31 1/2
T-19P62	22.50	2420-0-2420 2125-0-2125	2000 1750		300	860	2K	6 3/4	5	7	34 1/2
T-19P63	23.00	1560-0-1560 1265-0-1265	1250 1000		500	925	2K	6 3/4	5 1/4	7	38
T-19P64	28.50	1875-0-1875 1560-0-1560	1500 1250		500	1130	2K	6 3/4	6	7	43 1/4
T-19P65	29.50	3000-0-3000 2420-0-2420	2500 2000		300	1195	2K	6 3/4	6	7	44
T-19P66	35.00	2125-0-2125 1875-0-1875	1750 1500		500	1185	2K	6 3/4	4 1/2	10	45 1/2
T-19P67	42.50	2450-0-2450 2125-0-2125	2000 1750		500	1380	2K	6 3/4	4 3/4	10	51
T-19P68	50.00	3000-0-3000 2450-0-2450	2500 2000		500	1760	2K	6 3/4	5 3/4	10	61

\*These transformers designed for double rectifiers and will deliver both secondary ratings simultaneously. If only the lower voltage taps are used the current rating is equal to the current rating of both windings.

**COMBINATION PLATE AND FILAMENT — for transmitter applications**

T-19R30	\$7.75	560-0-560	400	150	2G	3 3/4	4	4 7/8	8 3/4
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Filament windings: 5V at 3A; 6.3V at 3A Ct.; 7.5V at 2.5A Ct.

**TRANSMITTER INPUT AND FILTER CHOKES — "19" SERIES**

Matched input and smoothing chokes for amateur, amplifier or experimental applications. Inductance values are measured under full load conditions and adequate insulation is provided for recommended service.

**Input or Swinging Chokes**

Type No.	List Price	Cap. D.C. M.A.	Inductance Henries	D.C. Res. Ohms	Volts Insulation	Mtg. Fig.	Dimensions			Wt. Lbs.
							W.	D.	H.	
T-19C39	\$ 3.25	150	5-20	215	3000	2F	2 7/8	3	3 1/2	3 3/4
T-19C35	4.00	200	5-20	130	3000	2D	3 1/2	3 3/8	4 1/4	5 1/2
T-19C36	6.50	300	5-20	105	5000	2D	3 7/8	4	4 5/8	10 3/4
T-19C37	10.00	400	5-20	90	5000	2J	4 1/2	5 3/4	6 1/8	19 1/2
T-19C38	14.00	500	5-20	75	5000	2J	5 1/8	6	7 1/2	26
T-63C15-	7.50	280	12-38	156	5000	2J	4	4 1/4	6 1/4	11 1/2
T-64C06-	10.00	380	10-19	93	5000	2J	4 3/4	5	6 7/8	18 1/4

**Smoothing Chokes**

T-19C46	3.25	150	12	215	3000	2F	2 7/8	3	3 1/2	3 1/2
T-19C42	4.00	200	12	130	3000	2D	3 1/2	3 3/8	4 1/4	5 1/2
T-19C43	6.50	300	12	105	5000	2D	3 7/8	4	4 5/8	10 3/4
T-19C44	10.00	400	12	90	5000	2J	4 1/2	5 3/4	6 1/8	19 1/2
T-19C45	14.00	500	12	75	5000	2J	5 1/8	6	7 1/2	26
T-64C07-	12.50	380	20	160	5000	2K	6	6 3/4	7 5/8	25

C.H.T. plate transformers are listed on page 18 — other filter chokes on pages 6 and 17.



# FILAMENT TRANSFORMERS

## EXCITER LAMP TRANSFORMERS



Improved voltage regulation and minimum heat rise. Rated for continuous operation at full load. Primary 115 volts 50-60 cycles except those marked \* which have primary taps of 105, 110 and 115 volts to compensate for low line or voltage drop in filament leads.

### One Secondary

Type No.	List Price	Sec. Volts	Sec. Amps.	Pri. V. A.	Volts Insulation	Mtg. Fig.	Dimensions			Wt. Lbs.
							W.	D.	H.	
T-50F61	\$1.50	2.5 Ct.	3.5	10	1600	2B	2	1 7/8	2 3/8	1
T-19F88	1.75	2.5 Ct.	5.25	15	1600	3C	2	2	2 3/8	1 1/4
T-19F89	2.25	2.5 Ct.	10	25	1600	3C	2 1/2	2	3	2
T-19F90	3.00	2.5 Ct.	10	25	7500	3C	2 1/2	2 1/2	3 1/4	2 1/4
T-64F33*	4.50	2.5 Ct.	10	25	7500	2N	3 3/4	3 3/8	4	4 1/2
T-19F82	5.75	2.5 Ct.	15	45	10,000	3C	3 3/8	2 3/8	4	4
T-63F99	3.25	5 Ct.	4	20	1600	2D	3	2 1/2	3 1/4	2 1/4
T-19F83	2.25	5 Ct.	5	30	1600	3C	2 1/2	2	3	2
T-19F84	2.75	5 Ct.	8	45	1600	3C	2 9/16	2 3/4	3 1/4	2 3/4
T-19F85	3.50	5 Ct.	13	75	1600	3C	3 3/8	2 3/8	4	4
T-19F86	6.00	5 Ct.	21	120	1600	3C	3 3/8	3	5	4 1/2
T-19F91	2.25	5.25 Ct.	4	25	1600	3C	2 1/2	2 3/8	3 1/4	2 1/4
T-19F92	3.25	5.25 Ct.	13	75	1600	3C	3 3/8	2 1/2	4	4
T-74F23*	5.00	5.25 Ct.	13	75	1600	2D	3 1/2	3 3/8	4	4 1/4
T-74F24*	7.00	5.25 Ct.	21	125	1600	2D	3 7/8	3 7/8	4 5/8	5 1/4
T-19F80	1.25	6.3 Ct.	1	7	1600	2B	1 1/2	1 3/8	1 5/8	5/8
T-19F81	1.50	6.3 Ct.	2	14	1600	2B	1 5/8	1 5/8	2	3/4
T-19F97	1.75	6.3 Ct.	3	21	1600	2B	2	2	2 3/8	1 1/2
T-61F85	2.00	6.3, 5, 2.5	2.5	18	1600	2E	2 5/8	2	2 1/4	1 1/2
T-73F60*	3.75	6.3 Ct.	5	36	1600	2D	3	2 7/8	3 3/4	3 1/4
T-19F98	2.75	6.3 Ct.	6	47	1600	3C	2 1/2	2 3/8	3 1/4	2 3/4
T-19F99	3.50	6.3 Ct.	10	73	1600	3C	3 3/4	2 3/8	4	4
T-64F13*-	2.75	7.5 Ct.	2.5	21	1600	2D	3	2 1/2	3 3/4	2 1/4
T-19F93	2.25	7.5 Ct.	4	34	1600	3C	2 1/2	2 1/4	3 1/4	2 1/4
T-19F94	3.00	7.5 Ct.	8	67	1600	3C	3	2 7/8	3 3/4	4
T-92F20	4.75	7.5 Ct.	8	68	1600	2D	3 5/8	3 3/8	4	4 3/4
T-19F95	2.75	10 Ct.	4	48	1600	3C	2 9/16	2 3/4	3 1/4	2 3/4
T-19F96	3.50	10 Ct.	8	92	1600	3C	3	2 7/8	3 3/4	4
T-64F14*	4.75	10 Ct.	8	90	1600	2D	3 5/8	3 3/8	4	5
T-19F87	6.25	10 Ct.	12	140	1600	3C	3 3/8	3 1/4	4	6 3/4

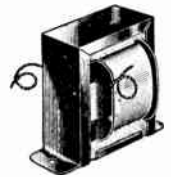


Fig. 2B

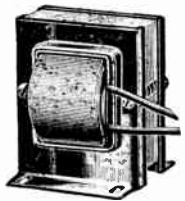


Fig. 3C



Fig. 2D

### Multiple Secondaries

The trend of amateur transmitter design has been carefully studied in planning this series. One transformer from this group will often supply all filament voltages required.

T-19F76	\$4.75	Sec. 1, 5 V. Sec. 2, 7.5 V. tapped at 6.3 and 5	3 6	67	1600 1600	2G	3 3/8	3 1/8	4 5/8	4 3/4
T-19F77	7.00	Sec. 1, 5 V. Sec. 2, 2.5 V. Ct. Sec. 3, 10 V. tapped at 7.5, 6.3 and 5	3 10 8	133	1600 7500 1600	2G	3 3/4	3 5/8	5	7
T-19F78	5.25	Sec. 1, 2.5 V. Ct. Sec. 2, 5 V.	10 3	45	7500 1600	2G	3 3/8	3 3/8	4 5/8	5 1/2
T-19F79	6.75	Sec. 1, 6.3 V. Ct. Sec. 2, 10 V. tapped at 7.5, 6.3 and 5	3 10	133	1600 1600	2G	3 3/8	3 5/8	4 5/8	6
T-54F66-	3.25	Sec. 1, 7.5 V. Ct. Sec. 2, 7.5 V. Ct.	2.5 2.5	42	1600	2E	3	2 3/4	3 3/4	3 1/4
T-79F84	4.75	Sec. 1, 2.5 V. Ct.; #2, 5 V. Ct.; #3, 6.3 V. Ct.	3.5, 3, 3	48	1600	2G	3 3/4	3 1/4	4 5/8	4 3/4
T-85F14*-	17.50	Sec. 1, 2.5 V. Ct.; #2, 2.5 V. Ct.; #3, 2.5 V. Ct.	5, 5, 10	55	10,000	2Q	7 5/8	5 1/2	5 1/2	17
T-70F46-	7.75	Sec. 1, 5 V. Ct.; #2, 5 V. Ct.; #3, 5 V. Ct.	3, 3, 6	67	5000	2N	4	3 3/8	4	3 1/2

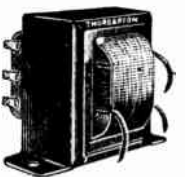


Fig. 2E



Fig. 2G

### EXCITER LAMP TRANSFORMERS

Type No.	List Price	Pri. Volts	Secondary		Mtg. Fig.	Dimensions			Wt. Lbs.
			Volts	Amps.		W.	D.	H.	
T-64F37-	\$6.00	110/115/120	10	7.5	3C	3 3/4	3 1/2	4	5 3/4
T-64F38-	4.00	110 115/120	8.5	4	3C	3	2 3/4	3 3/4	3 1/4

C.H.T. Filament transformers are listed on Page 17.





### STEP DOWN AUTOTRANSFORMERS

#### Convenience Outlet Type

Widely used in the export trade to reduce 220-250 volts to 110-125 volts. Input side equipped with cord and plug. Output side has standard receptacle. Mounting style 2V.

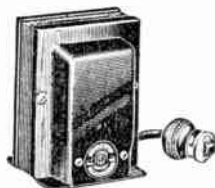


Fig. 2V

Type No.	List Price	Sec. V.A.	Dimensions			Wt. Lbs.
			W.	D.	H.	
T-26V04	\$ 4.50	80	3 3/8	3	4 5/8	4 1/2
T-50V10-	5.50	125	3 3/4	3 1/4	4 7/8	5 3/4
T-18V06	6.00	150	3 3/8	4 3/4	4 5/8	6 1/4
T-40V15-	6.50	175	3 3/4	3 5/8	4 7/8	8
T-50V11	7.50	250	3 3/4	4 3/4	4 7/8	10 1/4
T-18V07	13.50	500	3 3/4	4 7/8	4 7/8	13

### LINE VOLTAGE ADJUSTING AUTOTRANSFORMERS

#### Convenience Outlet Type

For boosting or lowering line voltage to care for ordinary line variation. Input taps may be selected by means of a convenient plug arrangement as illustrated (Fig. 4E). Input voltages 95, 105 and 125 — 60 cycles; output 115 volts. Mounting style 2V.

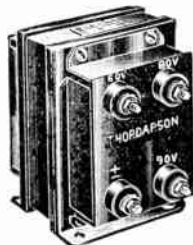


Fig. 2W

T-18V20	\$ 5.00	100	3 3/8	3 1/2	4 5/8	4 1/2
T-18V21	6.00	150	3 3/8	3 3/4	4 5/8	5
T-18V22	7.50	250	3 7/8	3 5/8	4 7/8	6 1/2
T-18V23	12.00	500	3 7/8	4 1/8	4 7/8	9
T-61V07-	5.00	*150	3 3/8	4	4 5/8	4 1/2

\*Input 90 or 110 Volts — Separate plug for each.

### PRIMARY REGULATING AUTOTRANSFORMERS

For increasing or decreasing line voltage. Taps for 60, 80, 90, 100, 110, 120, and 125 volts. 50-60 cycles. Complete with instructions. Mounting style 2W except T-82V13, 2M.

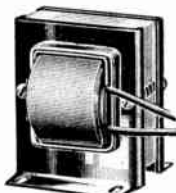


Fig. 3C

T-82V11	\$12.50	500	4 1/2	7	6 1/4	16 3/4
T-82V12	17.50	1000	5 1/8	7 1/4	6 7/8	22 1/2
T-82V13-	22.50	2000	6 3/4	7 1/2	7 1/2	39 1/2

### LINE VOLTAGE AUTOTRANSFORMERS

Provide means of increasing or decreasing primary voltages from 0 to 135 volts in 5 volt steps, when operated from 120 volt line. Mounting style 3C (with lugs).

T-18V03	6.25	150	3	2 9/16	3 11/16	4
T-18V04	7.75	250	3 5/8	2 3/4	4	6
T-18V05	10.50	500	4 1/4	3 3/8	6	11

### ISOLATION TRANSFORMERS

Electrostatic shield between primary and secondary. Features unique "plug-in" primary voltage adjustment — no changing of connections. Prevent radiation of line noise by electrical therapeutic machines, clippers, dryers, etc., or for use in amateur transmitting stations. Reduce line interference to radio receivers. Mounting style 4E except T-18V06, 2V.

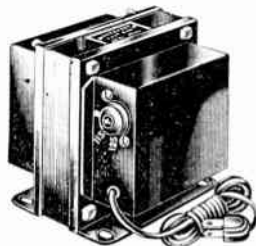


Fig. 4E

T-18V00	\$10.50	100	3 3/4	3 3/4	4 7/8	8
T-18V01	19.50	250	5 7/8	6 1/4	6	20
T-18V02-	27.50	500	6 3/4	7 1/4	6 3/4	35

### FENCE CONTROLLER TRANSFORMER

Recommended for use in circuit shown in September, 1938 issue of Popular Mechanics. Note: For 6 volt D.C. operation, with suitable relays. Open horizontal mounting.

Type No.	List Price	Primary	Sec. (Open Circuit)	Dimensions			Wt. Lbs.
				W.	D.	H.	
T-18V10	\$3.00	6 V. D.C.	8,000 V. (37 M.A. Peak) 9,000 V. (25 M.A. Peak)	3 1/2	2	3 1/4	1

### SIGNALING TRANSFORMERS—Listed by Underwriters' Laboratories

While designed primarily for bells, horns, gongs, and other intermittent signal duty, these transformers may be used for many additional applications. Cases are compound filled and have separately enclosed primary and secondary wiring compartments. Knockouts permit attachment of rigid or flexible conduit without exposing the wiring. Primary 115 volts, 50-60 cycles. Four secondary leads provide the following combination of output voltages — 4, 8, 12, 16, 20 and 24 volts. Mounting figure 3V.

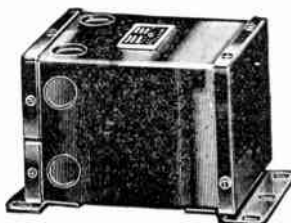


Fig. 3V

Type No.	List Price	Intermittent Duty Rating	Constant Duty Rating	Dimensions			Wt. Lbs.
				W.	D.	H.	
T-47V01	\$ 6.00	50 V. A.	35 V. A.	5 5/8	4 1/2	4	6 1/4
T-47V02	9.75	100 V. A.	85 V. A.	6 3/8	4 1/2	4	8
T-47V03	21.75	250 V. A.	190 V. A.	7 5/8	4 1/2	4	14 1/4
T-47V04	35.00	500 V. A.	475 V. A.	8 3/8	5 1/4	5 1/2	22 1/2

Automatic Voltage Regulators are listed on opposite page.



# MATCHING TRANSFORMERS (Low Level)

## AUTOMATIC VOLTAGE REGULATORS



### MATCHING TRANSFORMERS (Low Level)

A complete line of low level input, microphone, line and mixer transformers to fit all applications. Special winding methods result in low leakage reactance so essential to good frequency response. Several styles of mountings are offered for the most popular types. Low level audio transformers are susceptible to hum if located too close to power transformers, etc. C.H.T. and Tru-Fidelity units have hum-bucking windings and are recommended for minimum hum pick-up.

#### LOW IMPEDANCE SOURCE (MICROPHONE, LINE, MIXER) TO GRID

Type No.	List Price	Application	Impedance in Ohms		Overall Ratio	Mtg. Fig.	Dimensions			Wt. Lbs.
			Pri.	Sec.			W.	D.	H.	
T-65A73	\$2.75	DB mike to grid	200 Ct.	100,000	1:22.2	2F	2½	2½	3	2
T-30A20	3.00					2A	2½	2½	3	2
T-58A37	2.25	DB mike to grid	200 Ct.	100,000		2F	2	2½	2¾	1½
T-83A78	2.00	Single button mike to single	100	400,000 Ct.	1:64	2F	2	1⅞	2¾	1¼
T-86A02	1.75	or P.P. grids				2B	2	1⅞	2¾	1
T-23A57	2.25	Single button mike to single grid	100	400,000	1:64	2A	2	1⅞	2¾	1¼
T-55A16	2.75	Dyn. mike, line or mixer to single or P.P. grids	200/50	100,000 Ct.	1:22.3	2F	2	2⅞	2¾	1½
T-63A72	3.75	1, 2, 3 or 4 circuit mixer to grid	50, 100, 150, 200	100,000	1:22.2	2F	2½	2½	3	2¼
T-63A71	3.75	1, 2, 3 or 4 circuit mixer to grid	200, 400, 600, 800	100,000	1:11	2F	2½	2½	3	2¼
T-61A94	3.25	Line to single or P.P. Cl. A grids	500/125	100,000 Ct.	1:14.1	2F	2½	2½	3	2¼
T-62D65-	6.00	Line to 845 Class AB grids	500	7,220	1:3.8	2D	3¾	3¾	4	5
T-83D21	3.50	Line to P.P. grids of 6L6's or 50's Class AB	500	5,100 12,500	1:3.2 1:5	2F	2½	2½	3	2¼

#### MICROPHONE OR LINE TO MIXER OR LINE

Type No.	List Price	Application	Impedance in Ohms		Pri. M.A.	Mtg. Fig.	Dimensions			Wt. Lbs.
			Pri.	Sec.			W.	D.	H.	
T-63A73-	\$3.25	DB mike or line to line or mixer	200 Ct. or 50	200 Ct. or 50		2F	2½	2½	3	2¼
T-70A82	3.50	DB mike to line	200 Ct. or 50	500 Ct. or 125		2F	2½	2½	3	2¼
T-70A83	3.50	Crystal mike to line or mixer	100,000	200 Ct. or 50		2F	2½	2½	3	2¼

#### TUBE TO LINE OR MIXER (LOW LEVEL)

T-14A90	\$2.50	Sgl. or P.P. Plates to line or mixer	20,000 Ct.	500 Ct. or 125	8**	2F	2	2⅞	2¾	1½
T-14A91	2.50	Sgl. or P.P. Plates to line or mixer	20,000 Ct.	200 Ct. or 50	8**	2F	2	2⅞	2¾	1½
T-55A15-	2.25	Plate to line or mixer	15,000/10,000	200 Ct. or 50	8	2F	2	2⅞	2¾	1½

\*\*Per Side.

#### AUTOMATIC VOLTAGE REGULATORS

Will deliver a constant voltage (within ±1%) despite line fluctuations from 90 to 130 volts and/or secondary loads from 1/3 to full load rating. Operation is fully automatic and instantaneous. Once installed no further adjustment is necessary. Supplies optional output voltages of 110, 115 or 120 volts — 60 cycles. Ideal for use with plate, filament or power transformers or for use in technical laboratories. Engineering Bulletin SD422 is available from all Thordarson distributors.

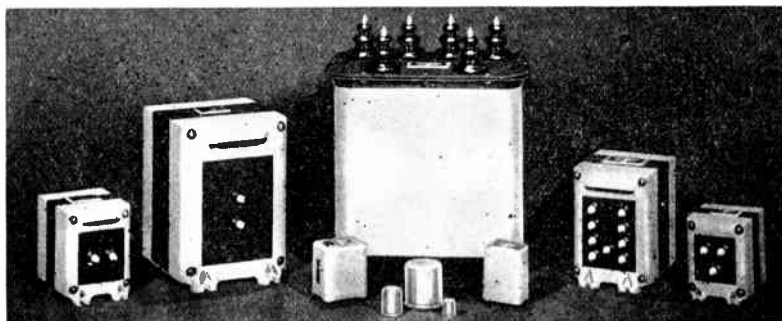
Type No.	List Price	Capacity V.A.	Mtg. Fig.	Dimensions			Wt. Lbs.
				W.	D.	H.	
T-9V30	\$ 40.00	100	SN	5⅞	10½	6½	43
T-9V31	65.00	250	SN	6	10½	8½	61
T-9V32	100.00	500	2Q	7	13	10	117
T-9V33	175.00	1000	2Q	7	18	10	150



Mtg. Fig. SN

#### THORDARSON BROADCAST UNITS

The same high quality transformers that have been made to the special requirements of discriminating engineers, broadcast stations and laboratories are now available as stock catalog items. Thordarson offers a complete line of transformers and chokes for broadcast use, each capable of meeting and surpassing the most rigid broadcast tolerances. These transformers are listed and described in the new Broadcast Catalog, No. 500-D. Broadcast stations, experimenters, laboratories or air craft stations are urged to secure a copy of this valuable listing.



The "First Family" in the Broadcast Field

Transformers for complete broadcast service are listed in catalog No. 500-D.



# THE C. H. T. SERIES

## TRANSMITTER TRANSFORMERS



C.H.T. transformer and choke components are made for quality amplifier and amateur transmitter applications. For the first time in transformer history a definite pattern of case design has been followed from the smallest audio to the largest plate transformer. Each unit has the complete protection of compound filled cases against varying climatic conditions. Mounting templates and complete instructions are furnished to insure a quick and efficient installation.

### MULTI-MATCH MODULATION TRANSFORMERS

**Plug-in-Jack Terminal Board, the only Modulation Transformer built with this unique feature.**

Enables quick and accurate matching of tube loads without soldering. The experimenter is thus assured of peak transformer performance while testing new tubes or circuit changes. See pages 20 and 21 for complete table of Driver and Modulator combinations for all transmitting tubes.

Type No.	List Price	Cap. Watts	Pri. M.A. Per Side	Sec. M.A.		Mtg. Fig.	Dimensions			Wt. Lbs.
				Series	Par.		W.	D.	H.	
T-11M74	\$ 9.00	40	100	80	160	3G	4	4 1/2	4 3/8	7 3/4
T-11M75	12.50	75	145	145	290	3G	4	4 1/2	4 3/8	9
T-11M76	19.50	125	210	160	320	3G	5 1/8	5 1/2	6	18
T-11M77	30.00	300	250	250	500	3G	6	7 1/2	7 1/4	30
T-11M78	60.00	500	320	320	640	3G	7	8 5/8	7 1/2	51

### MULTI-MATCH DRIVER TRANSFORMERS

Plug-in Connectors and recessed sub-base lugs permit single hole sub-panel wiring. See Table on pages 20 and 21.

Type No.	List Price	Cap. Watts	Max. Pri. M.A. Per Side	Ratio Pri. to 1/2 Sec.	Mtg. Fig.	Dimensions			Wt. Lbs.
						W.	D.	H.	
T-15D76*	\$ 8.25	15	60	1:1, 1.2:1, 1.4:1, 1.6:1, 1.8:1	3H	4	4 1/2	4 3/8	7 1/2
T-15D77*	8.25	15	60	2:1, 2.2:1, 2.4:1, 2.6:1, 2.8:1	3H	4	4 1/2	4 3/8	6
T-15D78*	8.25	15	60	3:1, 3.2:1, 3.4:1, 3.6:1, 3.8:1	3H	4	4 1/2	4 3/8	6
T-15D79*	8.25	15	60	4:1, 4.5:1, 5:1, 5.5:1, 6:1	3H	4	4 1/2	4 3/8	6
T-15D80†	11.50	30	120	1:1, 1.25:1, 1.5:1, 1.75:1, 2:1	3H	4	4 1/2	4 7/8	8 3/4
T-15D81†	11.50	30	120	2.25:1, 2.5:1, 2.75:1, 3:1, 3.25:1	3H	4	4 1/2	4 7/8	8
T-15D82‡	8.25	15		1:3.15, 1:2.75, 1:2.5, 1:2.25, 1:2, 1:1.75, 1:1.4, 1:1.25, 1:1.85, 1:1.75	3H	4	4 1/2	4 3/8	5 3/4
T-15D83‡	11.50	30		1:3.15, 1:2.75, 1:2.5, 1:2.25, 1:2, 1:1.75, 1:1.4, 1:1.25, 1:1.85, 1:1.75	3H	4	4 1/2	4 7/8	8 1/2
T-15D84§	11.50	30	80	1.5:1, 2:1, 2.5:1, 3:1, 3.5:1	3H	4	4 1/2	4 7/8	8 3/4

\*P.P. 45's or 2A3's. †P.P. Par. 2A3's. ‡Primary for 500 ohm line. §P.P. 6L6's with inverse feedback.

### DRIVER TRANSFORMERS (For Specific Applications)

Type No.	List Price	Driver Tubes	Output Tubes	Class	Ratio Pri. to 1/2 Sec.	Pri. M.A.	Mtg. Fig.	Dimensions			Wt. Lbs.
								W.	D.	H.	
T-15D85*	\$7.50	Sgl. 6F6, 42, 2A5 Triode	P.P. 6L6-40W P.P. 6L6-60W	AB <sub>2</sub>	1.4:1, 1.3:1 1.2:1	40	3M	2 3/4	3	3 1/2	2 1/2
T-15D86*	7.50	P.P. 6F6, 42, 2A5 Triodes	P.P. Par. 6L6 120 W.	AB <sub>2</sub>	2.6:1	32	3M	2 3/4	3	3 1/2	2 1/2
T-18D19-	18.00	P.P. 845	P.P. 849, 204A	B	5:1	100	3Q	5 1/4	5 1/2	7	18 1/2

\*With humbucking coil construction.

### MULTIPLE-TAP LINE TO GRID TRANSFORMERS (HIGH LEVEL) Mtg. Fig. 3K

Type No.	List Price	Primary Ohms	Secondary Ohms	Dimensions			Wt. Lbs.
				W.	D.	H.	
T-15A65	\$10.50	500, 333, 250, 200, 125, 50	50,000/12,500, P.P. Cl. A 845	4	4 1/2	4 7/8	8
T-15D87	11.00	500, 333, 250, 200, 125, 50	7220, P.P. Cl. AB 845	4	4 1/2	4 7/8	8

### TELEVISION TRANSFORMERS

Plate and Filament. Electrostatically shielded.

Type No.	List Price	Kinescope Tubes	Pri. Volts	Secondary	Pri. V. A.	Volts Insulation	Mtg. Fig.	Dimensions			Wt. Lbs.
								W.	D.	H.	
T-16R50-	\$16.00	1801	115	No. 1—2.5 V. @ 1.75 A. for RCA-879 No. 2—3000 2000 V. D.C. @ 3 M.A.	40	7,500	3X	5 1/8	5 1/2	6 1/2	14
T-16R51-	18.50	1800	115	No. 1—2.5 V. @ 5 A. for RCA-878 No. 2—6000/4500/3000 V. D.C. @ 5 M.A.	105	10,000	3X	5 1/8	5 1/2	7	16 1/2
T-16F55-	11.00	1800 1801	105/115	No. 1—2.5 V. @ 2.1 A.	10	10,000	3X	4 1/8	4 1/2	5 3/8	7 1/2

### HORIZONTAL OUTPUT TRANSFORMER

Type No.	List Price	Overall Ratio	Application	Mtg. Fig.	Dimensions			Wt. Lbs.
					W.	D.	H.	
T-16S58-	\$16.00	5 : 1	To couple output of horizontal deflecting circuit (6F6G, etc.) to horizontal deflecting yoke. Designed to pass a 13,200 cycle saw tooth voltage.	3W	2	2	3 1/4	1 1/2

See page 11 for other modulation transformers and page 10 for other driver transformers.





# C. H. T.—Filament Transformers and Chokes



## MULTI-VOLT FILAMENT TRANSFORMERS

Terminals are brought out to solder lugs on a recessed base (except Mtg. 3X). This permits of mounting on chassis with one hole for sub-panel wiring. Side knock-out holes for above panel wiring.

### Single Secondary Transformers

Type No.	List Price	Primary Volts	Secondary Volts	Amps.	Pri. V.A.	Insulation	Mtg. Fig.	Dimensions			Wt. Lbs.
								W.	D.	H.	
T-11F59	\$5.75	105-115	5 Ct.	5	30	2000	3K	2 3/4	3	3 1/2	5
T-11F63	8.00	105-115	5 Ct.	13	70	2000	3K	4	4 1/2	4 3/8	7 1/2
T-11F55	11.50	105-115	5.25 Ct.	22	130	2000	3K	5 1/8	5 1/2	6	14
T-11F60	6.25	105-115	6.3 Ct.	5	35	2000	3K	2 3/4	3	3 1/2	5 3/4
T-11F62	6.75	105-115	7.5 Ct.	8	65	2000	3K	4	4 1/2	3 7/8	6 1/2
T-11F64	9.50	105-115	10 Ct.	10	110	2000	3K	4	4 1/2	4 7/8	9 3/4
T-11F53	8.00	105-115	2.5 Ct.	10	25	7500	3K	4	4 1/2	5 3/8	8 1/2
T-11F61	18.50	105-115	2.5 Ct.	20	55	15,000	3X	5 1/4	5 1/2	6	14
T-11F54	16.00	105-115	5 Ct.	20	110	10,000	3X	5 1/8	5 1/2	6	15



Fig. 3K



Fig. 3L

### Tapped Secondary Transformers

T-11F50	\$9.00	105-115	7.5 tap at 6.3, 5* and 2.5 Ct.	6.5	55	2000	3K	4	4 1/2	4 3/4	6 1/4
T-11F51	9.50	105-115	10 tap at 7.5 and 6.3 Ct.	8	90	2000	3K	4	4 1/2	4 7/8	7 3/4
T-11F52	13.25	105-115	11 tap at 10 and 7.5 Ct.	10	125	2000	3K	5 1/8	5 1/2	6	13 1/2

\*Not center tapped.

### Multiple Secondary Transformers

T-11F56	7.75	105-115	No. 1 = 6.3 Ct. No. 2 = 2.5 Ct. No. 3 = 5 Ct.	3 3.5 3	50	2000	3K	4	4 1/2	3 7/8	6
T-11F57	13.75	105-115	No. 1 = 10 Ct. No. 2 = 10 Ct. No. 3 = 6.3 Ct. No. 4 = 5 Ct.	8 4 3 3	170	2000	3K	5 1/8	5 1/2	6 3/4	15
T-11F58	15.00	105-115	No. 1 = 7.5 Ct. No. 2 = 7.5 Ct. No. 3 = 6.3 Ct. No. 4 = 5 Ct.	6.5 3.25 3 3	120	2000	3K	5 1/8	5 1/2	6	13 1/4



Fig. 3H

## INPUT AND SMOOTHING CHOKES

Companion units to the C. H. T. Multi-Volt Plate Transformers, these chokes are accurately rated and the inductance shown is obtained with full rated D.C. applied. Many commercial choke ratings are obtained by tests not comparable to operating values. Thordarson test methods give the ACTUAL inductance as obtained in filter circuits.

### C. H. T. Input Chokes

Type No.	List Price	Inductance Henries	Current M.A.	Volts Insulation	D.C. Res.	Mtg. Fig.	Dimensions			Wt. Lbs.
							W.	D.	H.	
T-15C36	\$ 8.00	5-25	200-20	4,000	105	3L	4	4 1/2	4 7/8	10
T-15C37	10.00	5-25	300-30	4,000	78	3L	5 1/8	5 1/2	6 3/4	22
T-15C38	12.00	5-25	400-30	4,000	95	3L	5 1/8	5 1/2	6 3/4	24
T-15C39	22.00	5-25	500-30	10,000	86	3L	5 7/8	7 1/4	8 1/4	38 1/2
T-15C41	26.50	5-25	650-50	10,000	46	3L	7	7 1/2	8	51



Fig. 3G

### C. H. T. Smoothing Chokes

T-15C45	\$ 8.00	12	200	4,000	105	3L	4	4 1/2	4 7/8	10
T-15C46	10.00	12	300	4,000	78	3L	5 1/8	5 1/2	6 3/4	22
T-15C47	12.00	12	400	4,000	95	3L	5 1/8	5 1/2	6 3/4	24
T-15C48	22.00	12	500	10,000	86	3L	5 7/8	7 1/4	8 1/4	38 1/2
T-15C50	26.50	12	650	10,000	46	3L	7	7 1/2	8	51



Fig. 3X



**Complete Transformer Manual—No. 340, 50c**—The Thordarson Transformer Manual is a complete book, containing the Radio Servicing Guide, the Replacement Transformer Encyclopedia, the Transmitter Guide, and the Sound Amplifier Guide, plus Thordarson catalogs and prices. It is bound in an attractive blue and orange cover with looseleaf arrangement, giving the user opportunity to keep the Manual up-to-date by adding the latest Thordarson releases.

## For the Amateur

**Transmitter Guide—No. 344-C, 15c**—Fifty-two pages of up-to-the-minute data on transmitter design and operation. Portable units, beginners transmitters, and larger rigs up to 1000 watts are fully described. Circuit diagrams, parts lists, and photographs illustrate each article.





### MULTI-VOLT PLATE TRANSFORMERS

The value of Thordarson experience in manufacturing quality transformers is best demonstrated by the C.H.T. Multi-Volt Transformers. These units, engineered for continuous operation, provide extreme flexibility, excellent regulation and quiet operation. The new 3P mounting, used on the larger types, consists of two heavy cast cases for full shielding of the coil. Moisture proof compound is used for complete coil protection. Primary volts, 115-230.

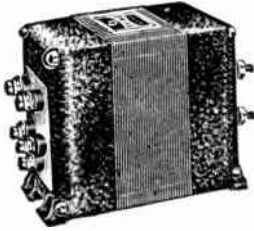


Fig. 3P

Type No.	List Price	Sec. A.C. Load Volts	D.C. Volts	D.C. M.A.	Pri. V. A.	Mtg. Fig.	Dimensions			Wt. Lbs.
							W.	D.	H.	
T-15P11	\$12.50	665/665 or 535/535	500 or 400	200	160	3K	5 1/8	5 1/2	5 3/8	15 3/4
T-15P12	15.00	835/835 or 655/655	650 or 500	200	200	3K	5 1/8	5 1/2	6 3/4	19 1/2
T-15P13	20.00	945/945 or 770/770	750 or 600	300	315	3Q	5 7/8	7 3/4	7 1/4	31 3/4
T-15P14	25.00	1225/1225 or 945/945	1000 or 750	300	427	3Q	5 7/8	8 1/4	8 1/4	41
T-15P15	30.00	1450/1450 or 1190/1190	1250 or 1000	300	520	3Q	7	9	8	51 1/4
T-15P16	45.00	1540/1540 or 1255/1255	1250 or 1000	500	875	3P	6 3/8	11 1/4	9	81
T-15P17	32.50	1815/1815 or 1535/1535	1500 or 1250	300	665	3Q	7	9	8	55
T-15P18	60.00	2130/2130 or 1845/1845	1750 or 1500	500	1210	3P	6 3/8	12 1/2	9	96
T-15P19	50.00	2950/2950 or 2365/2365	2500 or 2000	300	1160	3P	6 3/8	11 3/4	9	85
T-15P20	85.00	2960/2960 or 2390/2390	2500 or 2000	650	2380	3P	7 1/2	13 1/2	9 5/8	140
T-15P21	80.00	3440/3440 or 2980/2980 2340/2340 or 1815/1815	3000 or 2500 2000 or 1500	500	2180	3P	7 1/2	12 3/4	9 5/8	129
T-15P22	50.00	2070/2070 or 1785/1785 1495/1495 or 1210/1210	1750 or 1500 1250 or 1000	300	745	3P	6 3/8	10 3/4	9	76



Fig. 3Q

### PLATE AND FILAMENT TRANSFORMERS

Combination plate and filament transformers for such tubes of medium power as 6L6, 807, T-20, RK-23, RK-39, etc. Primary 115 volts, 50-60 cycles. Mounting figure 3K.

T-15R00	\$10.50	500/500 (A.C.)	150	140	5 1/8	5 1/2	6	15
Filament Windings: 5V, 3A; 7.5V, tapped at 6.3, 5A.								
T-15R01	15.00	500/500 (A.C.)	400	310	5 7/8	6 3/4	6	24 1/2
Filament Windings: 5V, 6A; 6.3V., 6 A.								
T-15R02	13.25	750/750 (A.C.)	200	220	5 1/8	5 1/2	6	17
Filament Windings: 2.5V, 10A; 7.5V tapped at 6.3, 3A.								
T-15R03	13.75	400/400 (A.C.)	200	205	5 1/8	5 1/2	6	19
Filament Windings: 2.5V, 4A; 6.3V, 3A; 5V, 3A.								



Fig. 3K

### MULTI-VOLT BIAS TRANSFORMERS

Rectifier plate and filament terminals on recessed base. Six secondary taps are brought out to plug-in jacks for convenient change of voltage. Mounting figure 3N. Primary 115 volts, 50-60 cycles.

Type No.	List Price	Pri. V. A.	D.C. Volts	M.A.	Filament		Dimensions			Wt. Lbs.
					Volts	Amps.	W.	D.	H.	
T-15R60	\$9.50	65	150; 135; 120; -110; 100; 90	200	5	3	4	4 1/2	4 7/8	6 3/4
T-15R61	10.50	100	275; 250; 225; -200; 175; 150	200	5	3	4	4 1/2	4 7/8	8 1/2
T-15R62	12.50	155	500; 450; 400; -350; 300; 275	200	5	3	5 1/8	5 1/2	5 3/8	15 1/4



Fig. 3N

### MULTIPLE-TAP OUTPUT TRANSFORMERS

Designed especially for amplifiers featured in Thordarson No. 346-D Sound Guide. Exceptional adaptability and frequency response will dictate their use in other quality sound systems. Mounting style 3H.

Type No.	List Price	Tube Type	Class	Ohm Impedance Pri.	Pri. M.A.	Sec. Per Side	Max. Watts	Dimensions			Wt. Lbs.
								W.	D.	H.	
T-15S90*	\$9.25	2-6V6 P.P. 2-6L6 P.P. 2-2A3 P.P. (self bias)	AB1 AB1 AB	8000 5000 5000	70	15	4	4 1/2	4 3/8	7 1/4	
T-15S91*	11.50	2-6L6 P.P. (300 V. Pl. & Sc.) 2-2A3 P.P. (fixed bias)	AB AB	4300 3000	95	25	4	4 1/2	4 7/8	8	
T-15S92*	13.75	2-6L6 P.P. 2-6L6 P.P.	AB1 AB2	6600 5500	90	40	4	4 1/2	5 3/8	8 3/4	
T-15S93*	15.00	4-6L6 P.P. Par. 2-6L6 P.P.	AB1 AB2	3300 3800	155	60	4	4 1/2	5 3/8	15 1/2	
T-15S94*	17.50	4-6L6 P.P. Par.	AB2	1900	500/250/166 /125/100/84	230	120	5 1/8	5 1/2	5 3/8	18

\*Tertiary winding to give a feedback voltage 10% of full primary. Split Primaries.

### MULTIPLE-TAP LINE TO VOICE COIL TRANSFORMERS

T-15S96	11.00	Line to Voice Coil	1000/500	50/24/16/8/6/4/3/2	25	4	4 1/2	4	7 1/4
T-15S97	14.50	Line to Voice Coil	1000/500	50/24/16/8/6/4/3/2	60	4	4 1/2	4	9

See page 12 for other plate transformers and pages 8 and 9 for other outputs.



# C. H. T. AMPLIFIER TRANSFORMERS

## AUDIO COUPLING TRANSFORMERS



### MULTI-VOLT POWER TRANSFORMERS

Specified for build-it-yourself amplifiers described in Sound Amplifier Guide No. 346-D. Primary 115 volts 50-60 cycles. Mounting style 3K except T-15R04, 3M.

Type No.	List Price	Volts Ct.	M.A.	Volts (Rect.Fil.)	Amp.	Volts Ct.	Amp.	Volts Ct.	Amp.	Dimensions			Wt. Lbs.
										W.	D.	H.	
T-15R04	\$ 4.75	510	25			6.3	2.1			2¾	3	3½	3
T-15R05	10.50	680 77 Bias tap	135	5	3	6.3	2	6.3	2.25	4	4½	5½	10
T-15R06	9.75	725	175	5	3	6.3	5			4	4½	5½	11
T-15R07	10.50	760	280	5	3	6.3	7			4	4½	5½	12
T-15R08	13.75	900	325	5	6	6.3	8			5¼	5½	5½	22



Fig. 3K

### C.H.T. AMPLIFIER CHOKES

Specified for build-it-yourself amplifiers fully described in Sound Amplifier Guide No. 346-D. Indicated for other quality receiver and amplifier applications. These types have two windings each. The first line of description applies when the windings are connected in parallel, the second for series connection. Mounting style 3L.

Type No.	List Price	Inductance Henries	Current M.A.	Volts Insulation	D.C. Res.	Dimensions			Wt. Lbs.
						W.	D.	H.	
T-15C52	\$5.00	30 Parallel 120 Series	35 17	1,600	750 3000	2¾	3	3½	3¼
T-15C53	5.50	12 Parallel 50 Series	100 50	1,600	272 1090	2¾	3	3½	3¼
T-15C54	5.50	8 Parallel 32 Series	150 75	1,600	184 735	2¾	3	3½	3¼
T-15C55	7.00	2 Parallel 8 Series	500 250	1,600	32½ 130	4	4½	4¾	7½
T-15C56	9.00	2 Parallel 8 Series	700 350	1,600	27 107	4	4½	4¾	9¾



Fig. 3L

### AUDIO COUPLING TRANSFORMERS

Ultra modern design, balanced windings, hum bucking coil construction and moisture-proof compound-filled cases. Frequency response variation  $\pm 1\frac{1}{2}$  db 60 to 8,000 C.P.S. Mounting style 3M.

#### Low Impedance Source to Grid

Type No.	List Price	Primary Ohms	Secondary Ohms	Max. D.C. per side (M.A.)	Max. D.C. unbalance (M.A.)	Max. Sig. Level (db)	Dimensions			Wt. Lbs.
							W.	D.	H.	
T-15A66	\$7.25	500, 333, 250, 200, 125, 50	60,000/15,000 Single Grid	100	2.5	+10	2¾	3	3½	2¼
T-15A67	8.00	500, 333, 250, 200, 125, 50	120,000/30,000 P. P. Grids	100	2.5	+20	2¾	3	3½	2¼
T-15A68	8.00	60, 38, 30, 22, 15, 10, 5.5, 2.5	60,000/15,000 Single Grid	100	2.5	0	2¾	3	3½	2¼

#### Low Impedance Source to Line or Mixer

T-15A69	7.25	500, 333, 250, 200, 125, 50	500, 333, 250, 200, 125, 50	100	2.5	+20	2¾	3	3½	2
T-15A70	7.50	60, 38, 30, 22, 15, 10, 5.5, 2.5	500, 333, 250, 200, 125, 50	100	2.5	+20	2¾	3	3½	2

#### Tube to Line (Low Level)

T-15A71	7.25	20,000/5,000 Single Plate	500, 333, 250, 200, 125, 50	8	8	+15	2¾	3	3½	1¾
T-15A72	7.25	20,000/5,000 P.P. Plates	500, 333, 250, 200, 125, 50	10	0	+20	2¾	3	3½	1¾

#### Interstage Coupling Transformers (Class A)

T-15A73	6.50	10,000/2,500 Single Plate	40,000/10,000 Single Grid.	0	0	+15	2¾	3	3½	2¼
T-15A74	6.50	10,000/2,500 Single Plate	40,000/10,000 P.P. Grids	0	0	+15	2¾	3	3½	2½
T-15A75	7.00	20,000/5,000 P.P. Plates	45,000/11,250 P.P. Grids	10	0	+20	2¾	3	3½	2¼



Fig. 3G



Fig. 3W



Fig. 3M

See page 18 for other Amplifier Components, pages 3 and 4 for other power transformers, pages 15 and 22 for other audio coupling transformers.





# DRIVER AND MODULATOR COMBINATIONS



MODULATOR STAGE					DRIVER STAGE					
P-P Class B Tubes	Power Output Watts	Plate Volts	Bias Volts	Pl. to Pl. Load Ohms	Use Mod. Trans. No.	P-P Driver Tubes	Trans. Ratio, Pri. to 1/2 Sec.	Use Driver Trans. No.	Trans. for 500 Ohm Line	§Ratio 500 Ohm Line to 1/2 Sec.
<b>R.C.A. TUBES</b>										
										Where T-15D82 appears T-19D05 may also be used.
46	30	400	0	5,600	T-11M74 or T-19M14	*45	5:1	T-15D79 or T-19D04	T-15D82	1:85
46	40	500	0	8,000	T-11M75 or T-19M14	*45	5:1	T-15D79 or T-19D04	T-15D82	1:85
46	50	600	0	9,600	T-11M75 or T-19M15	*45	5:1	T-15D79 or T-19D04	T-15D82	1:85
4-46's	56	400	0	2,800	T-11M75 or T-19M15	*45	5:1	T-15D79 or T-19D04	T-15D82	1:85
4-46's	96	600	0	4,800	T-11M76 or T-19M16	*45	5:1	T-15D79 or T-19D04	T-15D82	1:85
203A	200	1000	-35	6,900	T-11M77 or T-19M17	†2A3	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.5
203A	200	1000	-35	6,900	T-11M77 or T-19M17	**6L6	3.5:1	T-15D84	T-15D82	1:1.25
203A	260	1250	-45	9,000	T-11M77 or T-19M17	†2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.5
203A	260	1250	-45	9,000	T-11M77 or T-19M17	**6L6	3.5:1	T-15D84	T-15D82	1:1.25
4-203A	400	1000	-35	3,450	T-11M78	†4-2A3	2.25:1	T-15D81	T-15D83	1:1.25
4-203A	400	1000	-35	4,500	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.25
4-203A	520	1250	-45	3,450	T-11M78	†4-2A3	2:1	T-15D80	T-15D83	1:1.25
4-203A	520	1250	-45	4,500	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.25
211	200	1000	-77	6,900	T-11M77 or T-19M17	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
211	260	1250	-100	9,000	T-11M77 or T-19M17	2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:2
800	90	750	-40	6,400	T-11M76 or T-19M16	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25
800	100	1000	-55	12,500	T-11M76 or T-19M16	2A3	2.8:1	T-15D77 or T-19D02	T-15D82	1:1.25
800	100	1000	-55	12,500	T-11M76 or T-19M16	45	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.2
801	45	600	-75	10,000	T-11M74 or T-19M14	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25
801	45	600	-75	10,000	T-11M74 or T-19M14	45	2:1	T-15D77 or T-19D02	T-15D82	1:2.25
801	75	750	-80	11,000	T-11M75 or T-19M16	45	1.8:1	T-15D76 or T-19D01	T-15D82	1:2.25
801	75	750	-80	11,000	T-11M75 or T-19M16	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
805	300	1250	0	6,700	T-11M77	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
805	370	1500	-16	8,200	T-11M78	2A3	3:1	T-15D78 or T-19D03	T-15D82	1:1.25
806	500	2000	-150	11,500	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2
806	500	2000	-150	11,500	T-11M78	**6L6	1.5:1	T-15D84	T-15D83	1:2.5
808	190	1250	-15	12,700	T-11M77 or T-19M17	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
809	60	500	0	5,200	T-11M75 or T-19M15	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:7.5
809	60	500	0	5,200	T-11M75 or T-19M15	45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25
809	100	750	-5	8,400	T-11M76 or T-19M16	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:7.5
809	100	750	-5	8,400	T-11M76 or T-19M16	45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25
810	510	1500	-30	6,600	T-11M78	4-2A3	2.25:1	T-15D81	T-15D83	1:1.25
830B	175	1000	-35	7,600	T-11M77 or T-19M17	2A3	3:1	T-15D78 or T-19D03	T-15D82	1:1.25
838	200	1000	0	6,900	T-11M77 or T-19M17	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:85
838	260	1250	0	9,000	T-11M77 or T-19M17	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:85
4-838	400	1000	0	3,450	T-11M78	4-2A3	3.25:1	T-15D81	T-15D83	1:7.5
4-838	400	1000	0	3,450	T-11M78	**6L6	3.5:1	T-15D84	T-15D83	1:1.25
4-838	520	1250	0	4,500	T-11M78	4-2A3	3.25:1	T-15D81	T-15D83	1:7.5
4-838	520	1250	0	4,500	T-11M78	**6L6	3.5:1	T-15D84	T-15D83	1:1.25
1608	50	425	-15	4,800	T-11M75 or T-19M15	*45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25
<b>TAYLOR TUBES</b>										
T-20	50	600	-30	8,100	T-11M75 or T-19M15	*45	2.2:1	T-15D77 or T-19D02	T-15D82	1:2
T-20	70	800	-40	12,000	T-11M75 or T-19M16	*45	2:1	T-15D77 or T-19D02	T-15D82	1:2.25
TZ-20	70	800	0	12,000	T-11M75 or T-19M16	*45	3.2:1	T-15D78 or T-19D03	T-15D82	1:1.4
T-55	175	1000	-40	6,900	T-11M77 or T-19M17	2A3	2.8:1	T-15D77 or T-19D02	T-15D82	1:1.25
T-55	225	1250	-50	9,400	T-11M77 or T-19M17	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.4
T-55	275	1500	-60	12,000	T-11M77	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
T-155	Same as HD-203-A									
203-A	Same as R.C.A. 203A									
4-203A	Same as R.C.A. 203A									
HD-203A	300	1500	-50	9,600	T-11M77	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25
HD-203A	300	1750	-67.5	13,000	T-11M77	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25
HD-203A	400	1750	-67.5	10,000	T-11M78	2A3	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HD-203A	400	2000	-75	12,500	T-11M78	2A3	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HD-203A	500	2000	-75	10,000	T-11M78	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HD-203A	500	1500	-50	6,400	T-11M78	4-2A3	2:1	T-15D80	T-15D83	1:1.25
HD-203A	500	1500	-50	6,400	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.4
HD-203A	600	1750	-67.5	7,600	T-11M78	4-2A3	1.75:1	T-15D80	T-15D83	1:1.4
HD-203A	600	1750	-67.5	7,600	T-11M78	**6L6	2.5:1	T-15D84	T-15D83	1:1.75
203B	300	1250	-45	7,900	T-11M77	†2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:2
4-203B	600	1250	-45	3,900	T-11M78	†4-2A3	1.75:1	T-15D80	T-15D83	1:1.4
4-203B	600	1250	-45	3,900	T-11M78	**6L6	2.5:1	T-15D84	T-15D83	1:1.75
203Z	200	1000	0	6,900	T-11M77 or T-19M17	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:7.5
203Z	260	1100	0	6,700	T-11M77	†2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:85
203Z	300	1250	0	7,900	T-11M77	†2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:85
211	Same as R.C.A. 211									
T-756	100	850	-25	9,400	T-11M76 or T-19M16	2A3	3:1	T-15D78 or T-19D03	T-15D82	1:1.25
T-756	125	850	-25	7,500	T-11M76 or T-19M17	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
T-814	500	2000	-150	11,500	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2
T-814	500	2000	-150	11,500	T-11M78	**6L6	1.5:1	T-15D80	T-15D82	1:3.15
T-822	Same as HD-203A									
TZ-40	175	1000	0	6,800	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:85
TZ-40	175	1000	0	6,800	T-11M77 or T-19M17	45	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.5
TZ-40	100	750	0	6,000	T-11M76 or T-19M16	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:7.5
TZ-40	100	750	0	6,000	T-11M76 or T-19M16	45	3:1	T-15D78 or T-19D03	T-15D82	1:1.4

See pages 10 and 16 for driver transformers.



# DRIVER AND MODULATOR COMBINATIONS



MODULATOR STAGE					DRIVER STAGE					
P-P Class B Tubes	Power Output Watts	Plate Volts	Bias Volts	Pl. to Pl. Load Ohms	Use Mod. Trans. No.	P-P Driver Tubes	Trans. Ratio, Pri. to 1/2 Sec.	Use Driver Trans. No.	Trans. for 500 Ohm Line	Ohm Line to 1/2 Sec.
<b>EIMAC TUBES</b>										
35T	150	1000	-22	7,200	T-11M77 or T-19M17	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.4
35T	200	1250	-30	9,600	T-11M77 or T-19M17	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.5
100TH	210	1000	0	5,200	T-11M77 or T-19M17	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
100TH	260	1250	0	7,200	T-11M77	2A3	3.6:1	T-15D78 or T-19D03	T-15D82	1:1.25
100TH	300	1500	-10	9,600	T-11M77	2A3	3.6:1	T-15D78 or T-19D03	T-15D82	1:1.25
100TH	380	2000	-20	16,000	T-11M78	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
100TL	170	1000	-90	5,200	T-11M77 or T-19M17	**6L6	2:1	T-15D84	T-15D82	1:2
100TL	230	1250	-112	7,200	T-11M77	**6L6	1.5:1	T-15D84	T-15D82	1:2.5
100TL	270	1500	-140	9,600	T-11M77	**6L6	1.5:1	T-15D84	T-15D82	1:2.5
100TL	350	2000	-185	16,000	T-11M78	**6L6	1.5:1	T-15D84	T-15D82	1:2.5
150T	500	2000	-150	11,500	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2
150T	600	2500	-195	14,000	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2
150T	500	2000	-150	11,500	T-11M78	**6L6	1.5:1	T-15D84	T-15D83	1:2.5
150T	600	2500	-195	14,000	T-11M78	**6L6	1.5:1	T-15D84	T-15D83	1:2.5
250TH	300	1000	0	4,000	T-11M77	**6L6	3.5:1	T-15D84	T-15D83	1:1.25
250TH	400	1250	0	5,200	T-11M78	**6L6	3.5:1	T-15D84	T-15D83	1:1.25
250TH	500	1500	-22.5	6,400	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.4
<b>RAYTHEON TUBES</b>										
RK-12	100	750	0	8,700	T-11M76 or T-19M16	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75
RK-18	100	1000	-50	12,000	T-11M76 or T-19M16	*45	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.75
RK-18	100	1000	-50	12,000	T-11M76 or T-19M16	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
RK-31	110	1000	0	13,600	T-11M76 or T-19M17	*45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25
RK-31	140	1250	0	17,000	T-11M77 or T-19M17	*45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25
RK-31	110	1000	0	13,600	T-11M76 or T-19M17	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75
RK-31	140	1250	0	17,000	T-11M77 or T-19M17	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75
RK-52	200	1000	0	7,200	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
RK-52	250	1250	0	10,000	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
RK-57	300	1250	0	6,700	T-11M77	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
RK-57	370	1500	-16	8,200	T-11M78	2A3	3:1	T-15D78 or T-19D03	T-15D82	1:1.25
RK-58	200	1000	0	6,900	T-11M77 or T-19M17	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
RK-58	260	1250	0	9,000	T-11M77 or T-19M17	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
<b>HYTRON TUBES</b>										
HY-25	75	800	-9	9,000	T-11M75 or T-19M16	2A3	5:1	T-15D79 or T-19D04	T-15D82	1:1.75
HY-40	140	800	-28	5,800	T-11M77 or T-19M17	2A3	3:4 to 1	T-15D78 or T-19D03	T-15D82	1:1.25
HY-40	175	1000	-37.5	7,000	T-11M77 or T-19M17	2A3	3:4 to 1	T-15D78 or T-19D03	T-15D82	1:1.25
HY-57	110	800	-9	9,000	T-11M76 or T-19M17	2A3	5:1	T-15D79 or T-19D04	T-15D82	1:1.75
HY-51A	180	1000	-35	7,000	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
HY-51B	180	1000	-35	7,000	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
<b>AMPEREX TUBES</b>										
HF-100	260	1500	-52	12,000	T-11M77	2A3	3.2:1	T-15D78 or T-19D03	T-15D82	1:1.25
HF-100	350	1750	-62	16,000	T-11M78	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
ZB-120	150	750	0	4,800	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
ZB-120	200	1000	0	6,900	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
ZB-120	245	1250	0	9,000	T-11M77 or T-19M17	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:1.75
ZB-120	300	1500	-9	11,200	T-11M77	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
HF-200	500	2000	-100	11,200	T-11M78	2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:1.75
HF-200	500	2500	-130	16,000	T-11M78	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HF-200	600	2500	-130	16,000	T-11M78	2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:1.75
HF-200	500	2000	-100	11,200	T-11M78	**6L6	2.5:1	T-15D84	T-15D82	1:1.75
HF-200	600	2500	-130	16,000	T-11M78	**6L6	2.5:1	T-15D84	T-15D82	1:1.75
<b>HEINTZ &amp; KAUFMAN GAMMATRON TUBES</b>										
HK-24	45	500	0	6,400	T-11M75 or T-19M15	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:1.75
HK-24	105	1000	-29	15,000	T-11M76 or T-19M16	2A3	3.2:1	T-15D78 or T-19D03	T-15D82	1:1.25
HK-54	170	1250	-35	12,500	T-11M77 or T-19M17	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
HK-54	200	1500	-45	16,800	T-11M77 or T-19M17	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
HK-154	200	1000	-155	7,500	T-11M77 or T-19M17	2A3	1.4:1	T-15D76 or T-19D01	T-15D82	1:2.25
HK-154	223	1250	-210	11,400	T-11M77 or T-19M17	2A3	1.2:1	T-15D76 or T-19D01	T-15D82	1:2.75
HK-254	240	1500	-40	10,000	T-11M77 or T-19M17	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HK-254	328	2000	-65	16,000	T-11M78	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HK-254	418	2500	-80	22,000	T-11M78	2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:1.75
HK-354	100	1000	-60	15,000	T-11M76 or T-19M16	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25
HK-354	220	1500	-100	15,000	T-11M77 or T-19M17	2A3	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HK-354	400	2000	-150	15,000	T-11M78	2A3	1.4:1	T-15D76 or T-19D01	T-15D82	1:2.25
354E	319	1500	-25	10,000	T-11M77	4-2A3	2.25:1	T-15D81	T-15D83	1:1.25
354E	472	2000	-37.5	11,000	T-11M78	4-2A3	2:1	T-15D80	T-15D83	1:1.25
354E	595	2500	-50	16,000	T-11M78	4-2A3	1.75:1	T-15D80	T-15D83	1:1.4
354F	290	1500	-15	12,000	T-11M77	4-2A3	2.75:1	T-15D81	T-15D83	1:1.85
354F	445	2000	-22.5	12,000	T-11M78	4-2A3	2.5:1	T-15D81	T-15D83	1:1.85
<b>WESTERN ELECTRIC TUBES</b>										
242A, 261A, 276A	Same as R.C.A. 211									

NOTE: This ratio is correct only when the tubes supplying power to the 500 ohm line are of the same type and operated under the same conditions as the driver tubes listed under "P.P. Driver Tubes." 2A3 driver tubes are operated with 300 plate volts, self biased, unless preceded by †. 45 driver tubes are operated with 275 plate volts, self biased, unless preceded by \*. †2A3 driver tubes are operated with 300 plate volts, fixed bias. \*45 driver tubes are operated with 250 plate volts, self biased. \*\*6L6's with 16.6N feed-back, 400 volts plate, 300 volts screen.

See Pages 11 and 16 for modulation transformers.



Fig. 3S



Fig. 3T

Thordarson Tru-Fidelity transformers are definitely a high quality group. Such features as balanced "hum bucking" coils, special high permeability cores, heavy cast cases, one hole swivel mounting and extremely wide frequency range recommend them to engineers who demand the best.

### CRYSTAL MICROPHONE OR PHOTO CELL TO LINE

Type No.	List Price	Pri. Ohms	Sec. Ohms	Max. D.C. per side (M.A.)	Max. D.C. un-balance (M.A.)	Max. Sig. Level (db)	Mtg. Fig.	Dimensions			Wt. Lbs.
								W.	D.	H.	
T-90A06	\$18.00	250,000/62,500	†500*/333/250/ 200*/125/50	0	0	+10	3T	3 1/8	2 1/2	4 1/8	4 3/4

### PLATE TO LINE (LOW LEVEL)

T-90A02	17.50	20,000/5000 Single Plate	†500*/333/250/ 200*/125/50	8	8	+15	3T	3 1/8	2 1/2	4 1/8	5
T-90A01	16.50	20,000/5000 Single† or P-P Plates	†500*/333/250/ 200*/125/50	10	0	+20	3T	3 1/8	2 1/2	4 1/8	4 1/2

†With single tube use parallel feed with resistor or T-90C09.

### MIXER

T-90A10	16.00	500*/333/250 200*/125/50	†500*/333/250/ 200*/125/50	100	.5	+10	3T	3 1/8	2 1/2	4 1/8	4 3/4
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### LINE TO GRID

T-90A00	17.00	500*/333/250 200*/125/50	75,000/18,750 Single Grid	100	.5	+10	3T	3 1/8	2 1/2	4 1/8	4
T-90A11	20.00	500*/333/250 200*/125/50	150,000/37,500 P-P Grids	100	.5	+20	3T	3 1/8	2 1/2	4 1/8	4

### INTERSTAGE

T-90A03	15.00	10,000/2500 Single Plate	Ratio-overall 1 to 2	40,000/10,000 Single Grid	0	0	+15	3T	3 1/8	2 1/2	4 1/8	4 1/2
T-90A04	15.00	10,000/2500 Single Plate	Ratio-overall 1 to 2	40,000/10,000 P-P Grids	0	0	+15	3T	3 1/8	2 1/2	4 1/8	4 3/4
T-90A05	16.50	20,000/5000 P-P Plates	Ratio-overall 1 to 1 1/2	45,000/11,250 P-P Grids	10	0	+20	3T	3 1/8	2 1/2	4 1/8	4 3/4

### OUTPUT

T-90S07	18.00	5000/3000/1250/750 P-P 2A3, etc.	†500*/333/250/ 200*/125/50	60	5	+32	3T	3 1/8	2 1/2	4 1/8	4 3/4
T-90S08	17.50	5000/3000/1250/750 P-P 2A3, etc.	15/10/7.5/ 5/3.75/1.25	60	5	+32	3T	3 1/8	2 1/2	4 1/8	4 3/4
T-90S13	20.00	5000/3000/1250/750 P-P 2A3, etc.	†500*/333/250/ 200*/125/50 or 15/10/7.5/ 5/3.75/1.25	60	5	+34	3S	4	3 7/8	4 7/8	11

### LINE TO VOICE COIL

T-90S12	14.00	500*/333/250 200*/125/50	15/10/7.5/ 5/3.75/1.25	0	0	+32	3T	3 1/8	2 1/2	4 1/8	4 3/4
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### PLATE REACTOR

Type No.	List Price	Connection	Henries	M.A.	D.C. Ohms	Mtg. Fig.	Dimensions			Wt. Lbs.
							W	D.	H.	
T-90C09	\$12.50	Series Parallel	300 75	8 16	4,000 1,000	3T	3 1/8	2 1/2	4 1/8	4 1/2

\*Indicates inductive and capacitive balance to center tap for use on balanced transmission lines.

†Frequency response warranted on 500 and 200 ohm taps

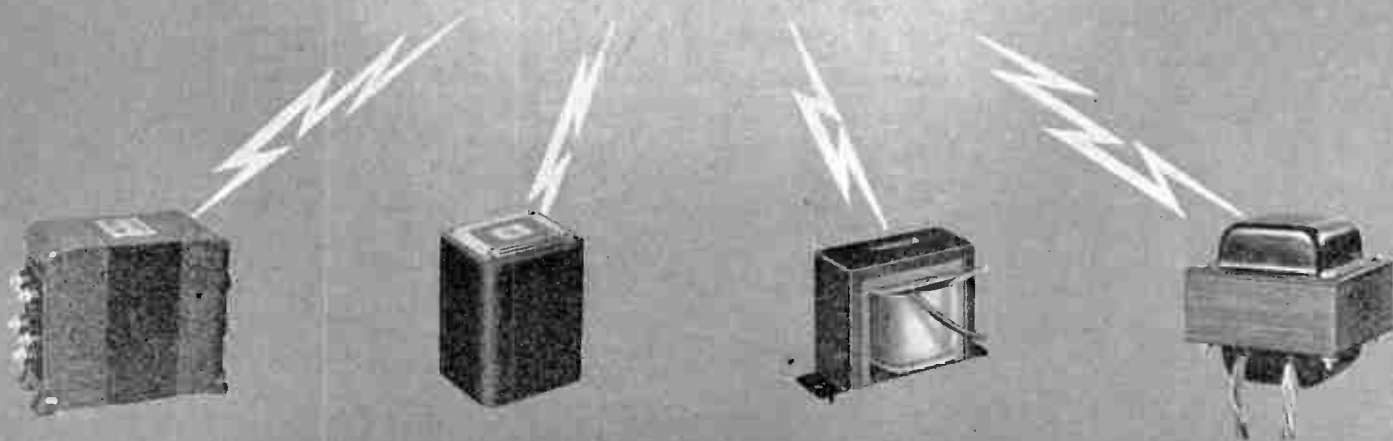
Other audio transformers are listed on pages 6, 7, 15 and 19.



# THORDARSON

**Complete Transformer Catalog No. 400-D**

**1940 • SPRING-SUMMER • 1940**



**THORDARSON ELECTRIC MFG. CO.**

**500 W. HURON ST., CHICAGO, ILL.**

*Demand "Power by Thordarson"*



# INDEX—WITH LIST PRICES (EFFECTIVE JAN. 1. 1940)

(SEE BACK COVER FOR CLASSIFIED INDEX)

**Catalog prices are list, subject to trade discount. Add 60% for 25 cycle 115 v. primary; 30% for 230 v. 60 cycle primary.**

The letter separating the first two digits of the type number from the last two indicates the classification of the unit. The following legend will further explain:

A = Audio, D = Driver, K = Foundation Unit, P = Plate, S = Output or Speaker, W = Wired Amplifier.  
 C = Choke, F = Filament, M = Modulation, R = Power, V = Voltage Changer.

Type No.	Page No.	List Price	Type No.	Page No.	List Price	Type No.	Page No.	List Price	Type No.	Page No.	List Price	Type No.	Page No.	List Price	Type No.	Page No.	List Price
T-9V30	15	\$40.00	T-14R50	9	\$15.00	T-15D87	16	\$11.00	T-19P62	12	\$22.50	T-57A41	7	\$ 3.00	T-72S58	9	\$ 1.65
T-9V31	15	65.00	T-14C51	9	8.00	T-15S90	18	9.25	T-19P63	12	23.00	T-57A42	7	3.25	T-72A59	9	1.65
T-9V32	15	100.00	T-14C61	6	1.05	T-15S91	18	11.50	T-19P64	12	28.50	T-57C51	6	1.50	T-73M52	11	18.00
T-9V33	15	175.00	T-14C62	6	1.05	T-15S92	18	13.75	T-19P65	12	29.50	T-57C52	6	1.75	T-73F60	13	3.75
R-1068	6-23	2.50	T-14C63	6	1.05	T-15S93	18	15.00	T-19P66	12	35.00	T-57C53	6	2.00	T-74F23	13	5.00
T-11K16	24	3.00	T-14C64	6	1.05	T-15S94	18	17.50	T-19P67	12	42.50	T-57C54	6	2.25	T-74F24	13	7.00
T-11K17	24	2.00	T-14C70	6	2.50	T-15S96	18	11.00	T-19P68	12	50.00	T-58A37	15	2.25	T-74R28	4	6.50
T-11K19	24	2.25	T-14S80	9	2.00	T-15S97	18	14.50	T-19P69	12	13.00	T-58A70	7	3.25	T-74C29	6	3.75
T-11K20	24	2.00	T-14S81	8	1.25	T-16C07	6	2.25	T-19F76	13	4.75	T-58S72	8	3.75	T-74C30	6-24	1.50
T-11F50	17	9.00	T-14S82	8	1.25	T-17C00-B	6	2.75	T-19F77	13	7.00	T-60S48	9	3.00	T-74A31	6-7	3.25
T-11F51	17	9.50	T-14S83	8	1.25	T-17D01	7	2.00	T-19F78	13	5.25	T-60R49	3	2.25	T-74D32	10	3.50
T-11F52	17	13.25	T-14S84	8	1.25	T-17A02	7	2.25	T-19F79	13	6.75	T-60P95	12	8.00	T-75D10	10	5.50
T-11F53	17	8.00	T-14A90	15	2.50	T-17D03	10	4.50	T-19F80	13	1.25	T-61S25	9	3.25	T-75M11	11	20.00
T-11F54	17	16.00	T-14A91	15	2.50	T-17D04	10	4.50	T-19F81	13	1.50	T-61S26	9	3.50	T-75F25	13	5.50
T-11F55	17	11.50	T-14A92	7	1.25	T-17S10	8	3.00	T-19F82	13	5.75	T-61D40	10	5.50	T-75R47	4	3.75
T-11F56	17	7.75	T-14D93	7	1.75	T-17S11	8	4.50	T-19F83	13	2.25	T-61F85	13	2.00	T-75C49	6	1.50
T-11F57	17	13.75	T-15R00	18	10.50	T-17S12	8	4.50	T-19F84	13	2.75	T-61A94	15	3.25	T-75R50	4	7.50
T-11F58	17	15.00	T-15R01	18	15.00	T-17S13	8	6.00	T-19F85	13	3.25	T-61A96	15	3.00	T-75C51	6	5.00
T-11F59	17	5.75	T-15R02	18	13.25	T-17S14	8	6.00	T-19F86	13	6.00	T-62P57	12	7.50	T-75A73	15	2.25
T-11F60	17	6.25	T-15R03	18	13.75	T-17S15	8	6.50	T-19F87	13	6.25	T-62D65	15	6.00	T-75A74	7	2.50
T-11F61	17	18.50	T-15R04	19	4.75	T-17S16	8	12.00	T-19F88	13	1.75	T-62P82	12	22.50	T-75S75	8	4.00
T-11F62	17	6.75	T-15R05	19	10.50	T-17S17	9	6.50	T-19F89	13	2.25	T-63C15	12	7.50	T-76S74	9	3.00
T-11F63	17	8.00	T-15R06	19	9.75	T-17R30	4	8.50	T-19F90	13	3.00	T-63R62	3	3.00	T-77R63-A	4	3.75
T-11F64	17	9.50	T-15R07	19	10.50	T-17R31	4	12.50	T-19F91	13	2.25	T-63R63	3	3.50	T-78D46	7	1.50
T-11M69	16	5.50	T-15R08	19	13.75	T-17R32	10	10.00	T-19F92	13	3.25	T-63A71	15	3.75	T-79F84	13	4.75
T-11M70	16	7.50	T-15P11	18	12.50	T-17R33	10	12.50	T-19F93	13	2.25	T-63A72	15	3.75	T-80D54	10	5.50
T-11M71	16	13.00	T-15P12	18	15.00	T-17C40	10	4.75	T-19F94	13	3.00	T-63A73	15	3.25	T-80R92-C	4	7.50
T-11M74	16	9.00	T-15P13	18	20.00	T-17S57	9	2.25	T-19F95	13	2.75	T-63F99	13	3.25	T-81S01	8	1.50
T-11M75	16	12.50	T-15P14	18	25.00	T-17M59	11	3.00	T-19F96	13	3.50	T-64C06	12	10.00	T-81C15	6	2.50
T-11M76	16	19.50	T-15P15	18	30.00	T-18V00	14	10.50	T-19F97	13	1.75	T-64C07	12	12.50	T-81D42	10	3.25
T-11M77	16	30.00	T-15P16	18	45.00	T-18V01	14	19.50	T-19F98	13	2.75	T-64F13	13	2.75	T-81D52	10	3.50
T-11M78	16	60.00	T-15P17	18	32.50	T-18V03	14	6.25	T-19F99	13	3.50	T-64F14	13	4.75	T-82M09	11	20.00
T-13R00	3	4.00	T-15P18	18	60.00	T-18V04	14	7.75	T-23A57	15	2.25	T-64F16	13	10.50	T-82V11	14	12.50
T-13R01	3	2.50	T-15P19	18	50.00	T-18V05	14	10.50	T-26V04	14	4.50	T-64F17	13	8.00	T-82V12	14	17.50
T-13R02	3	3.25	T-15P20	18	85.00	T-18V06	14	6.00	T-29C27	6	1.50	T-64D22	10	4.50	T-82V13	14	22.50
T-13R03	3	3.50	T-15P21	18	80.00	T-18V07	14	13.50	T-29A99	7	1.75	T-64M25	11	6.00	T-82M25	11	40.00
T-13R04	3	4.25	T-15P22	18	50.00	T-18V10	14	3.00	T-30A20	15	3.00	T-64M26	11	6.00	T-83D21	15	3.50
T-13R05	3	4.00	T-15C36	17	8.00	T-18V20	14	5.00	T-33A91	7	2.00	T-64F33	13	4.50	T-83M22	11	9.00
T-13R06	3	5.25	T-15C37	17	10.00	T-18V21	14	6.00	T-33S99	8	1.50	T-65A73	15	2.75	T-83R77-A	4	3.25
T-13R07	3	5.50	T-15C38	17	12.00	T-18V22	14	7.50	T-37C36	6	2.00	T-65S94	8	4.00	T-83A78	15	2.00
T-13R08	3	4.50	T-15C39	17	22.00	T-18V23	14	12.00	T-37R70-C	3	7.50	T-66D98	10	4.75	T-83R82	4	10.00
T-13R09	3	6.50	T-15C41	17	26.50	T-18C92	6	1.50	T-43C92	6	1.65	T-67A45	15	3.25	T-83S84	8	6.00
T-13R11	3	2.50	T-15C45	17	8.00	T-19D01	10	6.00	T-44C02	6	1.50	T-67C46	6	1.75	T-83R85	4	12.00
T-13R12	3	3.25	T-15C46	17	10.00	T-19D02	10	6.00	T-47V01	14	6.00	T-67D47	10	2.50	T-83S87	8	9.00
T-13R13	3	4.00	T-15C47	17	12.00	T-19D03	10	6.00	T-47V02	14	9.75	T-67S48	8	3.50	T-84S58	8	6.00
T-13R14	3	4.25	T-15C48	17	22.00	T-19D04	10	6.00	T-47V03	14	21.75	T-67C49	6	2.75	T-84D59	10	3.50
T-13R15	3	5.75	T-15C50	17	26.50	T-19D05	10	6.00	T-47V04	14	35.00	T-67D50	10	2.75	T-84P60	12	7.75
T-13R16	3	6.50	T-15C52	19	5.00	T-19D06	10	3.00	T-47C07	6	1.65	T-67S51	8	3.50	T-84M70	11	10.00
T-13R17	3	4.00	T-15C53	19	5.50	T-19M13	11	4.00	T-47A25	7	1.75	T-67S52	8	4.00	T-84R81-C	4	3.50
T-13R18	3	4.50	T-15C54	19	5.50	T-19M14	11	7.00	T-49R00	3	3.00	T-67S53	8	6.00	T-86A02	15	1.75
T-13R19	3	2.35	T-15C55	19	7.00	T-19M15	11	10.00	T-49C91	6	1.50	T-67S54	8	4.00	T-86A03	7	2.00
T-13C26	6	.90	T-15C56	19	9.00	T-19M16	11	15.00	T-50R02	3	2.50	T-67S60	8	2.50	T-87R85	4	7.00
T-13C27	6	1.10	T-15R60	18	9.50	T-19M17	11	24.00	T-50R03	3	3.50	T-67M69	11	2.75	T-89R28	4	11.00
T-13C28	6	1.20	T-15R61	18	10.50	T-19M21	11	7.00	T-50V11	14	7.50	T-67M73	11	3.50	T-89S68	8	6.50
T-13C29	6	1.60	T-15R62	18	12.50	T-19M22	11	10.00	T-50F61	13	1.50	T-67M74	11	1.50	T-89S74	8	3.75
T-13C30	6	2.00	T-15A65	16	10.50	T-19R30	13	7.75	T-51D00	10	4.50	T-67D78	10	3.00	T-89S75	8	4.00
T-13A34	7	1.35	T-15A66	19	7.25	T-19R31	10	5.50	T-52C98	6	1.75	T-67D89	10	3.00	T-90A00	22	17.00
T-13A35	7	1.50	T-15A67	19	8.00	T-19R32	10	7.25	T-53C19	6	1.50	T-67A91	7	3.00	T-90A01	22	16.50
T-13A36	7	1.75	T-15A68	19	8.00	T-19C35	12	4.00	T-53S81	9	4.00	T-67S92	8	4.00	T-90A02	22	17.50
T-13S37	8	1.25	T-15A69	19	7.25	T-19C36	12	6.50	T-54P48	12	6.50	T-67R93	4	7.50	T-90A03	22	15.00
T-13S38	9	1.50	T-15A70	19	7.50	T-19C37	12	10.00	T-54D63	10	2.25	T-67R97	4	4.25	T-90A04	22	15.00
T-13S39	8	1.25	T-15A71	19	7.25	T-19C38	12	14.00	T-54F66	13	3.25	T-68S06	8	2.50	T-90A05	22	16.50
T-13S40	8	1.50	T-15A72	19	7.25	T-19C39	12	3.25	T-55R14	4	7.50	T-68C07	6	2.00	T-90A06	22	18.00
T-13S41	9	2.75	T-15A73	19	6.50	T-19C42	12	4.00	T-55A15	15	2.25	T-68C08	6	1.75	T-90S07	22	18.00
T-13S42	9	1.50	T-15A74	19	6.50	T-19C43	12	6.50	T-55A16	15	2.75	T-68R26	4	6.75	T-90S08	22	17.50
T-13S43	8	1.35	T-15A75	19	7.00	T-19C44	12	10.00	T-56R01	3	5.50	T-69R35	4	6.50	T-90C09	22	12.50
T-14A29	7	2.25	T-15D76	16	8.25	T-19C45	12	14.00	T-56R02	3	4.00	T-70R20	3	2.75	T-90A10	22	16.00
T-14R32	24	6.50	T-15D77	16	8.25	T-19C46	12	3.25	T-56R03	3	5.50	T-70R21	3	3.50	T-90A11	22	20.00
T-14R33	4	2.75	T-15D78	16	8.25	T-19P54	12	5.75	T-56R04	3	5.00	T-70F46	13	7.75	T-90S12	22	14.00
T-14R34	4	3.25	T-15D79	16	8.25	T-19P55	12	7.50	T-56R05	3	5.75	T-70R61	3	4.00	T-90S13	22	20.00
T-14R35	4	3.75	T-15D80	16	11.50	T-19P56	12	8.00	T-57S01	9	2.00	T-70R62	3	5.50	T-92F20	13	4.75
T-14R36	4	4.25															

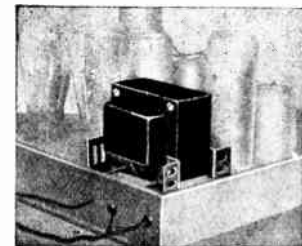
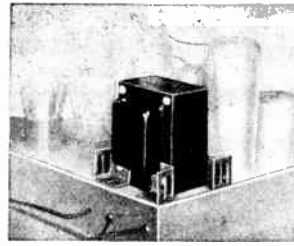
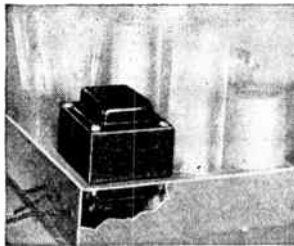


# REPLACEMENT POWER TRANSFORMERS

# THORDARSON

## UNIVERSAL DUPLICATE POWER TRANSFORMERS — "13R" Series

Thordarson "13R" Series Power Transformers are favored by servicemen in all parts of the world. There is a type for practically every receiver listed in Riders Manuals. Specific recommendations are shown in Thordarson Replacement Transformer Encyclopedia and Service Guide No. 352-E.



MOUNTING FIGURE 3A permits mounting in flush, vertical or horizontal position as shown in these photographs. Adjustable mounting brackets are furnished.

Other quality features include: Electrostatic shields between primary and secondary windings; double shells to protect the coil from mechanical injury and to provide magnetic shielding; 10-inch RMA Color Coded Leads. Primary 110-120 volts 50-60 cycles.

Type No.	List Price	Pri. V.A.	Secondary		Filament Windings			Dimensions			Wt. Lbs.		
			A.C. Volts	D.C. M.A.	Rect. Fil.	Fil. No. 1	Fil. No. 2	Fil. No. 3	W.	D.		H.	
T-13R19	\$2.35	45	480 Ct.	40	5V-2A	6.3V-2A Ct.				2 1/2	2 5/8	2 5/8	2 1/2
T-13R11	2.50	60	580 Ct.	50	5V-3A	6.3V-2A Ct.				2 1/2	2 5/8	3	3 1/4
T-13R12	3.25	65	700 Ct.	70	5V-3A	6.3V-2.5A Ct.				2 1/2	3 1/8	3	3 1/4
T-13R13	4.00	90	700 Ct.	90	5V-3A	6.3V-3.5A Ct.				3 1/8	3 3/8	3 3/4	5 1/4
T-13R14	4.25	115	700 Ct.	120	5V-4A	6.3V-4.7A Ct.				3 1/8	3 1/2	3 3/4	5 1/4
T-13R15	5.75	140	750 Ct.	150	5V-4A	6.3V-5A Ct.				3 3/4	3 3/8	4 1/2	6 1/2
T-13R16	6.50	180	800 Ct.	200	5V-4A	6.3V-5.14A Ct.				3 3/4	3 5/8	4 1/2	7 3/4
T-13R17	4.00	85	600 Ct.	60	5V-3A	6.3V-2.5A Ct.	2.5V-7.5A Ct.			2 5/8	3 5/8	3 3/8	4 1/2
T-13R18	4.50	115	700 Ct.	90	5V-3A	6.3 tapped at 2.5V-3.5A Ct.	2.5V-9A Ct.			3 3/4	3 1/4	4 1/2	5 3/4
T-13R08	4.50	105	700 Ct.	90	5V-3A	6.3V-3.3A Ct.	2.5V-6A Ct.			3 1/8	3 1/2	3 3/4	5 1/4
T-13R09	6.50	160	750 Ct.	180	5V-3A	6.3V-3.3A Ct.	2.5V-6A Ct.			3 3/4	3 9/16	4 1/2	7 1/2
T-13R00	4.00	70	550 Ct.	70	5V-3A	5V-.5A Ct.	2.5V-10.5A Ct.			2 5/8	3 3/8	3 3/8	4
T-13R01	2.50	60	650 Ct.	40	5V-3A	2.5V-4A Ct.				2 1/2	2 5/8	3	3 1/4
T-13R02	3.25	60	700 Ct.	50	5V-3A	2.5V-7.25A Ct.				2 1/2	2 5/8	3	3 1/4
T-13R03	3.50	75	700 Ct.	70	5V-3A	2.5V-9A Ct.				2 5/8	3 5/8	3 3/8	4
T-13R04	4.25	115	700 Ct.	100	5V-3A	2.5V-12.5A Ct.				3 1/8	3 1/2	3 3/4	5 1/4
T-13R05	4.00	110	700 Ct.	70	5V-3A	2.5V-9A Ct.	2.5V-3.5A Ct.			3 1/8	3 1/2	3 3/4	5 1/4
T-13R06	5.25	130	700 Ct.	120	5V-3A	2.5V-12.5A Ct.	2.5V-3.5A Ct.			3 3/4	3 3/8	4 1/2	6 1/2
T-13R07	5.50	140	800 Ct.	110	5V-3A	2.5V-15A Ct.	2.5V-3.5A Ct.			3 3/4	3 1/2	4 1/2	6 3/4

## OTHER REPLACEMENT POWER TRANSFORMERS

Case style 2H — Half shell or flush mounting. Terminal lug identification printed on coil label.

T-60R49	\$2.25	30	560 Ct.	30	5V-2A	2.5V-3.5A Ct.				3	2 1/2	2 3/8	2
T-49R00	3.00	65	700 Ct.	70	5V-2A	2.5V-8.5A Ct.				3 7/8	3 1/4	3 3/8	4 1/2
T-63R62	3.00	65	700 Ct.	70	5V-2A	2.5V-7A Ct.	2.5V-1.5A Ct.			3 7/8	3 1/4	3 5/8	4 1/2
T-50R02	2.50	40	620 Ct.	40	5V-2A	2.5V-5A Ct.				3 1/2	3	3	3 1/4
T-50R03	3.50	75	700 Ct.	80	5V-2A	2.5V-12A Ct.				3 7/8	3 1/4	3 5/8	5 1/2
T-63R63	3.50	75	700 Ct.	80	5V-2A	2.5V-9A Ct.	2.5V-3A Ct.			3 7/8	3 1/4	3 5/8	5 1/4
T-70R20	2.75	45	600 Ct.	50	5V-2A	6.3V-2A Ct.				3 3/8	2 7/8	3	3
T-70R21	3.50	70	700 Ct.	70	5V-2A	2.5V-4A Ct.	6.3V-3A Ct.			3 7/8	3 1/4	3 3/8	4 1/4

Case style 2G — Fully shielded upright mounting with leads brought out through base. Knock out holes provide optional above panel connection.

T-56R01	\$5.50	60	650 Ct.	70	5V-2A	2.5V-3A Ct.	1.5V-1A 1.5V-4A	5V-.5A Ct.		3 3/8	3 3/4	4 5/8	5 3/4
(Primary — 110 volts 50-60 cycles)													
T-56R02	4.00	70	700 Ct.	70	5V-2A	2.5V-9A Ct.	2.5V-1.5A Ct.			3 3/4	3 3/4	4 5/8	6
T-56R03	5.50	85	700 Ct.	105	5V-3A	2.5V-3A Ct.	2.5V-1.75A Ct.	1.5V-5A 1.5V-1A		3 3/4	3 3/4	4 7/8	7 1/4
T-56R04	5.00	90	700 Ct.	105	5V-3A	2.5V-12A Ct.				3 3/4	3 3/4	5	7 1/2
(Primary 110 volts 50-60 cycles)													
T-56R05	5.75	115	700 Ct.	110	5V-3A	2.5V-9A Ct.	2.5V-3A Ct.	2.5V-3A Ct.		3 3/4	3 3/4	4 7/8	7 3/4
T-37R70-C	7.50	95	700 Ct.	80	5V-2A Ct.	3V-10A Ct.	5V-2.5A Ct.			3 3/8	4	4 5/8	6 3/4
For Sparton Models 235, 589, 593, 600 Series, 737, 931.													
T-70R78	3.25	60	680 Ct.	55	5V-2A	6.3V-1.5A Ct.				3 3/8	3	4 5/8	4
T-70R61	4.00	60	770 Ct.	70	5V-2A	6.3V-2.5A Ct.				3 3/8	3 1/4	4 5/8	4 3/4
T-70R62	5.50	110	700 Ct.	145	5V-3A	6.3V-4.5A Ct.				3 3/4	3 7/8	4 7/8	8 1/2

Other Power Transformers are listed on pages 4 and 19.





## POWER TRANSFORMERS — AMPLIFIER, TRANSMITTER AND GENERAL PURPOSE

For continuous duty applications in high quality receivers, amplifiers or for low power stages of transmitters and many similar applications. Primary 115 volts 50-60 cycles.



Fig. 2G

Type No.	List Price	Pri. V.A.	Secondary		Bias Tap	Rect. Fil.	Fil. No. 1	Fil. No. 2	Mtg. Fig.	Dimensions			Wt. Lbs.
			A.C. Volts	D.C. M.A.						W.	D.	H.	
T-75R47	\$3.75	75	610 Ct.	125		5V-2A	6.3V-2A Ct.		2H	3 7/8	3 1/4	3 5/8	6
T-84R81-C-	3.50	70	720 Ct.	70		5V-2A	6.3V at 2.65A		2G	3 1/4	3 1/4	3 7/8	4 3/8
T-77R63-A-	3.75	75	750 Ct.	75		5V-2A	6.3V at 2.2A		2G	3 1/4	3 1/2	4 5/8	4 7/8
T-83R77-A-	3.25	65	660 Ct.	70		5V-2A Ct.	6.3V at 2.2A		2G	2 3/4	3 1/2	3 1/2	4
T-80R92-C-	7.50	160	840 Ct.	200		5V-3A	2.5V at 3A Ct.	2.5V at 1.5A	2G	3 1/2	4 5/8	4 3/4	9 1/4
T-92R21	7.50	150	800 Ct.	200		5V-3A	6.3V-5A Ct.		2G	3 3/4	4 1/4	4 7/8	9
T-17R30	8.50	200	740 Ct.	280		5V-3A	6.3V-7A Ct.		2G	3 3/4	3 1/2	4 7/8	9 1/2
T-17R31	12.50	300	860 Ct.	325		5V-6A	6.3V-8A Ct.		2G	3 3/4	5 1/4	4 7/8	13 1/2
T-74R28	6.50	105	880 Ct.	125	38V	5V-3A 2.5V-3A	6.3V-3.3A Ct.		2G	3 3/4	3 3/4	4 7/8	8
T-87R85	7.00	145	660 Ct.	160	77V	5V-3A 5V-2A	6.3V-2A Ct.	2.5V-5A Ct.	2G	3 3/4	3 7/8	4 7/8	8 1/2
T-68R26	6.75	160	1100 Ct.	150		5V-3A	7.5V-2.5A Ct.	2.5V-5A Ct.	2G	3 3/4	4 3/8	4 7/8	10 1/8
T-69R35	6.50	135	775 Ct.	200		5V-3A	6.3V-3A Ct.		2G	3 3/4	4 3/8	4 7/8	9 1/2
T-75R50	7.50	160	870 Ct.	250	80V	5V-3A 2.5V-3A	6.3V-1.5A Ct.	2.5V-10A Ct.	2G	3 3/4	4 3/8	4 7/8	10 1/2
T-83R82	10.00	200	1480 Ct.	140	150V	5V-3A 2.5V-3A	7.5V-2.5A Ct.		2G	3 3/4	4 3/4	4 7/8	11 1/2
T-83R85	12.00	290	1480 Ct.	200	150V	5V-3A 2.5V-3A	7.5V-5A Ct.		2G	3 3/4	5 1/4	4 7/8	13 1/2
T-89R28	11.00	250	1100 Ct.	275		5V-3A Ct. 5V-2A Ct.	6.3V-6A Ct.		2G	3 3/4	5 1/4	4 7/8	15
T-55R14-	7.50	150	930 Ct.	150		5V-3A	2.5V-5A Ct.	2.5V-2A Ct.	2G	3 3/4	4 1/4	5	9 1/4
T-67R93-	7.50	135	700 Ct.	200		5V-3A 5V-2A	2.5V-15A Ct.	5V-2A	2G	3 3/4	4 3/8	5	10

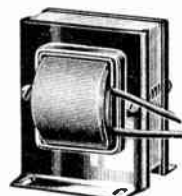


Fig. 3C

### SPEAKER-FIELD SUPPLY TRANSFORMERS

T-67R97	4.25	55	115 V.D.C.	50 to 250	5V-3A			2G	3 7/8	3 1/4	3 1/4	4 3/4
T-92R53	5.75	120	300 V.D.C.	200	5V-3A			2G	3 7/8	3 7/8	3 1/4	6 1/4

### SIX VOLT VIBRATOR TRANSFORMERS

These transformers, while primarily designed for replacements using original mounting brackets, are equipped with mounting feet for use in experimental or original equipment.

Type No.	List Price	Secondary		Mtg. Fig.	Dimensions			Wt. Lbs.
		D.C. Volts to Filter	M.A.		W.	D.	H.	
T-14R33	\$2.75	225	40	3C	2 1/2	2 3/8	3 1/8	2
T-14R34	3.25	250	50	3C	2 1/2	2 1/2	3 1/8	2 1/4
T-14R35	3.75	260	60	3C	2 1/2	2 5/8	3 1/8	2 1/2
T-14R36	4.25	285	75	3C	2 1/2	2 7/8	3 1/8	3
T-14R37	4.75	350	75	3C	2 1/2	3 1/8	3 1/8	3 1/2
T-14R38	5.25	320	100	2G	3 3/4	3 1/4	4 5/8	5
T-14R39	2.75	150	40	2B	2	2	2 3/8	1 1/4

### 115 V. 50-60 CYCLE OR 6 V. D. C. VIBRATOR TRANSFORMER

T-14R40	6.50	350 Fil.-6.3 Ct.	135 4.75 Amp.	2G	3 3/4	4	5	8 1/2
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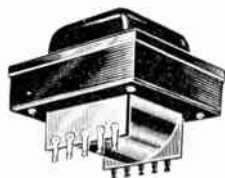


Fig. 2H

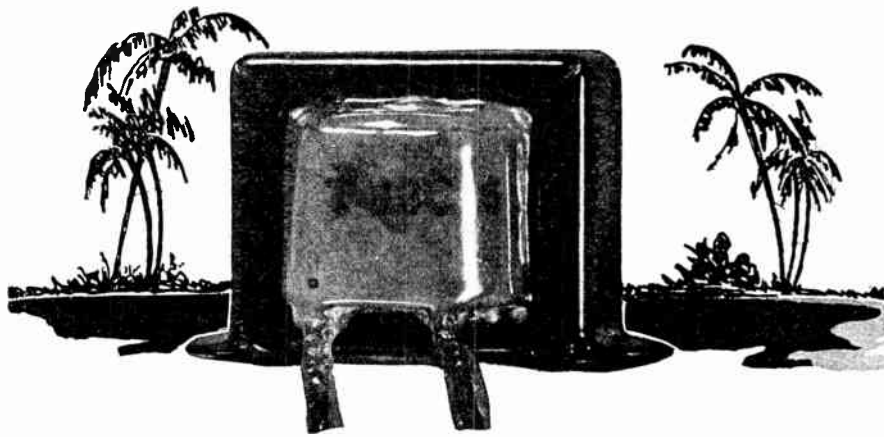


Fig. 2B



Thordarson Replacement Transformer Encyclopedia and Service Guide No. 352-E—FREE—Recommends proper transformer and choke replacement for receivers listed in Rider's Manuals. This handy, useful time-saver, originated by Thordarson is now used by good service engineers the world over. In addition, it contains a new edition of the popular Service Guide giving practical everyday solutions to service problems, including useful charts and tables.





# THORDARSON TROPEX TRANSFORMERS

## Protected Against Excessive Moisture, Salt Air, Tropical Climates

**I**N THE Thordarson TROPEX Transformers Thordarson engineers have won the battle against the corrosive and destructive effects of moisture, high humidity and salt air as found in tropical or coastal countries and regions with heavy rainfall. The TropeX process encloses the entire transformer, fully protecting the fine wire windings against the elements that shorten the life of a transformer through electrolysis.

TropeX finish is practically colorless, neat appearing and clean to handle. It is the answer to the transformer problems of servicemen in territories affected by adverse climatic conditions, especially excessive moisture.

The TropeX process can be applied to practically any open mounting type transformer. Listed on this page are the popular replacement audios and chokes in TropeX finish. You will recognize the type numbers as being standard Thordarson items with the suffix "X" which designates TropeX finish. When ordering, be sure to include this suffix "X" on each item where you desire TropeX finish. Write factory for information and prices on types not shown in this listing.

The additional cost for THORDARSON TROPEX transformers is surprisingly small. The following table has been compiled to enable you to easily determine what this price increase will be by merely referring to the weight of the transformer as listed.

WEIGHT OF TRANSFORMER	ADD TO LIST PRICE
Up to 3/8 lbs.	20c
From 1 lb. to 1 1/8 lbs.	25c
From 2 lbs. to 2 1/8 lbs.	40c
From 3 lbs. to 4 1/8 lbs.	50c
From 5 lbs. to 6 1/8 lbs.	60c
Over 7 lbs.	10c per lb.

### TROPEX REPLACEMENT AUDIO TRANSFORMERS

Type No.	Application	List Price
T-13A34-X	10,000 ohm plate to single grid	\$1.55
T-29A99-X	10,000 ohm plate to single grid	2.00
T-13A35-X	10,000 ohm plate to P.P. grids	1.70
T-33A91-X	10,000 ohm plate to P.P. grids	2.25
T-13A36-X	P.P. 10,000 ohm plates to P.P. grids	2.00
T-78D46-X	Single 30 to class B 19, 1J6G, or 30's	1.70
T-17D01-X	Single 6F6 etc., to 2-6F6, etc.	2.25

### TROPEX OUTPUT TRANSFORMERS

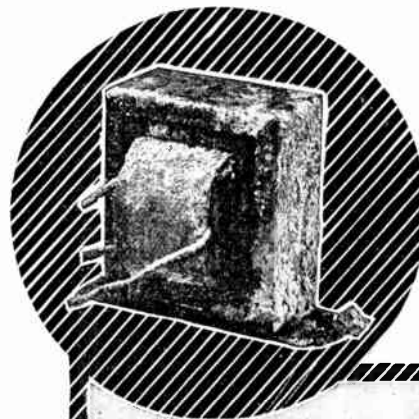
Type No.	Application	List Price
T-13S37-X	Single 6F6, 42, 2A5 etc. to voice coil	\$1.45
T-13S39-X	Single 45, 1-2A5 etc. to voice coil	1.45
T-13S40-X	P.P. 6F6, 42, 2A5 etc. to voice coil	1.70
T-33S99-X	P.P. 45, 71A, 43 etc. to voice coil	1.75
T-81S01-X	Class B 19, 1J6G, 30's etc. to voice coil	1.70
T-13S43-X	Single 1F4, 1D4, 1F5G etc. to voice coil	1.55
T-14S81-X	Single 6FC, 2A5 etc. or P.P. 45, 71A etc. to voice coil	1.45
T-14S82-X	Single 25L6 etc. to voice coil	1.45

### TROPEX UNIVERSAL OUTPUT TRANSFORMERS

Type No.	Application	List Price	
T-13S38-X	Any single or P.P. tubes to voice coil	\$1.70	
T-57S01-X		2.25	
T-57S02-X		2.25	
T-13S41-X		Any P.P. tubes to voice coil	3.15
T-13S42-X		Any single tube to voice coil	1.70

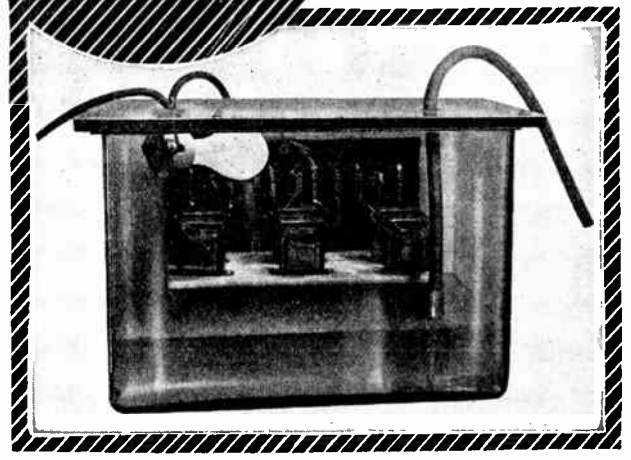
### TROPEX FILTER CHOKES

Type No.	Application	List Price
T-13C26-X	8 Hy at 40 MA 530 ohms DC	\$1.10
T-13C27-X	10 Hy at 40 MA 475 ohms DC	1.30
T-13C28-X	10 Hy at 65 MA 460 ohms DC	1.45
T-13C29-X	9 Hy at 85 MA 250 ohms DC	1.85
T-13C30-X	8 Hy at 150 MA 200 ohms DC	2.40
T-18C92-X	22 Hy at 35 MA 405 ohms DC	1.75
T-14C61-X	7 Hy at 55 MA 200 ohms DC	1.25
T-14C62-X	8 Hy at 55 MA 250 ohms DC	1.25
T-14C63-X	8 Hy at 55 MA 300 ohms DC	1.25
T-14C64-X	10 Hy at 55 MA 350 ohms DC	1.25



**G**rueling test applied to TROPEX Transformers — three months... and still O. K.! Another Proof of Thordarson Stamina.

*Test Conditions: 120 F., 85% Humidity; Saturated salt solution constantly agitated; 300V @ 5MA through primary and 300V between primary and ground.*



See Page 2 for numerical index — page 24 for classified index.

## REPLACEMENT FILTER CHOKES

Inductance and current ratings suitable for any receiver. Black enamel strap mounting. Inductance ratings given for high inductance no current as well as actual operating conditions. The A.C. D.C. Chokes are designed for use in circuits where the D.C. resistance of the winding is the important factor.

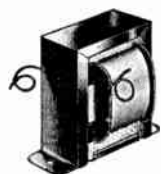


Fig. 2B

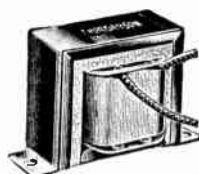


Fig. 3B

Type No.	List Price	Inductance		Current Rating M.A.	D.C. Res. Ohms	Volts Ins.	Mtg. Fig.	Dimensions			Wt. Lbs.
		At Zero D.C.	At Rated D.C.					W.	D.	H.	
T-13C26	\$ .90	21	8	40	530	1600	3B	1 3/4	1 3/8	1 3/8	1/2
T-13C27	1.10	22	10	40	475	1600	3B	2	1 5/8	1 5/8	3/4
T-13C28	1.20	20	10	65	460	1600	3B	2 3/8	1 3/4	2	1
T-43C92	1.65	24	10	75	260	1600	2C	1 7/8	2 1/8	2 1/2	1 1/4
T-47C07	1.65	20	12	75	410	1600	3B	2	2 5/8	2 1/4	1 1/4
T-44C02	1.50	31	12	80	405	1600	3B	1 1/2	2 3/8	2	1 1/4
T-57C51	1.50	15	6	80	138	1600	2B	2	2	2 3/8	1 1/4
T-13C29	1.60	20	9	85	250	1600	3B	2 3/8	2	2	1 1/2
T-68C07	2.00	32	15	85	375	1600	2B	2	2 1/2	3	2
T-57C53	2.00	27	10	110	200	1600	2B	2	2 1/2	3	2 1/4
T-75C49	1.50	22	8	120	290	1600	3B	2	2 3/8	2	1 1/2
T-53C19	1.50	..	..	..	..	..	2B	2	2	2 3/8	1 1/4
T-13C30	2.00	25	8	150	200	1600	2B	2 1/2	2	2 5/8	2 1/4

### Chokes for A.C.-D.C. Sets

T-14C61	\$1.05	14	7	55	200	1600	3B	2	1 5/8	1 5/8	3/4
T-14C62	1.05	16	8	55	250	1600	3B	2	1 5/8	1 5/8	3/4
T-14C63	1.05	19	8	55	300	1600	3B	2	1 5/8	1 5/8	3/4
T-14C64	1.05	21	10	55	350	1600	3B	2	1 5/8	1 5/8	3/4



Fig. 2C

## FILTER CHOKES (General Purpose)

For use in amplifiers, transmitters, etc. These chokes are rated in actual inductance as measured under full rated load.

Type No.	List Price	Current Rating M.A.	Inductance Henries	D.C. Res. Ohms	Volts Ins.	Mtg. Fig.	Dimensions			Wt. Lbs.
							W.	D.	H.	
T-57C52	\$1.75	80	5	138	1600	2F	2	2	2 3/8	1 1/2
T-16C07	2.25	85	15	375	1600	2F	3 3/8	2 1/2	3	2 1/4
T-57C54	2.25	110	10	200	1600	2F	2 1/2	2 1/2	3	2 1/4
T-49C91	1.50	120	4	160	1600	2F	2	2	2 1/2	1 1/4
T-17C00-B	2.75	150	12	231	1600	2F	2 7/8	3	3 1/2	3 3/4
T-74C29	3.75	150	15	200	2000	2G	3 1/2	3 3/8	4 5/8	5 1/4
T-67C49	2.75	200	5	80	1600	2F	3	2 7/8	3 1/2	3 3/4
T-75C51	5.00	250	13	121	1600	2G	3 7/8	3 3/4	5	8



Fig. 2F

## AUDIO REACTORS

For use in circuits where the voltage drop caused by a resistor load is objectionable, also for isolating plate current from transformer primaries. \*Types T-81C15 and T-93C20 are for use in tuned circuits to accentuate a pre-determined band of frequencies. (Amplifier Guide No. 346-B). †T-14C70 is designed primarily for use with two special Thordarson Tone Control dual potentiometers R-1068 @ \$2.50 list. (Amplifier Guide No. 346-D).

Type No.	List Price	Application	Type Tubes	Induct. Hen.	At M.A.	Max. M.A.	D.C. Ohms	Mtg. Fig.	Dimensions			Wt. Lbs.
									W.	D.	H.	
T-37C36	\$2.00	Plate Impedance	{56-30-76-6C5- 55-85, etc.	300	5	10	6470	2F	2	2 1/8	2 3/8	1 1/2
T-67C46	1.75							2B	2	2	2 3/8	1 1/4
T-52C98	1.75	{Plate Impedance for S.G. Detector or grid impedance	24-57-56-76- 6C5-6F5-6J7	700	.5	8	6150	2F	2	1 7/8	2 3/8	1 1/4
T-29C27	1.50							2B	2	1 1/2	2 3/8	1
T-68C08	1.75	Plate Impedance or Filter	45-46-10, etc.	22	35	35	405	2F	2	2 1/8	2 3/8	1 1/2
T-18C92	1.50							3B	2	1 3/4	2 3/8	1 1/2
T-74A31	3.25	Center tapped impedance		2220	0	8	12210	2F	2 1/2	2 1/2	3	2 1/4
T-81C15*	2.50	Tuned Audio Circuits		.75	.5	100	30	2B	1 5/8	1 5/8	2	3/4
T-93C20*	3.00	Tuned Audio Circuits		250	.5	8.0	6400	2B	2	2	2 3/8	1 1/4
T-74C30	1.50	Tuned Audio Circuits or Filter		42	15	15	2100	2B	2	1 1/2	2 3/8	1
T-14C70†	2.50	Tone Control, Hum Bucking Type		22	0	5	220	3Y	1 1/2	1 1/2	2 1/2	1/2

Amplifier and transmitting type chokes are listed on pages 12, 17 and 19.





# AUDIO TRANSFORMERS

Receiver and Amplifier

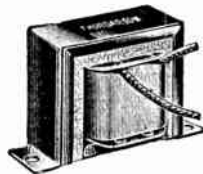


Fig. 3B

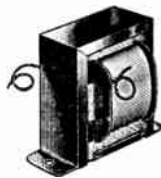


Fig. 2B



Fig. 2C



Fig. 2F

## PLATE TO GRID INTERSTAGE TRANSFORMERS

Here is a variety of units designed for the same general application but varying in size, frequency response and style of mounting.\* Type T-75A74 will couple a super-regenerative detector to an audio stage; any tendency toward outside noise is reduced by the static shield between windings.

Type No.	List Price	Application	Ratio	Imped. in Ohms		Pri. M.A.	Mtg. Fig.	Dimensions			Wt. Lbs.
				Pri.	Sec.			W.	D.	H.	
T-13A34	\$1.35	Midget 10,000 ohm plate to grid	3:1	10,000	90,000	8	3B	2	1 5/8	1 3/8	3/4
T-29A99	1.75	Medium 10,000 ohm plate to grid	3.26:1	10,000	106,300	8	2B	2	2	2 3/8	1 1/4
T-57A36	2.00						2F	2	2 1/8	2 3/8	1 1/2
T-47A25	1.75		3:1	10,000	90,000	8	2C	2	1 5/8	2 3/8	1
T-57A38	2.75	Large 10,000 ohm plate to grid	3:1	10,000	90,000	8	2F	2 1/2	2 1/2	3	2 1/4
T-75A74*	2.50	10,000 ohm plate to grid Static Shield between primary and secondary.	2:1	10,000	40,000	8	2F	2	2 1/8	2 3/8	1 1/2

## PUSH-PULL INPUT TRANSFORMERS

Each unit serves similar applications, varying in size, frequency response and style of mounting.\* T-74A31, ordinarily a push-pull input transformer, may also be used as a tapped push-pull grid impedance with ratios of 1:1, 1:2 or 1:4 by connecting the primary and secondary in series, according to instructions furnished.

T-14A92	\$1.25	Midget 10,000 ohm plate to P.P. grids	3:1	10,000	90,000	8	3B	1 3/4	1 3/8	1 3/8	1 1/2
T-13A35	1.50	Midget 10,000 ohm plate to P.P. grids	3:1	10,000	90,000	8	3B	1 5/8	2	1 5/8	3/4
T-33A91	2.00	Medium 10,000 ohm plate to P.P. grids	3.26:1	10,000	106,300	8	2B	2	2	2 3/8	1 1/4
T-86A03	2.00						3B	2 3/8	2	2	1 1/2
T-14A29	2.25						2C	2 1/8	1 7/8	2 1/2	1 1/4
T-57A39	2.25						2F	2	2 1/8	2 3/8	1 1/2
T-57A40	2.75	Large 10,000 ohm plate to P.P. grids	3:1	10,000	90,000	8	2B	2 1/2	2	3	2
T-57A41	3.00						2F	2 1/2	2 1/2	3	2 1/4
T-74A31*	3.25	10,000 ohm plate to P.P. grids	1:1	10,000	10,000	8	2F	2 1/2	2 1/2	3	2 1/4
T-57A42	3.25	10,000 ohm plate to P.P. grids	3:1	10,000	90,000	8	2B	2 1/2	2	3	2

For Coupling screen grid or power detector to P.P. output — Clarion AC60, etc.

## PUSH-PULL INTERSTAGE TRANSFORMERS

For connecting push-pull plates to push-pull grids, these types offer a choice of size and ratio. Suitable for replacement or amplifier circuits.

T-13A36	\$1.75	Midget P.P. 10,000 ohm plates to P.P. power tube grids	1:1	20,000	20,000	8*	3B	2	2 3/8	1 3/4	1
T-58A70	3.25	} Large P.P. 10,000 ohm plates to P.P. or P.P. par. power tube grids.	1.5:1 Split sec.	20,000	45,000	10*	2F	2 1/2	2 1/2	3	2 1/4
T-67A91	3.00						2B	2 1/2	2 1/2	3	2

\*Per side.

## UNIVERSAL AUDIO REPLACEMENT TRANSFORMER

To couple single plate to single grid; single plate to push-pull grids; push-pull plates to push-pull grids. Has split secondary.

T-17A02	\$2.25	Universal	3:1	Universal	10	2F	2	2 1/8	2 3/8	1 1/2
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## REPLACEMENT DRIVER TRANSFORMERS

Their compact open mounting style facilitates installation.

Type No.	List Price	Driver Tubes	Output Tubes	Class	Ratio Pri. to 1/2 Sec.	Ohms Imped.		Pri. M.A.	Mtg. Fig.	Dimensions			Wt. Lbs.
						Pri.	1/2 Sec.			W.	D.	H.	
T-78D46	\$1.50	1-30	1-1J6G, 19 2-30	B	2.4:1	20,000	3,500	7	2B	1 5/8	1 5/8	2	3/4
T-17D01	2.00	1-6F6 Triode 1-42 Triode 1-2A5 Triode	2-6F6, 6L6, etc.	AB	1.7:1 1.5:1 1.3:1	10,000	3,300 4,500 5,800	31	3B	2 3/8	2	2	1 1/2
T-14D93	1.75	1-76 Triode	1-6A6, 6N7	B	4:1	20,000	1,250	8	3B	1 5/8	2	1 5/8	3/4

Other audio Transformers are listed on pages 15, 19 and 22.



# OUTPUT TRANSFORMERS



## REPLACEMENT OUTPUT TRANSFORMERS

Small strap mounting types easily attached to the speaker or mounted on the chassis. Plate load and voice coil combinations for all popular receivers.

Type No.	List Price	Tube Type	Class	Ohms Impedance		Pri. Per Side	M.A. Watts	Max. Fig.	Mtg.	Dimensions			Wt. Lbs.
				Pri.	Sec.					W.	D.	H.	
T-14S81	\$1.25	1-42, 2A5, 6F6 or P-P45, 71	A	7,000 Ct.	3 to 6	40	5	3B	1 3/4	1 3/8	1 3/8	1/2	
T-14S82	1.25	1-25L6	A	1,500	3 to 6	55	5	3B	1 3/4	1 3/8	1 3/8	1/2	
T-14S83	1.25	1A5-G, 1E7-G	A	25,000 Ct.	3 to 6	8	5	3B	1 3/4	1 3/8	1 3/8	1/2	
T-14S84	1.25	1-1C5G, 1Q5G	A	8,000	3 to 6	10	5	3B	1 3/4	1 3/8	1 3/8	1/2	
T-13S37	1.25	1-6F6, 42, 2A5, 47	A	7,000	1-2-4	36	5	3E	1 3/4	1 3/8	1 3/8	1/2	
T-13S39	1.25	1-45, 12A5 1-31, 43, 71A	A	4,000	1-2-4	36	5	3E	1 3/4	1 3/8	1 3/8	1/2	
T-13S43	1.35	1-1F4, 1D4, 1F5G	A	16,000	1-2-4	10	5	3E	1 3/4	1 3/8	1 3/8	1/2	
T-33S99	1.50	2-45, 71, 43, 25A6 P-P 1-6N7, 6A6, 1C5G, 53 P-P	A B	8,000	6 to 12	36	10	2B	2	2	2 3/8	1 1/4	
T-13S40	1.50	2-6F6, 42 P-P 2-2A5, 47 P-P	A A	14,000	1-2-4	40	10	3E	2	1 5/8	1 3/8	3/4	
T-81S01	1.50	1-19, 1J6G, 1G6G P-P 2-30, 49 P-P 2-31 P-P	B B A	10,000	2-4-8	15	8	2B	1 5/8	1 5/8	2	3/4	

## HEAVY DUTY OUTPUT TRANSFORMERS TO LINE OR SPEAKER (High Level)

Thordarson output transformers will satisfy the plate requirements of tubes as used in amplifiers, radio receivers and amateur equipment. Several secondary impedances are incorporated to accommodate various speaker combinations.

T-17S10	\$3.00	1-6L6	A	2,500	2-4-8-500	80	8	2F	2 1/2	2 1/2	3	2 1/4
T-17S11	4.50	2-6V6 P-P	AB1	8,000*	4-8-15-250-500	52	15	2F	2 7/8	3	3 1/2	3 1/2
T-17S12	4.50	2-6L6 P-P	AB1	4,300*	4-8-15-250-500 (with 300 V. on plate and screen)	95	25	2F	2 7/8	3	3 1/2	3 1/2
T-17S13	6.00	2-6L6 P-P	AB1	6,600*	4-8-15-250-500	80	34	2G	3 3/8	3 5/8	4 5/8	5 1/2
T-17S14	6.00	2-6L6 P-P	AB2	5,500*	4-8-15-250-500	90	40	2G	3 3/8	3 5/8	4 5/8	5 1/4
T-17S15	6.50	4-6L6 P-P Par.	AB1	3,300*	4-8-15-250-500	155	60	2G	3 3/8	3 7/8	4 5/8	5 3/4
T-17S16	12.00	4-6L6 P-P Par.	AB2	1,900*	84-100-125- 166-250-500	230	120	2G	3 3/4	5	4 5/8	14 1/4
T-67S60	2.50	1-19, 1J6G P-P 2-30, 49 P-P 2-31 P-P	B B A	10,000	4-8-2000	15	10	2F	2	2 1/8	2 3/8	1 1/2
T-68S06	2.50	1-6F6, 42, 2A5 1-47, 31, 33	A A	7,000	10 or 2,000	36	5	2F	2	1 7/8	2 3/8	1
T-67S51	3.50	2-6F6, 42, 2A5, 47 P-P 1-79 P-P	A B	14,000	4-8-15-500	40	20	2F	2 1/2	2 1/2	3	2 1/4
T-67S48	3.50	2-45, 71, 43, 25A6 P-P 1-6N7, 6A6, 53 P-P	A B	8,000	4-8-15-500	36	25	2F	2 1/2	2 1/2	3	2 1/4
T-67S52	4.00	2-46, 59 P-P 2-6F6, 42, 2A5 P-P 2-6N7, 6A6, 53 P-P Par.	B AB2 B	5,800	4-8-15-500	60	30	2F	2 7/8	3	3 1/2	3 1/2
T-67S53	6.00	4-46's or 59's P-P Par.	B	2,900	4-8-15-500	120	60	2G	3 3/8	3 5/8	4	5 1/4
T-58S72	3.75	2-2A3, 6B4G P-P 2-48, 25L6 P-P	AB A	3,000	4-8-15-500	60	30	2F	2 7/8	3	3 1/2	3 1/4
T-67S54	4.00	2-6L6 P-P 2-2A3, 6B4G, 45 P-P 2-19 P-P Par.	A AB B	5,000	4-8-15-500	60	30	2F	2 7/8	3	3 1/2	3 1/2
T-67S92	4.00	4-2A3, 6B4G, 45 P-P Par. 4-48, 25L6 P-P Par.	AB A	1,500	4-8-15-500	80	40	2F	2 7/8	3	3 1/2	3 1/2
T-65S94	4.00	2-50 P-P 2-6F6, 42, 2A5 P-P 1-79 P-P	A AB2 B	8,000	4-8-15-500	55	40	2F	2 7/8	3	3 1/2	3 1/2
T-75S75	4.00	2-6F6, 42 or 2A5 1-6N7, 6A6, 53 P-P 2-6N6G, 6B5, 2B6, 6AC5 P-P	AB2 B A	10,000	4-8-15-500	45	40	2F	2 7/8	3	3 1/2	3 1/2
T-84S58	6.00	2-6L6 P-P	AB2	3,800	4-8-15-500	115	60	2G	3 3/8	3 3/4	4 5/8	6
T-89S75	4.00	2-6L6 P-P	AB1	6,600	4-8-15-500	80	40	2F	2 7/8	3	3 1/2	3 1/2
T-89S74	3.75	1-6L6	A	4,000	4-8-15-500	70	15	2F	2 1/2	2 1/2	3	2 1/4
T-89S68	6.50	4-6L6 P-P Par.	AB1	3,300	50-125-200 250-333-500	150	75	2G	3 3/8	3 5/8	4 5/8	5 3/4
T-83S84	6.00	2-50 P-P or P-P 2A3	AB2	5,000	4-8-15-500	80	45	2G	3 3/8	3 1/2	4 5/8	5 1/4
T-83S87	9.00	4-50 P-P Par.	AB2	3,000	4-8-15-500	160	90	2G	3 7/8	3 5/8	5	7 3/4

\*10% feed back winding.

See page 11 for modulation transformers and page 18 for other output transformers.



# UNIVERSAL OUTPUT TRANSFORMERS

## TRANSCIVER TRANSFORMERS

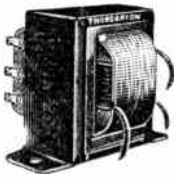


Fig. 2E



Fig. 2B



Fig. 2F



Fig. 2A

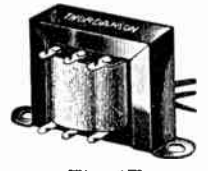


Fig. 3E

### UNIVERSAL REPLACEMENT TUBE TO VOICE COIL

Preferred by many because of their wide plate impedance and voice coil coverage. Proper matching of load impedances to speaker voice coils is accomplished by using taps as specified in the instruction sheets.

Type No.	List Price	Tube Type	Class	Ohms Impedance		Pri. M.A. Per Side	Max. Watts	Mtg. Fig.	Dimensions			Wt. Lbs.	
				Pri.	Sec.				W.	D.	H.		
T-13S38	\$1.50	Universal Single or P-P Tubes	A	4,000/7,000	Adjustable .1 to 29	36	8	3E	2	1 1/8	1 5/8	3/4	
T-57S01*	2.00			8,000/10,000					2E	2	2	2 3/8	1 1/4
T-57S02†	2.00			14,000 Ct.					2B	2	2	2 3/8	1 1/4
T-17S57	2.25								2C	2 1/8	1 7/8	2 1/2	1 1/4
T-13S42	1.50	Universal Single Tube	A	1,500/2,000 4,000/5,000 7,000	Adjustable .1 to 29	55	10	3E	2	1 1/8	1 5/8	3/4	
T-13S41	2.75	Universal P-P Tubes	A	3,000/5,000 6,600/7,000 8,000/10,000	Adjustable .1 to 29	60	20	2E	2 1/2	2	3	2 1/4	

\*Solder terminals for voice coil connections. †Color coded leads for voice coil connections.

### UNIVERSAL TUBE TO LINE

T-61S25	3.25	Univ. Single Tube	2,500/4,000 5,000/6,000/7,000	500	60	10	2E	2 1/2	2	3	2 1/4
T-61S26	3.50	Univ. P-P Tubes	8,000/10,000 12,000/14,000 Ct.	500	55	10	2E	2 1/2	2	3	2 1/4

### UNIVERSAL LINE TO SPEAKER

Type No.	List Price	Application	Ohms Impedance		Max. Watts	Mtg. Fig.	Dimensions			Wt. Lbs.
			Pri.	Sec.			W.	D.	H.	
T-53S81	\$4.00	Line to Voice Coil	500/250	4-8-15	35	2D	2 7/8	3	3 3/4	3 1/2
T-60S48	3.00	Line to Voice Coil 1 to 6 may be con. in par. to 500 ohm line	500/1,000 1,500/2,000 2,500/3,000	Pri. as 500 ohm- .06 to 8.; pri. as 1,000 ohm .12 to 16, etc.	10	2E	2 1/2	2	3	2
T-14S80	2.00	Line to Voice Coil	500	2-4-6-8	12	2E	2	2	2 3/8	1 1/2
T-17S17	6.50	Line to Voice Coil	500	4/8/16/25/50	75	2E	3 5/8	4	4	6 1/2
T-76S74	3.00	Line to multiple spkrs. (autotransformer)	500	250/166/125/ 100/84	30	2E	2 1/2	2	3	2 1/2

### TRANSFORMER AND CHOKE FOR 32 VOLT D.C. SUPPLY

These units are specified for the excellent 32 volt D.C. supply presented in Thordarson Service Guide No. 342-C.

Type No.	List Price	D.C.* Volts	Max. D.C. Amps.	Mtg. Fig.	Dimensions			Wt. Lbs.
					W.	D.	H.	
T-14R50-	\$15.00	32	3	3C	4 1/8	4 1/2	6 5/8	18 1/4
*Tapped primary. For use with type 83 or Raytheon RX-203 tubes.								
T-14C51-	8.00	Choke	.18 H @ 3 A. D.C.	3C	4 1/8	3 1/2	6 1/8	13 1/2
D.C. Resistance 1.3 ohms								

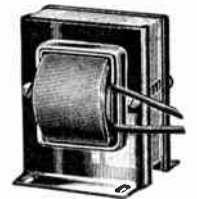


Fig. 3C

### TRANSCIVER TRANSFORMERS

Smallest practical size—Light weight—Easy to mount—Efficient

Type No.	List Price	Application	Ohms Impedance		Max. D.C. Pri.	Max. Power Watts	Mtg. Fig.	Dimensions			Wt. Lbs.
			Pri.	Sec.				W.	D.	H.	
T-72A59	\$1.65	Plate and Single Button micro. to grid	5,000 200	100,000	10	5	2B	1 5/8	1 5/8	2	3/4
T-72S58	1.65	Pent. Plate to low or high imp. phones or osc.	10,000	2,000 50	30	5	2B	1 5/8	1 5/8	2	3/4

See pages 11 and 16 for modulation transformers and page 18 for other output transformers.





### UNIVERSAL DRIVER TRANSFORMERS — "19" SERIES

Through the use of five ratios on each transformer, this series will handle all driver transformer requirements usually encountered in amateur transmitter circuits. See pages 20 and 21 for complete table of Driver and Modulator combinations.

Type No.	List Price	Cap. Watts	Max. Pri. M.A. Per Side	Ratio Pri. to 1/2 Sec.	Mtg. Fig.	Dimensions			Wt. Lbs.
						W.	D.	H.	
T-19D01	\$6.00	15	60	1:1, 1.2:1, 1.4:1, 1.6:1, 1.8:1	4D	2 7/8	3	3 1/2	3 1/2
T-19D02	6.00	15	60	2:1, 2.2:1, 2.4:1, 2.6:1, 2.8:1	4D	2 7/8	3	3 1/2	3 1/2
T-19D03	6.00	15	60	3:1, 3.2:1, 3.4:1, 3.6:1, 3.8:1	4D	2 7/8	3	3 1/2	3 1/2
T-19D04	6.00	15	60	4:1, 4.5:1, 5:1, 5.5:1, 6:1	4D	2 7/8	3	3 1/2	3 1/2
T-19D05	6.00	15	Primary for 500 ohm line	1:3.15, 1:2.75, 1:2.5, 1:2.25, 1:2, 1:1.75, 1:1.4, 1:1.25, 1:1.85, 1:1.75	4D	2 7/8	3	3 1/2	3 1/2

### DRIVER TRANSFORMERS (FOR SPECIFIC APPLICATIONS)

Thordarson driver transformers have the correct primary to secondary ratio for the tubes specified, insuring good regulation and minimum driver distortion on the positive grid peaks.

Type No.	List Price	Driver Tubes	Output Tubes	Class	Ratio Pri. to 1/2 Sec.	Pri. M.A.	Mtg. Fig.	Dimensions			Wt. Lbs.
								W.	D.	H.	
T-19D06	\$3.00	1-6A6, 1-6N7, 1-6C5	1-6A6, 6N7	B	5:1, 4:1 3:1, 2.5:1	10	2F	2	2 1/8	2 3/8	1 1/2
T-54D63	2.25	1-30, 1-49, 1-6C5	1-1J6G, 19, 2-49, 2-6V6	B, B, AB2	2.4:1	7	2F	2	1 7/8	2 3/8	1 1/4
T-67D50	2.75	1-89 Triode	1-79	B	2:1	32	2F	2	2 1/8	2 3/8	1 1/2
T-67D89-	3.00	1-89, 6F6, 42 Triode	2-79, 6A6, 6N7	B	3:1	32	2F	2 1/2	2 1/2	3	2 1/4
T-67D47	2.50	1-6N7, 6A6, 53	1-6N7, 6A6, 53	B	5.25:1	10	2F	2	2 1/8	2 3/8	1 1/2
T-81D52	3.50	1-6C5, 76 1-56	2-6F6 Triode 2-42, 2A5 Triode	AB AB	1.82:1 1.67:1	8	2F	2 1/2	2 1/2	3	2 1/4
T-84D59*	3.50	2-6C5, 6N7 2-6A6, 53	2-6L6, 6V6 2-6N7, 6A6, 53	AB2 B	5:1	10	2F	2 1/2	2 1/2	3	2 1/4
T-74D32	3.50	2-6C5, 76, 56	2-6F6, 42, 2A5 4-2A3, 6B4G	AB2 AB	3:1	10	2F	2 1/2	2 1/2	3	2 1/4
T-81D42	3.25	1-6F6 Triode 1-42 Triode 1-2A5 Triode	2-6F6 Triode 2-42 or 2-2A5 Pentode	AB2 AB2 AB2	1.7:1 1.5:1 1.3:1	31	2F	2 1/2	2 1/2	8	2 1/4
T-17D03*	4.50	1-6F6 Triode	2-6L6	AB2	1.4:1	40	2F	2 7/8	3	3 1/2	3 1/2
T-17D04*	4.50	2-6F6	4-6L6	AB2	2.6:1	32	2F	2 7/8	3	3 1/2	3 1/2
T-67D78	3.00	1-46, 59, 6F6, 42, 2A5 Triode	2-46, 59 2-6L6	B AB2	2.2:1	32	2F	2 1/2	2 1/2	3	2 1/4
T-64D22-*	4.50	2-45, 2A3	2-800, 830B, etc.	B	1.55:1	40	2T	2 3/4	3 1/8	4 1/8	4 1/4
T-66D98-	4.75	2-46, 6F6, 42, 45, 59, 2A5 P-P Triodes	4-46 4-59	B B	4:1	32	2R	2 3/4	4 1/8	3 3/8	4 1/4
T-51D00-*	4.50	2-6F6, 42, 45, 2A5 P-P	2-210, 801, 35T	B	2:1	40	2A	2 7/8	3	3 1/2	3 1/4
T-80D54-*	5.50	2-6F6 P-P Triodes, 2-42 P-P Triodes	2-838 2-830B, 800	B B	4:1	40	2G	3 3/8	3 1/2	4 5/8	5 1/2
T-61D40-*	5.50	2-2A3 P-P	2-50T, 150T 2-203A, 801	B B	1.67:1	130	2D	3 3/8	3 5/8	4	5
T-75D10*	5.50	2-2A3 P-P	2-838, 805, TZ-40	B, B	3.2:1	130	2D	3 3/8	3 5/8	4	5

\*Split secondary as required for inverse feedback and separate power tube bias.

### UNIVERSAL BIAS TRANSFORMERS

Primary 115 Volts, 50-60 Cycles. Mounting Figure 2N—No Filament Winding.



Fig. 2N

Type No.	List Price	Application	Current M.A.	Dimensions			Wt. Lbs.
				W.	D.	H.	
T-19R31	\$5.50	Will supply D.C. voltages of 10 to 100 in app. 5 volt steps	200	3 3/8	3 1/4	4	4
T-19R32	7.25	Will supply D.C. voltages of 100 to 400 in app. 15 volt steps	200	3 3/4	4	4 5/8	9 1/4

### TELEVISION TRANSFORMERS (Plate and Filament)

Electrostatically Shielded. Primary 115 Volts — 50-60 Cycles. Mounting Figure 2G.



Fig. 2G

Type No.	List Price	Kinescope Tubes	Secondary	Volts Insulation	Dimensions			Wt. Lbs.
					W.	D.	H.	
T-17R32	\$10.00	5"	No. 1 — 2300V. A.C. 3000V. D.C. No. 2 — 2.5V at 2A No. 3 — 2.5V at 2A	7500	3 3/8	3 1/8	4 5/8	4 1/2
T-17R33	12.50	9"	No. 1 — 4500V. A.C. 6000V. D.C. No. 2 — 2.5V at 5A No. 3 — 2.5V at 2A	10,000	3 3/8	4 5/8	4	6 1/2

### Television Filter Reactor

Type No.	List Price	Filter Reactor			D.C. Res.	Mtg. Fig.	Dimensions			Wt. Lbs.
		Inductance Henries	Current M.A.	Volts Insulation			W.	D.	H.	
T-17C40	\$4.75	1500	3	10,000	12,000	2F	2 7/8	3	3 1/2	2 1/4

Multi-match driver transformers are listed on page 16.



# MODULATION TRANSFORMERS

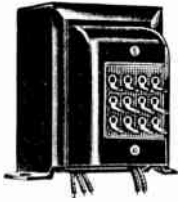


Fig. 4D

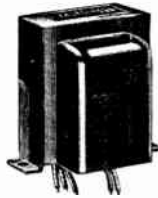


Fig. 2F



Fig. 2D

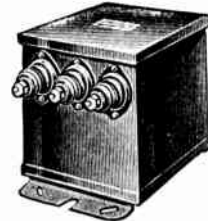


Fig. 2Q

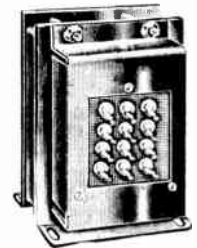


Fig. 2N

## UNIVERSAL MODULATION TRANSFORMERS "19" SERIES

Tapped coils enable the experimenter to match any modulator tubes to any class C R.F. load. See pages 20 and 21 for complete table of Driver and Modulator combinations.

Type No.	List Price	Cap. Watts	Pri. M.A. Per Side	Secondary M.A. Series	M.A. Par.	Mtg. Fig.	Dimensions			Wt. Lbs.
							W.	D.	H.	
T-19M13	\$ 4.00	15	50	50	100	2N	2½	2¾	3	2
T-19M14	7.00	30	75	75	150	2N	3¾	3¾	4	4½
T-19M15	10.00	60	125	125	250	2N	3¾	4½	4	6½
T-19M16	15.00	100	175	175	350	2N	4½	5	6	12½
T-19M17	24.00	250	225	225	450	2Q	5¾	8½	7¼	30¾

## MODULATION TRANSFORMERS (FOR SPECIFIC APPLICATIONS)

This series of modulation transformers meets the need for efficient, quiet, long life units at reasonable costs. Engineered and constructed for specific tube types, their efficiency is high and the frequency characteristics are good.

Type No.	List Price	Tube Type	Class	Ohms Impedance		Max. D.C. Sec. M.A.	Max. Audio Pwr.	Mtg. Fig.	Dimensions			Wt. Lbs.
				Pri.	Sec.				W.	D.	H.	
T-67M69	\$ 2.75	1-19	B	10,000	2,700	50	10	2F	2	2	2¾	1½
T-17M59	3.00	1-6A6, 6N7 or 53	B	10,000	3,000, 3,750, 4,500	100	10	2F	2½	2½	3	2
T-72M02-	6.00	2-2A3	AB	5,000	3,000 5,000	125	50	2D	4½	4¾	5	5
T-64M26	6.00	2-46 or 59 2-250	B	5,800	5,000	100	40	2D	3¾	3¾	4	5
			AB		10,000							
T-19M21	7.00	2-TZ-20	B	10,000	3,750 6,600	200 150	75	2D	3½	4¼	4	7
T-70M84-	15.00	2-801, TZ-20, 35T	B	10,000	4,500 6,250 12,500	200	150	2Q	5⅞	8	6¼	20¾
T-19M22	10.00	2-809 2-RK-12	B	8,400	5,000	200	100	2D	4½	4½	6	13¼
			B		7,850							
T-84M70	10.00	2-6L6 2-35T 4-210	AB	3,800	2,500	250	75	2D	3¾	3¾	4½	10
			B		5,000							
			B		7,500							
T-14M49	16.50	2-TZ-40	B	6,900	2,850	350 300 235	175	2Q	5⅞	7¾	6¼	20
					4,500							
					6,500							
T-64M25-	6.00	2-TZ-20, 210, 46	B	8,000	5,000, 10,000	200	40	2D	3⅞	4¼	4½	8
T-75M11-	20.00	2-ZB-120, HK-154 838, 35T, RK-52	B	10,000	2,500, 10,000	400 200	300	2Q	5⅞	8½	7¼	30
T-82M09-	20.00	2-35T, RK-52, ZB-120	B	10,000	1,250, 5,000	500 250	300	2Q	5¾	9½	7¼	29½
T-82M25	40.00	2-805, HD-203A, 822	B	9,000	4,000, 6,000, 8,000	500	650	2Q	8	6¾	8	47

## GRID MODULATION TRANSFORMERS

T-67M73	3.50	1-42, 6F6, 46 Triode	A	6,300	5,400	32	10	2D	2½	2½	3	2¼
T-67M74	4.50	P.P. 45-2A3	AB	5,000	5,000	60	20	2D	2⅞	3	3½	3½

## MODULATION TRANSFORMERS FOR MATCHING LINES TO R. F. LOADS

Primaries of these transformers may be connected directly to the 500 ohm output terminals of any amplifier or receiver. \*Type T-83M22 is equipped with a tap at 200 ohms for use with "Breting 14" receivers.

Type No.	List Price	Pri. Ohms	Secondary Ohms Load	Max. D.C. Sec. M.A.	Max. Watts	Mtg. Fig.	Dimensions			Wt. Lbs.
							W.	D.	H.	
T-73M52	\$18.00	500	5,000-6,000-7,000-8,000-9,000-10,000	215	80	2Q	5⅞	8	6¼	21
T-83M22*	9.00	500-200	5,000-6,000-7,000-8,000-9,000-10,000	150	30	2N	3⅞	4¼	4½	8

Multi-Match modulation transformers are listed on page 16.



**PLATE SUPPLY TRANSFORMERS — "19" SERIES**

These plate transformers are rated in D.C. voltages from a two section filter, including the voltage drop through the rectifier tubes. Designed especially for Amateur Short Wave or experimental equipment. Electrostatic shield between primary and secondary. Primary 115 volts 50-60 cycles.



Fig. 2G

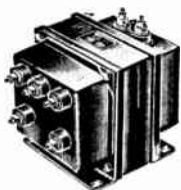


Fig. 2K



Fig. 2F

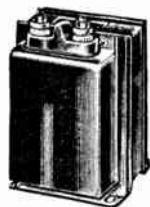


Fig. 2J

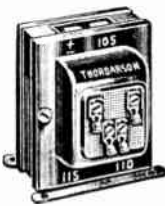


Fig. 2D

Type No.	List Price	Sec. A.C. Load Volts	D.C. Volts	Bias Tap	D.C. M.A.	Pri. V.A.	Mtg. Fig.	Dimensions			Wt. Lbs.
								W.	D.	H.	
T-19P54	\$ 5.75	560-0-560	400		150	115	2G	3 3/4	3 1/2	5	7
T-19P55	7.50	660-0-660 550-0-550	500 400	30 V.	250	200	2G	3 7/8	3 1/2	4 7/8	8
T-84P60	7.75	515-0-515	400	30V.	250	190	2G	3 7/8	4 3/4	4 7/8	11 3/4
T-19P56	8.00	900-0-900 800-0-800	750 600		225	260	2G	3 7/8	4	4 7/8	10
T-19P57	10.00	1075-0-1075 507-0-507	1000* 400		125 150	245	2G	3 7/8	4 1/4	4 7/8	10 1/2
T-19P58	13.00	1200-0-1200 900-0-900	1000* 750		200 150	500	2G	4 1/2	5 1/2	6 1/8	19
T-19P69	13.00	1180-0-1180 900-0-900	1000 750		300	430	2G	4 7/8	6 1/8	6 5/8	20
T-19P59	16.00	1560-0-1560 1250-0-1250	1250 1000		300	550	2K	5 7/8	7	7	26 1/2
T-19P60	18.50	1875-0-1875 1560-0-1560	1500 1250		300	620	2K	6 3/4	4 1/8	7	29 1/4
T-19P61	20.00	2125-0-2125 1875-0-1875	1750 1500		300	745	2K	6 3/4	4 1/2	7	31 1/2
T-19P62	22.50	2420-0-2420 2125-0-2125	2000 1750		300	860	2K	6 3/4	5	7	34 1/2
T-19P63	23.00	1560-0-1560 1265-0-1265	1250 1000		500	925	2K	6 3/4	5 1/4	7	38
T-19P64	28.50	1875-0-1875 1560-0-1560	1500 1250		500	1130	2K	6 3/4	6	7	43 1/4
T-19P65	29.50	3000-0-3000 2420-0-2420	2500 2000		300	1195	2K	6 3/4	6	7	44
T-19P66	35.00	2125-0-2125 1875-0-1875	1750 1500		500	1185	2K	6 3/4	4 1/2	10	45 1/2
T-19P67	42.50	2450-0-2450 2125-0-2125	2000 1750		500	1380	2K	6 3/4	4 3/4	10	51
T-19P68	50.00	3000-0-3000 2450-0-2450	2500 2000		500	1760	2K	6 3/4	5 3/4	10	61
T-54P48-	6.50	800-0-800	680		150	130	3C	4 1/2	3 1/2	6 1/4	10 3/4
T-60P95-	8.00	545-0-545	450		250	140	2D	4 1/2	4 1/2	6 1/4	13 1/4
T-62P57-	7.50	750-0-750	625		200	180	3C	4 1/2	3 5/8	6 1/4	12 1/4
T-62P82-	22.50	1335-0-1335	1000		500	750	2S	6 3/4	6 1/4	11	42 1/2

\*These transformers designed for double rectifiers and will deliver both secondary ratings simultaneously. If only the lower voltage taps are used the current rating is equal to the current rating of both windings.

**TRANSMITTER INPUT AND FILTER CHOKES — "19" SERIES**

Matched input and smoothing chokes for amateur, amplifier or experimental applications. Inductance values are measured under full load conditions and adequate insulation is provided for recommended service.

**Input or Swinging Chokes**

Type No.	List Price	Cap. D.C. M.A.	Inductance Henries	D.C. Res. Ohms	Volts Insulation	Mtg. Fig.	Dimensions			Wt. Lbs.
							W.	D.	H.	
T-19C39	\$ 3.25	150	5-20	215	3000	2F	2 7/8	3	3 1/2	3 3/4
T-19C35	4.00	200	5-20	130	3000	2D	3 1/2	3 3/8	4 1/4	5 1/2
T-19C36	6.50	300	5-20	105	5000	2D	3 7/8	4	4 5/8	10 3/4
T-19C37	10.00	400	5-20	90	5000	2J	4 1/2	5 3/4	6 1/8	19 1/2
T-19C38	14.00	500	5-20	75	5000	2J	5 1/8	6	7 1/2	25 1/4
T-63C15-	7.50	280	12-38	156	5000	2J	4	4 1/4	6 1/4	11 1/2
T-64C06-	10.00	380	10-19	93	5000	2J	4 3/4	5	6 7/8	18 1/4

**Smoothing Chokes**

T-19C46	3.25	150	12	215	3000	2F	2 7/8	3	3 1/2	3 1/2
T-19C42	4.00	200	12	130	3000	2D	3 1/2	3 3/8	4 1/4	5 1/2
T-19C43	6.50	300	12	105	5000	2D	3 7/8	4	4 5/8	10 3/4
T-19C44	10.00	400	12	90	5000	2J	4 1/2	5 3/4	6 1/8	19 3/4
T-19C45	14.00	500	12	75	5000	2J	5 1/8	6	7 1/2	25 1/4
T-64C07-	12.50	380	20	160	5000	2K	6	6 3/4	7 5/8	25

C.H.T. plate transformers are listed on page 18 — other filter chokes on pages 6 and 17.





# FILAMENT TRANSFORMERS

## EXCITER LAMP TRANSFORMERS



Improved voltage regulation and minimum heat rise. Rated for continuous operation at full load. Primary 115 volts 50-60 cycles except those marked \* which have primary taps of 105, 110 and 115 volts to compensate for low line or voltage drop in filament leads.

### One Secondary

Type No.	List Price	Sec. Volts	Sec. Amps.	Pri. V. A.	Volts Insulation	Mtg. Fig.	Dimensions			Wt. Lbs.
							W.	D.	H.	
T-50F61	\$1.50	2.5 Ct.	3.5	10	1600	2B	2	1 1/8	2 3/8	1
T-19F88	1.75	2.5 Ct.	5.25	15	1600	2B	2	2	2 3/8	1 1/4
T-19F89	2.25	2.5 Ct.	10	25	1600	2B	2 1/2	2	3	2
T-19F90	3.00	2.5 Ct.	10	25	7500	3C	2 1/2	2 1/2	3 1/4	2 1/4
T-64F33*	4.50	2.5 Ct.	10	25	7500	2N	3 3/4	3 3/8	4	4 1/2
T-19F82	5.75	2.5 Ct.	15	45	10,000	3C	3 3/8	2 3/8	4	4
T-63F99	3.25	5 Ct.	4	20	1600	2D	3	2 1/2	3 1/4	2 1/4
T-19F83	2.25	5 Ct.	5	30	1600	3C	2 1/2	2	3	2
T-19F84	2.75	5 Ct.	8	45	1600	3C	2 3/8	2 3/4	3 1/4	2 3/4
T-19F85	3.25	5 Ct.	13	75	1600	3C	3 3/8	2 3/8	4	4
T-19F86	6.00	5 Ct.	21	120	1600	3C	3 3/8	3	5	4 1/2
T-19F91	2.25	5.25 Ct.	4	25	1600	3C	2 1/2	2 3/8	3 1/4	2 1/4
T-19F92	3.25	5.25 Ct.	13	75	1600	3C	3 3/8	2 1/2	4	4
T-74F23*	5.00	5.25 Ct.	13	75	1600	2D	3 1/2	3 3/8	4	4 1/4
T-74F24*	7.00	5.25 Ct.	21	125	1600	2D	3 7/8	3 7/8	4 5/8	5 1/4
T-19F80	1.25	6.3 Ct.	1	7	1600	2B	1 1/8	1 3/8	1 1/8	5/8
T-19F81	1.50	6.3 Ct.	2	14	1600	2B	1 5/8	1 3/8	2	3/4
T-19F97	1.75	6.3 Ct.	3	21	1600	2B	2	2	2 3/8	1 1/2
T-61F85	2.00	6.3, 5, 2.5	2.5	18	1600	2E	2 5/8	2	2 1/4	1 1/2
T-73F60*	3.75	6.3 Ct.	5	36	1600	2D	3	2 1/8	3 3/4	3 1/4
T-19F98	2.75	6.3 Ct.	6	47	1600	3C	2 1/2	2 3/8	3 1/4	2 3/4
T-19F99	3.50	6.3 Ct.	10	73	1600	3C	3 3/4	2 3/8	4	4
T-64F13-*	2.75	7.5 Ct.	2.5	21	1600	2D	3	2 1/2	3 3/4	2 1/4
T-19F93	2.25	7.5 Ct.	4	34	1600	3C	2 1/2	2 1/4	3 1/4	2 1/4
T-19F94	3.00	7.5 Ct.	8	67	1600	3C	3	2 1/8	3 3/4	4
T-92F20	4.75	7.5 Ct.	8	68	1600	2D	3 5/8	3 3/8	4	4 3/4
T-75F25-	5.50	7.5 Ct.	2.5	25	5000	2D	3 3/8	2 1/2	4	4 1/4
T-19F95	2.75	10 Ct.	4	48	1600	3C	2 3/8	2 3/4	3 1/4	2 3/4
T-19F96	3.50	10 Ct.	8	92	1600	3C	3	2 7/8	3 3/4	4
T-64F14*	4.75	10 Ct.	8	90	1600	2D	3 5/8	3 3/8	4	5
T-19F87	6.25	10 Ct.	12	140	1600	3C	3 3/8	3 1/4	4	6 3/4

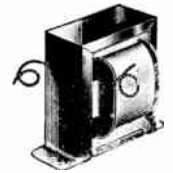


Fig. 2B

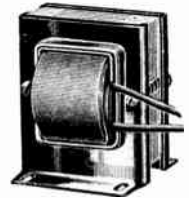


Fig. 3C



Fig. 2D

### Multiple Secondaries

The trend of amateur transmitter design has been carefully studied in planning this series. One transformer from this group will often supply all filament voltages required.

T-19F76	\$4.75	Sec. 1, 5 V. Sec. 2, 7.5 V. tapped at 6.3 and 5	3 6	67	1600 1600	2G	3 3/8	3 1/8	4 5/8	4 3/4
T-19F77	7.00	Sec. 1, 5 V. Sec. 2, 2.5 V. Ct. Sec. 3, 10 V. tapped at 7.5, 6.3 and 5	3 10 8	133	1600 7500 1600	2G	3 3/4	3 5/8	5	7
T-19F78	5.25	Sec. 1, 2.5 V. Ct. Sec. 2, 5 V.	10 3	45	7500 1600	2G	3 3/8	3 3/8	4 5/8	5
T-19F79	6.75	Sec. 1, 6.3 V. Ct. Sec. 2, 10 V. tapped at 7.5, 6.3 and 5	3 10	133	1600 1600	2G	3 3/8	3 5/8	4 5/8	6
T-54F66-	3.25	Sec. 1, 7.5 V. Ct. Sec. 2, 7.5 V. Ct.	2.5 2.5	42	1600	2E	3	2 3/4	3 3/4	3 1/4
T-64F16-*	10.50	Sec. 1, 2.5V Ct.; #2, 7.5V Ct.; #3, 10V Ct. #4, 10V Ct.	5 1.25 3.25 & 6.5	130	1600	2N	4 1/2	4 1/2	6 1/4	13 1/2
T-64F17-*	8.00	Sec. 1, 2.5V Ct.; #2, 7.5V Ct.; #3, 7.5V Ct.	4 4.5 6.5	95	1600	2N	4 1/4	3 7/8	4 5/8	8
T-79F84	4.75	Sec. 1, 2.5 V. Ct.; #2, 5 V. Ct.; #3, 6.3 V. Ct.	3.5, 3, 3	48	1600	2G	3 3/8	3 1/4	4 5/8	4 3/4
T-70F46-	7.75	Sec. 1, 5 V. Ct.; #2, 5 V. Ct.; #3, 5 V. Ct.	3, 3, 6	67	5000	2N	4	3 3/8	4	3 1/2

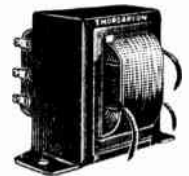


Fig. 2E



Fig. 2G

### COMBINATION PLATE AND FILAMENT — for transmitter applications

Type No.	List Price	Sec. A.C. Load Volts	D.C. Volts	D.C. M.A.	Mtg. Fig.	Dimensions			Wt. Lbs.
						W.	D.	H.	
T-19R30	\$7.75	560-0-560	400	150	2G	3 3/4	4	4 1/8	8 3/4

Filament windings: 5V at 3A; 6.3V at 3A Ct.; 7.5V at 2.5A Ct.

C.I.T. Filament transformers are listed on Page 17.



### STEP DOWN AUTOTRANSFORMERS

#### Convenience Outlet Type

Widely used in the export trade to reduce 220-250 volts to 110-125 volts, 50-60 cycles. Input side equipped with cord and plug. Output side has standard receptacle. Mounting style 2V.

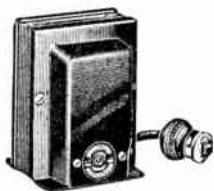


Fig. 2V

Type No.	List Price	Sec. V.A.	Dimensions			Wt. Lbs.
			W.	D.	H.	
T-26V04	\$ 4.50	80	3 $\frac{3}{8}$	3	4 $\frac{5}{8}$	4 $\frac{1}{2}$
T-18V06	6.00	150	3 $\frac{3}{8}$	4 $\frac{3}{4}$	4 $\frac{5}{8}$	6 $\frac{1}{4}$
T-50V11	7.50	250	3 $\frac{3}{4}$	4 $\frac{3}{8}$	4 $\frac{7}{8}$	10 $\frac{1}{4}$
T-18V07	13.50	500	3 $\frac{3}{4}$	4 $\frac{7}{8}$	4 $\frac{7}{8}$	13

### LINE VOLTAGE ADJUSTING AUTOTRANSFORMERS

#### Convenience Outlet Type

For boosting or lowering line voltage to care for ordinary line variation. Input taps may be selected by means of a convenient plug arrangement as illustrated (Fig. 4E). Input voltages 95, 105 and 125, 50-60 cycles; output 115 volts. Mounting style 2V.

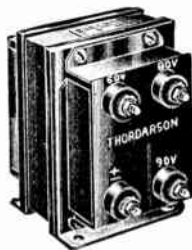


Fig. 2W

T-18V20	\$ 5.00	100	3 $\frac{3}{8}$	3 $\frac{1}{2}$	4 $\frac{5}{8}$	4 $\frac{1}{2}$
T-18V21	6.00	150	3 $\frac{3}{8}$	3 $\frac{3}{4}$	4 $\frac{5}{8}$	5
T-18V22	7.50	250	3 $\frac{7}{8}$	3 $\frac{5}{8}$	4 $\frac{7}{8}$	6 $\frac{1}{2}$
T-18V23	12.00	500	3 $\frac{7}{8}$	4 $\frac{1}{8}$	4 $\frac{7}{8}$	9

### PRIMARY REGULATING AUTOTRANSFORMERS

For increasing or decreasing line voltage. Taps for 60, 80, 90, 100, 110, 120, and 125 volts. 50-60 cycles. Complete with instructions. Mounting style 2W except T-82V13, 2M.

T-82V11	\$12.50	500	4 $\frac{1}{2}$	7	6 $\frac{1}{4}$	16 $\frac{3}{4}$
T-82V12	17.50	1000	5 $\frac{1}{8}$	7 $\frac{1}{4}$	6 $\frac{7}{8}$	22 $\frac{1}{2}$
T-82V13	22.50	2000	6 $\frac{3}{4}$	7 $\frac{1}{2}$	7 $\frac{1}{2}$	39 $\frac{1}{2}$

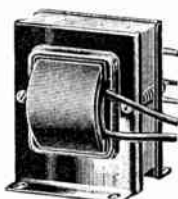


Fig. 3C

### LINE VOLTAGE AUTOTRANSFORMERS

Provide means of increasing or decreasing line voltages from 0 to 135 volts in 5 volt steps, when operated from 100 to 135 volt line. Mounting style 3C (with lugs).

T-18V03	6.25	150	3	2 $\frac{9}{16}$	3 $\frac{11}{16}$	3 $\frac{1}{2}$
T-18V04	7.75	250	3 $\frac{5}{16}$	2 $\frac{3}{4}$	4	5 $\frac{1}{4}$
T-18V05	10.50	500	4 $\frac{1}{4}$	3 $\frac{3}{8}$	6	14 $\frac{1}{4}$

### ISOLATION TRANSFORMERS

Electrostatic shield between primary and secondary. Feature unique "plug-in" primary voltage adjustment — no changing of connections. Prevent radiation of line noise by electrical therapeutic machines, clippers, dryers, etc., or for use in amateur transmitting stations. Reduce line interference to radio receivers. Mounting style 4E except T-18V00, 2V. Primary 105, 115, 125 volts, 50-60 cycles. Secondary 115 volts.

T-18V00	\$10.50	100	3 $\frac{3}{4}$	3 $\frac{3}{4}$	4 $\frac{7}{8}$	8
T-18V01	19.50	250	5 $\frac{7}{8}$	6 $\frac{1}{4}$	6	20

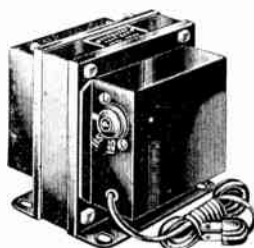


Fig. 4E

### FENCE CONTROLLER TRANSFORMER

Recommended for use in circuit shown in September, 1938 issue of Popular Mechanics. Note: For 6 volt D.C. operation, with suitable relays. Open horizontal mounting.

Type No.	List Price	Primary	Sec. (Open Circuit)	Dimensions			Wt. Lbs.
				W.	D.	H.	
T-18V10	\$3.00	6 V. D.C.	8,000 V. (37 M.A. Peak) 9,000 V. (25 M.A. Peak)	3 $\frac{1}{2}$	2	3 $\frac{1}{4}$	1

### SIGNALING TRANSFORMERS—Listed by Underwriters' Laboratories

While designed primarily for bells, horns, gongs, and other intermittent signal duty, these transformers may be used for many additional applications. Cases are compound filled and have separately enclosed primary and secondary wiring compartments. Knockouts permit attachment of rigid or flexible conduit without exposing the wiring. Primary 115 volts, 50-60 cycles. Four secondary leads provide the following combination of output voltages — 4, 8, 12, 16, 20 and 24 volts. Mounting figure 3V.

Type No.	List Price	Intermittent Duty Rating	Constant Duty Rating	Dimensions			Wt. Lbs.
				W.	D.	H.	
T-47V01	\$ 6.00	50 V. A.	35 V. A.	5 $\frac{5}{8}$	4 $\frac{1}{2}$	4	6 $\frac{1}{4}$
T-47V02	9.75	100 V. A.	85 V. A.	6 $\frac{3}{8}$	4 $\frac{1}{2}$	4	8
T-47V03	21.75	250 V. A.	190 V. A.	7 $\frac{5}{8}$	4 $\frac{1}{2}$	4	14 $\frac{1}{4}$
T-47V04	35.00	500 V. A.	475 V. A.	8 $\frac{3}{8}$	5 $\frac{1}{4}$	5 $\frac{1}{2}$	22 $\frac{1}{2}$

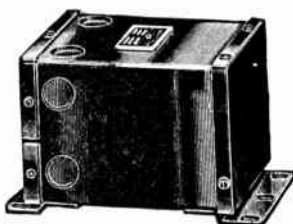


Fig. 3V

Automatic Voltage Regulators are listed on opposite page.



# MATCHING TRANSFORMERS (Low Level)

## AUTOMATIC VOLTAGE REGULATORS



### MATCHING TRANSFORMERS (Low Level)

A complete line of low level input, microphone, line and mixer transformers to fit all applications. Special winding methods result in low leakage reactance so essential to good frequency response. Several styles of mountings are offered for the most popular types. Low level audio transformers are susceptible to hum if located too close to power transformers, etc., C.H.T. and Tru-Fidelity units have hum-bucking windings and are recommended for minimum hum pick-up.

#### LOW IMPEDANCE SOURCE (MICROPHONE, LINE, MIXER) TO GRID

Type No.	List Price	Application	Impedance in Ohms		Overall Ratio	Mtg. Fig.	Dimensions			Wt. Lbs.
			Pri.	Sec.			W.	D.	H.	
T-65A73	\$2.75	DB mike to grid	200 Ct.	100,000	1:22.2	2F	2½	2½	3	2
T-30A20	3.00					2A	2½	2½	3	2
T-58A37	2.25	DB mike to grid	200 Ct.	100,000		2F	2	2½	2¾	1½
T-83A78	2.00	Single button mike to single	100	400,000 Ct.	1:64	2F	2	1⅞	2¾	1¼
T-86A02	1.75	or P.P. grids				2B	2	1⅞	2¾	1
T-23A57	2.25	Single button mike to single grid	100	400,000	1:64	2A	2	1⅞	2¾	1¼
T-55A16	2.75	Dyn. mike, line or mixer to single or P.P. grids	200/50	100,000 Ct.	1:22.3	2F	2	2⅞	2¾	1½
T-63A72	3.75	1, 2, 3 or 4 circuit mixer to grid	50, 100, 150, 200	100,000	1:22.2	2F	2½	2½	3	2¼
T-63A71	3.75	1, 2, 3 or 4 circuit mixer to grid	200, 400, 600, 800	100,000	1:11	2F	2½	2½	3	2¼
T-61A94	3.25	Line to single or P.P. Cl. A grids	500/125	100,000 Ct.	1:14.1	2F	2½	2½	3	2¼
T-62D65-	6.00	Line to 845 Class AB grids	500	7,220	1:3.8	2D	3⅞	3⅞	4	5
T-83D21	3.50	Line to P.P. grids of 6L6's or 50's Class AB	500	5,100 12,500	1:3.2 1:5	2F	2½	2½	3	2¼

#### MICROPHONE OR LINE TO MIXER OR LINE

Type No.	List Price	Application	Impedance in Ohms		Pri. M.A.	Mtg. Fig.	Dimensions			Wt. Lbs.
			Pri.	Sec.			W.	D.	H.	
T-63A73-	\$3.25	DB mike or line to line or mixer	200 Ct. or 50	200 Ct. or 50		2F	2½	2½	3	2¼
T-70A82	3.50	DB mike to line	200 Ct. or 50	500 Ct. or 125		2F	2½	2½	3	2¼
T-70A83	3.50	Crystal mike to line or mixer	100,000	200 Ct. or 50		2F	2½	2½	3	2¼
T-61A96-	3.00	Pick-up or line to line or mixer	500 Ct. or 125	200 Ct. or 50		2F	2½	2½	3	2¼
T-67A45-	3.25	Dble. button mike to line or mixer	200 Ct.	200 Ct. or 50		2A	2½	2½	3	2¼

#### TUBE TO LINE OR MIXER (LOW LEVEL)

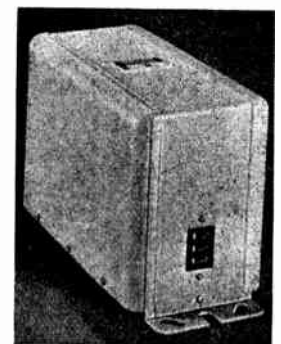
T-14A90	\$2.50	Sgl. or P.P. Plates to line or mixer	20,000 Ct.	500 Ct. or 125	8**	2F	2	2⅞	2¾	1½
T-14A91	2.50	Sgl. or P.P. Plates to line or mixer	20,000 Ct.	200 Ct. or 50	8**	2F	2	2⅞	2¾	1½
T-55A15-	2.25	Plate to line or mixer	15,000/10,000	200 Ct. or 50	8	2F	2	2⅞	2¾	1½
T-75A73-	2.25	P.P. plates to line or mixer	20,000 Ct.	200 Ct. or 50	8**	2F	2	2⅞	2¾	1½

\*\*Per Side.

#### AUTOMATIC VOLTAGE REGULATORS

Will deliver a constant voltage (within ±1%) despite line fluctuations from 90 to 130 volts and/or secondary loads from 1/3 to full load rating. Operation is fully automatic and instantaneous. Once installed no further adjustment is necessary. Supplies optional output voltages of 110, 115 or 120 volts — 60 cycles. Ideal for use with plate, filament or power transformers or for use in technical laboratories. Engineering Bulletin SD422A is available from all Thordarson distributors.

Type No.	List Price	Capacity V.A.	Mtg. Fig.	Dimensions			Wt. Lbs.
				W.	D.	H.	
T-9V30	\$ 40.00	100	SN	5⅞	10½	6½	43
T-9V31	65.00	250	SN	6	10½	8½	61
T-9V32	100.00	500	2Q	7	13	10	117
T-9V33	175.00	1000	2Q	7	18	10	150



Mtg. Fig. SN

Transformers for complete broadcast service are listed in catalog No. 500-D.





# THE C. H. T. SERIES

## TRANSMITTER TRANSFORMERS



C.H.T. transformer and choke components are made for quality amplifier and amateur transmitter applications. For the first time in transformer history a definite pattern of case design has been followed from the smallest audio to the largest plate transformer. Each unit has the complete protection of compound filled cases against varying climatic conditions. Mounting templates and complete instructions are furnished to insure a quick and efficient installation.

### MULTI-MATCH MODULATION TRANSFORMERS

**Plug-in-Jack Terminal Board, the only Modulation Transformer built with this unique feature.**

Enables quick and accurate matching of tube loads without soldering. The experimenter is thus assured of peak transformer performance while testing new tubes or circuit changes. See pages 20 and 21 for complete table of Driver and Modulator combinations for all transmitting tubes.

Type No.	List Price	Cap. Watts	Pri. M.A. Per Side	Sec. M.A.		Mtg. Fig.	Dimensions			Wt. Lbs.
				Series	Par.		W.	D.	H.	
T-11M74	\$ 9.00	40	100	80	160	3G	4	4½	4¾	7¾
T-11M75	12.50	75	145	145	290	3G	4	4½	4¾	9
T-11M76	19.50	125	210	160	320	3G	5½	5½	6	18
T-11M77	30.00	300	250	250	500	3G	6	7½	7¼	30
T-11M78	60.00	500	320	320	640	3G	7	8½	7½	51

### CATHODE MODULATION TRANSFORMERS

Complete instructions including table for matching Class C stages and modulator tubes packed with each unit.

Type No.	List Price	Cap. Watts	Impedance in Ohms		Max. Sec. Current D.C. M.A.	Mtg. Fig.	Dimensions			Wt. Lbs.
			Pri.	Sec.			W.	D.	H.	
T-11M69	\$5.50	15	5,000 7,000 10,000	80 to 2,000	300	3G	2¾	3	3½	3
T-11M70	7.50	40	3,000 6,600 10,000	80 to 2,000	400	3G	4	4½	4¾	7
T-11M71	13.00	100	6,000 8,000 10,000	80 to 2,000	600	3G	4	4½	4¾	10

### MULTI-MATCH DRIVER TRANSFORMERS

Plug-in Connectors and recessed sub-base lugs permit single hole sub-panel wiring. See Table on pages 20 and 21.

Type No.	List Price	Cap. Watts	Max. Pri. M.A. Per Side	Ratio Pri. to ½ Sec.	Mtg. Fig.	Dimensions			Wt. Lbs.
						W.	D.	H.	
T-15D76*	\$ 8.25	15	60	1:1, 1.2:1, 1.4:1, 1.6:1, 1.8:1	3H	4	4½	4¾	7½
T-15D77*	8.25	15	60	2:1, 2.2:1, 2.4:1, 2.6:1, 2.8:1	3H	4	4½	4¾	6
T-15D78*	8.25	15	60	3:1, 3.2:1, 3.4:1, 3.6:1, 3.8:1	3H	4	4½	4¾	6
T-15D79*	8.25	15	60	4:1, 4.5:1, 5:1, 5.5:1, 6:1	3H	4	4½	4¾	6
T-15D80†	11.50	30	120	1:1, 1.25:1, 1.5:1, 1.75:1, 2:1	3H	4	4½	4¾	8¾
T-15D81†	11.50	30	120	2.25:1, 2.5:1, 2.75:1, 3:1, 3.25:1	3H	4	4½	4¾	8
T-15D82‡	8.25	15		1:3.15, 1:2.75, 1:2.5, 1:2.25, 1:2, 1:1.75, 1:1.4, 1:1.25, 1:1.85, 1:1.75	3H	4	4½	4¾	5¾
T-15D83‡	11.50	30		1:3.15, 1:2.75, 1:2.5, 1:2.25, 1:2, 1:1.75, 1:1.4, 1:1.25, 1:1.85, 1:1.75	3H	4	4½	4¾	8½
T-15D84§	11.50	30	80	1.5:1, 2:1, 2.5:1, 3:1, 3.5:1	3H	4	4½	4¾	8¾

\*P.P. 45's or 2A3's. †P.P. Par. 2A3's. ‡Primary for 500 ohm line. §P.P. 6L6's with inverse feedback.

### DRIVER TRANSFORMERS (For Specific Applications)

Type No.	List Price	Driver Tubes	Output Tubes	Class	Ratio Pri. to ½ Sec.	Pri. M.A.	Mtg. Fig.	Dimensions			Wt. Lbs.
								W.	D.	H.	
T-15D85*	\$ 7.50	Sgl. 6F6, 42, 2A5 Triode	P.P. 6L6-40W P.P. 6L6-60W	AB <sub>2</sub>	1.4:1, 1.3:1 1.2:1	40	3M	2¾	3	3½	2½
T-15D86*	7.50	P.P. 6F6, 42, 2A5 Triodes	P.P. Par. 6L6 120 W.	AB <sub>2</sub>	2.6:1	32	3M	2¾	3	3½	2½

\*With humbucking coil construction.

### MULTIPLE-TAP LINE TO GRID TRANSFORMERS (HIGH LEVEL) Mtg. Fig. 3K

Type No.	List Price	Primary Ohms	Secondary Ohms	Dimensions			Wt. Lbs.
				W.	D.	H.	
T-15A65	\$10.50	500, 333, 250, 200, 125, 50	50,000/12,500, P.P. Cl. A 845	4	4½	4¾	8
T-15D87	11.00	500, 333, 250, 200, 125, 50	7220, P.P. Cl. AB 845	4	4½	4¾	8

See page 11 for other modulation transformers and page 10 for other driver transformers.



## MULTI-VOLT FILAMENT TRANSFORMERS

Terminals are brought out to solder lugs on a recessed base (except Mtg. 3X). This permits mounting on chassis with one hole for sub-panel wiring. Side knock-out holes for above panel wiring 50-60 cycles.

### Single Secondary Transformers

Type No.	List Price	Primary Volts	Secondary Volts	Amps.	Pri. V.A.	Volts Insulation	Mtg. Fig.	Dimensions			Wt. Lbs.
								W.	D.	H.	
T-11F59	\$5.75	105-115	5 Ct.	5	30	2000	3K	2 3/4	3	3 1/2	5
T-11F63	8.00	105-115	5 Ct.	13	70	2000	3K	4	4 1/2	4 3/8	7 1/2
T-11F55	11.50	105-115	5.25 Ct.	22	130	2000	3K	5 1/8	5 1/2	6	14
T-11F60	6.25	105-115	6.3 Ct.	5	35	2000	3K	2 3/4	3	3 1/2	5 3/4
T-11F62	6.75	105-115	7.5 Ct.	8	65	2000	3K	4	4 1/2	3 7/8	6 1/2
T-11F64	9.50	105-115	10 Ct.	10	110	2000	3K	4	4 1/2	4 7/8	9 3/4
T-11F53	8.00	105-115	2.5 Ct.	10	25	7500	3K	4	4 1/2	5 3/8	8 1/2
T-11F61	18.50	105-115	2.5 Ct.	20	55	15,000	3X	5 1/8	5 1/2	6	14
T-11F54	16.00	105-115	5 Ct.	20	110	10,000	3X	5 1/8	5 1/2	6	15

### Tapped Secondary Transformers

T-11F50	\$9.00	105-115	7.5 tap at 6.3, 5* and 2.5 Ct.	6.5	55	2000	3K	4	4 1/2	4 3/8	6 1/4
T-11F51	9.50	105-115	10 tap at 7.5 and 6.3 Ct.	8	90	2000	3K	4	4 1/2	4 7/8	7 3/4
T-11F52	13.25	105-115	11 tap at 10 and 7.5 Ct.	10	125	2000	3K	5 1/8	5 1/2	6	13 1/2

\*Not center tapped.

### Multiple Secondary Transformers

T-11F56	\$ 7.75	105-115	No. 1 = 6.3 Ct. No. 2 = 2.5 Ct. No. 3 = 5 Ct.	3 3.5 3	50	2000	3K	4	4 1/2	3 7/8	6
T-11F57	13.75	105-115	No. 1 = 10 Ct. No. 2 = 10 Ct. No. 3 = 6.3 Ct. No. 4 = 5 Ct.	8 4 3 3	170	2000	3K	5 1/8	5 1/2	6 3/4	15
T-11F58	15.00	105-115	No. 1 = 7.5 Ct. No. 2 = 7.5 Ct. No. 3 = 6.3 Ct. No. 4 = 5 Ct.	6.5 3.25 3 3	120	2000	3K	5 1/8	5 1/2	6	13 1/4

## INPUT AND SMOOTHING CHOKES

Companion units to the C. H. T. Multi-Volt Plate Transformers, these chokes are accurately rated and the inductance shown is obtained with full rated D.C. applied. Many commercial choke ratings are obtained by tests not comparable to operating values. Thordarson test methods give the ACTUAL inductance as obtained in filter circuits.

### C. H. T. Input Chokes

Type No.	List Price	Inductance Henries	Current M.A.	Volts Insulation	D.C. Res.	Mtg. Fig.	Dimensions			Wt. Lbs.
							W.	D.	H.	
T-15C36	\$ 8.00	5-25	200-20	4,000	105	3L	4	4 1/2	4 7/8	10
T-15C37	10.00	5-25	300-30	4,000	78	3L	5 1/8	5 1/2	6 3/4	22
T-15C38	12.00	5-25	400-30	4,000	95	3L	5 1/8	5 1/2	6 3/4	24
T-15C39	22.00	5-25	500-30	10,000	86	3L	5 1/8	7 1/4	8 1/4	38 1/2
T-15C41	26.50	5-25	650-50	10,000	46	3L	7	7 1/2	8	51

### C. H. T. Smoothing Chokes

T-15C45	\$ 8.00	12	200	4,000	105	3L	4	4 1/2	4 7/8	10
T-15C46	10.00	12	300	4,000	78	3L	5 1/8	5 1/2	6 3/4	22
T-15C47	12.00	12	400	4,000	95	3L	5 1/8	5 1/2	6 3/4	24
T-15C48	22.00	12	500	10,000	86	3L	5 1/8	7 1/4	8 1/4	38 1/2
T-15C50	26.50	12	650	10,000	46	3L	7	7 1/2	8	51



Fig. 3K



Fig. 3L



Fig. 3H



Fig. 3G



Fig. 3X



**Complete Transformer Manual—No. 340, 35c**—The Thordarson Transformer Manual is a complete book, containing the Radio Servicing Guide, the Replacement Transformer Encyclopedia, the Transmitter Guide, and the Sound Amplifier Guide, plus Thordarson catalogs and prices. It is bound in an attractive blue and orange cover with looseleaf arrangement, giving the user opportunity to keep the Manual up-to-date by adding the latest Thordarson releases.

### For the Amateur

**Transmitter Guide—No. 344-C, 15c**—Fifty-two pages of up-to-the-minute data on transmitter design and operation. Portable units, beginners transmitters, and larger rigs up to 1000 watts are fully described. Circuit diagrams, parts lists, and photographs illustrate each article.





#### MULTI-VOLT PLATE TRANSFORMERS

The value of Thordarson experience in manufacturing quality transformers is best demonstrated by the C.H.T. Multi-Volt Transformers. These units, engineered for continuous operation, provide extreme flexibility, excellent regulation and quiet operation. The new 3P mounting, used on the larger types, consists of two heavy cast cases for full shielding of the coil. Moisture-proof compound is used for complete coil protection. Primary, 115-230, 50-60 cycles.

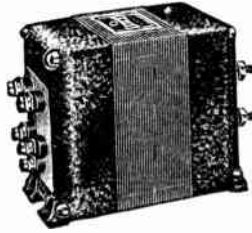


Fig. 3P

Type No.	List Price	Sec. A.C. Load Volts	D.C. Volts	D.C. M.A.	Pri. V. A.	Mtg. Fig.	Dimensions			Wt. Lbs.
							W.	D.	H.	
T-15P11	\$12.50	665/665 or 535/535	500 or 400	200	160	3K	5 1/8	5 1/2	5 3/8	15 3/4
T-15P12	15.00	835/835 or 655/655	650 or 500	200	200	3K	5 1/8	5 1/2	6 3/4	19 1/2
T-15P13	20.00	945/945 or 770/770	750 or 600	300	315	3Q	5 7/8	7 3/4	7 1/4	31 3/4
T-15P14	25.00	1225/1225 or 945/945	1000 or 750	300	427	3Q	5 7/8	8 1/4	8 1/4	41
T-15P15	30.00	1450/1450 or 1190/1190	1250 or 1000	300	520	3Q	7	9	8	51 1/4
T-15P16	45.00	1540/1540 or 1255/1255	1250 or 1000	500	875	3P	6 3/8	11 1/4	9	81
T-15P17	32.50	1815/1815 or 1535/1535	1500 or 1250	300	665	3Q	7	9	8	55
T-15P18	60.00	2130/2130 or 1845/1845	1750 or 1500	500	1210	3P	6 3/8	12 1/2	9	96
T-15P19	50.00	2950/2950 or 2365/2365	2500 or 2000	300	1160	3P	6 3/8	11 3/4	9	85
T-15P20	85.00	2960/2960 or 2390/2390	2500 or 2000	650	2380	3P	7 1/2	13 1/2	9 5/8	140
T-15P21	80.00	3440/3440 or 2980/2980	3000 or 2500	500	2180	3P	7 1/2	12 3/4	9 5/8	129
T-15P22	50.00	2070/2070 or 1785/1785	1750 or 1500	300	745	3P	6 3/8	10 3/4	9	76
		1495/1495 or 1210/1210	1250 or 1000							



Fig. 3Q

#### PLATE AND FILAMENT TRANSFORMERS

Combination plate and filament transformers for such tubes of medium power as 6L6, 807, T-20, RK-23, RK-39, etc. Primary 115 volts, 50-60 cycles. Mounting figure 3K.

T-15R00	\$10.50	500/500 (A.C.)		150	140		5 1/8	5 1/2	6	15
Filament Windings: 5V, 3A; 7.5V, tapped at 6.3, 5A.										
T-15R01	15.00	500/500 (A.C.)		400	310		5 7/8	6 3/4	6	24 1/2
Filament Windings: 5V, 6A; 6.3V., 6 A.										
T-15R02	13.25	750/750 (A.C.)		200	220		5 1/8	5 1/2	6	17
Filament Windings: 2.5V, 10A; 7.5V tapped at 6.3, 3A.										
T-15R03	13.75	400/400 (A.C.)		200	205		5 1/8	5 1/2	6	19
Filament Windings: 2.5V, 4A; 6.3V, 3A; 5V, 3A.										



Fig. 3K

#### MULTI-VOLT BIAS TRANSFORMERS

Rectifier plate and filament terminals on recessed base. Six secondary taps are brought out to plug-in jacks for convenient change of voltage. Mounting figure 3N. Primary 115 volts, 50-60 cycles.

Type No.	List Price	Pri. V. A.	D.C. Volts	M.A.	Filament		Dimensions			Wt. Lbs.
					Volts	Amps.	W.	D.	H.	
T-15R60	\$9.50	65	150; 135; 120; -110; 100; 90	200	5	3	4	4 1/2	4 7/8	6 3/4
T-15R61	10.50	100	275; 250; 225; -200; 175; 150	200	5	3	4	4 1/2	4 7/8	8 1/2
T-15R62	12.50	155	500; 450; 400; -350; 300; 275	200	5	3	5 1/8	5 1/2	5 3/8	15 1/4

#### MULTIPLE-TAP OUTPUT TRANSFORMERS

Designed especially for amplifiers featured in Thordarson No. 346-D Sound Guide. Exceptional adaptability and frequency response will dictate their use in other quality sound systems. Mounting style 3H.

Type No.	List Price	Tube Type	Class	Ohm Impedance		Pri. M.A.	Max. Per Side Watts	Dimensions			Wt. Lbs.
				Pri.	Sec.			W.	D.	H.	
T-15S90*	\$ 9.25	2-6V6 P.P.	AB1	8000	2/3/4/6/-	70	15	4	4 1/2	4 3/8	7 1/4
		2-6L6 P.P.	AB1	5000	8/16/125/-						
		2-2A3 P.P. (self bias)	AB	5000	250/500						
T-15S91*	11.50	2-6L6 P.P. (300 V. Pl. & Sc.)	AB	4300	Same	95	25	4	4 1/2	4 7/8	8
		2-2A3 P.P. (fixed bias)	AB	3000	as above						
T-15S92*	13.75	2-6L6 P.P.	AB1	6600	Same	90	40	4	4 1/2	5 3/8	8 3/4
		2-6L6 P.P.	AB2	5500	as above						
T-15S93*	15.00	4-6L6 P.P. Par.	AB1	3300	Same	155	60	4	4 1/2	5 3/8	15 1/2
		2-6L6 P.P.	AB2	3800	as above						
T-15S94*	17.50	4-6L6 P.P. Par.	AB2	1900	500/250/166	230	120	5 1/8	5 1/2	5 3/8	18
					/125/100/84						

\*Tertiary winding to give a feedback voltage 10% of full primary. Split Primaries.

#### MULTIPLE-TAP LINE TO VOICE COIL TRANSFORMERS

T-15S96	11.00	Line to Voice Coil	1000/500	50/24/16/8/6/4/3/2	25	4	4 1/2	4	7 1/4
T-15S97	14.50	Line to Voice Coil	1000/500	50/24/16/8/6/4/3/2	60	4	4 1/2	4	9

See page 12 for other plate transformers and pages 8 and 9 for other outputs.





# C. H. T. AMPLIFIER TRANSFORMERS

## AUDIO COUPLING TRANSFORMERS



### MULTI-VOLT POWER TRANSFORMERS

Specified for build-it-yourself amplifiers described in Sound Amplifier Guide No. 346-D. Primary 115 volts, 50-60 cycles. Mounting style 3K except T-15R04, 3M.

Type No.	List Price	Volts Ct.	M.A. (Rect.Fil.)	Volts Amp.	Volts Ct.	Amp.	Volts Ct.	Amp.	Dimensions			Wt. Lbs.
									W.	D.	H.	
T-15R04	\$ 4.75	510	25		6.3	2.1			2 3/4	3	3 1/2	3
T-15R05	10.50	680 77 Bias tap	135	5 3 5 2	6.3	2	6.3 2.5	2.25 5	4	4 1/2	5 1/2	10
T-15R06	9.75	725	175	5 3	6.3	5			4	4 1/2	5 1/2	11
T-15R07	10.50	760	280	5 3	6.3	7			4	4 1/2	5 1/2	12
T-15R08	13.75	900	325	5 6	6.3	8			5 1/4	5 1/2	5 5/8	22



Fig. 3K

### C.H.T. AMPLIFIER CHOKES

Specified for build-it-yourself amplifiers fully described in Sound Amplifier Guide No. 346-D. Indicated for other quality receiver and amplifier applications. These types have two windings each. The first line of description applies when the windings are connected in parallel, the second for series connection. Mounting style 3L.

Type No.	List Price	Inductance Henries	Current M.A.	Volts Insulation	D.C. Res.	Dimensions			Wt. Lbs.
						W.	D.	H.	
T-15C52	\$5.00	30 Parallel 120 Series	35 17	1,600	675 2700	2 3/4	3	3 1/2	3
T-15C53	5.50	12 Parallel 50 Series	100 50	1,600	272 1090	2 3/4	3	3 1/2	3 1/4
T-15C54	5.50	8 Parallel 32 Series	150 75	1,600	184 735	2 3/4	3	3 1/2	3 1/2
T-15C55	7.00	2 Parallel 8 Series	500 250	1,600	32 1/2 130	4	4 1/2	4 3/8	7 1/2
T-15C56	9.00	2 Parallel 8 Series	700 350	1,600	27 107	4	4 1/2	4 1/8	9 3/4



Fig. 3L

### AUDIO COUPLING TRANSFORMERS

Ultra-modern design, balanced windings, hum bucking coil construction and moisture-proof compound-filled cases. Frequency response variation  $\pm 1\frac{1}{2}$  db 60 to 8,000 C.P.S. Mounting style 3M.

#### Low Impedance Source to Grid

Type No.	List Price	Primary Ohms	Secondary Ohms	Max. D.C. per side (M.A.)	Max. D.C. unbalance (M.A.)	Max. Sig. Level (db)	Dimensions			Wt. Lbs.
							W.	D.	H.	
T-15A66	\$7.25	500, 333, 250, 200, 125, 50	60,000/15,000 Single Grid	100	2.5	+10	2 3/4	3	3 1/2	2 1/4
T-15A67	8.00	500, 333, 250, 200, 125, 50	120,000/30,000 P. P. Grids	100	2.5	+20	2 3/4	3	3 1/2	2 1/4
T-15A68	8.00	60, 38, 30, 22, 15, 10, 5.5, 2.5	60,000/15,000 Single Grid	100	2.5	0	2 3/4	3	3 1/2	2 1/2



Fig. 3G

#### Low Impedance Source to Line or Mixer

T-15A69	7.25	500, 333, 250, 200, 125, 50	500, 333, 250, 200, 125, 50	100	2.5	+20	2 3/4	3	3 1/2	2
T-15A70	7.50	60, 38, 30, 22, 15, 10, 5.5, 2.5	500, 333, 250, 200, 125, 50	100	2.5	+20	2 3/4	3	3 1/2	2



Fig. 3W

#### Tube to Line (Low Level)

T-15A71	7.25	20,000/5,000 Single Plate	500, 333, 250, 200, 125, 50	8	8	+15	2 3/4	3	3 1/2	1 3/4
T-15A72	7.25	20,000/5,000 P.P. Plates	500, 333, 250, 200, 125, 50	10	0	+20	2 3/4	3	3 1/2	1 3/4

#### Interstage Coupling Transformers (Class A)

T-15A73	6.50	10,000/2,500 Single Plate	40,000/10,000 Single Grid.	0	0	+15	2 3/4	3	3 1/2	2 1/4
T-15A74	6.50	10,000/2,500 Single Plate	40,000/10,000 P.P. Grids	0	0	+15	2 3/4	3	3 1/2	2 1/2
T-15A75	7.00	20,000/5,000 P.P. Plates	45,000/11,250 P.P. Grids	10	0	+20	2 3/4	3	3 1/2	2 1/4



Fig. 3M

See page 18 for other Amplifier Components, pages 3 and 4 for other power transformers, pages 15 and 22 for other audio coupling transformers.



# DRIVER AND MODULATOR COMBINATIONS



MODULATOR STAGE					DRIVER STAGE					
P-P Class B Tubes	Power Output Watts	Plate Volts	Bias Volts	Pl. to Pl. Load Ohms	Use Mod. Trans. No.	P-P Driver Tubes	Trans. Ratio, Pri. to 1/2 Sec.	Use Driver Trans. No.	Trans. for 500 Ohm Line	Ratio 500 Ohm Line to 1/2 Sec.
<b>R.C.A. TUBES</b>										
										Where T-15D82 appears T-19D05 may also be used.
46	30	400	0	5,600	T-11M74 or T-19M14	*45	5:1	T-15D79 or T-19D04	T-15D82	1:1.85
46	40	500	0	8,000	T-11M75 or T-19M14	*45	5:1	T-15D79 or T-19D04	T-15D82	1:1.85
46	50	600	0	9,600	T-11M75 or T-19M15	*45	5:1	T-15D79 or T-19D04	T-15D82	1:1.85
4-46's	56	400	0	2,800	T-11M75 or T-19M15	*45	5:1	T-15D79 or T-19D04	T-15D82	1:1.85
4-46's	96	600	0	4,800	T-11M76 or T-19M16	*45	5:1	T-15D79 or T-19D04	T-15D82	1:1.85
203A	200	1000	-35	6,900	T-11M77 or T-19M17	†2A3	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.5
203A	200	1000	-35	6,900	T-11M77 or T-19M17	**6L6	3.5:1	T-15D84	T-15D82	1:1.25
203A	260	1250	-45	9,000	T-11M77 or T-19M17	†2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.5
203A	260	1250	-45	9,000	T-11M77 or T-19M17	**6L6	3.5:1	T-15D84	T-15D82	1:1.25
4-203A	400	1000	-35	3,450	T-11M78	†4-2A3	2.25:1	T-15D81	T-15D83	1:1.25
4-203A	400	1000	-35	4,500	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.25
4-203A	520	1250	-45	3,450	T-11M78	†4-2A3	2:1	T-15D80	T-15D83	1:1.25
4-203A	520	1250	-45	4,500	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.25
211	200	1000	-77	6,900	T-11M77 or T-19M17	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
211	260	1250	-100	9,000	T-11M77 or T-19M17	2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:2
800	90	750	-40	6,400	T-11M76 or T-19M16	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25
800	100	1000	-55	12,500	T-11M76 or T-19M16	2A3	2.8:1	T-15D77 or T-19D02	T-15D82	1:1.25
800	100	1000	-55	12,500	T-11M76 or T-19M16	45	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.2
801	45	600	-75	10,000	T-11M74 or T-19M14	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25
801	45	600	-75	10,000	T-11M74 or T-19M14	45	2:1	T-15D77 or T-19D02	T-15D82	1:2.25
801	75	750	-80	11,000	T-11M75 or T-19M16	45	1.8:1	T-15D76 or T-19D01	T-15D82	1:2.25
801	75	750	-80	11,000	T-11M75 or T-19M16	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
805	300	1250	0	6,700	T-11M77	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
805	370	1500	-16	8,200	T-11M78	2A3	3:1	T-15D78 or T-19D03	T-15D82	1:1.25
806	500	2000	-150	11,500	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2
806	500	2000	-150	11,500	T-11M78	**6L6	1.5:1	T-15D84	T-15D83	1:2.5
808	190	1250	-15	12,700	T-11M77 or T-19M17	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
809	60	500	0	5,200	T-11M75 or T-19M15	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75
809	60	500	0	5,200	T-11M75 or T-19M15	45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25
809	100	750	-5	8,400	T-11M76 or T-19M16	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75
809	100	750	-5	8,400	T-11M76 or T-19M16	45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25
810	510	1500	-30	6,600	T-11M78	4-2A3	2.25:1	T-15D81	T-15D83	1:1.25
811	175	1250	0	15,000	T-11M77 or T-19M17	2A3	5:1	T-15D79 or T-19D04	T-15D82	1:1.85
811	225	1500	-9	18,000	T-11M77 or T-19M17	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:1.25
830B	175	1000	-35	7,600	T-11M77 or T-19M17	2A3	3:1	T-15D78 or T-19D03	T-15D82	1:1.25
838	200	1000	0	6,900	T-11M77 or T-19M17	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
838	260	1250	0	9,000	T-11M77 or T-19M17	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
4-838	400	1000	0	3,450	T-11M78	4-2A3	3.25:1	T-15D81	T-15D83	1:1.75
4-838	400	1000	0	3,450	T-11M78	**6L6	3.5:1	T-15D84	T-15D83	1:1.25
4-838	520	1250	0	4,500	T-11M78	4-2A3	3.25:1	T-15D81	T-15D83	1:1.75
4-838	520	1250	0	4,500	T-11M78	**6L6	3.5:1	T-15D84	T-15D83	1:1.25
1608	50	425	-15	4,800	T-11M75 or T-19M15	*45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25
<b>TAYLOR TUBES</b>										
T-20	50	600	-30	8,100	T-11M75 or T-19M15	*45	2.2:1	T-15D77 or T-19D02	T-15D82	1:2
T-20	70	800	-40	12,000	T-11M75 or T-19M16	*45	2:1	T-15D77 or T-19D02	T-15D82	1:2.25
TZ-20	70	800	0	12,000	T-11M75 or T-19M16	*45	3.2:1	T-15D78 or T-19D03	T-15D82	1:1.4
T-55	175	1000	-40	6,900	T-11M77 or T-19M17	2A3	2.8:1	T-15D77 or T-19D02	T-15D82	1:1.25
T-55	225	1250	-50	9,400	T-11M77 or T-19M17	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.4
T-55	275	1500	-60	12,000	T-11M77	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
T-155	Same as HD-203-A									
203-A	Same as R.C.A. 203A									
4-203A	Same as R.C.A. 203A									
HD-203A	300	1500	-50	9,600	T-11M77	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25
HD-203A	300	1750	-67.5	13,000	T-11M77	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25
HD-203A	400	1750	-67.5	10,000	T-11M78	2A3	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HD-203A	400	2000	-75	12,500	T-11M78	2A3	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HD-203A	500	2000	-75	10,000	T-11M78	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HD-203A	500	1500	-50	6,400	T-11M78	4-2A3	2:1	T-15D80	T-15D83	1:1.25
HD-203A	500	1500	-50	6,400	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.4
HD-203A	600	1750	-67.5	7,600	T-11M78	4-2A3	1.75:1	T-15D80	T-15D83	1:1.4
HD-203A	600	1750	-67.5	7,600	T-11M78	**6L6	2.5:1	T-15D84	T-15D83	1:1.75
203B	300	1250	-45	7,900	T-11M77	†2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:2
4-203B	600	1250	-45	3,900	T-11M78	†4-2A3	1.75:1	T-15D80	T-15D83	1:1.4
4-203B	600	1250	-45	3,900	T-11M78	**6L6	2.5:1	T-15D84	T-15D83	1:1.75
203Z	200	1000	0	6,900	T-11M77 or T-19M17	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:1.75
203Z	260	1100	0	6,700	T-11M77	†2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
203Z	300	1250	0	7,900	T-11M77	†2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
211	Same as R.C.A. 211									
T-756	100	850	-25	9,400	T-11M76 or T-19M16	2A3	3:1	T-15D78 or T-19D03	T-15D82	1:1.25
T-756	125	850	-25	7,500	T-11M76 or T-19M17	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
T-814	500	2000	-150	11,500	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2
T-814	500	2000	-150	11,500	T-11M78	**6L6	1.5:1	T-15D80	T-15D82	1:3.15
T-822	Same as HD-203A									
TZ-40	175	1000	0	6,800	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
TZ-40	175	1000	0	6,800	T-11M77 or T-19M17	45	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.5
TZ-40	100	750	0	6,000	T-11M76 or T-19M16	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:1.75
TZ-40	100	750	0	6,000	T-11M76 or T-19M16	45	3:1	T-15D73 or T-19D03	T-15D82	1:1.4

See pages 10 and 16 for driver transformers.



# DRIVER AND MODULATOR COMBINATIONS



MODULATOR STAGE					DRIVER STAGE					
P-P Class B Tubes	Power Output Watts	Plate Volts	Bias Volts	Pl. to Pl. Load Ohms	Use Mod. Trans. No.	P-P Driver Tubes	Trans. Ratio, Pri. to 1/2 Sec.	Use Driver Trans. No.	Trans. for 500 Ohm Line	Ohm Line to 1/2 Sec.
<b>EIMAC TUBES</b>										
35T	150	1000	-22	7,200	T-11M77 or T-19M17	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.4
35T	200	1250	-30	9,600	T-11M77 or T-19M17	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.5
100TH	210	1000	0	5,200	T-11M77 or T-19M17	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
100TH	260	1250	0	7,200	T-11M77	2A3	3.6:1	T-15D78 or T-19D03	T-15D82	1:1.25
100TH	300	1500	-10	9,600	T-11M77	2A3	3.6:1	T-15D78 or T-19D03	T-15D82	1:1.25
100TH	380	2000	-20	16,000	T-11M78	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
100TL	170	1000	-90	5,200	T-11M77 or T-19M17	**6L6	2:1	T-15D84	T-15D82	1:2
100TL	230	1250	-112	7,200	T-11M77	**6L6	1.5:1	T-15D84	T-15D82	1:2.5
100TL	270	1500	-140	9,600	T-11M77	**6L6	1.5:1	T-15D84	T-15D82	1:2.5
100TL	350	2000	-185	16,000	T-11M78	**6L6	1.5:1	T-15D84	T-15D82	1:2.5
150T	500	2000	-150	11,500	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2
150T	600	2500	-195	14,000	T-11M78	4-2A3	1.25:1	T-15D80	T-15D83	1:2
150T	600	2000	-150	11,500	T-11M78	**6L6	1.5:1	T-15D84	T-15D83	1:2.5
150T	600	2500	-195	14,000	T-11M78	**6L6	1.5:1	T-15D84	T-15D83	1:2.5
250TH	300	1000	0	4,000	T-11M77	**6L6	3.5:1	T-15D84	T-15D83	1:1.25
250TH	400	1250	0	5,200	T-11M78	**6L6	8.5:1	T-15D84	T-15D83	1:1.25
250TH	500	1500	-22.5	6,400	T-11M78	**6L6	3:1	T-15D84	T-15D83	1:1.4

Where T-15D82 appears T-19D05 may also be used.

<b>RAYTHEON TUBES</b>										
RK-12	100	750	0	8,700	T-11M76 or T-19M16	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75
RK-18	100	1000	-50	12,000	T-11M76 or T-19M16	*45	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.75
RK-18	100	1000	-50	12,000	T-11M76 or T-19M16	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
RK-31	110	1000	0	13,600	T-11M76 or T-19M17	*45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25
RK-31	140	1250	0	17,000	T-11M77 or T-19M17	*45	4:1	T-15D79 or T-19D04	T-15D82	1:1.25
RK-31	110	1000	0	13,600	T-11M76 or T-19M17	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75
RK-31	140	1250	0	17,000	T-11M77 or T-19M17	2A3	6:1	T-15D79 or T-19D04	T-15D82	1:1.75
RK-52	200	1000	0	7,200	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
RK-52	250	1250	0	10,000	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
RK-57	300	1250	0	6,700	T-11M77	2A3	3.4:1	T-15D78 or T-19D03	T-15D82	1:1.25
RK-57	370	1500	-16	8,200	T-11M78	2A3	3:1	T-15D78 or T-19D03	T-15D82	1:1.25
RK-58	200	1000	0	6,900	T-11M77 or T-19M17	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85
RK-58	260	1250	0	9,000	T-11M77 or T-19M17	2A3	3.8:1	T-15D78 or T-19D03	T-15D82	1:1.85

<b>HYTRON TUBES</b>										
HY-25	75	800	-9	9,000	T-11M75 or T-19M16	2A3	5:1	T-15D79 or T-19D04	T-15D82	1:1.75
HY-40	140	800	-28	5,800	T-11M77 or T-19M17	2A3	3.4 to 1	T-15D78 or T-19D03	T-15D82	1:1.25
HY-40	175	1000	-37.5	7,000	T-11M77 or T-19M17	2A3	3.4 to 1	T-15D78 or T-19D03	T-15D82	1:1.25
HY-57	110	800	-9	9,000	T-11M76 or T-19M17	2A3	5:1	T-15D79 or T-19D04	T-15D82	1:1.75
HY-51A	180	1000	-35	7,000	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
HY-51B	180	1000	-35	7,000	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85

<b>AMPEREX TUBES</b>										
HF-100	260	1500	-52	12,000	T-11M77	2A3	3.2:1	T-15D78 or T-19D03	T-15D82	1:1.25
HF-100	350	1750	-62	16,000	T-11M78	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
ZB-120	150	750	0	4,800	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
ZB-120	200	1000	0	6,900	T-11M77 or T-19M17	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
ZB-120	245	1250	0	9,000	T-11M77 or T-19M17	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:1.75
ZB-120	300	1500	-9	11,200	T-11M77	2A3	4:1	T-15D79 or T-19D04	T-15D82	1:1.85
HF-200	500	2000	-100	11,200	T-11M78	2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:1.75
HF-200	500	2500	-130	16,000	T-11M78	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HF-200	600	2500	-130	16,000	T-11M78	2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:1.75
HF-200	500	2000	-100	11,200	T-11M78	**6L6	2.5:1	T-15D84	T-15D82	1:1.75
HF-200	600	2500	-130	16,000	T-11M78	**6L6	2.5:1	T-15D84	T-15D82	1:1.75

<b>HEINTZ &amp; KAUFMAN GAMMATRON TUBES</b>										
HK-24	45	500	0	6,400	T-11M75 or T-19M15	2A3	4.5:1	T-15D79 or T-19D04	T-15D82	1:1.75
HK-24	105	1000	-29	15,000	T-11M76 or T-19M16	2A3	3.2:1	T-15D78 or T-19D03	T-15D82	1:1.25
HK-54	170	1250	-35	12,500	T-11M77 or T-19M17	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
HK-54	200	1500	-45	16,800	T-11M77 or T-19M17	2A3	2.4:1	T-15D77 or T-19D02	T-15D82	1:1.4
HK-154	200	1000	-155	7,500	T-11M77 or T-19M17	2A3	1.4:1	T-15D76 or T-19D01	T-15D82	1:2.25
HK-154	223	1250	-210	11,400	T-11M77 or T-19M17	2A3	1.2:1	T-15D76 or T-19D01	T-15D82	1:2.75
HK-254	240	1500	-40	10,000	T-11M77 or T-19M17	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HK-254	328	2000	-65	16,000	T-11M78	2A3	2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HK-254	418	2500	-80	22,000	T-11M78	2A3	1.8:1	T-15D76 or T-19D01	T-15D82	1:1.75
HK-354	100	1000	-60	15,000	T-11M76 or T-19M16	2A3	2.6:1	T-15D77 or T-19D02	T-15D82	1:1.25
HK-354	220	1500	-100	15,000	T-11M77 or T-19M17	2A3	2.2:1	T-15D77 or T-19D02	T-15D82	1:1.75
HK-354	400	2000	-150	15,000	T-11M78	2A3	1.4:1	T-15D76 or T-19D01	T-15D82	1:2.25
354E	319	1500	-25	10,000	T-11M77	4-2A3	2.25:1	T-15D81	T-15D83	1:1.25
354E	472	2000	-37.5	11,000	T-11M78	4-2A3	2:1	T-15D80	T-15D83	1:1.25
354E	595	2500	-50	16,000	T-11M78	4-2A3	1.75:1	T-15D80	T-15D83	1:1.4
354F	290	1500	-15	12,000	T-11M77	4-2A3	2.75:1	T-15D81	T-15D83	1:1.85
354F	445	2000	-22.5	12,000	T-11M78	4-2A3	2.5:1	T-15D81	T-15D83	1:1.85

<b>WESTERN ELECTRIC TUBES</b>										
242A, 261A, 276A	Same as R.C.A. 211									

NOTE: This ratio is correct only when the tubes supplying power to the 500 ohm line are of the same type and operated under the same conditions as the driver tubes listed under "P.P. Driver Tubes." 2A3 driver tubes are operated with 300 plate volts, self biased, unless preceded by †. 45 driver tubes are operated with 275 plate volts, self biased, unless preceded by \*. †2A3 driver tubes are operated with 300 plate volts, fixed bias. \*45 driver tubes are operated with 250 plate volts, self biased. \*\*6L6's with 16.6N feed-back, 400 volts plate, 300 volts screen.

See Pages 11 and 16 for modulation transformers.





Fig. 3S



Fig. 3T

Thordarson Tru-Fidelity transformers are definitely a high quality group. Such features as balanced "hum bucking" coils, special high permeability cores, heavy cast cases, one hole swivel mounting and extremely wide frequency range recommend them to engineers who demand the best.

### CRYSTAL MICROPHONE OR PHOTO CELL TO LINE

Type No.	List Price	Pri. Ohms	Sec. Ohms	Max. D.C. per side (M.A.)	Max. D.C. un-balance (M.A.)	Max. Sig. Level (db)	Mtg. Fig.	Dimensions			Wt. Lbs.
								W.	D.	H.	
T-90A06	\$18.00	250,000/62,500	†500*/333/250/ 200*/125/50	0	0	+10	3T	3 1/8	2 1/2	4 1/8	4 3/4

### PLATE TO LINE (LOW LEVEL)

T-90A02	17.50	20,000/5000 Single Plate	†500*/333/250/ 200*/125/50	8	8	+15	3T	3 1/8	2 1/2	4 1/8	5
T-90A01	16.50	20,000/5000 Single† or P-P Plates	†500*/333/250/ 200*/125/50	10	0	+20	3T	3 1/8	2 1/2	4 1/8	4 1/2

†With single tube use parallel feed with resistor or T-90C09.

### MIXER

T-90A10	16.00	500*/333/250 200*/125/50	†500*/333/250/ 200*/125/50	100	.5	+10	3T	3 1/8	2 1/2	4 1/8	4 3/4
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### LINE TO GRID

T-90A00	17.00	500*/333/250 200*/125/50	75,000/18,750 Single Grid	100	.5	+10	3T	3 1/8	2 1/2	4 1/8	4
T-90A11	20.00	500*/333/250 200*/125/50	150,000/37,500 P-P Grids	100	.5	+20	3T	3 1/8	2 1/2	4 1/8	4

### INTERSTAGE

T-90A03	15.00	10,000/2500 Single Plate	Ratio-overall 1 to 2	40,000/10,000 Single Grid	0	0	+15	3T	3 1/8	2 1/2	4 1/8	4 1/2
T-90A04	15.00	10,000/2500 Single Plate	Ratio-overall 1 to 2	40,000/10,000 P-P Grids	0	0	+15	3T	3 1/8	2 1/2	4 1/8	4 3/4
T-90A05	16.50	20,000/5000 P-P Plates	Ratio-overall 1 to 1 1/2	45,000/11,250 P-P Grids	10	0	+20	3T	3 1/8	2 1/2	4 1/8	4 3/4

### OUTPUT

T-90S07	18.00	5000/3000/1250/750 P-P 2A3, etc.		†500*/333/250/ 200*/125/50	60	5	+32	3T	3 1/8	2 1/2	4 1/8	4 3/4
T-90S08	17.50	5000/3000/1250/750 P-P 2A3, etc.		15/10/7.5/ 5/3.75/1.25	60	5	+32	3T	3 1/8	2 1/2	4 1/8	4 3/4
T-90S13	20.00	5000/3000/1250/750 P-P 2A3, etc.		†500*/333/250/ 200*/125/50 or 15/10/7.5/ 5/3.75/1.25	60	5	+34	3S	4	3 3/8	4 7/8	11

### LINE TO VOICE COIL

T-90S12	14.00	500*/333/250 200*/125/50		15/10/7.5/ 5/3.75/1.25	0	0	+32	3T	3 1/8	2 1/2	4 1/8	4 3/4
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### PLATE REACTOR

Type No.	List Price	Connection	Henries	M.A.	D.C. Ohms	Mtg. Fig.	Dimensions			Wt. Lbs.
							W	D.	H.	
T-90C09	\$12.50	Series Parallel	300 75	8 16	4,000 1,000	3T	3 1/8	2 1/2	4 1/8	4 1/2

\*Indicates inductive and capacitive balance to center tap for use on balanced transmission lines.

†Frequency response warranted on 500 and 200 ohm taps

Other audio transformers are listed on pages 6, 7, 15 and 19.

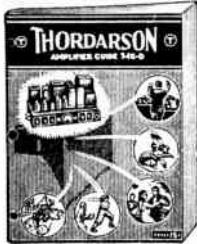


# AMPLIFIERS



## "Build a Thordarson Amplifier"

P. A. men and experimenters interested in building high quality amplifiers are finding the Thordarson Amplifier Guide No. 346-D a worthwhile source of information. It contains laboratory designed and tested circuits of amplifiers from 8 to 120 watts output. Complete parts list and mechanical chassis drawings enable the constructor to obtain superior results with matched transformer and choke components. Data is included for pre-amplifiers, dual tone controls, speaker impedance matching and testing. Obtain your copy of the Guide from your supplier or factory. (15 cents postpaid.)



Below is a brief description and transformer-choke complements of popular amplifiers fully covered in the Amplifier Guide. Optional selection of C.H.T. or regular components is indicated.

### 8 WATT AMPLIFIER

Mic. channel — 111 db.  
Phono channel — 66 db.  
6 watts speaker field power  
Tubes: 1-6J7, 1-6F5, 1-6L6G, 1-80  
T-75R47 Power Transformer  
T-57C54 Choke  
T-17S10 Output Transformer

### 20 WATT UNIVERSAL AMPLIFIER

6 volt battery operation  
115 volt 60 cycle operation  
Mic. channel — 114 db.  
Phono channel — 75 db.  
Tubes: 2-6J7, 1-6C5, 2-6L6G, 2-6W5G  
T-14R40 Power Transformer  
T-15A74 Input Transformer  
T-17S12 or T-15S91 Output Transformer  
T-17C00-B First Choke  
T-37C36 Second Choke

### 120 WATT AMPLIFIER

For use with single or four channel pre-amplifiers  
500 ohm input — 72.5 db. or  
High impedance input — 90 db.  
Dual treble and bass tone controls  
Tubes: 1-6J7, 2-6C5, 2-6F6, 4-6L6G, 2-83, 1-80  
T-15R01 Power Transformer  
T-15R06 Power Transformer  
T-15C56 First Choke  
T-68C07 Second Choke  
T-15A74 Input Transformer  
T-15D86 Driver Transformer or T-17D04  
T-15S94 Output Transformer or T-17S16  
T-67C46 Choke  
T-14C70 Choke  
2-R-1068

### 15 WATT AMPLIFIER

Mic. channel — 113 db.  
Phono channel — 72 db.  
10 watts speaker field power  
Tubes: 2-6J7, 1-6C5, 2-6V6G, 1-5Z3  
T-70R62 or T-15R06 Power Transformer  
T-57C54 or T-15C54 First Choke  
T-67C46 Second Choke  
T-15A74 Input Transformer  
T-17S11 or T-15S90 Output Transformer

### 40 WATT AMPLIFIER

2 Mic. channels — 118.5 db.  
2 Phono channels — 74 db.  
25 watts speaker field power  
Dual treble and bass tone controls  
Tubes: 2-6J7, 1-6F5, 1-6C5, 1-6F6, 2-6L6G, 2-5Z3  
T-17R31 or T-15R08 Power Transformer  
T-75C51 or T-15C56 First Choke  
T-18C92 Second Choke  
T-67C46 Third Choke  
T-15D85 Driver Transformer  
T-14C70 Tone Control Choke  
T-17S14 or T-15S92 Output Transformer  
2-R-1068

### 10 WATT TRU-FIDELITY PHONO AMPLIFIER

2 Phono channels — 81 db.  
Volume expansion  
Dual treble and bass tone controls  
Tubes: 4-6C5, 1-6L7, 1-6H6, 2-2A3 or 2-6A3, 1-5Z3, 1-80  
T-87R85 or T-15R05 Power Transformer  
T-90A04 Input Transformer  
T-15C54 Choke  
T-74C30 Choke  
T-67C46 Choke  
T-18C92 Choke  
T-14C70 Tone Control Choke  
T-90S13 Output Transformer  
2-R-1068

### 25 WATT AMPLIFIER

2 Mic. channels — 113 db.  
1 Phono channel — 72 db.  
18 watts speaker field power  
Treble and bass tone controls  
Tubes: 3-6J7, 1-6C5, 2-6L6G, 1-5Z3  
T-17R30 or T-15R07 Power Transformer  
T-67C49 or T-15C55 First Choke  
T-67C46 Second Choke  
T-15A74 Input Transformer  
T-17S12 or T-15S91 Output Transformer

### 60 WATT AMPLIFIER

2 Mic. channels — 112 db.  
2 Phono channels — 73 db.  
Dual treble and bass tone controls  
Tubes: 3-6J7, 2-6C5, 4-6L6G, 1-83, 1-80  
T-89R28 Power Transformer  
T-75C51 First Choke  
T-68C07 Second Choke  
T-67C46 Third Choke  
T-15A74 Input Transformer  
T-14C70 Tone Control Choke  
T-17S15 or T-15S93 Output Transformer  
2-R-1068

### SINGLE CHANNEL PRE-AMPLIFIER

Any high impedance Mic. to Line  
60 db. gain  
115 volt 60 cycle operation  
Tubes: 1-6F5, 1-6J7 and 1-6X5  
T-15R04 Power Transformer  
T-15A71 Tube to Line Transformer  
2 T-13C26 Chokes

### FOUR CHANNEL PRE-AMPLIFIER

Four high impedance Mic. to Line  
55 db. gain  
Complete mixing  
115 Volt 60 cycle operation  
Tubes: 4-6F5, 1-6J7 and 1-6X5  
T-15R04 Power Transformer  
T-15A71 Tube to Line Transformer  
2 T-13C26 Chokes  
2-R-1068

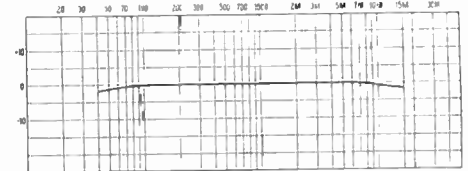
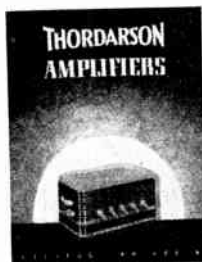


Photo and frequency curve of 40 watt amplifier. Complete constructional data is given in Thordarson Amplifier Guide, No. 346-D.



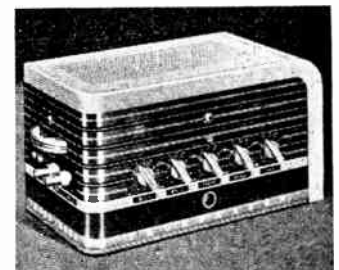
Catalog No. 600-D

## THORDARSON AMPLIFIERS (Factory Wired and Tested)

"Built for Audio Experts by Audio Experts"

The finest amplifiers are built by Thordarson — pioneers in producing quality audio components. Absolute fidelity is insured by accurate laboratory design and rigid inspection during production. New models from 8 to 75 watts undistorted output satisfy practically every sound requirement. A 28 watt universal amplifier with built in record-player operates from either 6 volt battery or 115 volts a.c.

Catalog 600-D illustrates and describes the beautiful walnut cabinet models and streamlined steel enclosures. Obtain a copy from your distributor or write factory direct.



Model T-25W20

Build or buy a Thordarson Amplifier in 1940.

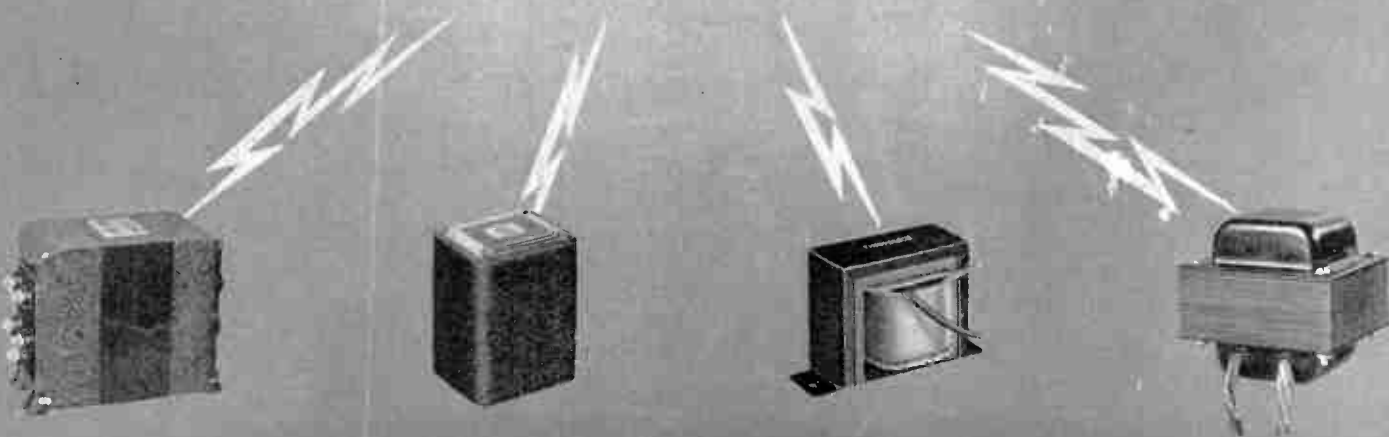




# THORDARSON

**Complete Transformer Catalog No. 400-D**

1939 • FALL - WINTER • 1940



**THORDARSON ELECTRIC MFG. CO.**

**500 W. HURON ST., CHICAGO, ILL.**

*Demand "Power by Thordarson"*



# INDEX — WITH LIST PRICES (EFFECTIVE AUG. 1, 1939)

(SEE BACK COVER FOR CLASSIFIED INDEX)

**Catalog prices are list, subject to trade discount. Add 60% for 25 cycle 115 v. primary; 30% for 230 v. 60 cycle primary.**

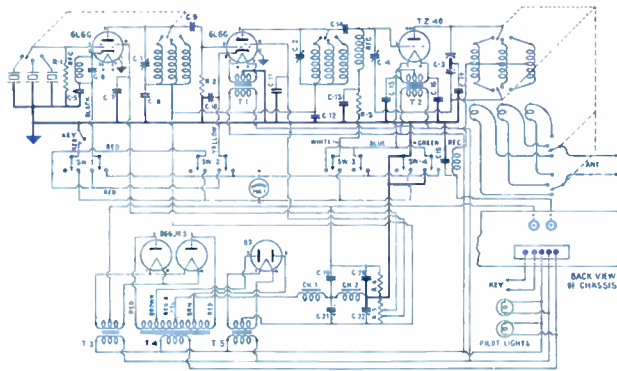
The letter separating the first two digits of the type number from the last two indicates the classification of the unit. The following legend will further explain:

A = Audio, D = Driver, K = Foundation Unit, P = Plate, S = Output or Speaker, W = Wired Amplifier.  
 C = Choke, F = Filament, M = Modulation, R = Power, V = Voltage Changer,

Type No.	Page No.	List Price	Type No.	Page No.	List Price	Type No.	Page No.	List Price	Type No.	Page No.	List Price	Type No.	Page No.	List Price	Type No.	Page No.	List Price
T-9V30	15	\$40.00	T-14R50	9	\$15.00	T-15D84	16	\$11.50	T-19C44	12	\$10.00	T-55A16	15	\$ 2.75	T-72S58	9	1.65
T-9V31	15	65.00	T-14C51	9	8.00	T-15D85	16	7.50	T-19C45	12	14.00	T-56R01	3	5.50	T-72A59	9	1.65
T-9V32	15	100.00	T-14C61	6	1.05	T-15D86	16	7.50	T-19C46	12	3.25	T-56R03	3	5.50	T-73M52	11	\$18.00
T-9V33	15	175.00	T-14C62	6	1.05	T-15D87	16	11.00	T-19P54	12	5.75	T-56R05	3	5.75	T-73F60	13	3.75
R-1068	6-23	2.50	T-14C63	6	1.05	T-15S90	18	9.25	T-19P55	12	7.50	T-57S01	9	2.00	T-74F23	13	5.00
T-11K16	24	3.00	T-14C64	6	1.05	T-15S91	18	11.50	T-19P56	12	8.00	T-57S02	9	2.00	T-74F24	13	7.00
T-11K17	24	2.00	T-14C70	6	2.50	T-15S92	18	13.75	T-19P57	12	10.00	T-57A36	7	2.00	T-74R28	4	6.50
T-11K19	24	2.25	T-14S80	9	2.00	T-15S93	18	15.00	T-19P58	12	13.00	T-57A38	7	2.75	T-74C29	6	3.75
T-11K20	24	2.00	T-14S81	8	1.25	T-15S94	18	17.50	T-19P59	12	16.00	T-57A39	7	2.25	T-74C30	6-24	1.50
T-11F50	17	9.00	T-14S82	8	1.25	T-15S95	18	11.00	T-19P60	12	18.50	T-57A40	7	2.75	T-74A31	6-7	3.25
T-11F51	17	9.50	T-14S83	8	1.25	T-15S97	18	14.50	T-19P61	12	20.00	T-57A41	7	3.00	T-74D32	10	3.50
T-11F52	17	13.25	T-14S84	8	1.25	T-16C07	6	2.25	T-19P62	12	22.50	T-57A42	7	3.25	T-75D10	10	5.50
T-11F53	17	8.00	T-14A90	15	2.50	T-16R50	16	16.00	T-19P63	12	23.00	T-57C51	6	1.50	T-75M11	11	20.00
T-11F54	17	16.00	T-14A91	15	2.50	T-16R51	16	18.50	T-19P64	12	28.50	T-57C52	6	1.75	T-75R47	4	3.75
T-11F55	17	11.50	T-14A92	7	1.25	T-16F55	16	11.00	T-19P65	12	29.50	T-57C53	6	2.00	T-75C49	6	1.50
T-11F56	17	7.75	T-14D93	7	1.75	T-16S58	16	16.00	T-19P66	12	35.00	T-57C54	6	2.25	T-75R50	4	7.50
T-11F57	17	13.75	T-15R00	18	10.50	T-17C00-B	6	2.75	T-19P67	12	42.50	T-58A37	15	2.25	T-75C51	6	5.00
T-11F58	17	15.00	T-15R01	18	15.00	T-17D01	7	2.00	T-19P68	12	50.00	T-58A70	7	3.25	T-75A74	7	2.50
T-11F59	17	5.75	T-15R02	18	13.25	T-17A02	7	2.25	T-19P69	12	13.00	T-58S72	8	3.75	T-75S75	8	4.00
T-11F60	17	6.25	T-15R03	18	13.75	T-17D03	10	4.50	T-19F76	13	4.75	T-60S48	9	3.00	T-76S74	9	3.00
T-11F61	17	18.50	T-15R04	19	4.75	T-17D04	10	4.50	T-19F77	13	7.00	T-60R49	3	2.25	T-77R63-A	4	3.75
T-11F62	17	6.75	T-15R05	19	10.50	T-17S10	8	3.00	T-19F78	13	5.25	T-61V07	14	5.00	T-78D46	7	1.50
T-11F63	17	8.00	T-15R06	19	9.75	T-17S11	8	4.50	T-19F79	13	6.75	T-61S25	9	3.25	T-79F84	13	4.75
T-11F64	17	9.50	T-15R07	19	10.50	T-17S12	8	4.50	T-19F80	13	1.25	T-61S26	9	3.50	T-80R92-C	4	7.50
T-11M74	16	9.00	T-15R08	19	13.75	T-17S13	8	6.00	T-19F81	13	1.50	T-61D40	10	5.50	T-81S01	8	1.50
T-11M75	16	12.50	T-15P11	18	12.50	T-17S14	8	6.00	T-19F82	13	5.75	T-61F85	13	2.00	T-81C15	6	2.50
T-11M76	16	19.50	T-15P12	18	15.00	T-17S15	8	6.50	T-19F83	13	2.25	T-61A94	15	3.25	T-81D42	10	3.25
T-11M77	16	30.00	T-15P13	18	20.00	T-17S16	8	12.00	T-19F84	13	2.75	T-62D65	15	6.00	T-81D52	10	3.50
T-11M78	16	60.00	T-15P14	18	25.00	T-17S17	9	6.50	T-19F85	13	3.50	T-63C15	12	7.50	T-82M09	11	20.00
T-13R00	3	4.00	T-15P15	18	30.00	T-17R30	4	8.50	T-19F86	13	6.00	T-63R63	3	3.50	T-82V11	14	12.50
T-13R01	3	2.50	T-15P16	18	45.00	T-17R31	4	12.50	T-19F87	13	6.25	T-63A71	15	3.75	T-82V12	14	17.50
T-13R02	3	3.25	T-15P17	18	32.50	T-17R32	10	10.00	T-19F88	13	1.75	T-63A72	15	3.75	T-82V13	14	22.50
T-13R03	3	3.50	T-15P18	18	60.00	T-17R33	10	12.50	T-19F89	13	2.25	T-63A73	15	3.25	T-82M25	11	40.00
T-13R04	3	4.25	T-15P19	18	50.00	T-17C40	10	4.75	T-19F90	13	3.00	T-63F99	13	3.25	T-83D21	15	3.50
T-13R05	3	4.00	T-15P20	18	85.00	T-17S57	9	2.25	T-19F91	13	2.25	T-64C06	12	10.00	T-83M22	11	9.00
T-13R06	3	5.25	T-15P21	18	80.00	T-17M59	11	3.00	T-19F92	13	3.25	T-64C07	12	12.50	T-83R77-A	4	3.25
T-13R07	3	5.50	T-15P22	18	50.00	T-18V00	14	10.50	T-19F93	13	2.25	T-64F13	13	2.75	T-83A78	15	2.00
T-13R08	3	4.50	T-15C36	17	8.00	T-18V01	14	19.50	T-19F94	13	3.00	T-64F14	13	4.75	T-83R82	4	10.00
T-13R09	3	6.50	T-15C37	17	10.00	T-18V02	14	27.50	T-19F95	13	2.75	T-64M25	11	6.00	T-83D83	10	3.75
T-13R11	3	2.50	T-15C38	17	12.00	T-18V03	14	6.25	T-19F96	13	3.50	T-64M26	11	6.00	T-83S84	8	6.00
T-13R12	3	3.25	T-15C39	17	22.00	T-18V04	14	7.75	T-19F97	13	1.75	T-64F33	13	4.50	T-83R85	4	12.00
T-13R13	3	4.00	T-15C41	17	26.50	T-18V05	14	10.50	T-19F98	13	2.75	T-64F37	13	6.00	T-83S87	8	9.00
T-13R14	3	4.25	T-15C45	17	8.00	T-18V06	14	6.00	T-19F99	13	3.50	T-64F38	13	4.00	T-84S58	8	6.00
T-13R15	3	5.75	T-15C46	17	10.00	T-18V07	14	13.50	T-23A57	15	2.25	T-65A73	15	2.75	T-84D59	10	3.50
T-13R16	3	6.50	T-15C47	17	12.00	T-18V10	14	3.00	T-26V04	14	4.50	T-65S94	8	4.00	T-84P60	12	7.75
T-13R17	3	4.00	T-15C48	17	22.00	T-18D19	16	18.00	T-29C27	6	1.50	T-67C46	6	1.75	T-84M70	11	10.00
T-13R18	3	4.50	T-15C50	17	26.50	T-18V20	14	5.00	T-29A99	7	1.75	T-67D47	10	2.50	T-84R81-C	4	3.50
T-13R19	3	2.35	T-15C52	19	5.00	T-18V21	14	6.00	T-30A20	15	3.00	T-67S48	8	3.50	T-85F14	13	17.50
T-13C26	6	.90	T-15C53	19	5.50	T-18V22	14	7.50	T-33A91	7	2.00	T-67C49	6	2.75	T-86A02	15	1.75
T-13C27	6	1.10	T-15C54	19	5.50	T-18V23	14	12.00	T-33S99	8	1.50	T-67D50	10	2.75	T-86A03	7	2.00
T-13C28	6	1.20	T-15C55	19	7.00	T-18C92	6	1.50	T-37C36	6	2.00	T-67S51	8	3.50	T-87R85	4	7.00
T-13C29	6	1.60	T-15C56	19	9.00	T-19D01	10	6.00	T-37R70-C	3	7.50	T-67S52	8	4.00	T-89R28	4	11.00
T-13C30	6	2.00	T-15R60	18	9.50	T-19D02	10	6.00	T-40V15	14	6.50	T-67S54	8	4.00	T-89S68	8	6.50
T-13A34	7	1.35	T-15R61	18	10.50	T-19D03	10	6.00	T-43C92	6	1.65	T-67M69	11	2.75	T-89S74	8	3.75
T-13A35	7	1.50	T-15R62	18	12.50	T-19D04	10	6.00	T-44C02	6	1.50	T-67M73	11	3.50	T-89S75	8	4.00
T-13A36	7	1.75	T-15A65	16	10.50	T-19D05	10	6.00	T-47V01	14	6.00	T-67M74	11	1.50	T-90A00	22	17.00
T-13S37	8	1.25	T-15A66	19	7.25	T-19D06	10	3.00	T-47V02	14	9.75	T-67D78	11	3.00	T-90A01	22	16.50
T-13S38	9	1.50	T-15A67	19	8.00	T-19M13	11	4.00	T-47V03	14	21.75	T-67D89	10	3.00	T-90A02	22	17.50
T-13S39	8	1.25	T-15A68	19	8.00	T-19M14	11	7.00	T-47V04	14	35.00	T-67A91	7	3.00	T-90A03	22	15.00
T-13S40	8	1.50	T-15A69	19	7.25	T-19M15	11	10.00	T-47C07	6	1.65	T-67S92	8	4.00	T-90A04	2	15.00
T-13S41	9	2.75	T-15A70	19	7.50	T-19M16	11	15.00	T-47A25	7	1.75	T-67R97	4	4.25	T-90A05	22	16.50
T-13S42	9	1.50	T-15A71	19	7.25	T-19M17	11	24.00	T-49R00	3	3.00	T-68S06	8	2.50	T-90A06	22	18.00
T-13S43	8	1.35	T-15A72	19	7.25	T-19M21	11	7.00	T-49C91	6	1.50	T-68C07	6	2.00	T-90S07	22	18.00
T-14A29	7	2.25	T-15A73	19	6.50	T-19M22	11	10.00	T-50R03	3	3.50	T-68C08	6	1.75	T-90S08	22	17.50
T-14R32	24	6.50	T-15A74	19	6.50	T-19R30	12	7.75	T-50V10	14	5.50	T-68R26	4	6.75	T-90C09	22	12.50
T-14R33	4	2.75	T-15A75	19	7.00	T-19R31	10	5.50	T-50V11	14	7.50	T-69R35	4	6.50	T-90A10	22	16.00
T-14R34	4	3.25	T-15D76	16	8.25	T-19R32	10	7.25	T-50F61	13	1.50	T-70R20	3	2.75	T-90A11	22	20.00
T-14R35	4	3.75	T-15D77	16	8.25	T-19C35	12	4.00	T-51D00	10	4.50	T-70R21	3	3.50	T-90S12	22	14.00
T-14R36	4	4.25	T-15D78	16	8.25	T-19C36	12	6.50	T-52C98	6	1.75	T-70F46	13	7.75	T-90S13	22	20.00
T-14R37	4	4.75	T-15D79	16	8.25	T-19C37	12	10.00	T-53F19	6	1.50	T-70R61	3	4.00	T-92F20	13	4.75
T-14R38	4	5.25	T-15D80	16	11.50	T-19C38	12	14.00	T-53S81	9	4.00	T-70R62	3	5.50	T-92R21	4	7.50
T-14R39	4	2.75	T-15D81	16													

# Parts List and Schematic Drawings for Multi-Band Transmitter

## Radio Frequency Unit



### THORDARSON COMPONENTS

#### Foundation Unit

Includes punched chassis and panel, brackets, mounting strips, grommets, and complete instructions for constructing and using the R. F. unit.

- T-17K21..... List Price \$12.00  
 T-17K21G — (Same as above but with grey panel)..... List Price 12.50

#### Transformers and Chokes

Part No.	Description	List Price
T-1	Fil. transf.	\$ 2.00
T-2	Fil. transf.	2.25
T-3	Fil. transf.	1.75
T-4	Plate transf.	10.00
T-5	Fil. transf.	2.25
CH-1	First choke	5.00
CH-2	Second choke	5.00

### RESISTORS

Diagram No.	Value in Ohms	Watts	Type	List Price
R-1	50,000	1	IRC BT-1	\$0.20
R-2	50,000	10	Ohmite Red Devil	.40
R-3	2,500	25	Ohmite Wire Wound	.75
R-4	100,000	50	Ohmite Wire Wound	1.45
R-5	20,000	50	Ohmite Semi-variable	1.50

### CONDENSERS

Diagram No.	Mfd.	Voltage Rating	Description	List Price
C-1	Var. Cond.	National TMS-250		\$ 3.00
C-2	Var. Cond.	National TMS-250		3.00
C-3	Var. Cond.	National TMS-200D		10.00
C-4	Neut. Cond.	Johnson 13G45		2.25
C-5	.001	1000 V Mica	Aerovox 1455 or C-D 4-6D1	.40
C-6	.0001	1000 V Mica	Aerovox 1455 or C-D 4-6T1	.35
C-7	.001	1000 V Mica	Aerovox 1455 or C-D 4-6D1	.40
C-8	.001	1000 V Mica	Aerovox 1455 or C-D 4-6D1	.40
C-9	.001	1000 V Mica	Aerovox 1455 or C-D 4-6D1	.40
C-10	.001	1000 V Mica	Aerovox 1455 or C-D 4-6D1	.40
C-11	.001	1000 V Mica	Aerovox 1455 or C-D 4-6D1	.40
C-12	.005	1000 V Mica	Aerovox 1455 or C-D 4-6D5	.55
C-13	.001	1000 V Mica	Aerovox 1455 or C-D 4-6D1	.40
C-14	.001	1000 V Mica	Aerovox 1455 or C-D 4-6D1	.40
C-15	.001	1000 V Mica	Aerovox 1455 or C-D 4-6D1	.40
C-16	.001	1000 V Mica	Aerovox 1455 or C-D 4-6D1	.40
C-17	.001	5000 V Mica	Aerovox 1457 or C-D 4-25D1	1.50
C-18	.001	5000 V Mica	Aerovox 1457 or C-D 4-25D1	1.50
C-19	2.	1500 V Oil fil.	Aerovox 1505 (2" can)	3.90
C-20	2.	1500 V Oil fil.	Aerovox 1505 (2" can)	3.90
C-21	4.	600 V Elect.	Aerovox GL600	1.85
C-22	4.	600 V Elect.	Aerovox GL600	1.85

### MISCELLANEOUS PARTS

No.	Description	List Price
3	5-contact sockets, Amphenol #S5 @ 12c	\$ .36
5	4-contact sockets, Amphenol #S4 @ 12c	.60
2	Octal sockets, Amphenol #S8 @ 15c	.30
4	4-contact isolantite sockets Amphenol SS4 @ 40c	2.00
8	Feed thru insulators, Johnson #55 @ 30c	2.40
4	Feed thru insulators, Johnson #42 @ 20c	.80
3	RF chokes, National R100 @ 60c	1.80
1	4" shaft extension, Yaxley RS243	.30
1	2-gang band switch, Centralab #2543	2.70
1	1-gang band switch, Centralab #2542	1.70
1	Coil turret, Barker Williamson, Model "B"	12.50
1	160 meter coil* Barker Williamson 160BL—center linked	4.25
1	80 meter coil* Barker Williamson 80 BL—center linked	4.00
1	40 meter coil* Barker Williamson 40 BL—center linked	3.50
1	20 meter coil* Barker Williamson 20 BL—center linked	3.00
1	10 meter coil* Barker Williamson 10 BL center linked	3.00
1	2 1/4" Coto-Coil wheel C1-45, with indicator plate C1-47 marked "OSC. PLATE"	2.00
1	2 1/4" Coto-Coil wheel C1-45, with indicator plate C1-47 marked "BUFFER PLATE"	2.00
1	2 1/4" Coto-Coil wheel C1-45 with indicator plate C1-47 marked "PWR. AMP. PLATE"	2.00

NOTE: Miscellaneous items required, in addition to above, include hook up wire, nuts, screws, 5000 volt transmitter cable, solder, etc. See instruction sheet SD-386 for detailed listing.

\*Only three Barker Williamson coils supplied with PL-100 kit. Specify coils desired.

Approximate List Price Complete (Less Tubes, Cabinet and Crystals) \$149.25

## Modulator Unit

### THORDARSON COMPONENTS

#### Foundation Unit

Includes punched chassis and panel, brackets, mounting strips grommets and complete instructions for constructing and using the modulator unit

- T-17K22..... List Price \$9.00  
 T-17K22G — (Same as above but with grey panel)..... List Price 9.50

#### Transformers and Chokes

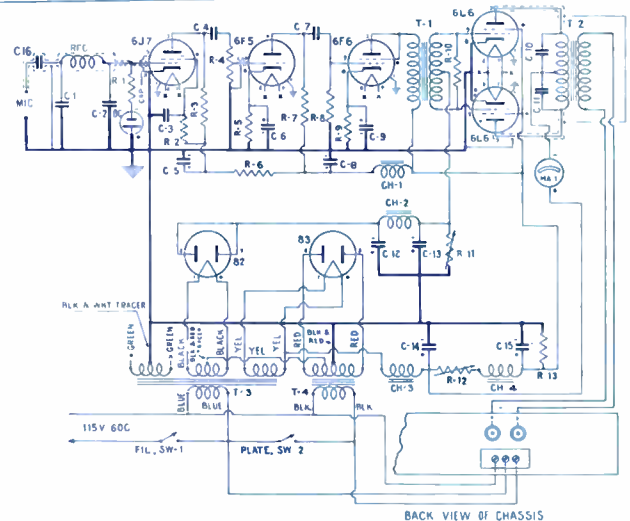
Part No.	Description	List Price
T-1	T-67D78	Driver transf. \$ 3.00
T-2	T-11M75	CHT Mod. transf. 12.50
T-3	T-79F84	Filament transf. 4.75
T-4	T-84P60	Plate transf. 7.75
CH-1	T-74C30	Third choke 1.50
CH-2	T-75C49	Bias choke 1.50
CH-3	T-75C51	First choke 5.00
CH-4	T-68C07	Second choke 2.00

### RESISTORS

Diagram No.	Value in Ohms	Watts	Type	List Price
R-1	5 meg.	1/2	IRC BT-1/2	\$0.17
R-2	3 meg.	1	IRC BT-1	.20
R-3	250,000	1	IRC BT-1	.20
R-4	500,000	Vol. cont.	IRC 13-133	1.00
R-5	2,000	1	IRC BT-1	.20
R-6	20,000	1	IRC BT-1	.20
R-7	100,000	1	IRC BT-1	.20
R-8	250,000	1	IRC BT-1	.20
R-9	750	10	IRC type AB	.40
R-10	10,000	2	IRC BT-2	.30
R-11	1,500	25	Ohmite sem. var.	.85
R-12	2,500	25	Ohmite sem. var.	.85
R-13	25,000	50	Ohmite wirew'nd	1.25

### CONDENSERS

Diagram No.	Mfd.	Voltage Rating	Description	List Price
C-1	.0001	500 V Mica	A'vox. 1467 or C-D 5W-5T1	\$ .15
C-2	.0001	500 V Mica	A'vox. 1467 or C-D 5W-5T1	.15
C-3	.04	400 V Paper	A'vox. 484 or C-D DT-4S4	.15
C-4	.1	400 V Paper	A'vox. 484 or C-D DT-4P1	.20
C-5	8	450 V Elect.	A'vox. PBS 450 or C-D JR508	.95
C-6	10	25 V Elect.	A'vox. PR25 or C-D ED-2100	.50
C-7	.1	400 V Paper	A'vox. 484 or C-D DT-4P1	.20
C-8/C-15	8-8	450 V Du. El.	A'vox. 2G	1.60
C-9	10	50 V Elect.	A'vox. PR50	.65
C-10	.002	1000 V Mica	A'vox. 1455 or C-D 4-6D2	.45
C-11	.002	1000 V Mica	A'vox. 1455 or C-D 4-6D2	.45
C-12	8	200 V Elect.	A'vox. PBS 200 or C-D JR 208	.80
C-13	8	200 V Elect.	A'vox. PBS 200 or C-D JR 208	.80
C-14	8	600 V Elect.	A'vox. GL600	2.60
C-16	.01	400 V Paper	A'vox. 484 or C-D DT-4S1	.15



### MISCELLANEOUS PARTS

No.	Description	List Price
1	R.F. Choke, National R-100	.60
1	Mic. Connector, Amphenol MC1F	.50
1	Mic. Connector Amphenol PCIM	.30
1	Bias Cell, Mallory #F7	.30
1	Bias Cell holder, Mallory #GB-1A	.10
1	1 1/2" Bar knob, black streamlined	.15
1	AC Line cord and plug Belden #1725	.50
5	Octal sockets, Amphenol S8 @ 15c	.75
2	4-contact sockets, Amphenol S4 @ 12c	.24
2	Metal tube grid caps @ 10c	.20
1	Dial plate, Crowe #566	.20
2	Feed thru insulators, Johnson #55 @ 30c	.60
1	0-300 MA meter, Simpson #27S \$6.35 or Triplett #327 (illuminated)	6.45
2	Metal Tube shields ARHCO #92 @ 20c	.40
1	Red Jewel & candelabra bracket, ARHCO #93 40c or Drake Mfg. #10C	.30
1	Green Jewel & candelabra bracket ARHCO #93 @ 40c or Drake Mfg. #10C	.30
2	110 volt Carbon Lamps type G6 @ 35c	.70

NOTE: Miscellaneous items required, in addition to above, include hook up wire, nuts, screws, 5000 volt transmitter cable solder, etc. See instruction sheet SD-386 for detailed listing.

Approximate List Price Complete (Less Tubes) \$78.00

Note: The brands and types specified in the parts list were used in the original laboratory models. Parts of equivalent quality may be substituted except where physical limitations prohibit.

Total Approximate List Price of Complete Thordarson 100-Watt Multi-Band Transmitter \$244.75 (Including Cabinet, but Less Tubes and Crystals)

# THORDARSON ELECTRIC MFG. CO.

500 WEST HURON STREET

CHICAGO, ILLINOIS

SD-378C 10M 1-39

Printed in U. S. A.



# New! "MULTI-BAND" TRANSMITTER

## by THORDARSON

### INSTANTANEOUS BAND-SWITCHING FROM FRONT OF PANEL

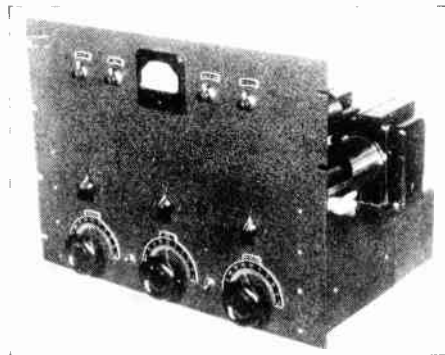
- Any 3 pre-selected amateur bands can be panel switched.
- Operates efficiently from 10 to 160 meters.
- 100 watts input on all bands.
- Single meter reads all plate currents as well as grid current of final stage.
- Power supply and R-F section on one chassis.
- Band-Switching feature optional, regular plug-in coils may be used.
- Tube lineup: 6L6G—6L6G—TZ-40.

### PHONE OPERATION

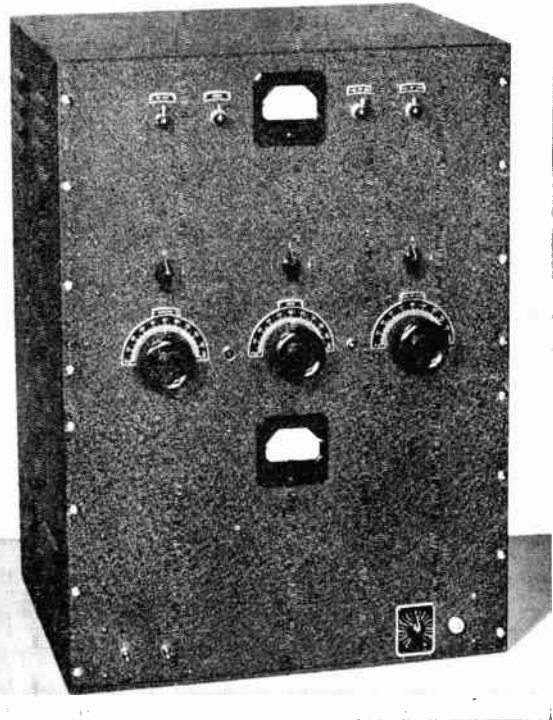
- Plate modulation by a separate unit using a pair of 6L6's.

### RADIO FREQUENCY UNIT

This unit may be plate modulated for phone operation by the 6L6 modulator shown below, or it may be operated as a complete CW transmitter. The band-switch feature permits almost instantaneous switching over any three pre-determined bands, the desired bands being selected by inserting the proper coils. A single power transformer tapped for two rectifier circuits supplies power to the entire R. F. section. A conventional 6L6-G crystal oscillator is capacity coupled to a 6L6-G buffer-doubler which in turn is also capacity coupled to a Taylor TZ-40, providing ample output on all bands including 10 meters. A meter switching arrangement permits metering of all circuits as well as providing an "off" position for the "tune-up" procedure. Fixed neutralization is provided so that no readjustment is required in changing bands. For CW the cathode circuits of both the oscillator and the buffer-doubler stages are keyed simultaneously. If the band-switch feature is not desired, provision is made for the use of regular plug-in coils.



R. F. Unit



Complete Transmitter

### THORDARSON FOUNDATION UNIT

Includes punched chassis and panel, brackets, mounting strips, grommets, and complete instructions for constructing and using the R. F. unit.

T-17K21 ..... List Price \$12.00

T-17K21G — (Same as above but with grey panel) ..... List Price 12.50

### KIT OF THORDARSON TRANSFORMERS AND CHOKES

KT-101 ..... List Price \$28.25

### KIT OF COMPONENT PARTS

Other than Thordarson parts, foundation unit, tubes, cabinet and crystals. Includes Barker-Williamson final plate coils for any three bands.

PL-100 ..... List Price \$109.00

### CABINET

Will house complete transmitter including radio frequency and modulator units as illustrated above.

CAB-102 ..... List Price \$17.50

### MODULATOR UNIT

Ample power for plate modulation of the R. F. unit is provided by this 6L6 modulator. Fixed bias is accomplished through a separate bias rectifier, and ample driving power is obtained from the single triode connected 6F6. Hum is at an absolute minimum, and transients usually encountered with 6L6's in class AB<sub>2</sub> have been entirely eliminated. This renders speech clear, natural, and free of distortion. For phone operation, the two line switches of the R. F. unit are replaced with jewels and the filaments and the plates of both units are controlled simultaneously by the two switches on the modulator panel. This measure simplifies operation and allows rapid control of the transmitter. Connections between the two chassis are easily made by regular connector strips.

### THORDARSON FOUNDATION UNIT

Includes punched chassis and panel, brackets, mounting strips, grommets and complete instructions for constructing and using the modulator unit.

T-17K22 ..... List Price \$9.00

T-17K22G—(Same as above but with grey panel) ..... List Price \$9.50

### KIT OF THORDARSON TRANSFORMERS AND CHOKES

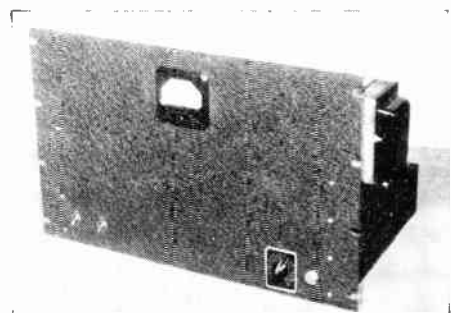
KT-201 ..... List Price \$38.00

### KIT OF COMPONENT PARTS

Other than Thordarson transformers, foundation unit and tubes.

PL-200 ..... List Price \$31.00

SEE DETAILED PARTS LIST ON REVERSE SIDE



Modulator Unit

### COMPLETE INSTRUCTION BOOK

Full details of building data, photos, diagrams and layout.

SD-386A ..... List Price 25c