JNL

M4791 FM. R.F. AMPLIFIER

INSTRUCTION BOOK

GATES

GATES RADIO COMPANY
A Subsidiary of Harris-Intertype Corporation
QUINCY, ILLINOIS

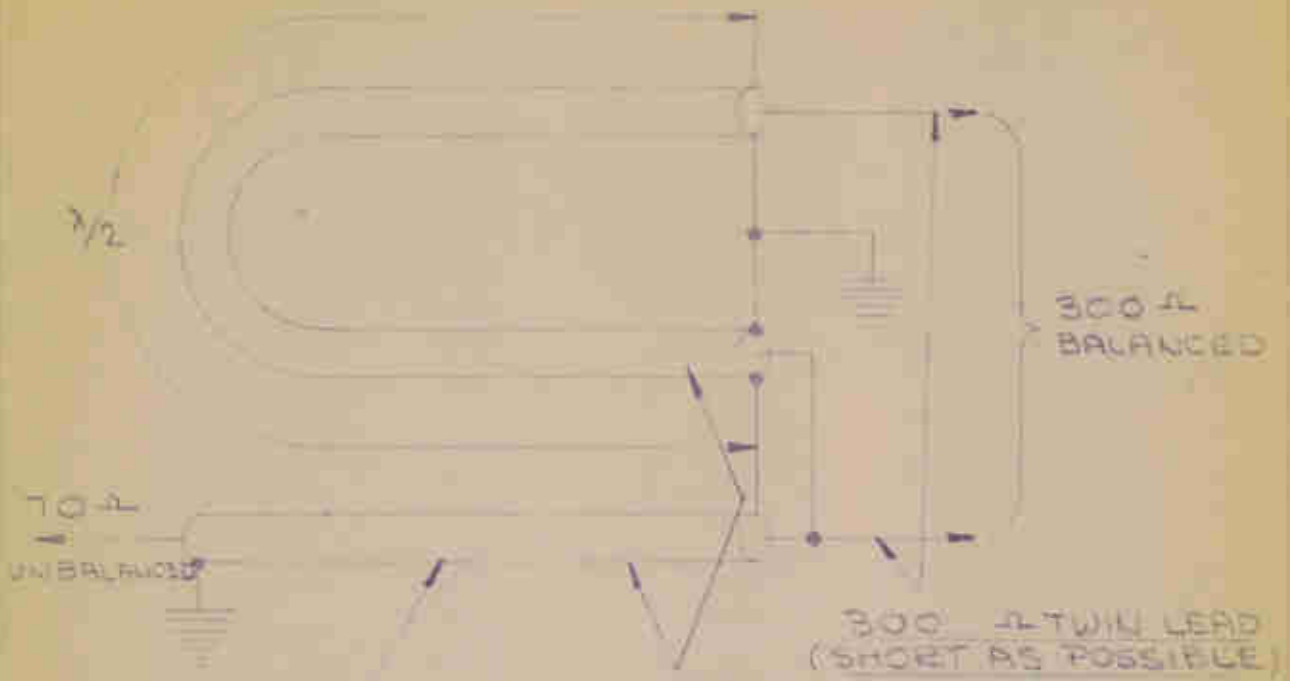


FIG. I

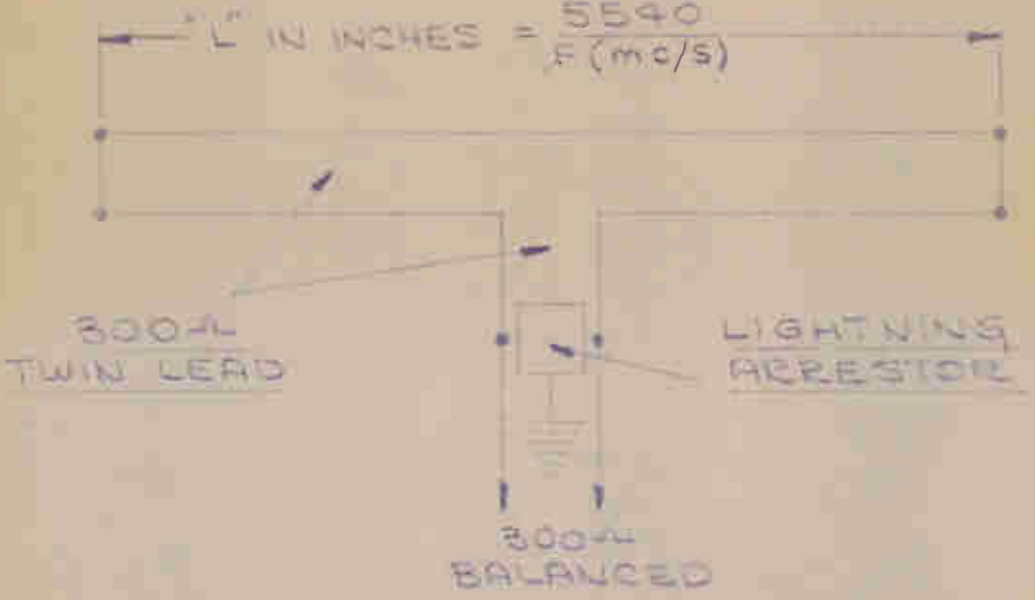


FIG. II

M4791 BROADCAST FM R.F. AMPLIFIER

General

The M4791 Broadcast FM R.F. Amplifier is designed to operate any approved broadcast FM frequency and modulation monitor from a received signal as transmitted by an FM broadcast station. The amplifier is normally part of the Gates' RCM15, RCM16 or RCM17 Remote Control Equipment. As such, the amplifier will be rack mounted and usually located at the radio station studios. The amplifier is fixed tuned (full frequency range of 88-108 Mc/s).

Full frequency range from 88-108 Mc/s is accomplished in two bands.

Band I -------- 88-100 Mc/s

Band II -------- 100-108 Mc/s

Front panel controls are a power "On-Off" switch and a pilot lamp. Operating voltages are supplied by a Gates' PWR3-M4285 regulated power supply. An R.F. gain control (R12) is a shaft locking type control located on the rear of the chassis.

Installation

The amplifier is rack mounted and is normally adjacent to the FM monitor. Coaxial cable for coupling the amplifier and FM monitor is supplied. It is necessary that a good electrical ground is used and that the coaxial cable shield at the monitor input is grounded to the monitor chassis.

An antenna is not normally furnished as part of the M4791 Amplifier. The M4791 Amplifier requires a 5 millivolt R.F. input signal for a power output of 2 watts across a 50 ohm load. As such, some installations will need a simple dipole antenna where other installations may require a more elebarate antenna. There will probably be a few cases where an antenna of approximately 6 db gain will be required. The amplifier input is for a 70 ohm unbalanced coaxial line. It is recommended that RG59/U coaxial cable be used for the antenna transmission line. Most directional FM antennas require a 300 ohm balanced transmission line. For this case Figure I can be used for transferring the 300 ohm balanced antenna to the 70 ohm unbalanced amplifier input.

Suitable lightning protection must be supplied at the antenna. When cutting the $\lambda/2$ of RG59/U for the balancing section, the velocity of propagation constant must be considered. For RG59/U this constant is 65.9%. A simple folded dipole is shown in Figure II.

The antenna transmission line can be of any length but it is suggested it be as short as possible in order to reduce losses. The matching section as shown in Figure I should be located near the antenna. It can be mounted to the antenna mast. It is necessary to use coaxial input and output cables to the amplifier.

Operation

The amplifier consists of three fixed tuned voltage amplifier, a Class "A" power amplifier and voltage regulator stages. The second voltage amplifier (V2-6BA6) is a remote cutoff tube and the gain of the amplifier is controlled at this stage by means of a variable positive cathode bias. Screen voltages to V2 and V3 is regulated at a positive 150 volts.

The amplifier is normally tuned to the customer's frequency when it leaves the factory, However, if it is desired to place the amplifier on another frequency the data given below should be followed.

A 47 ohm, 2 watt composition resistor is connected across J2 to ground (leads must be short). Connect a VTVM (suitable for measuring voltages at 88-108 Mc/s) across this load resistor. Connect a suitable signal generator (FM sweep is not required) to J1. This must be a coaxial lead with little leakage. The signal generator should be capable of producing approximately 1 volt R.F. and as low as 1 millivolt signal voltages.

As the amplifier stages are tuned, it will be necessary to reduce the signal level input to prevent overloading. The R.F. gain control (R12) is fully advanced. When properly tuned, there will be 10 volts indicated by the VTVM across the 47 ohm load resistor with approximately 5 millivolts of input signal. Refer to the following table for tuning adjustments:

Freq. Mc/s	L1/L2 Slug Pos.	L4 Slug Pos.	L7 Slug Pos.	L9 Slug Pos.	C1	C8	C15	C26	C33
88-100	11 turns CW	11 turns CW	11 turns CW	11 turns CW	Peak	Peak	Peak	Peak	Peak
100-108	Full CCW	Full CCW	Full CCW	Full CCW	Peak	Peak	Peak	Peak	Peak

C34 is used to tune out any reactance of L13. C34 will require no adjustment. The voltages shown on the schematic diagram were measured using a VTVM and the amplifier operating normally.

When the amplifier is first installed, the tuning capacitor C1, C8, C15, C26 and C33 should be peaked for maximum deflection on the modulation monitor meter in the carrier level position. Since most monitors operate on a rather large variation of input voltage, the R.F. gain control (R12) can be set at maximum sensitivity.

If for any reason the R.F. gain control (R12) is varied, C1, C8, C15, C26 and C33 must be readjusted for maximum R.F. output to the frequency and modulation monitor.

In Paragraph Three, under Operation, the frequency and modulation monitor can be used as a substitute for the VTVM. In this case, the frequency and modulation monitor meter is placed in the carrier level position and the amplifier is tuned for maximum deflection of the carrier level meter.

The bandpass of the amplifier is equal to, or greater than, ±100 Kc/s at 1 db down.

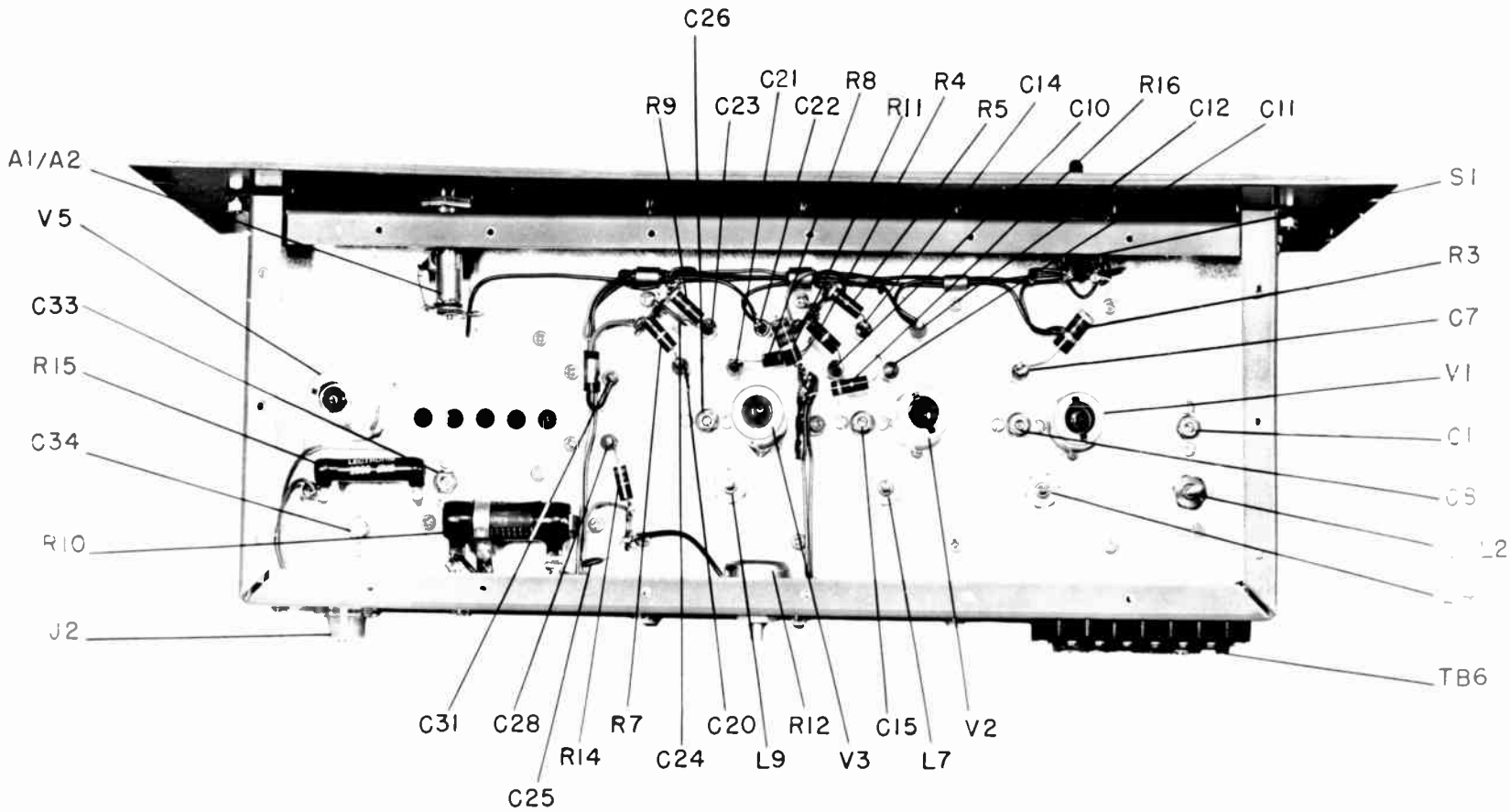
PARTS LIST

For FM R.F. Amplifier for FM Frequency Modulation Monitors (RCM15/16/17 Remote Control)

Symbol No.	Drawing No.	Description
A1	A-33379-101	Pilot Light Assembly
A2		Lamp, #47
C1,		Variable Cap., 25 mmfd., LC-2077 Bud
C8,C15,C26,C33		Variable Cap., 15 mmfd., LC-2076 Bud
C2, C24,C36		Cap., .01 mfd., Hi-Kap DD-103 Centralab
C3,C5,C6,C17,C18,C25,C13, C29, C35,C37,C38,C39		Cap., .001 mfd. Hi-Kap DD-102 Centralab
C19		Cap., 330 mmfd., R-1333 Sangamo
C4,C7,C10,C11,C12, C14,C20,C21,C22, C23,C28,C31,C32		Feedthru Capacitor, .001 ± 20% #327-102 Erie
C9,C16		Cap., 10 mmfd., ±10% NPOK, Erie
C27		Cap., 20 mmfd., ±10% NPOK, Erie
C34		Variable Cap., 25 mmfd., LC-2077 Bud
C40	A-31865-101	Neut. Cond.
J1		Receptacle, 83-1R Amphenol
J2		Receptacle, 83-22R Amphenol
L1		Coil (Two Loops of #7002 Birnbach around L2 Coil Form)
L2,L4,L7,L9	A-31859-101	HF Coil
L3,L6,L8,	A-9289-1	Coil
L5,L10,L14,L15		R.F. Choke, Z-50 Ohmite
L12	A-9291-1	Coil
L13	A-9290-1	Pick-Up Loop Coil
P1		Plug, 83-1SP Amphenol
P2		Plug, 83-22SP Amphenol
R1		Resistor, 300 ohm, 1 W. 5% A-B
R2		Resistor, 3000 ohm, 1 W. 5% A-B
R3		Resistor, 47K ohm, 2 W. 10% A-B
R7		Resistor, 1000 ohm, 1 W. 10% A-B
R5,R9		Resistor, 4700 ohm, 1 W. 5% A-B
R6		Resistor, 470K ohm, ½W., 10% A-B
R4		Resistor, 20K ohm, 1W., 10% A-B
R8		Resistor, 180 ohm, 1W. 10% A-B
R10		Resistor, 10K ohm, 25W., #0215, Ohmite
R11		Resistor, 68K ohm, 2W., 10% A-B
R12		Control, 5000 ohm, 2W.CLU-5021 Ohmite
R13		Resistor, 270 ohm, 2W., 10% A-B
R14		Resistor, 47K ohm, 1 W., 10% A-B

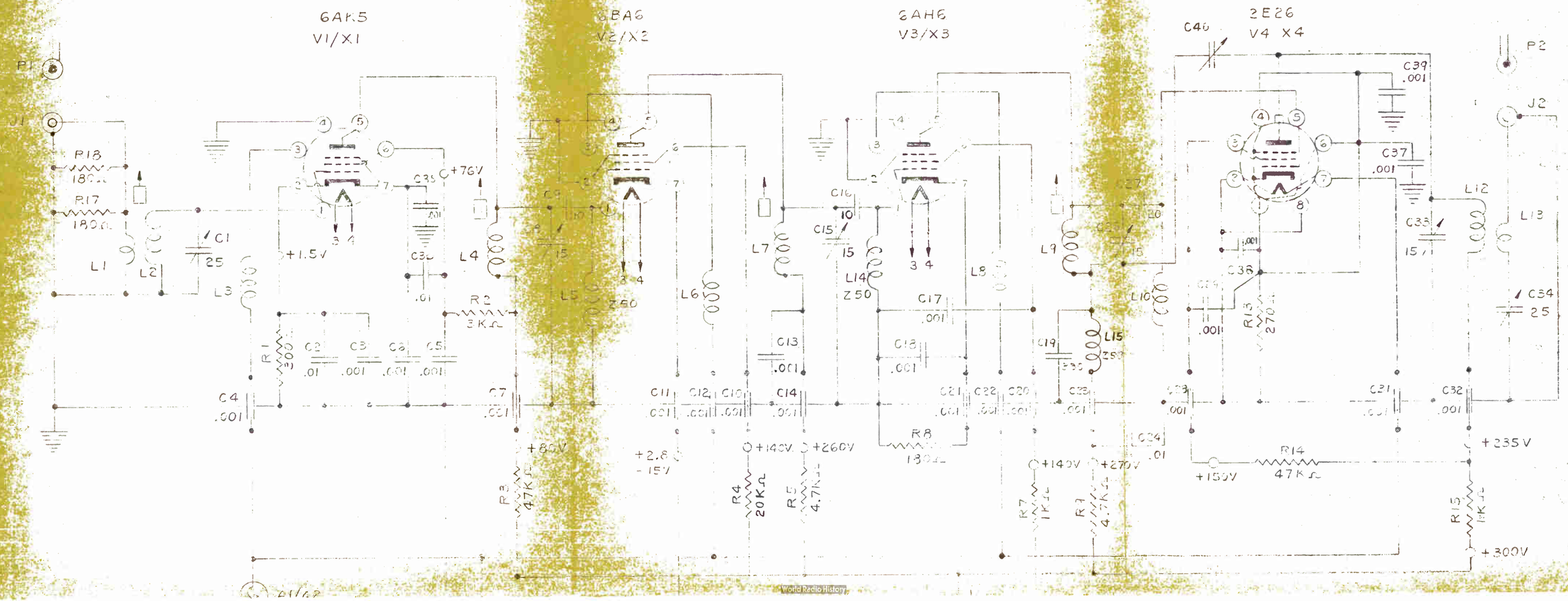
PARTS LIST (Con't.)

Symbol No.	Drawing No.	Description
R15		Resistor, 1000 ohm, 10W., Type 1 3/4 Lectrohm
R16		Resistor, 240 ohm, 1W., 5% A-B
R17,R18		Resistor, 180 ohm, ½W., 5% A-B
S1		Toggle Switch, D.P.S.T. #216-B-25 Carling
TB6		Terminal Board, 6-141Y Jones
V1		Tube, 6AK5
V2		Tube, 6BA6
V3		Tube, 6AH6
V4		Tube, 2E26
V5		Tube, 0A2
X1,X2,X3,X5		Socket, #147-913 Amphenol
X4		Socket, MIP8-T Amphenol



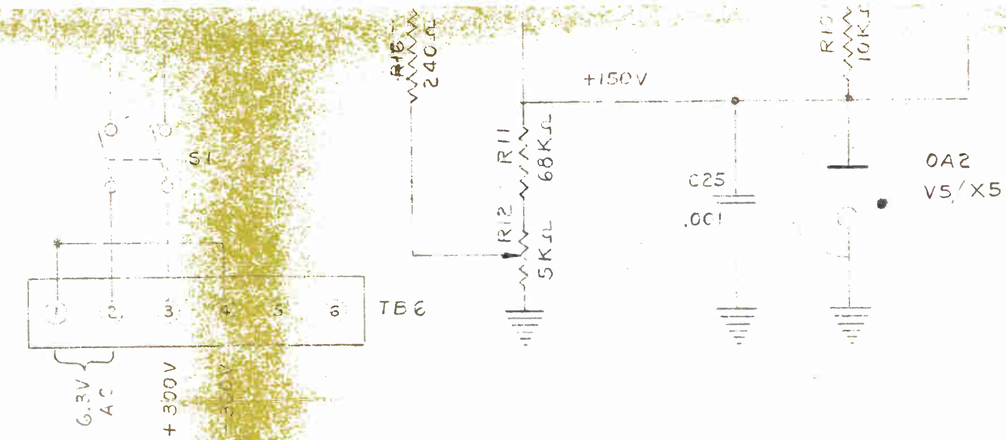
TOP VIEW
M-4791 FM RF AMPLIFIER

Drawing Number
C-18685



TOTAL HEATER CURRENT DRAIN = 1.725 AMP.

TOTAL PLATE CURRENT DRAIN = 0.085 AMP AT 2 WATTS OUTPUT



3	2	1
ECN 7833 HMC 3-19-55	ECN 7775 2-19-59 DL	ECN 5564 RGK 3-18-54

Variations on Finished Dimensions unless otherwise marked

Basic Dimensions	Fractional Dimensions	Decimal Dimensions
Up to ¼	± 1/128	± .005
Above ¼ to 6	± 1/64	± .005
Above 6 to 24	± 1/32	± .010
Above 24	± 1/16	± .015

SCHEMATIC FOR ~~FM~~ RF AMPLIFIER
M 4791

MATL.	FIN.	PART NO.
DRAWN BY D.L DATE 10-28-53	7.	
CHECKED BY RCH DATE 10-28-53		DWG. NO. C-18683

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QUINCY, ILLINOIS