UNIVERSAL

POWER AMPLIFIER

12 TO 100 W_{RMS}

FRASER ELECTRONICS

Fraser Electronics
P.O.Box 778
Edmonton, Alberta T5J 2L4

This is a universal power amplifier kit suitable for high fidelity reproduction, as well as for musical instrument and public address applications. If C1 and C4 are shorted, it can also be used wherever a DC frequency response is needed, with the provision that Q1 and Q2 are matched. Under no case do the outputs need to be matched.

If R10 is set so that with no signal input, there is a standing current of 20mA in the output transistors, a distortion of less than .1% can be realized at any level up to full output. For maximum ruggedness, however, it is recommended that R10 be a short instead. The distortion at low power may reach 1%, but for bands or P.A., where ruggedness is more important than extremely low distortion, this is quite reasonable.

The frequency response is from 10Hz to over 50KHz -1db. Less than 1V RMS is required to get full power on all versions, while the input resistance is 10K. If this is too low, R2 may be increased in value, but a DC offset may occur at the output if you do this. When the amplifier is properly completed, the S/N ratio will be from 75 to 85db with the input shorted.

The output transistors must be heatsunk with a general rule being, the bigger, the better. For the 12W version, heatsinks rated at 10°C/W, such as Wakefield 633 for each transistor will be adequate. The 25 W version requires at least 6°C/W per transistor, such as Wakefield 680-1. The 40W version needs at least 5°C/W per transistor, such as the Wakefield 621. The 70W amplifier requires at least 2.5°C/W per output transistor, such as Wakefield 403. The 100W amplifiers require at least 1.9°C/W per output transistor, such as a Wakefield 413, or 421. Both output transistors may be mounted on the same heatsink provided the °C/W rating above is divided by 2.

The 2N3055 transistor may be used as an output transistor on the 70W and 100W/4Ω versions, provided, that the transistors have been selected for a minimum breakdown voltage of 85 Volts. Any transistor with a minimum breakdown voltage of $100V_{CEO}$, with all other specs being the same, may replace the 2N3440 in this circuit.

Universal Power Amplifier Parts List

Watts/Impedance	12W/8Ω	25W/8Ω	40W/8Ω	70W/8Ω	100W/8Ω	100W/4Ω	
Part							
C1	10/25V						uFd
C2	47 to 200(47 normally, but up to 200 if oscillation occurs)						pFd
C3	100/25V	100/35V	100/35V	100/50V	100/50V	100/50V	uFd
C4	100/15V						uFd
C5	47/25V	47/35V	47/50V	47/50V	100/50V	150/50V	uFd
C6,C7	.047						uFd
CF(Mono)	1000/25v	1500/30	2000/35	3000/40	4000/50	4000/40	uFd/Volts
CF(Stereo)	1500/25v	2000/30	3000/35	4000/40	5000/50	6000/40	uFd/volts
D1,2,3	1N4002 or equivalent						
D4,5	1N914 or equivalent						
Q1,2	2N3906	2N3906	2N3645	2N2905A	2N2905A	2N2905A	or equiv.
Q3	2N3568	2N3568	40408	40408	2N3440	40408	or equiv.
Q4	2N2219A	40408	40408	40409	40409	40409	Or equiv.
Q5	2N2905A	2N2905A	40634	40410	40410	40410	or equiv.
Q6,7	MJE180	2N3055	2N3055	2N3442	2N3773	2N3773	or equiv.
Q8	2N5135	2N3568					or equiv.
Q9	2N5142	2N3645					or equiv.
R1,12,13,14	1000						ohms
R2,6	10,000						ohms
R3	10K	12K	15K	18K	18K	18K	ohms
R4	680						ohms
R5,11,17,18	100						ohms
R7	620	560	470	390	330	390	ohms
R8	1K	1.8K	2.2K	2.7K	3.9K	3.3K	ohms
R9	1.8K	2.2K	2.7K	3.3K	3.9K	3.3K	ohms
R10	100 ohm trimmer for Hi-Fi-Shorted for Band & P.A.						
R15,16	68						ohms
R19,20	.47/2W	.43/2W	.39/5W	.33/5W	.27/5W	.27/5W	ohms
T (Mono)	166J28	166J36	166J50	167J55	167L70	167L55	Hammond
T (Stereo)	167K30	167L36	167L44	167L55	167N70		Hammond
Dp(Mono)	1N4002's	1N4002s	1N4141s	1N4141s	1N4141s	1N4141s	Rectifiers
Dp(Stereo)	1N4002's	1N4141s	1N4141s	6A B.R.	10A B.R.	10A B.R.	Min-100V CEO

The following components are to be used only when driving an electrostatic speaker, though using them on nornal loads will not hurt.

C8	.1/100V	uFd
L1	10 turns of #18 to #22 wire wrapped around R21, or 10uH(Miller #4622)	
R21,22	22 ohm 1W resistors in all cases.	

The following are used when driving a line transformer

D6,D7	Any 2A or more 200V or more rectifier diode.

The following are not mounted on the board

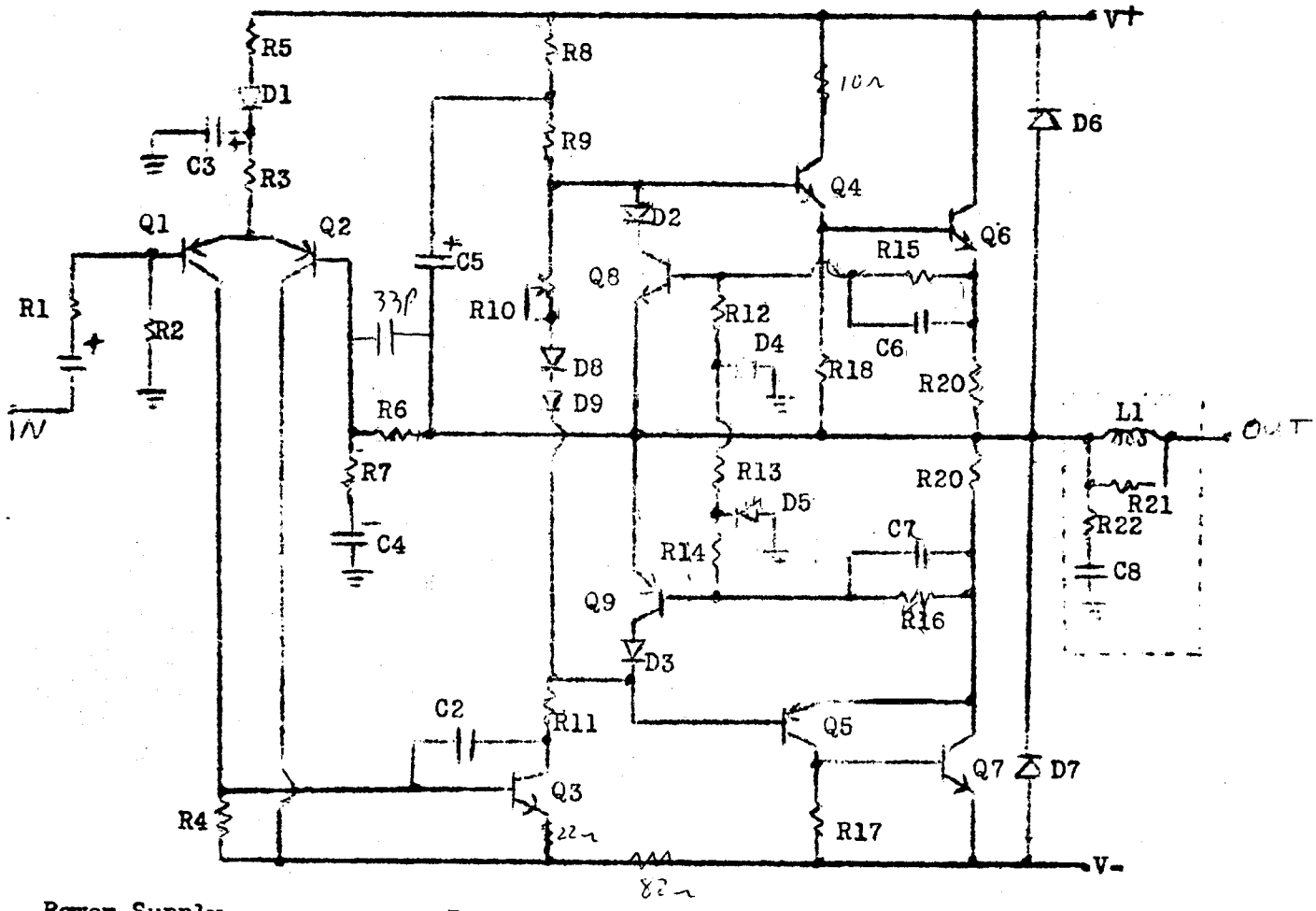
D8,9	1N4001, 1N3754, or equivalent.						
F(Mono)	.5A	.5A	.75A	1A	1.5A	1.5A	Slo-Blo
F(Stereo)	1A	1A	1.5A	2A	3A	3A.	Slo-Blo

The following is optional and should be connected in series with the spkr.

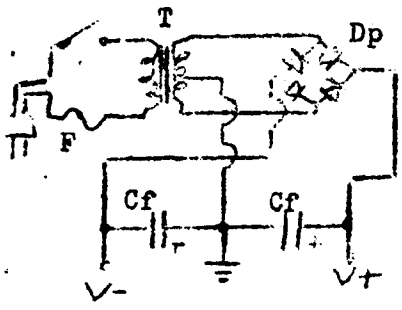
Speaker Fuse	1A	2A	2A	3A	5A	5A	Fast-Blo

You will also need a case, line cord, power switch, pilot lamp, fuse holders, input, and output jacks, and heatsinks to construct a basic amplifier.

UNIVERSAL POWER AMPLIFIER
Schematic Diagram



Power Supply

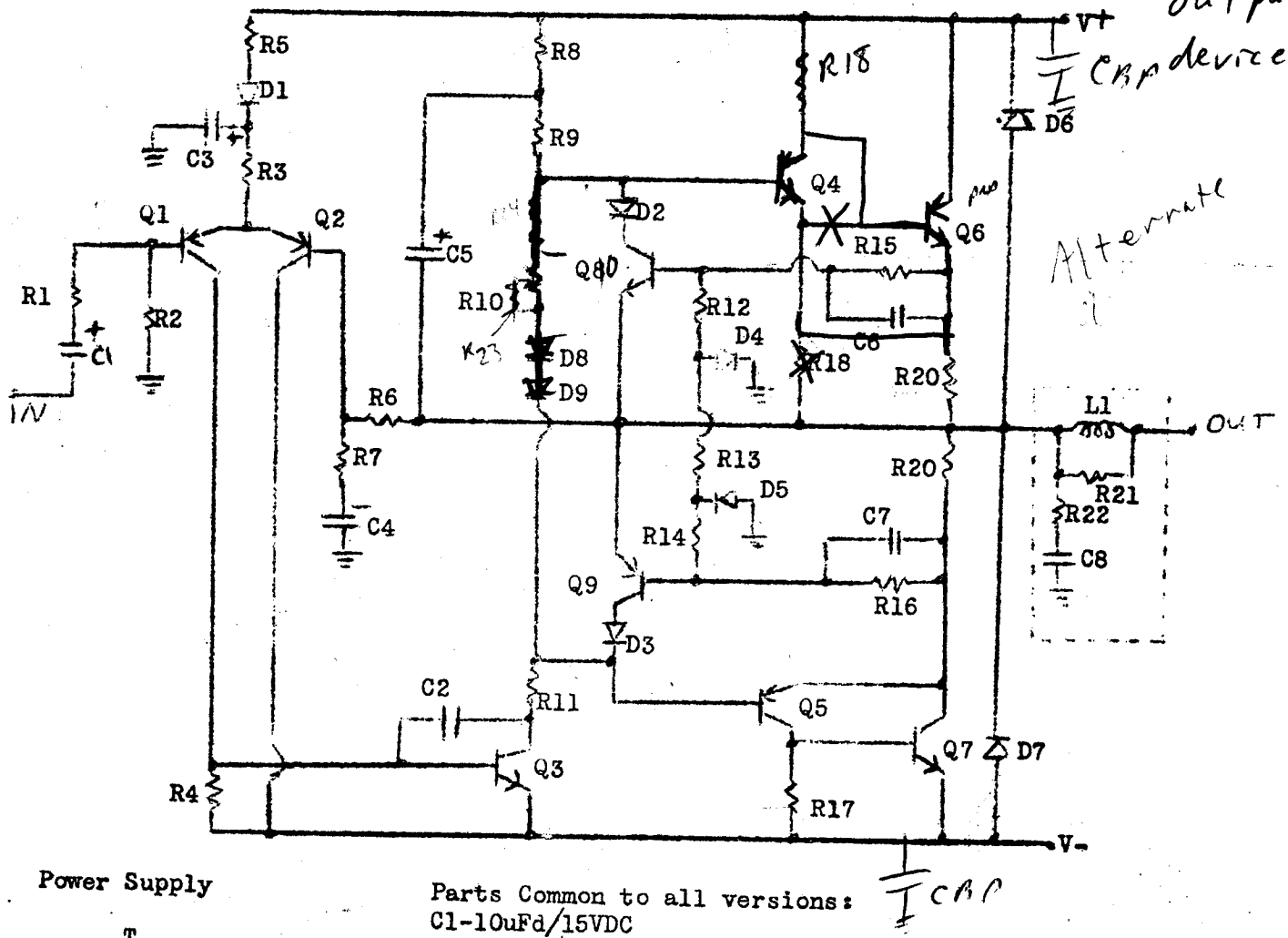


Parts Common to all versions:

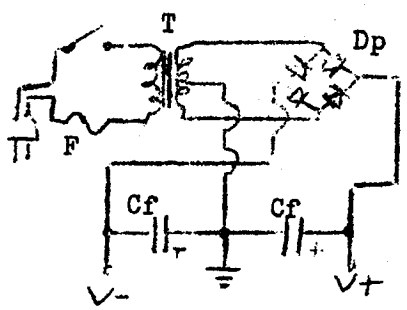
C1-10uFd/15VDC
C2-47pFd/100VDC
C4-100uFd/15VDC
C6,C7-.047uFd/25VDC
D1,D2,D3-1N4002 or equiv.
D4,D6-1N914 or equiv.
D6,D7-Any 2A or more 200V or more diode
D8,D9-1N4001,1N3754 or equiv.
C8-.1uFd/100VDC
R1,12,13,14-1000ohms $\frac{1}{4}$W or more.
R2,6-10Kohms $\frac{1}{4}$W or more.
R5,11,17,18-100-120ohms $\frac{1}{2}$W or more.
R10-100ohm trimmer for Hi-Fi-Shorted For Bands or P.A.
R15,16-68 ohms $\frac{1}{2}$W
R21,22-22 ohms 1W or more.
L1-10 turns of #18 to #22 wire wrapped around R21, or 10uH (Miller 4622)

UNIVERSAL POWER AMPLIFIER
Schematic Diagram

* Alternate output with complementary output devices

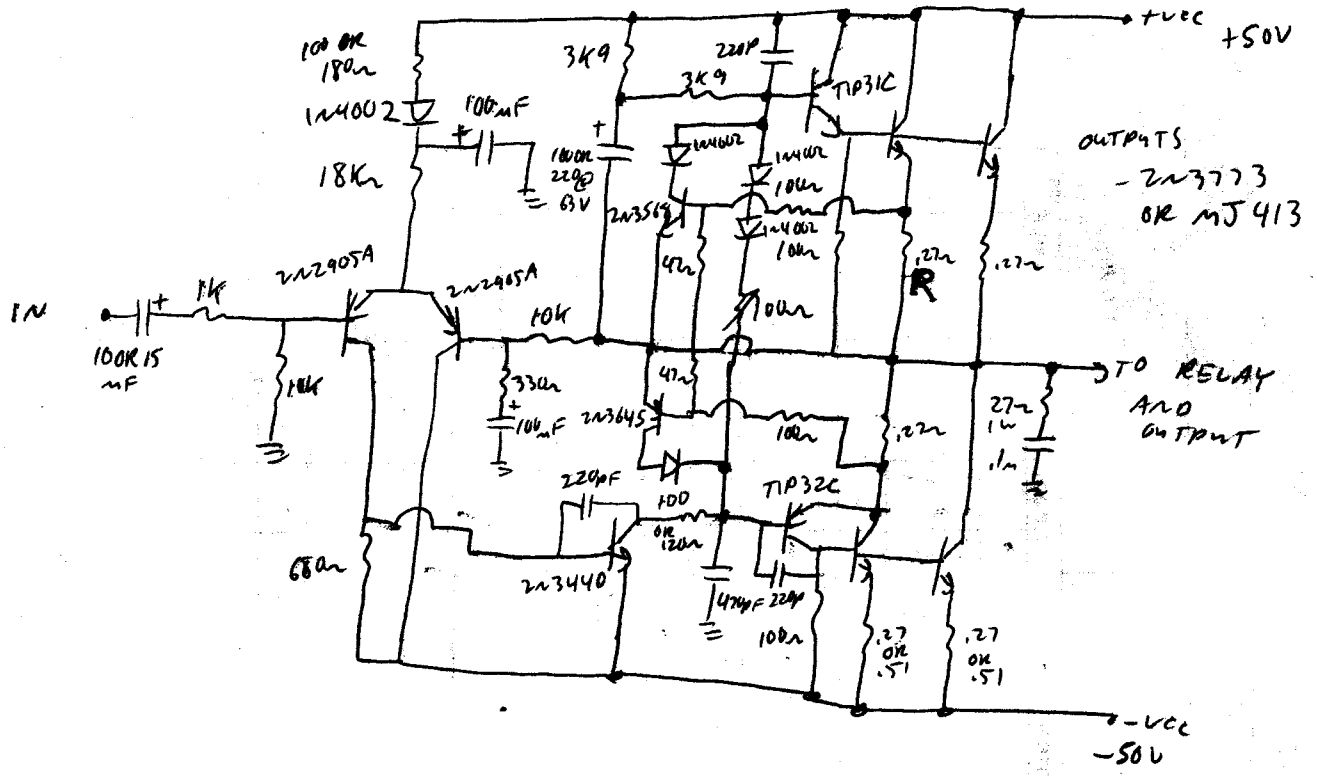


Power Supply



Parts Common to all versions:
C1-10uFd/15VDC
C2-47pFd/100VDC
C4-100uFd/15VDC
C6,C7-.047uFd/25VDC
D1,D2,D3-1N4002 or equiv.
D4,D5-1N914 or equiv.
D6,D7-Any 2A or more 200V or more diode
D8,D9-1N4001,1N3754 or equiv.
C8-.1uFd/100VDC
R1,12,13,14-1000ohms $\frac{1}{4}$W or more.
R2,6-10Kohms $\frac{1}{4}$W or more.
R5,11,17,18-100-120ohms $\frac{1}{2}$W or more.
R10-100ohm trimmer for Hi-Fi-Shorted For Bands or P.A.
R15,16-68 ohms $\frac{1}{2}$W
R21,22-22 ohms 1W or more.
L1-10 turns of #18 to #22 wire wrapped around R21, or 10uH (Miller 4622)

POWER AMP CIRCUIT 200/4 (160W RMS INTO 4Ω) (105W INTO 8Ω)



TIP31C - USE 40409 IF TIP ARE
TIP32C " 40410 NOT AVAILABLE

- BIAS POT SET FOR 5mV ACROSS RESISTOR INDICATED AS R.
- THIS IS DONE WITH THE INPUT SHORTED AND A LOAD CONNECTED.

POWER SUPPLY