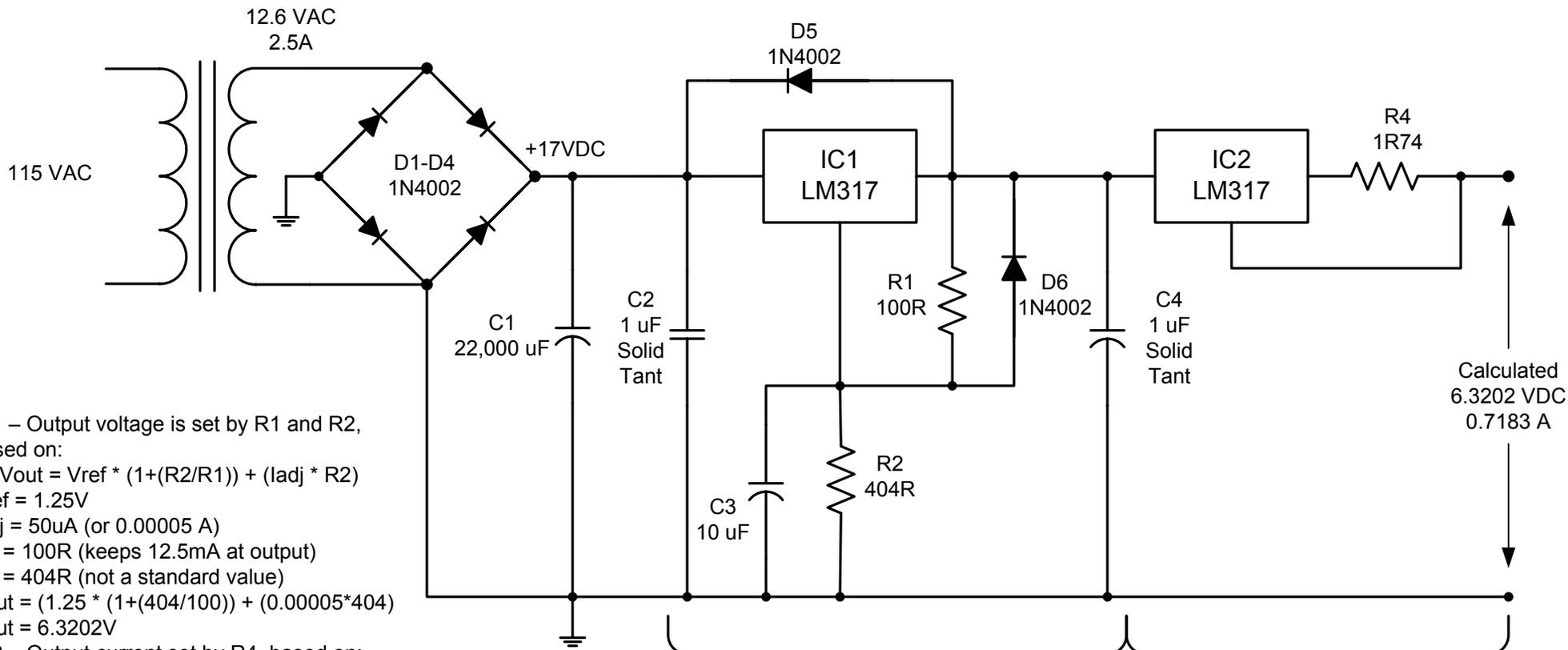


# DC Heater Source using LM317 Regulators



**IC1** – Output voltage is set by R1 and R2, based on:

$$V_{out} = V_{ref} * (1 + (R2/R1)) + (I_{adj} * R2)$$

$V_{ref} = 1.25V$   
 $I_{adj} = 50\mu A$  (or 0.00005 A)  
 $R1 = 100R$  (keeps 12.5mA at output)  
 $R2 = 404R$  (not a standard value)  
 $V_{out} = (1.25 * (1 + (404/100))) + (0.00005 * 404)$   
 $V_{out} = 6.3202V$

**IC2** – Output current set by R4, based on:

$$I_{out} = V_{ref} / R$$

$V_{ref} = 1.25V$   
 $R4 = 1R74$   
 $I_{out} = 1.25 / 1.74$   
 $I_{out} = 0.7183A$

**C2** – pg 8 note, “An input bypass capacitor is recommended. A 0.1µF disc or 1µF solid tantalum on the input is suitable input bypassing for almost all applications.”

**C3** – pg 8 note, “...adjustment terminal can be bypassed to ground...”, “With a 10 µF bypass capacitor 80dB ripple rejection is obtainable at any output level.”

**D5, D6** – pg 8 note, “When external capacitors are used with any IC regulator it is sometimes necessary to add protection diodes to prevent the capacitors from discharging through low current points into the regulator.” And, “No protection is needed for output voltages of 25V or less and 10 µF capacitance.” **D5 and D6 may be unnecessary.**

LM117/317 Datasheet, pg 15  
Adjustable Regulator with  
Improved Ripple Rejection

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**C4** – pg 8 note, “Although the LM117 is stable with no output capacitors, like any feedback circuit, certain values of external capacitance can cause excessive ringing. This occurs with values between 500 pF and 5000 pF. A 1 µF solid tantalum (or 25 µF aluminum electrolytic) on the output swamps this effect and insures stability.”

## Design Requirements:

6.3V heaters for 4 tubes, each drawing 0.18A, or 0.72A total

### Limits:

**LM317**  $V_{in} - V_{out} \leq 15V, 2.2A$  (T package)

**LM338**  $V_{in} - V_{out} \leq 10V, 8A$  ( $V_{ref} = 1.24V, I_{adj} = 45 \mu A$ )