Mounting Fans in the KWM-2 and 516F-2 (DRAFT)

By John May/K6MAY

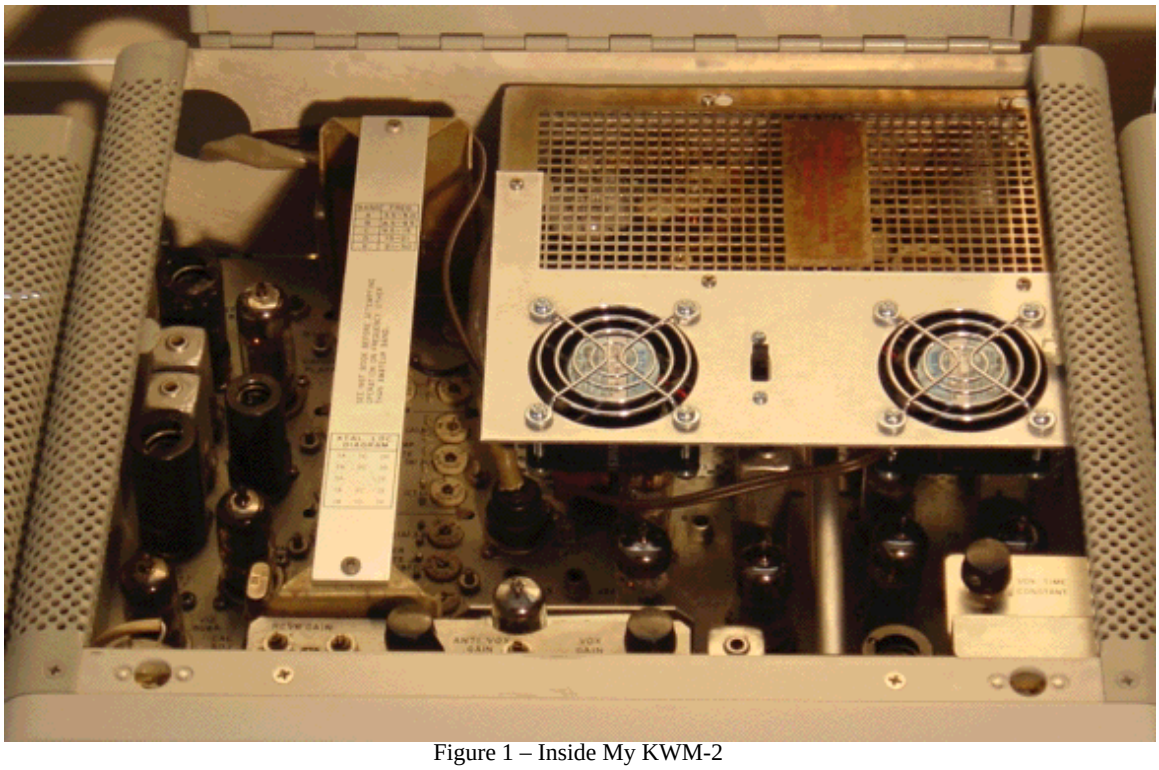

Figure 1 – Inside My KWM-2

In the March 1995 issue (#71. page 29) of Electric Radio Magazine, David Ishmael /WA6VVL published an article entitled "Cooling the Collins KWM-2". In David's article he described a "drop-in" bracket that attached to the 6146 PA cage of a KWM-2. This bracket mounts using three of the existing screws that's used to attach the PA cage cover. The bracket was made from 0.062" aluminum. This bracket contained two 2.36" (60mm) fans, wire fan guards, and a slide switch in case you wanted switch the fans off. The great thing about David's modification was that it made no permanent changes or did no damage to the KWM-2. If need be, the modification was fully reversible. The benefit was that it lowers the KWM-2's internal temperature by 20˚C, extending component life and decreasing temperature dependent frequency drift.

I first saw David's bracket on Ian McLean/VK3KCM's site (http://www.angelfire.com/de/vk3kcm/fans.html). I thought this was a great idea so I grabbed a piece of aluminum and made my first bracket. Worked Great! The only problem is that I don't have the sheet metal tools to do a professional job. Later I found out that David sells these brackets for a mere $12. When I got my second KWM-2, I order three of David's brackets (just in case I get a third KWM-2). Now, they not only work great, but look great too.

In a recent email thread of the Collins Collector's Club, Mac McCullough/W5HPM described how he mounted a small muffin fan to the backside of the resistor cage on the back of the 516F-2 power supply. Mac had impressive results. The fan not only kept the resistor bank cool, but also cooled the main transformer and chokes as well. Mac got me thinking. I had converted my 516F-2 to solid state (using the Peter Dahl kit) when I had to re-cap. It was running much cooler, but the transformers, chokes, and resistors still produced quite a bit of heat. What if a bracket could be made that attached to the resistor cage and had the benefits of David Ishmael's KWM-2 bracket.

In this paper, I describe David Ishmael's KWM-2 bracket, my idea for a 516F-2 bracket, and four possible wiring diagrams that are applicable to both brackets. The description of both brackets is in the form of mechanical drawings (see Figures X and Y). I also have included a parts list and sources for the required components. In addition, I have included some photographs of my use of David's bracket.

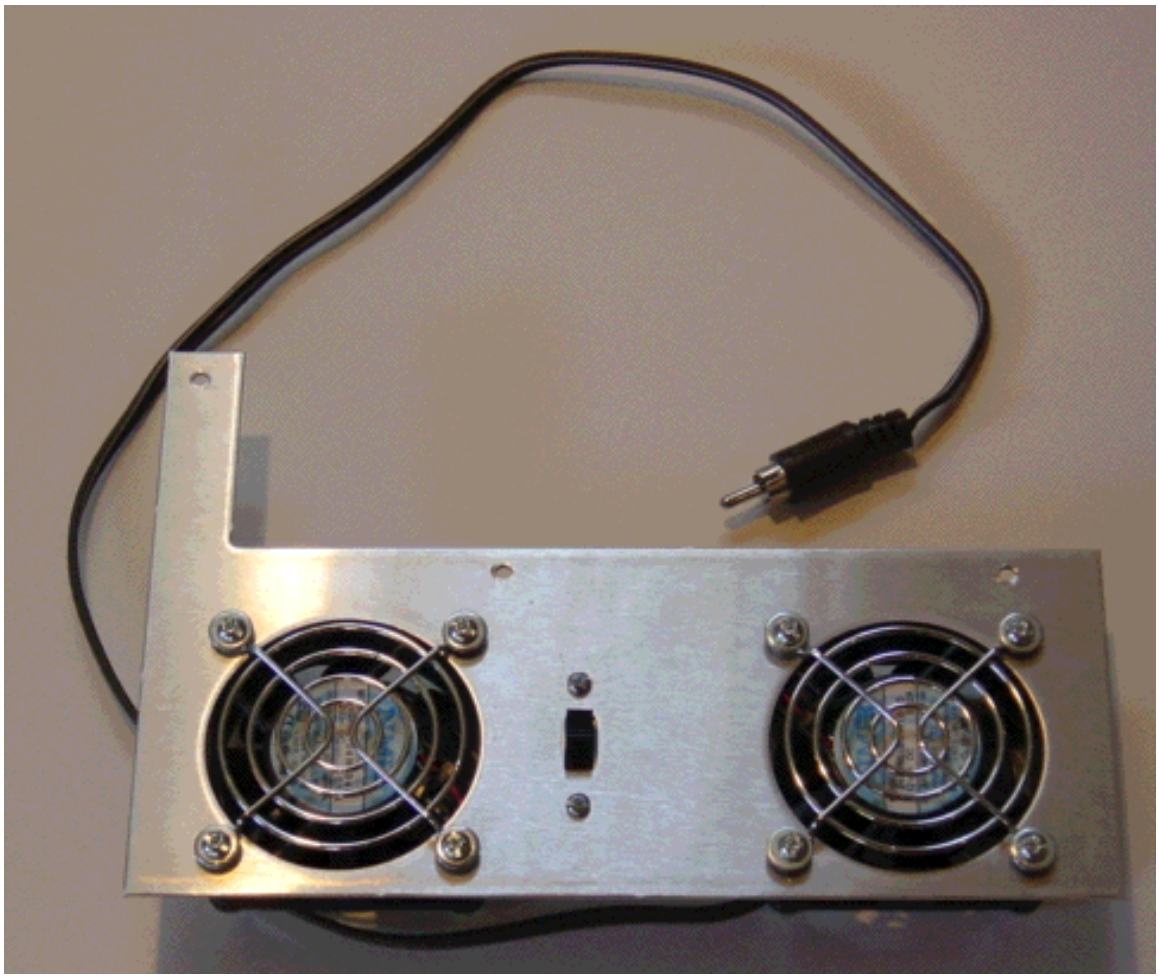

Figure 2 – My Fan Bracket

There are three easy choices for Fan Voltages 120VAC, 12VDC, and 24VDC.

1) 120VAC Fans

Fans that operate from 120 VAC use this simplest wiring. No bridge rectifiers or capacitors are required. Power is obtained by connecting the fans directly to a 120 VAC source. The power cable is simply run through one of the exiting rear holes in the back of the KWM-2.

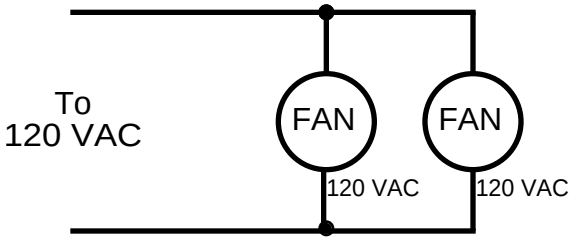

Figure 3 – AC Operation

2) 12 VDC Fans

This is my choice. Fans require a bridge rectifier and capacitor to provide the DC voltage (see Figure 4). Power is provided off the 6.3 VAC filament voltage. The 6.3 VAC may be obtained by running a cable from the fans to the rear connector on the back of the KWM-2. The 6.3 VAC could also be obtained from pins x and y on the 9-pin tube socket that is used for connecting to a noise blanker. I have been unable to find a 9-pin plug that will fit this socket, so I get my power from the 6.3 VAC rear connector. This Voltage becomes 8.9 VDC when rectified and filtered. Fans run a little quieter and slower because they are running on the lower voltage.

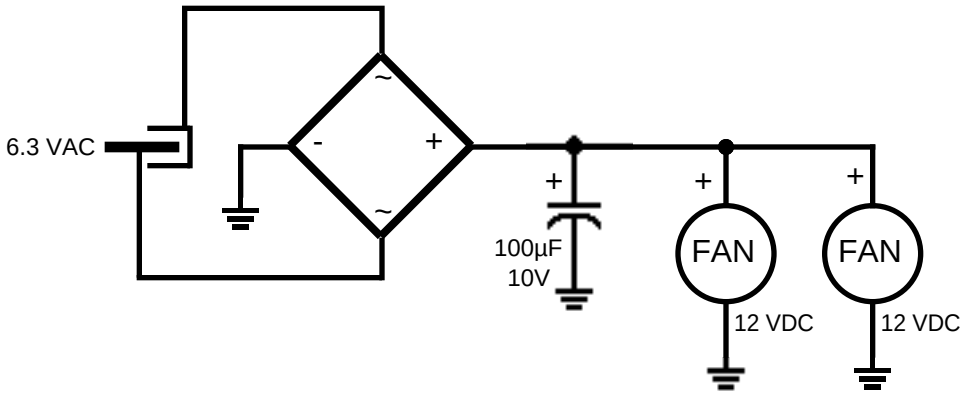

Figure 4 – DC Supply

The fans could also be run at full power by using a voltage doubler (see figure 5).

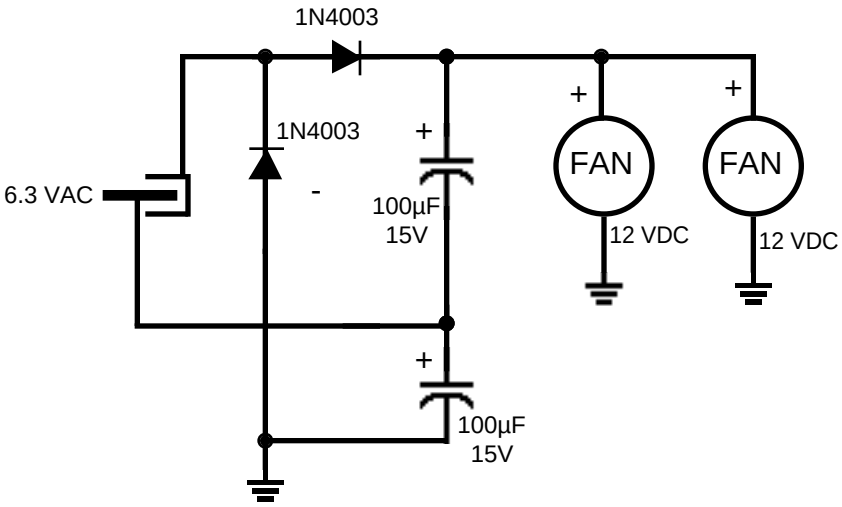

Figure 5 – Voltage Doubler Circuit

In my Figure 4 version, I mounted the bridge rectifier to the bracket using a small L shaped angle (1/2" x 1/2") that I obtained from an old Erector set. I mounted the capacitor by directly soldering it to the pins of the bridge rectifier.

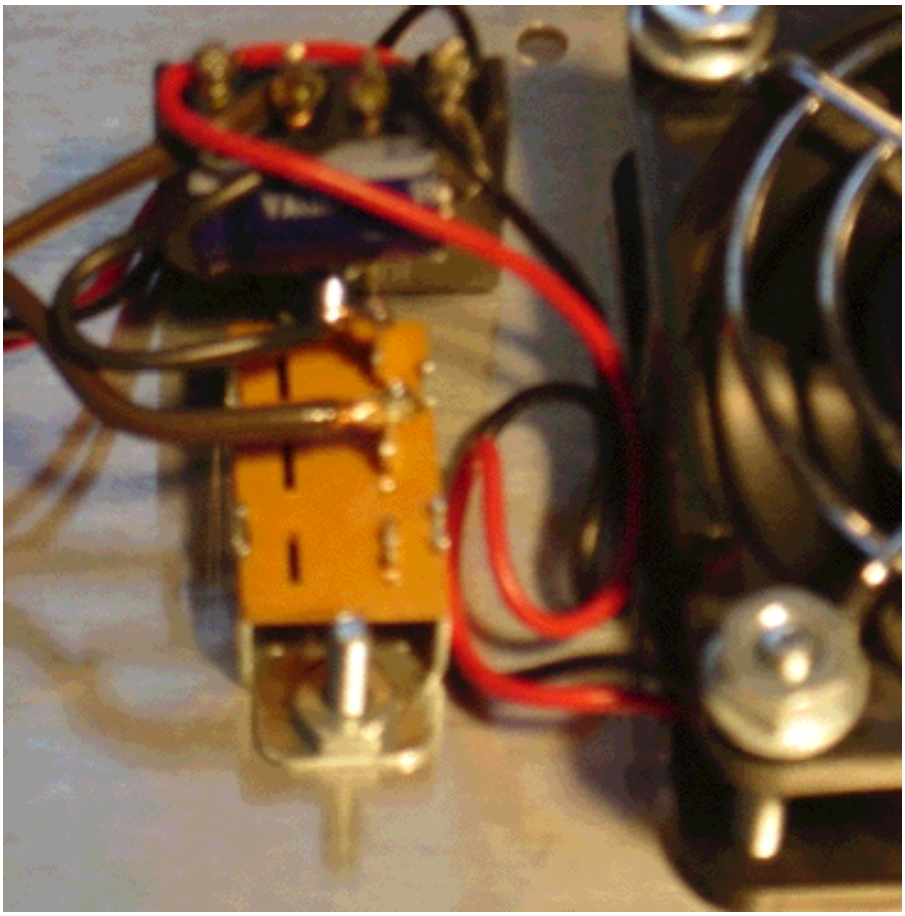

Figure 6 – Mounting the Bridge Rectifier to David Ishmael's Bracket

You could also use the circuit in Figure 7. This circuit uses a variable voltage supply. This will give you more control over the speed of the fan. The disadvantage is that there are a number of components. The components can be mounted to a circuit board. A company called VelleMan Kits makes a Power Supply Kit that has all the components (including circuit board). The model number for the kit is K 1823 and is sold at Radio Shack. Com stores (not the regular Radio Shack stores). Most of the 12 volt fans I've seen draw anywhere from 100 mA to 300mA. The Velleman supply will provide about 1 amp (about 1.5 amps if you heat sink the 317T voltage regulator. I have also included the PCB layout for this circuit. It can be mounting can be a problem. On the KWM-2 fan bracket, it can be mounted vertically (using small L brackets) on the underside if the bracket. You will have to drill two additional holes in David's bracket. The position of the board is anywhere you can find that provides mechanical (and electrical) clearance. On the 516F-2 fan bracket, it can be mounted vertically on the top of the bracket.

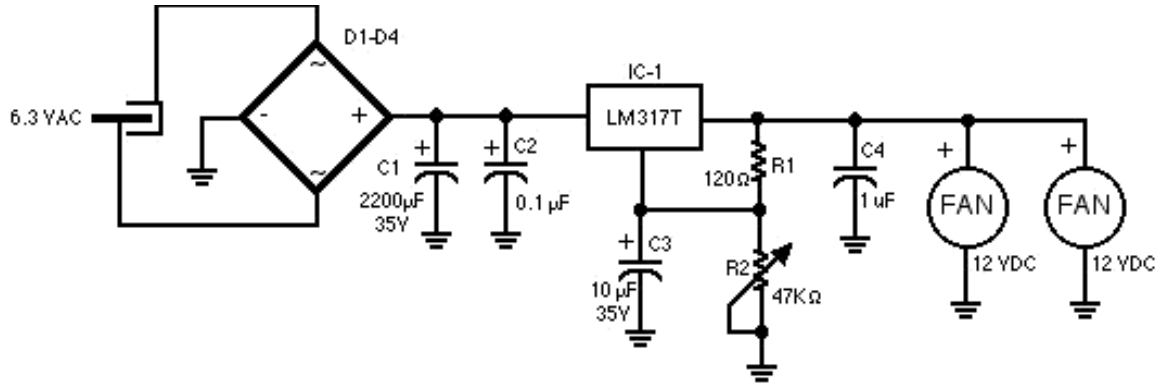

Figure 7 – Variable Supply

2) 24 VDC Fans

24 Volt fans may be used with the voltage doubler circuit. They will run quitter (and slower) than the 12 V on the doubler. This is an advantage if the only fans you have are 24 VDC. Otherwise, I see no benefit.

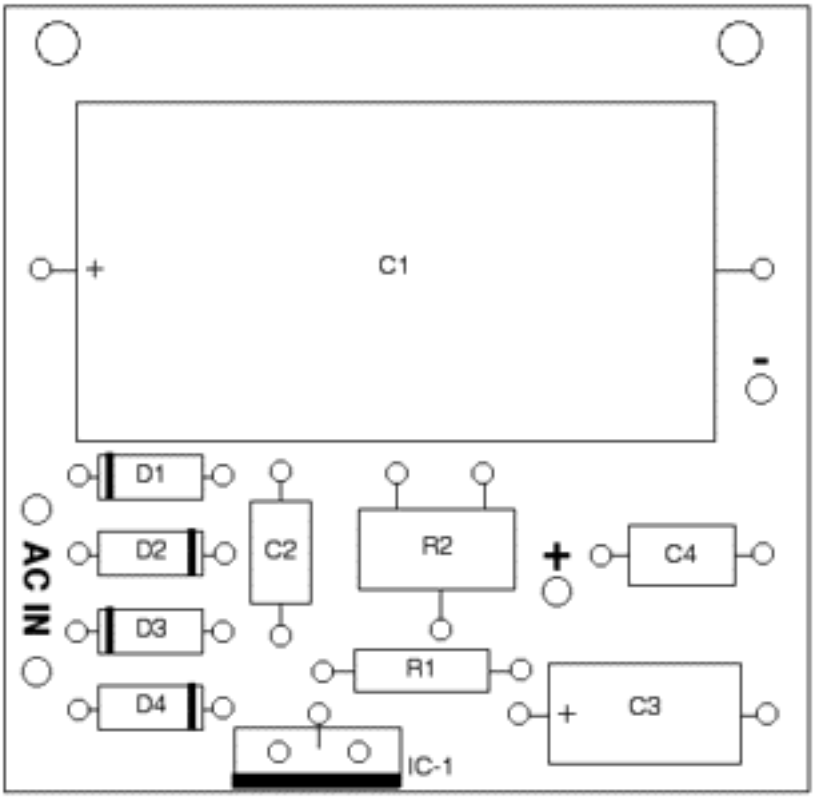

Figure 8 – Component Layout

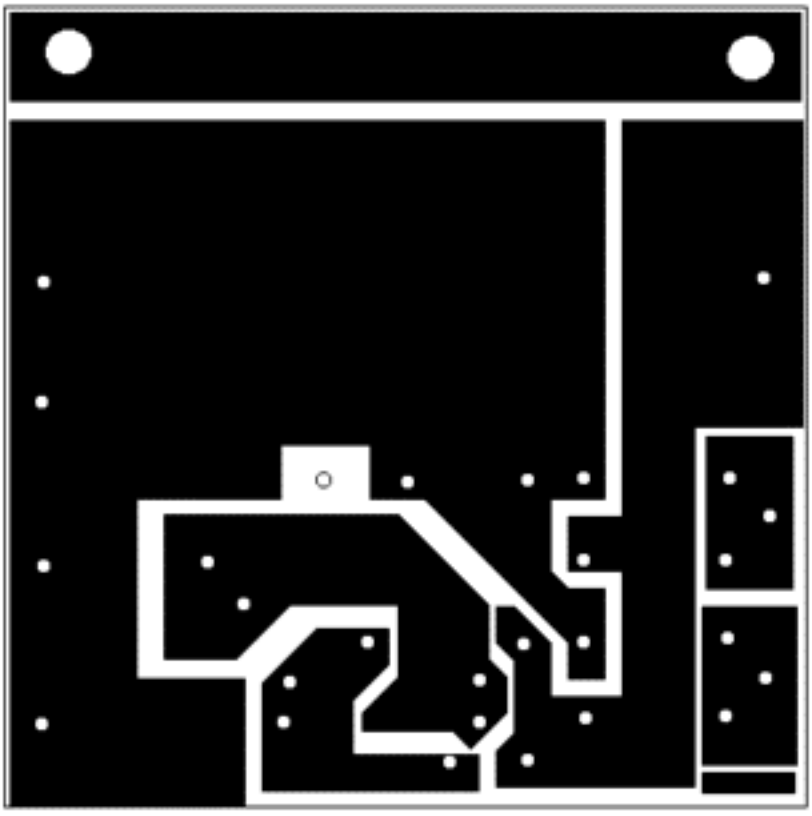
Figure 9 – PCB Layout

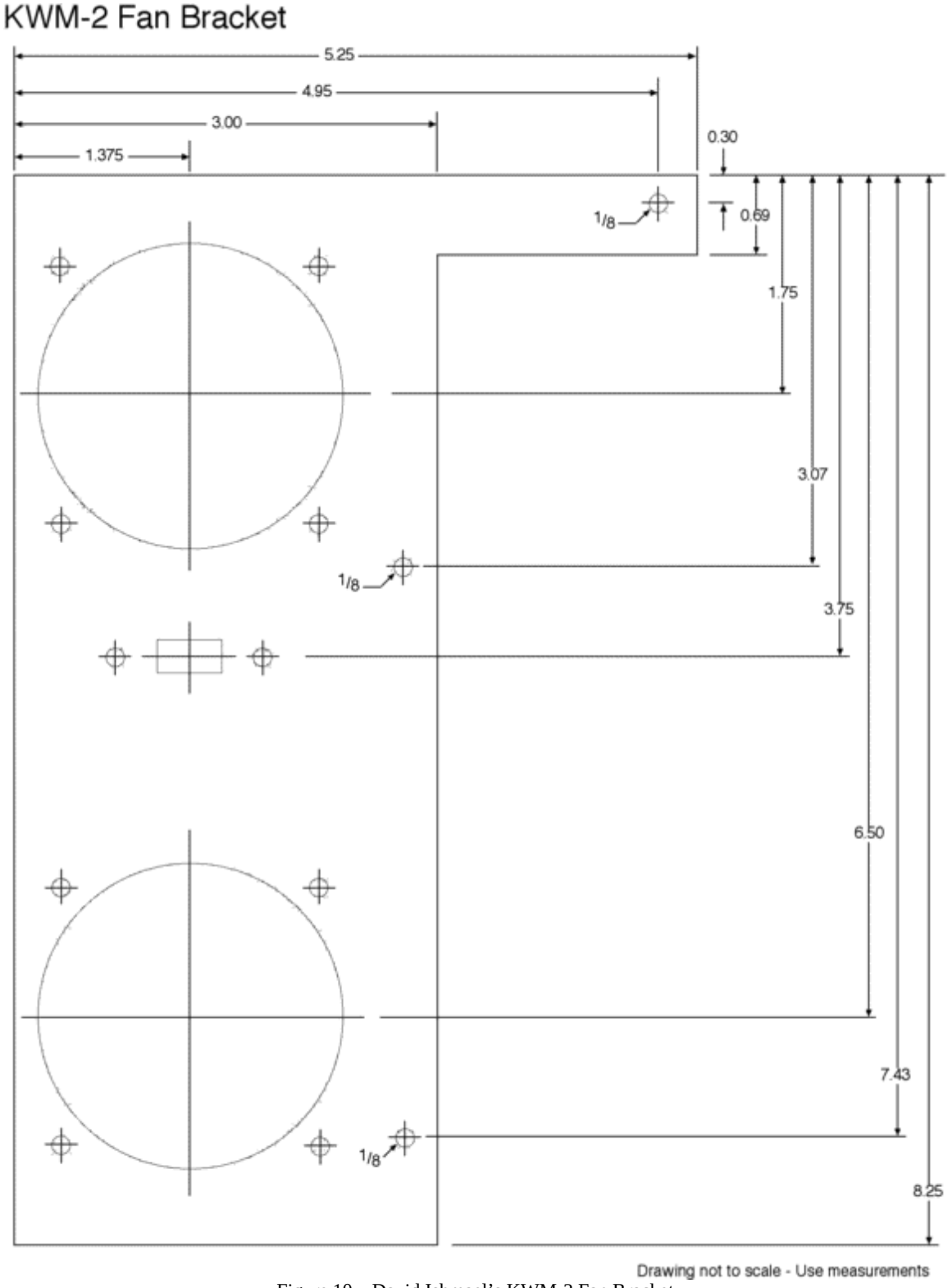

Figure 10 – David Ishmael's KWM-2 Fan Bracket

516F-2 Fan Bracket

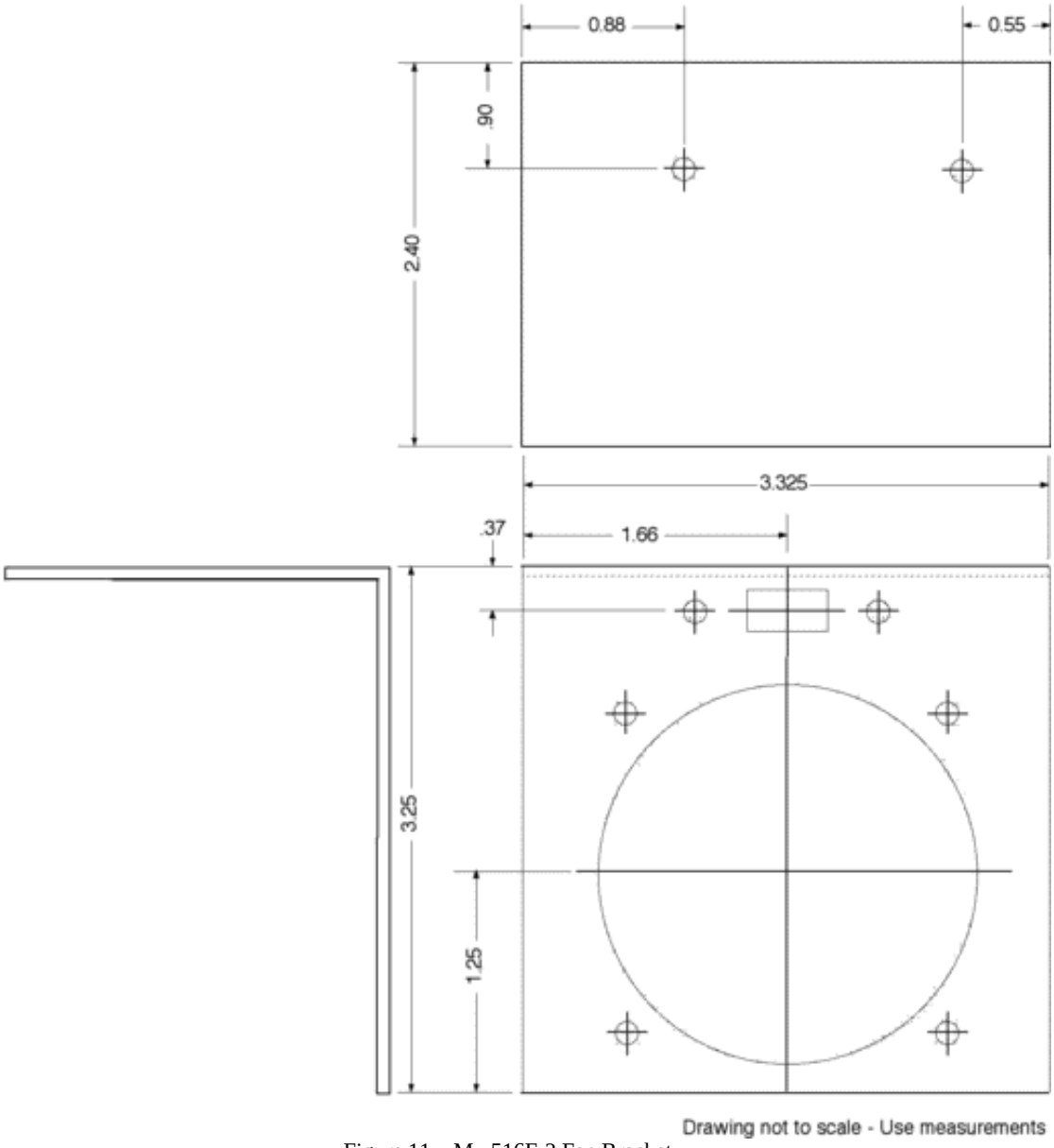

Figure 11 – My 516F-2 Fan Bracket

Fan Bracket Details

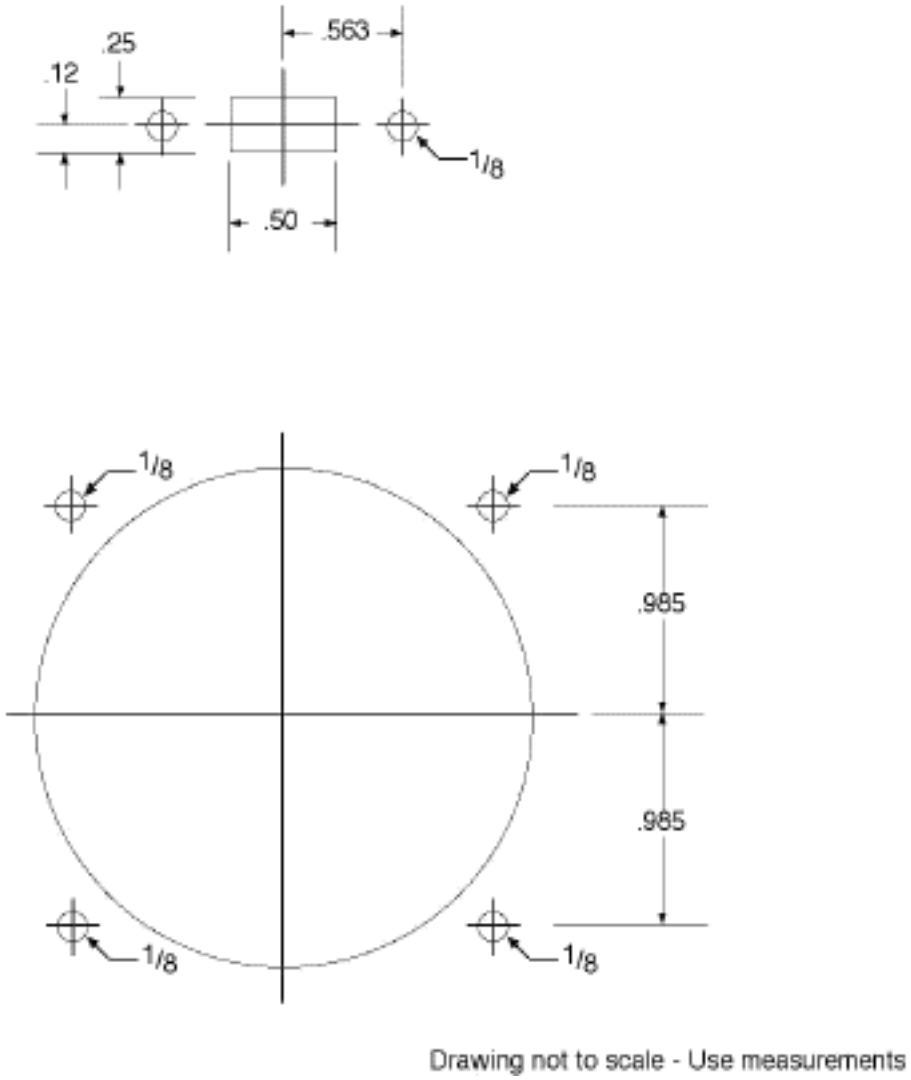

Figure 12 – Hole details for Switch and Fan (used on both brackets)

Parts List for KWM-2 Fans

Qty	Item
1	Fan Bracket for KWM-2 Available from David Ishmael
2	Fans (see Fan Table)
2 or 4	Fan Guards
8	Screws
16	Washers
8	Nuts
1	Slide Switch
2	Screws
2	Lock washers
2	Nuts
1	Cable with RCA Phono connector
1	Bridge Rectifier
1	100µF, 10V electrolytic capacitor
1	L shaped bracket

Parts List for 516F-2 Fans

Qty	Item
1	Fan Bracket for 516F-2
1	Fans (see Fan Table)
1 or 2	Fan Guards
4	Screws
8	Washers
4	Nuts
1	Slide Switch
2	Screws
2	Lock washers
2	Nuts
1	Cable with RCA Phono connector
1	Bridge Rectifier
1	100µF, 10V electrolytic capacitor
1	L shaped bracket

Suppliers

KWM-2 Fan Bracket available from:

David W. Ishmael - WA6VVL
2222 Sycamore Avenue
Tustin CA 92780
(714) 573-0901
daveishmael@home.com home email
dave_ishmael@qscaudio.com work email

qty 1 - $12
qty 2 - $22
qty 3 - $31

NMB Technologies Fans and Fan Guards available from:

Newark Electronics
4801 N. Ravenswood
Chicago, IL 60640 USA
Phone: 800-463-9275
Phone2: 773-784-5100
Fax: 773-907-5339
http://www.newark.com/

Bridge rectifier, capacitors, and VelleManPower Supply Kit available from:

Radio Shack.com

NOTES FOR DRAFT:

I use a 12 volt fan implementation that draws its power from the 6.3 jack. You could also draw 6.3 volts off J24 the NB power socket (inside the KWM-2), but I've not found a source for the 9 pin plug that would be needed to fit J24.

The fan I used is an NMB Technologies 2408NL-04W-B40P00.

DC Tube axial Fan, 2408NL Series, Low-Noise, Slim Micro-Boxer™, 2.4 in sq x 0.8 inch Deep, 14 CFM, 12 volt DC, 1.10 watt, 26 dBA, -10 deg C to +70 deg C Operating Temperature.

The Fan guards may also be obtained from Newark:

NMB Technologies 055023

Fan Guard, Round, 4 Rings, Nickel Chrome Plated, for Fan Series 2400.

The cost is $0.93 each (You will need either two or four - depending if you want guards on both the bottom and top of the fan).

You will also need:

a SPST slide switch
a Bridge Rectifier (almost any one will do, just needs to work mechanically - I used one that mounts vertically)
a 100uF 25 volt electrolytic capacitor
A six foot audio speaker cable with a molded RCA plug on both ends (It's about 14-16 AWG). I cut the cable to the length I needed to reach from the fan bracket to the back of the KWM-2 - about 2 1/2 feet.

I got the above components from Radio Shack.

You will also need:

Bolts, nuts and washers to mount the fans and fan guards to the fan bracket.
Bolts and nuts to mount the slide switch to the fan bracket.

These can be obtained from Home Depot (I used stainless steel hardware) - sorry, I can't remember the screw sizes.

I also used a small L bracket (I used it from an Erector set) to mount the bridge rectifier to one of the same screws that hold the switch to the fan bracket. I soldered the capacitor, RCA plug wires, switch wires, and fan wires directly to the wires on the bridge rectifier.

The is one of the best mods I have seen (and done) to the KWM-2(A). I keep my rig on 24 x7.

I did meet someone at a hamfest who simply placed the fans on top of the KWM-2 (over the final amp cage) and claims that it kept the finals so cool that they no longer achieved thermionic emission. Sounds like an urban legend to me (or that his 6146's need replacing).