

## Negative Feedback Selector (NFS) Kit Assembly & Installation Manual for Dyna-70 & Dyna-120 Amplifiers

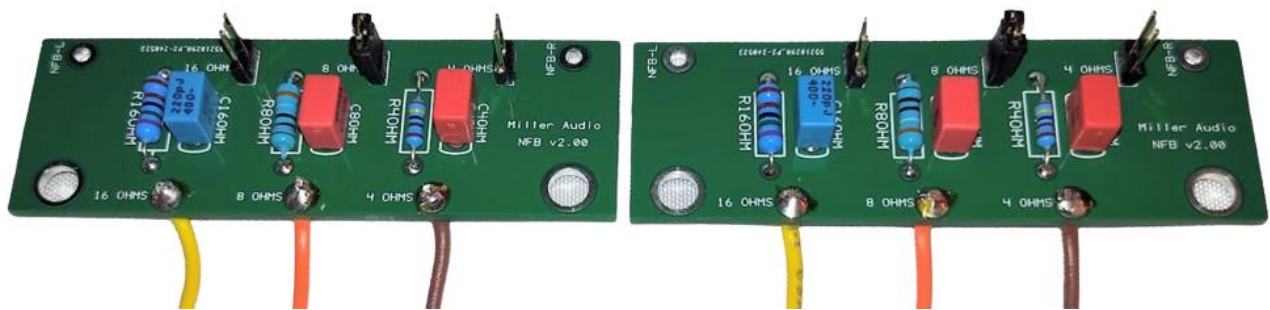


Photo 1: Prototype NFS PCB's, ready to install into a Dyna-70 / -120 Ultimate Amplifier

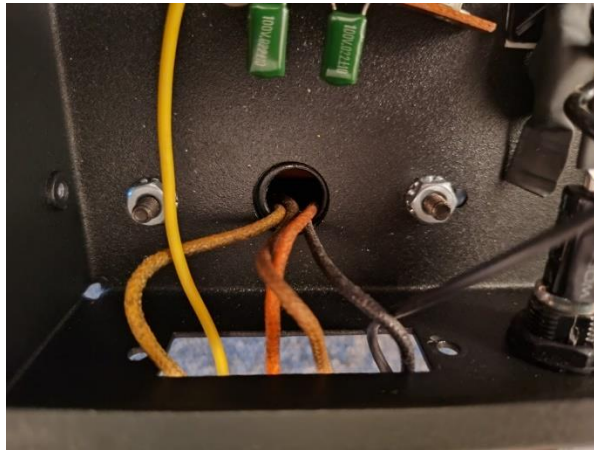
### Parts Supplied:

- 2- PCB's for Left & Right Channels
- 6- Header Pins (kit includes extra parts, these are easily damaged with too much heat)
- 2- Jumper Links (only one is used per PCB; it goes on the desired impedance Header Pin)
- 2- 680 pF/400V 5% Film Caps
- 2- 470 pF/400V 5% Film Caps
- 2- 220 pF/400V 5% Film Caps
- 2- 2.4K Ohm 1% Resistors
- 2- 3.9K Ohm 1% Resistors
- 2- 7.5K Ohm 1% Resistors
- 6 inches each of 18 ga. stranded wire in Yellow (16-Ohm), Orange (8-Ohm) & Brown (4-Ohm)
- 2- 8/32 Standoffs

**Before starting assembly, we recommend:**

- That you inspect the kit and ensure you have all parts listed above;
- You read this Kit Assembly and Installation Manual 3-4 times to ensure you understand and can follow the assembly and installation steps as presented;
- You install the smallest, shortest, or lowest height parts first, followed by larger / taller parts last.
- You have access to the original Dynaco ST-70 Assembly Manual.

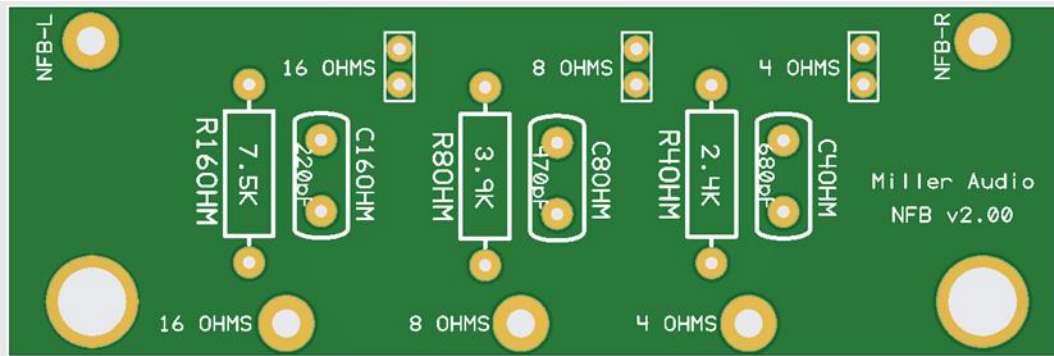
**WARNING!** *Be sure to prevent any solder or wire debris from falling into the open Output Transformer openings within the chassis, ref. **Photo 2** below. If any solder, metal particles or pieces of wire fall into the transformer, you must remove the Transformer and clean it out to prevent the possibility of a short in your Output Transformer. Use some duct tape, a small rag cloth stuffed into the openings, etc. to keep anything from falling into the transformer! **Remember this warning, you will read it again !***



**Photo 2: Block all Transformer Openings to prevent a short in Transformers !**

**A. Lead Preparation**

1. Start by cutting the supplied 6 inches of colored wire in half; you should complete having 6 pieces of wire, all approximately 3 inches in length and 2 wires of each color (Yellow, Orange & Brown).
2. Strip and tin approximately 0.1" (i.e., one tenth of an inch) of wire lead on each of the 6 wires.
3. Once you have tinned all leads, solder the Yellow wires to the 16-Ohm input solder terminal; the Orange wires to the 8-Ohm input terminal, and the Brown wires to the 4-Ohm terminal. You can solder from the top or bottom of the PCB, it's your choice. For the prototype, we inserted the wires from the bottom of the PCB, as depicted in the first page photo, **Photo 1**.



**Photo 3- Unpopulated NFS PCB showing component location & RC values**

## **B. PCB Component Installation**

4. Refer to **Photo 3** above for component locations & values; install the 3 resistors in their respective locations; measure the resistance value if you are unsure of how to read resistor color codes - and match to the values as printed on the PCB. You can solder these in now or wait until the Film capacitors and header pins are installed and solder all at one time.
5. Then install the Film Capacitors in their respective locations. The Film caps are marked with their value on the part. Be careful when soldering Film caps, as these are much like the header pins and can easily be overheated when soldering. Be quick when soldering and don't linger on delicate parts. *Tip: You can heat a solder joint faster if you will clean the tip prior to soldering each joint and put a small amount of fresh solder on the tip; this gets heat into part from the solder tip the quickest.* Also use a "brass wire sponge" tip cleaner vs. using a water dampened sponge. This keeps the tip hot, yet cleans tip to a shiny silver, ready-to-solder appearance.

Note: We recommend that you solder only one pin of the Film cap at a time, and move to the next cap, soldering only one terminal again, then move to the third cap and solder it. Now go back and solder the second pins. This gives a small time interval to sink heat away from the caps into the copper circuit traces and cool before hitting them with heat again.

6. Finally install the header pins. We install by inserting pin into solder holes, then take a large, straight blade / slotted screwdriver and twist between the pins. This will distort them, bending the ends slightly, but help to keep pins in the hole locations and prevent from falling out.

Note: Follow the same process used to install the Film caps, soldering only one pin at a time, and allowing it to cool by moving to the next set of pins, until all header pins are soldered. It's not important that they be perfectly straight, but the jumper linking the two pins should be easy to slide onto both pins. *Be careful when handling and installing the PCB into chassis, the headers bend easily.*

7. Next, we will unsolder and move the Yellow 12-14 inch lead that is attached to the 16-ohm speaker output terminal. This is the "old" 16-ohm negative feedback wire that will now feed the selected feedback from the NFS PCB to the Dyna Ultimate Upgrade circuit card.

Prep the end of the Yellow wire (snip, strip and tin a fresh connection point for wire) and insert into the “NFB-L” or “NFB-R” terminals of the NFS PCB as appropriate. Remember you are working inside the amp with the chassis upside down- so Left will be Right and Right will be Left when viewed upside down with the bottom cover off.

Note: The Dyna circuit card end of this Yellow wire will remain in the “NFB” solder terminal on the Dyna Upgrade circuit card- leave as is, this is the point that the NFB signal is fed back into the audio input circuit from the NFS PCB, reference **Photo 4**.

### C. Dyna Ultimate Upgrade (DU2) Circuit Card Modification

8. Next, we must remove the 16-Ohm NFB parts that are on the DU2 PCB. We will remove R5 and R5L, the 7.5K Ohm 1% resistors, and C7 & C7L, the 220pF 5% Film caps; these components are located along the front edge of the DU2 circuit card, just near a solder terminal labeled “NFB”, near tubes V1 and V5.

Notes: This step can be done without removing the DU2 circuit card but be patient and take your time as it is a bit of a “fiddly” process and you will be working with limited access, but it can be done.

You can remove and discard these parts; they are no longer needed since they have been moved to the NFS PCB and the NFS kit includes the new parts that are re-located to the NFS PCB. Use solder wick and/or a solder sucker to remove all solder as well as the 4 components. Do so carefully and don't overheat or damage the solder locations as we must use these locations again.

9. Once the components are removed and the solder through-holes are cleaned, use a piece of wire (excess lead wire from the caps or resistors is ideal) as a jumper wire and solder where the resistors and film caps were. You can place this jumper wire on the top of the PCB or the bottom of the PCB (it's your choice, but with limited access, we found it easier to install from the top), ref. **Photo 4** below.

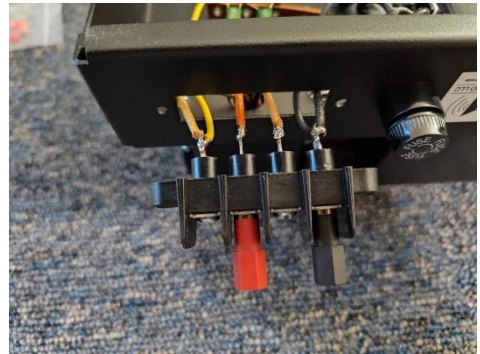


**Photo 4: Removal of 16-Ohm NFB Components from Dyna Ultimate Upgrade PCB**

This completes circuit card modification the DU2 circuit card, enabling each NFB impedance signal from the NFS PCB to be routed to the DU2 circuit card.

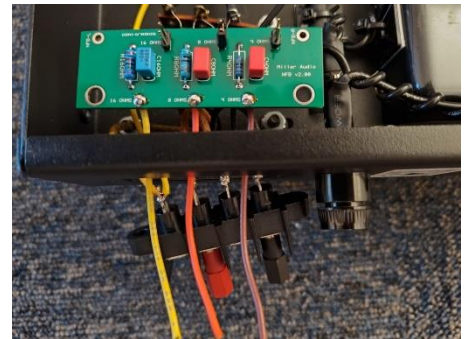
#### D. Mounting the NFS PCB in the Amplifier

10. Loosen and dismount the Right and Left Speaker Terminal Strip (if Miller Audio Terminal Blocks were used, loosen, and dismount them) while leaving all Output Transformer wires attached to the Terminal Strip/Terminal Block. Let them hang from the rear of the amplifier chassis, ref. **Photo 5**.



**Photo 5: Loosen Speaker Terminal and solder access for NFS connections**

11. Trim the 3 wire leads on the NFS PCB such that you have some excess, but not so much it interferes with remounting the Terminal Strip / Block. Strip and tin the lead ends about 0.2 inches, then wrap lead and solder the Yellow lead to the 16-Ohm terminal, the Orange lead to the 8-Ohm Terminal and the Brown lead to the 4-Ohm Terminal. (Note: On the prototype we left the leads 3 inches long and installation went fine), ref. **Photo 6**.



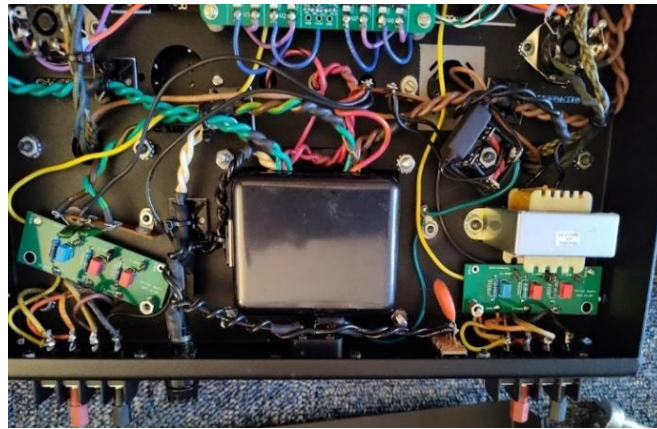
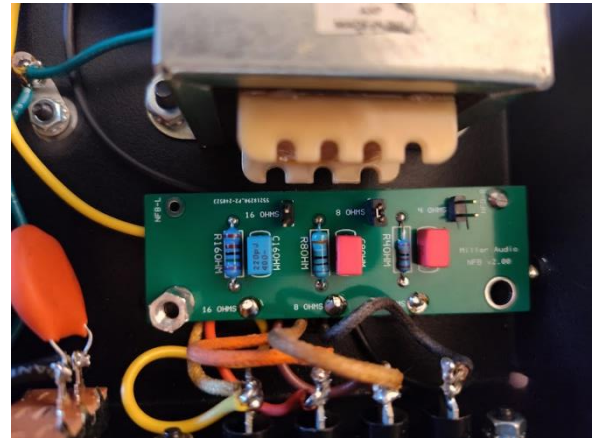
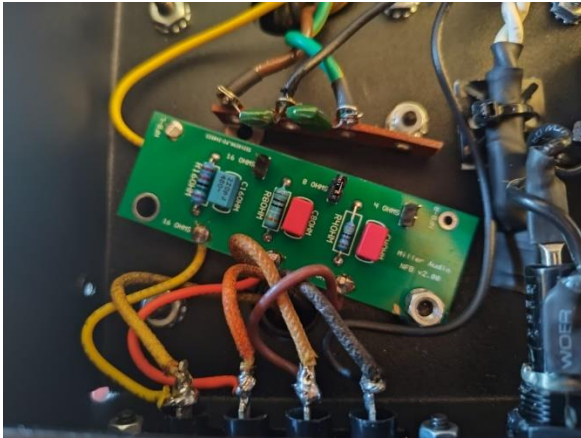
**Photo 6: Insertion of NFS PCB & connections to Speaker Terminals**

Note: The doubling of the leads on the speaker output terminals can be a bit “fiddly” and it can be difficult to keep both the transformer output wires and the NFS wires attached simultaneously while soldering. We wrap the 3 NFS wires around & over the Transformer wires, to help keep them in place when soldering the NFS wires.

**WARNING!** *Be sure to prevent any solder or wire debris from falling into the open output transformer openings within the chassis. If any solder, metal particles or pieces of wire fall into the transformer, you must remove and clean out to prevent the possibility of a short in your output transformer. Use some duct tape or a small rag cloth stuffed into the openings to keep anything from falling into the transformer. (Ask how we know this!)*

12. Mount the 8/32 standoff on one of the transformer 8/32 mounting screws and use the supplied 8/32 screw to hold PCB in Place. This single fastener mount is usually all it takes to mount the NFS PCB. Ensure that there are no live contacts on the bottom of the NFS PCB touching the chassis (or anything else). You can use some double stick foam tape to isolate the bottom of the PCB if so inclined. We used a single stand-off to mount the NFS PCB and had no problems with the prototype Dyna-70.

**WARNING! NEVER enable more than one speaker impedance at a time (that's why we only provide 2 pin jumpers in the kit). You can short the Output Transformer- it is not designed to operate more than one speaker impedance at a time.**



**END**

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## ADDENDUM

### NFS for VTA Audio Drive PCB Upgrades using 12AU7 & 6SN7 Tubes For VTA modified ST-70's, Mk III & Mk IV Amplifiers

The NFS Kit was originally designed for Miller Audio LLC Ultimate Upgrade amplifiers, yet our NFS will easily integrate into any upgraded ST-70, Mk III or Mk IV amplifier that uses a VTA / tubes4hifi.com audio drive upgrade card using 12AU7 or 6SN7 preamp tubes. The installation will closely follow the assembly & integration steps as described for the Dyna-70 Ultimate Upgrade circuit card in the previous pages & assembly steps.

**NOTE:** We have not tested or evaluated use of other 3<sup>rd</sup> Party upgrade PCB's that employ 6GH8A preamp tubes. We cannot verify our NFS upgrade kit is compatible with these circuit cards.

- Regardless of whether the VTA upgrade card has 12AU7's or 6SN7's, remove the Silver Mica 220pF 500V capacitor and the 6.8K resistor from the VTA PCB and install wire "jumpers", as described in Section C, Steps 8 & 9 above into the circuit card, refer to **Photo 7, below**.



**Photo 7: ST-70 / Mk III / Mk IV - Remove R8 & C12 from PCB's**

This creates a continuous NFB circuit on the VTA circuit card. See attached photos for location of the 16-Ohm NFB film capacitor & resistor combination; look for the Black or Brown Silver mica capacitor, near the NFB input terminal on the circuit card.

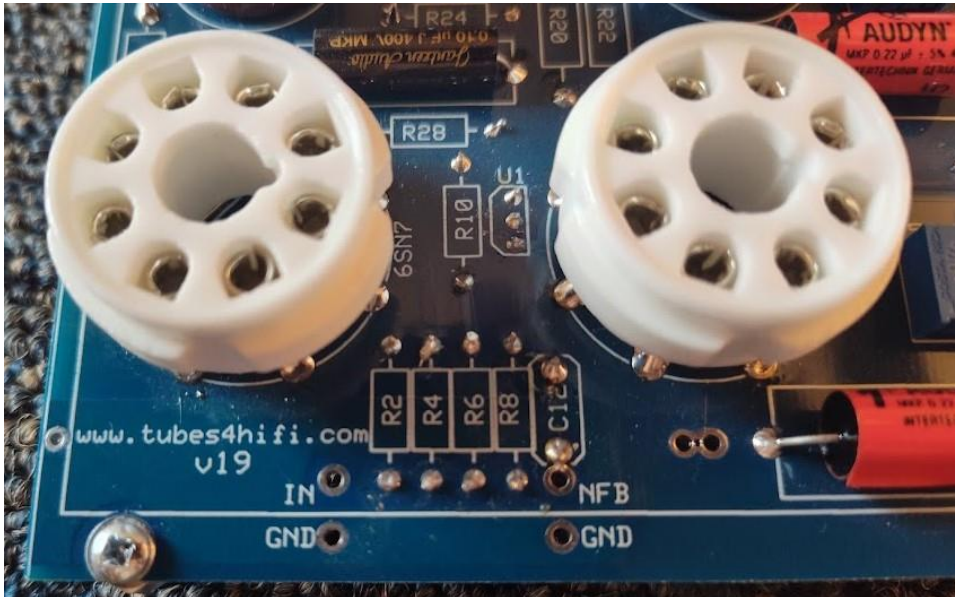


Photo 8: Location of R8 & C12 on the VTA Mk III or Mk IV Upgrade PCB

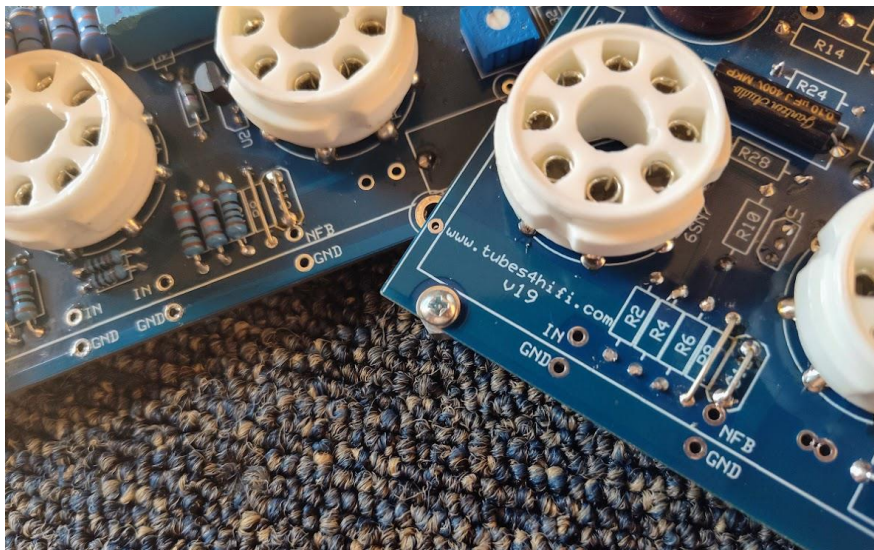


Photo 9: ST-70 & Mark III NFB “Jumper Wire” Installation at R8 and C12

**NOTE:** Whether an ST-70, Mk III, or Mk IV amplifier, the VTA upgrade circuit boards designate the 6.8K feedback resistor as “R8” and the Silver Mica Capacitor as “C12”. VTA used the same ID convention since all the PCBs are essentially ½ of an ST-70 drive stage design, **refer to Photo’s 8 & 9 above.**

- Install the new 16 Ohm NFS parts, a 220pF 600V film cap and a 6.8K 1/2W resistor, in the location for the 16-Ohm NFB parts on the NFS PCB. **Refer to Photo 1, 5 and 6** in previous pages above.



**NOTE:** Ignore the PCB call-out for the 7.5K resistor; (we use this value on the Dyna-70 & 120 amplifiers). You can try this value in your VTA ST-70, but they may or may not sound appropriate. Using the 6.8K resistor value, you will keep the 16-Ohm feedback gain as VTA designed in their upgraded PC-3 Circuit card.

- Populate the rest of the NFS PCB with the supplied Resistor & Capacitor values, then install and mount the NFS PCB as described in Section D, steps 10 through 12.
- If you have 4- or 8-Ohm impedance speakers, set the NFS to the correct speaker impedance in use and enjoy the improved sound and reduced distortion from the NFS device providing proper feedback gain for the impedance of your speakers.