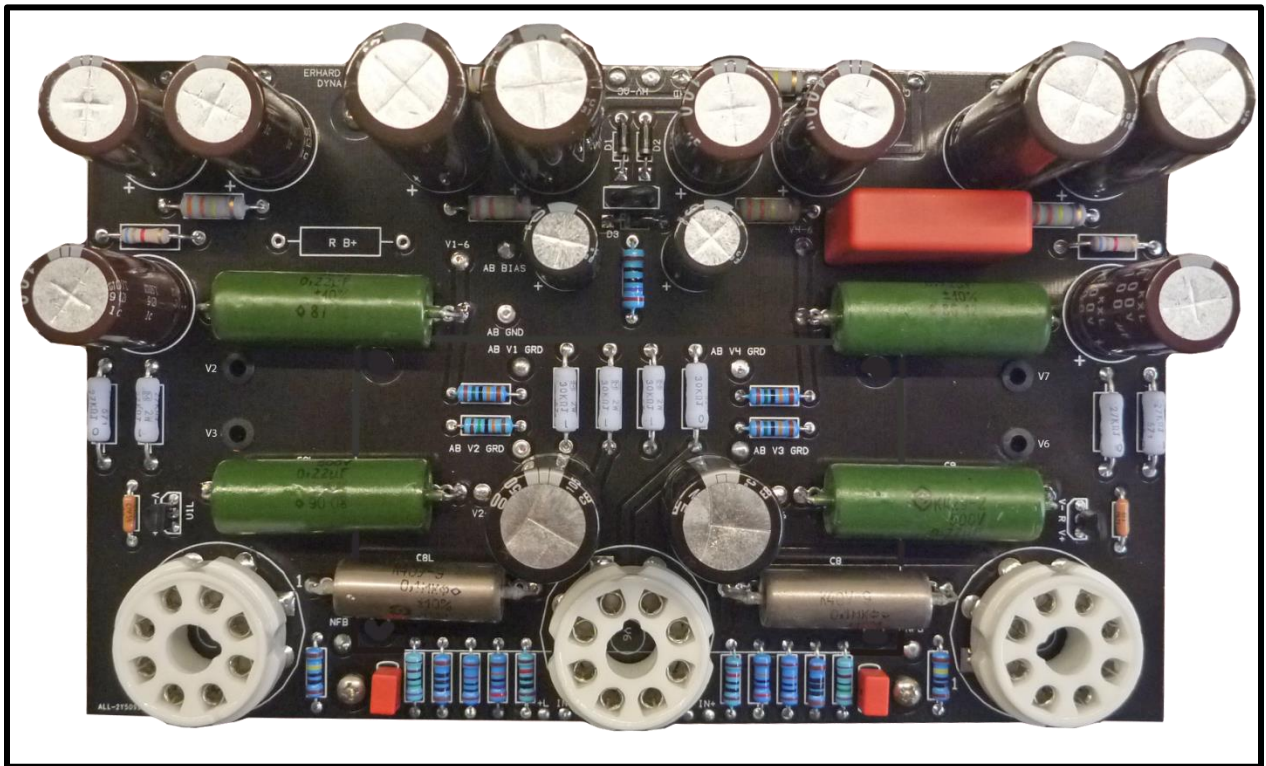




ADDENDUM

Dyna-70 Ultimate Upgrade Circuit Card Assembly



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Miller Audio LLC
October 2023

DYNA-70 CIRCUIT CARD ASSEMBLY

A. INTRODUCTION

Thank you for purchasing our Dyna-70 Ultimate Upgrade ST-70 kit. Since our introduction of the Dyna-70 Ultimate Upgrade audio system, we have received some feedback that we do not provide enough information & documentation for new owners of the Dyna-70 to assemble the primary circuit card.

This is true; we assumed this audio upgrade was not a beginner's kit, and we (falsely) assumed that only experienced kit builders would be assembling the Dyna-70 Ultimate Upgrade. This addendum has been prepared to discuss assembly of the Dyna-70 circuit card, but to also point out some tips and tricks we use here at Miller Audio LLC to assemble and check-out a new Printed Circuit Board (PCB) and resulting Circuit Card Assembly (CCA).

Let us start with some definitions; throughout our manuals and on our website, we use the terms "PCB" and "CCA" and it confuses builders. This is not our goal and the reason we have written this Addendum to help those building a Dyna-70 Ultimate Upgrade kit. The definitions are provided in the later pages of the Assembly Manuals, but the definitions are:

Printed Circuit Board ("PCB" aka Printed Wiring Board, PWB): an incomplete electronic assembly, a PCB provides or routes combinations of AC and DC voltages, analog, and digital signals, as well as hosting of electronic components. A PCB is a part of a CCA but cannot perform the function of a completed CCA. PCBs provide all interconnects between components and permits location of components on either side of the PCB. Photo 1 below is a pic of one of our PCB's supplied with the Dyna-70 Ultimate Upgrade Manual Bias Kit.

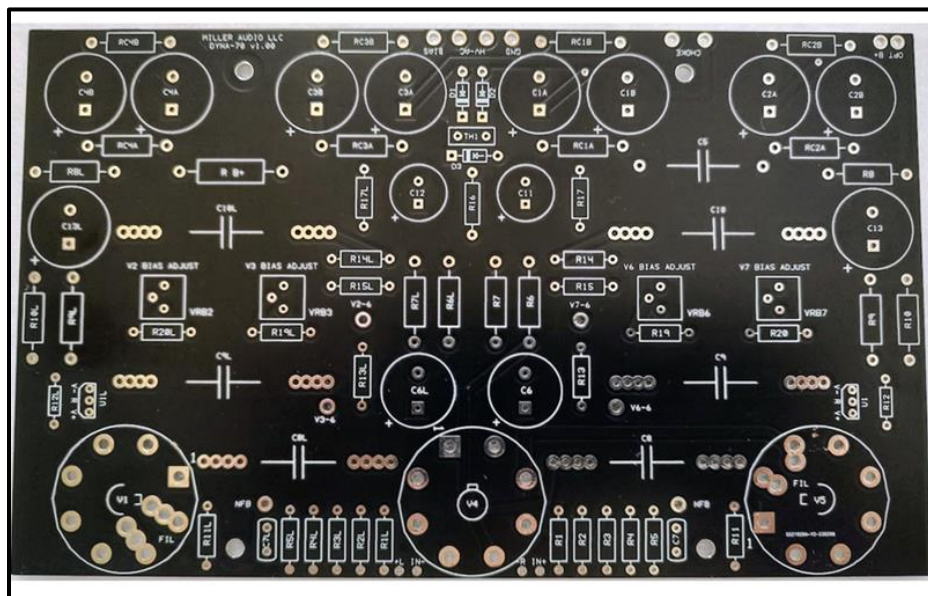


Photo 1: Dyna-70 Manual Bias Printed Circuit Board

CCA- Circuit Card Assembly: A complete electronic assembly consisting of a Printed Circuit Board (PCB) that is populated with passive and active electronic components, such as resistors, capacitors, diodes, inductors, transistors, microprocessor's, inputs & outputs, etc. The cover of this Addendum depicts an early-version of a completed, ready to install

Automatic Bias Circuit Card Assembly. (Note the B+ resistor has not yet been installed and the early locations of the LM-334 and R12 resistor on the top side of PCB).

B. ASSEMBLY TIPS

These assembly tips will help to build confidence in your assembly process of the Dyna-70 CCA. Please note and follow these instructions and tips; they can and will make the build better and aid your understanding of the details in proper assembly. Always remember to check 2-3 times before soldering in a component in the CCA. If you get stuck, give us a call, send an email, etc. and we will gladly try to talk you through any confusing or frustrating assembly step.

If all else fails, you are welcome to send us your Kit and we will gladly assembly your Dyna-70 Ultimate Upgrade circuit card for you (for a fee of course). As the designers and experienced builders of the Dyna-70 PCB/CCA, we have found it takes about 2.5 hours from start to finish to complete a Dyna-70 Circuit card assembly. Your time may vary, but it is more important to assemble correctly than to be concerned with how fast, or slow, you assemble the CCA.

1. Check that you have all the parts needed.

While we strive to package kits with all the proper values and number of components needed, we are human, and we do make mistakes. If your kit is missing a part, or the wrong quantity of parts, just contact us via email, phone call, etc. and we will ship the correct item(s) you need that are missing.

When your kit was ordered, we checked (and double checked) all items are correctly pulled and packaged, but some parts are ridiculously small, and one can drop them and not realize it.

2. Wipe circuit board with Isopropyl Alcohol before any soldering.

This is a preventative measure to ensure the PCB is clean and ready to accept solder. Likely we handled your PCB in pulling and packaging your kit; and you have also handled PCB when reviewing your kit parts content- so we have touched the PCB with our bare hands, leaving finger oils behind on the PCB. While the boards are usually washed and cleaned during final processing, this is a good step to take with any kit building electronic project with PCB's and components that will be "stuffed" into a PCB. NOTE: Please do not use solvents such as Methyl Ethyl Keytone (MEK), Acetone, or Lacquer Thinner in place of Isopropyl Alcohol, they will remove the printing on the PCB.

3. As a rule, anytime you are populating a PCB, it is best to install or "stuff" the smallest components first, working up to the largest parts being the last components installed.

Always start with the resistors, diodes (D1, 2 & 3), and small film capacitors first (C7 through C12), followed by the Inrush Current Limiter (or "ICL" or aka TH1 in the Parts List), then the tube sockets and finally the taller electrolytic capacitors.

Another tip is to use the supplied parts lists at the end of this document, as a "check list" of what to install, checking off the components as you stuff and solder each component. Be methodical in your approach, take your time, and take frequent breaks. This is a tedious process, yet a crucial step that takes time and focused attention. To aid in your

success, we have included both the Auto Bias and Manual Bias Parts List in this Addendum so you can use as a Check List.

One exception to this process will be in the installation of U1, the two LM-334's. We recommend that these two components be installed when you are conducting final wiring integration between the Dyna-70 CCA and the ST-70 chassis. U1's should be installed at same time you begin the wiring, but before you finalize the CCA installation and mount to the ST-70 chassis.

NOTE: The latest info on the -334's is addressed in Engineering Change Notice 002 (aka ECN#2). ECN 002 introduces a new part to the Dyna-70 design and eliminates problems with the earlier LM-334 thermal distortion issue addressed in ECN 001.

Also referenced in the Assembly Manuals is the 3-Watt Power resistor for setting the B+ voltage. This resistor gets quite warm; therefore, it is mounted off the PCB and elevated by about 1/8 to 3/16 of an inch, ref. Photo 2 below. We advise mounting this B+ resistor as one of the last components to install, since in its elevated position it is easy to bump and bend it out of alignment.

Another consideration is the value of the B+ resistor. We supply 3 resistors for the B+, depending on what the line voltage is to your home. We have found that using the 2200 ohm 3 Watt resistor is the preferred resistor to use here in the Dallas-Ft. Worth area and our local line voltages run around 122-124VAC. In the future we will drop the offering of the 3 resistors and just recommend use of the 2200 ohm 3W resistor.



Photo 2: The 3 Watt B+ Resistor is Mounted 1/8 - 3/16 of an inch above PCB (Brown-Orange resistor in photo center)

- 4. ALL electrolytic capacitor cans are oriented with the ground terminal to the back- or rear of the circuit card.**

This was done intentionally to help in the assembly process; ground is indicated by the White Stripe down the side of the cap can with a negative marking, Photo 3, next page.



Photo 3: All Electrolytic Cap Cans have the Ground terminal facing the rear of the Circuit Card Assembly

5. **Note orientation of the 6SN7 Sockets; none are installed in the same orientation- each has its own unique orientation, also indicated by the markings on PCB.**

The "notch" in the center hole of the socket corresponds to the notch represented and printed on the PCB; ref socket V4 (center socket) in [Photo 4](#) below.



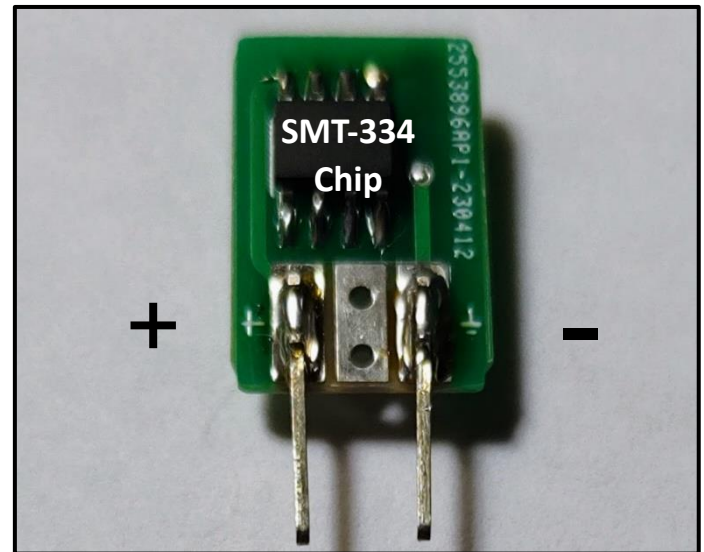
Photo 4: Socket Orientation for 6SN7's is indicated on the PCB

6. **Orientation and Installation of the new SMT-334 and optional re-location of R12, 1% precision 8 ohm resistor.**

NOTE: This is a simple but very easily confused process since you are working from the backside of the PCB and orientation is reversed. While the new SMT-334 is a thermally compensated part, we recommend for best sound performance and component service life, the SMT-334 should be mounted on the underside of the Dyna-70 CCA to shield it from tube heat. We also recommend that R12, the 8-ohm resistor that works in

conjunction with SMT-334, also is mounted on the underside of the Dyna-70 CCA to also shield it from heat. These two parts can be installed at the same time and the underside mounting of R12 is optional. If you are just upgrading the SMT-334, it is not necessary to relocate R12 to the underside. However, if you have a new build, mount R12 to the underside, it is not a critical part like the SMT-334 is. When installing we suggest you refer to the Engineering Change Notice 002, as well as these instructions so you are clear on the orientation. See following pics for each location. Always note the orientation of the pictures and where the tube sockets are!

As the photos depict, we transfer the polarity markings from the top side of the PCB to the bottom side to avoid mixing up polarities- DO THIS BEFORE you install any parts on the backside of the PCB. YOU WILL BE GLAD YOU DID!



NOTE: DO NOT let any component on the SMT-334 touch the electrical connections of R12 ! It is acceptable to bend the SMT-334 to create clearance so that the SMT PCB does not touch the Chassis.

AUTO BIAS PICK & PLACE CHECK LIST

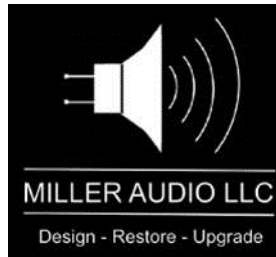
Dyna-70 Ultimate Upgrade Auto Bias Pick & Place List					
<u>Resistor</u>	<u>Value</u>	<u>Qty.</u>	<u>Type</u>	<u>Pick</u>	<u>Placed in PCB?</u>
R1	10K 1/2W	2	Metal Film		
R2	270K 1/2W	2	Metal Film		
R3	1K 1/2W	2	Metal Film		
R4	100R 1/2W	2	Metal Film		
R5	7.5K 1/2W	2	Metal Film		
R13,14	150K 1/2W	4	Metal Film		
R11	1M 1/2W	2	Metal Film		
R12	8R 1/2W	2	Metal Film		
R6,7	30K 2W	4	Metal Oxide		
R9,10	27K 2W	4	Metal Oxide		
R8	6.8K 1W	2	Carbon Film		
R15	270R 1W	1	Carbon Film		
RC1A&B thru RC4A&B	330K / 1W	8	Carbon Film		
R B+	2.2K, 3.3K, 4.3K / 3W	1 ea.	Metal Oxide		
RGS1 thru RGS4	1K 1W	4	Metal Oxide		
Bias Potentiometers	50K 1/2W	4	n/a		
<u>Capacitor</u>					
C1A&B	100uF 400V	2	Electrolytic		
C4A&B	100uF 400V	2	Electrolytic		
C13	100uF 400V	2	Electrolytic		
C2A,B	180uF 400V	2	Electrolytic		
C3A,B	220uF 400V	2	Electrolytic		
C5	1uF 630V	1	Film		
C6	100uF 350V	2	Electrolytic		
C7	220pF 400V	2	Film		
C8	0.1uF 400V	2	Polymer Film		
C9,10	0.22uF 400V	4	Polymer Film		
C11,12	100uF 160V	2	Electrolytic		
Filament Ground Caps	0.022uF	2	Polyester Film		
<u>Other</u>					
TH1	CL120	1	ICL		
U1	LM334	2	Transistor		
D1, 2 & 3	1N4004	3	Diode		
Octal Socket	8-Pin	3			
Dyna-70 PCB, AB Module	AB PCB		Main PCB		
Auto Bias Module	AB Module	1	Bias Module		
Dyna-70 AB, Asbly. Manual	Assembly Manual	1	Dyna-70, Auto Bias		
#4 Pan Head Mach.Screw		12			
#4 Aluminum Stand-off		8			
			*Audyn is std. equip. Coupling Cap		

MANUAL BIAS PICK & PLACE CHECK LIST

Dyna-70 Ultimate Upgrade Manual Bias Pick & Parts List					
<u>Resistor</u>	<u>Value</u>	<u>Qty.</u>	<u>Type</u>	<u>Pick</u>	<u>Placed in PCB?</u>
R1	10K 1/2W	2	Metal Film		
R2	270K 1/2W	2	Metal Film		
R3	1K 1/2W	2	Metal Film		
R4	100R 1/2W	2	Metal Film		
R5	7.5K 1/2W	2	Metal Film		
R13,14	150K 1/2W	4	Metal Film		
R11	1M 1/2W	2	Metal Film		
R12	8R 1/2W	2	Metal Film		
R6,7	30K 2W	4	Metal Oxide		
R9,10	27K 2W	4	Metal Oxide		
R8	6.8K 1W	2	Carbon Film		
R15	270R 1W	1	Carbon Film		
RC1A&B thru RC4A&B	330K / 1W	8	Carbon Film		
R B+	2.2K, 3.3K, 4.3K / 3W	1 ea.	Metal Oxide		
RGS1 thru RGS4	1K 1W	4	Metal Oxide		
Bias Potentiometers	50K 1/2W	4	n/a		
<u>Capacitor</u>					
C1A&B	100uF 400V	2	Electrolytic		
C4A&B	100uF 400V	2	Electrolytic		
C13	100uF 400V	2	Electrolytic		
C2A,B	180uF 400V	2	Electrolytic		
C3A,B	220uF 400V	2	Electrolytic		
C5	1uF 630V	1	Film		
C6	100uF 350V	2	Electrolytic		
C7	220pF 400V	2	Film		
C8	0.1uF 400V	2	Polymer Film		
C9,10	0.22uF 400V	4	Polymer Film		
C11,12	100uF 160V	2	Electrolytic		
Filament Ground Caps	0.022uF	2	Polyester Film		
<u>Other</u>					
TH1	CL120	1	ICL		
U1	LM334	2	Transistor		
D1, 2 & 3	1N4004	3	Diode		
Octal Socket	8-Pin	3			
Dyna-70 MB PCB	Manual Bias PCB		Main PCB		
Dyna-70, MB Asbly. Manual	Assembly Manual	1	Dyna-70, Man. Bias		
#4 Pan Head Mach.Screw		4			
#4 Aluminum Stand-off		4			
			*Audyn is std. equip. Coupling Cap		

Find an error, mistake or a difficult to follow or understand instruction in this document? Please let us know how to improve our information, instructions and documentation. You'll make the process better for yourself and all those that follow you with your comments, questions and corrections.

Thank You again for your business!



Miller Audio LLC reserves the right to make design changes, parts replacement, substitutions and specification revisions at any time without notice. If you have questions about these changes/updates, please contact us.

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