

# **Doubloon<sup>®</sup>**

## **Two Bus Power Supply**

**Augustica<sup>®</sup>**  
T e c h n o l o g i e s

[www.augustica.com](http://www.augustica.com)

# DANGER

**This power supply kit uses high-voltage and therefore may produce a lethal shock. Only persons who are competent at electronics assembly and understand the dangers of high voltages may attempt to assemble this kit! Safe assembly and operation of this kit is the users responsibility. The kit and this user manual are provided 'as is'. Augustica Technologies Inc does not accept responsibility for any damage, injury or death as a result of assembling this kit or using the information herein. The assembled kit must be properly enclosed to prevent contact with high voltages and kept out of reach of children. Keep this kit away from water and other damp environs. As with any self-assembled electronics project improper assembly could cause damage to the kit, overloading of a circuit or an electrical fire. If you don't feel comfortable in assembling the kit or using the power supply, please contact us to return it for a full refund.**

**Ideally, a variac should be used to slowly power up the kit, as it is better to have a misoriented electrolytic capacitor or a mislocated resistor blow at low voltages, rather than at high voltages. Once the power supply is powered up, be cautious at all times. In fact, even when the power supply is disconnected or shut down, assume that capacitors of the power supply will have their high voltage charges retained and, therefore, still will be able to provide a lethal shock.**

**Wear safety eye goggles, which is not as bizarre as it may sound - a bursting power supply capacitor may spray hot caustic chemicals in your face. Make a habit of using only one hand, with the other hand behind your back, while attaching probes or handling high voltage gear, as a current flow across your chest can result in death. In addition, wear rubber-soled shoes and work in dry environment. Remember, safety first, second, and last.**

**If you are not an experienced electrical practitioner, before attaching the transformer windings to the printed circuit board (PCB) of the power supply, have someone who is well experienced in electronics review your work. Again, if you don't feel comfortable in assembling the kit or using the power supply, please contact us to return it for a full refund.**

## **Doubloon**<sup>®</sup> Power Supply - Theory of Operation

The circuit of the power supply Doubloon<sup>®</sup> is shown in **Figure 1** (power supply's schematic also appears on the website [www.Augustica.com](http://www.Augustica.com)). The power supply uses two transformers (not shown on the schematic). The first transformer is employed to provide high B-plus voltage of 220 Volt AC and is connected to the terminal block K1. The second transformer is employed to provide low (filament) voltage of 8 Volt AC and is connected to the terminal block K3.

The high AC voltage produced by the first transformer is rectified by the rectifying bridge D1-D4 and then smoothed by capacitors C5, C6, C7, and C8. The capacitors connected in parallel with the diodes of the rectifying bridge D1-D4 suppress high-frequency noise generated by the diodes of the rectifying bridge. The high DC voltage then is applied to a MOSFET transistor that serves as a voltage regulator and AC filter. Resistors R1 and R2 are responsible for a 15 second delay during which the high B-plus DC voltage reaches its maximum level of about 320 Volt. This delay is significantly increases longevity of tube lifespan in the circuit to which the power supply Doubloon<sup>®</sup> delivers B plus voltage. Finally, additional smoothing of the high B-plus DC voltage is provided by capacitors C9 and C10. Red LED D7 serves not only as high B-plus DC voltage pilot light, but also, together with resistors R3 and R4, provides a minimum load and ensures that the high capacitance capacitors C5, C6, C7, C8, C9, and C10 are discharged once the power supply is switched off, even if no load is connected to the power supply.

The low AC voltage produced by the second (filament) transformer is rectified by the rectifying bridge D8–D11 and then smoothed by capacitors C15, C16, C17, and C18. The capacitors connected in parallel with the diodes of the rectifying bridge suppress high-frequency noise generated by the diodes of the rectifying bridge. High stability filament voltage of 6.3 Volt is produced in a simple manner using a low voltage drop regulator IC2 LD1084V. Green LED D14 serves not only as a pilot light, but also, together with resistor R7, provides a minimum load and ensures that the high capacitance capacitors C15, C16, C17, C18, C19 and C20 are discharged once the power supply is switched off, even if no load is connected to the power supply.

## **ASSEMBLY**

Cleanliness is essential. Before soldering, be sure to clean both sides the PCB with 70% to 90% isopropyl alcohol. Do not use dull looking solder. Solder should shine. If it does not shine, first clean away the outer oxidation with some steel wool or a copper-scouring pad. If the resistor leads look in the least gray, clean away the oxidation with either steel wool or a wire sniper's sharp edges. Admittedly, with new resistors and a fresh PCB, such metal dulling is rare, but if the parts have sat in your closet for a year or two, then expect a good amount of oxidation to have developed.

Be consistent in orienting the resistors, capacitors and diodes. Keep information nominal information on a resistor's, capacitor's, or diode's body flowing from the left side to the right side as you face the resistor, the capacitor, or the diode straight on. This will pay dividends later, if you need to locate and de-solder a resistor, a capacitor, or a diode placed in a wrong location. Because the board is double sided, with traces and pads on each side, it is easier to solder the resistors from their topside. As the PCB is overbuilt, it is difficult to remove an incorrectly placed part. Be sure to confirm all the electrolytic capacitor orientations, as a reversed polarized capacitor can easily vent (or even explode) when presented with high-voltage. Confirm twice, solder once.

Start with assembly of the high B-plus DC voltage bus of the power supply Doubloon<sup>®</sup> and first attach the MOSFET transistor IC1 to its heatsink. This transistor is extremely sensitive to electric static, therefore, you must use ESD safe soldering station and you also must wear an ESD bracelet. Once you attached the MOSFET transistor to its heatsink, you can insert heatsink leads and the MOSFET transistor leads into the PCB. Solder the leads of the MOSFET transistor to the PCB. At this point do not solder the heatsink's leads to the PCB - you will do it later.

Second, solder the rectifying bridge D1-D4 and capacitors C1, C2, C3, and C4. Connect a transformer or variac to the terminal block K1 and slowly bring voltage to 220 Volt AC. Measure the high B-plus DC voltage produced by the rectifying bridge D1-D4. If you applied 220 Volt AC to the rectifying bridge, after rectification you should obtain about 320 Volt DC without any load.

Third, solder diodes D5 and D6 and then solder resistors R1 and R2 followed by capacitors C5, C6, C7, C8, C9 and C10. Now solder red LED D7 and resistors R3 and R4. Connect a transformer or variac to the terminal block K1 again and slowly bring voltage to 220 Volt AC. Measure the high B-plus DC voltage produced by the high voltage bus of the power supply as a whole. If you applied 220 Volt AC to the terminal block K1, the power supply should deliver about 320 Volt DC measured at terminal block K2 without any load. Measure AC component that is present in the DC voltage after it is stabilized and filtered by the MOSFET transistor IC1. The AC component of the high B-plus DC voltage should fluctuate between 2 millivolts and 20 millivolts AC. If your measurements show substantially higher values of the AC component present in the high B-plus DC voltage, your MOSFET transistor is probably burned out and it has to be replaced. Otherwise, the MOSFET transistor is stabilizing and filtering the high B-plus DC voltage properly and now you can solder to the PCB the heatsink on which the MOSFET transistor is situated.

Fourth, assemble the low DC voltage (filament) bus of the power supply Doubloon<sup>®</sup> and start with attaching IC2 LD1084V low drop voltage regulator to its heatsink. Once you attached the IC2 LD1084V to its heatsink, you can insert heatsink leads and LD1084V leads into the PCB. Solder the regulator's leads to the PCB. At this point do not solder the heatsink's leads to the PCB - you will do it later.

Fifth, solder the rectifying bridge D8-D11 and capacitors C11, C12, C13, and C14. Connect a transformer or variac to the terminal block K3 and slowly bring AC voltage to 8 Volt AC. Measure the DC voltage produced by the rectifying bridge D8-D11. If you applied 8 Volt AC to the rectifying bridge, you should obtain about 11 Volt DC after rectification.

Sixth, solder diodes D12 and D13 and then solder resistors R5 and R6 followed by capacitors C15, C16, C17, C18, C19 and C20. Now solder green LED D14 and resistor R7. Connect a transformer or variac to the terminal block K3 again and measure the voltage produced by the low (filament) voltage bus of the power supply as a whole. If you applied 8 Volt AC to the terminal block K3, the power supply should deliver about 11 Volt DC measured at the terminal block K4 without any load. Measure AC component that is present in the filament DC voltage after it is stabilized and filtered by the IC2 LD1084V. The AC component of the filament DC voltage should be about 0.6 millivolts AC. If your measurements show substantially higher value of the AC component present in the DC voltage, your LD1084 is probably burned out and it has to be replaced. Otherwise, the LD1084V is stabilizing and filtering the filament DC voltage properly and now you can solder to the PCB heatsink on which the LD1084V is situated.

## TESTING

First, attach only the low voltage filament power supply's transformer windings to the terminal block K3, leaving the high voltage transformer leads unattached and electrical tape shrouded.

Second, if you are using a variac, slowly bring up the low AC voltage to 8 Volt AC, while looking for smoke or part discoloration or bulging.

Third, measure the filament voltage regulator IC2 LM1084V output voltage without and with a load. If the filament voltage regulator IC2 LD1084V fails to regulate, try either lowering the filament voltage a tad, or increasing it a tad, for example try 10 Volt instead of 11Volt, as the 1 Volt difference might be enough to bring the regulator back into regulation. Power down the filament bus of the power supply by disconnecting low voltage filament transformer or variac.

Fourth, attach the high B-plus voltage transformer or variac windings to the terminal block K1 and slowly bring up the high AC voltage, while looking for smoke or part discoloration or bulging.

Fifth, measure the B-plus voltage across the terminal block K2. If you applied 220 Volt AC to the terminal block K1, the power supply should deliver about 320 Volt DC without any load measured at the terminal block K2. If a load is attached to the terminal block K2, the power supply should deliver 270 - 280 Volt DC depending on resistance of the load.

Only after you are sure that both filament and B-plus power buses are working well should you attach the power supply to a headphone.

## **LET US KNOW WHAT YOU THINK**

If you would like to see some new audio PCB or kit or recommend a change to an existing product, drop us a line by e-mail on the website [www.Augustica.com](http://www.Augustica.com) (begin the subject line with either “Doubloon” or the spam filters are sure to eat your message).