# VoltageCtrl

| COLLABORATORS | | | |
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| WRITTEN BY | | August 24, 2024 | |

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# Contents

# Chapter 1

# VoltageCtrl

## 1.1 Voltage Controller

Voltage Controller

Typed and Edited By Craig
Diagrams From Coverdisk.

Purpose:
This circuit allows you to control hardware devices such as solenoids, lights and many other output devices. Diagram 1 supplied on this disk roughly describes how the circuit works, while Diagram 2 shows you how to go about building it. The Amos source code I‘ve also included for controlling the circuit which can be found in the Source_Code directory, titled ’Controller.Amos’. You’ll need to load the source code into Amos and compile it yourself.

What you will need:

| Description | Type | Quantity | Cost |
|---|---|---|---|
| | | 1 | £5.75 |
| 8 Bit Latching DAC | ZN428E | 1 | £0.28 |
| Dual Op-Amp | LM358 | 1 | £0.10 |
| IC Socket | 16 Pin | 1 | £0.48 |
| Power Transistor | TIP31C | 1 | £0.80 |
| Variable Resistor | 100K MultiTurn | | |
| NOTE1 | | 1 | £0.68 |
| Parallel Port Plug | 25 Way D-type | 1 Metre | £0.72 |
| Connecting Cable | 20 Way Ribbon Cable | | |
| NOTE2 | | | |
| Veroboard OR Circuit Board | Varies | | |
| NOTE3 | | | |
| Output Connector | Various | 1 OR More | |
| NOTE4 | | | |
| Total Cost | | | £8.86 |

Instructions:
Building the circuit should present very few problems to a hobbyist, and

indeed it's a good first project for those who know the theory, but have never actually built the circuit. You can either design a printed circuit board, or mount all the components on veroboard/stripboard and connect the pins as described.

This is something I'll leave up to you - if you're a pupil at school, I'd recommend asking a Physics or Info Tech teacher for some advice on how to fit all the components together. If you're an adult and don't have a clue how to build it, try asking your local TV repairmen (or poor electronic students) if they could build it for you.

How It Works:
This whole project is designed to plug into your Amiga's parallel port (always connect things with the computer turned off). Different values, between 0 and 255, are pumped straight into the DAC (Digital to Analogue Convertor) chip. The DAC chip translates this into a voltage, between 0 and 2.5 volts.

This value is read by the amplifier chip in two stages - the first just gives out what it takes in, the second gives a value between 0 and 30V. This voltage is used to switch the power transistor to a given voltage.

It may seem unnecessary to have the first amplifier stage and the power transistor in there. The reason for the op-amp (optically isolated amplifier) is to make sure that no nasty voltages get passed back to the Amiga - it's there to isolate things. For good measure, the DAC also contains an isolator circuit (IC) - but it's wise to build a certain redundancy level into any circuit.

The power transistor is there to switch an outside power source (you have to supply this) between 0 and 30 Volts. The amplifier cannot give a high current output - there's only so much power available to the parallel port of an Amiga, and overloading it will knacker your computer. So stick to the circuit given and don't try to cut corners!

Technical Notes:
The DAC connects straight through to the Amiga's parallel port because it is micro-computer compatible and operates at the same voltage levels. The IC is not static sensitive so no special handling precautions are needed, although you shouldn't head up the device you're soldering it straight on to the board. It's a much better idea to solder a chip socket on to the board, and plug the DAC chip into that.

Either of the I/O lines 10,11,12 can be used to select the chip, but the program must be altered for each line, because they are at different addresses in the Amiga's memory map. Checkout the Voltage controller program written in AMOS on this disk to control the circuit. Pins 6 and 7 are voltage references for the DAC. I have told it to use it's own reference level of 2.5 volts, so the maximum the DAC can output will be 2.5 volts. It can't output high current levels so a buffer stage is needed to stop the amplifying op-amp draining current from the DAC.

The first op-amp is just a voltage follower or buffer. It follows the input voltage, draining nearly no current because it has a high impendance. It can output the voltage totally separate of the input voltage and current, and so isolates the computer. Miss it out at your peril! The second op-amp amplifies the 0-2.5v from the DAC (via the buffer) and is amplified by the amount set by the preset (the 100k Potentiometer). It is much easier to vary the gain if a multi-turn potentiometer is used.

This output voltage can be between 0 to 30 volts DC. 30 volts is the maximum because it is the op-amp's maximum working voltage. Check the power transistor used can handle up this voltage. The last component is the power transistor. It supplies the same voltage as dictated by your AMOS program, but can supply more current when necessary. The TIP31C can supply up to 2 Amps. More capable transistors can be used but I find this to be ample.

The transistor can be directly soldered in if done quickly, but it can be mounted in some type of socket/holder. The output is then taken between the Emitter and ground, and can be used to power different applications including motors, solenoids, buzzers, lights and many more output type devices. I hope this covers most of the workings of the circuit.

End.

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