

CANADUINO Arduino PLC-100 V2 (DIY Kit)



This Kit offers a very affordable opportunity to add a programmable logic controller to many kinds of projects and machines like lighting, HVAC, greenhouses, water treatment, or even your pallet smoker. It will control your Halloween decoration or your manufacturing equipment. The integrated and battery backed RTC allows for easy timer-controlled operation.

CANADUINO PLC-100 V2 comes as DIY soldering kit and requires an Arduino NANO Atmega328 development module for operation (not included). It can be programmed using many different tools - from Arduino IDE to Mitov's visual programming tool "Visuino".

CANADUINO PLC-100 V2 fits a small budget but delivers power and versatility equal to 20x more expensive professional control devices.

CANADUINO PLC-100 V2 basic features:

- ✓ 4 analog 0-10V DC inputs (10-bit res.)
- ✓ 4 digital inputs (3.3-24V DC)
- ✓ 4 analog 0-10V DC outputs (8-bit res.)
- ✓ 6 digital 250V/5A relay outputs
- ✓ 1 x I2C with STEMMA connector
- ✓ Real-Time-Clock with battery backup
- ✓ SMD-assembled DC-DC power module

INTRODUCTION

CANADUINO PLC-100 V2 is a Do-It-Yourself kit that requires only basic soldering and troubleshooting skills. The included, already assembled DC-DC converter module guarantees the correct operating voltage for every part of the device.

The device offers 4 opto-insulated, digital inputs, operating safely on any input voltage between 3.3V and 24V for HIGH level. The six digital outputs are fast acting relays OMRON G5NB-1A-E with about 10ms operate and release time, and high-capacity 5A contacts.

The 0-10V analog inputs and outputs are compatible with many common applications like motor speed controllers, light dimmers, and dimmable LED ballasts. The module even provides a stabilized 10V DC supply voltage for those devices. The 0-10V analog inputs are protected against voltages of up to 30V DC.

We integrated a real-time-clock with battery backup for timer-controlled applications like, for example, a garden watering system. The RTC is connected to the I2C bus (address 0x68) which can also be accessed on the STEMMA compatible connector to connect external devices like sensors, displays, or any other devices and modules from Adafruit, Seeed Studio, Sparkfun, and other vendors.

The required operation voltage for the PLC is 12-24V DC with a minimum current capability of 500mA.

Screw terminals for wire gauge 22-14 AWG (1.5mm max.) guarantee reliable connections as required in professional and semi-professional equipment. The four mounting holes with 3.2mm diameter will take M3 bolts or standoffs for easy mounting to a base plate or inside of a control cabinet.

ASSEMBLING

Assembling is really easy. Of course, you must possess soldering and troubleshooting experience, but you are not required to have an engineering degree to get this module set up and running. The provided images (see website), schematic and BOM explain exactly how it's done. But for newbies, we have some recommendations to get started and avoid frustration:

Important notes:

- ⇒ Pin 1 of the ICs is always marked with a dot or notch and is the bottom-left pin when you can read the imprint on the package.
- ⇒ Pin 1 (or common) on resistor networks is always marked with a dot and/or is the most left pin when you can read the print on the package. This pin needs to line up with the marking (filled square) on the PCB.
- ⇒ LEDs always have a long (A) and a short (K) lead. We printed the polarity on the PCB.
- ⇒ Electrolytic capacitors have [-] printed on them, and [+] is the longer lead.

If you assemble parts with many pins, like ICs or resistor networks, it is always recommended to only solder 1 or 2 pins of each component, then flip the board over, and make sure the parts are nicely lined up before soldering all remaining pins.

1. Start with the lowest profile parts like the I2C pull-up resistors.
2. Proceed with the next taller parts, like MLCCs and LEDs. If you want, assemble the IC sockets. But for long-term reliability in a stressing environment, like high temperature differences or high humidity level, IC sockets are not recommended. Finish with the tallest parts (relays and battery holder).
3. Before you solder the DC-DC power supply module to the board, remove the unnecessary pin from the 6-pin female header by just pulling it out. Please leave about 2mm distance between the tallest parts on the DC-DC module (inductors) and the main PCB.
4. When everything is assembled, proceed with commissioning.

COMMISSIONING

Check the board with a magnifier glass and good lighting for shorts, bad solder joints or switched components. If everything looks good, provide power to the board (12-24V DC) and measure the 5V and 10V output voltages on the screw terminals. If the 10V is available, then the 11V must be available as well.

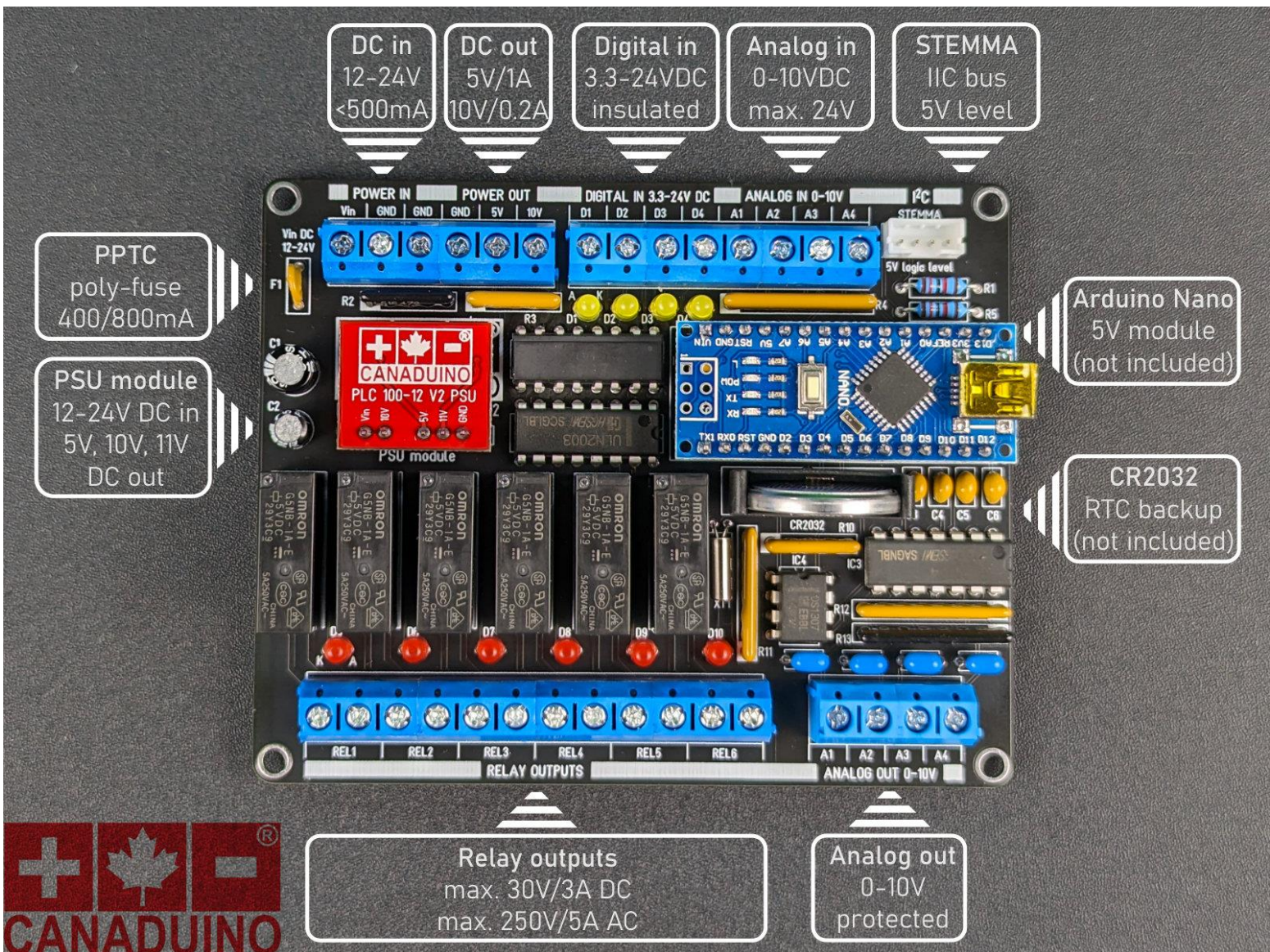
No smoke? Then insert your Arduino Nano module, the RTC backup battery, and load our demo sketch to test inputs, outputs, and the real-time-clock, before you start creating your sketch.

The port mapping is on the schematic. It might seem confusing, but it takes care of the chip's limitations: Not all ports can be used as digital outputs, and not all digital outputs are PWM-capable which is required for analog outputs. Just map the port numbers to "const" variables in your code:



```
// Define port mappings to Arduino pins
const int X4 = 13; // Digital Input 4 mapped to pin D13
const int YA2 = 9; // Analog Output (PWM) 2 mapped to pin D9
const int Y1 = A3; // Digital Output 1 mapped to pin A3
```

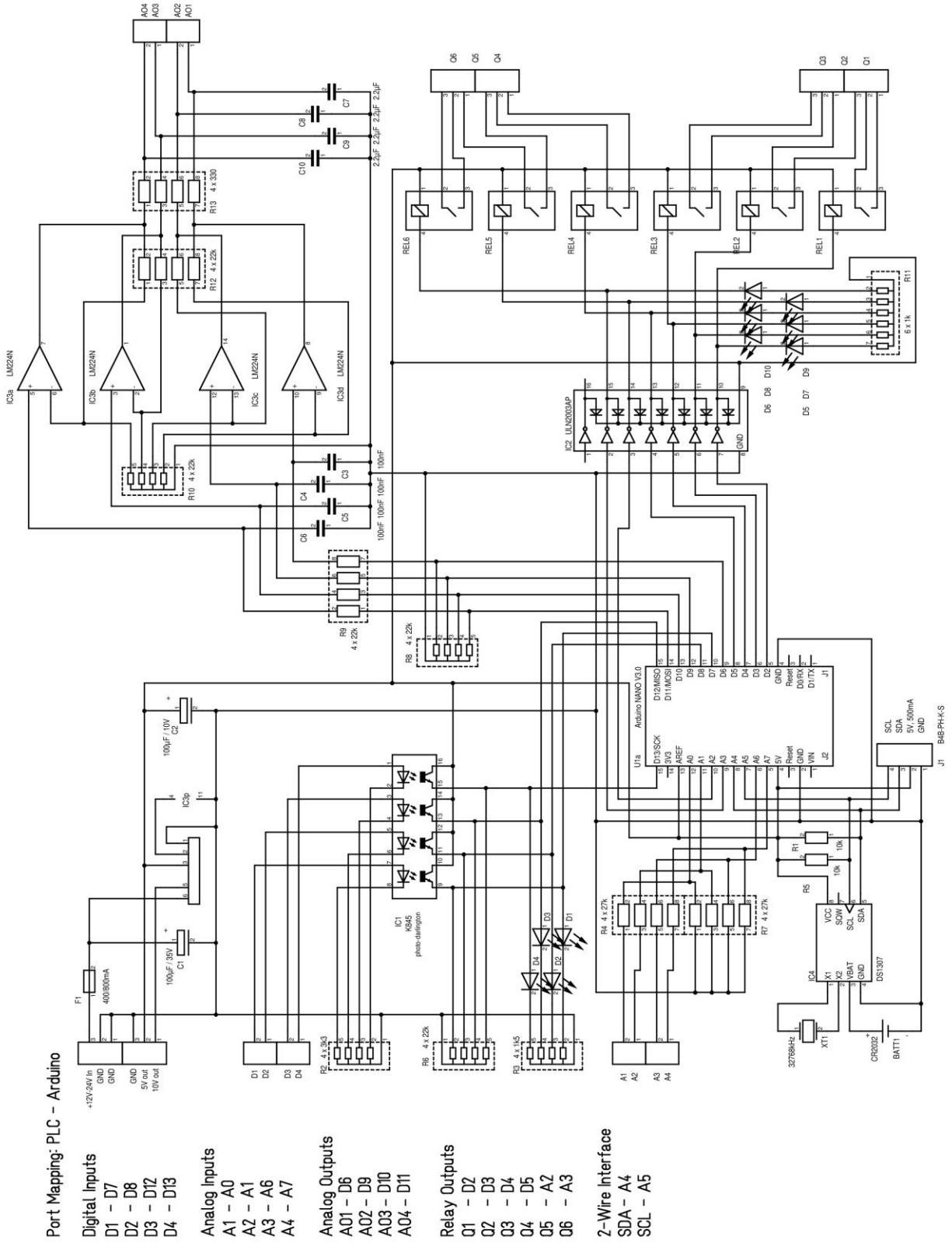
```
void setup() {
  // Initialize the pins
  pinMode(X4, INPUT); // Set X4 as input
  pinMode(YA2, OUTPUT); // Set YA2 as output
  pinMode(Y1, OUTPUT); // Set Y1 as output
}
```



Picture shows prototype: series product design might differ slightly.

PARTS LIST

Quantity	Name	Value
1	C1	100µF 35V
1	C2	100µF 10V
4	C3, C4, C5, C6	100nF 50V (2.54mm)
4	C7, C8, C9, C10	2.2µF 16V (5.08mm)
4	D1, D2, D3, D4	LED yellow 3mm
6	D5, D6, D7, D8, D9, D10	LED red 3mm
1	BATT	CR2032 holder
1	F1	400mA PPTC
1	IC1	K845 / LTV-845
1	IC2	ULN2003
1	IC3	LM224N
1	IC4	DS1307
2	Nano V3	female header 1x15
6	REL1 - REL6	Omron G5NB 5V
8	Screw Terminal 3.5mm	3-pole
3	Screw Terminal 3.5mm	2-pole
1	STEMMA	B4B-PH-K-S
1	1 x 6	Female socket
1	PSU Module	For PLC-100 V2
1	R2	4 x 3k3 SIP5 (332)
1	R3	4 x 1.5k SIP5 (273)
3	R6, R8, R10	4 x 22k SIP5 (223)
2	R1, R5	10k
1	R11	6 x 1k SIP7 (102)
2	R4, R7	4 x 27k SIP8 (273)
1	R9, R12	4 x 22k SIP8 (223)
1	R13	4 x 330 SIP8 (331)
1	XT1	32768kHz crystal
1	PCB	circuit board



Port Mapping: PLC - Arduino

Digital Inputs

- D1 - D7
- D2 - D8
- D3 - D12
- D4 - D13

Analog Inputs

- A1 - A0
- A2 - A1
- A3 - A6
- A4 - A7

Analog Outputs

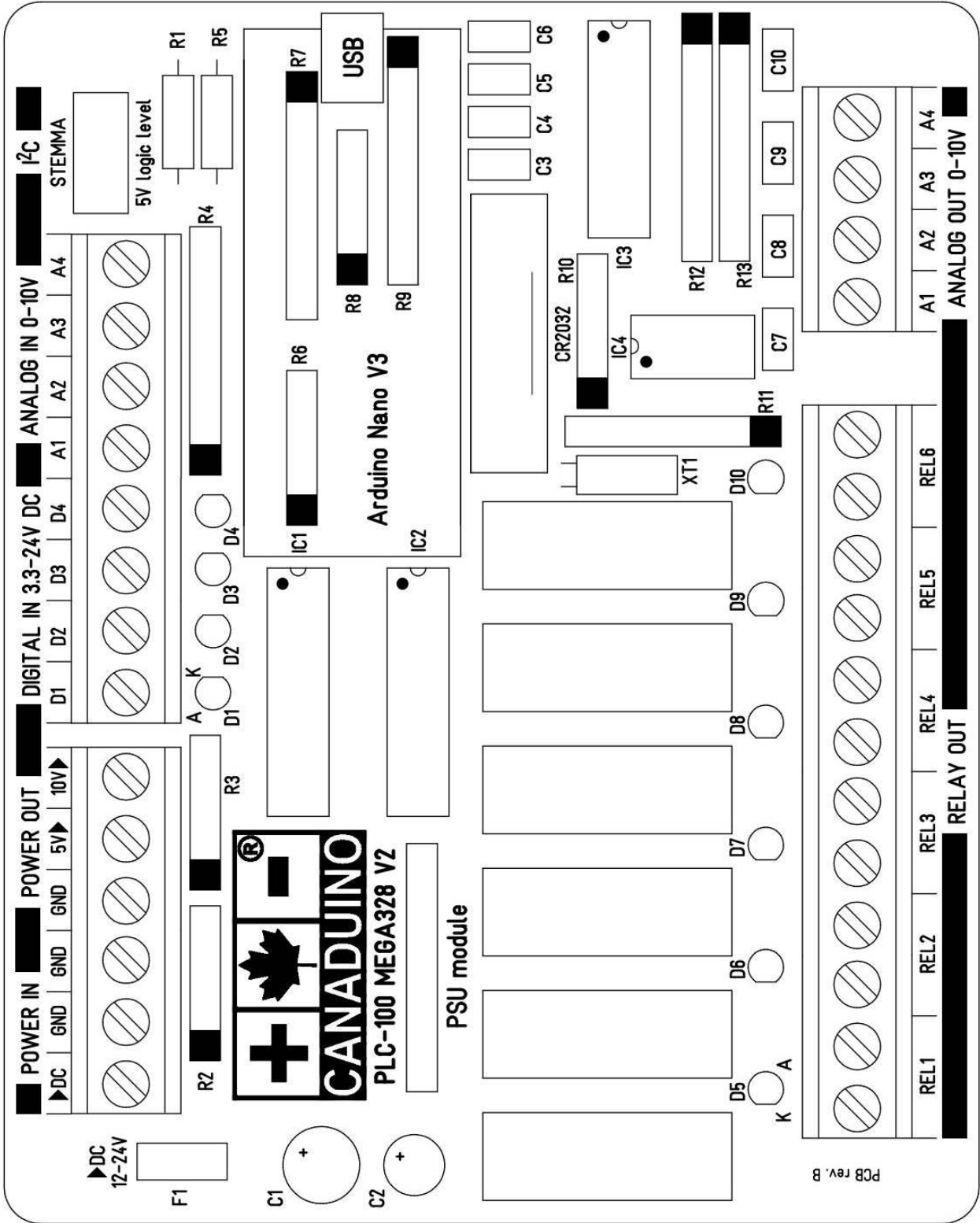
- A01 - D6
- A02 - D9
- A03 - D10
- A04 - D11

Relay Outputs

- O1 - D2
- O2 - D3
- O3 - D4
- O4 - D5
- O5 - A2
- O6 - A3

2-Wire Interface

- SDA - A4
- SCL - A5



PCB rev. B