

# INTEL-IRRIS

Intelligent Irrigation System for Low-cost Autonomous Water Control  
in Small-scale Agriculture



Intel-Irris



# Intelligent Irrigation System for Low-cost Autonomous Water Control in Small-scale Agriculture



## Training & capacity building with INTEL-IRRIS starter-kit

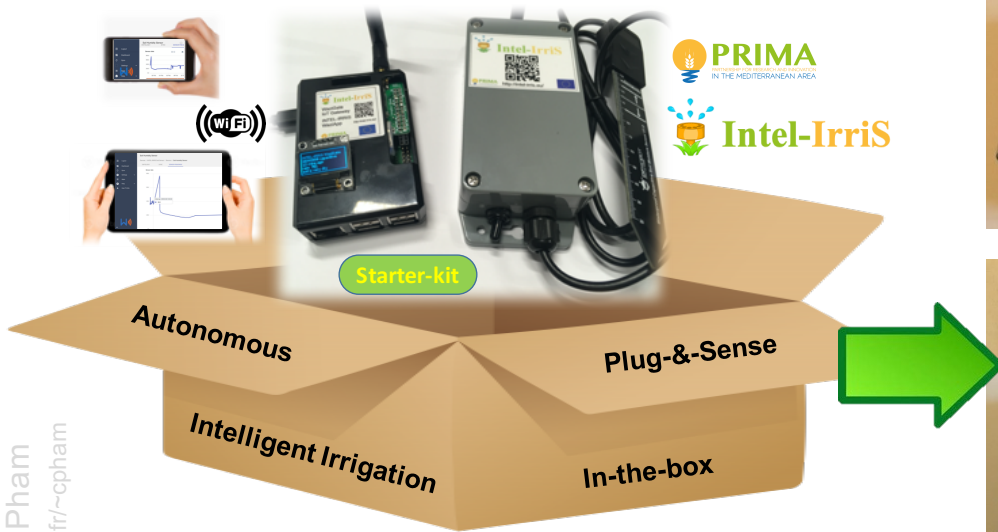


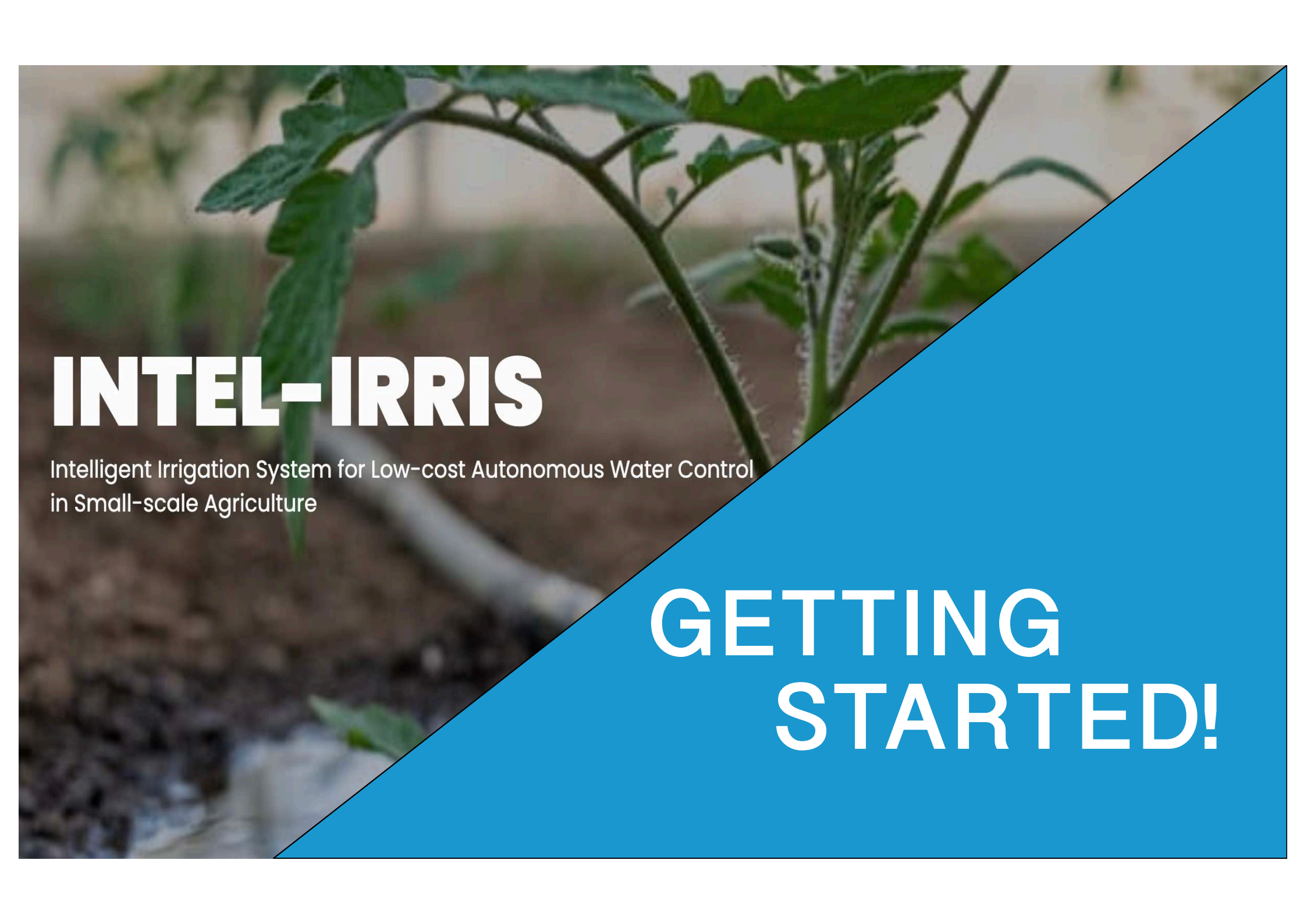
Prof. Congduc Pham  
<http://www.univ-pau.fr/~cpham>  
Université de Pau, France



# INTEL-IRRIS's starter-kit

🕒 **From idea to reality!**



A photograph of a young tomato plant in a garden bed. The plant has green leaves and a small, developing fruit. The background is slightly blurred, showing other plants and a fence. A large blue diagonal shape covers the bottom right portion of the image, containing white text.

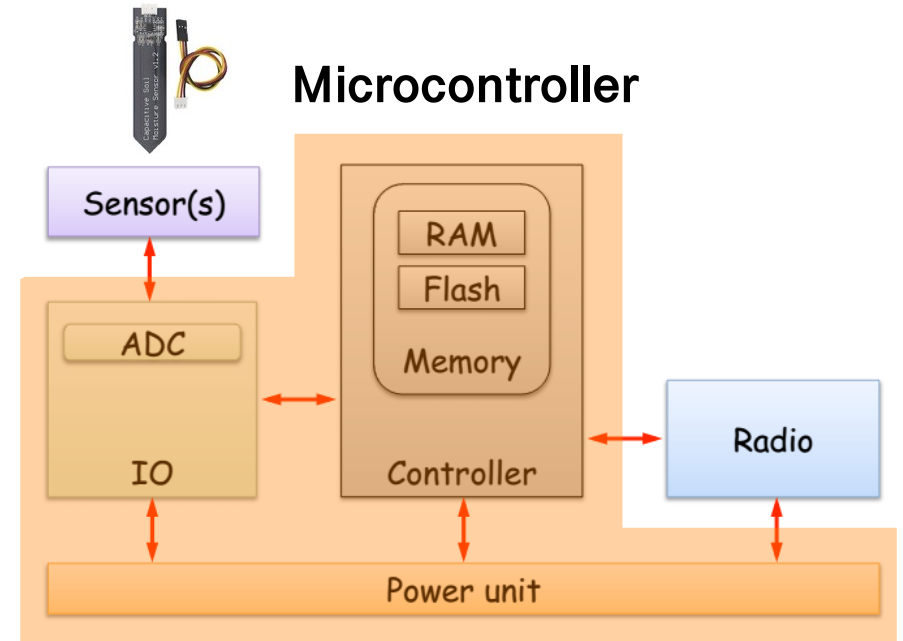
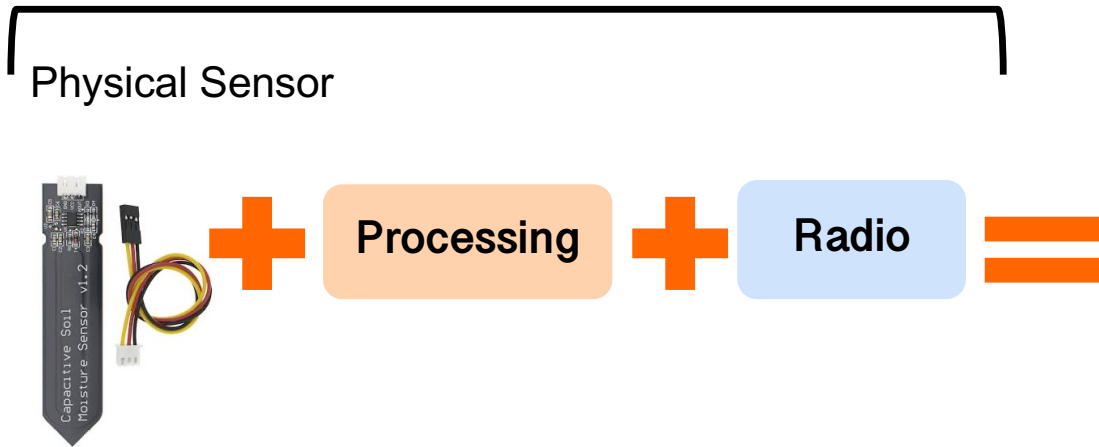
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GETTING  
STARTED!

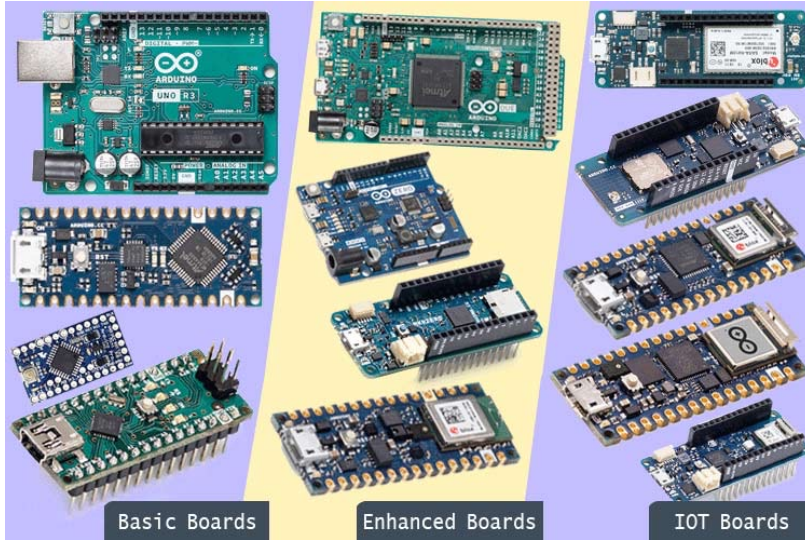
# Typical IoT device

- IoT device can be viewed as a simple Embedded System



**Q: uprocessor vs ucontroller?**

# the incredibly large microcontroller board ecosystem!



Basic Boards

Enhanced Boards

IOT Boards



LoPy

STM32 Nucleo-32



Teensy 3.2



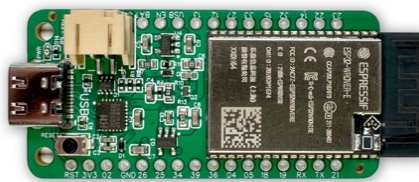
LinkIt Smart7688 duo



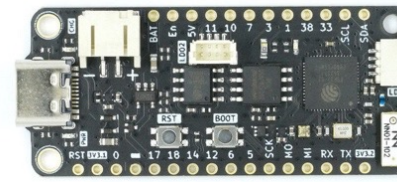
Adafruit Feather



uPesy ESP32



ePulse Feather Low Power ESP32



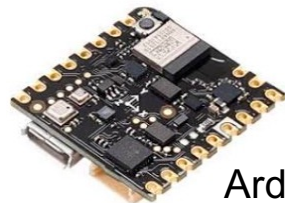
FeatherS3 – ESP32-S3



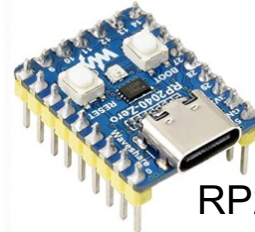
Heltec ESP32



XIAO SAMD21



Arduino Nicla Sense ME



RP2040 zero

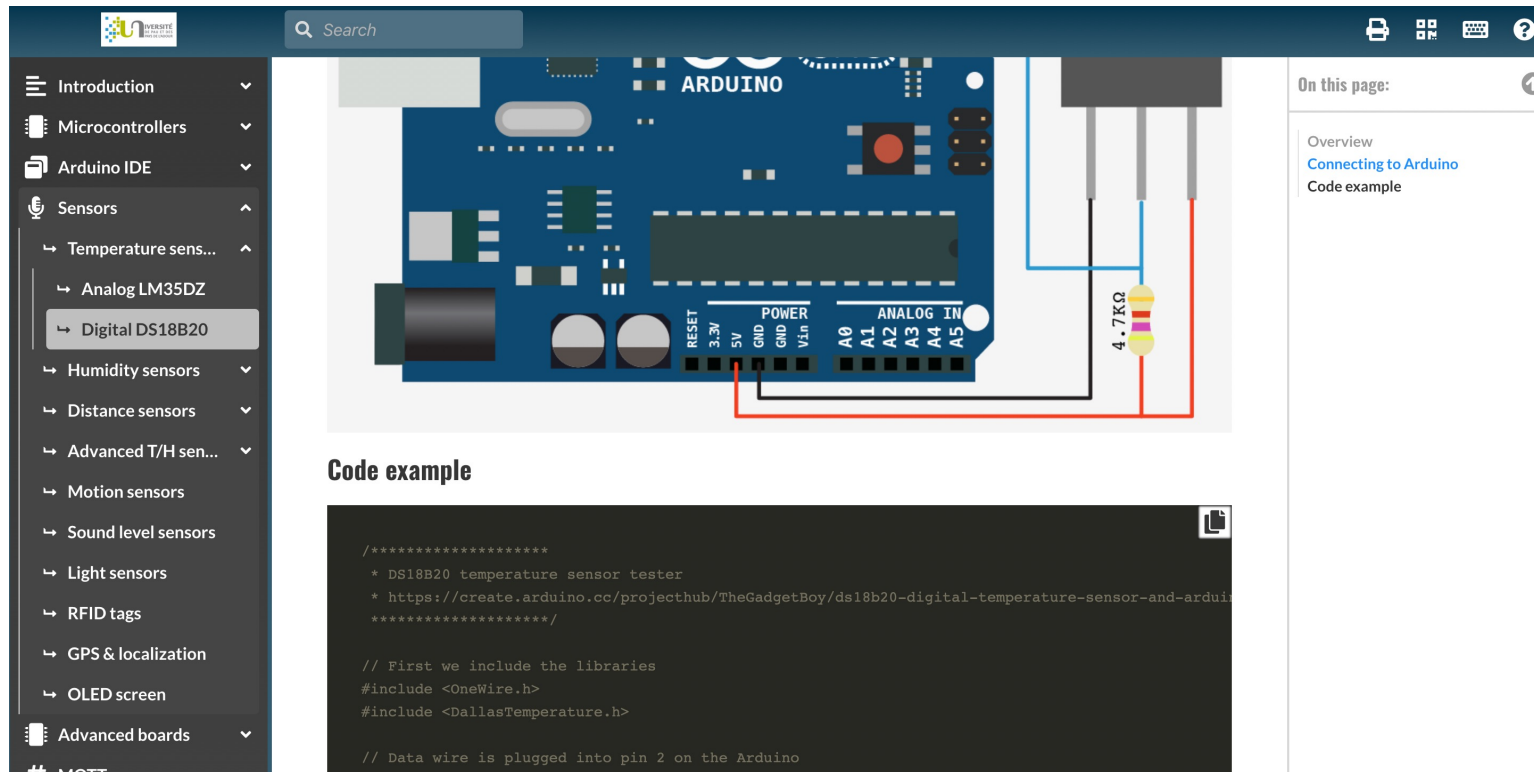


DFRobot Beetle



QT Py ESP32-C3

- ◉ <https://cpham.perso.univ-pau.fr/LORA/HUBIQUITOUS/solution-lab/arduino-lora-tutorial>



**Code example**

```
/*  
 * DS18B20 temperature sensor tester  
 * https://create.arduino.cc/projecthub/TheGadgetBoy/ds18b20-digital-temperature-sensor-and-arduino  
 */  
*****  
  
// First we include the libraries  
#include <OneWire.h>  
#include <DallasTemperature.h>  
  
// Data wire is plugged into pin 2 on the Arduino
```

# Discover the Arduino ecosystem

- ⦿ Understand microcontrollers & their architecture
- ⦿ Discover the most advanced boards with WiFi capabilities
- ⦿ Get to know how to program microcontrollers with Arduino IDE
- ⦿ Then step-by-step tutorial on connecting various sensors

**INTRODUCTION TO ARDUINO IDE**

The Arduino IDE (Integrated Development Environment) is used to write the computer code and upload this code to the physical board. The Arduino IDE is very simple and this simplicity is probably one of the main reason Arduino became so popular. We can certainly state that being compatible with the Arduino IDE is now one of the main requirements for a new microcontroller board. Over the years, many useful features have been added to the Arduino IDE and you can now managed third-party libraries and boards from the IDE, and still keep the simplicity of programming the board. The main window of the Arduino IDE is shown below, with the simple simple Blink example.

```

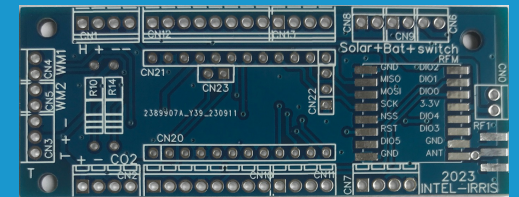
1 // sketch nov10a 5
2 // *****
3 * Turns on LED on for one second, then off for one second, repeatedly.
4 * Most Arduinos have an on-board LED you can control. On the Uno, it is attached to
5 * digital pin 13.
6 *****
7
8 // the setup function runs once when you press reset or power the board
9 void setup()
10 {
11   pinMode(LED_BUILTIN, HIGH); // initialize digital pin LED_BUILTIN as an output.
12 }
13
14 // the loop function runs over and over again forever
15 void loop()
16 {
17   digitalWrite(LED_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)
18   delay(1000); // wait for a second
19   digitalWrite(LED_BUILTIN, LOW); // turn the LED off by making the voltage LOW
20   delay(1000); // wait for a second
21 }
  
```

## Navigate and read:



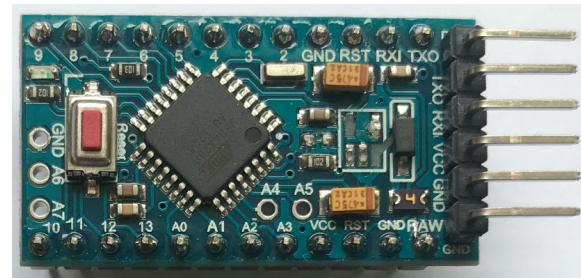
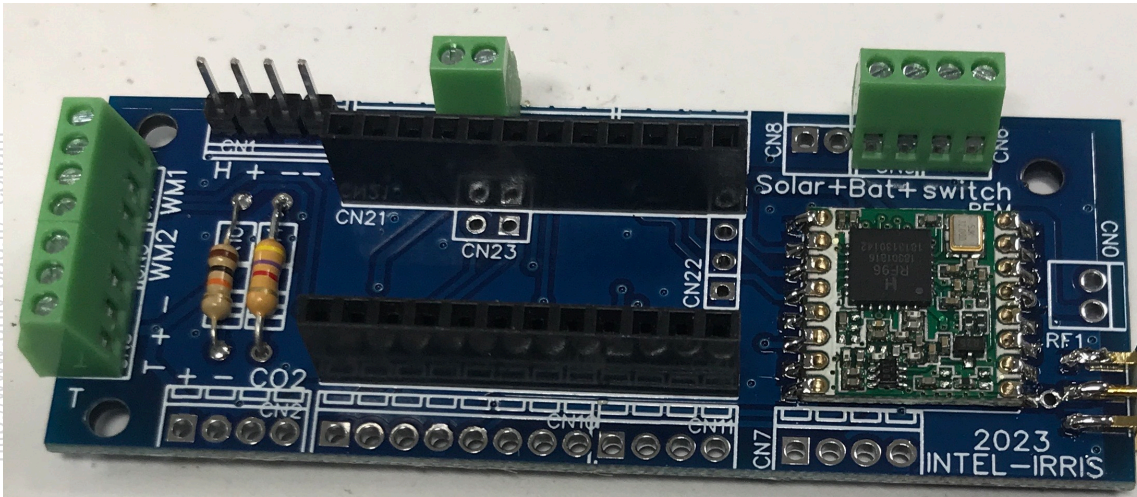
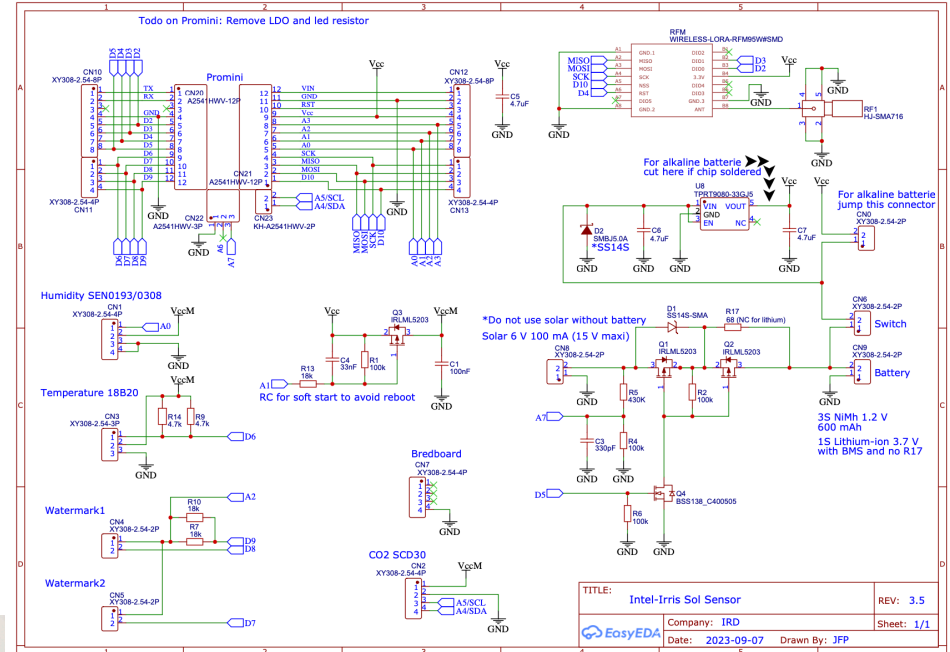
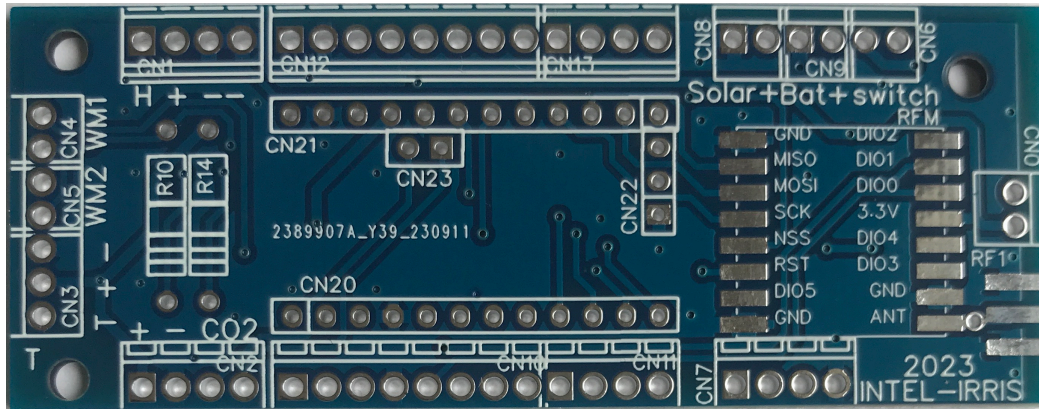
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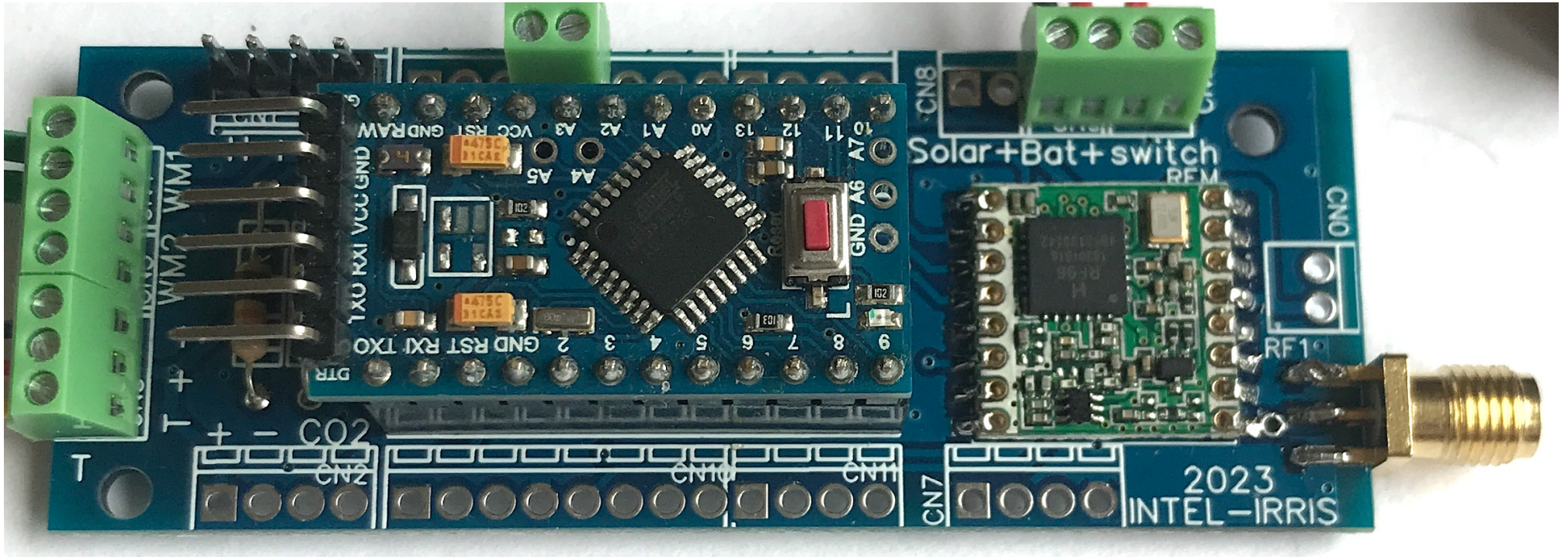
# HANDS-ON

# The new IRD PCB (raw version)

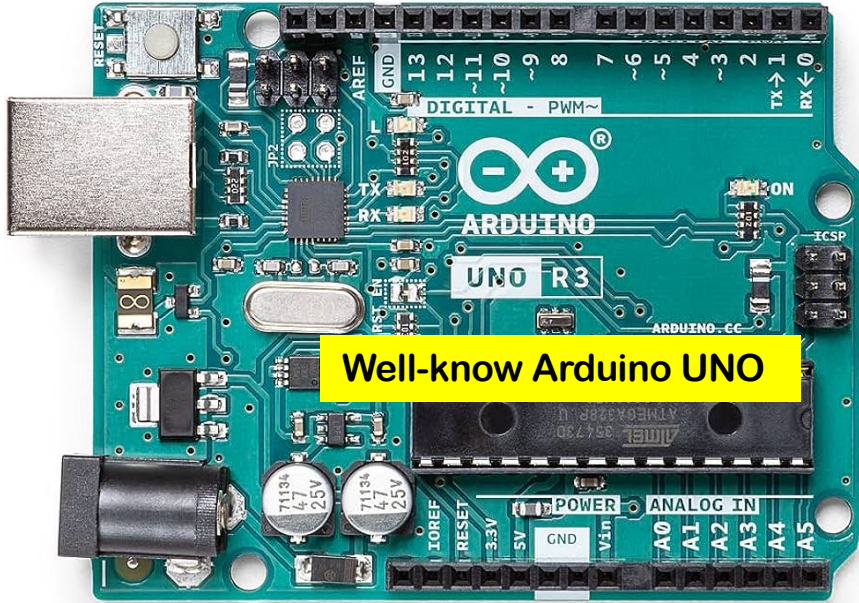


**Arduino Pro Mini**

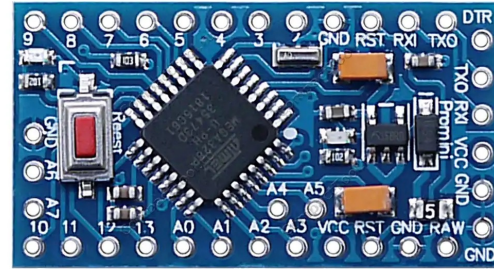
# The new IRD PCB: close-up view



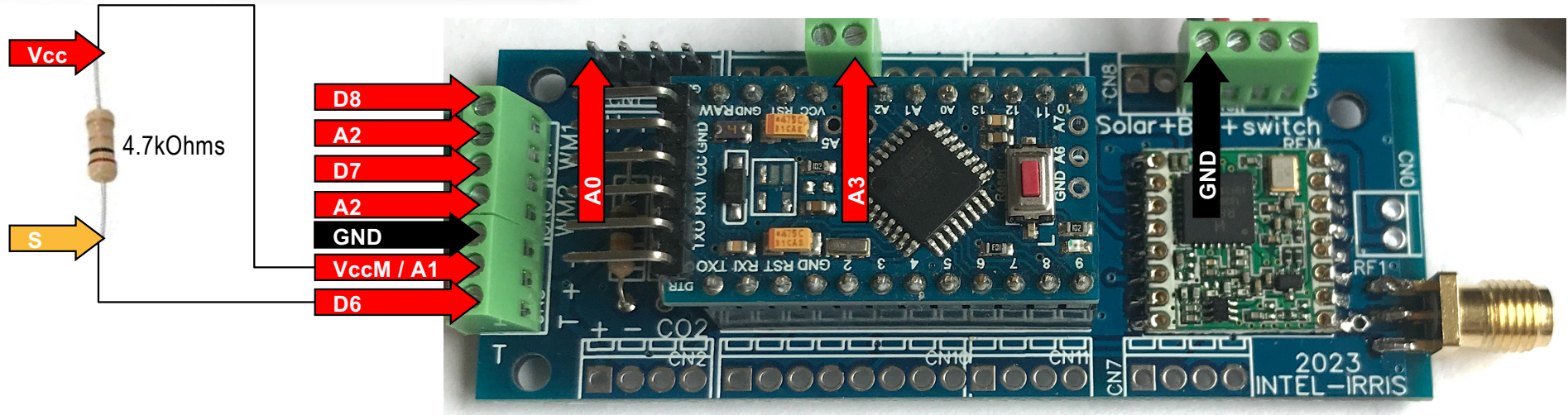
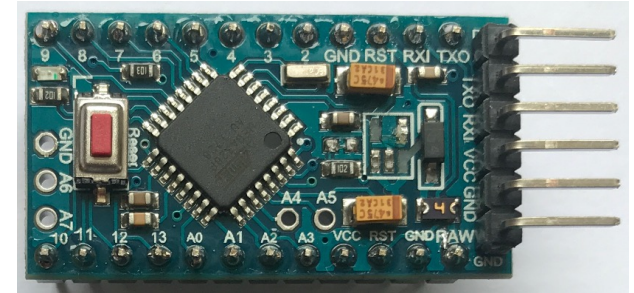
# Arduino pins exposed on the PCB



Well-know Arduino UNO

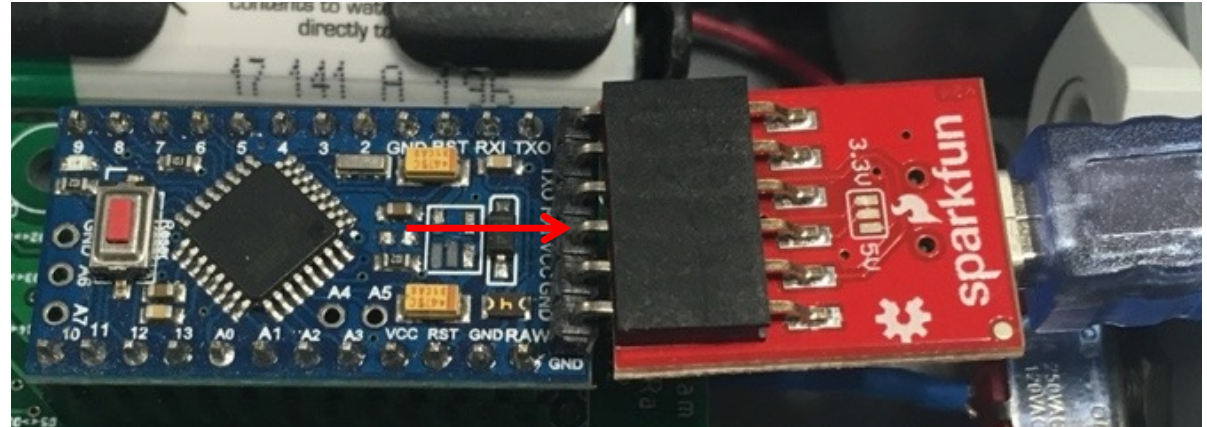
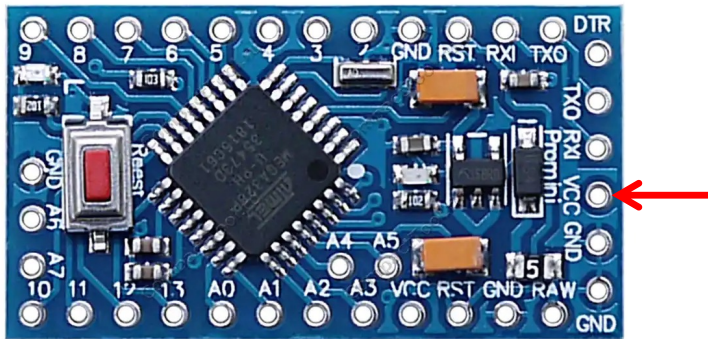


The compact Arduino Pro Mini



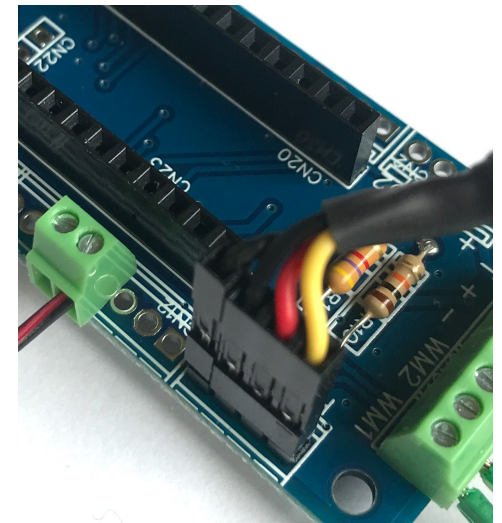
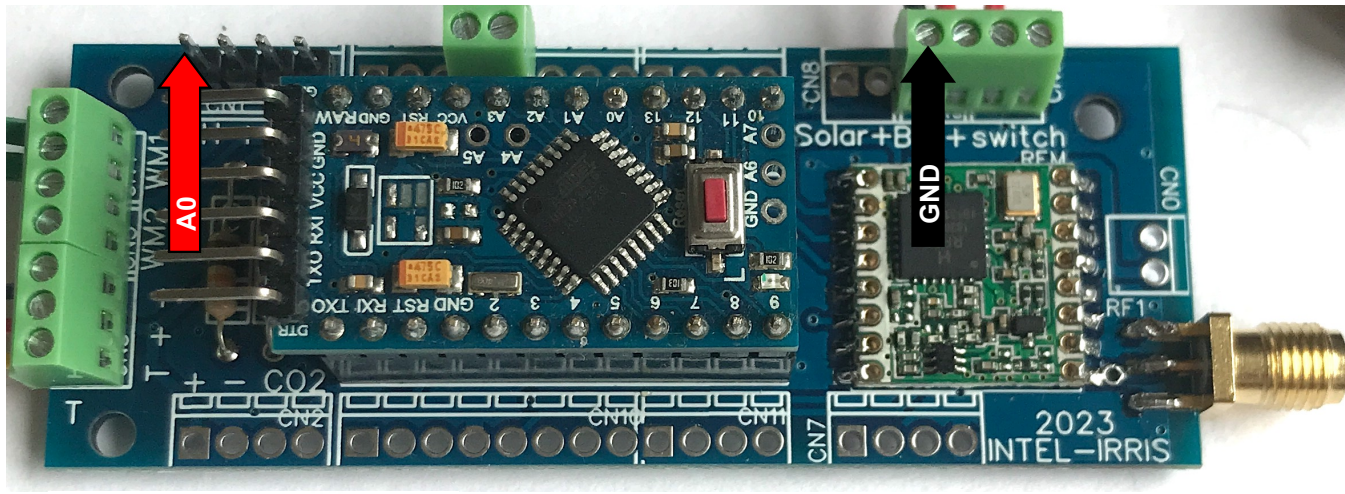
# Programming the microcontroller

Most Chinese clone version,  
check the VCC pin

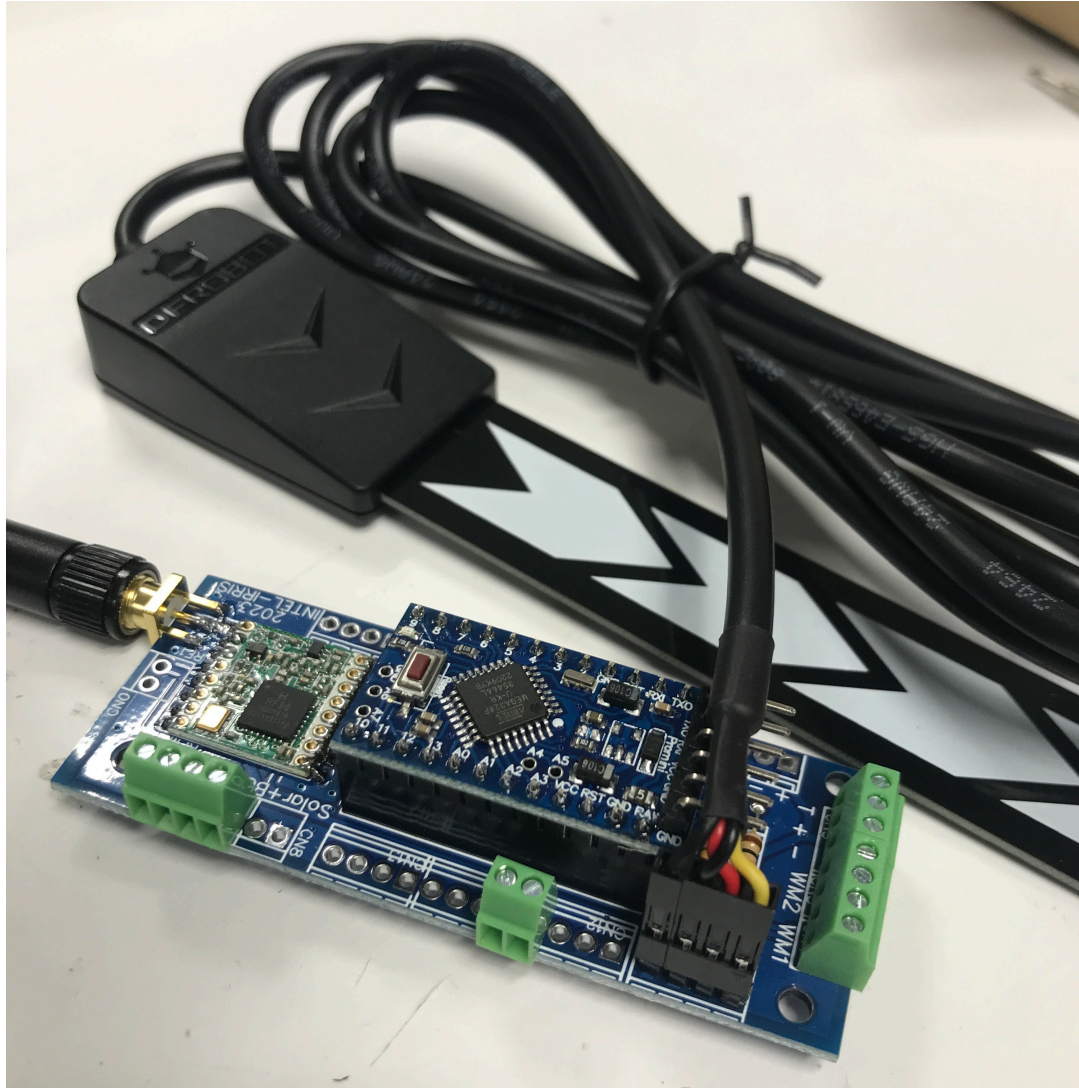


# 1<sup>st</sup> example: read from analog

- ◉ <https://cpham.perso.univ-pau.fr/LORA/HUBIQUITOUS/solution-lab/arduino-lora-tutorial/sensors/humidity/soil-humidity/>

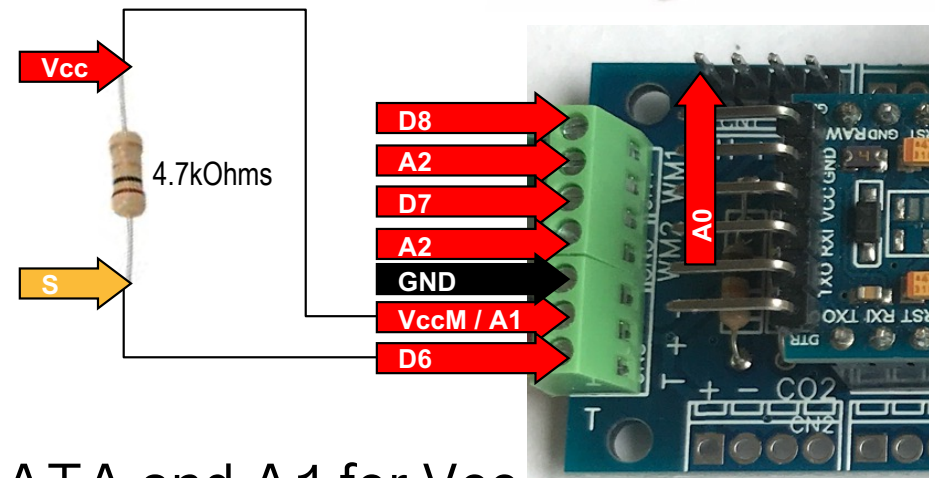
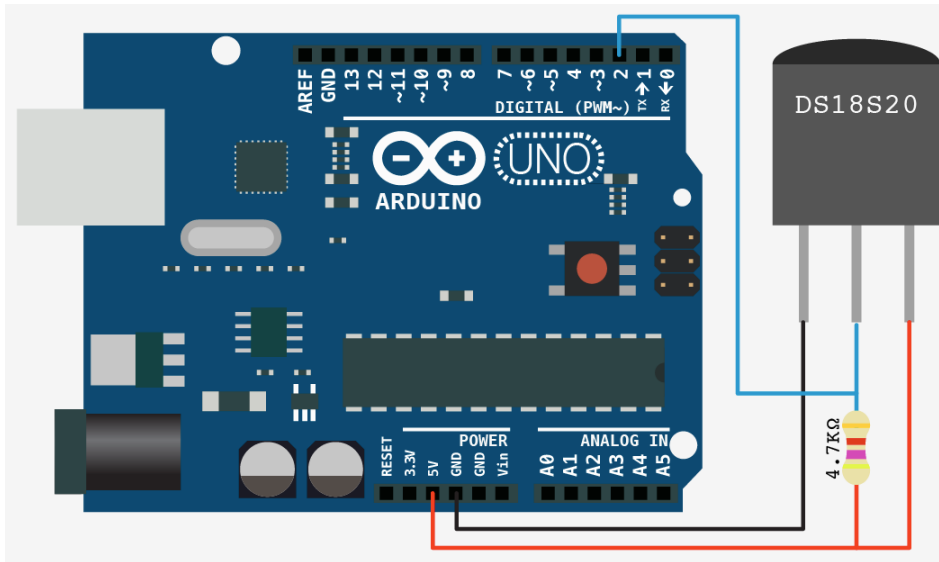


# Connecting SEN0308 in image



# 2<sup>nd</sup> example: read from digital, 1-wire

- ◉ <https://cpham.perso.univ-pau.fr/LORA/HUBIQUITOUS/solution-lab/arduino-lora-tutorial/sensors/temperature/ds18b20/>
- ◉ Use a digital temperature sensor DS18B20



- ◉ Adapt the code to use D6 for DATA and A1 for Vcc

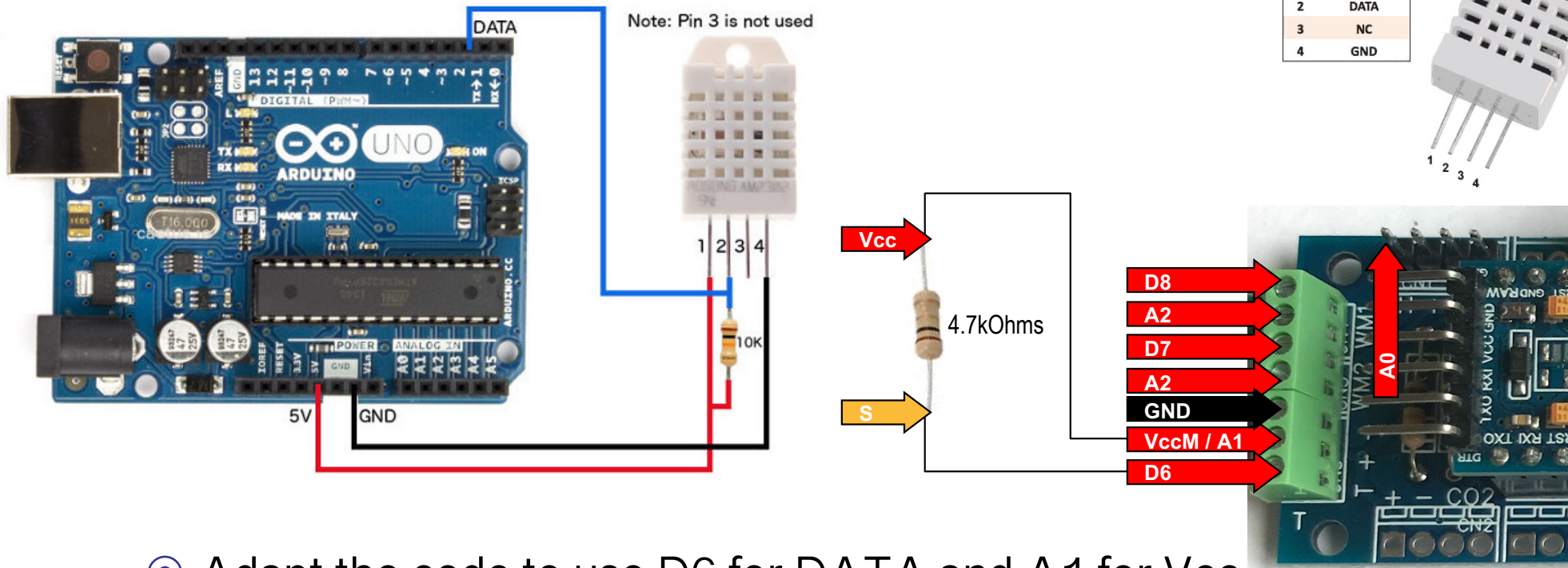


# Connecting DS18B20 in image



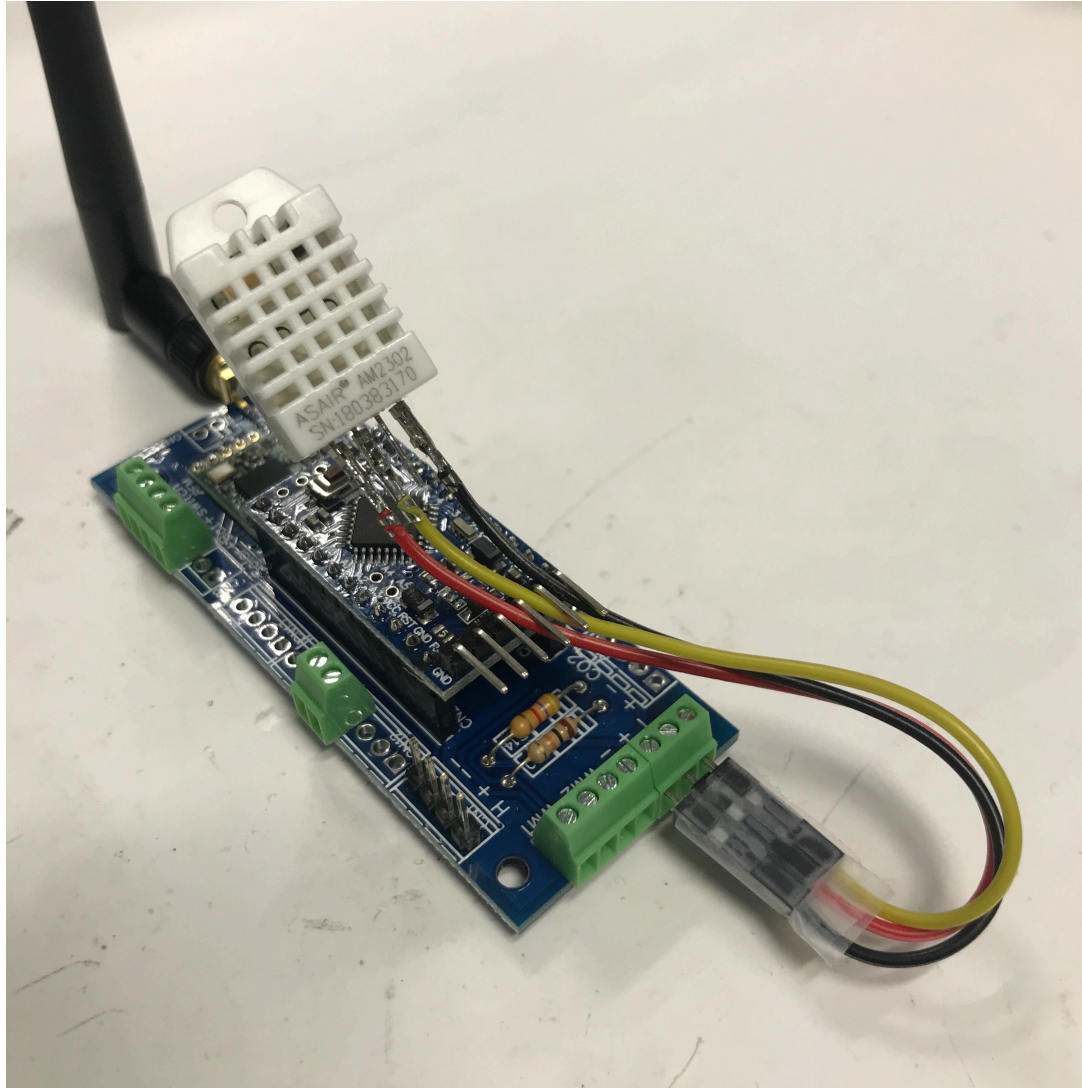
# 3rd example: read from digital DHT22

- ⦿ DHT22: combined temperature & humidity sensor
- ⦿ [https://cpham.perso.univ-pau.fr/LORA/HUBIQUITOUS/solution-lab/arduino-lora-tutorial/sensors/temp\\_hum/dht22/](https://cpham.perso.univ-pau.fr/LORA/HUBIQUITOUS/solution-lab/arduino-lora-tutorial/sensors/temp_hum/dht22/)



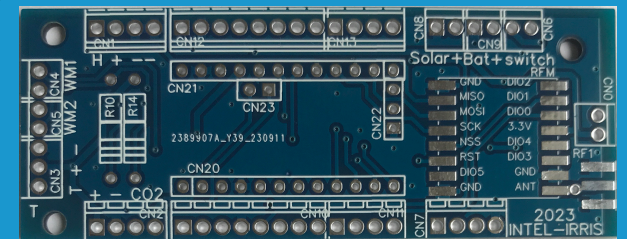
- ⦿ Adapt the code to use D6 for DATA and A1 for Vcc

# Connecting DHT22 in image



# INTEL-IRRIS

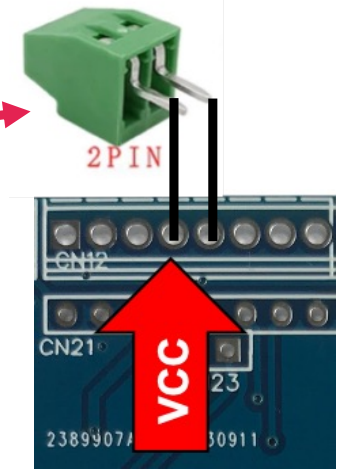
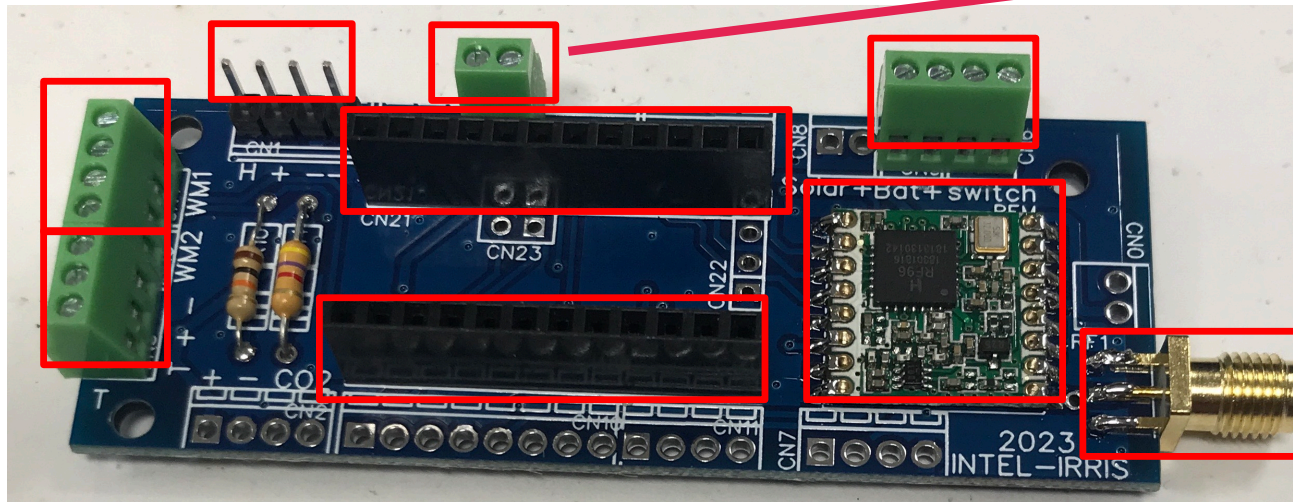
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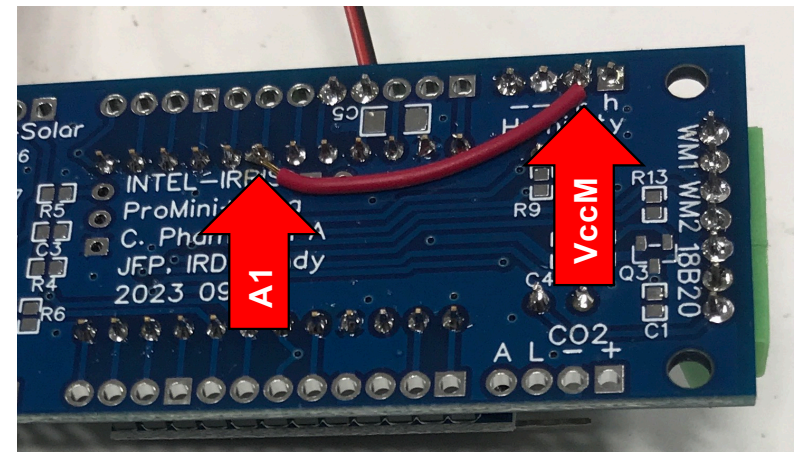
# BUILDING STARTER-KIT

# Wiring with new IRD PCB (raw version)

- First, solder the various components

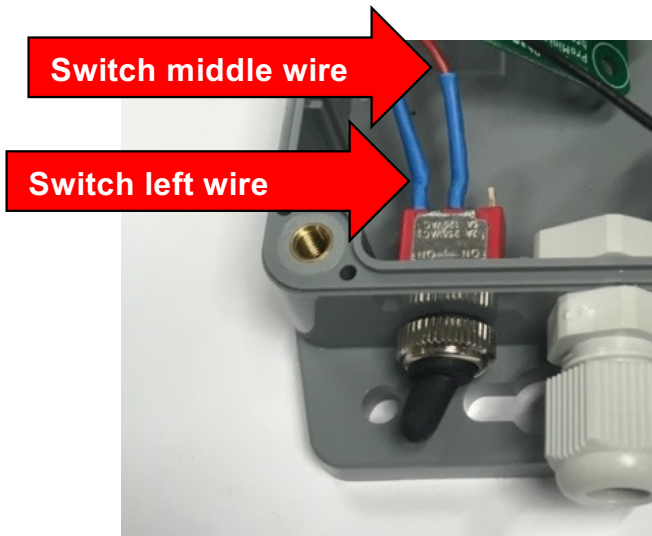
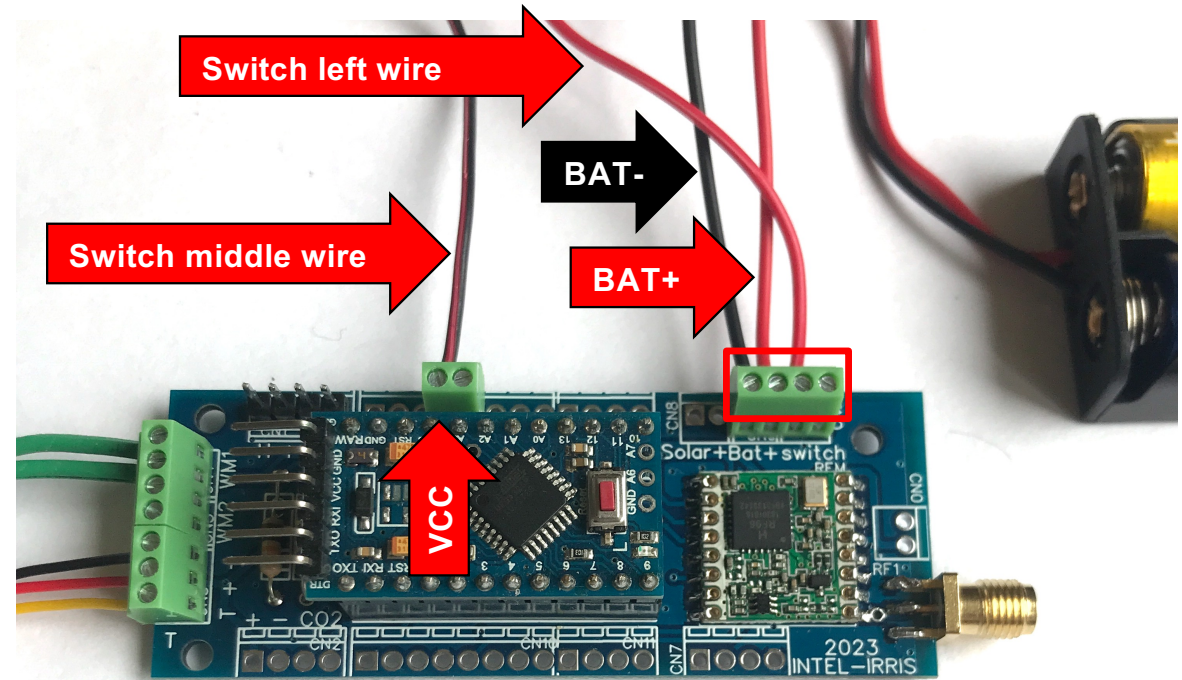
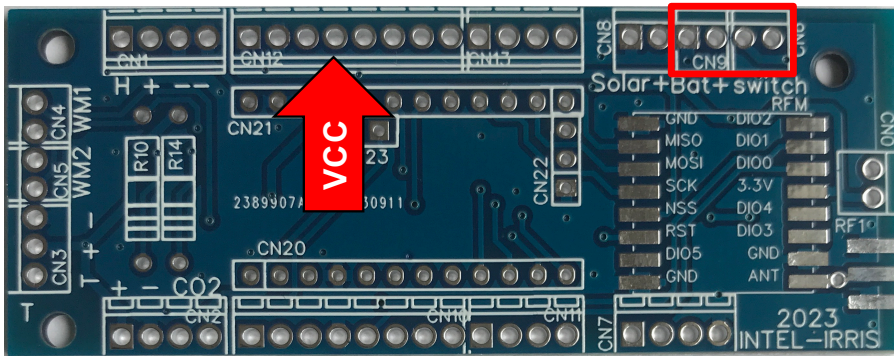


- For the raw PCB (no circuit for solar), need to link A1 to VccM on the back side of the PCB
- VccM can be taken on the + of the soil humidity sensor



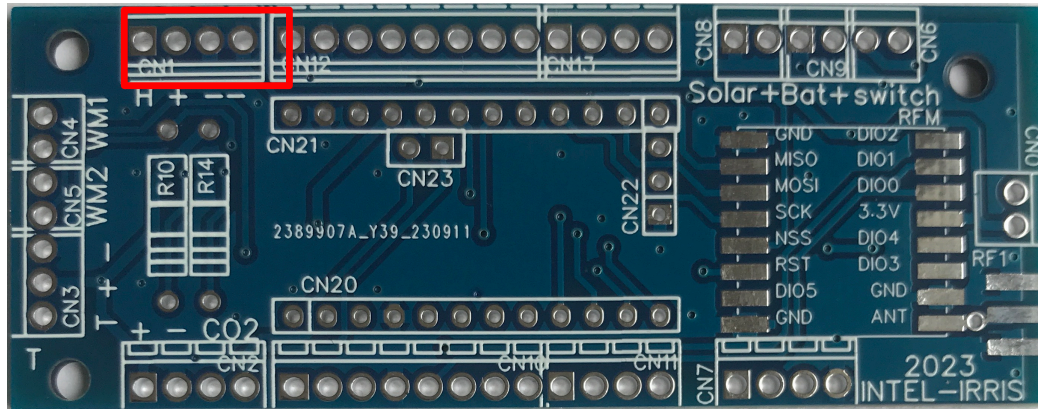
# Wiring with new IRD PCB (raw version)

## Power wires

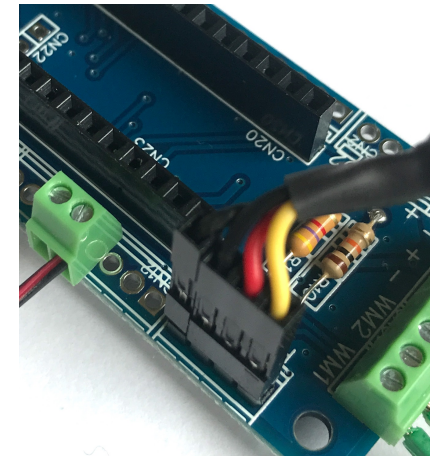
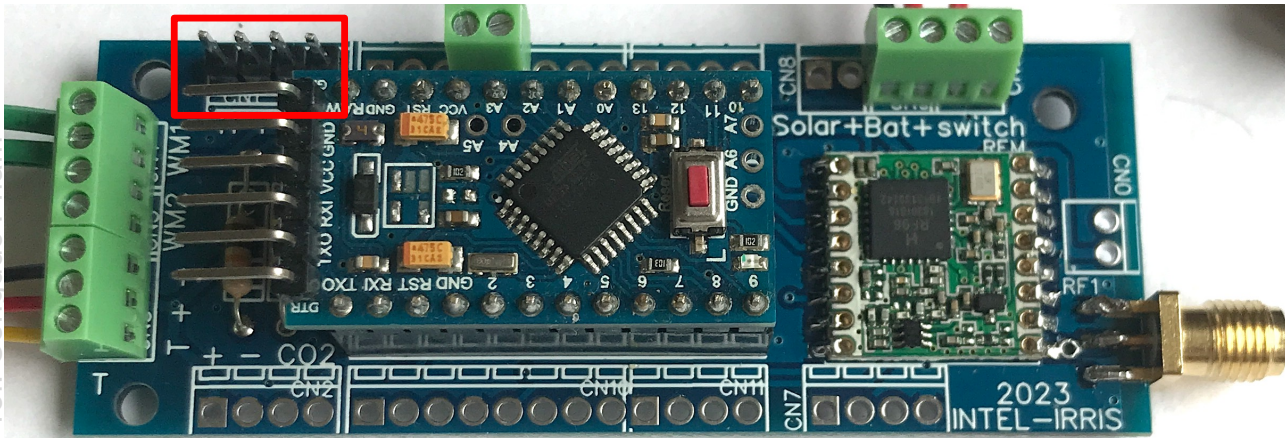


# Wiring with new IRD PCB (raw version)

⦿ SEN0308 capacitive

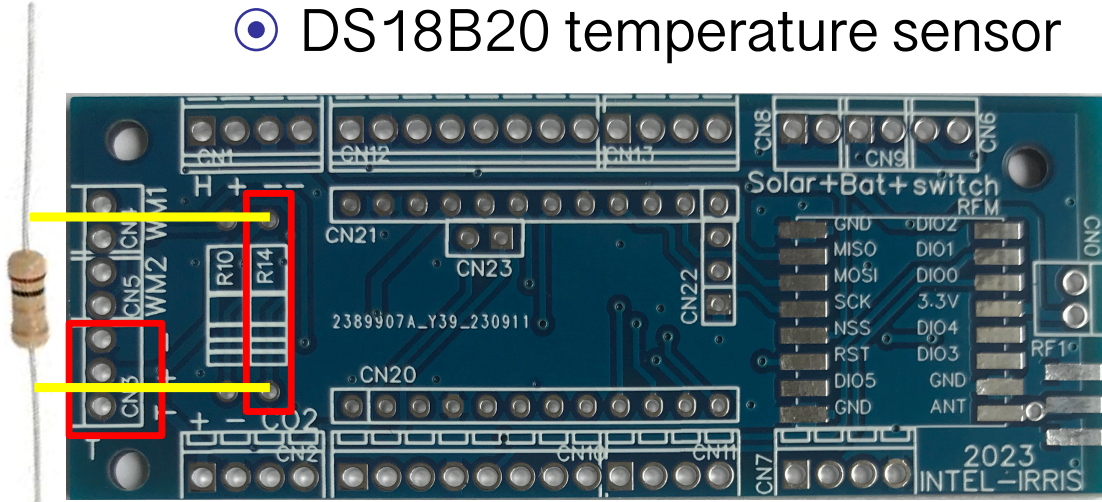


Just connect the sensor  
in the dedicated header  
-- are the 2 black wires  
+ is red and H is yellow

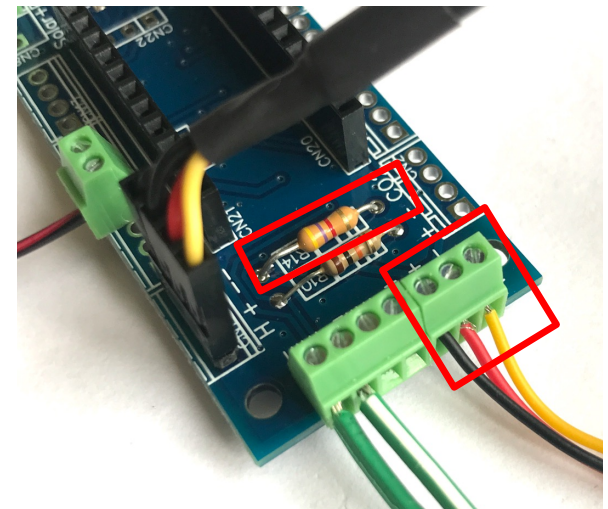
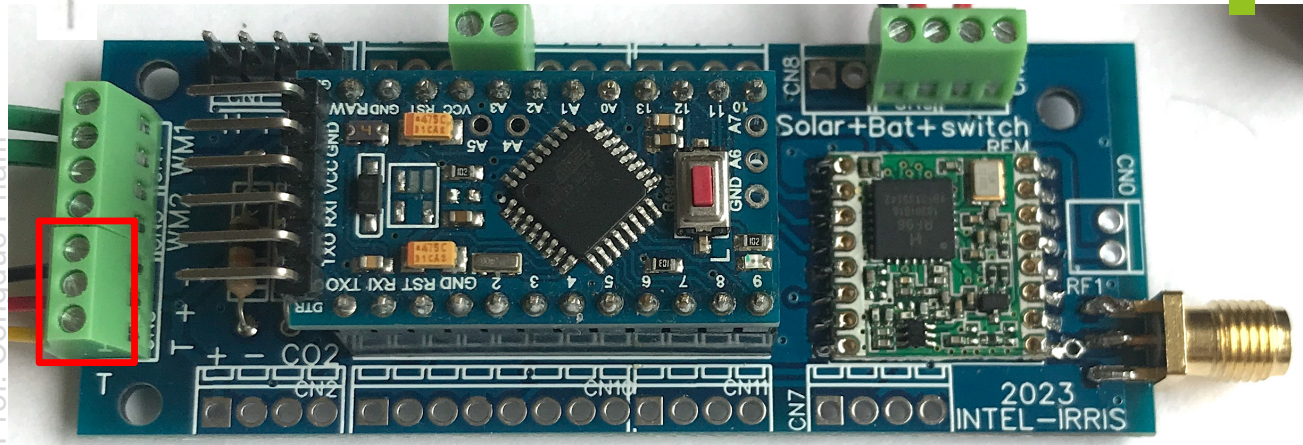


# Wiring with new IRD PCB (raw version)

DS18B20 temperature sensor



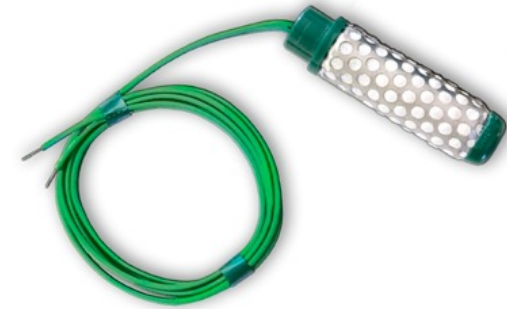
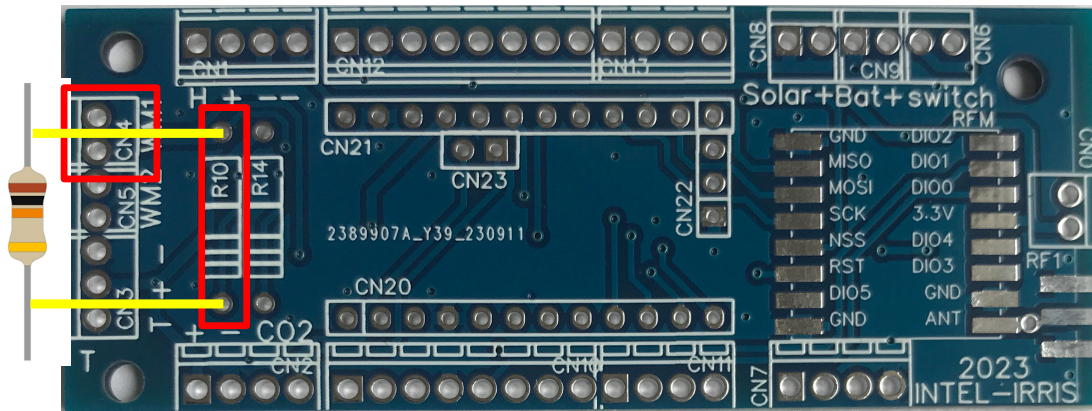
Solder a 4.7kOhms resistor then wire in the dedicated terminal block  
T+ – : Yellow, Red, Black wires



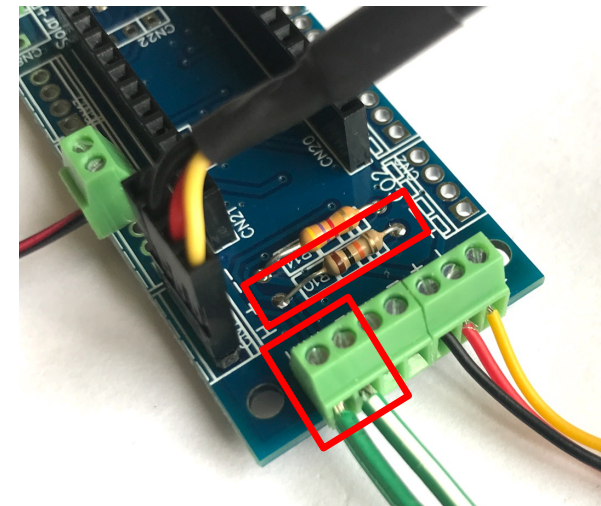
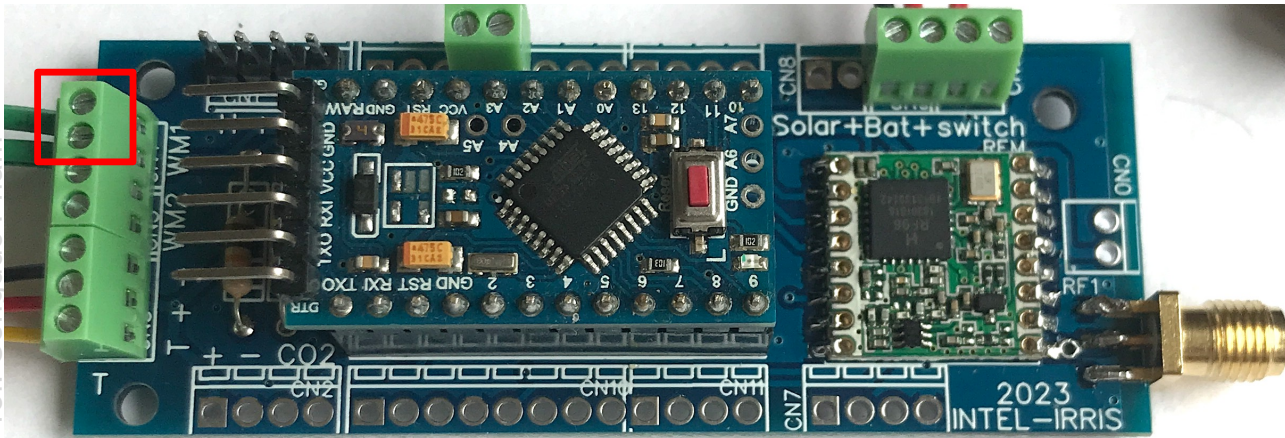


# Wiring with new IRD PCB (raw version)

## First Watermark

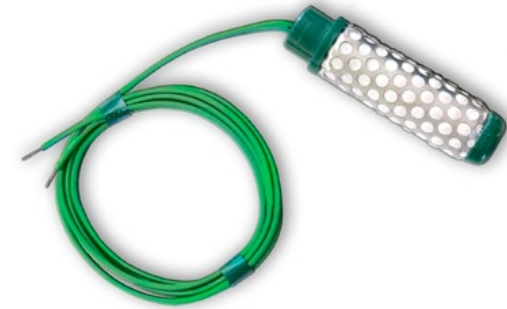
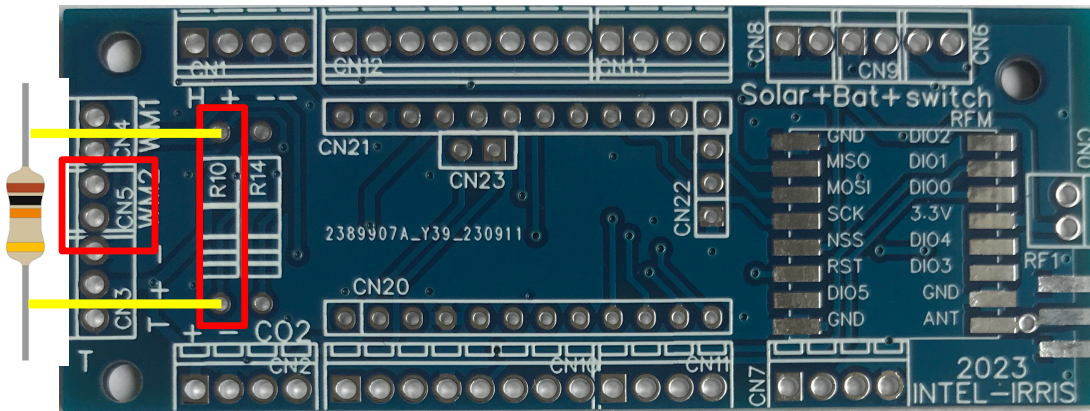


Solder a 10kOhms resistor then wire in the dedicated WM1 terminal block

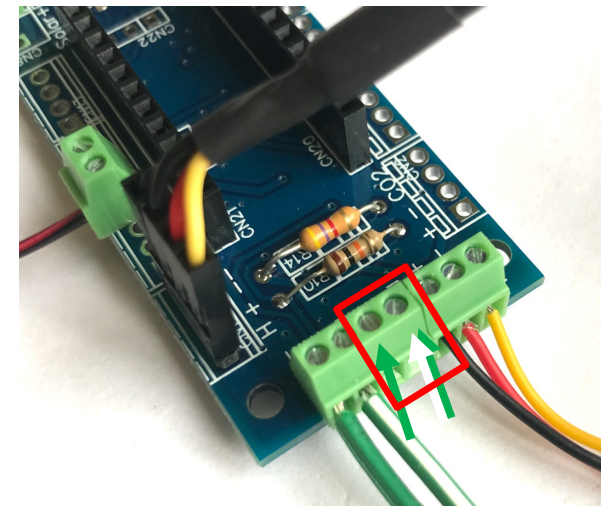
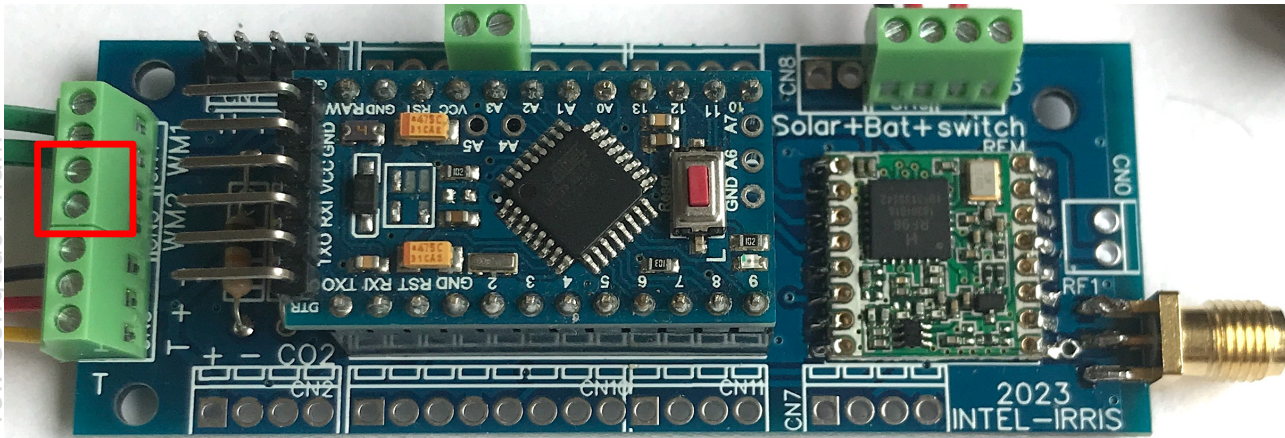


# Wiring with new IRD PCB (raw version)

## ◉ Second Watermark

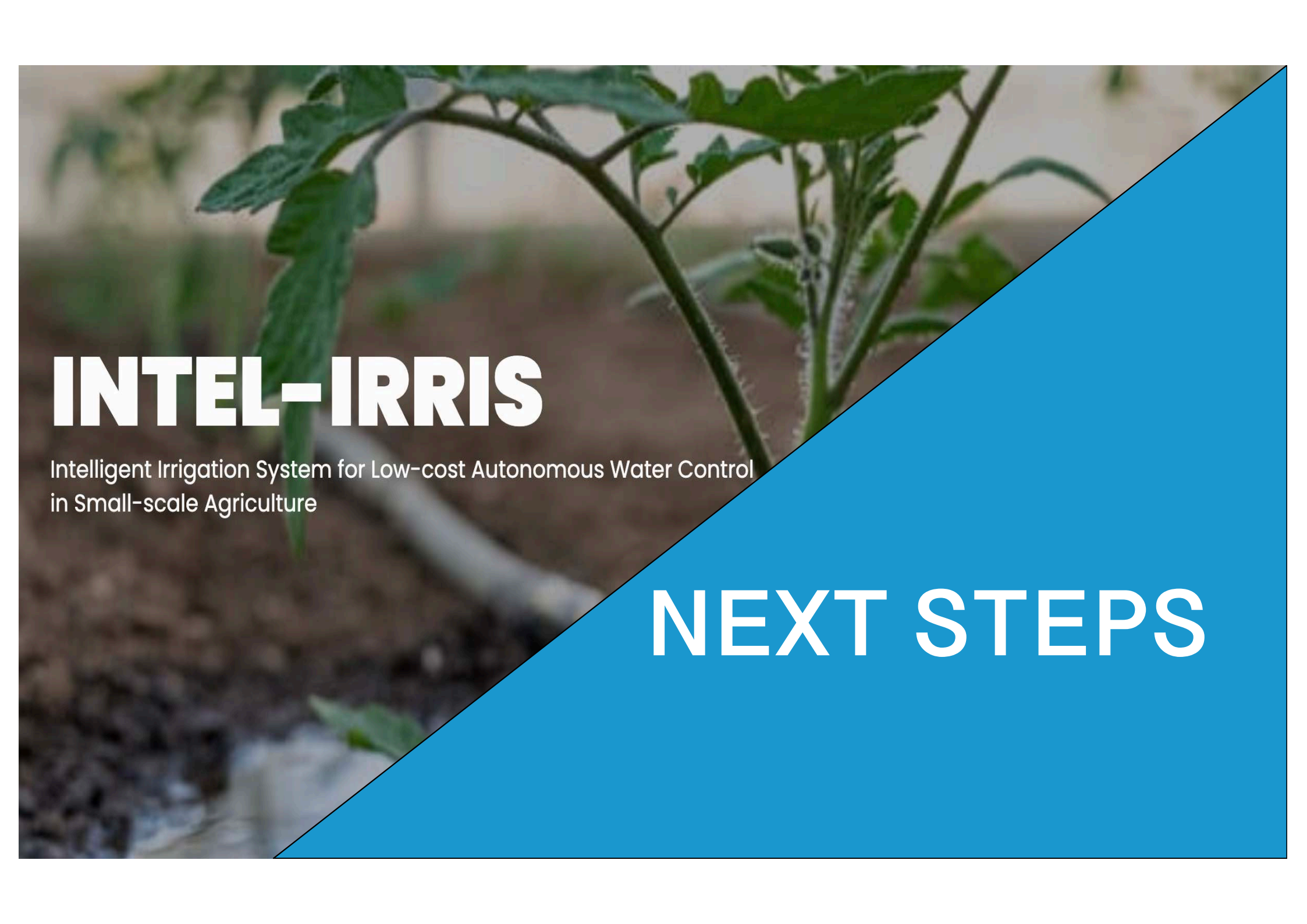


**No additional resistor  
 just wire in the dedicated WM2  
 terminal block**



# Final result with casing & sensors



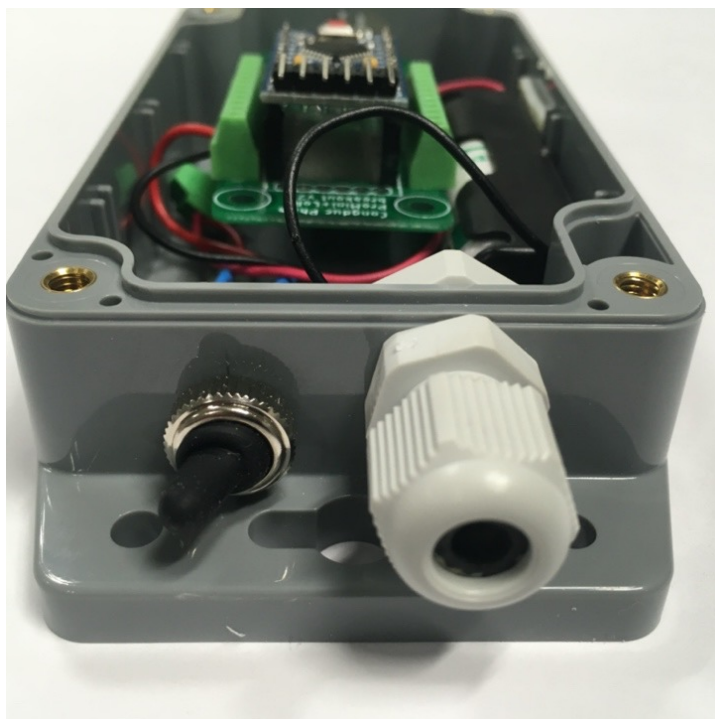


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## NEXT STEPS

# Transmission to WaziGate



Parameters for  
INTEL-IRRIS WaziGate

**LoRaWAN™**

SF12BW125  
868.1MHz | 433.175MHz  
Node id is 26011DAA  
1 msg/60mins  
1 sensor  
XLPP data



This dedicated video will show all these steps, from connecting the SEN0308 to testing transmission to the WaziGate  
Video n°4: <https://youtu.be/j-1Nk0tv0xM>



- Logout
- Intel-Irris WaziApp
- Dashboard
- Sync
- Settings
- Apps
- Help
- User Profile

### Dashboard

**Gateway**  
b827ebd1b236cab8  
ID b827ebd1b236cab8

**(NEW) Gateway**  
b827ebd1b236cab8  
ID dca6325c2a7a0000

**SOIL-AREA-1**  
ID 644b819568f31909da...

**Soil Humidity Sensor** 164.5  
Raw value from SEN0308 15 minutes ago

**Soil Temperature Sensor** -99  
degree Celsius 5 months ago

**Battery voltage** 3.46

### Farm

- Home Assistant
- Overview
- Energy
- Map
- Logbook
- History
- Configurator
- Media

intelirris Unknown

**Capacitive Sensor**

- SOIL-AREA-1/Raw value from SEN0308 16 minutes ago 164.5
- SOIL-AREA-1/Soil Temperature Sensor 2 weeks ago -99 °C
- SOIL-AREA-1/Battery voltage 16 minutes ago 3.46 Volts

**Tensiometer Sensor**

- SOIL-AREA-2/centibars from WM200 18 minutes ago 24 cbar
- SOIL-AREA-2/resistance value from WM200 18 minutes ago 4,287 Ohms
- SOIL-AREA-2/Soil Temperature Sensor 18 minutes ago 17.9 °C
- SOIL-AREA-2/Battery voltage 4 hours ago 2.77 Volts

**SOIL-AREA-1/Raw value from SEN0308**

164.5

**SOIL-AREA-2/Soil Temp...**

17.9 °C

**SOIL-AREA-2/soil condi...**

4

**SOIL-AREA-2/soil Temp...**

17.9 °C