# Session 1

# No-Code Programming for Biology

1. Welcome!
2. Turn off your video and mute yourselves for now
3. Feel free to introduce yourselves in the chat
4. As we go along, ask any questions in the chat

# No-Code Programming for Biology

# Today’s Session

**17:00** Welcome!

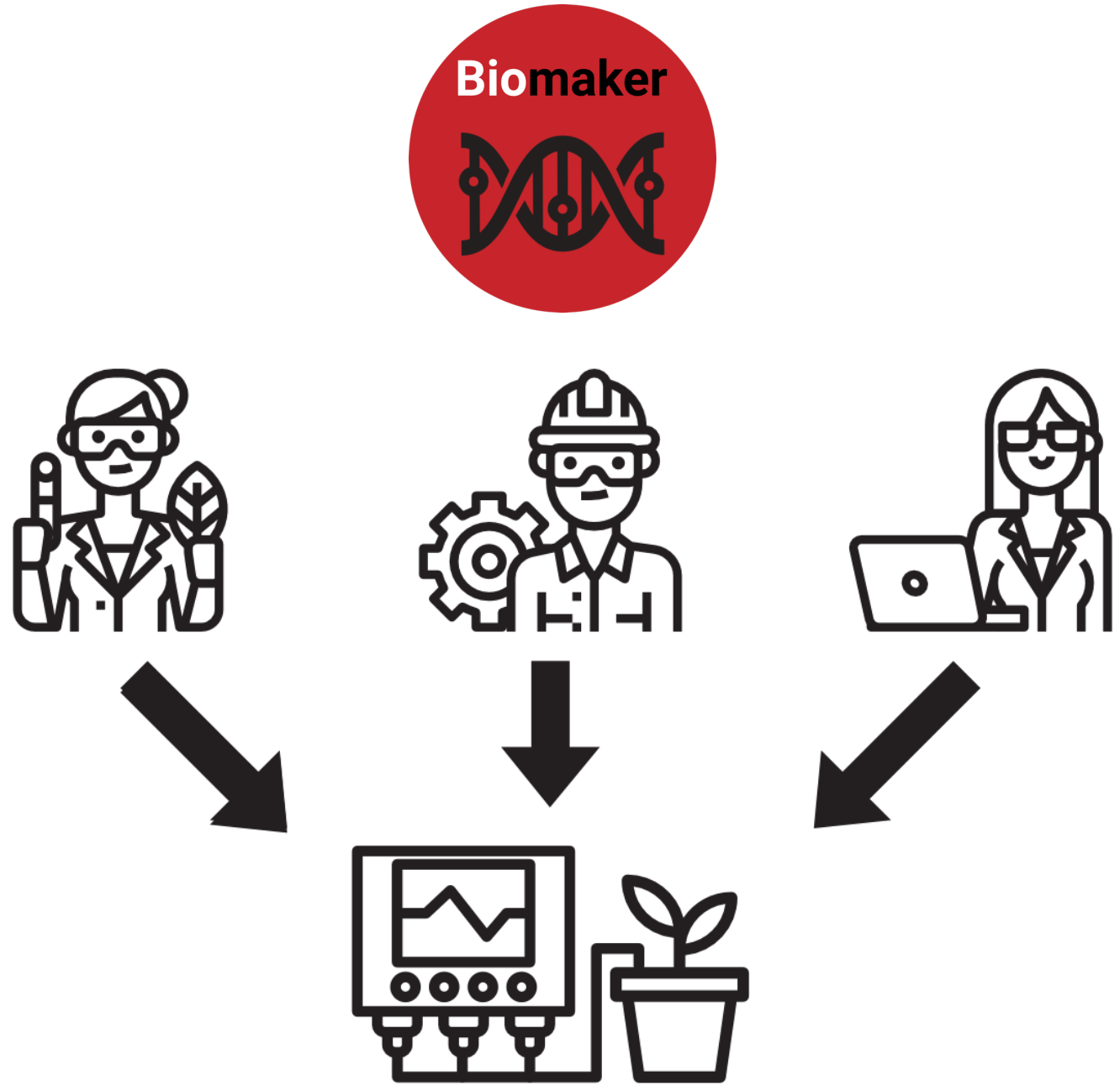
**17:05** Lesson 1: Introduction

An introduction to the grove board, microcontrollers and the XOD IDE

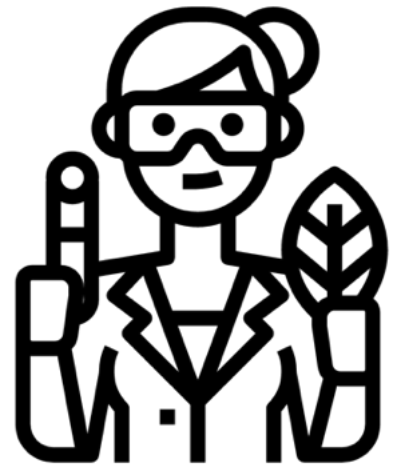
**17:30** Lesson 2: Getting Started (hands-on session)

Get started with using your board. We’ll start with some simple tasks like flashing an LED, pressing a button and sounding a buzzer

**18:25** Round-up


Biomaker

# No-Code Programming for Biology



# Before we Start

1. Downloaded the XOD Software

   www.xod.io

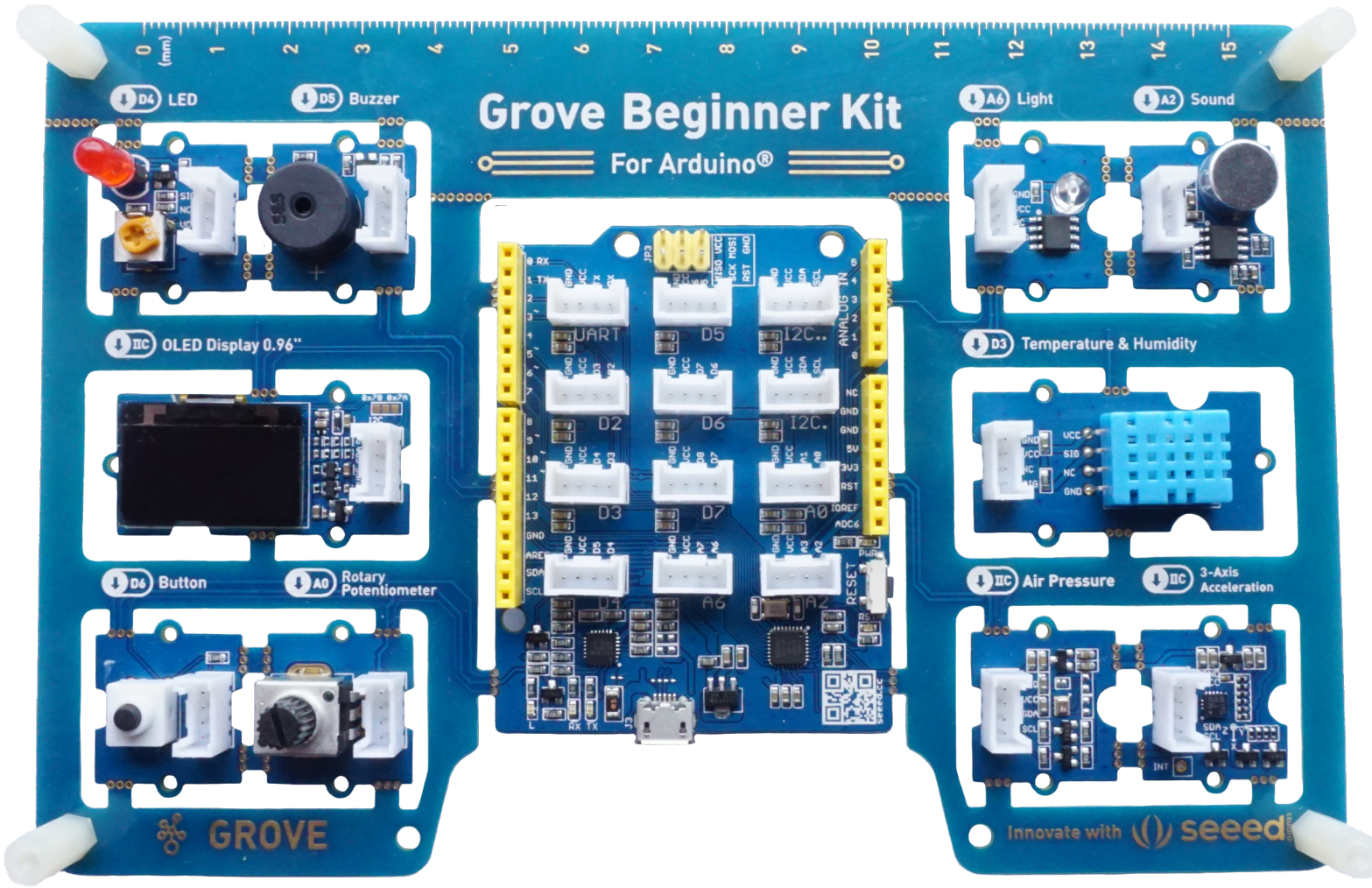
2. Downloaded the No-Code Programming Beginner's Guide

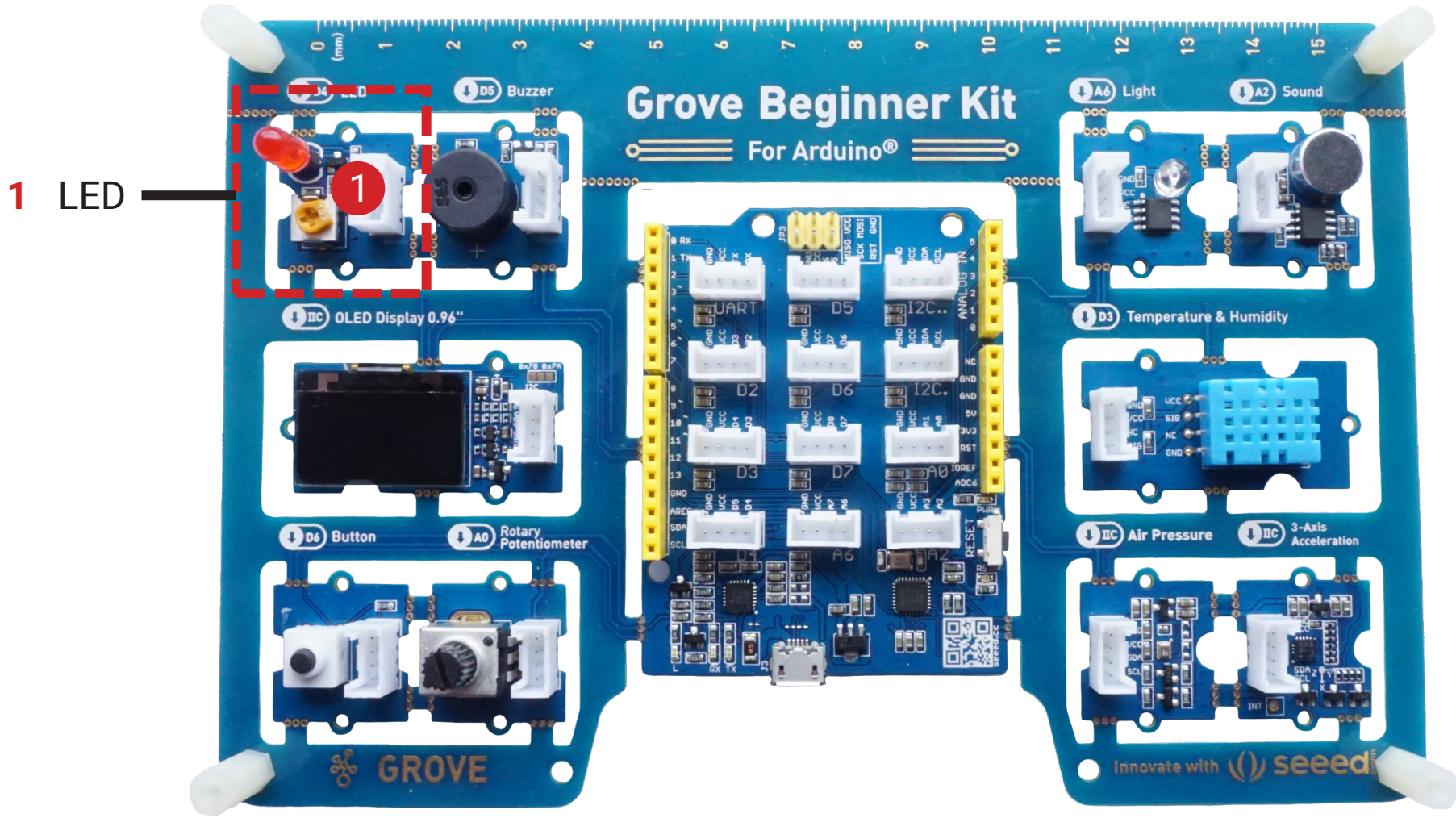
   www.biomaker.org/nocode-programming-for-biology-handbook

3. Installed USB Drivers (if required)

   www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers

# The Starter Kit


Grove Beginner Kit
For Arduino®
D4 LED
D5 Buzzer
A6 Light
A2 Sound
IIC OLED Display 0.96"
D3 Temperature & Humidity
D6 Button
A0 Rotary Potentiometer
IIC Air Pressure
IIC 3-Axis Acceleration
GROVE
Innovate with seeed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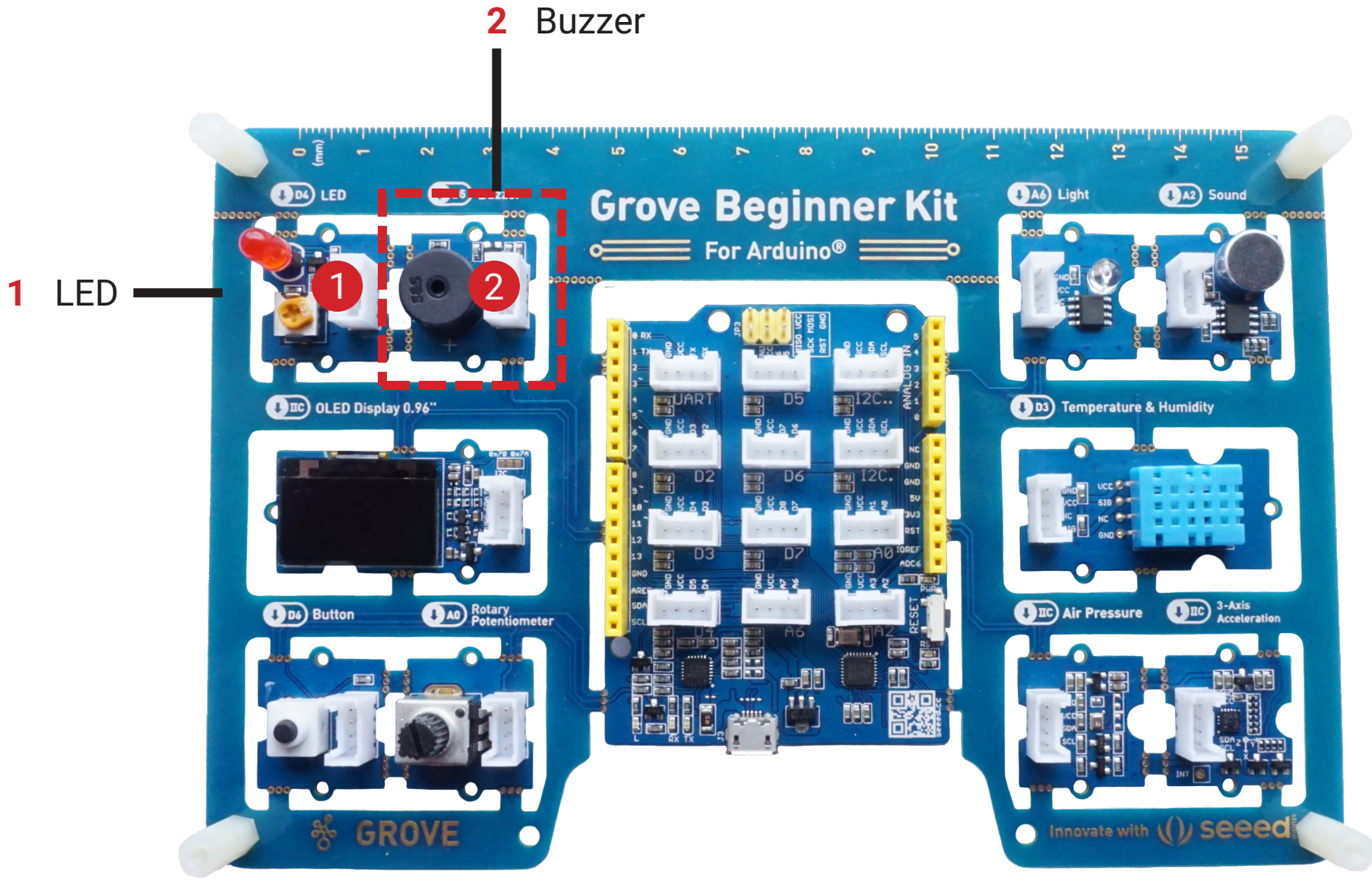
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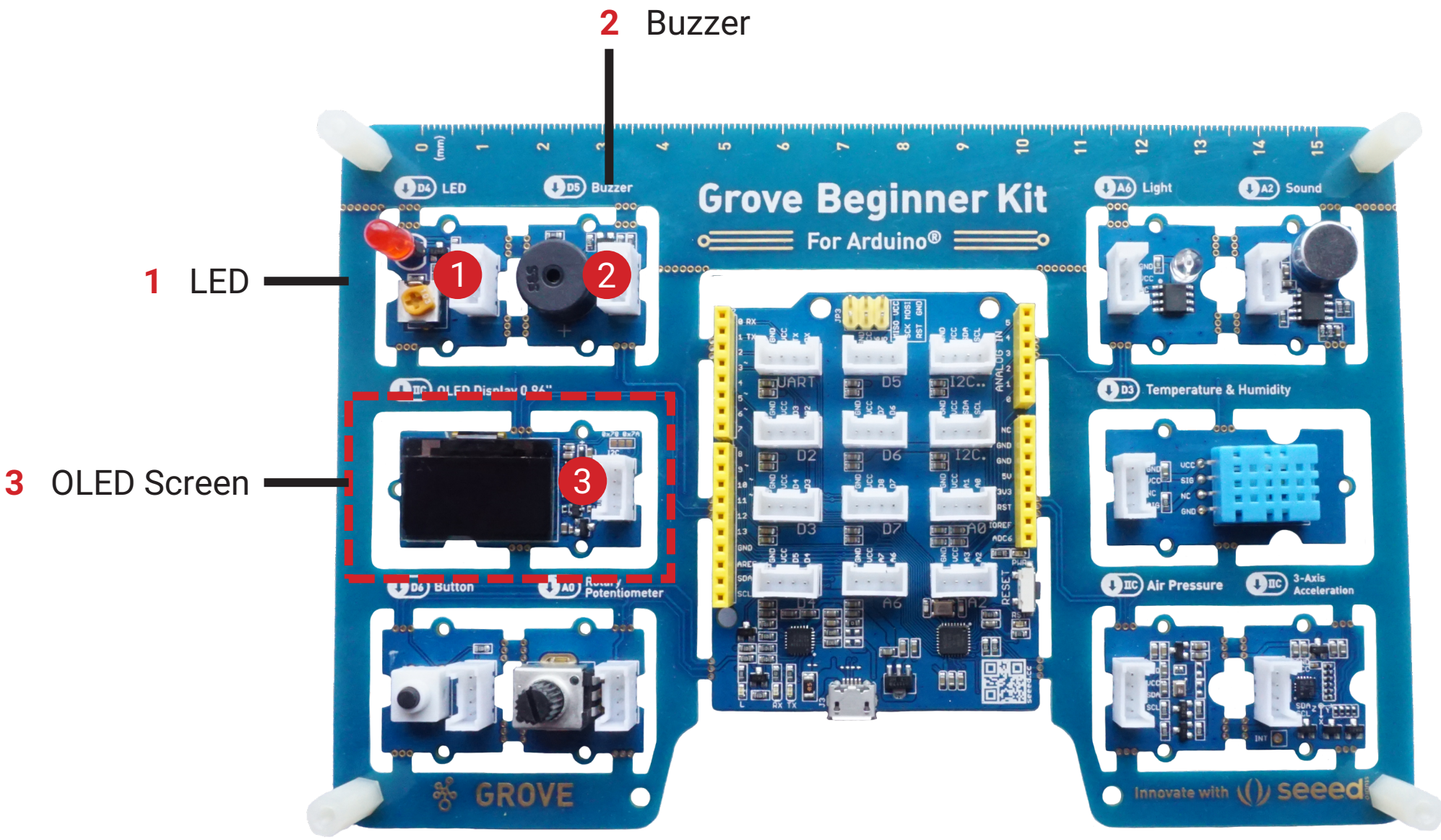
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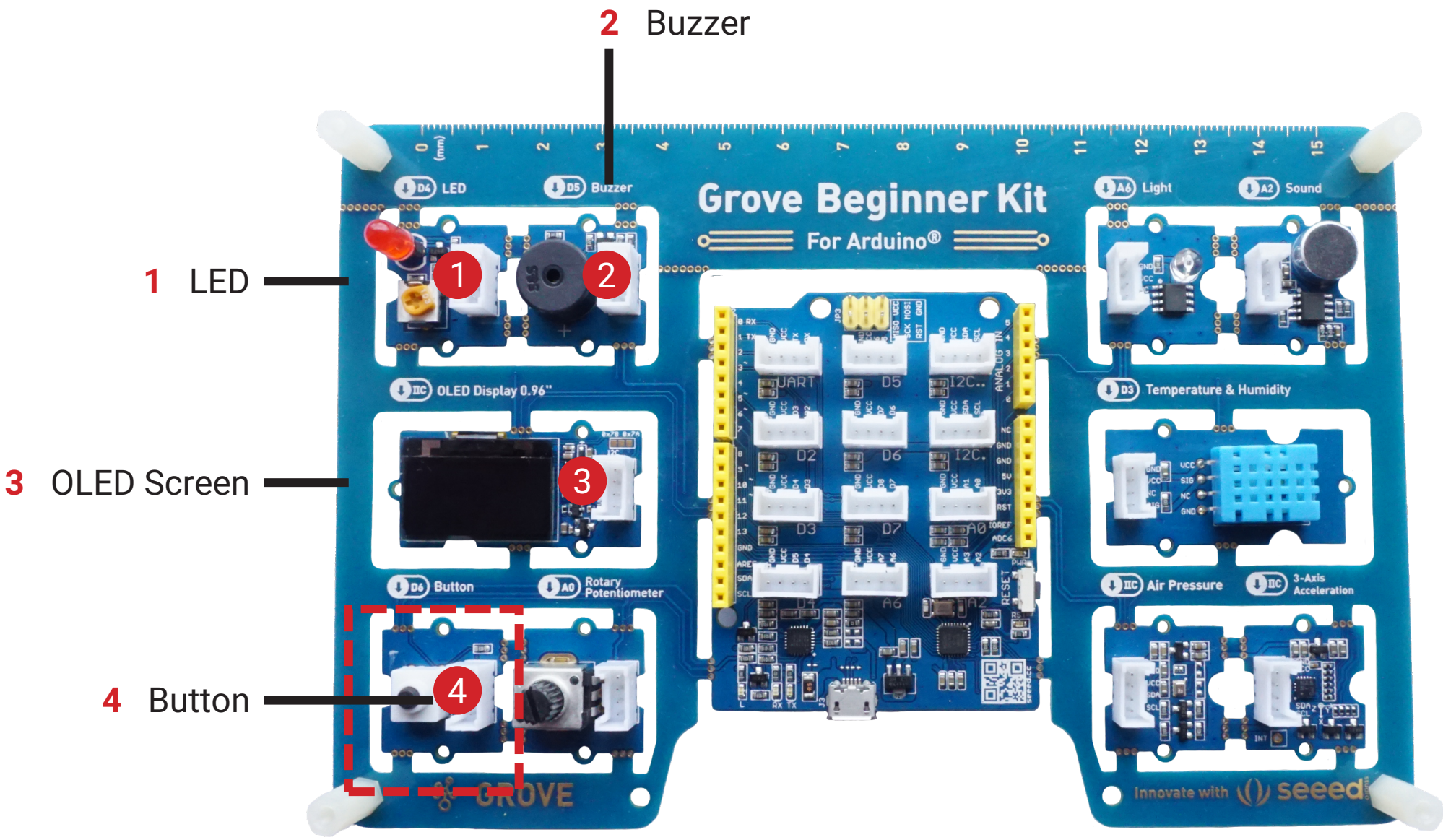
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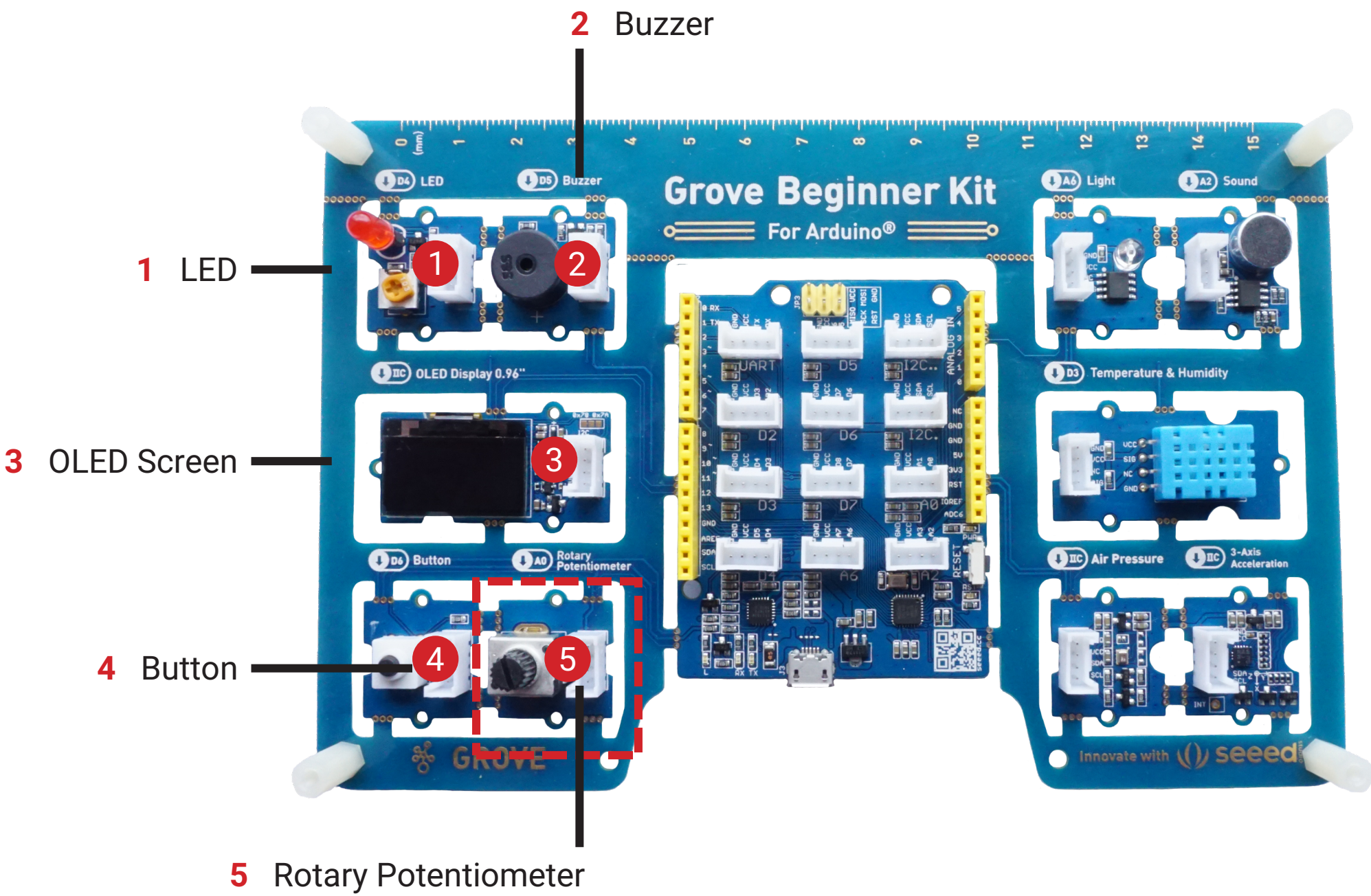
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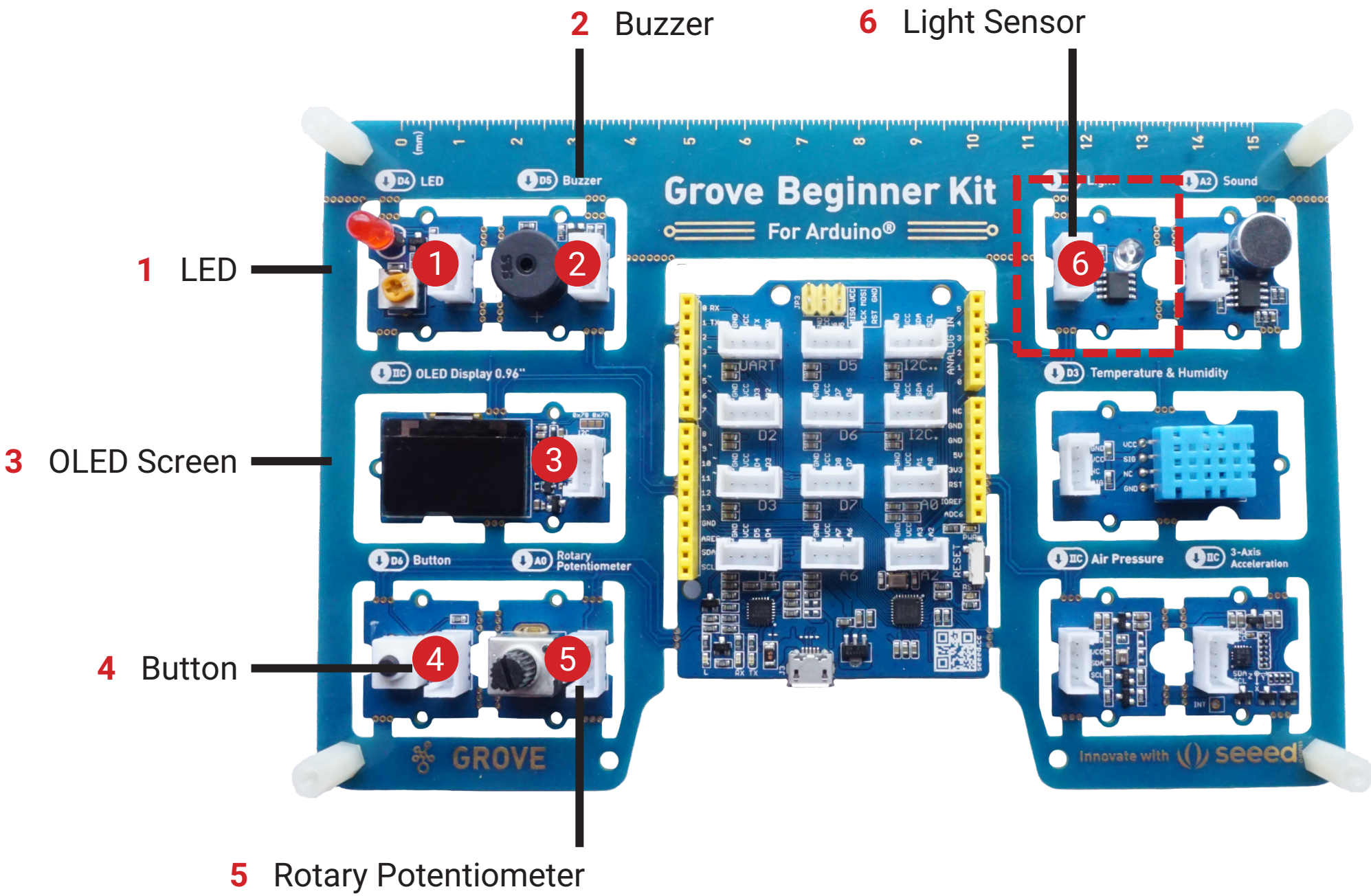
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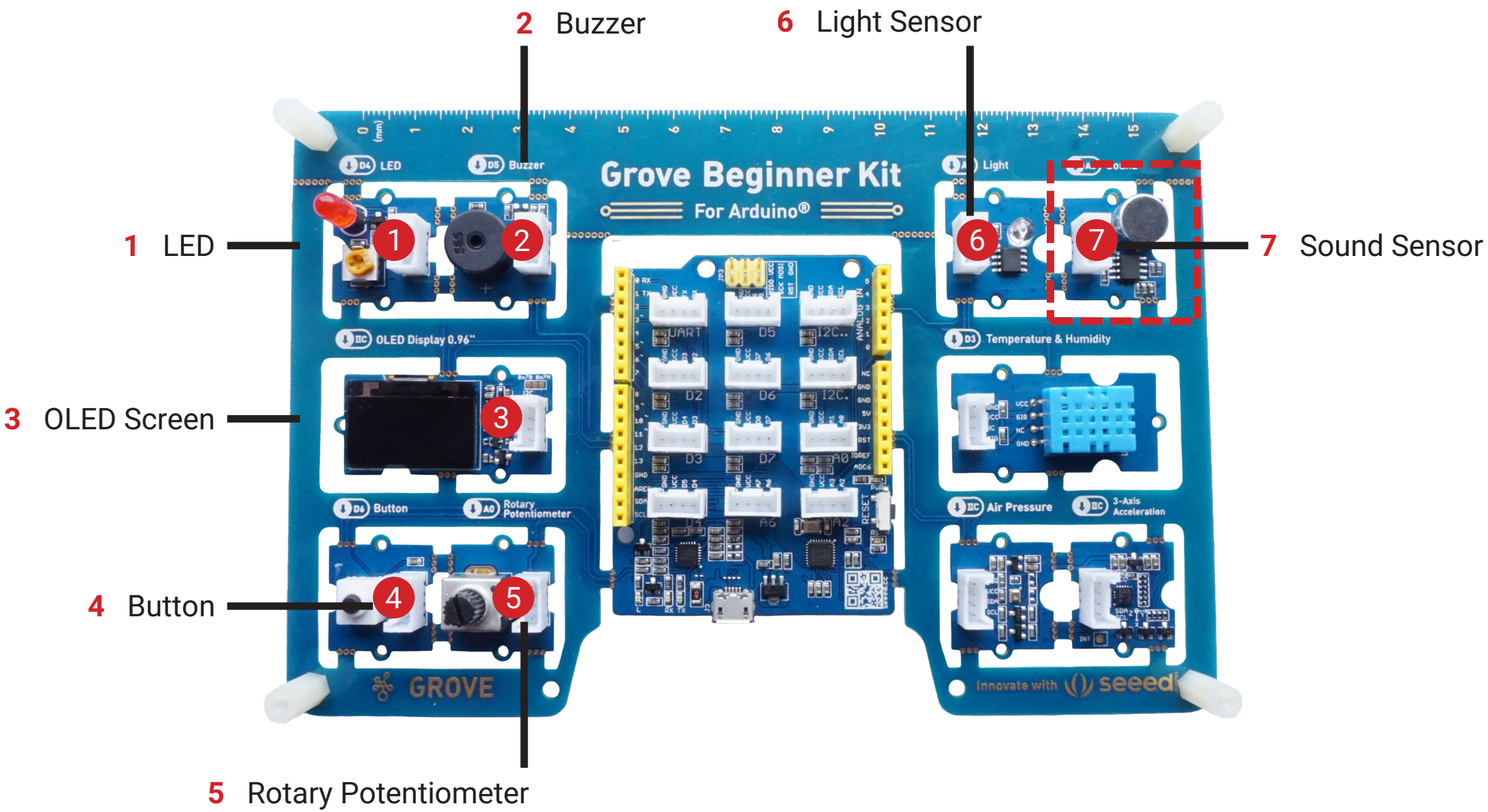
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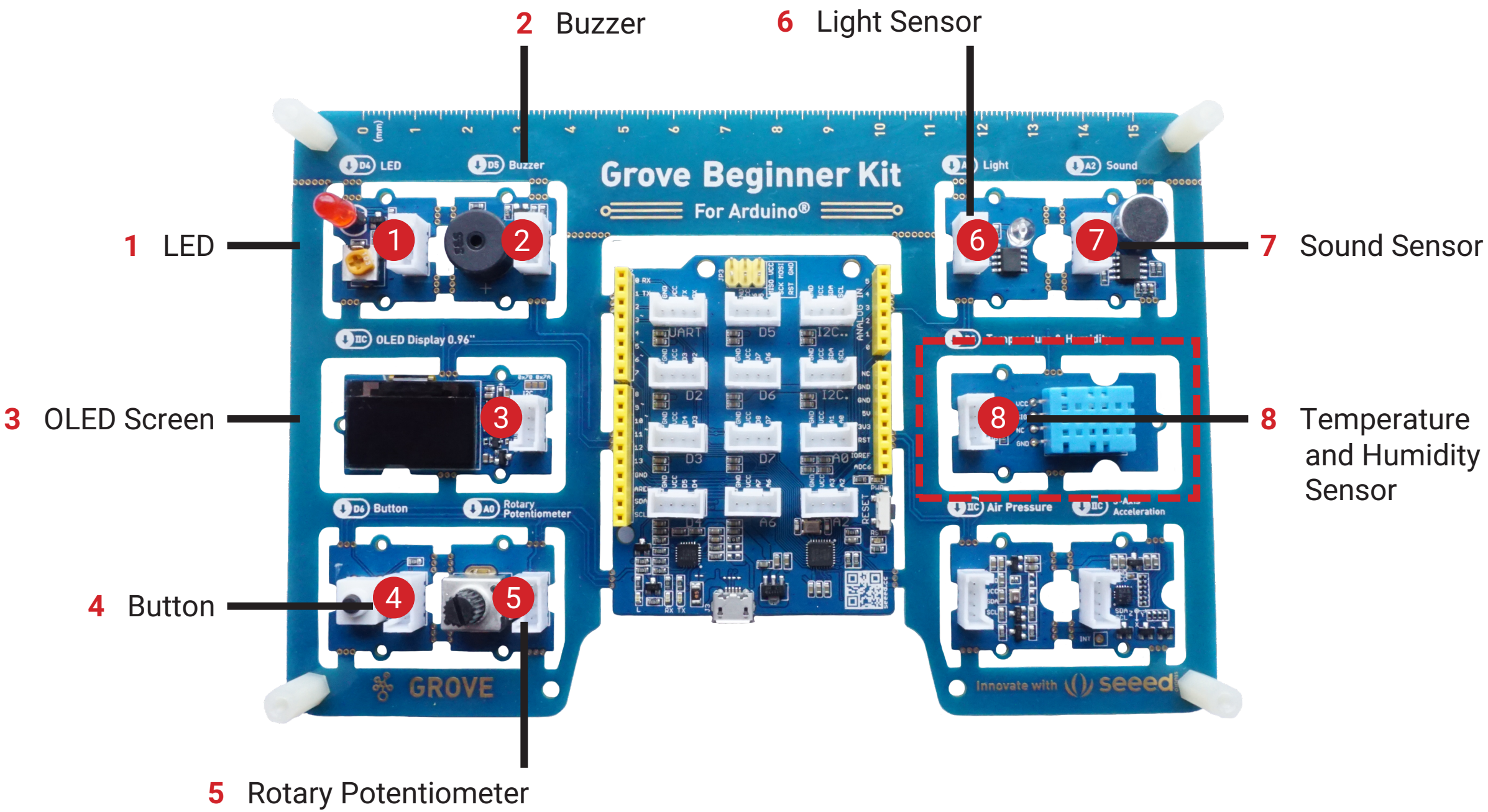
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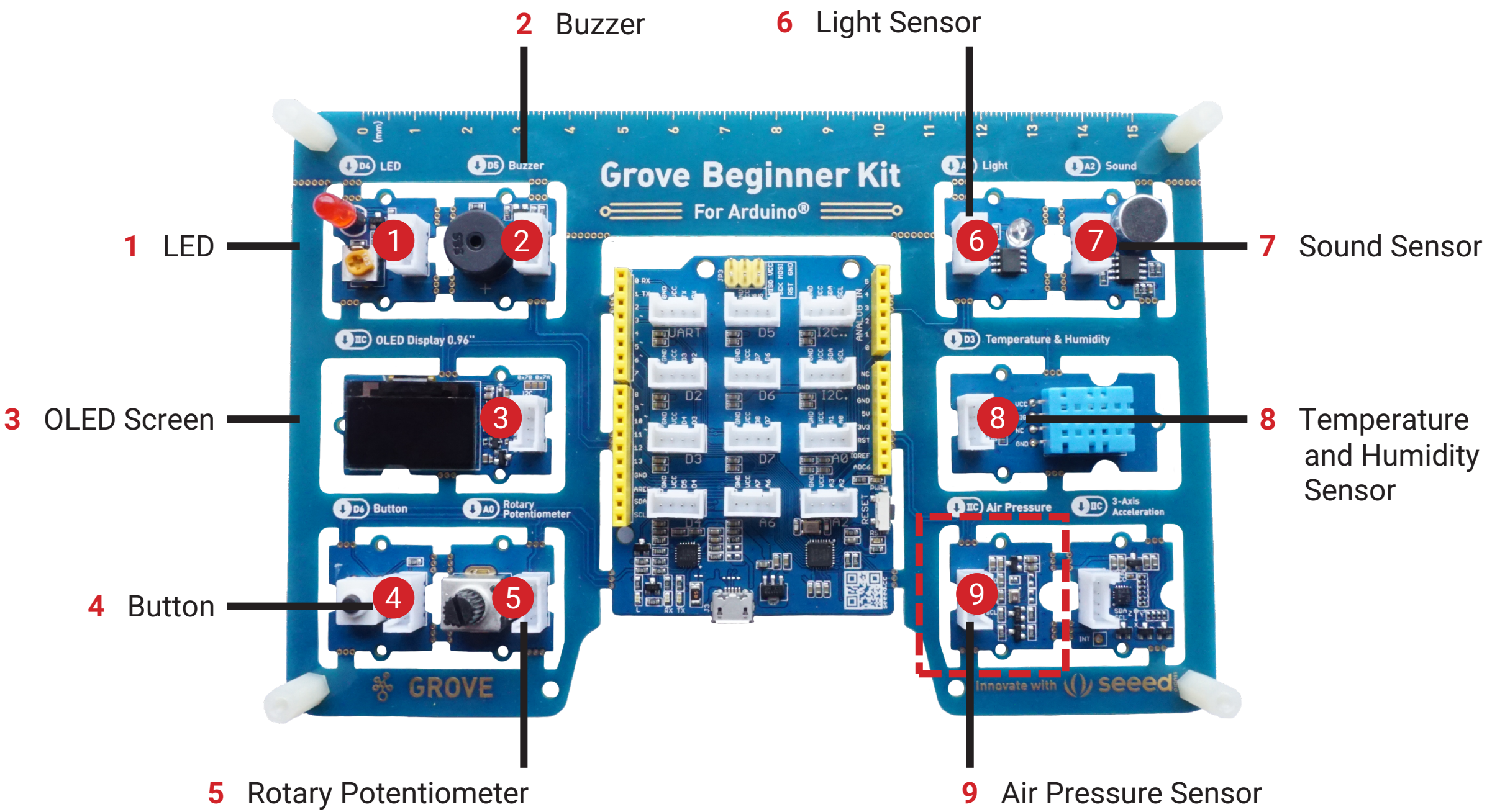
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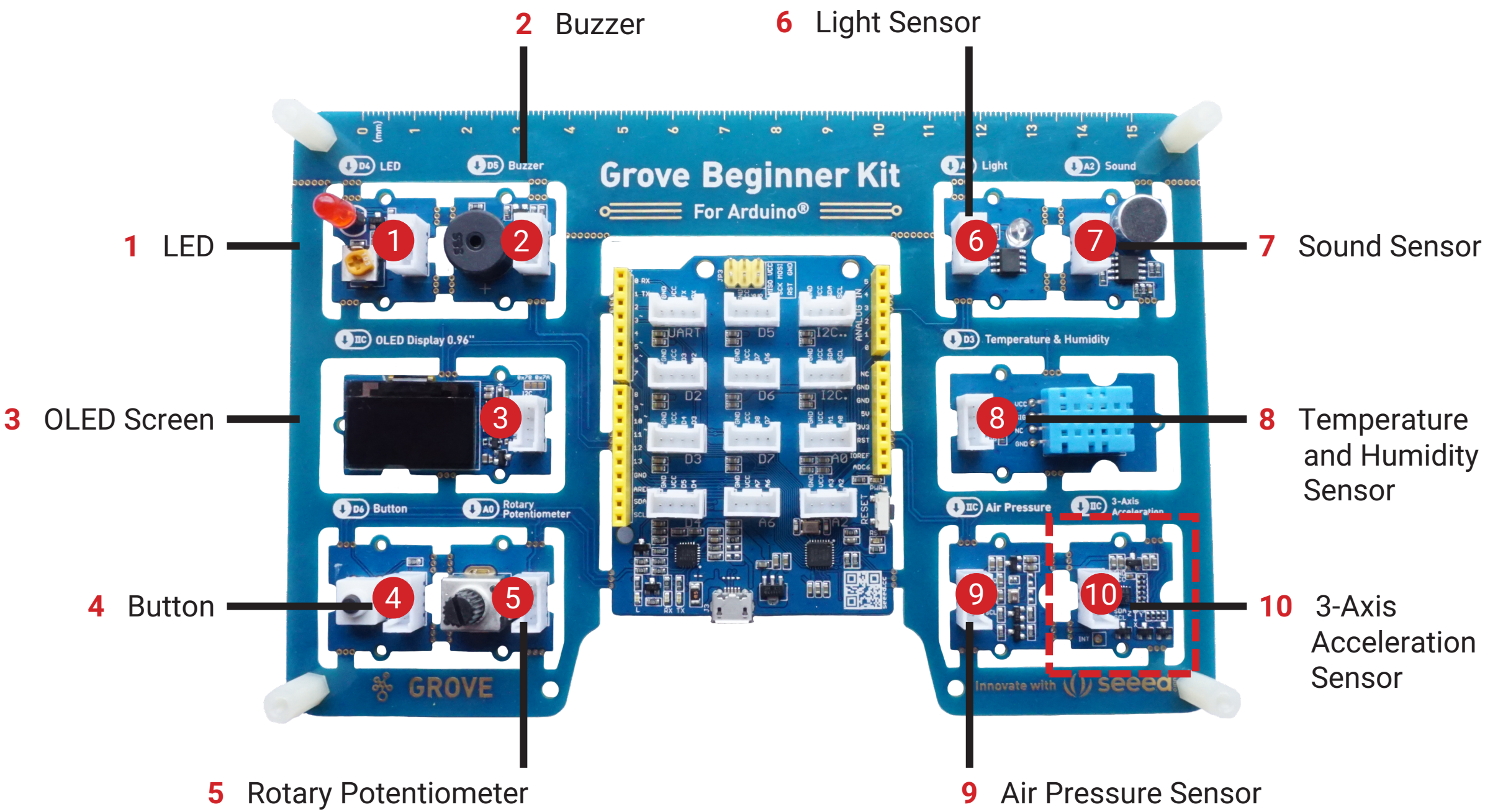
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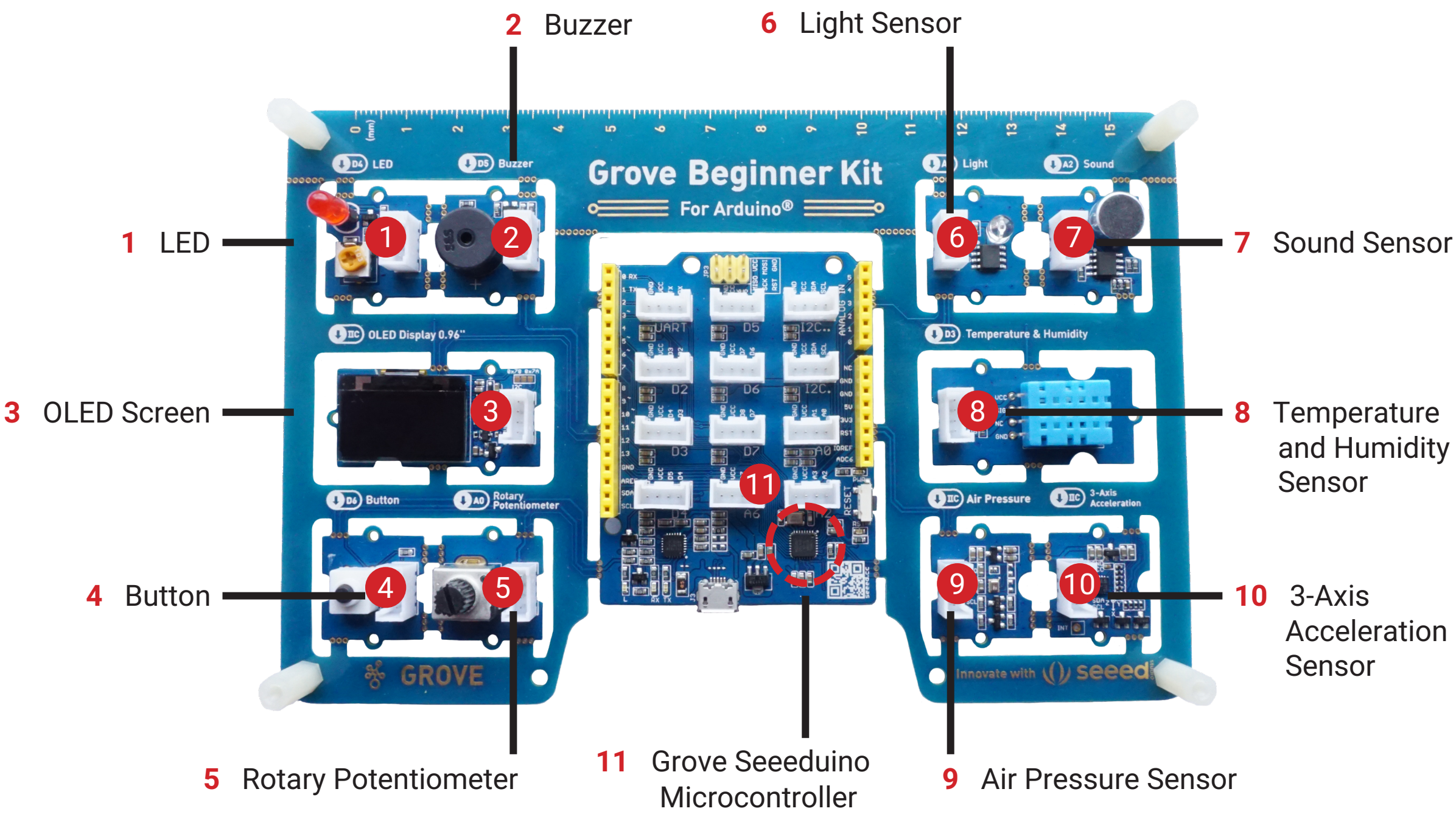
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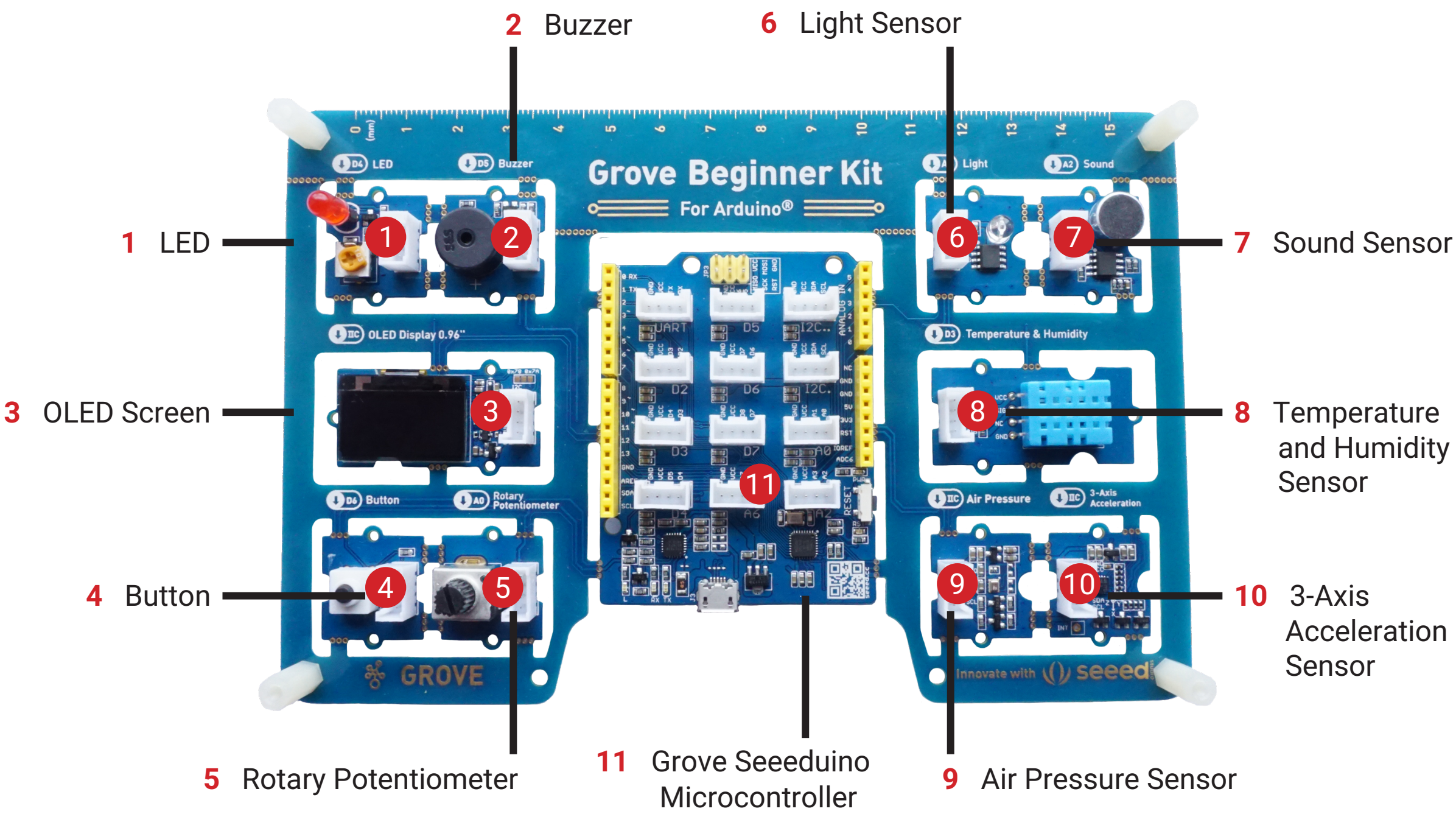
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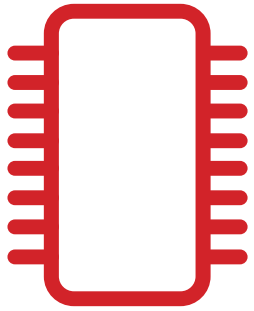
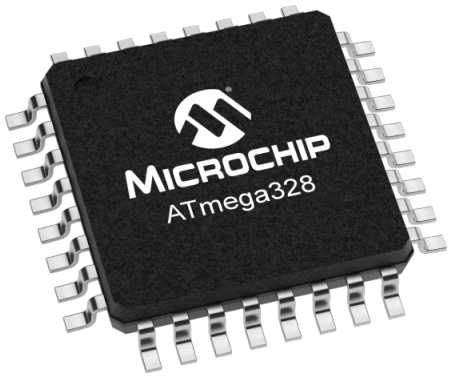


# The Microcontroller

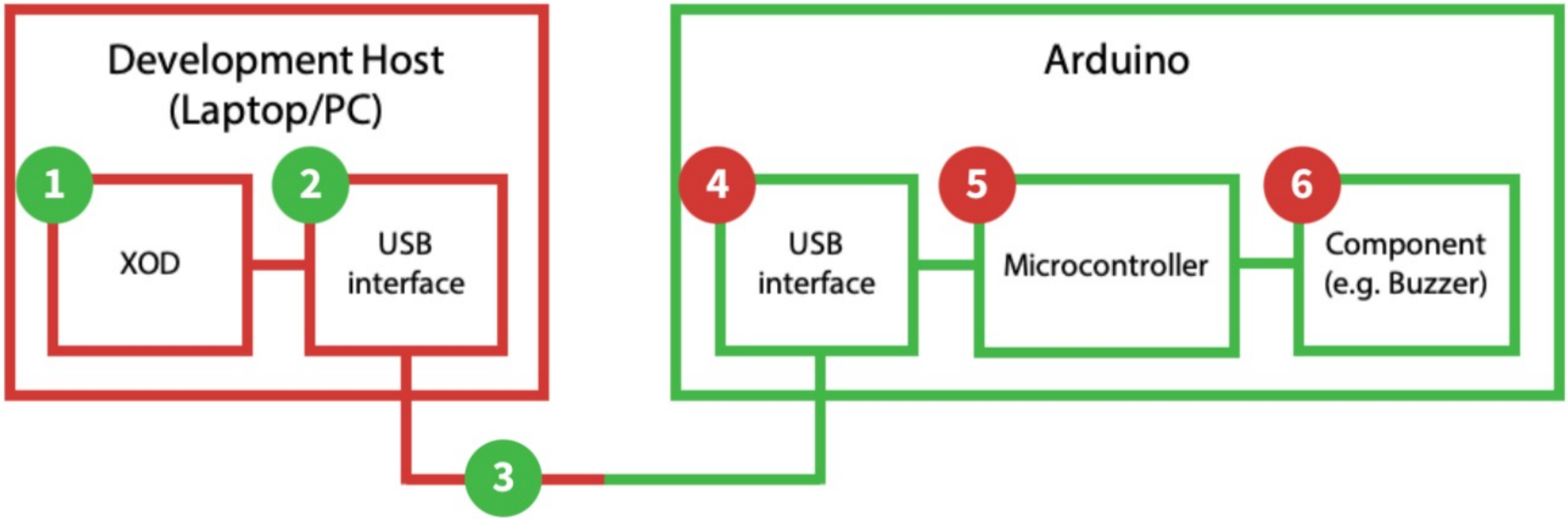


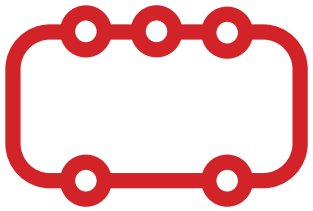

**A0-A6** Analog

**D0-D13** Digital

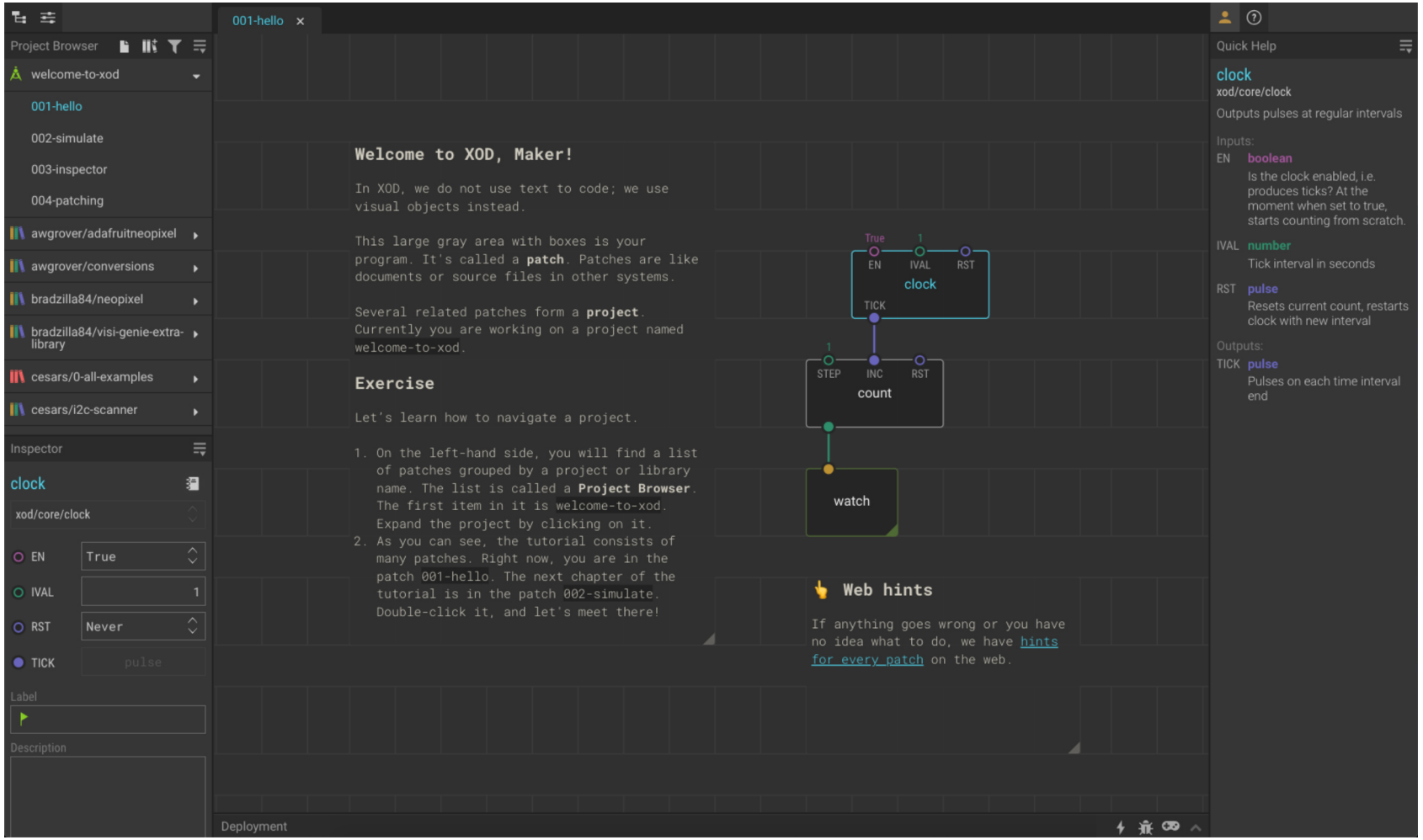
**I2C** I2C (require address)

| PIN | DEVICE |
|---|---|
| A0 | Rotary Potentiometer |
| A2 | Sound Sensor |
| A6 | Light Sensor |
| D3 | Temperature and Humidity Sensor |
| D4 | LED |
| D5 | Buzzer |
| D6 | Button |
| I2C (19h) | Three-Axis Accelerator |
| I2C (77h) | Air Pressure Sensor |
| I2C (3Ch) | OLED Screen |

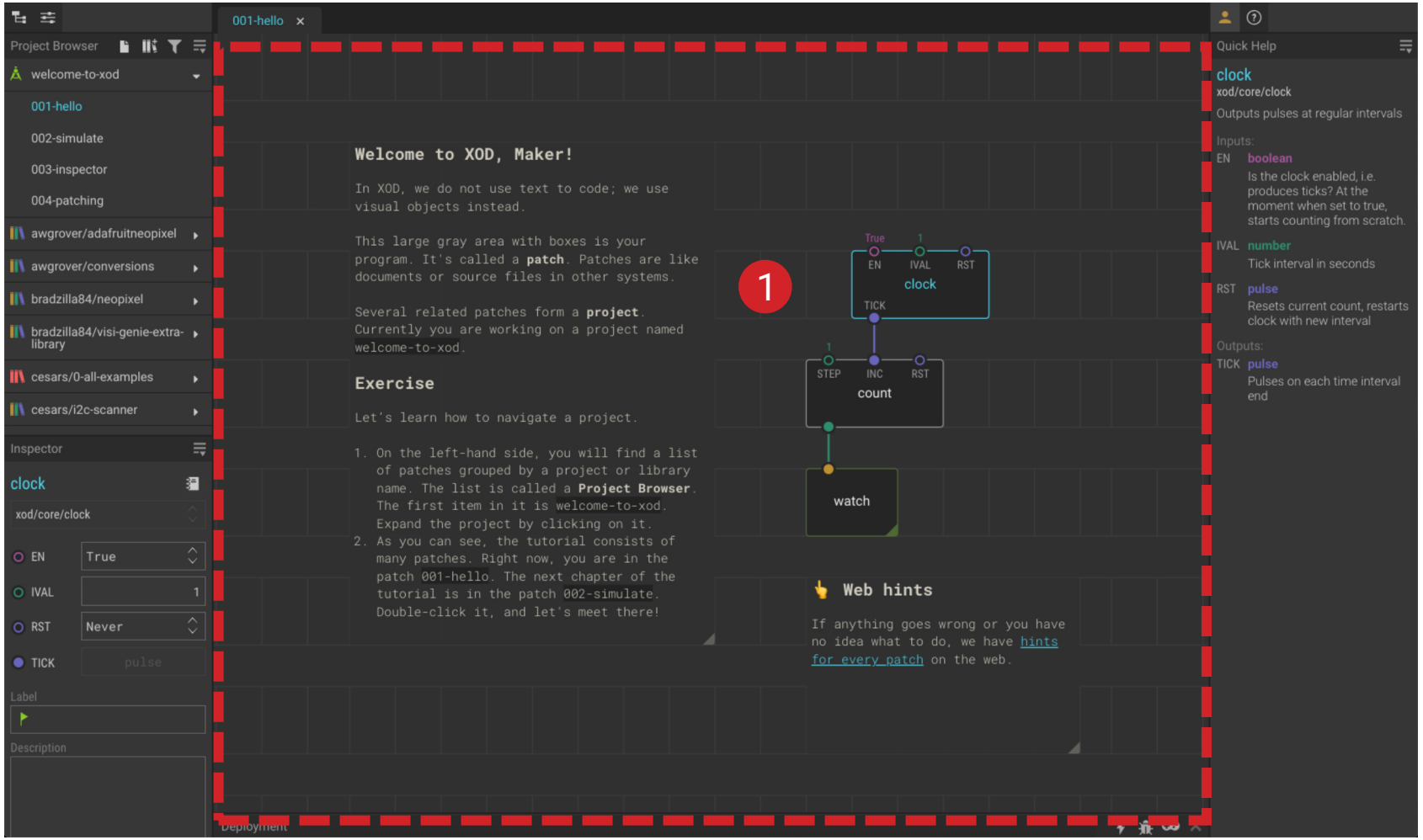

Development Host
(Laptop/PC)
1
XOD
2
USB
interface
3
Arduino
4
USB
interface
5
Microcontroller
6
Component
(e.g. Buzzer)



# The XOD IDE


001-hello
Project Browser
welcome-to-xod
001-hello
002-simulate
003-inspector
004-patching
awgrover/adafruitneopixel
awgrover/conversions
bradzilla84/neopixel
bradzilla84/visi-genie-extra-library
cesars/0-all-examples
cesars/i2c-scanner
Inspector
clock
xod/core/clock
EN
True
IVAL
1
RST
Never
TICK
pulse
Label
Description
Welcome to XOD, Maker!
In XOD, we do not use text to code; we use visual objects instead.
This large gray area with boxes is your program. It's called a patch. Patches are like documents or source files in other systems.
Several related patches form a project. Currently you are working on a project named welcome-to-xod.
Exercise
Let's learn how to navigate a project.
1. On the left-hand side, you will find a list of patches grouped by a project or library name. The list is called a Project Browser. The first item in it is welcome-to-xod. Expand the project by clicking on it.
2. As you can see, the tutorial consists of many patches. Right now, you are in the patch 001-hello. The next chapter of the tutorial is in the patch 002-simulate. Double-click it, and let's meet there!
True
1
EN
IVAL
RST
clock
TICK
1
STEP
INC
RST
count
watch
Web hints
If anything goes wrong or you have no idea what to do, we have hints for every patch on the web.
Deployment
Quick Help
clock
xod/core/clock
Outputs pulses at regular intervals
Inputs:
EN boolean
Is the clock enabled, i.e. produces ticks? At the moment when set to true, starts counting from scratch.
IVAL number
Tick interval in seconds
RST pulse
Resets current count, restarts clock with new interval
Outputs:
TICK pulse
Pulses on each time interval end

# 1 Your Patch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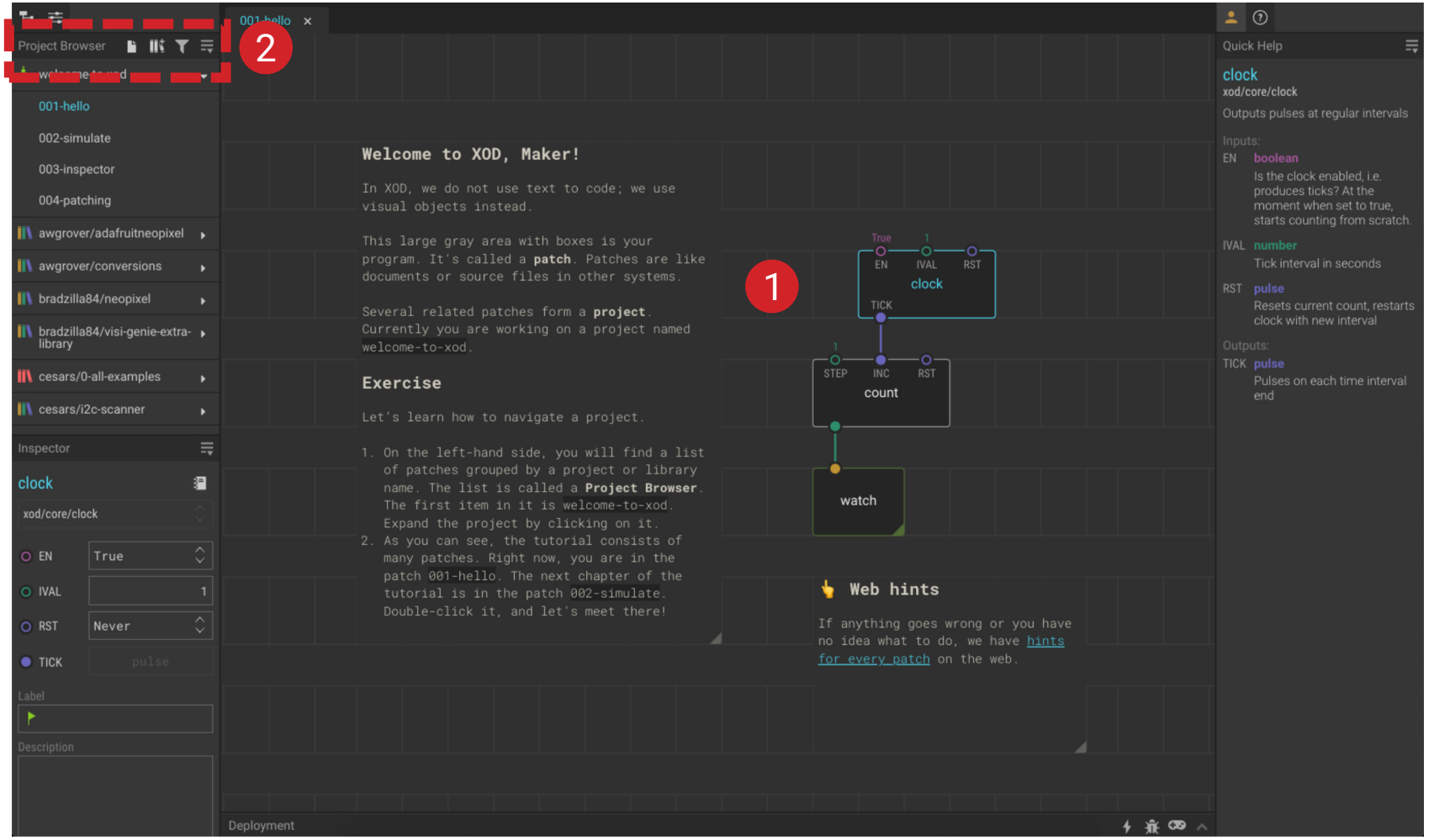
Pulses on each time interval end
Deployment

New Patch  Add Library

**2** Project Browser: Buttons

**1** Your Patch

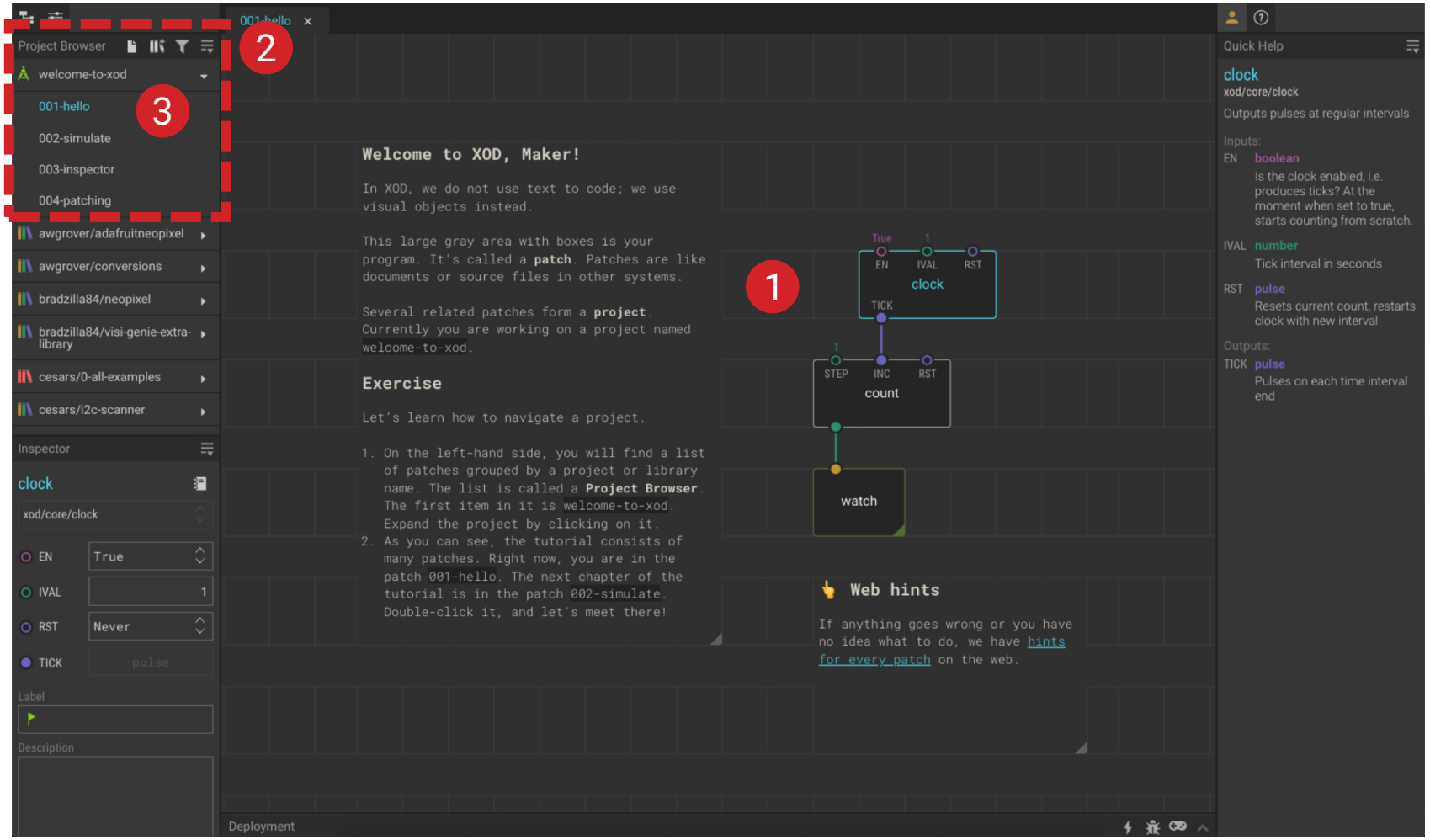


New Patch  Add Library

**1** Your Patch

**2** Project Browser: Buttons

**3** Project Browser: Project Patches



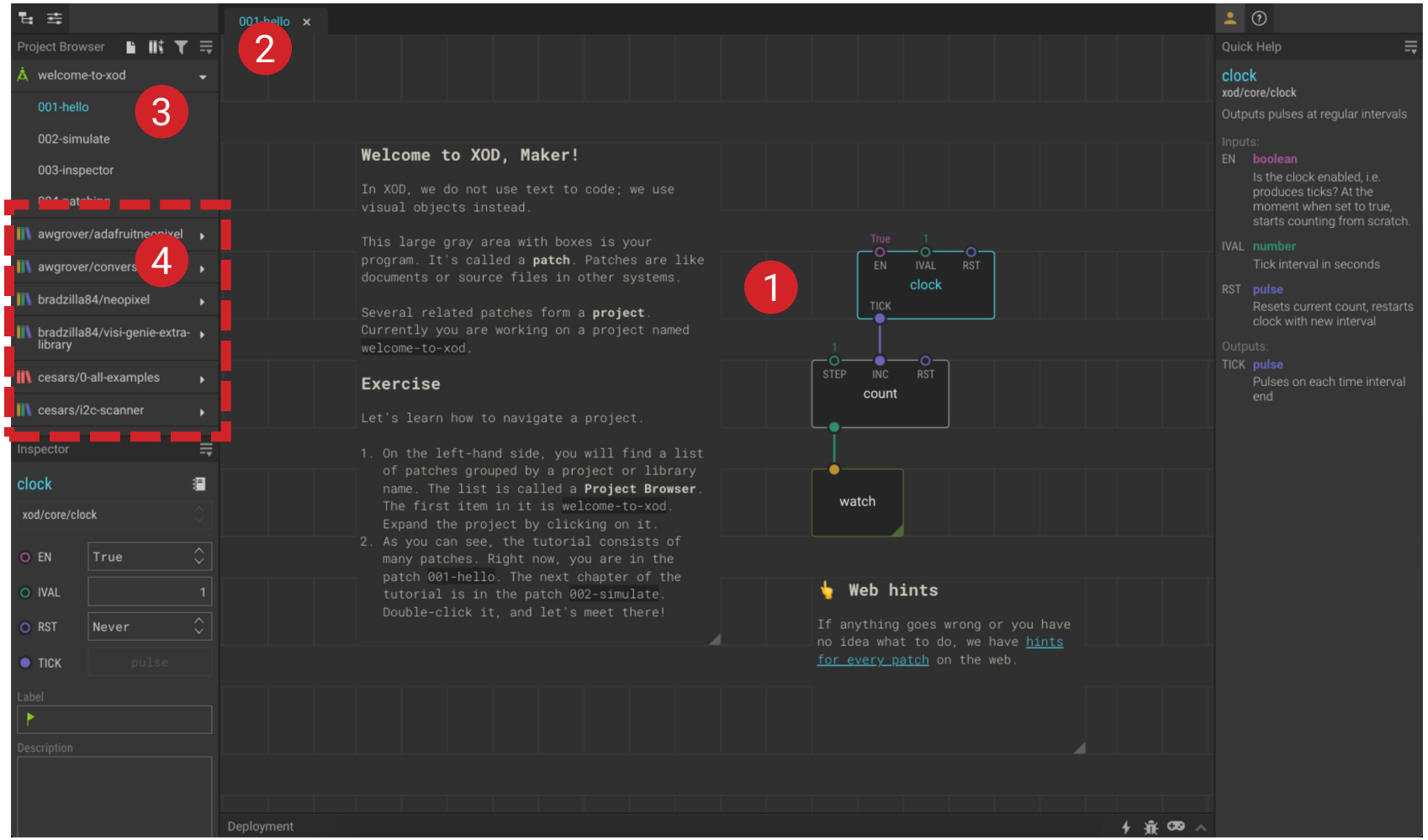
New Patch  Add Library

**1** Your Patch

**2** Project Browser: Buttons

**3** Project Browser: Project Patches

**4** Project Browser: Libraries



New Patch  Add Library

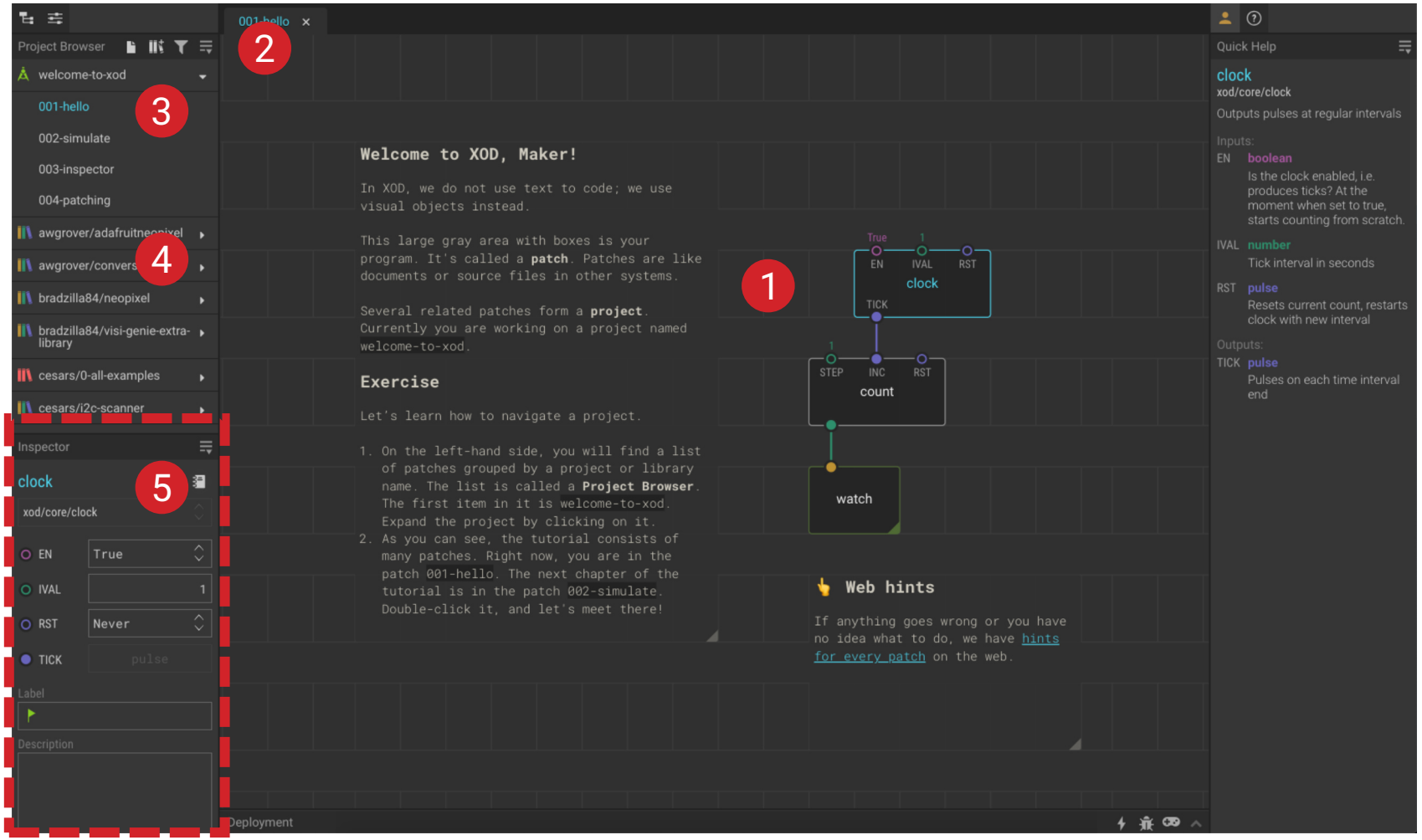
**1** Your Patch

**2** Project Browser: Buttons

**3** Project Browser: Project Patches

**4** Project Browser: Libraries

**5** Inspector



New Patch  Add Library

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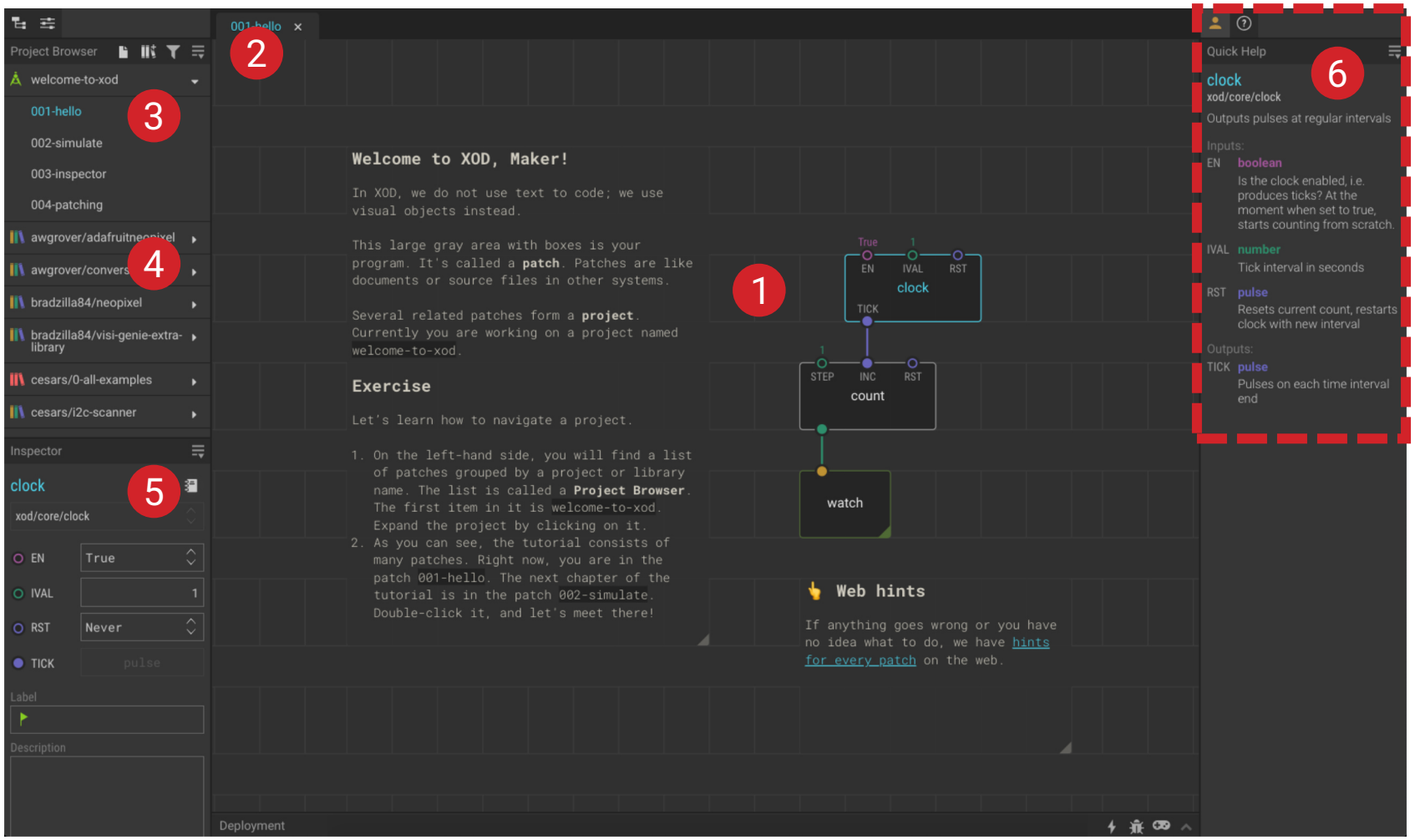



**2** Project Browser: Buttons

**3** Project Browser: Project Patches

**4** Project Browser: Libraries

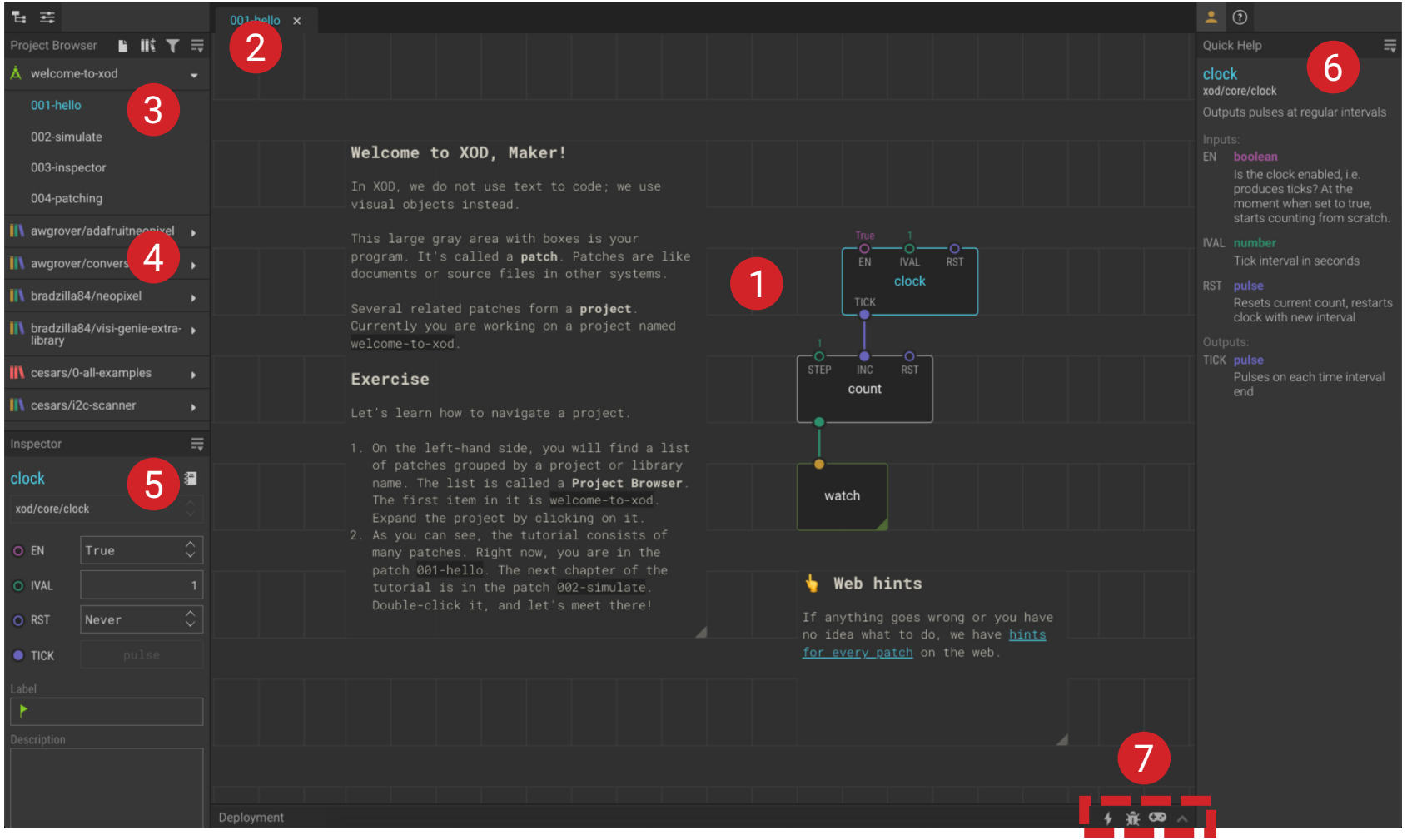
**5** Inspector

**6** Quick Help

New Patch

Add Library

**1** Your Patch




**2** Project Browser: Buttons

**3** Project Browser: Project Patches

**4** Project Browser: Libraries

**5** Inspector

**6** Quick Help

**7** Upload Buttons

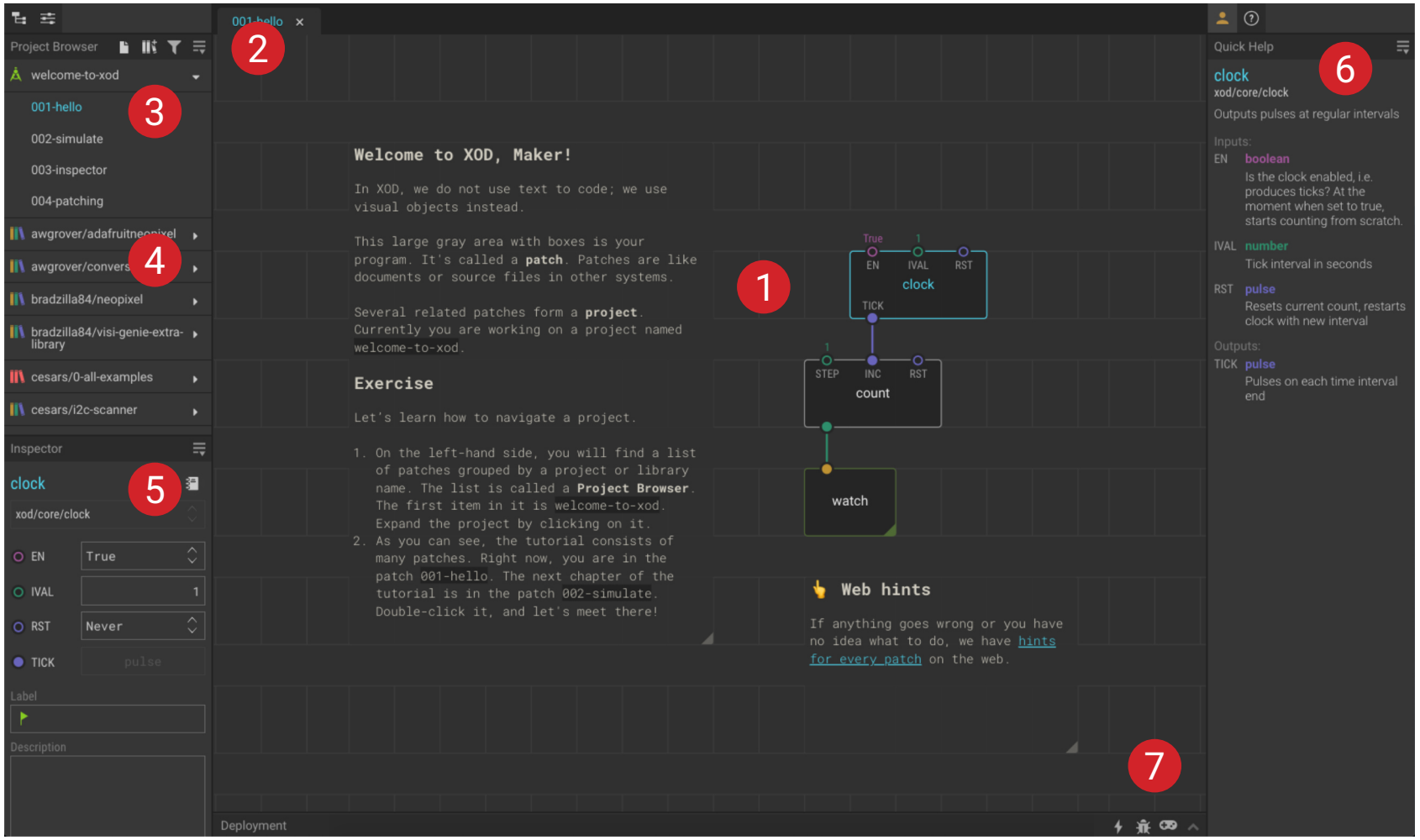
Upload

Upload And Debug

New Patch

Add Library

**1** Your Patch




**2** Project Browser: Buttons

**3** Project Browser: Project Patches

**4** Project Browser: Libraries

**5** Inspector

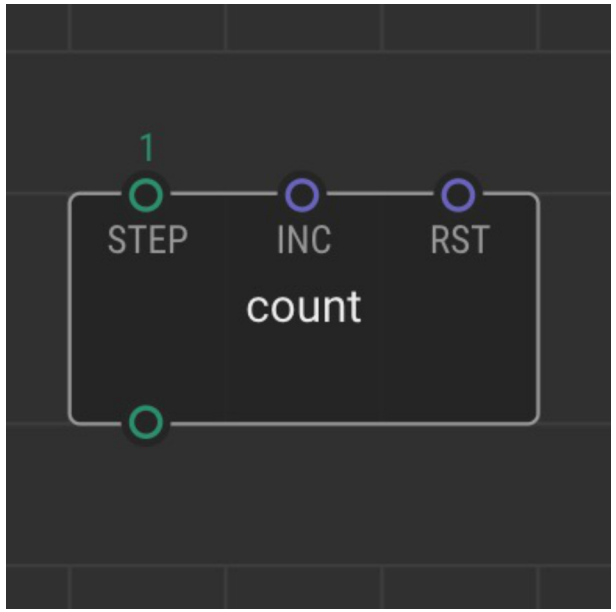
**6** Quick Help

**7** Upload Buttons

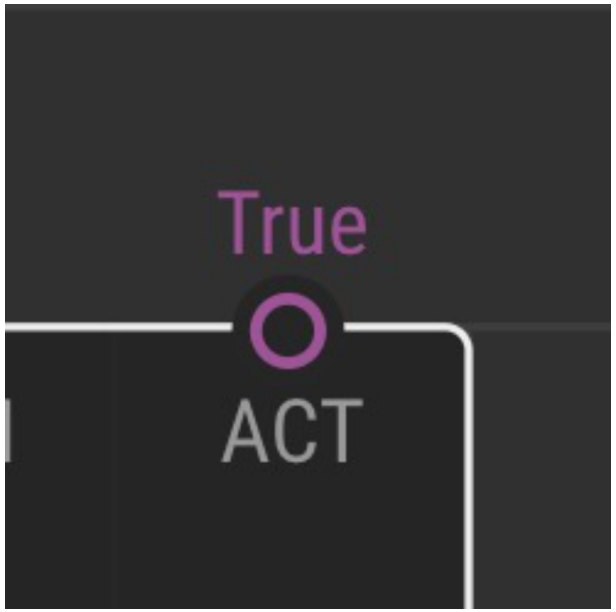
Upload

Upload And Debug

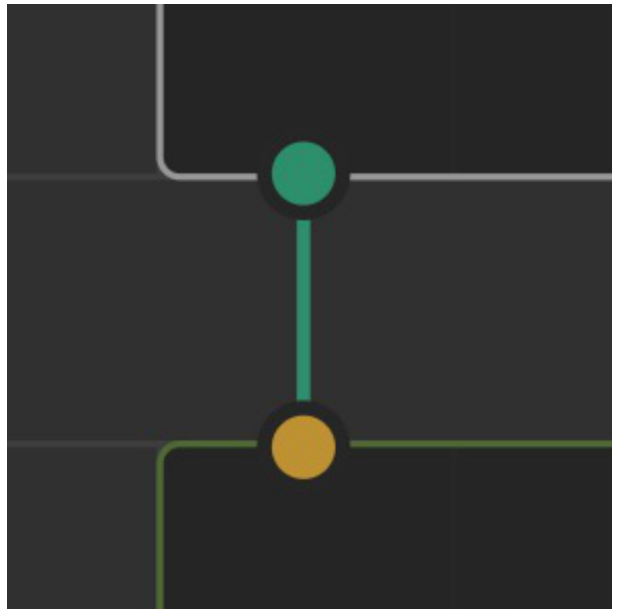
# Nodes




# Pins




# Links

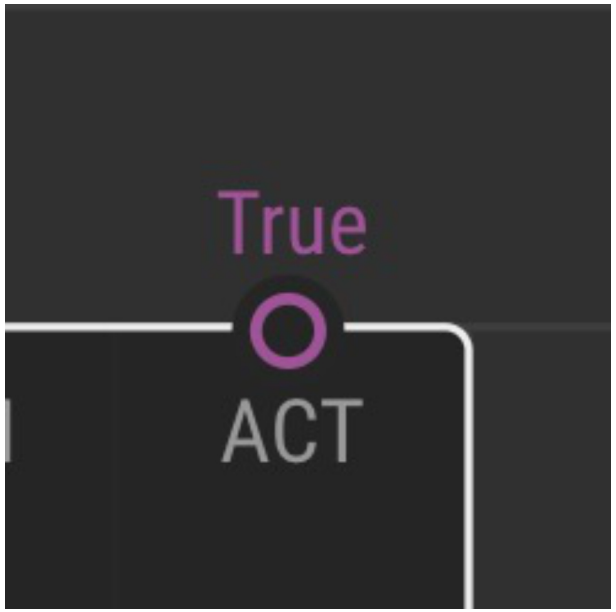


# Pins

Pulse

String

Boolean

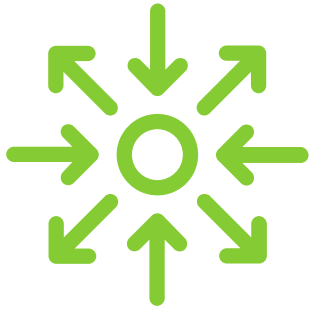



Port

Number

Byte

# Testing Your Board



# Inputs and Outputs

# Breakout Groups – 35min

1. Introduce yourselves
2. Work together and see if each of you can complete the tasks
3. Step-by-step instructions are in the Guide (**p20-29**)
4. Use the ’Ask for Help’ button if necessary

# Congratulations!

# You can now programme an Arduino Board!

# Homework Challenge!

1. How can you expand on your simple programme?
2. Can you use the potentiometer to turn the buzzer on?
3. Can you make the buzzer turn on and the LED turn off when the button is pressed?
4. Can you get your light to flash?
5. Work through Lesson 3 in the Guide (p32-45)

# Next Week

**17:00** Welcome and Recap

**17:05** Lesson 3: Explore XOD

Get to grips with some of the most useful nodes in XOD

**17:25** Lesson 4: Building Devices (hands-on session)

Learn how to make your own XOD nodes and use the inbuilt OLED screen

**17:55** Mini-Challenge (breakout groups)

What is the most interesting thing you can build with your Grove board

**16:20** Round-up

# Thank You

## More info:

## www.biomaker.org







# Session 2

# No-Code Programming for Biology

1. Welcome!
2. Turn off your video and mute yourselves for now
3. Feel free to introduce yourselves in the chat
4. As we go along, ask any questions in the chat

# No-Code Programming for Biology

# Today’s Session

**17:00** Welcome and Recap

**17:05** Lesson 3: Explore XOD

Get to grips with some of the most useful nodes in XOD

**17:25** Lesson 4: Building Devices (hands-on session)

Learn how to make your own XOD nodes and use the inbuilt OLED screen

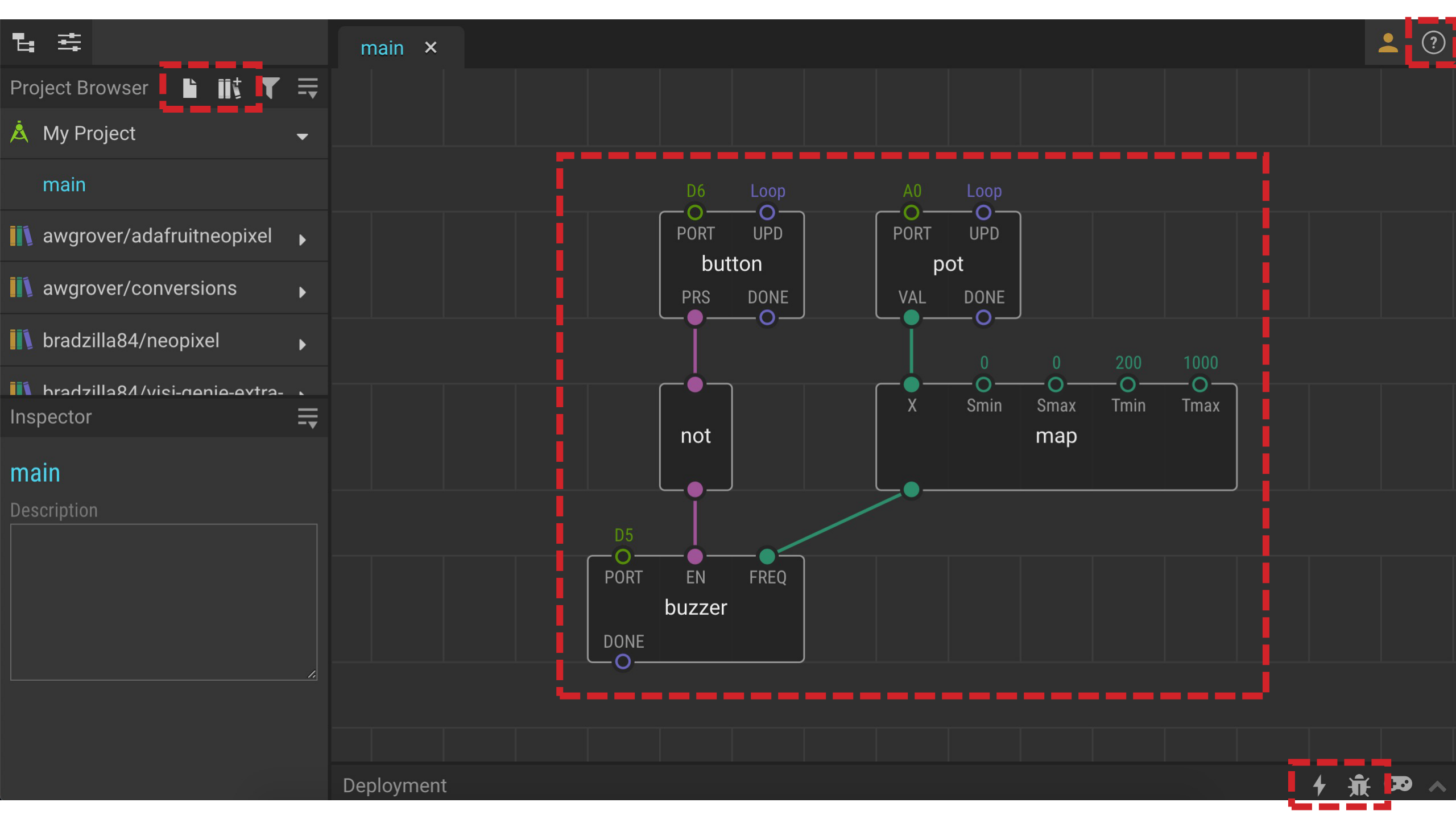
**17:55** Mini-Challenge (breakout groups)

What is the most interesting thing you can build with your Grove board?

**16:20** Round-up

# Last Week's Session

1. The Grove Board (**p6-7**)
2. The Microcontroller (**p8-11**)
3. The XOD IDE (**p12-15**)
4. Turned the LED on using the button (**p20-25**)
5. Controlled the buzzer using the button and potentiometer (**p26-29**)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My Project
main
awgrover/adafruitneopixel
awgrover/conversions
bradzilla84/neopixel
Inspector
main
Description
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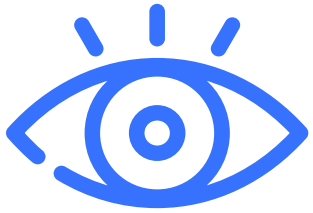
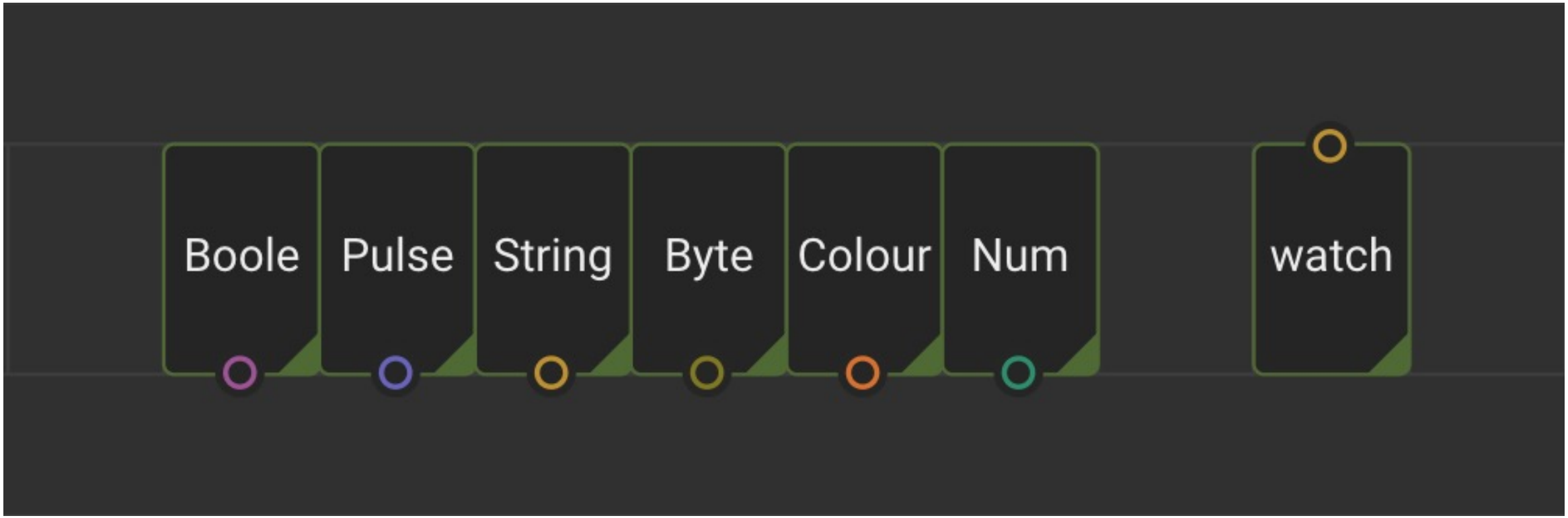
EN
FREQ
buzzer
DONE
Deployment



# Tweak and Watch Nodes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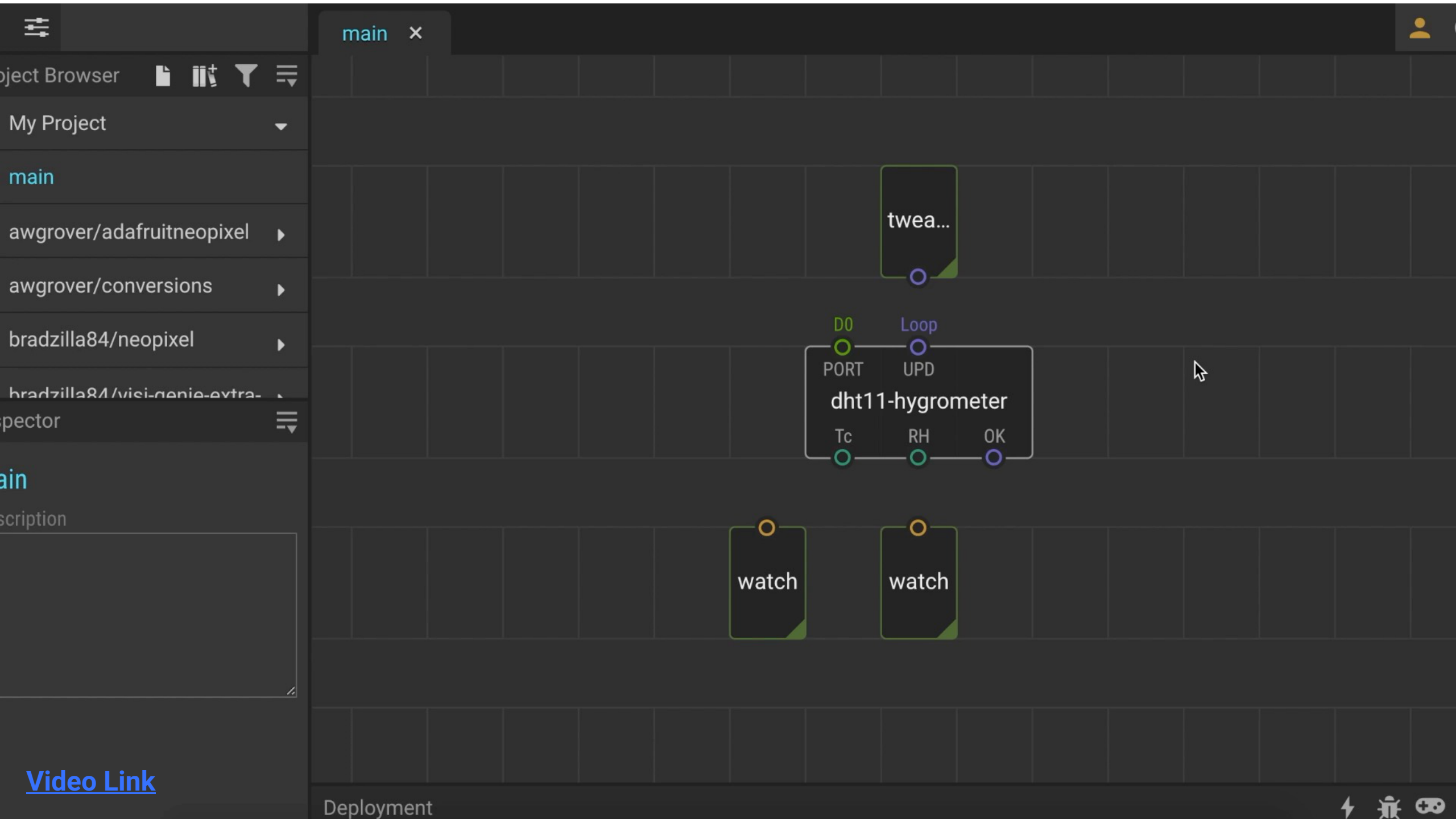
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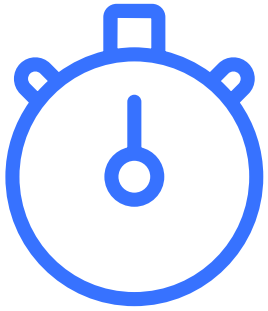
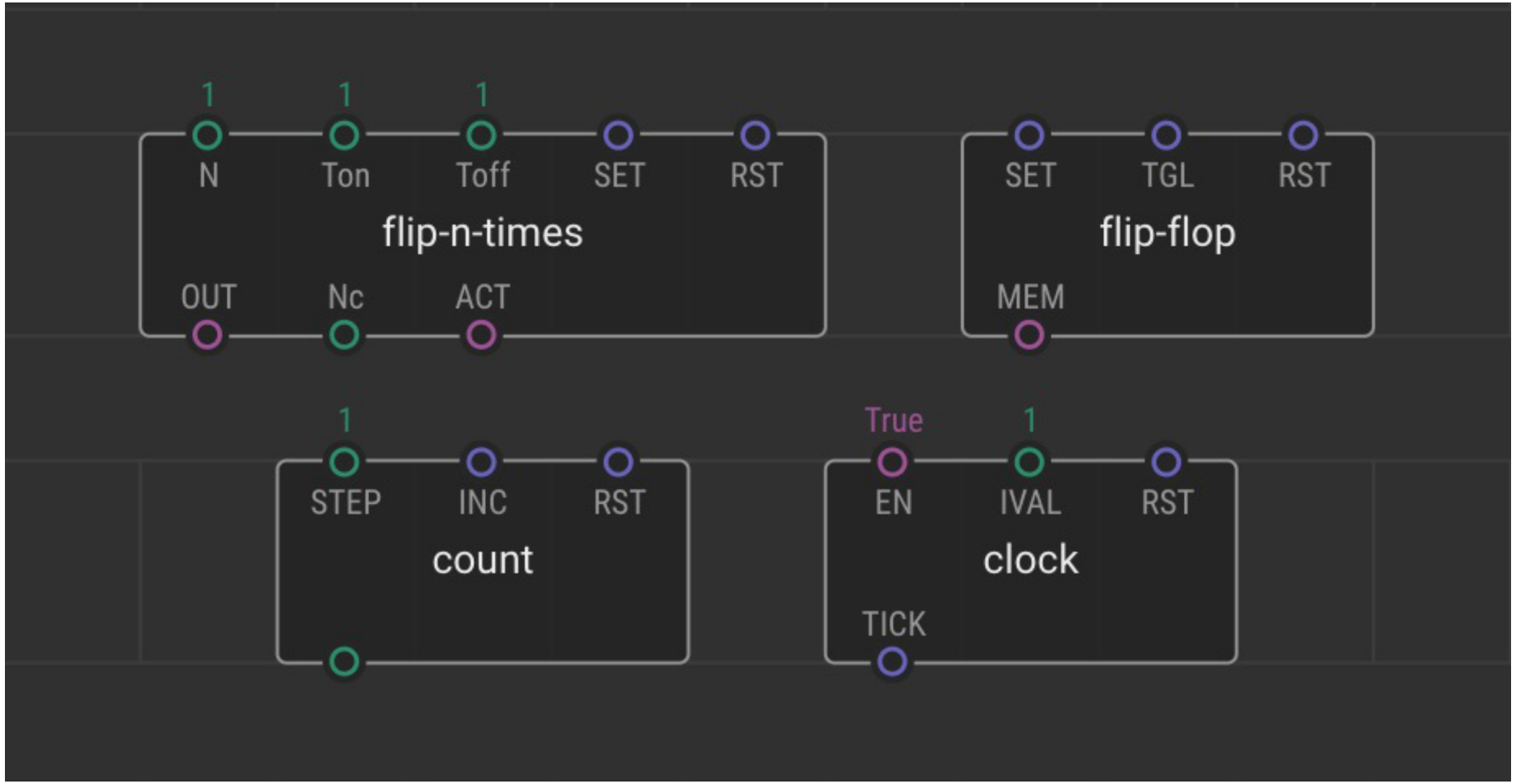
[Video Link]



# Flip, Clock and Count Nodes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RST
flip-n-times
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1
STEP
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RST
count
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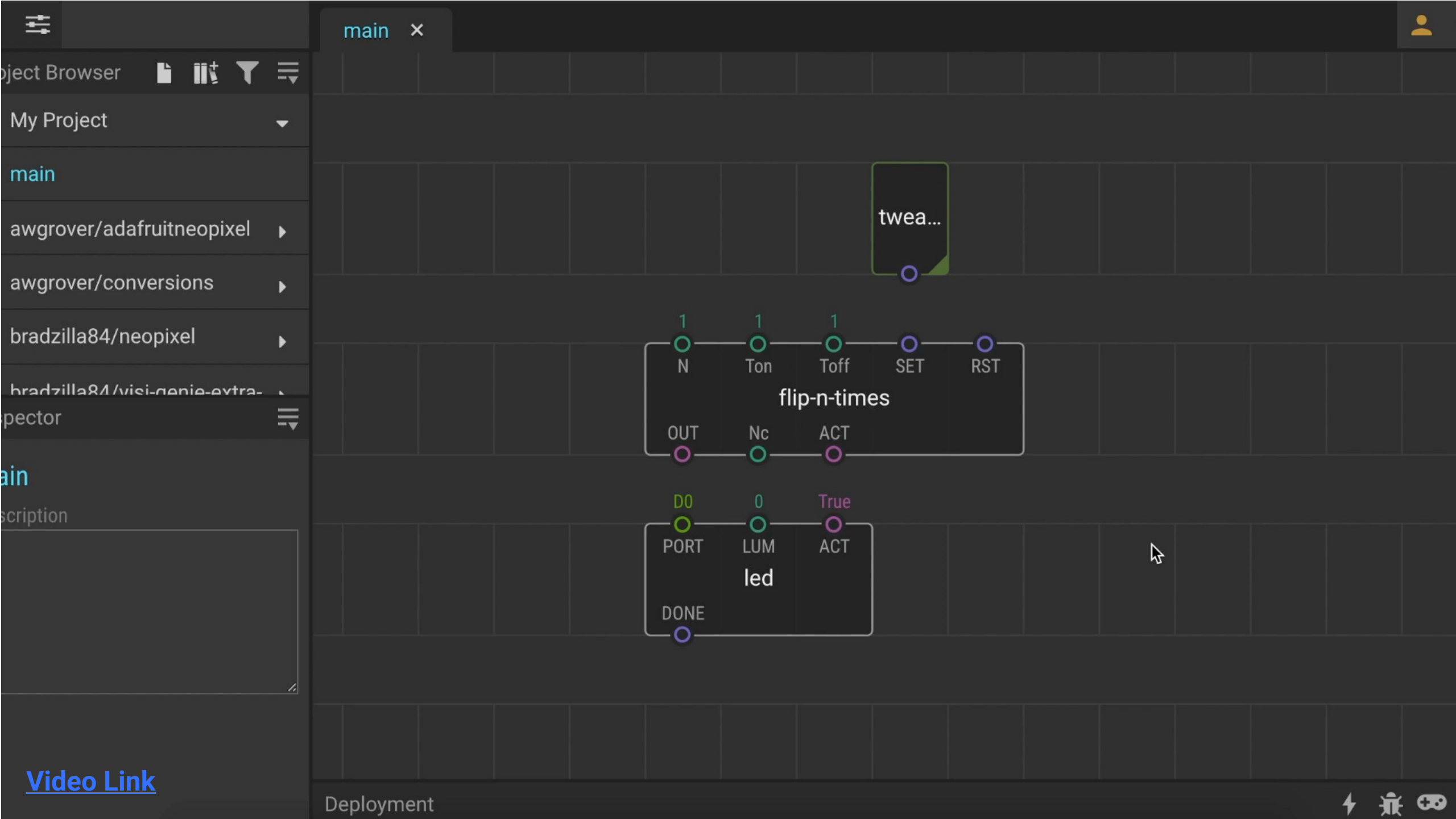
1
EN
IVAL
RST
clock
TICK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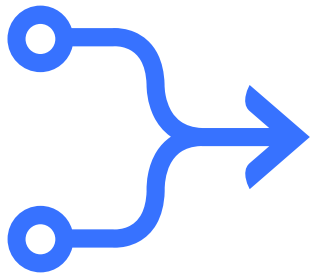
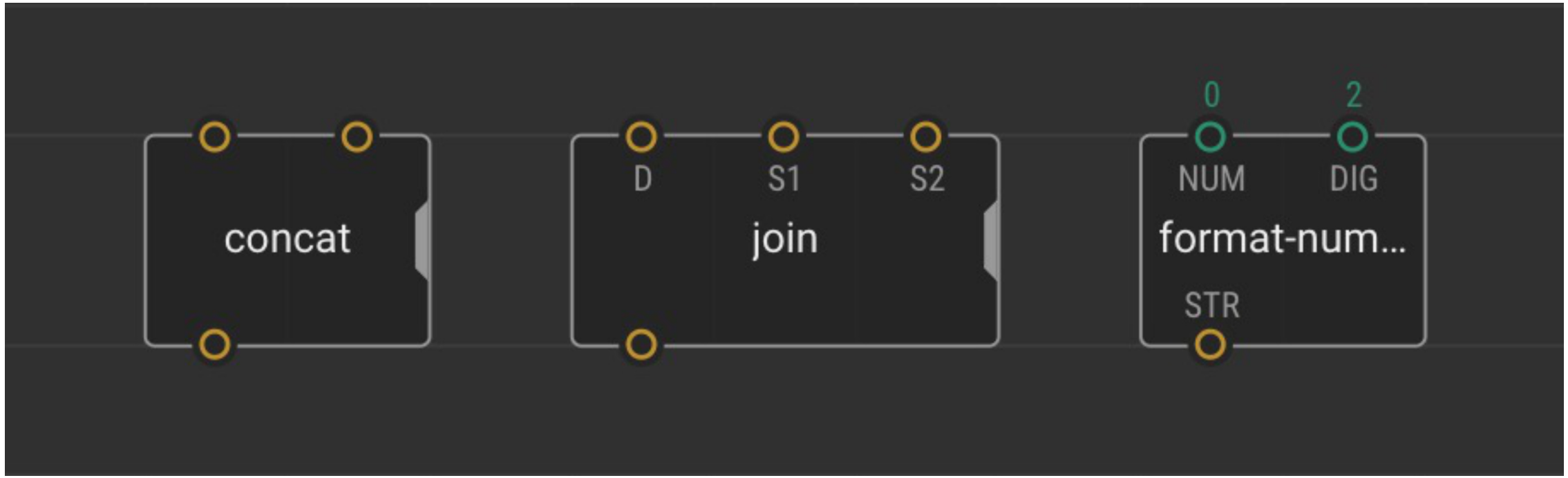
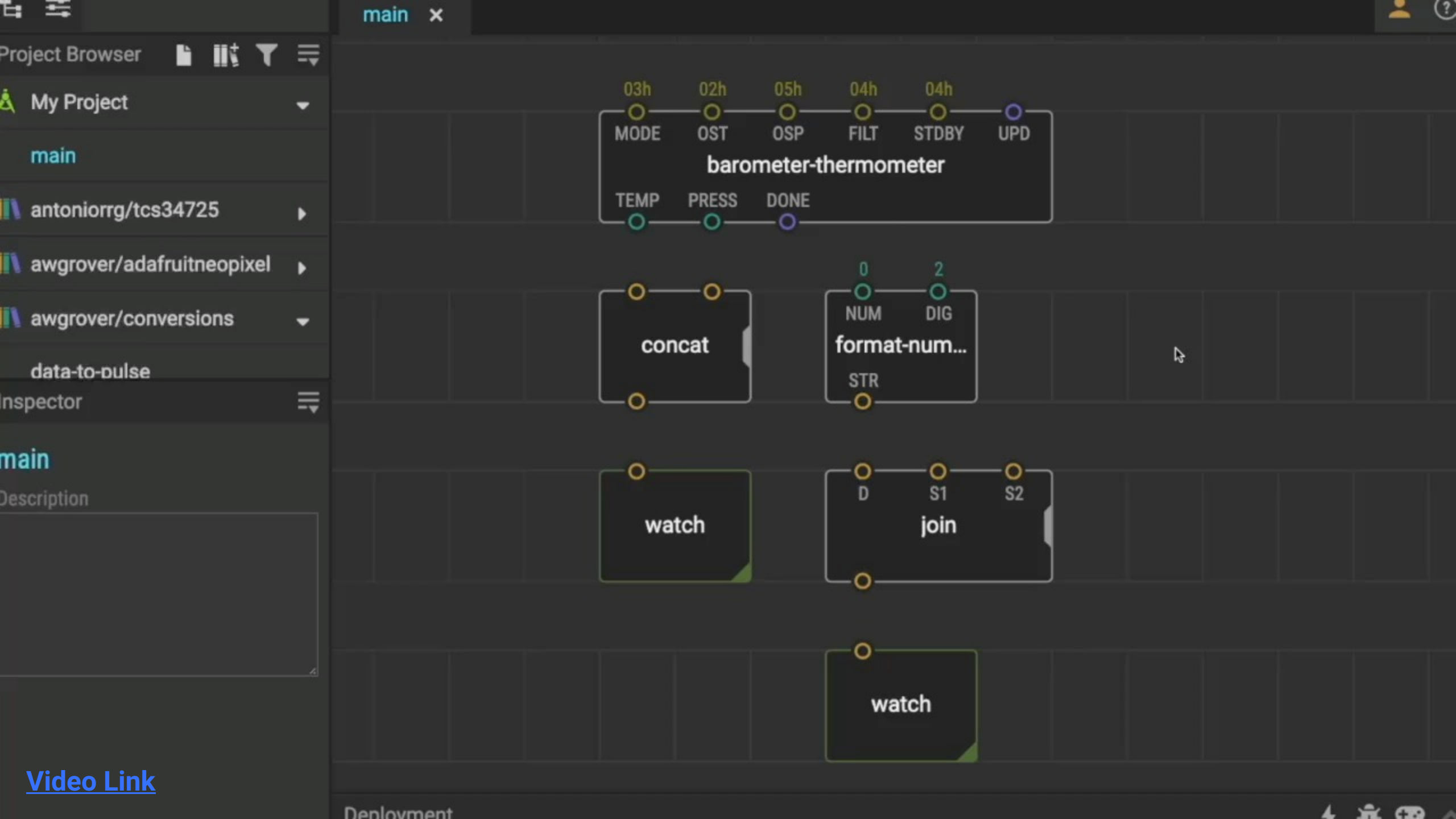
Deployment

Video Link



# Concat, Join and Format-Number Nodes


concat
D
S1
S2
join
0
2
NUM
DIG
format-num...
STR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Project Browser
My Project
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antoniorrg/tcs34725
awgrover/adafruitneopixel
awgrover/conversions
data-to-pulse
Inspector
main
Description
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02h
05h
04h
04h
MODE
OST
OSP
FILT
STDBY
UPD
barometer-thermometer
TEMP
PRESS
DONE
concat
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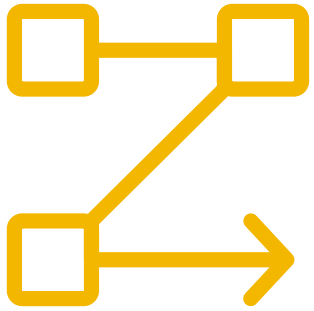
2
NUM
DIG
format-num...
STR
watch
D
S1
S2
join
watch
Deployment

[Video Link]



# Creating New Nodes


IN1
IN2
IN3
IN4
IN5
IN6
IN7
False
00h
0
D0
OUT1
OUT2
OUT3
OUT4
OUT5
OUT6
OUT7

# The Challenge!

# Breakout Rooms and Idea Session

1. Meet your new group and introduce yourselves
2. Work through Task 6 (**p50-54**)
3. Discuss ideas – what is the most interesting thing you can do with the OLED screen and other onboard devices?
4. Make a list – what things would you need to be able to make a device of your choice?

# Thank You

## More info:

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