Agenda

Midterm Review

Semester Lookahead

Serial Intro

Serial Workshop

What does this mean?

What does this mean?

What does this mean?

This is not a painting by Magritte

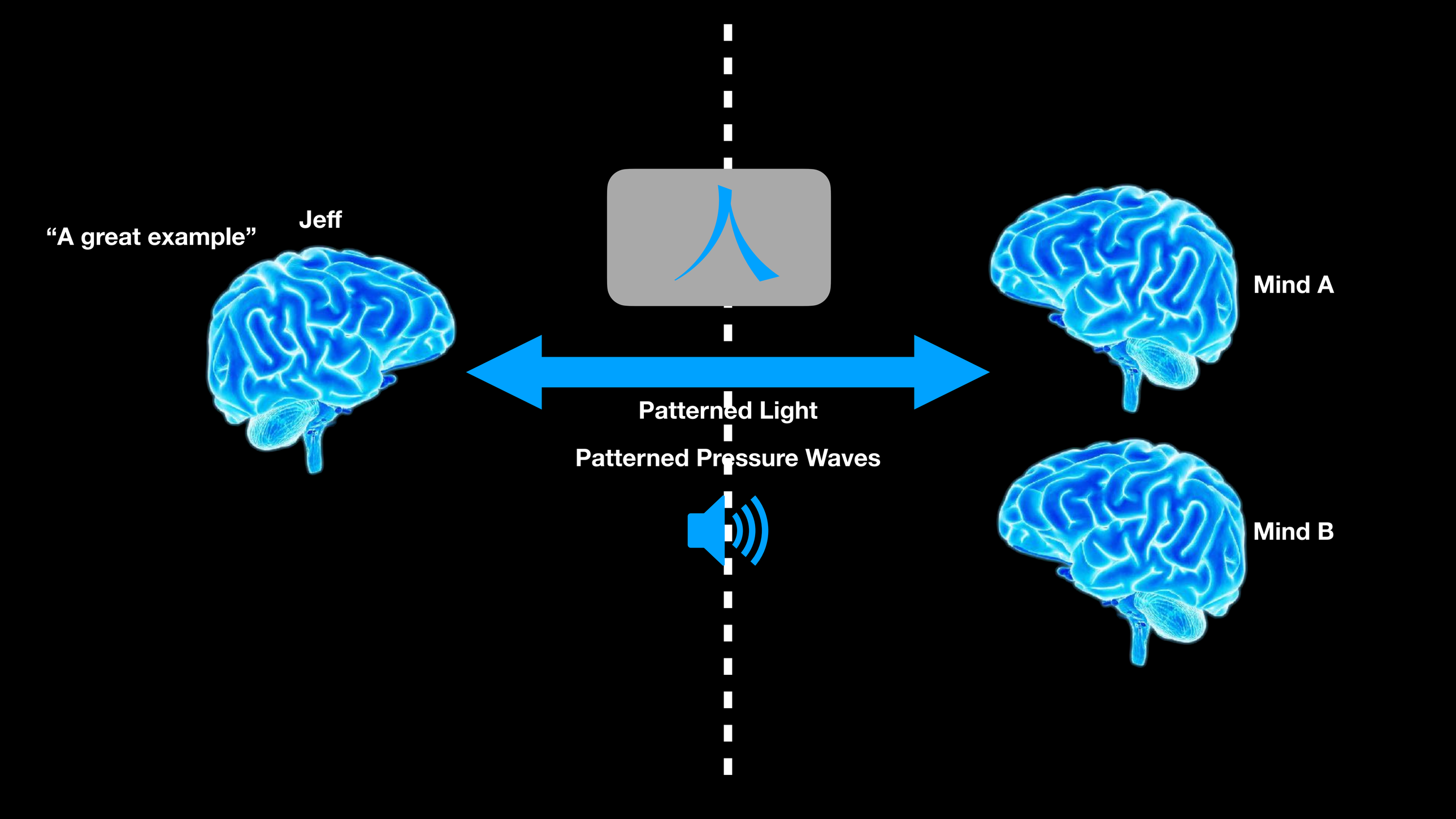
This is not the idea that this is not a painting by Magritte…

“A great example”

Jeff

Mind A

Mind B


“A great example”
Jeff
Patterned Light
Patterned Pressure Waves
Mind A
Mind B

“A great example”

Jeff

Patterned Light

Patterned Pressure Waves

“Person”

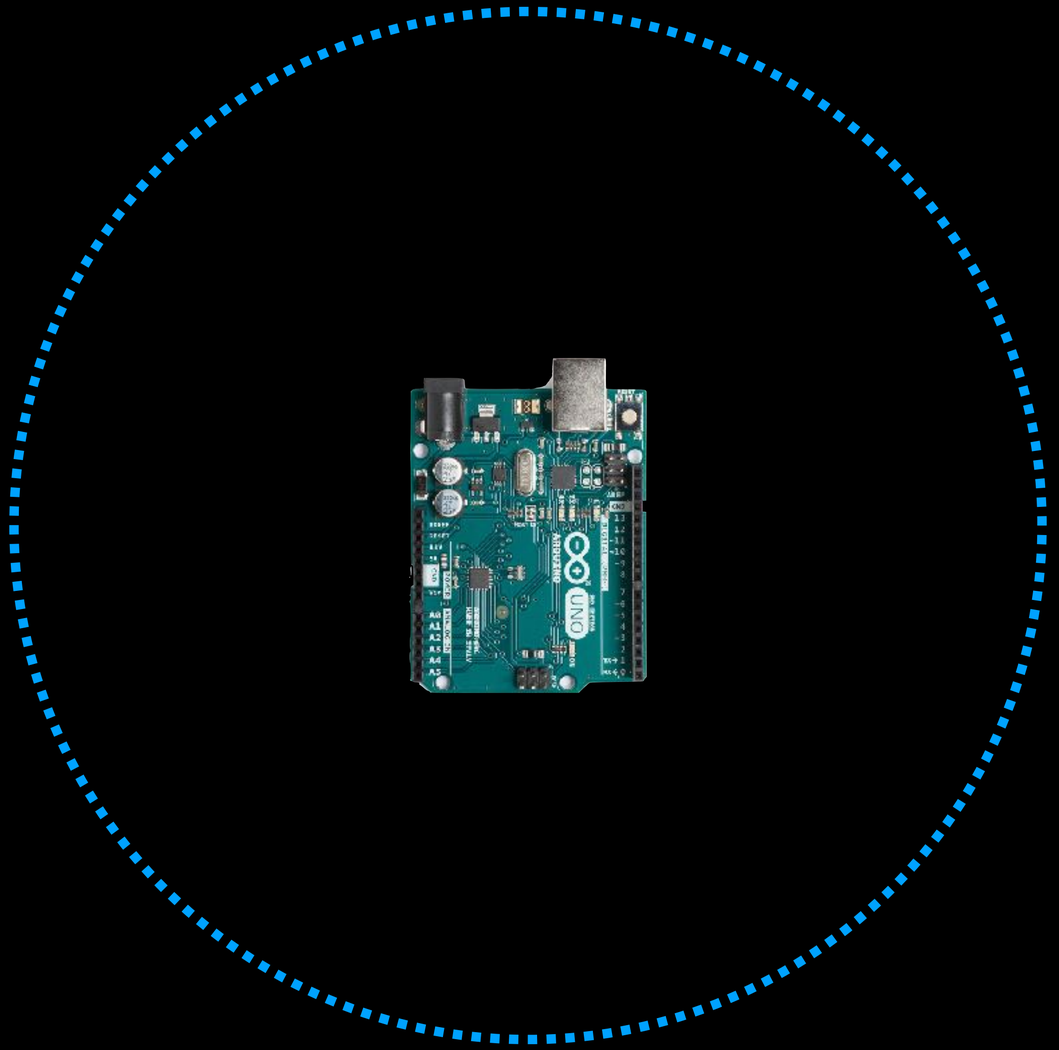
Mind A

Mind B

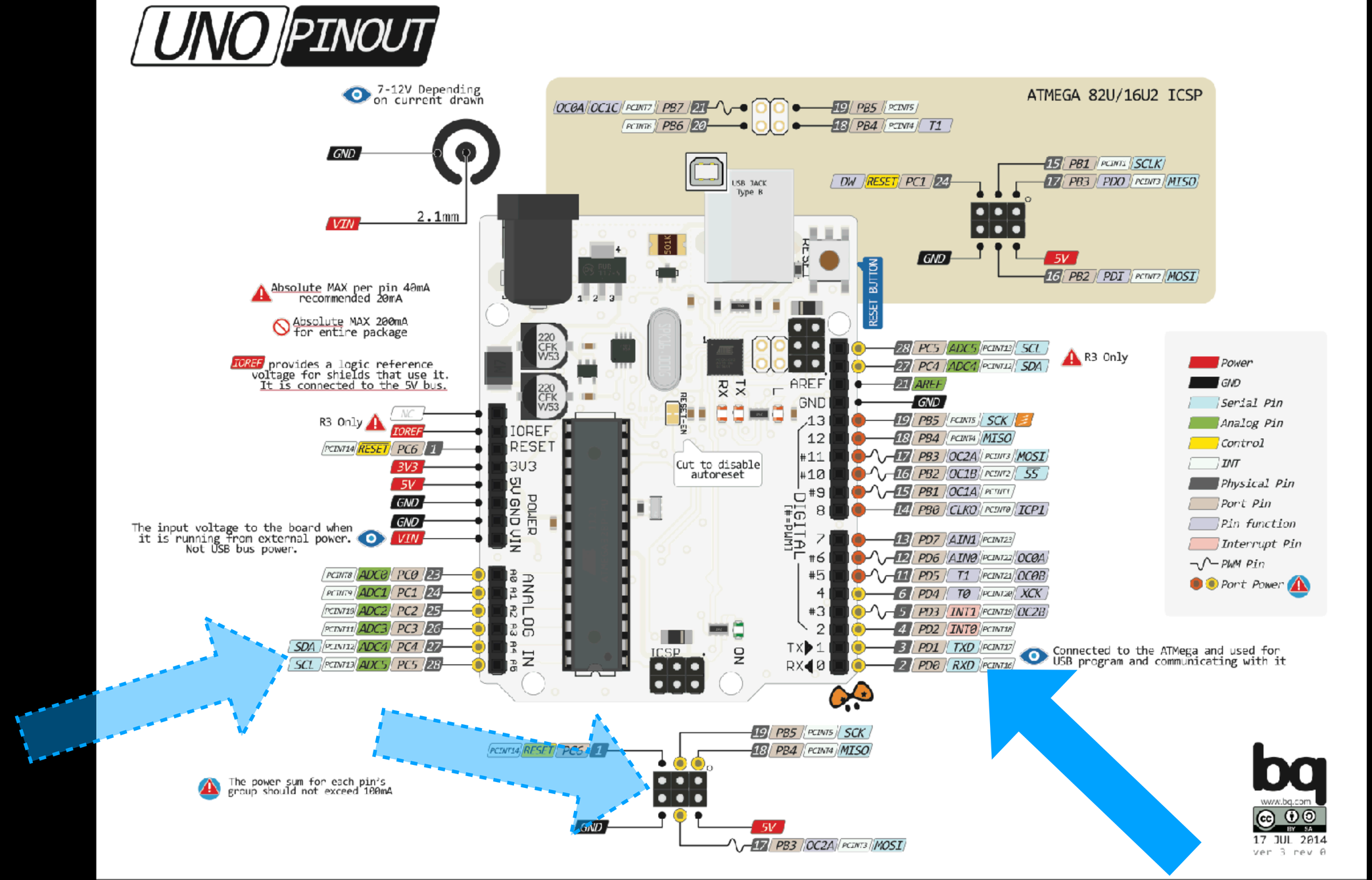
“8? Maybe a triangle?”

Why Serial?


UNO
ARDUINO



Arduino is lonely

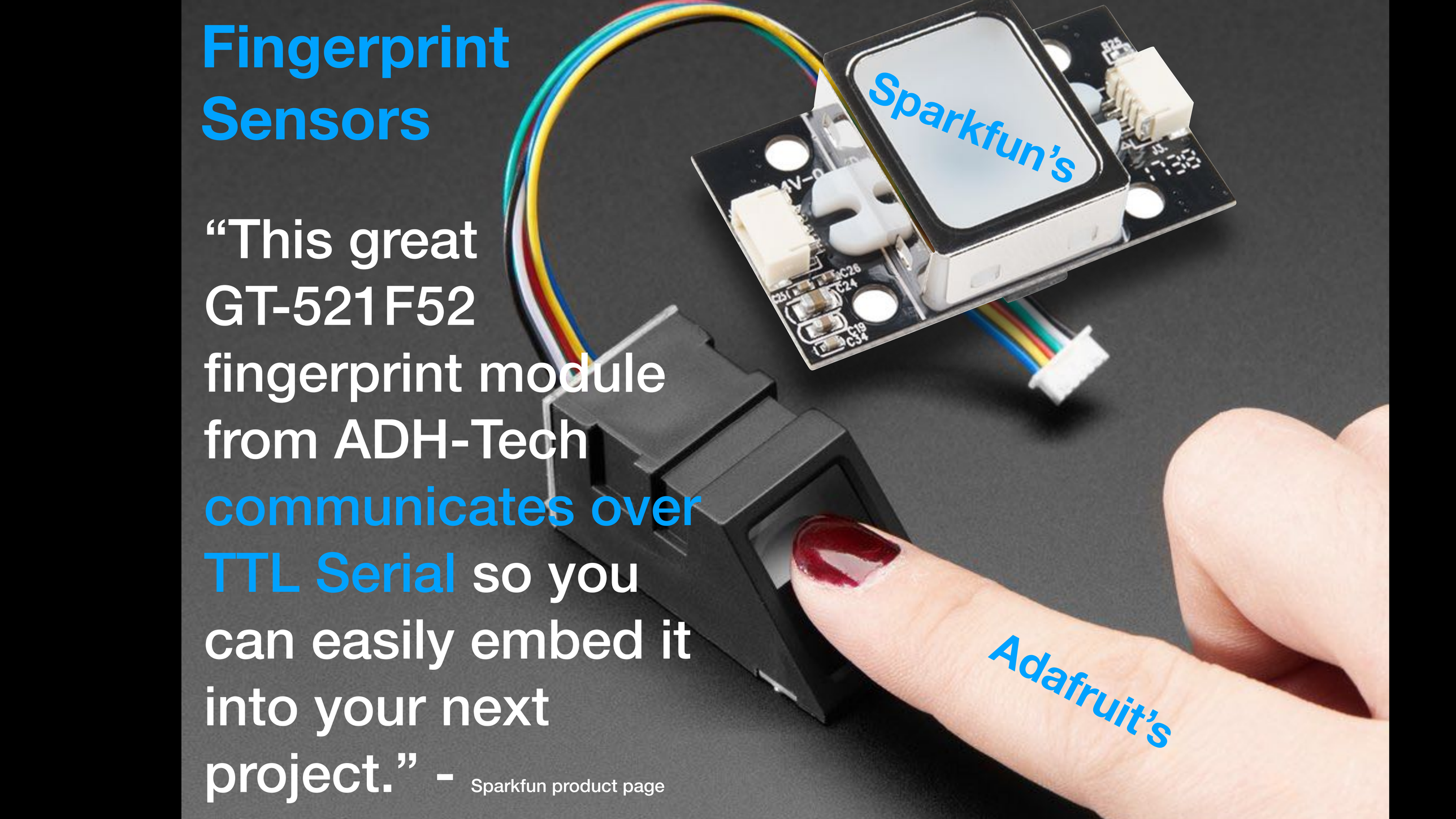


Arduino can talk to the world three ways


p5*JS


p5.js
node
JS
C++
Java

Fingerprint Sensors



"This great GT-521F52 fingerprint module from ADH-Tech communicates over TTL Serial so you can easily embed it into your next project." - Sparkfun product page

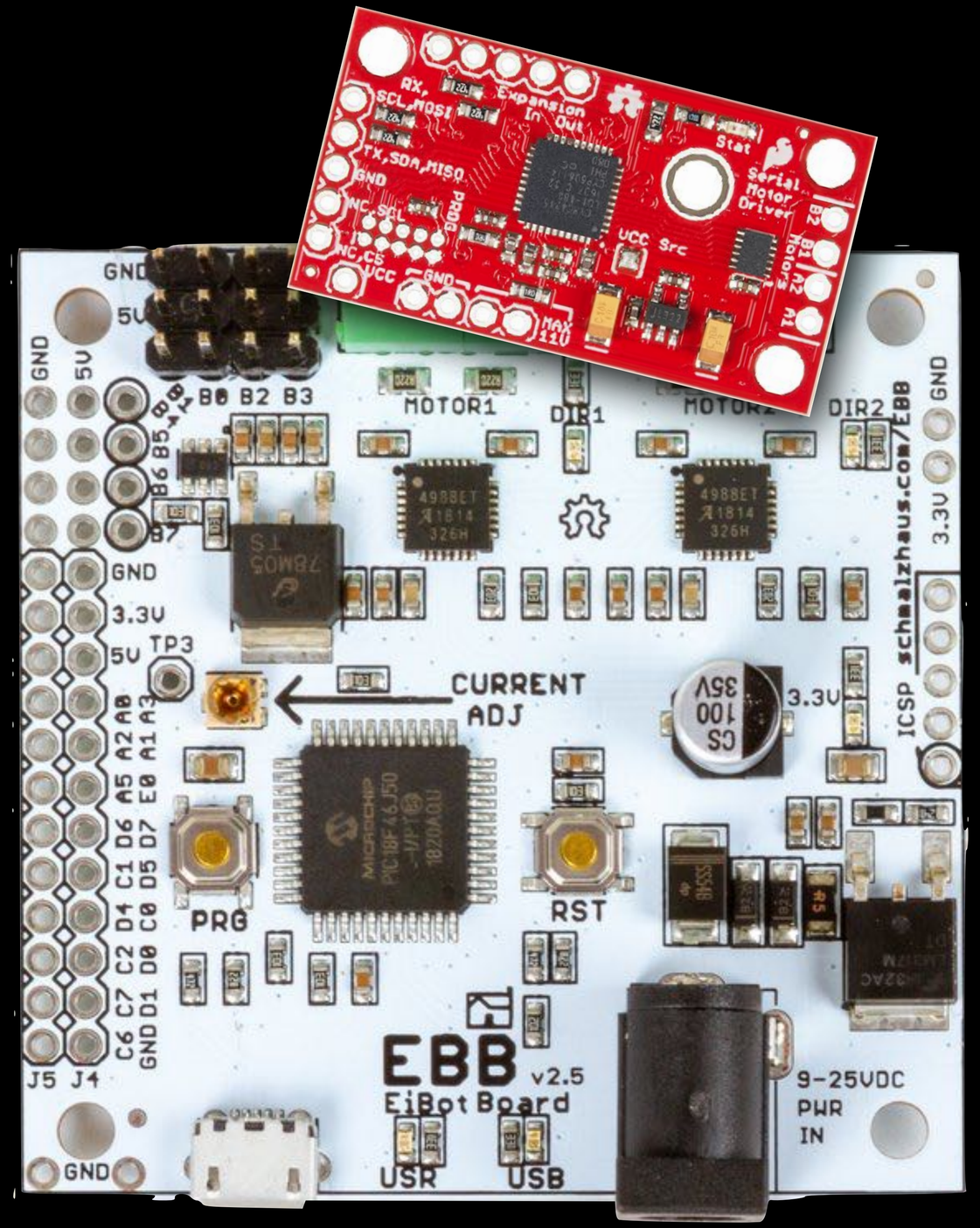
GSM + GPS

“On its own, this module can't do anything. It requires a microcontroller to drive it! We suggest and use an Arduino but any 3-5V microcontroller with a UART can send and receive commands over the RX/TX pins.”

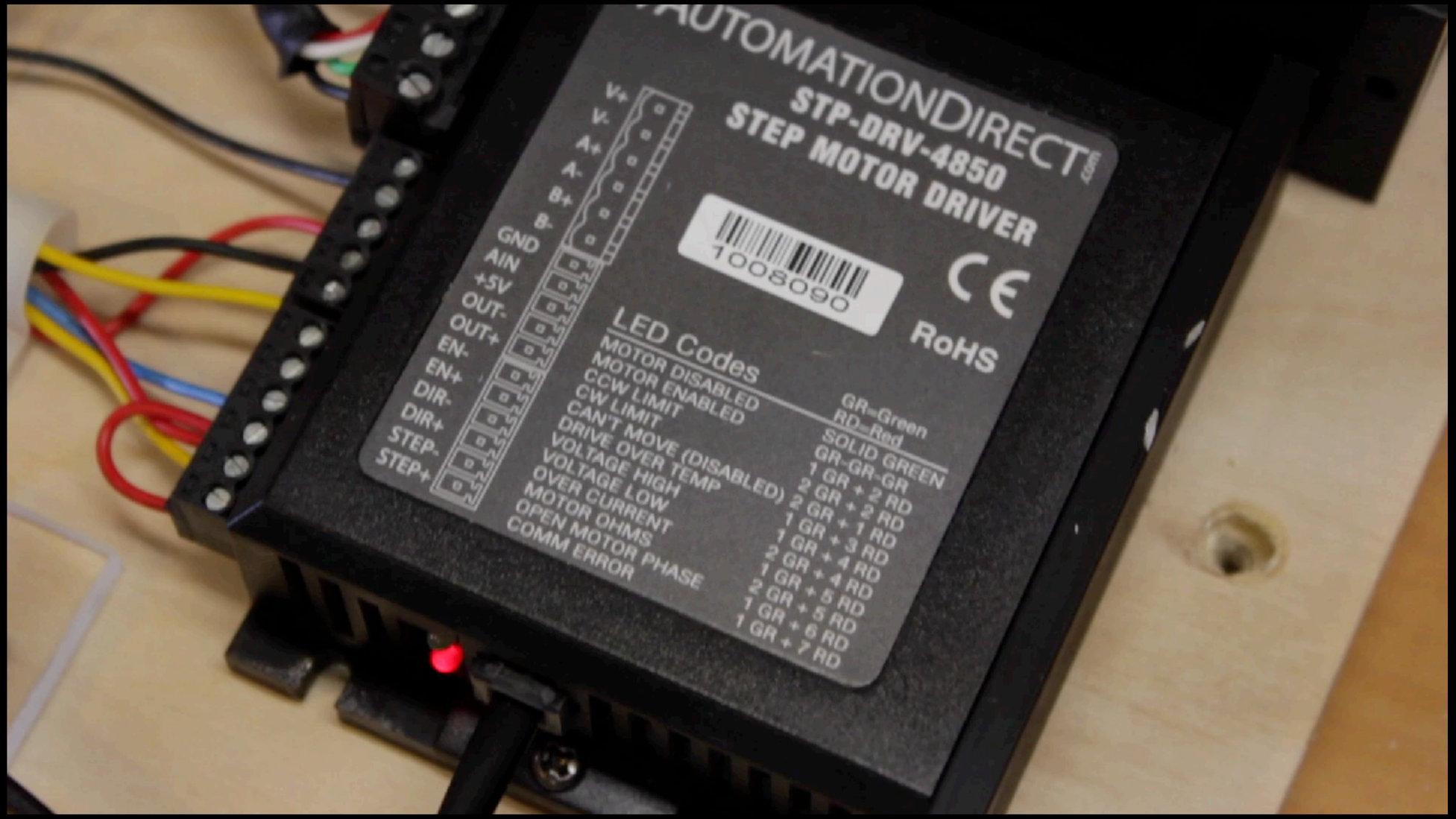
- Adafruit product page

Cheap Motor Control

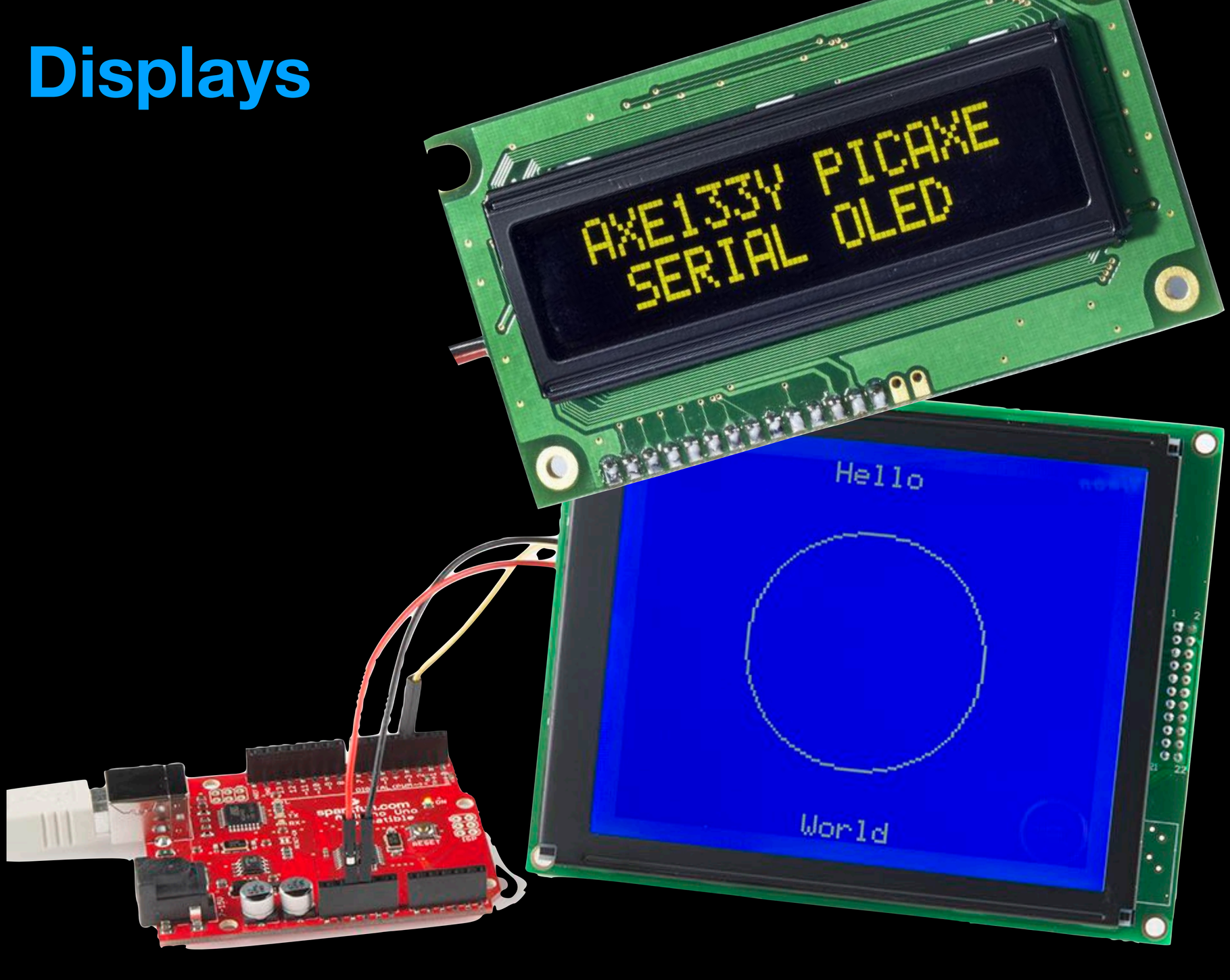
“You can easily type commands to it using a terminal emulator, or write your own application to send commands for moving the stepper motors.” - EEB Product page



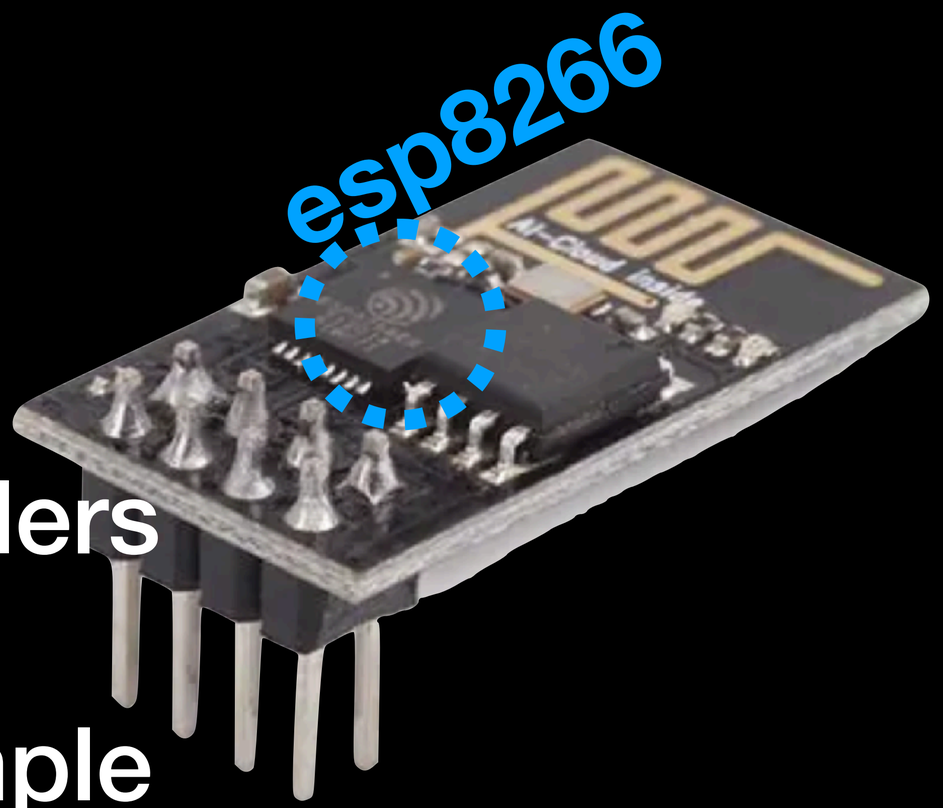
Mid-priced Motor Control


AUTOMATIONDIRECT
STP-DRV-4850
STEP MOTOR DRIVER
10008090
CE
RoHS
V+
V-
A+
A-
B+
B-
GND
AIN
+5V
OUT-
OUT+
EN-
EN+
DIR-
DIR+
STEP-
STEP+
LED Codes
GR=Green
RD=Red
MOTOR DISABLED SOLID GREEN
MOTOR ENABLED GR-GR-GR
CCW LIMIT 1 GR + 2 RD
CW LIMIT 2 GR + 2 RD
CAN'T MOVE (DISABLED) 2 GR + 1 RD
DRIVE OVER TEMP 1 GR + 3 RD
VOLTAGE HIGH 1 GR + 4 RD
VOLTAGE LOW 2 GR + 4 RD
OVER CURRENT 1 GR + 5 RD
MOTOR OHMS 2 GR + 5 RD
OPEN MOTOR PHASE 1 GR + 6 RD
COMM ERROR 1 GR + 7 RD

Displays



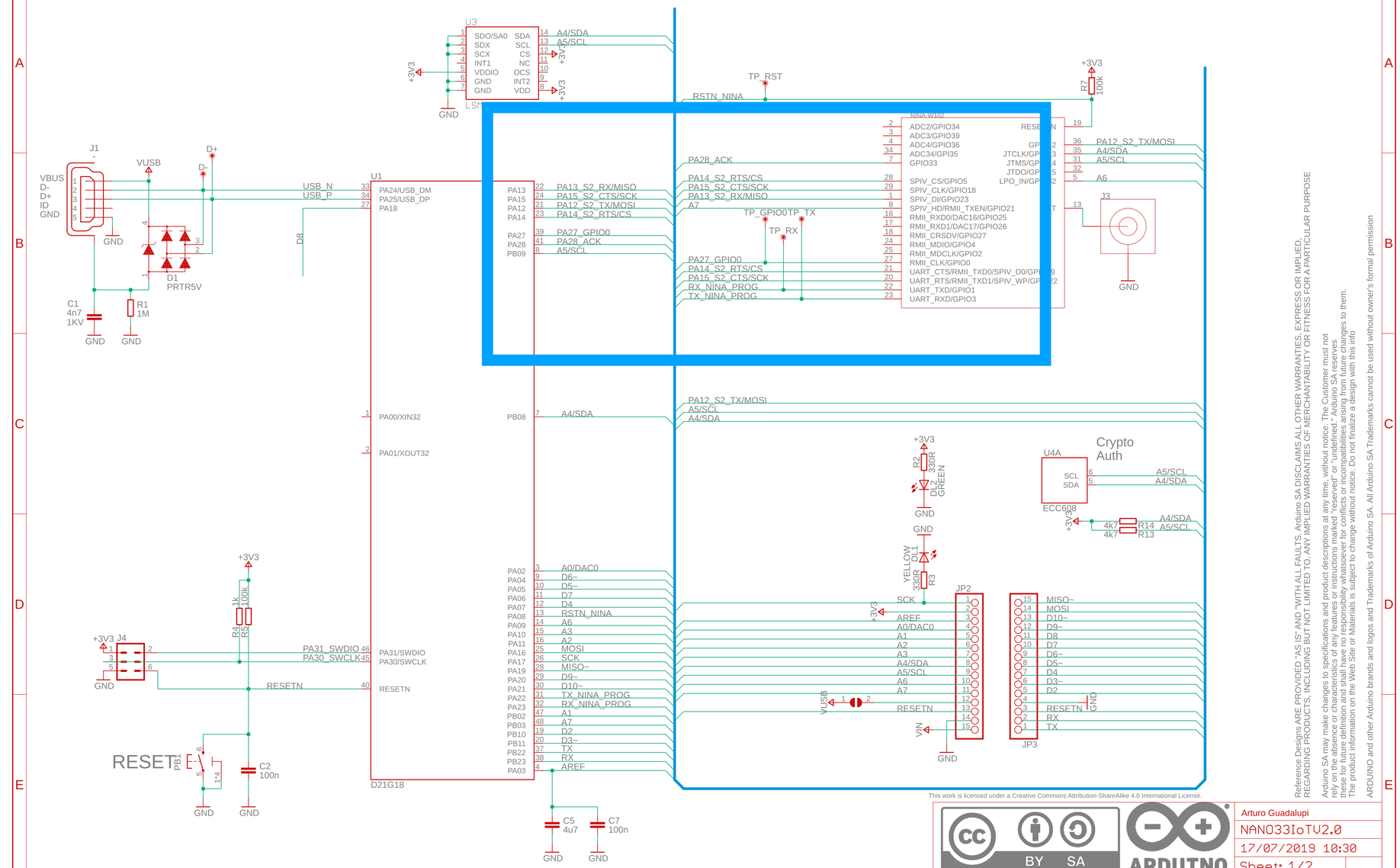
Wifi-serial circa 2014



“This small module allow[ed] microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style [serial] commands.” - Wikipedia

Wifi post 2018

“In late October 2014, Espressif Systems released a software development kit (SDK) for programming the chip directly, which removed the need for a separate microcontroller.” - Wikipedia


U3
SDO/SA0
SDX
SCX
INT1
VDDIO
GND
GND
SDA
SCL
CS
NC
OCS
INT2
VDD
A4/SDA
A5/SCL
+3V3
GND
TP_RST
RSTN_NINA
R7
100k
NINA-W102
ADC2/GPIO34
ADC3/GPIO39
ADC4/GPIO36
ADC34/GPI35
GPIO33
SPIV_CS/GPIO5
SPIV_CLK/GPIO18
SPIV_DI/GPIO23
SPIV_HD/RMII_TXEN/GPIO21
RMII_RXD0/DAC16/GPIO25
RMII_RXD1/DAC17/GPIO26
RMII_CRSDV/GPIO27
RMII_MDIO/GPIO4
RMII_MDCLK/GPIO2
RMII_CLK/GPIO0
UART_CTS/RMII_TXD0/SPIV_D0/GPIO19
UART_RTS/RMII_TXD1/SPIV_WP/GPIO22
UART_TXD/GPIO1
UART_RXD/GPIO3
PA28_ACK
PA14_S2_RTS/CS
PA15_S2_CTS/SCK
PA13_S2_RX/MISO
A7
TP_GPIO0
TP_TX
TP_RX
PA27_GPIO0
PA14_S2_RTS/CS
PA15_S2_CTS/SCK
RX_NINA_PROG
TX_NINA_PROG
PA12_S2_TX/MOSI
A4/SDA
A5/SCL
A6
J3
J1
VBUS
D-
D+
ID
GND
VUSB
D+
D-
D1
PRTR5V
C1
4n7
1KV
R1
1M
USB_N
USB_P
D8
U1
PA24/USB_DM
PA25/USB_DP
PA18
PA13
PA15
PA12
PA14
PA27
PA28
PB09
PA13_S2_RX/MISO
PA15_S2_CTS/SCK
PA12_S2_TX/MOSI
PA14_S2_RTS/CS
PA27_GPIO0
PA28_ACK
A5/SCL
PA00/XIN32
PA01/XOUT32
PB08
A4/SDA
PA12_S2_TX/MOSI
A5/SCL
A4/SDA
+3V3
R2
330R
D12
GREEN
GND
U4A
Crypto
Auth
SCL
SDA
ECC608
A5/SCL
A4/SDA
R14
4k7
R13
4k7
GND
YELLOW
D11
330R
R3
JP2
SCK
AREF
A0/DAC0
A1
A2
A3
A4/SDA
A5/SCL
A6
A7
VUSB
RESETN
VIN
GND
JP3
MISO~
MOSI
D10~
D9~
D8
D7
D6~
D5~
D4
D3~
D2
GND
RESETN
RX
TX
PA02
PA04
PA05
PA06
PA07
PA08
PA09
PA10
PA11
PA16
PA17
PA19
PA20
PA21
PA22
PA23
PB02
PB03
PB10
PB11
PB22
PB23
PA03
A0/DAC0
D6~
D5~
D7
D4
RSTN_NINA
A6
A3
A2
MOSI
SCK
MISO~
D9~
D10~
TX_NINA_PROG
RX_NINA_PROG
A1
A7
D2
D3~
TX
RX
AREF
D21G18
+3V3
J4
PA31_SWDIO
PA30_SWCLK
RESETN
PA31/SWDIO
PA30/SWCLK
RESETN
R4
1k
R5
100k
RESET
PB1
C2
100n
GND
C5
4u7
C7
100n
GND
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17/07/2019 10:30
Sheet: 1/2
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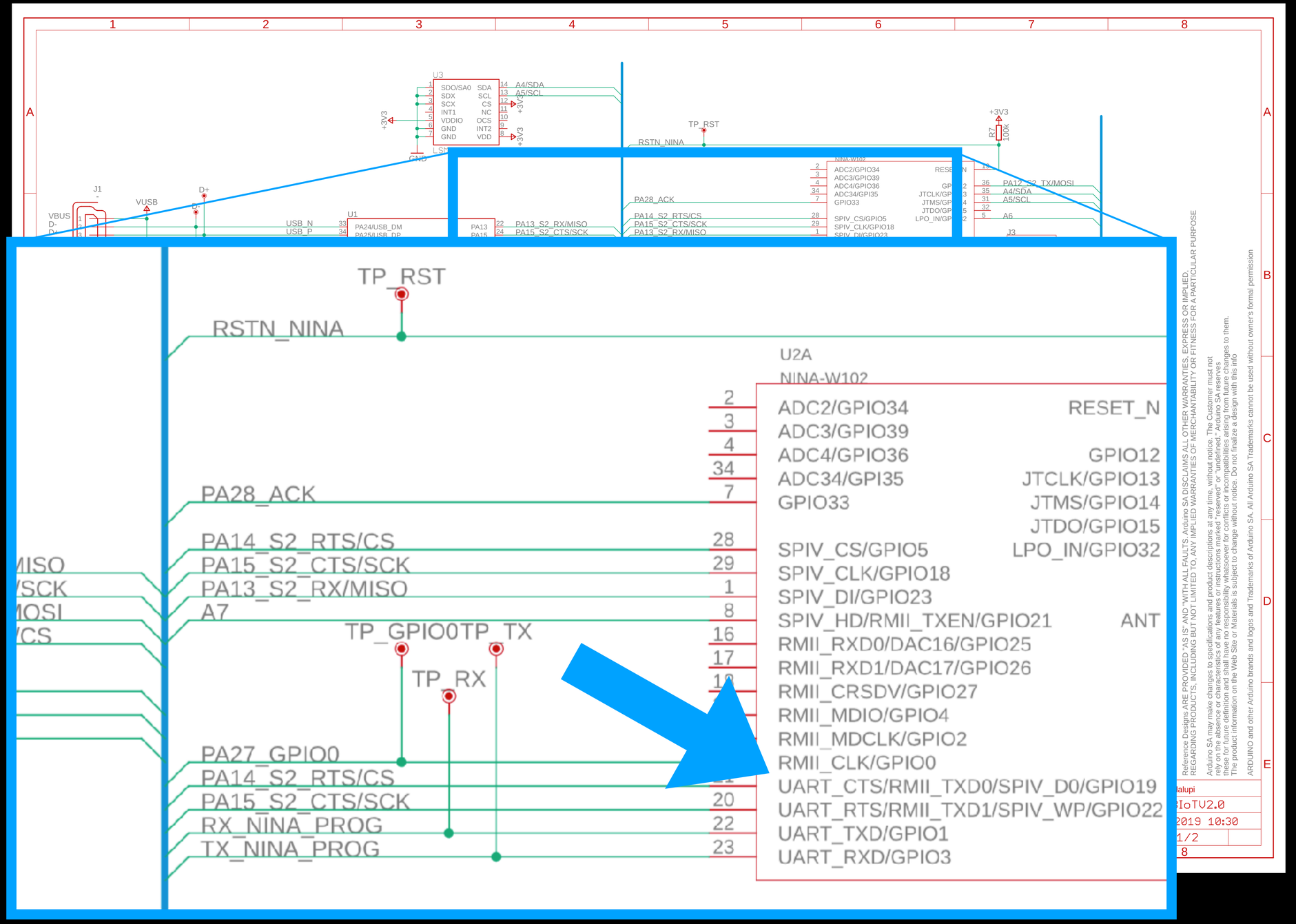
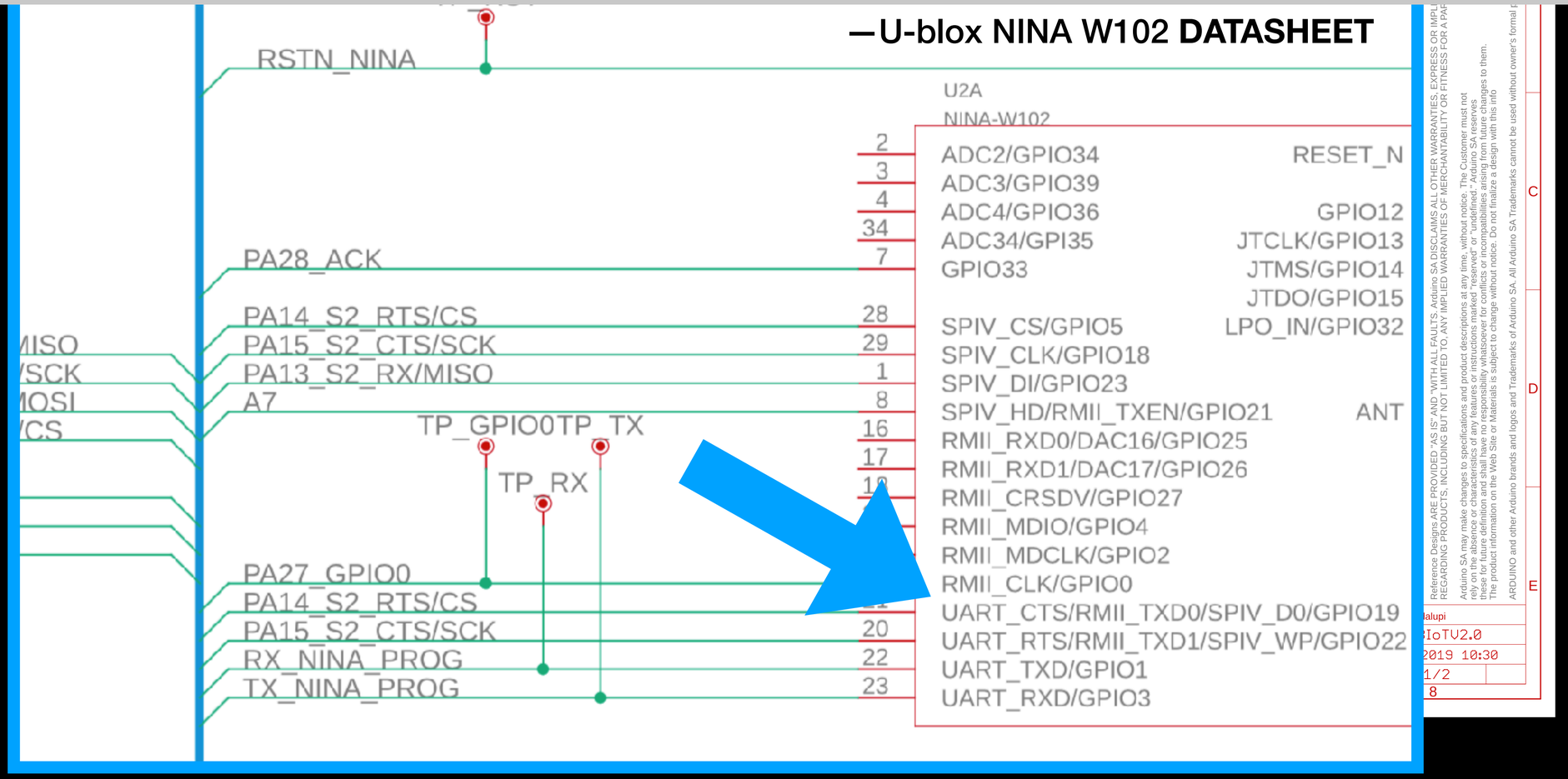
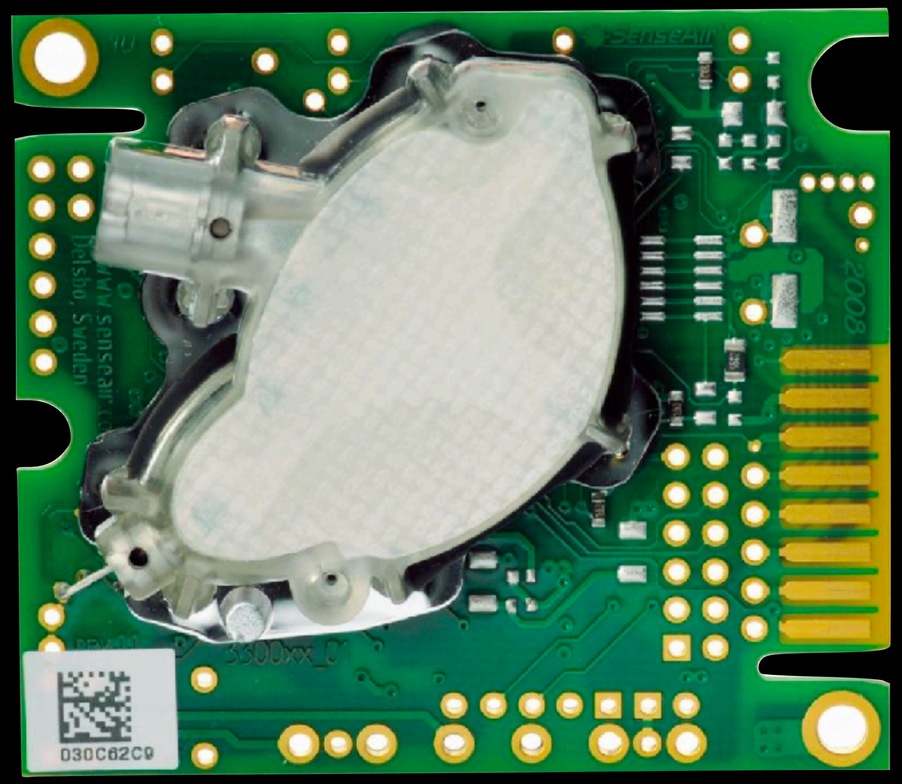


2.7.1 UARTs NINA-W10 modules have three UART interfaces, UART0 to UART2. Each interface provides asynchronous communication support for RS232, RS485, and IrDA standards (with external drivers). UART0 serves as the primary interface port. The maximum speed for all UART interfaces is 5 Mbit/s.



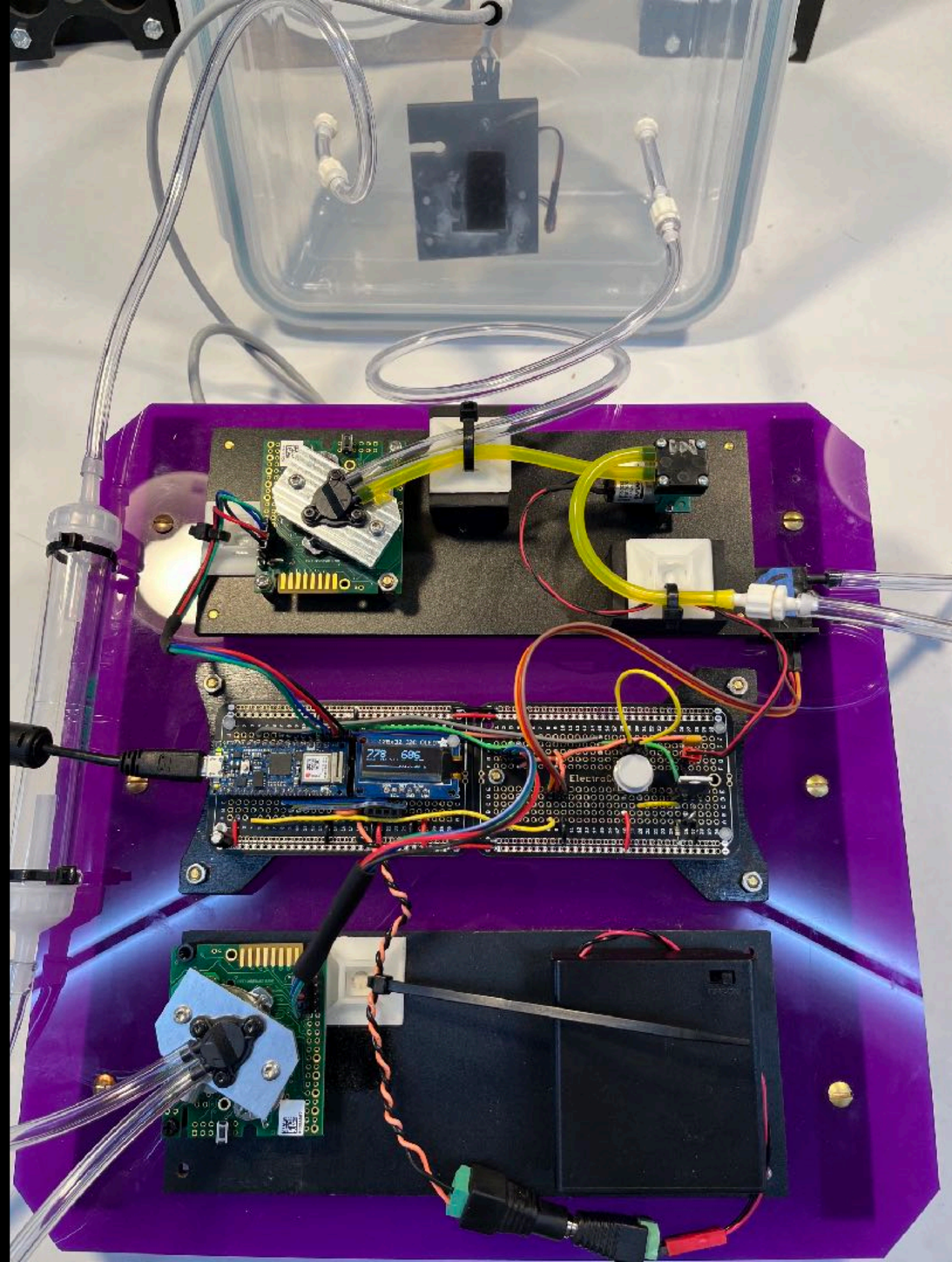
CO2 Sensor

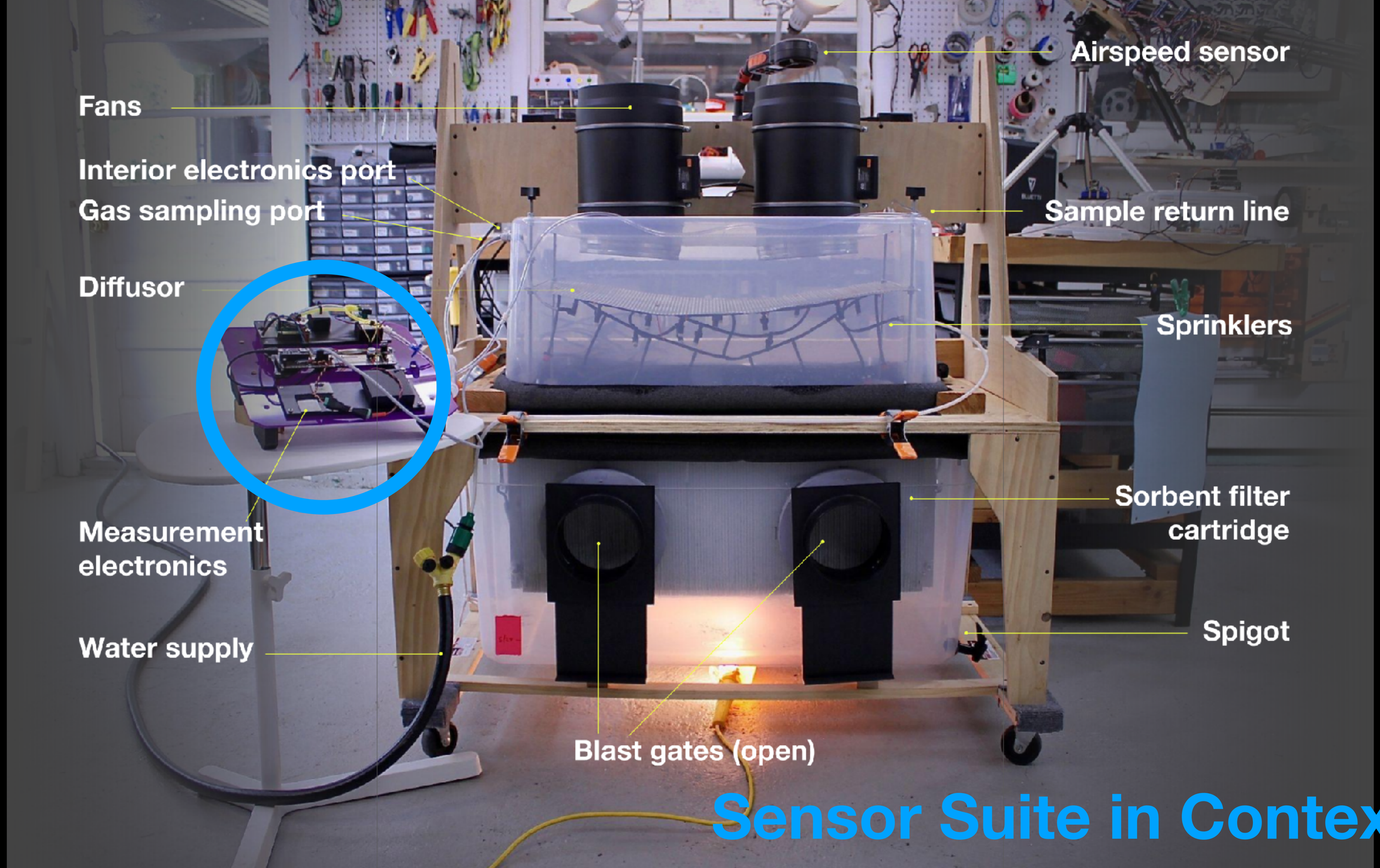


UART Serial, I2C *and* analog outputs

CO2 Sensor Suite:

2x serial to K30
1x serial to computer
WIFI to cloud (option)
I2C to sensors and display



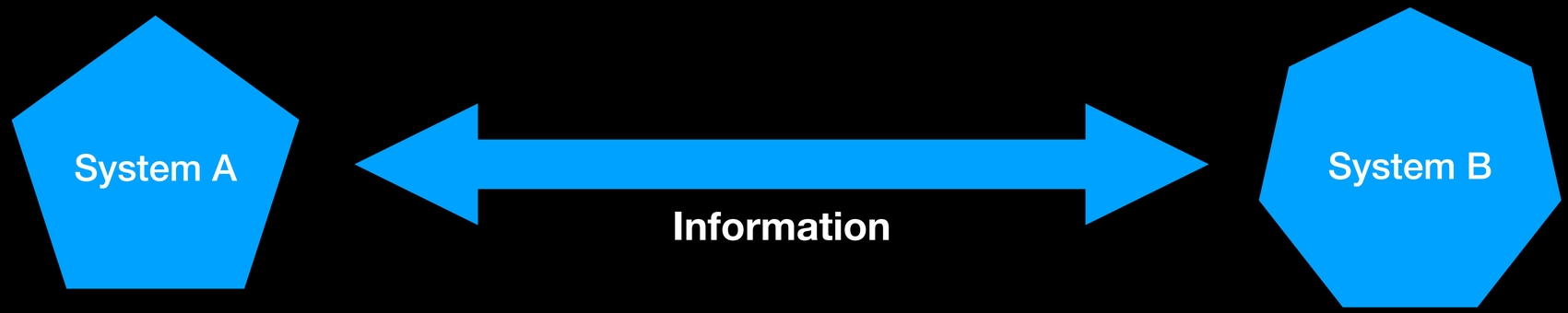


Sensor Suite in Context


p5.js
node
JS
C++
Java


Lua
GO
etc...


Lua
Java
Go
?
etc...


System A
Information
System B

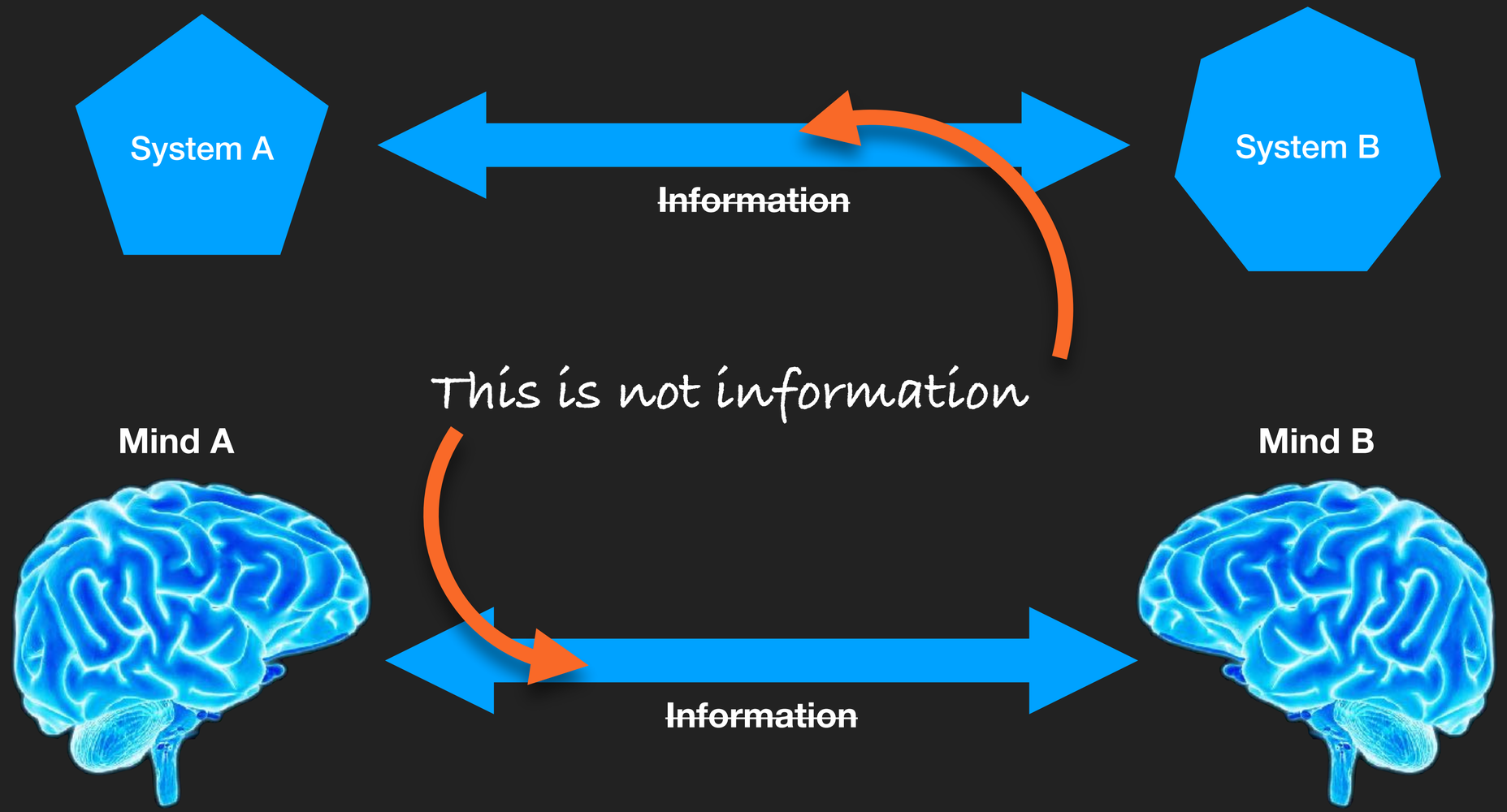
Mind A

Information

Mind B

This is not a painting by Magritte

This is not the idea that this is not a painting by Magritte…


System A
System B
~~Information~~
This is not information
Mind A
Mind B
~~Information~~


Voltage changing from moment to moment
System A
System B
~~Information~~

Variable declaration in code:

```
byte b = 64;
```

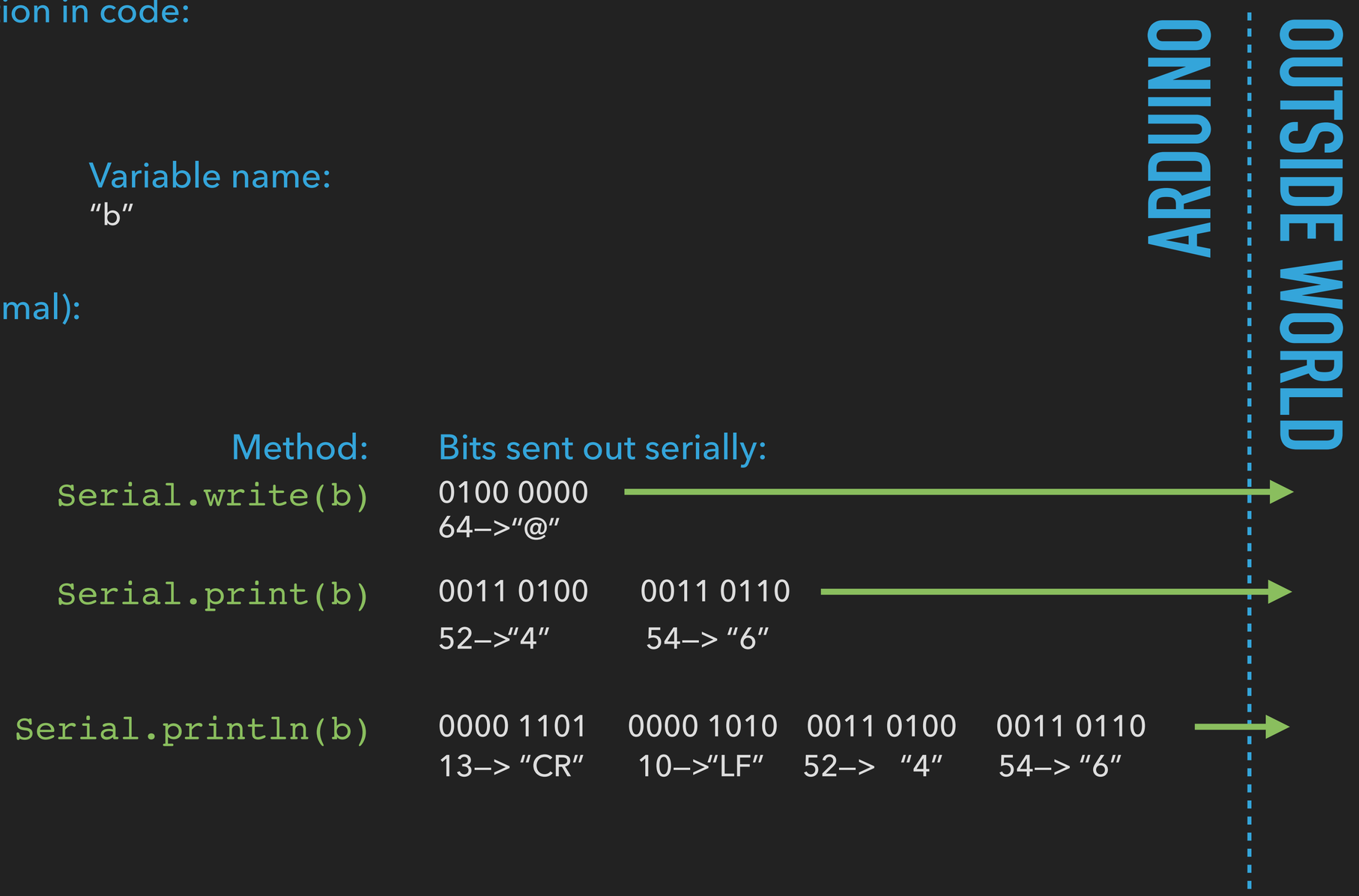
Bits in memory:
0100 0000

Variable name:
“b”

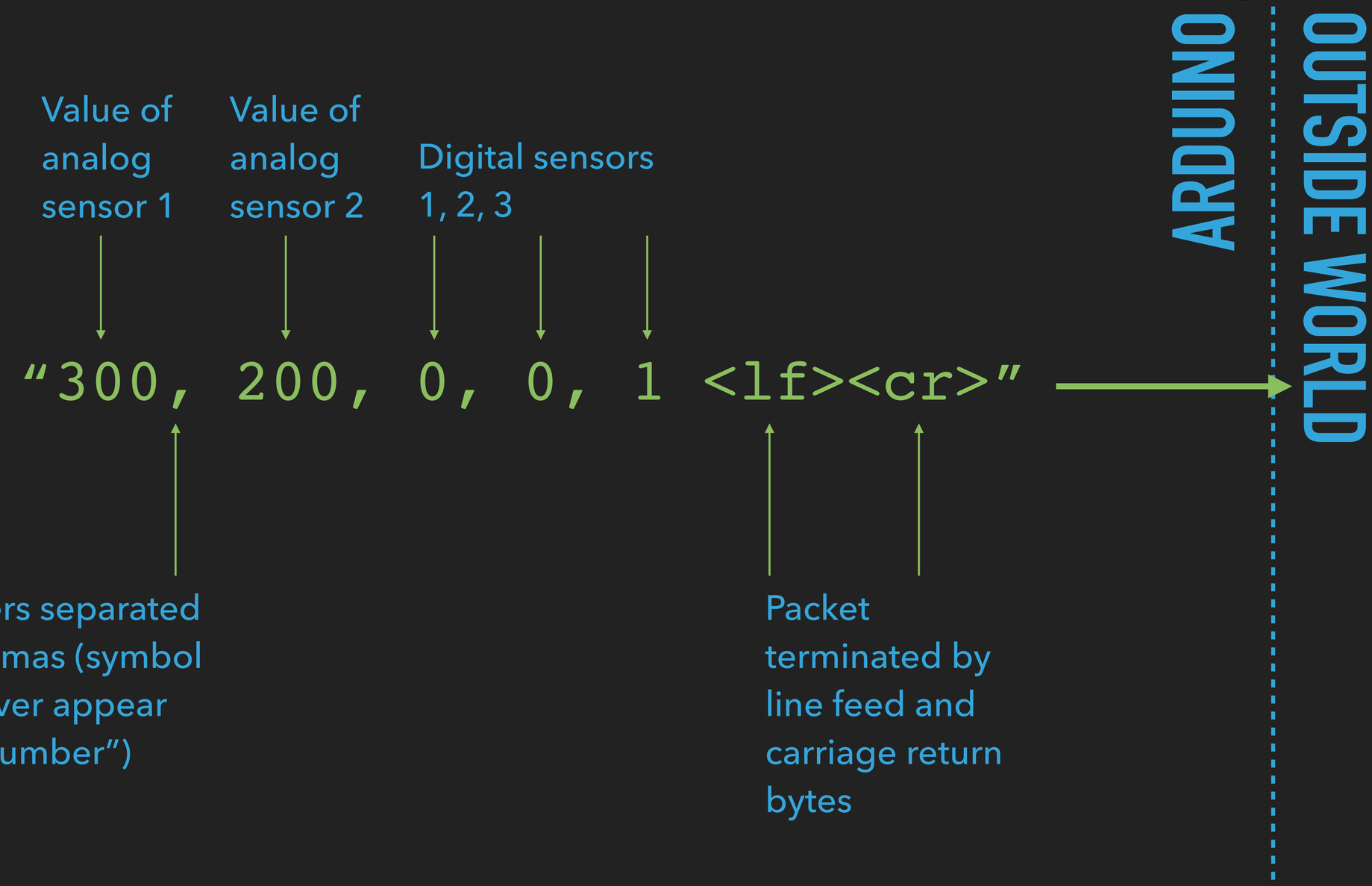
Value to us (decimal):

“64”

ASCII symbol
“@”



Sender generates data “packet” as a string



Receiver breaks up packet into parts