ENCS5140: LABVIEW WITH LINX

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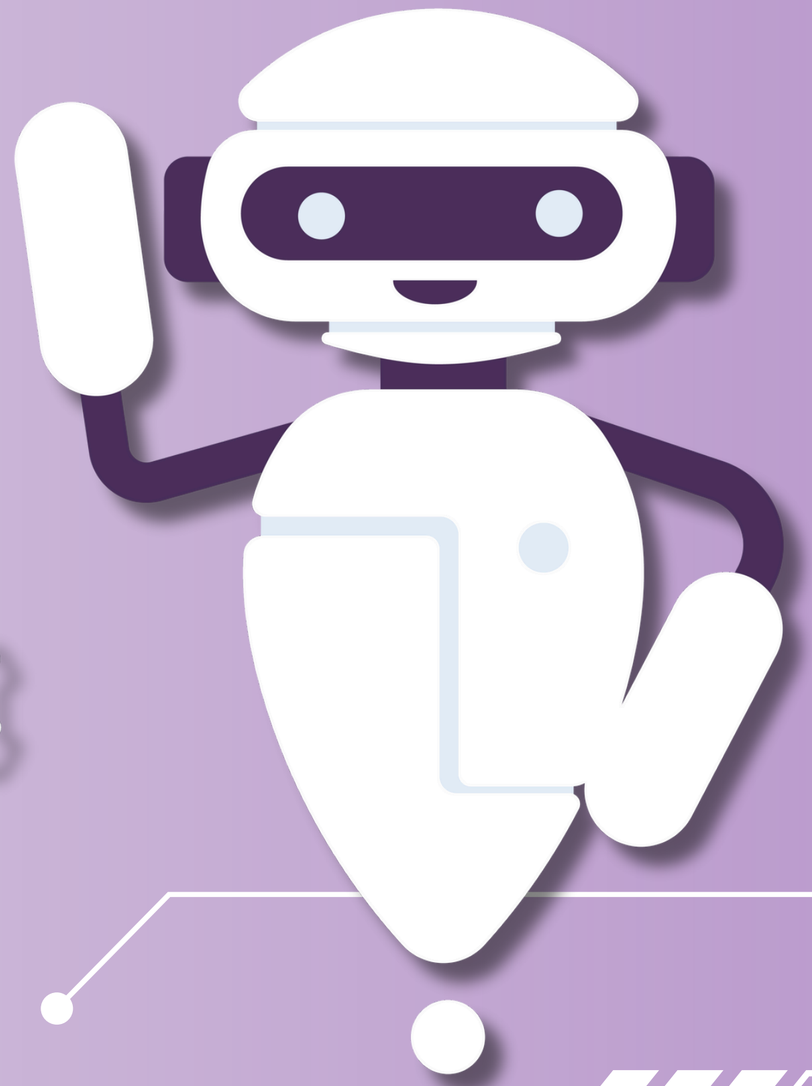


CONNECTION COMPONENTS

VISA RESOURCE NAME

Input that determines COM Port for Arduino connection

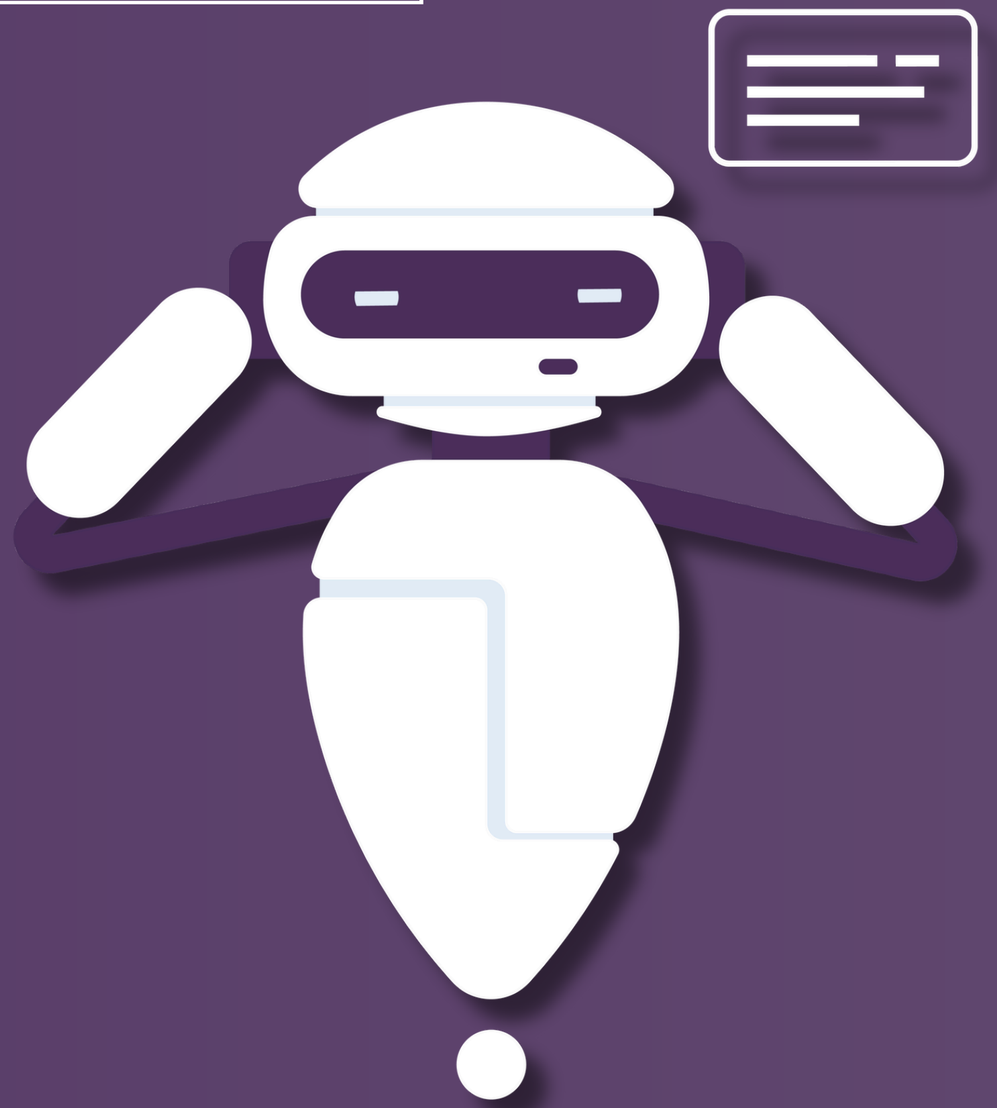
LINX OPEN.VI

Opens the LINX connection with the hardware

LINX CLOSE.VI

Closes the LINX connection

** All of these components are necessary to open any connection with the Arduino



AQUIRING COMPONENTS

- VISA Resource:
  Front Panel -> Right Click -> Modern -> I/O -> VISA Resource
- LINX Open.vi:
  Block Diagram -> Right Click -> MakerHub -> LINX -> Open
- LINX Close.vi:
  Block Diagram -> Right Click -> MakerHub -> LINX -> Close

RUNNING A CIRCUIT

** Every time you want to run the circuit, these steps must be done to upload it to the Arduino

From the top toolbar:
Tools -> MakerHub -> LINX -> LINX Firmware Wizard

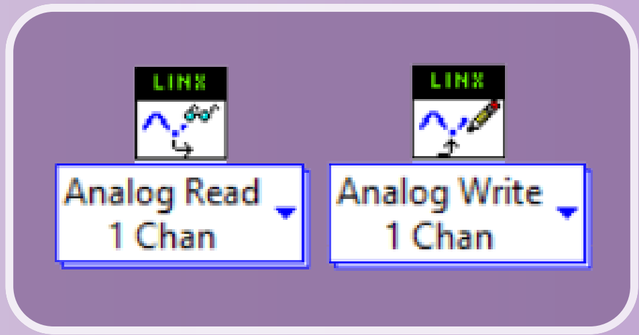
In the pop up:
Choose Arduino UNO as the Device Type and click Next
Choose the COM Port the Arduino is connected to and click Next
Click Next for the rest of the setup, and wait for the Firmware to finish
Click Finish once it is done

To run the circuit:
Click the  Run button from the top toolbar

READ AND WRITE BLOCKS

DIGITAL BLOCKS

Used for reading and writing True or False values (i.e. to turn an LED on and off)



ANALOG BLOCKS

Used for reading and writing analog values (i.e. potentiometer or LDR readings)

BLOCKS

Digital Blocks:
Block Diagram -> Right Click -> MakerHub -> LINX -> Peripherals -> Digital -> Read/Write

Analog Blocks:
Block Diagram -> Right Click -> MakerHub -> LINX -> Peripherals -> Analog -> Read/Write

DIGITAL READ

LINX Resource:
Connects LINX components in the circuit

DI Channel:
Informs LINX of which PIN the component is connected to (which PIN to read from)

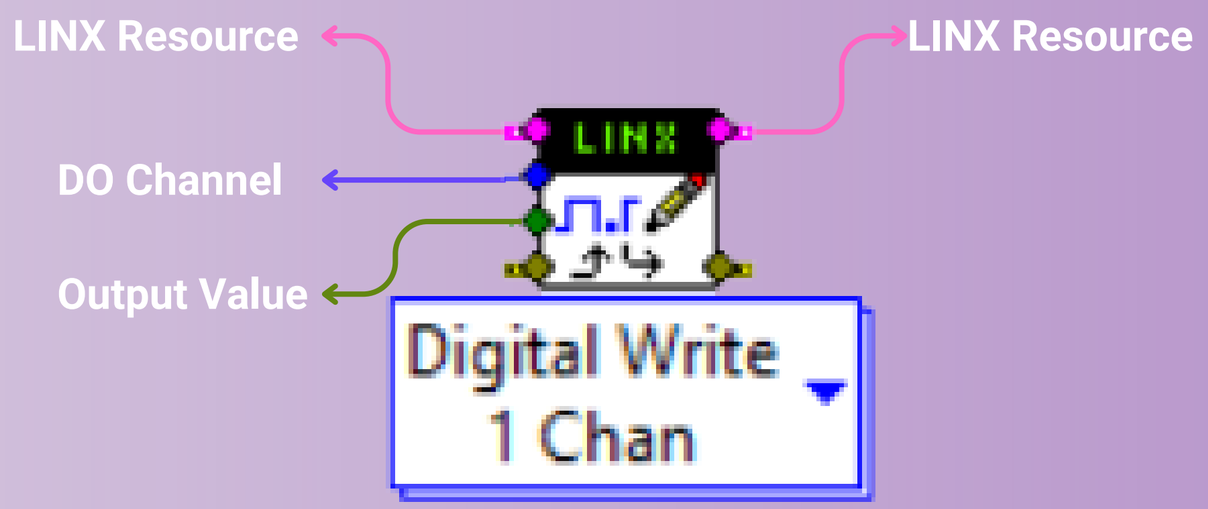
DI Value:
Outputs the read value

DIGITAL WRITE

LINX Resource:
Connects LINX components in the circuit

DO Channel:
Informs LINX of which PIN the component is connected to (which PIN to write to)

Output Value:
What output is written to the PIN



ANALOG READ

LINX Resource:
Connects LINX components in the circuit

Analog Channel:
Informs LINX of which PIN the component is connected to (which PIN to read from), must be an analog pin (Ax)

Voltage:
Analog voltage value that is read from the PIN

ANALOG WRITE

LINX Resource:
Connects LINX components in the circuit

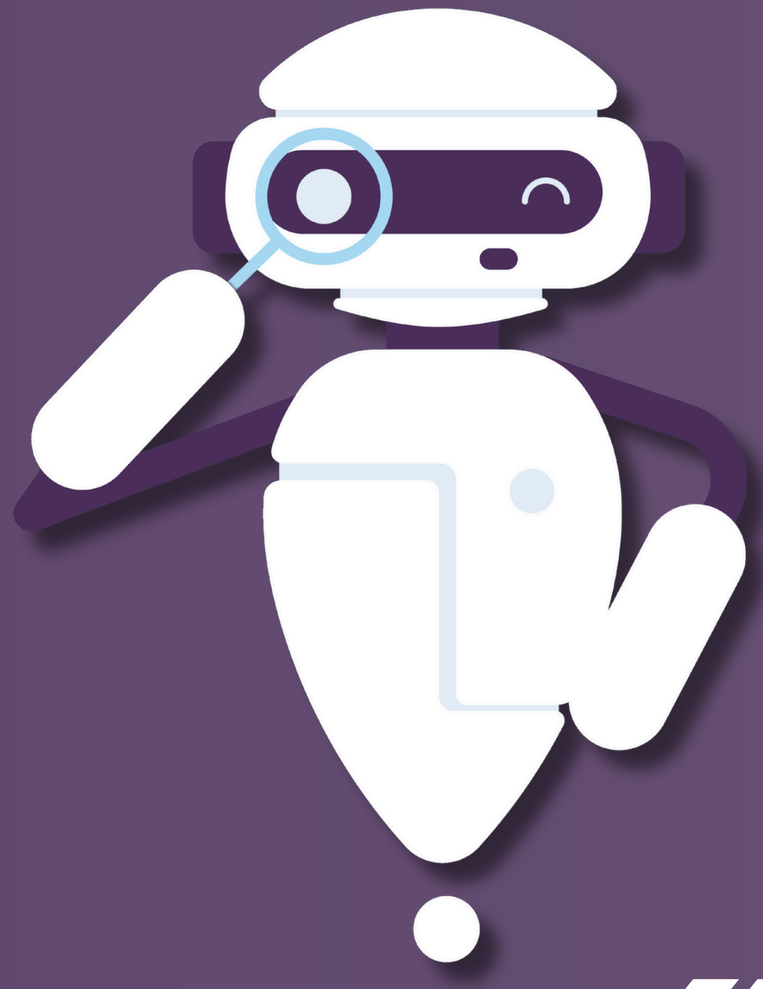
AO Channel:
Informs LINX of which PIN the component is connected to (which PIN to write to), again, must be an analog pin

AO Value:
What analog output is written to the PIN

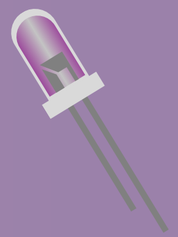
FRONT PANEL

** Tips for utilizing the front panel for efficient debugging and displays

1. Use Numeric Control block for PINs and uniquely name them to match their respective component
2. Use any form of display to reflect the hardware circuit in case there are any faulty connections
    a. For LEDs, use Boolean LED displays
    b. For analog components use a Numeric Indicator, as it provides the least dynamic display



EXAMPLES



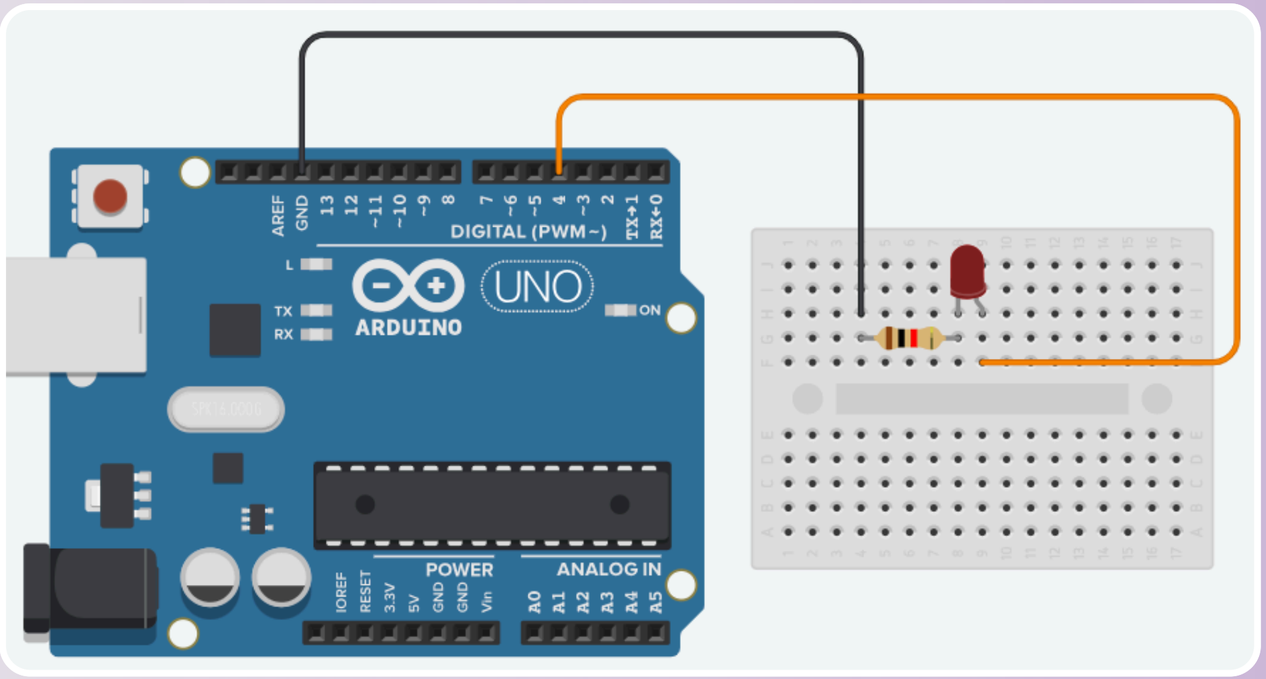
1. BLINKING AN LED

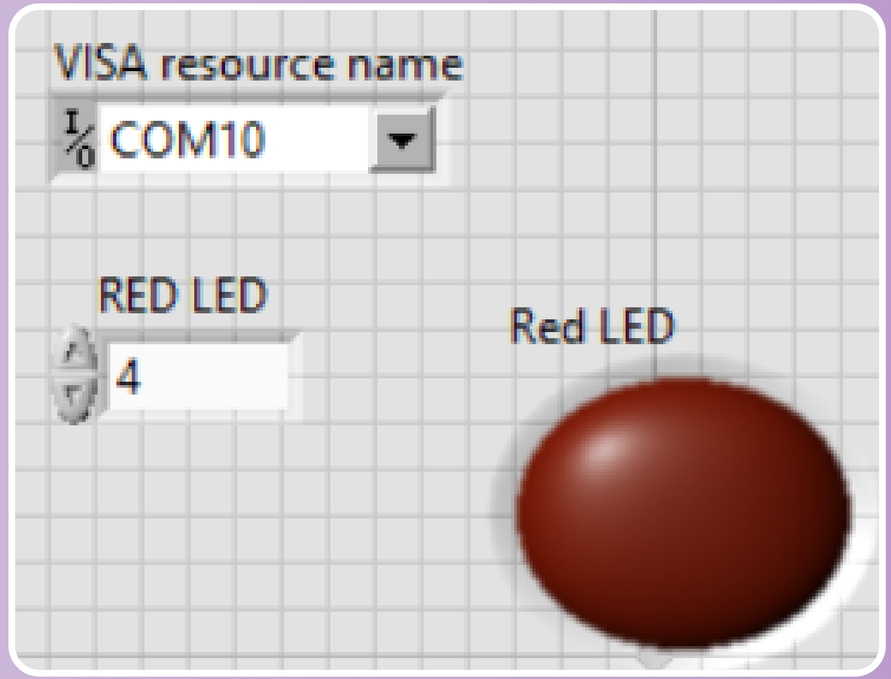
2. LDR READINGS

3. ULTRASONIC READINGS

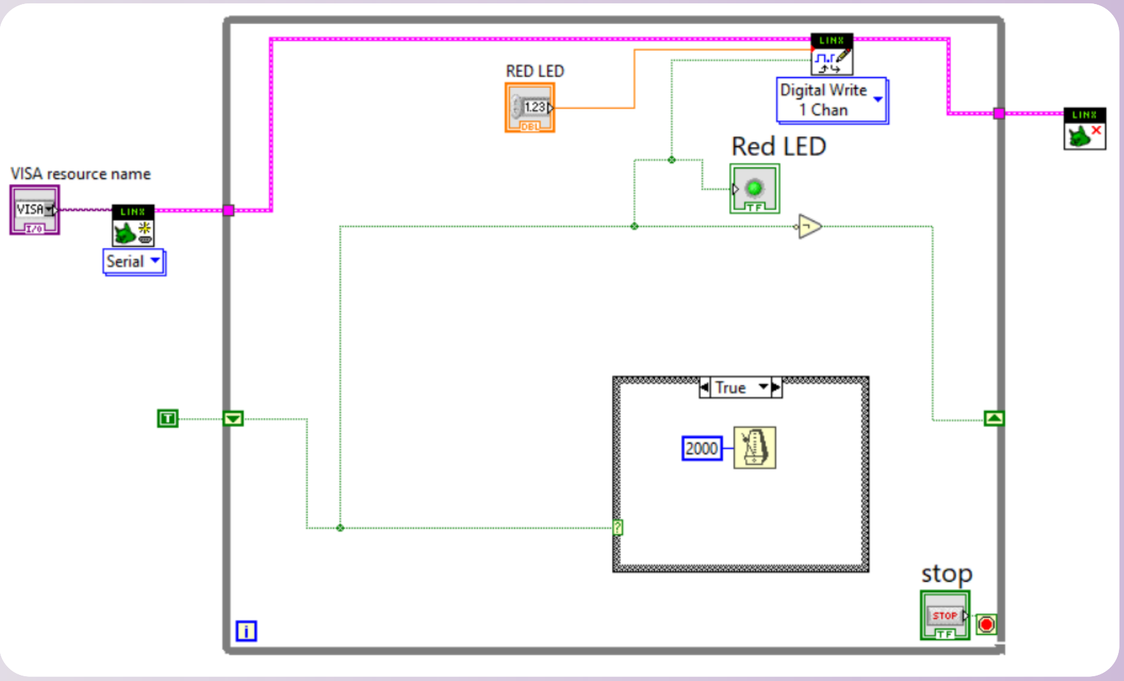
EXAMPLE 1

Connect the hardware, and prepare the Front Panel display



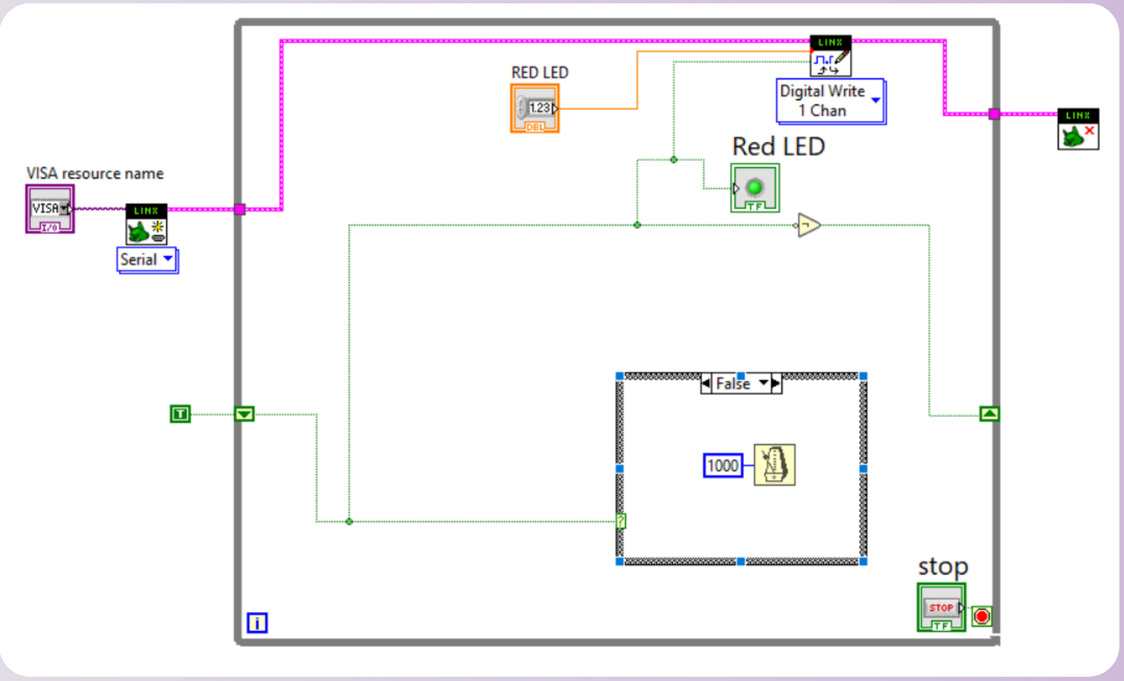


EXAMPLE 1 CONT.



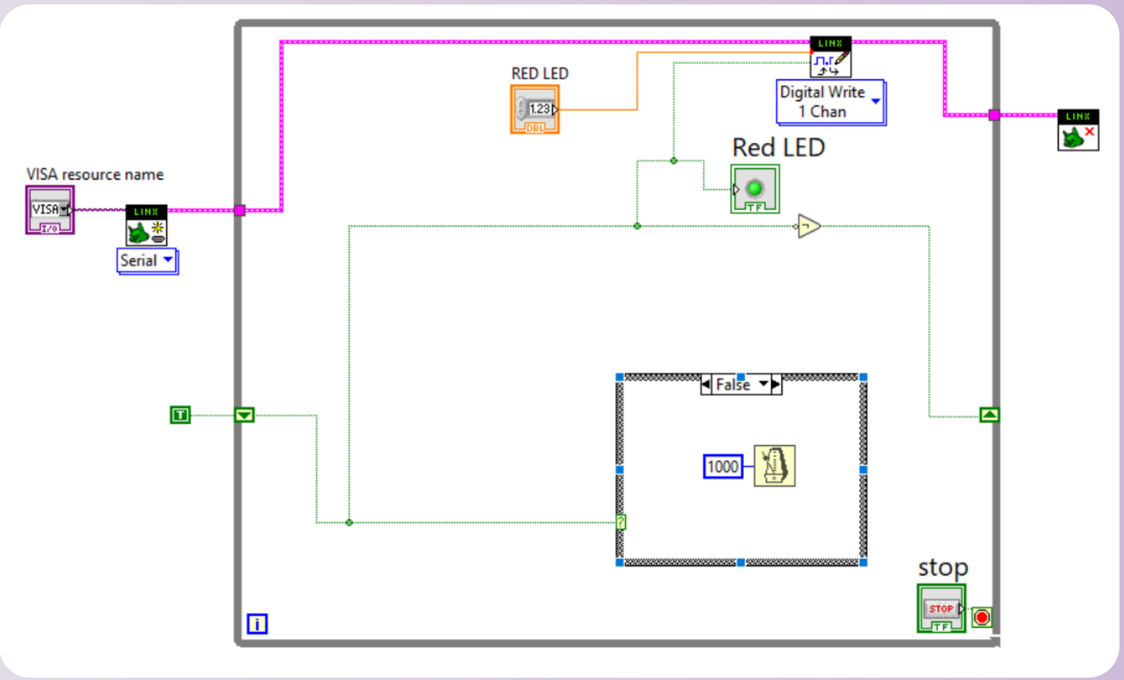
- Set up LINX connection components
- Use a while loop with button component to encase the full diagram, but make sure to keep LINX open and close blocks outside
- Right click the while loop block and click Add Shift Register
- Input of the shift register should be a True or False constant
- Wire one side of the shift register to a NOT gate, and connect its output to the other side
- Add a Case Structure block

EXAMPLE 1 CONT.



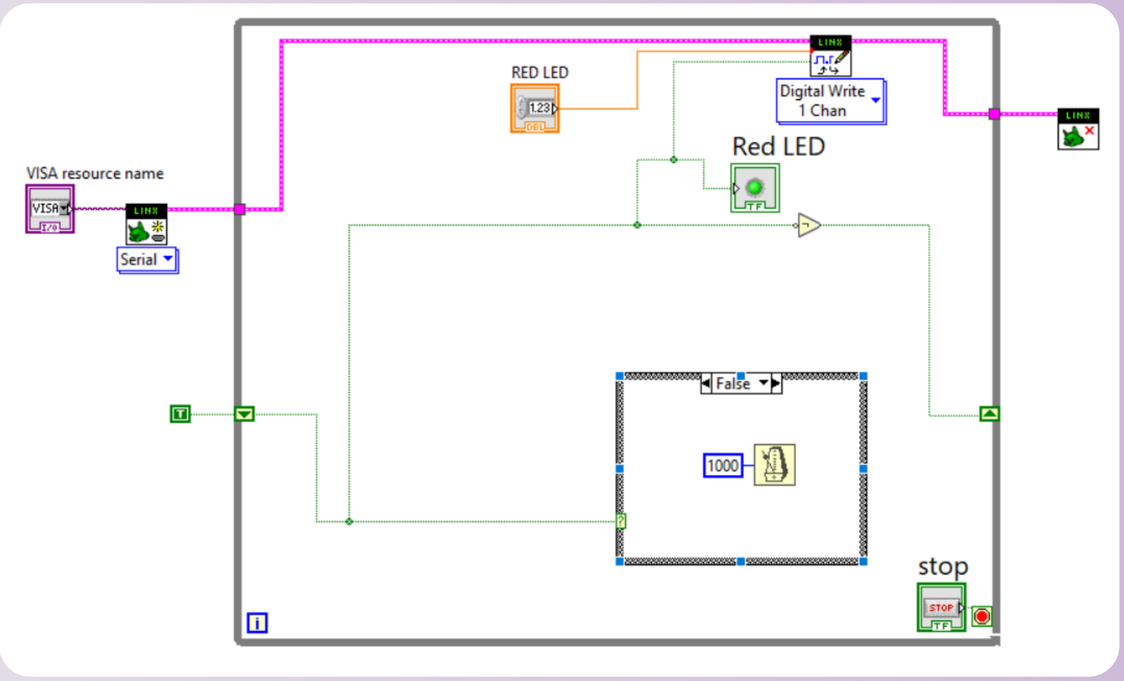
- Use the shift register’s value to control the case structure block
- Add a Wait Until Next ms Multiple component (Right Click -> Timing), in both True and False cases
- Right click on the timer input and Add a Constant to set the time delays for On and Off
- This example turns the LED on for 2 Sec (2000ms), and off for 1 Sec (1000ms)

EXAMPLE 1 CONT.



- Next, add in a Digital Write block, since we want to write a 1 or 0 value to a digital component (LED)
- Connect the open.vi output to the input LINX resource of Digital Write, and the output LINX resource of Digital Write to the input LINX resource of the close.vi
- Use the Numeric Indicator from the front panel to be the input for the DO Channel, This number should be the PIN the LED is connected to
- And use the shift register value to be the Output Value of Digital Write

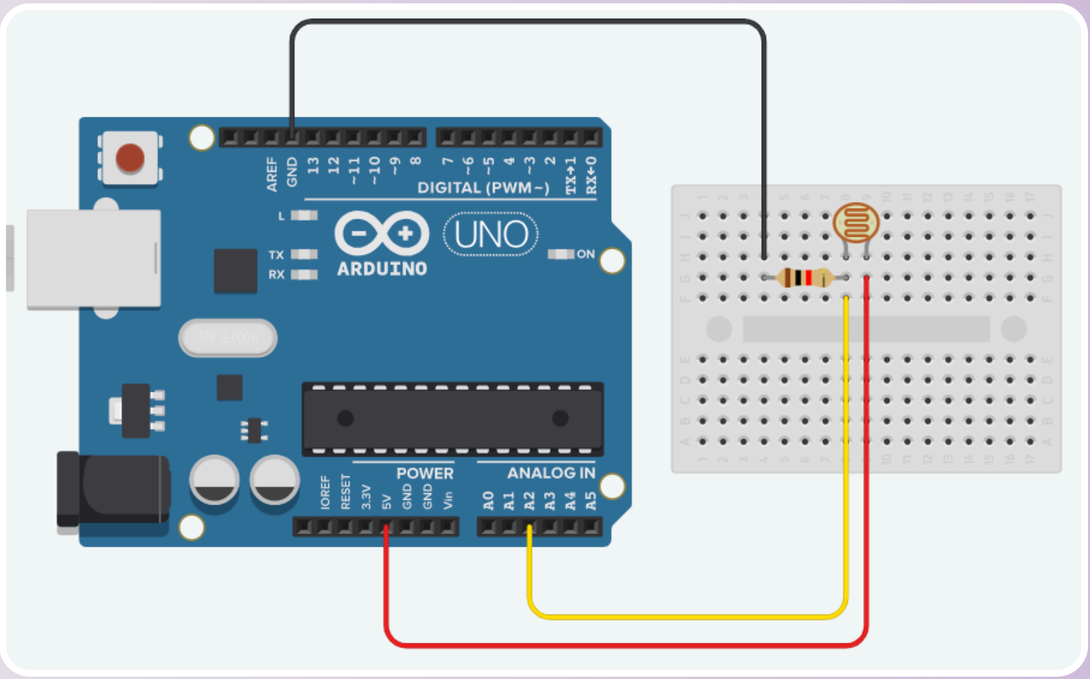
EXAMPLE 1 CONT.

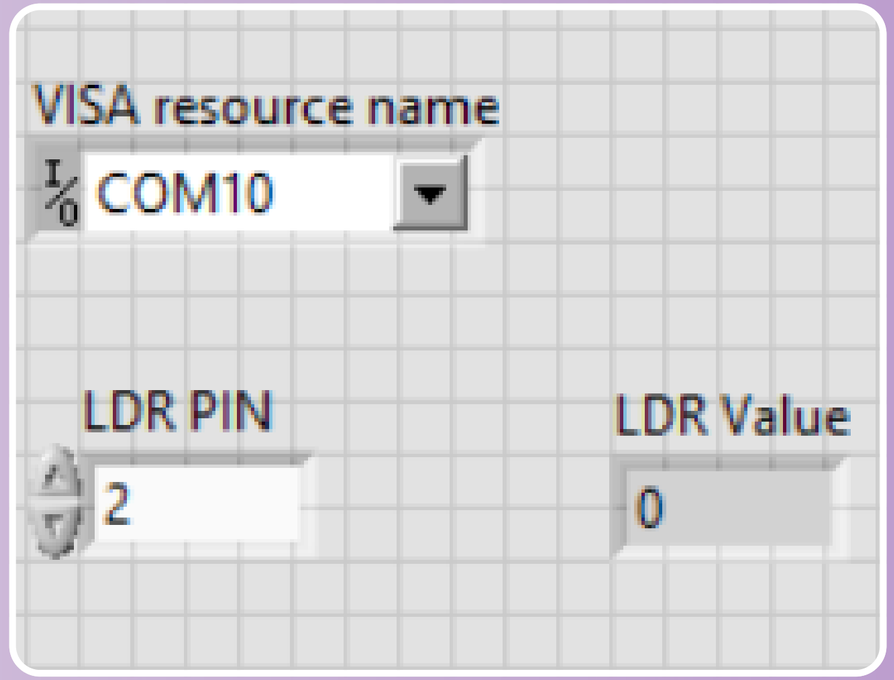


- Connect the same wire to the Red LED Boolean for the front panel to also display the same functionality
- Run the circuit as shown in previous slides
- Both your hardware LED and the Boolean LED on the front panel should now turn on for 2 Seconds and off for 1 Second

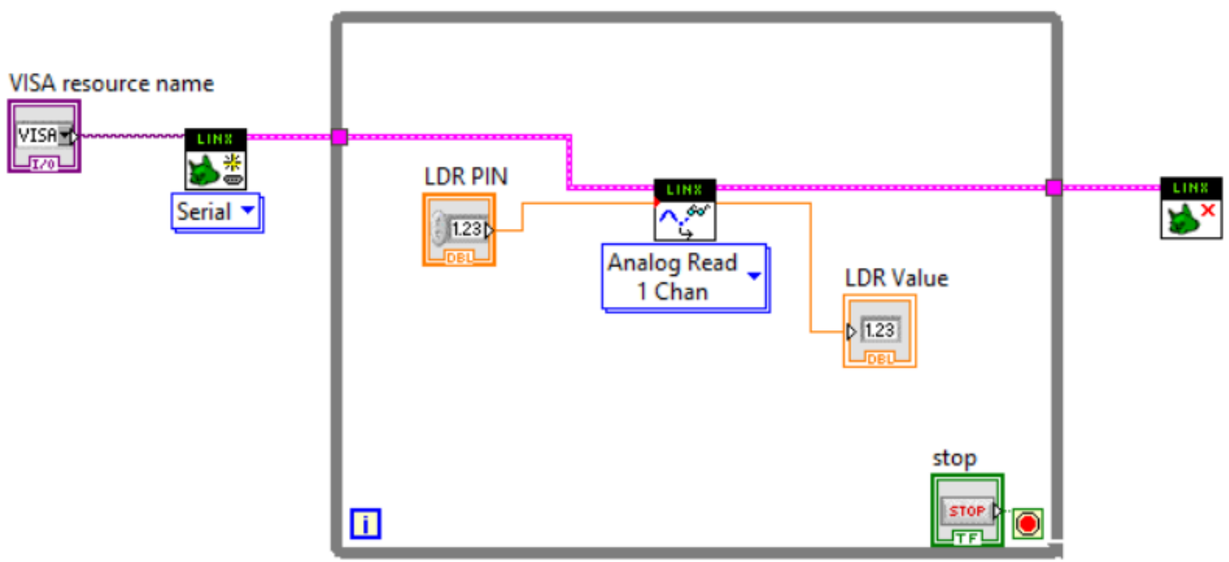
EXAMPLE 2

Connect the hardware, and prepare the Front Panel display





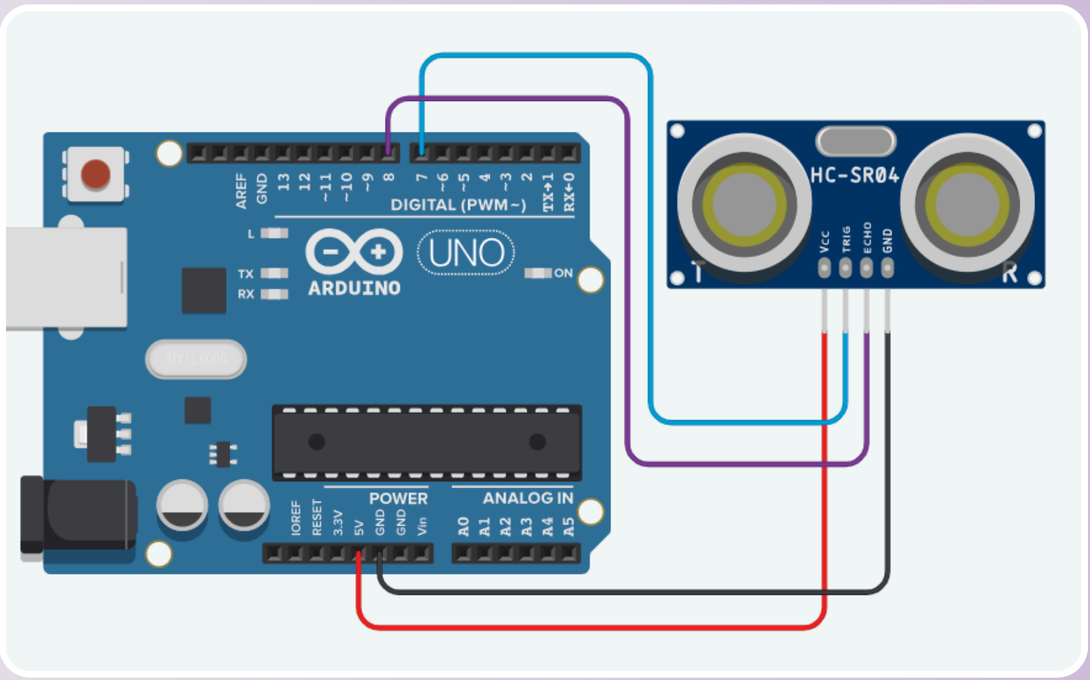
EXAMPLE 2 CONT.

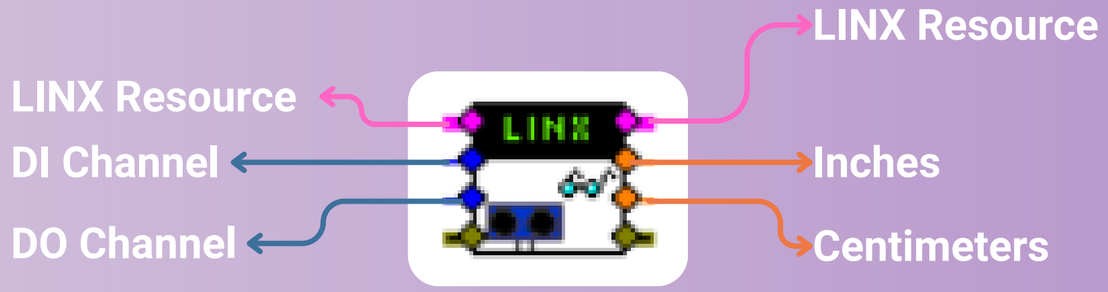


- Set up connection and while loop
- Use the Analog Read component since LDR readings are analog values
- Connect the LDR Pin (A2) to the Analog Channel port of Analog Read
- Connect the Voltage output port to the Numeric Indicator
- The circuit displays LDR readings

EXAMPLE 3

Connect the hardware, and prepare the Front Panel display



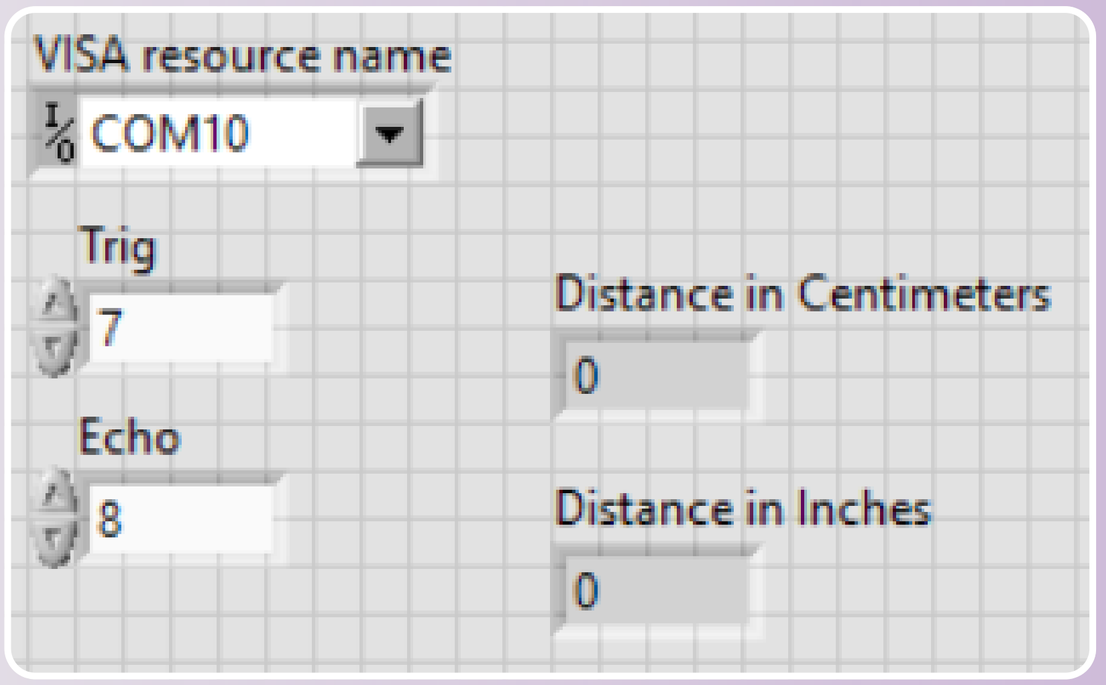


**LINX has a built in distance component where the Echo and Trig Pins are directly connected to the block, and the block outputs the distance in both inches and centimeters.

Block can be found through:

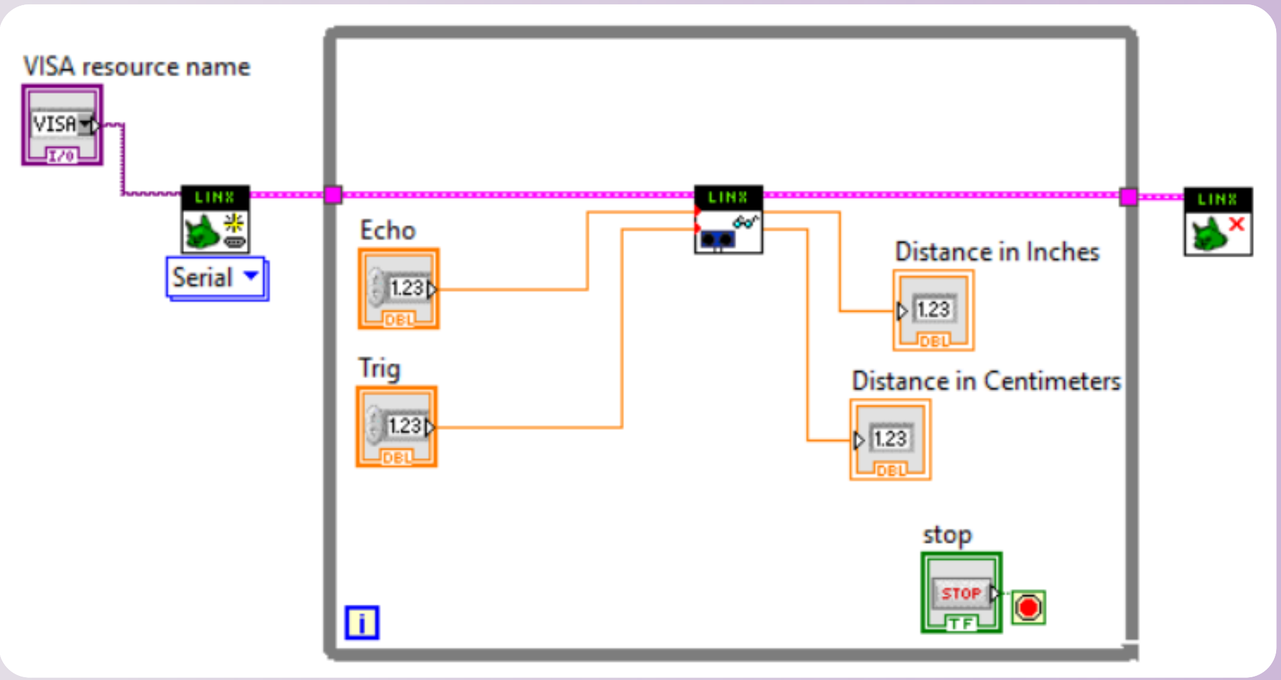
Block Diagram -> Right Click -> MakerHub -> LINX -> Sensors -> Distance -> Ultrasonic -> Read

EXAMPLE 3 CONT.



- Two Numeric Controls are needed since the Ultrasonic sensor has two pins, one is Trig and the other is the Echo pin.
- This display uses two Numeric Indicators, one for centimeters and one for inches
- You don’t necessarily need both distance readings, one is enough

EXAMPLE 3 CONT.



- Again, set up open.vi, close.vi and while loop
- Obtain the Read.vi block for the ultrasonic as previously shown
- The Echo pin connects to the DI Channel port
- The Trig pin connects to the DO Channel port
- Connect each distance output to its respective Numeric Indicator
- This circuit displays the distance read by the ultrasonic sensor

PRACTICE CONNECTIONS

TWO LEDS

Connect two LEDs
Turn one LED on for 1 S
and the other off
Alternate between the two
LEDs

PIR

Connect a PIR sensor
Use it to control an LED
When motion is detected,
turn on LED, else keep it off
**PIR is a digital component

ULTRA SONIC

Connect an ultrasonic to
an LED
When distance is within
10-20 cm, turn the LED
on, else keep it off

LDR

Connect an LDR and determine
bright and dark thresholds
Use these thresholds to control
an LED, When it is dark, turn
LED on, If it is bright, turn it off

EXAM TIPS

- When connecting multiple components to each other, say two LEDs with two Digital Write blocks, The first Digital Write block LINX Port is from Open.vi, the output LINX Port is connected to the second Digital Write, with the output LINX Port of the second Digital Write connected to the Close.vi (Domino like connection)
- Connect the hardware first
- Ensure you set the correct COM Port during setup
- Double check if you are using Analog or Digital blocks
- Always have a display for the output on the front panel in case your hardware is not wired correctly
- Practice well before the exam to get the hang of using the components
- Good Luck! :)

MESSAGE ME IF YOU STILL HAVE ANY QUESTIONS :)