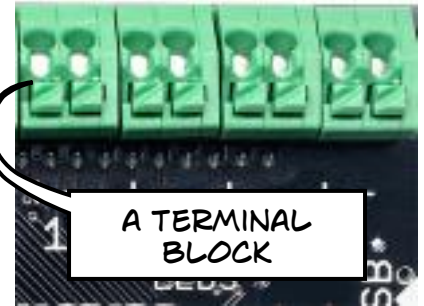
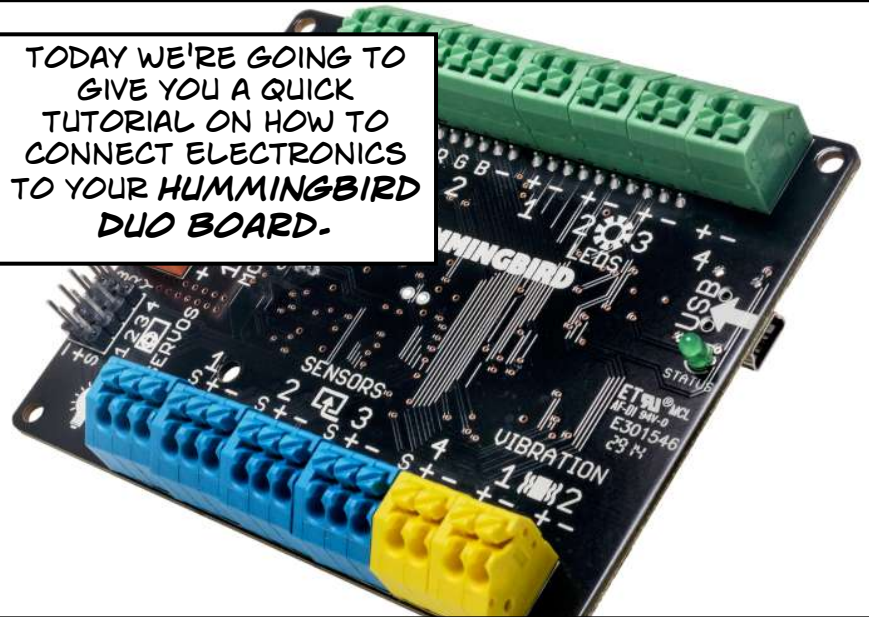


**CONNECTING ELECTRONICS**

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TODAY WE'RE GOING TO GIVE YOU A QUICK TUTORIAL ON HOW TO CONNECT ELECTRONICS TO YOUR HUMMINGBIRD DUO BOARD.

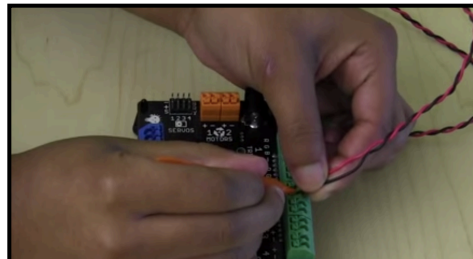
THERE'S NO SOLDERING OR CRIMPING INVOLVED; THE HUMMINGBIRD DUO'S **TERMINAL BLOCKS** MAKE CONNECTING AS EASY AS PUSHING AND RELEASING.



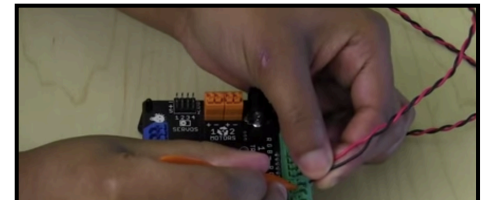
A TERMINAL BLOCK



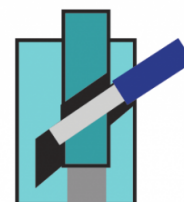
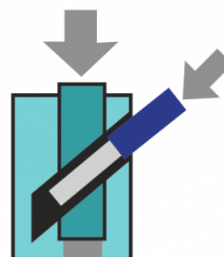
JUST USE THE **TERMINAL TOOL** TO PUSH DOWN ON THE TAB...



INSERT THE WIRE INTO THE HOLE...



AND RELEASE! (IT'S GOOD TO GENTLY TUG ON THE WIRE TO MAKE SURE THAT IT'S SECURE)



THERE ARE MANY DIFFERENT COMPONENTS THAT CONNECT WITH THE HUMMINGBIRD DUO BOARD. HERE ARE SOME SPECIFIC INSTRUCTIONS TO HELP YOU ATTACH ALL OF THEM!

# ATTACHING L.E.D.S

**SINGLE COLOR LED** LIGHTS ARE A LIGHT SOURCE WITH CONTROLLABLE BRIGHTNESS. THE DUO COMES WITH RED, ORANGE, YELLOW AND GREEN SINGLE COLORED LIGHTS. YOU CAN CONNECT UP TO FOUR!

EACH SINGLE COLOR LED HAS TWO WIRES. THE RED, ORANGE, YELLOW OR GREEN WIRE INDICATES WHAT COLOR THE LED IS, AND PLUGS INTO THE '+' TERMINAL.



THE BLACK WIRE PLUGS INTO THE '-' TERMINAL.



SINGLE COLOR LEDS CAN BE PLUGGED INTO ANY OF THE FOUR RIGHT-MOST GREEN TERMINALS.

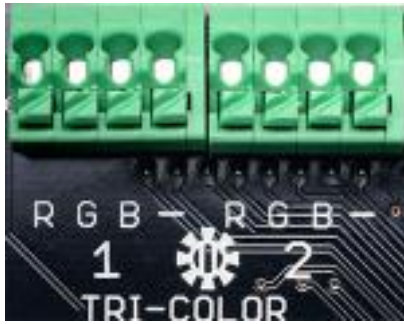
## TRI-COLOR LEDS



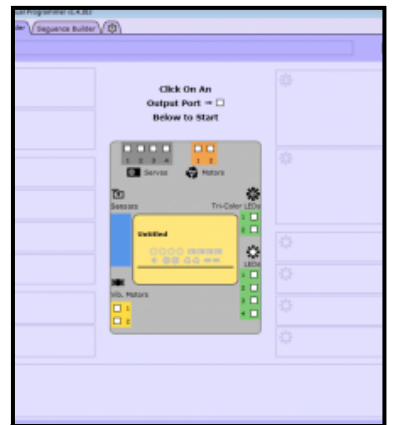
**TRI-COLOR LEDS** ARE RED-GREEN-BLUE (RGB) LIGHT SOURCES THAT CAN PRODUCE A VARIETY OF COLORS! YOU CAN CONNECT TWO TRI-COLOR LEDS AT A TIME.



UNLIKE SINGLE COLOR LEDS, TRI-COLORS HAVE 4 WIRES: RED, GREEN, BLUE, AND BLACK.



THE TRI-COLORS LEDS ATTACH TO THE **LEFT GREEN** TERMINALS. THE RED WIRE GOES IN THE SYMBOL '**R**', THE GREEN IN '**G**', THE BLUE IN '**B**', AND THE BLACK IN '**-**'.



YOU'LL LEARN HOW TO MAKE THEM CHANGE COLOR IN THE PROGRAMMING TUTORIAL!

# VIBRATION MOTOR



THE VIBRATION MOTOR HAS TWO WIRES, AND THEY'RE BOTH YELLOW.



THEY CONNECT INTO THE **YELLOW** "VIBRATION" TERMINALS. IT DOESN'T MATTER WHICH WIRE GOES IN THE PLUS AND THE MINUS, AS LONG AS THEY'RE PLUGGED INTO THE SAME BLOCK.

# MOTOR



THE STANDARD MOTOR HAS TWO ORANGE WIRES.



THE MOTOR PLUGS INTO THE **ORANGE** TERMINAL BLOCKS. LIKE THE VIBRATION MOTOR, IT DOESN'T MATTER WHICH WIRE IS POSITIVE AND WHICH IS NEGATIVE.



THE MOTOR WILL ALSO NEED SOME EXTRA POWER, SO NOW'S A GOOD TIME TO PLUG IN THE **POWER CABLE**.



THE SERVO CONNECTIONS ARE A LITTLE DIFFERENT. YOU WON'T USE THE TERMINAL TOOL FOR THESE. RATHER THAN A PUSH-IN PORT, THE SERVO USE A SIMPLE 3-PIN CONNECTOR.



BLACK  
RED  
YELLOW

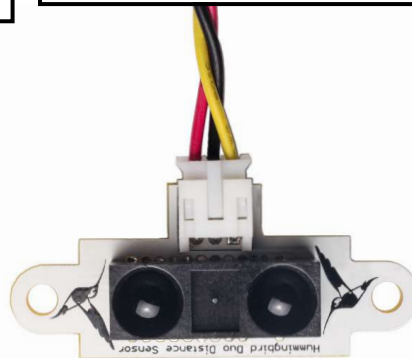
YOU'LL NEED TO MAKE SURE YOU PLUG THIS CONNECTOR INTO THE SERVO PORTS THE RIGHT WAY: THE YELLOW WIRE SHOULD ALIGN WITH PIN MARKED 'S' AND 'Y', THE RED WIRE WITH '+' AND 'R', AND THE BLACK WIRE WITH '-' AND 'B'.

# SENSORS

THERE ARE FIVE KINDS OF SENSORS THAT COME WITH THE HUMMINGBIRD DUO.



LIGHT



DISTANCE



SOUND

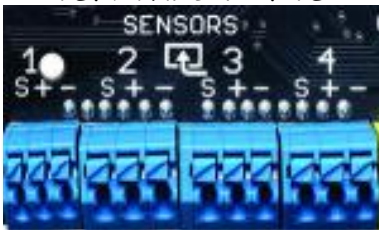


TEMPERATURE



ROTATION

THOUGH THE SENSORS ALL LOOK DIFFERENT, THEY PLUG IN THE SAME WAY INTO THE BLUE TERMINAL PORTS.



THE YELLOW WIRE CONNECTS TO AN 'S' TERMINAL, THE RED TO A '+' TERMINAL, AND THE BLACK WIRE TO A '-' TERMINAL.

THAT'S IT! THE ONLY THING LEFT TO DO IS TO CONNECT THE DUO TO A COMPUTER USING THE USB CABLE.

