

BTEC Coursework.

Soldering & Stripboard.

- The good soldered joint is :-
 - Shiny & bright.
 - Concave and Smooth.
 - NO Spikes, lumps, bumps or holes.
- With Stripboard all components are mounted 90° to the direction of the tracks.
- Both Stripboard and PCB components are mounted so that their values can be read either (Top to Bottom) or (Left to Right).

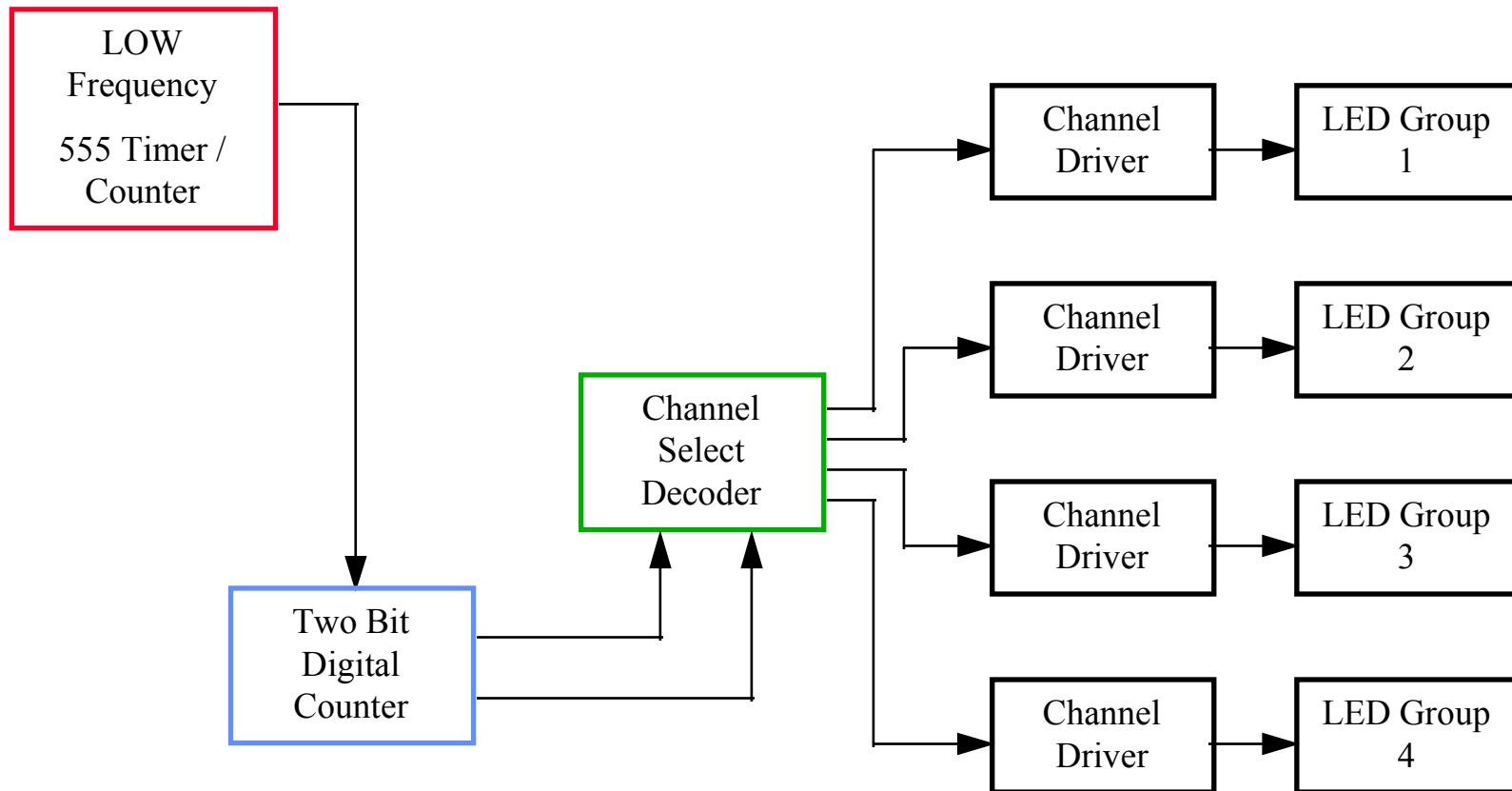
General Construction Concepts

General Construction Concepts.

- Connection from a Positive Power source should use **RED** wires. Last resort **Yellow**.
- Connection from a Negative Power source should use **BLACK** or **BLUE** wires.
- Connection from a Common Point should use **Green** wires.

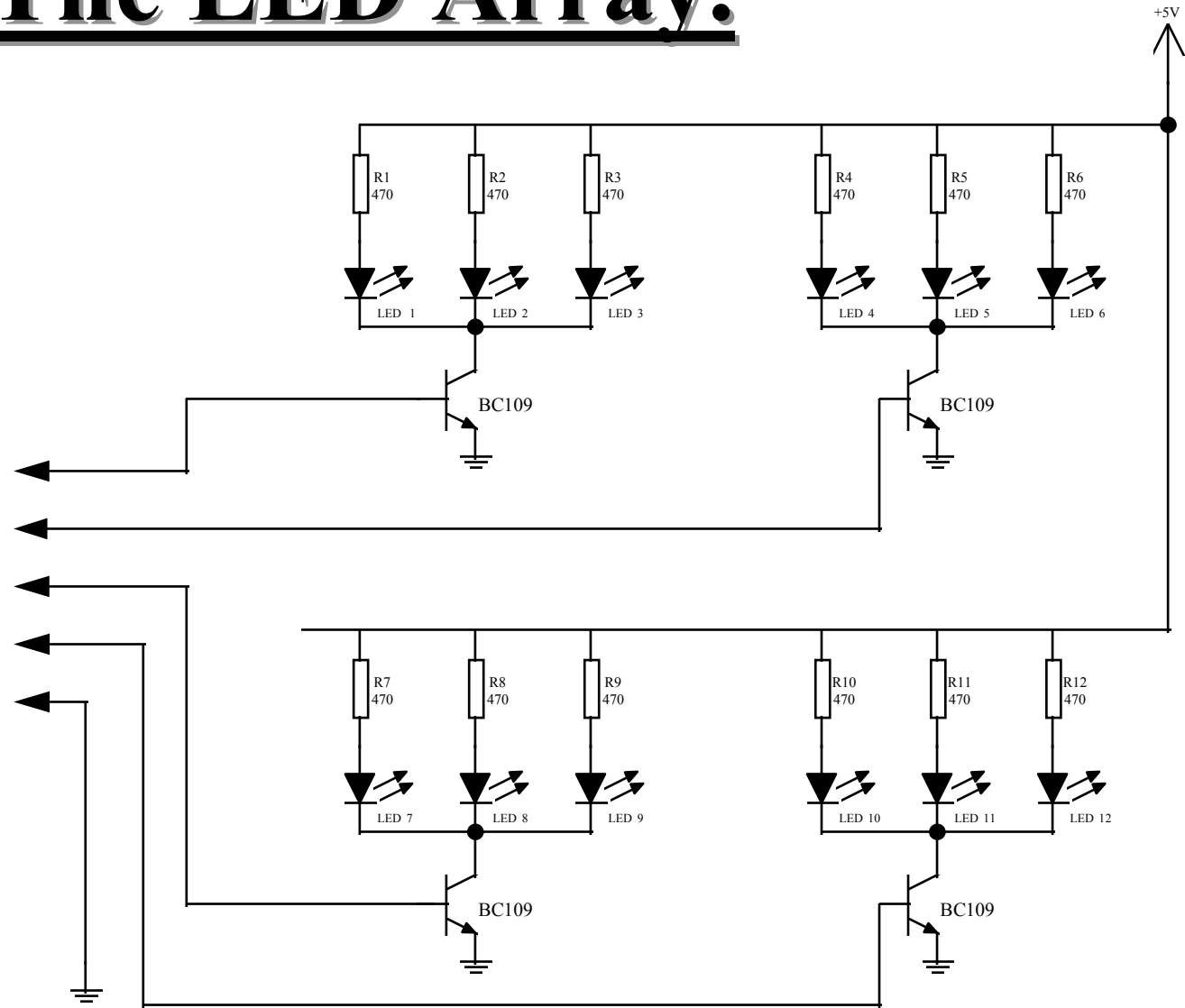
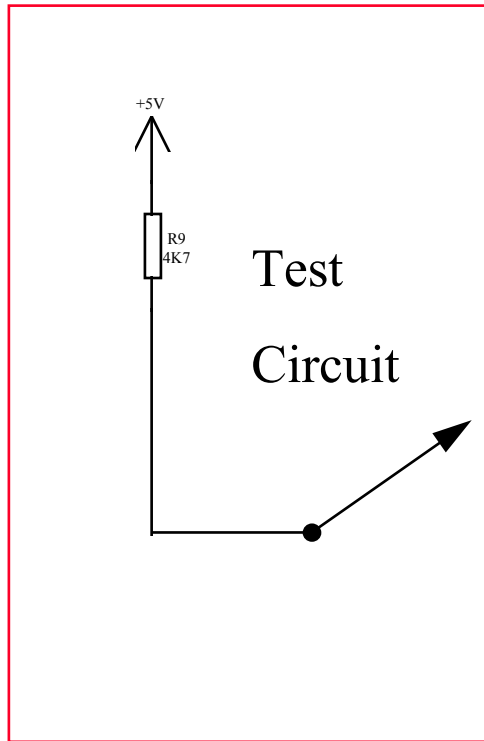
Light Pipe Controller System

Light Pipe Controller System.

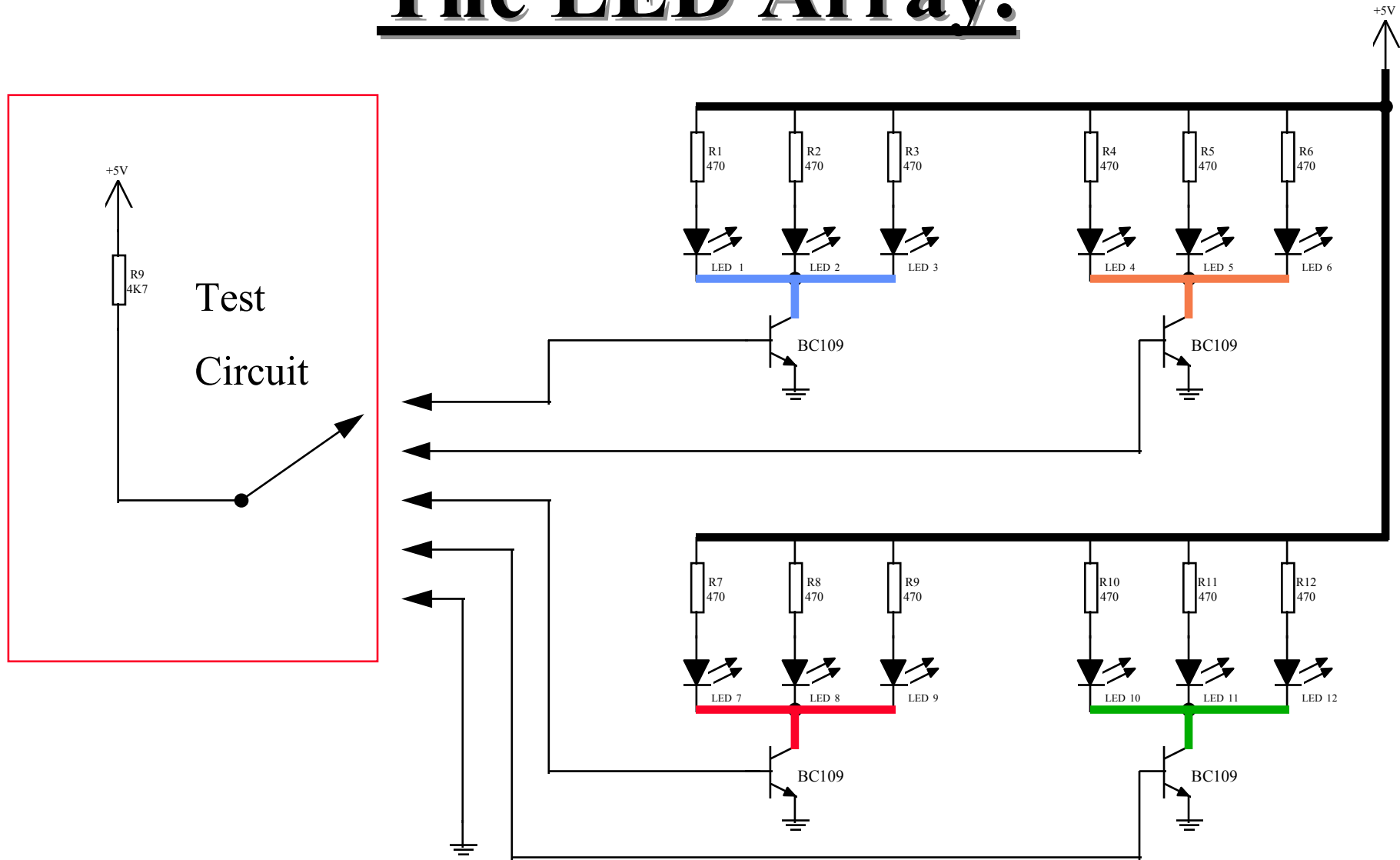


Block Diagram.

The LED Array.



The LED Array.



The Loom Wire sets

The LED, Resistor Assembly Process.

The LED Connections.

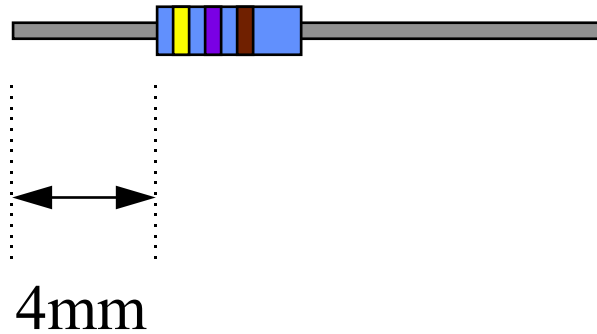
Step 1

Tin the resistor



Step 2

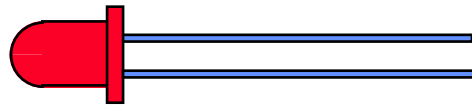
Cut to size



The LED Connections.

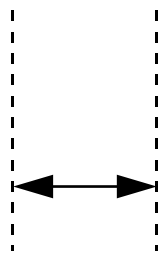
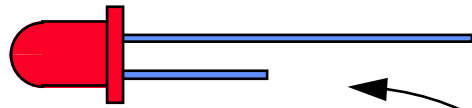
Step 3

Tin the LED



Step 4

Cut to size



4mm

+Ve Positive Leg
of the LED.

**Double check
before cutting.**

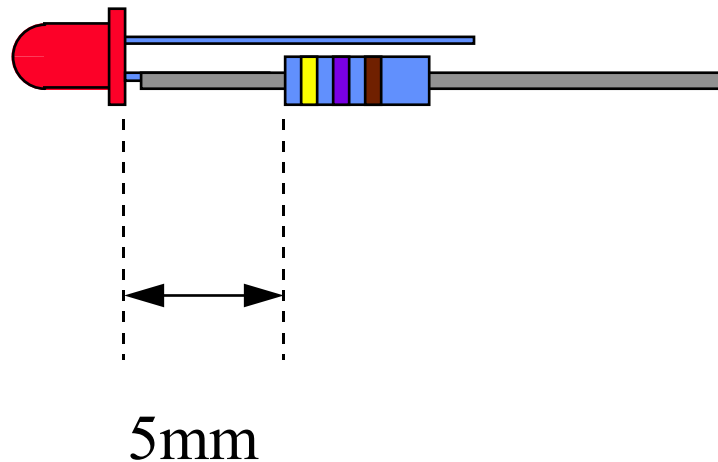
The LED Connections.

Step 5

Use a small amount of heat and bead of solder on Soldering Iron and join LED to the Resistor

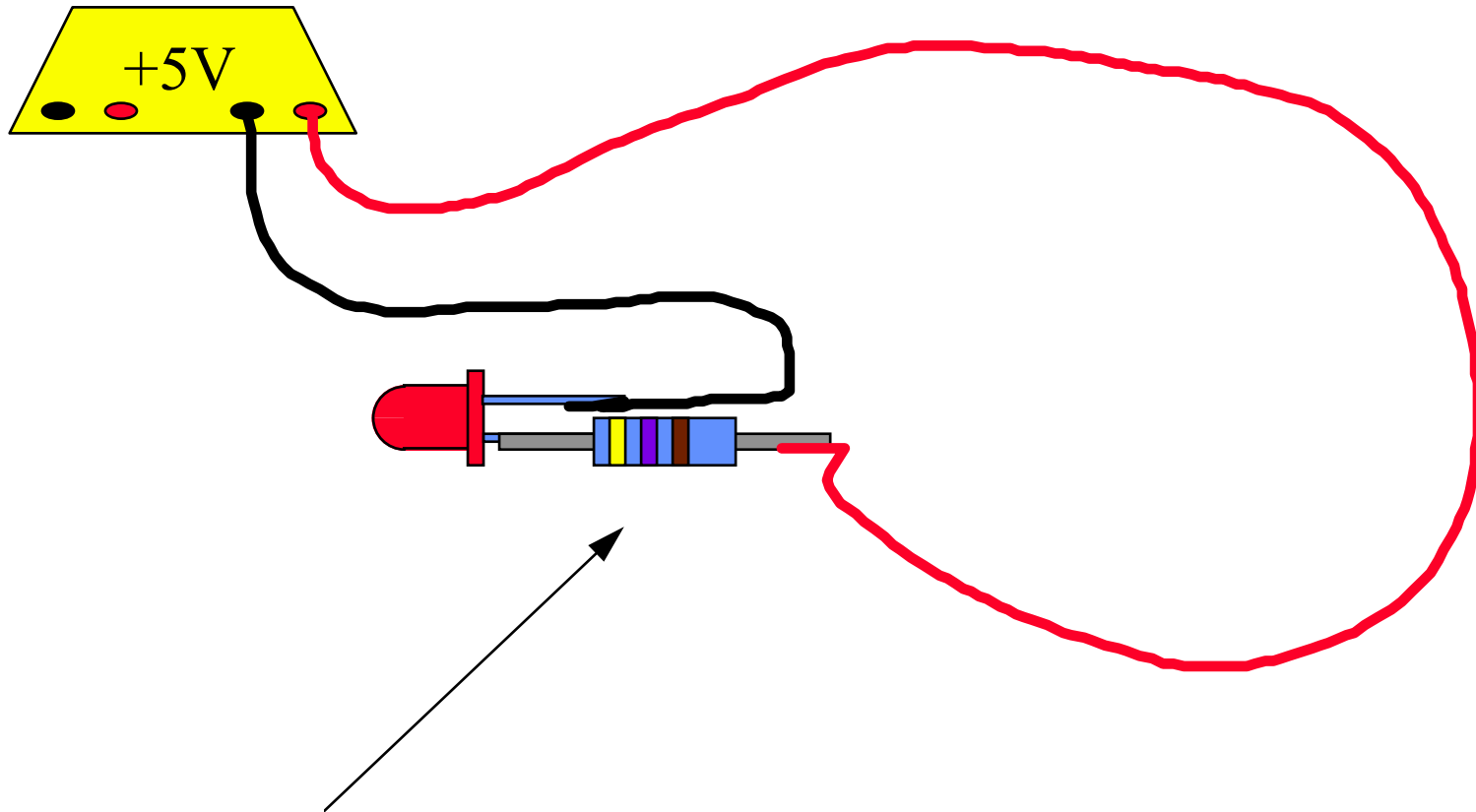
Step 6

Produce 12 LED resistor network assemblies



Testing the LED, Resistor Assembly.

Test the LED Resistor Network.



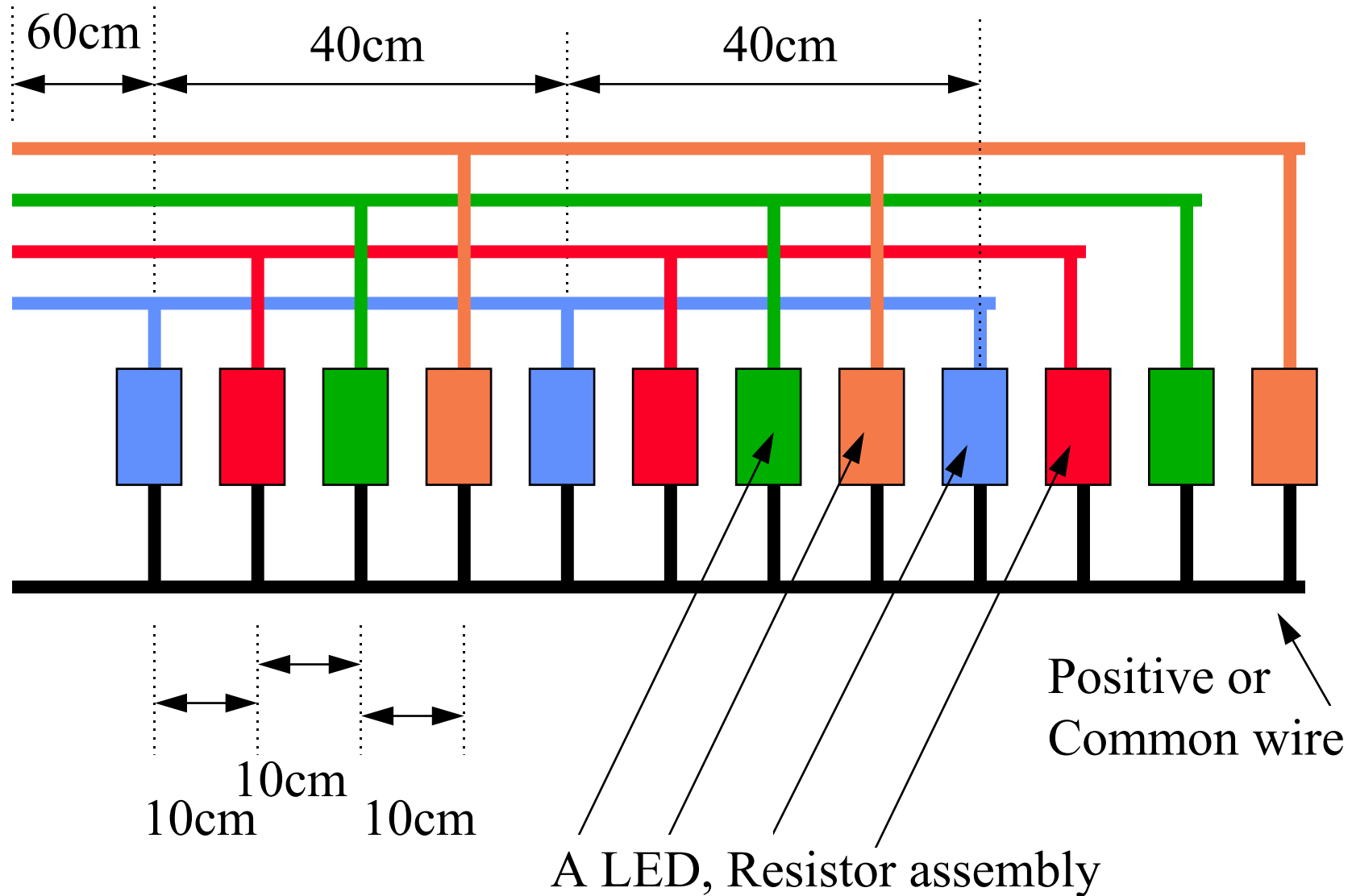
Final Outcome: LED should light when connected as above.

The Loom Assembly Process.

Build the loom.

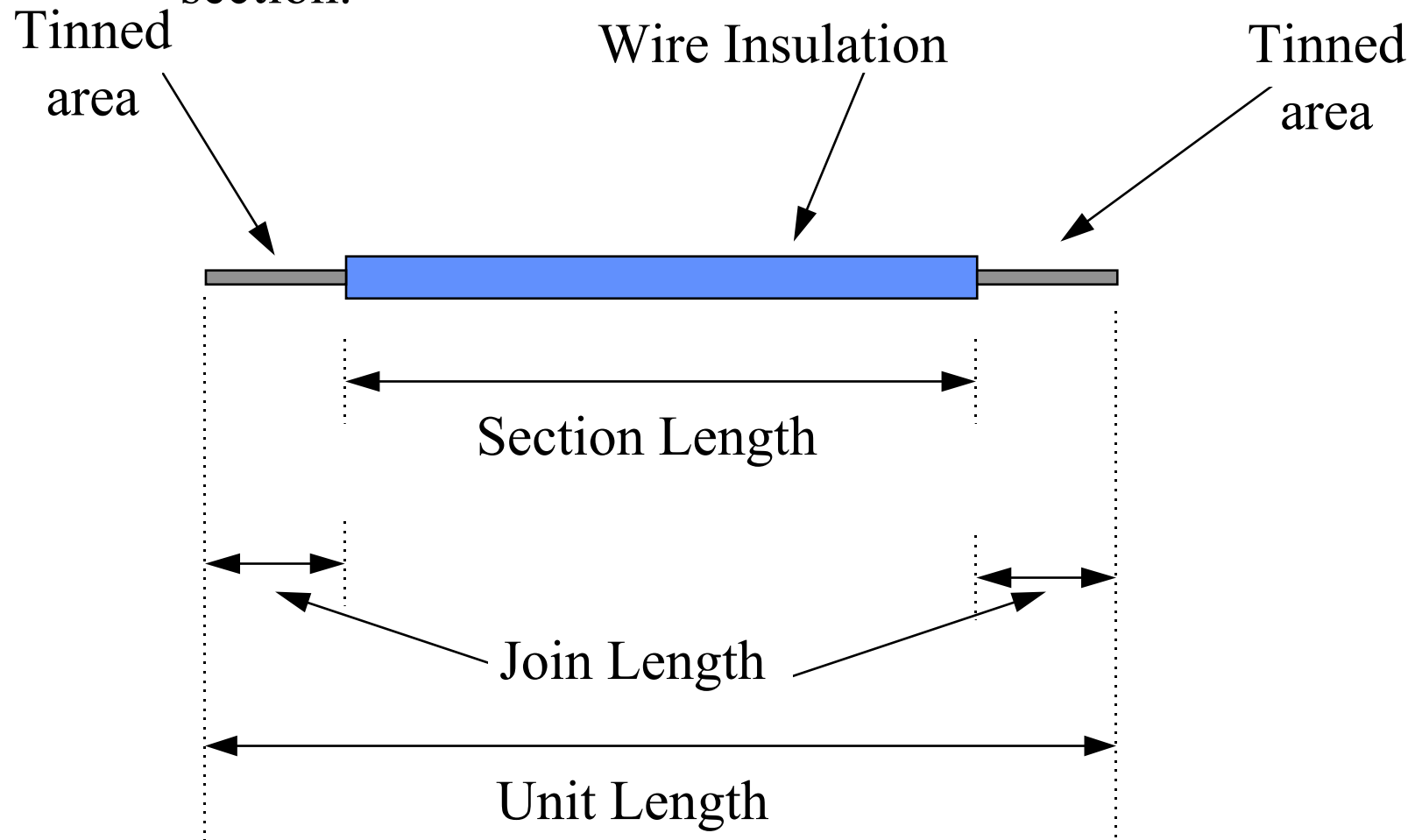
- You will need to calculate the length of wire for each of the following :-
 - BLUE LED, Resistor network set.
 - RED LED, Resistor network set.
 - GREEN LED, Resistor network set.
 - ORANGE LED, Resistor network set.
 - COMMON set of connections.
- You will also need to estimate how much wire you will use when making the terminating joints.

Build the loom.



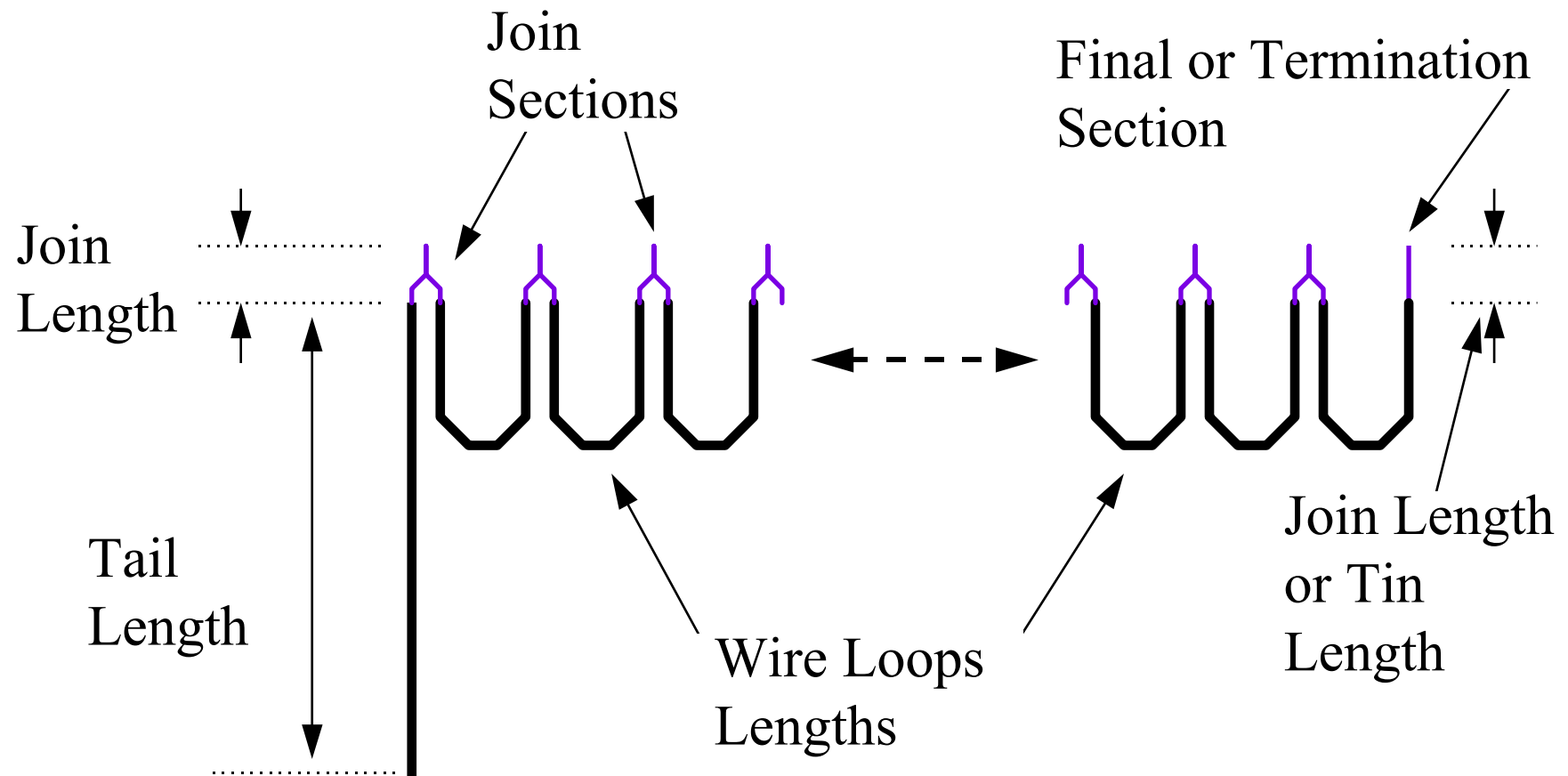
Build the loom.

Example Measurement of part of a loom section.



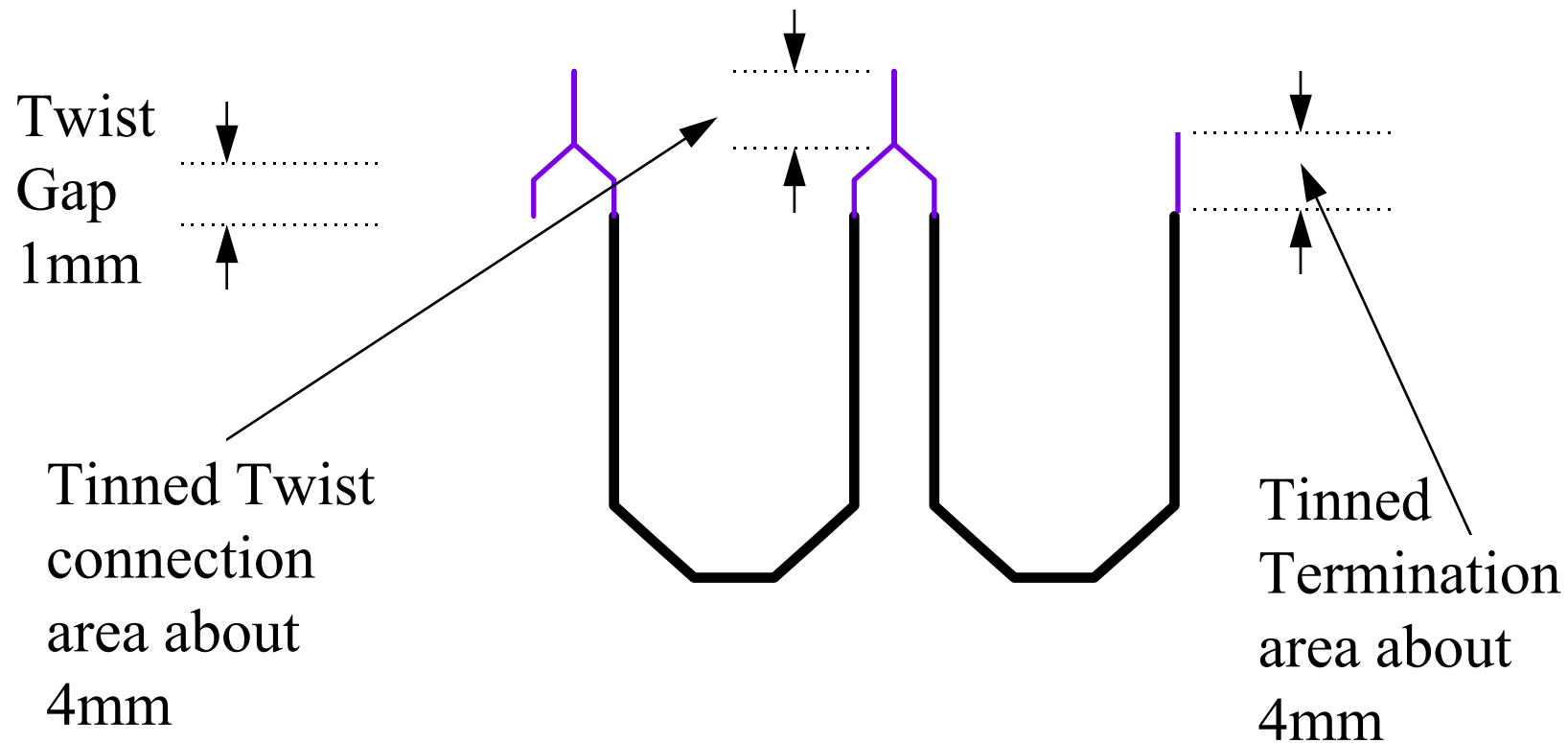
Build the loom.

Example construction of part of a loom section.

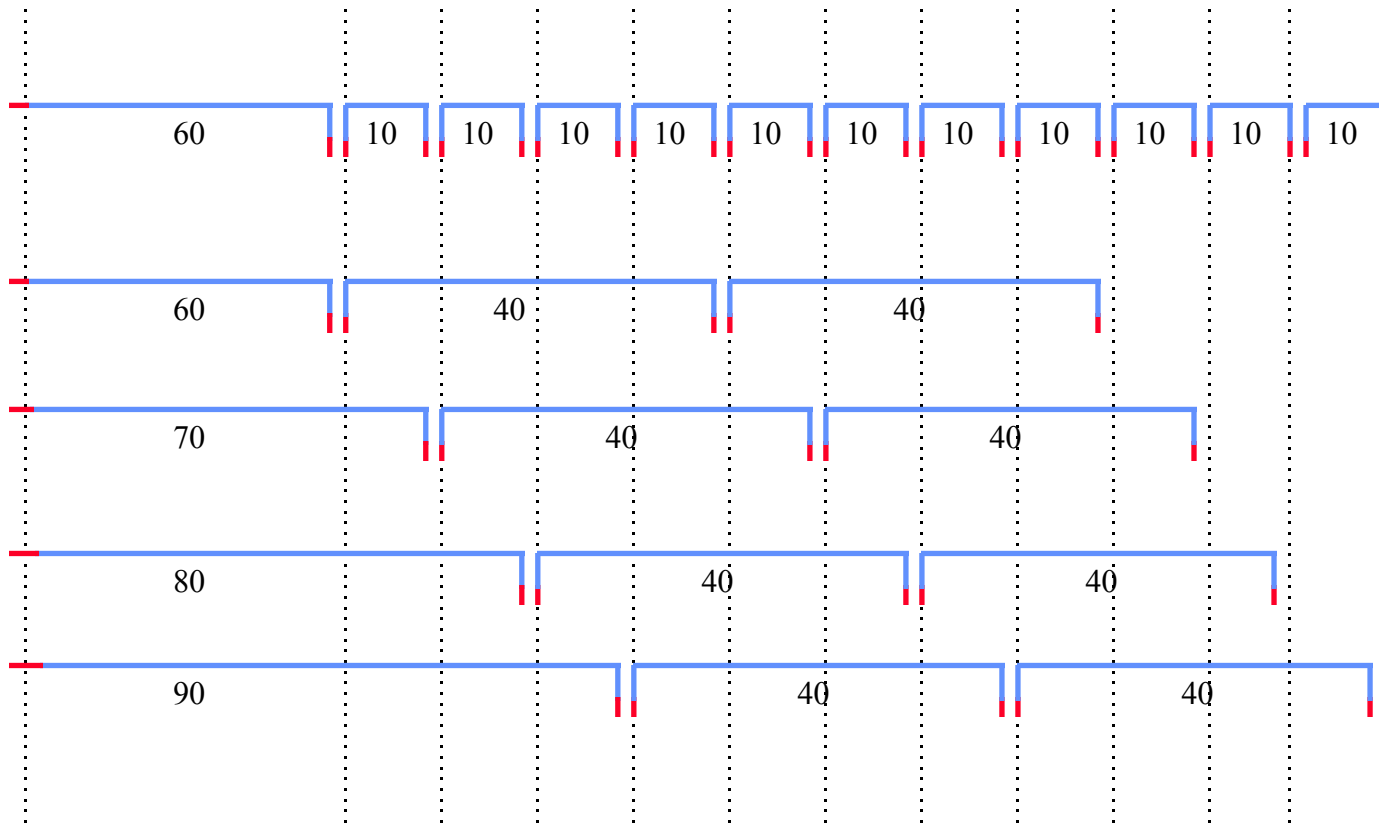


Build the loom.

Expanded view of Join and Termination sections.



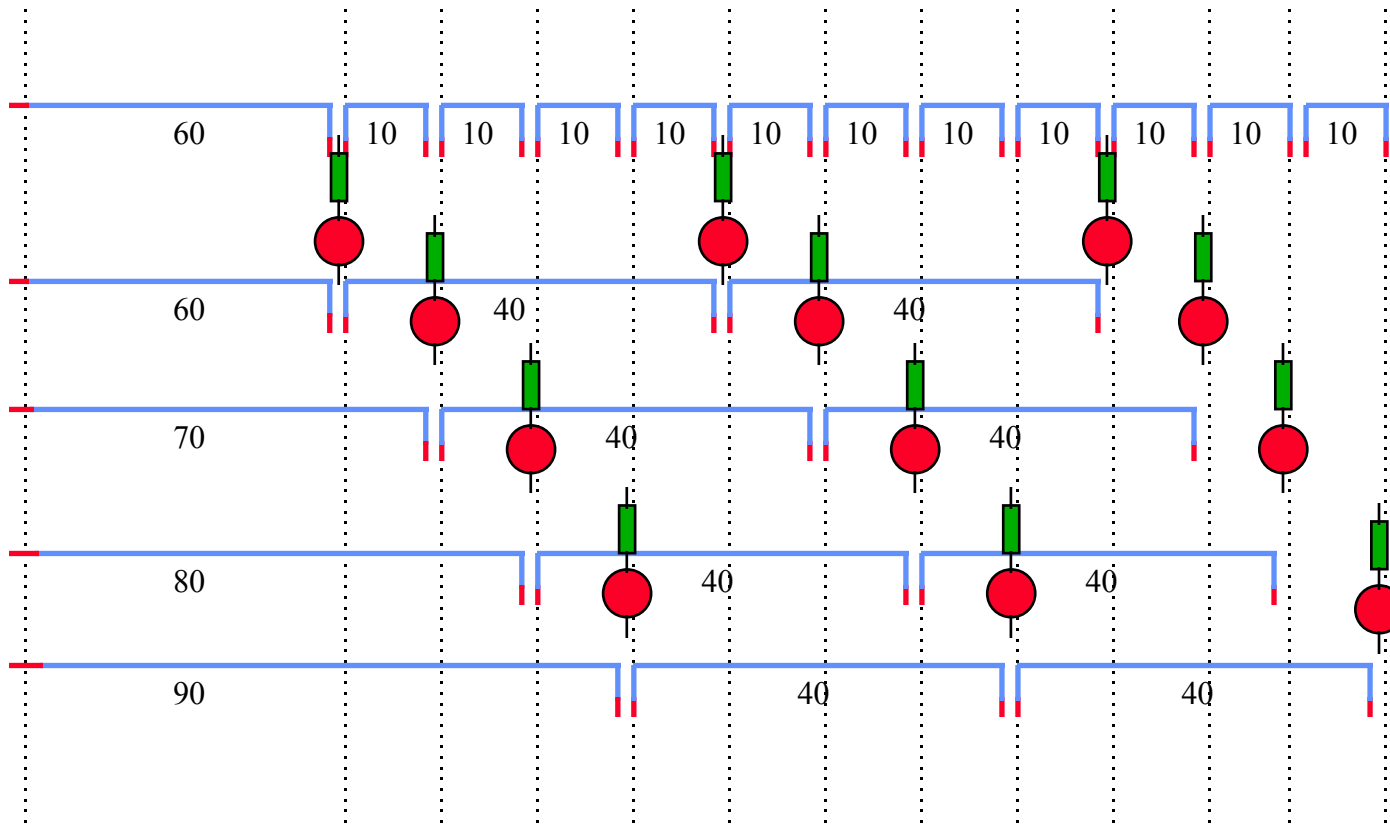
Build the loom.



Actual grouping of the Cable loom.

All measurements are in cm.

Build the loom.



Actual grouping of the Cable loom.

All measurements are in cm.

Build the loom.

- Wire length calculations in cm:-
 - BLUE set $60 + 40 + 40 + (6 * \#)$.
 - RED set $70 + 40 + 40 + (6 * \#)$.
 - GREEN set $80 + 40 + 40 + (6 * \#)$.
 - ORANGE set $90 + 40 + 40 + (6 * \#)$.
 - COMMON set $60 + 11 * 10 + (24 * \#)$.
- The Hash symbol (#) indicates the amount of extra wire you need (in mm) to allocate for the tinning or termination sections.

Build the loom.

- Wire length calculations in cm:-
 - BLUE set $140 + (6 * \#)$.
 - RED set $150 + (6 * \#)$.
 - GREEN set $160 + (6 * \#)$.
 - ORANGE set $170 + (6 * \#)$.
 - COMMON set $170 + (24 * \#)$.
- Which gives $790 + (48 * \#)$
- Therefore if $\# = 20\text{mm}$ then length =
 $790\text{cm} + 960\text{mm} = 886\text{cm}$ or 8.86m

The Light Pipe Assembly Process.

The Light Pipe Assembly.

2 * 7/0.2 Blue
Tinned Twisted Connection
Negative Group

Warning

Ensure you know where the wires are going.

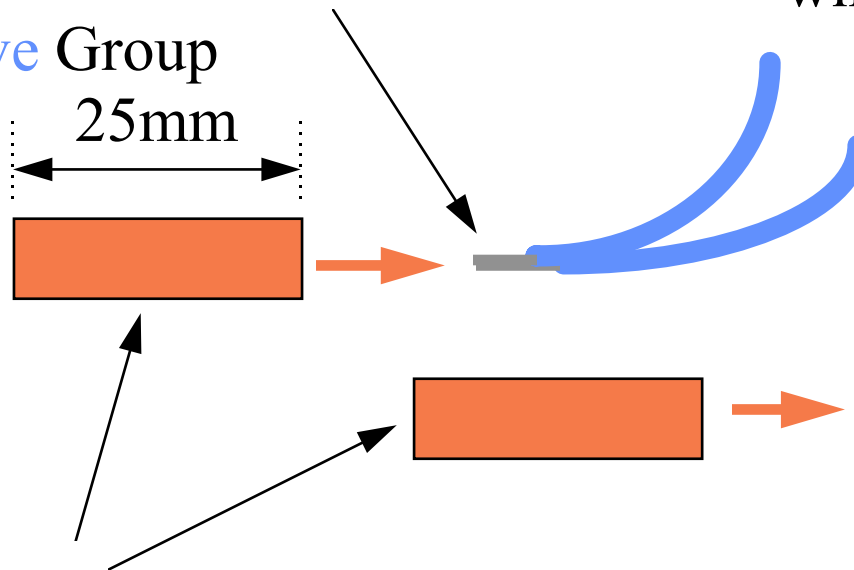
+3mm
Sleeving
solution

Push Sleeving sections
over the tinned wires
Sleeving lengths all
30mm long.

2 * 7/0.2 Blue
Tinned Twisted Connection
Positive / Common Line

The Light Pipe Assembly.

2 * 7/0.2 Blue
Tinned Twisted Connection
Negative Group



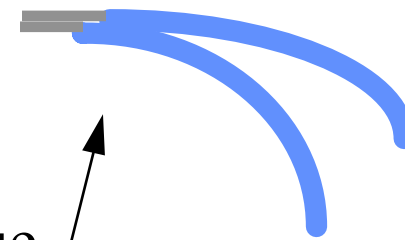
Push Sleeving sections
over the tinned wires
Sleeving lengths all
25mm long.

Warning

Ensure you know where the
wires are going.

< 2mm
Sleeving
solution

2 * 7/0.2 Blue
Tinned Twisted Connection
Positive / Common Line



The Light Pipe Assembly.

Warning

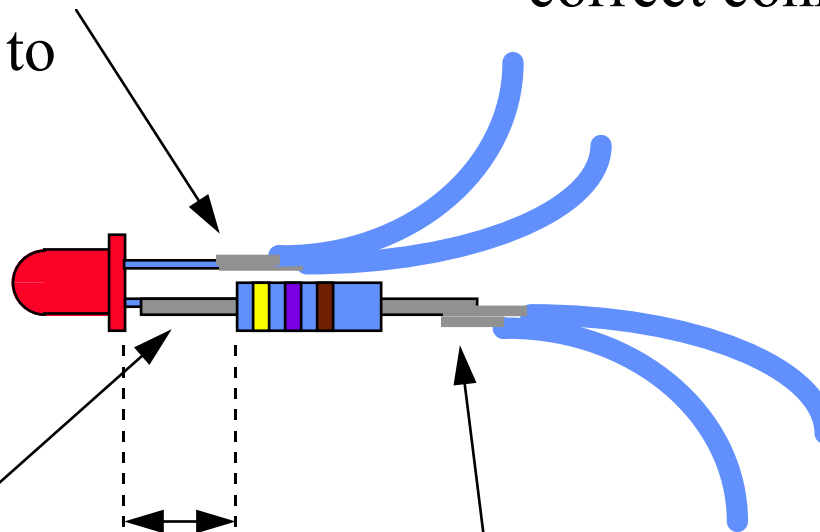
Ensure you have selected correct connection on LED.

2 * 7/0.2 Blue
Twisted Connection
Soldered directly to
LED

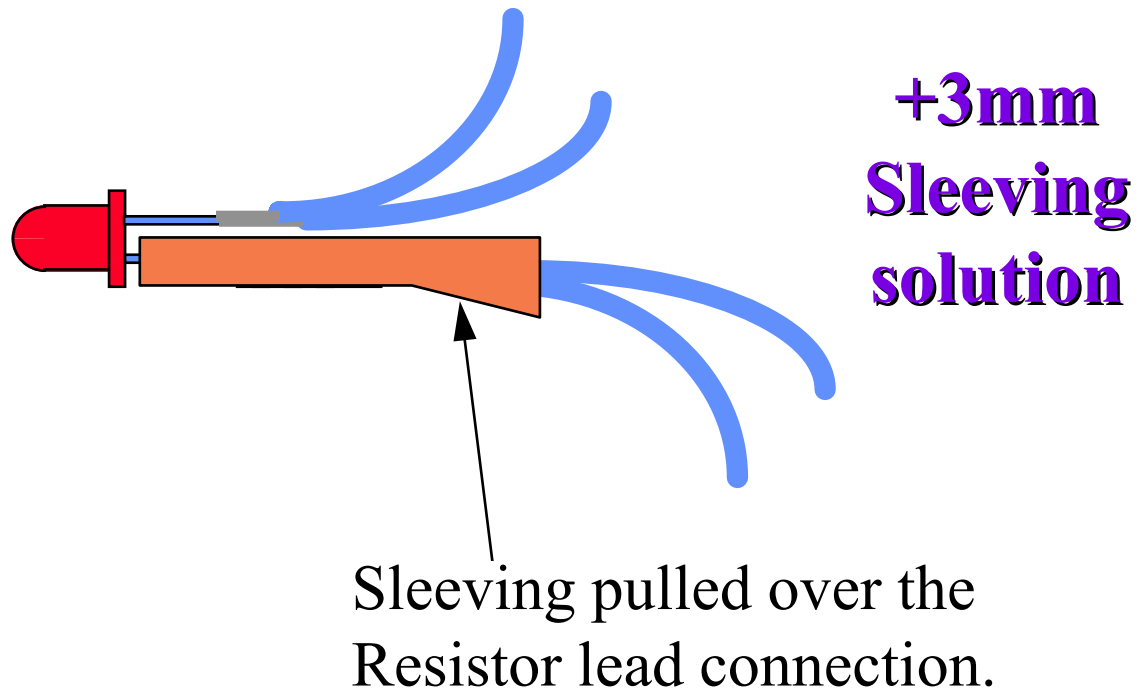
Resistor Soldered
directly to LED

5mm

2 * 7/0.2 Blue
Twisted Connection
Soldered directly to Resistor

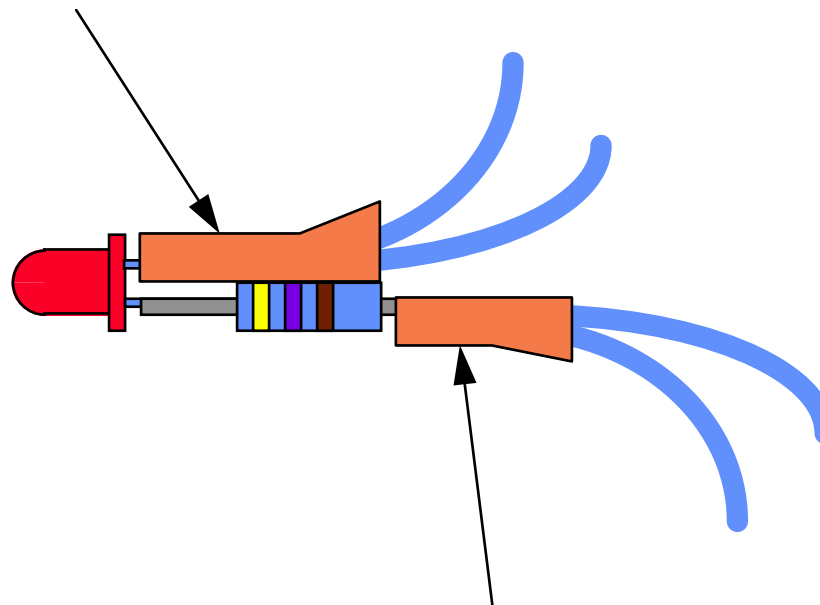


The Light Pipe Assembly.



The Light Pipe Assembly.

Sleeving pulled over the LED lead connection.

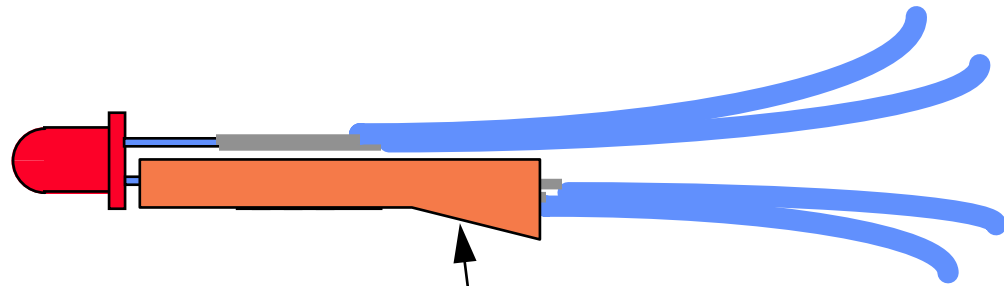


**< 2mm
Sleeving
solution**

Sleeving pulled over the Resistor lead connection.

The Light Pipe Assembly.

**+3mm
Sleeving
solution**



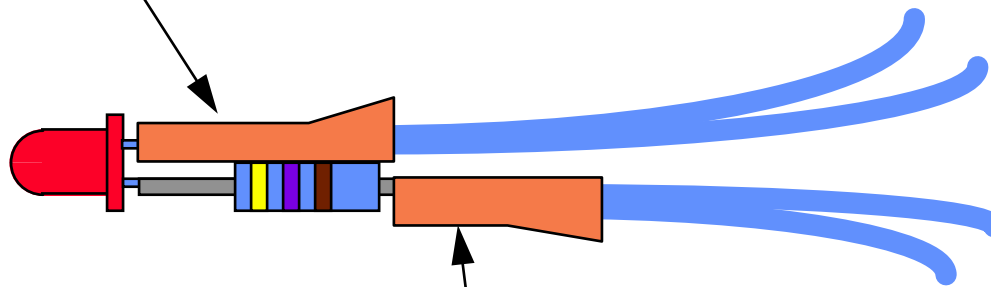
Straighten out
connection wires
to the LED
Resistor assembly.

Sleeving pulled over the
Resistor lead connection.

The Light Pipe Assembly.

Sleeving pulled over the LED lead connection.

**< 2mm
Sleeving
solution**



Straighten out connection wires to the LED Resistor assembly.

Sleeving pulled over the Resistor lead connection.

The Light Pipe Assembly.

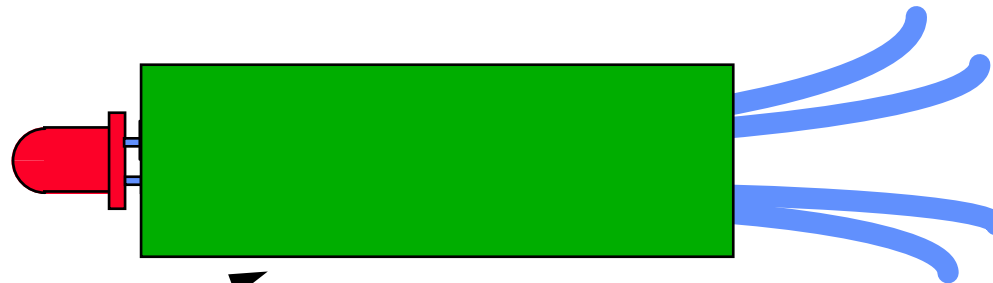
Remember

You need to make a clean cut through Heat shrink to avoid it splitting.

Warning

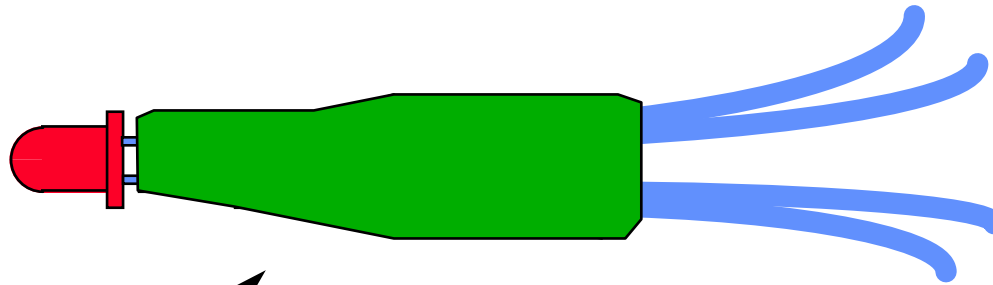
All connection joints tested before heat shrink is sealed.

Cover with
Heatshrink and
seal the LED ,
Resistor assembly.



←—————→
About 35 → 40mm

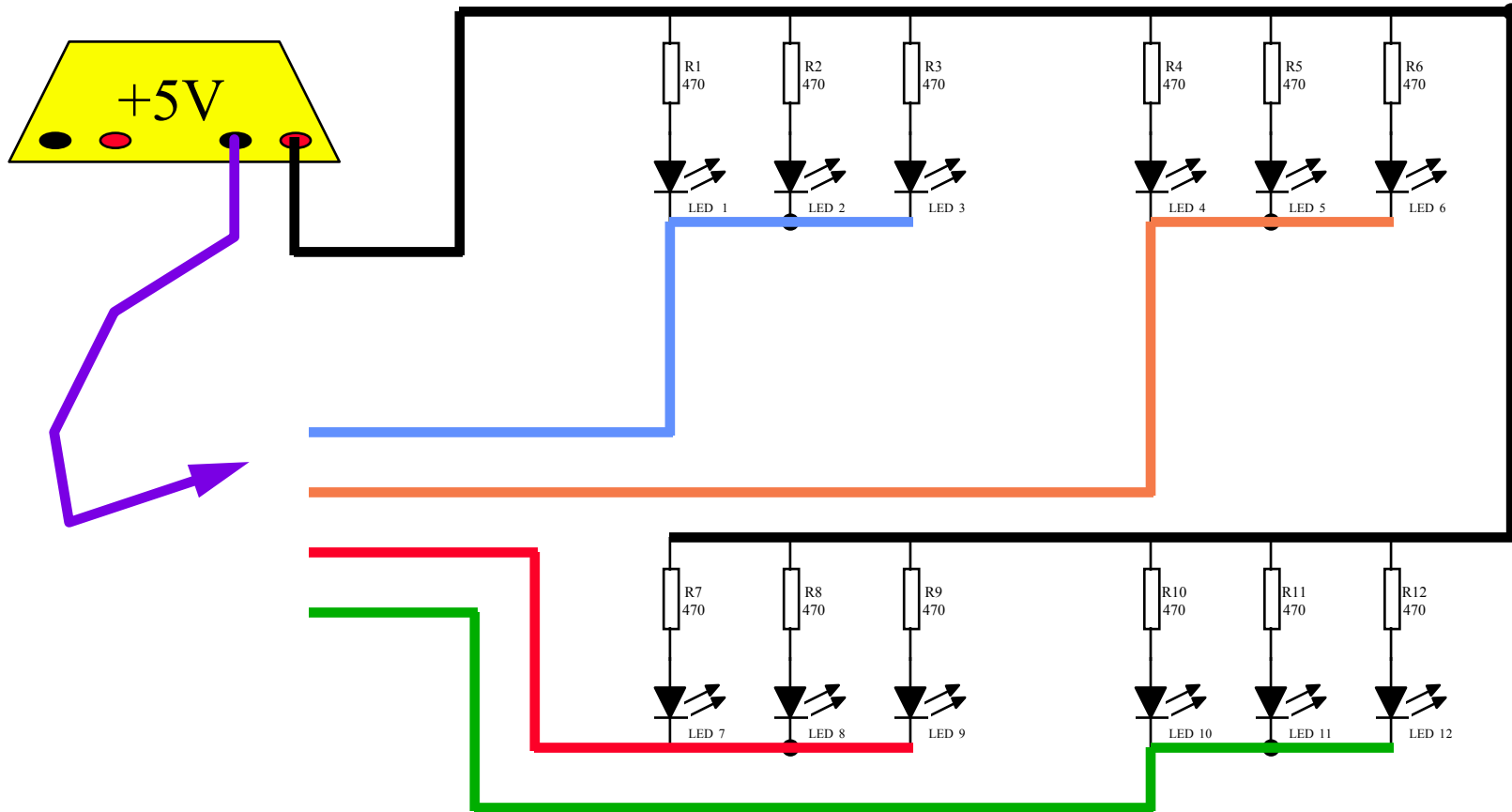
The Light Pipe Assembly.



Final Outcome after
heating process.

Testing the Loom Assembly.

Test the Loom Assembly.



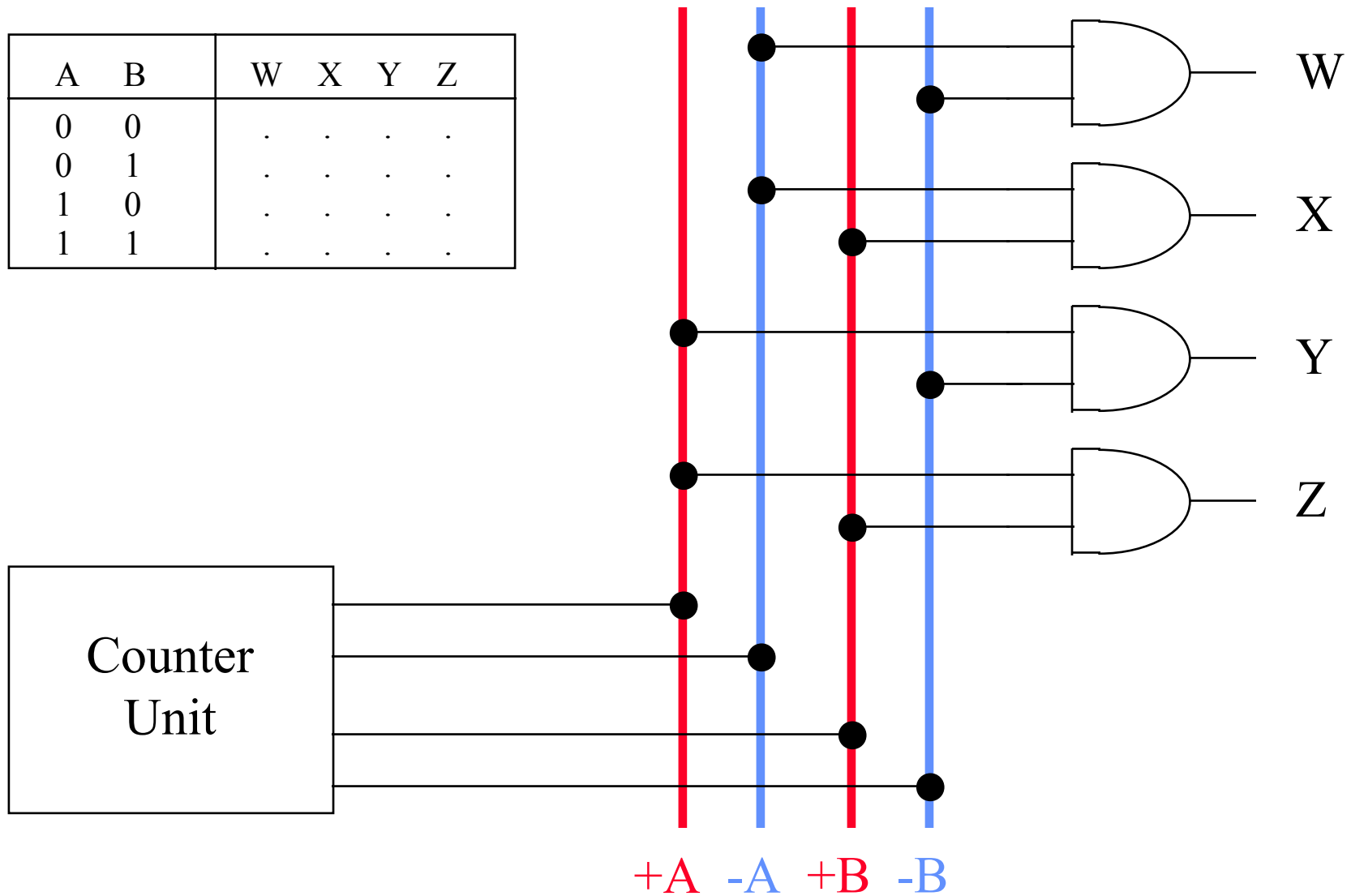
Final Outcome: Each Groups of 3 LEDs should light when connected as above. **Correct if any errors.**

Testing the Controller Board.

The Controller Board.

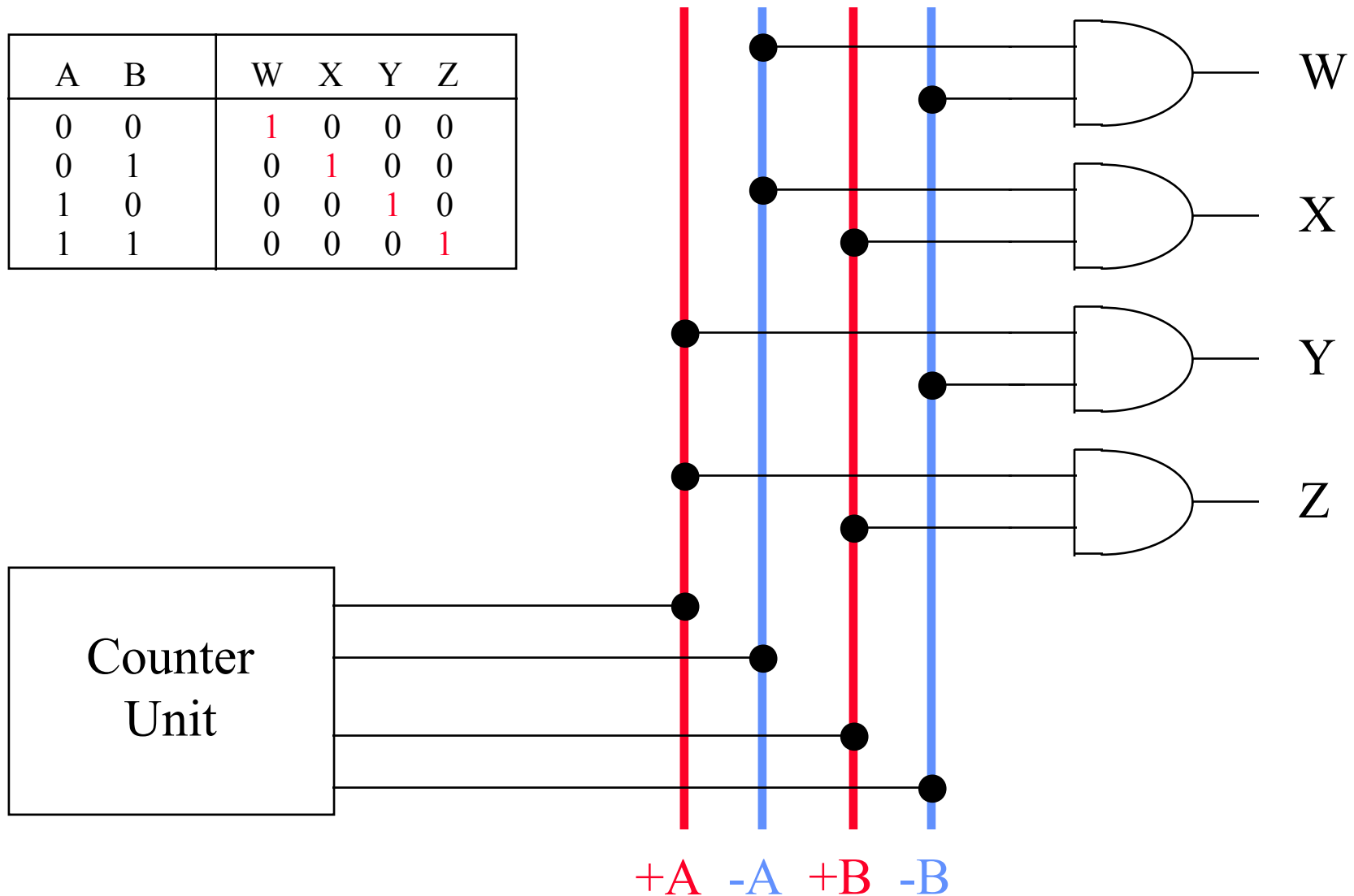
The Controller Board.

A	B	W	X	Y	Z
0	0	.	.	.	.
0	1	.	.	.	.
1	0	.	.	.	.
1	1	.	.	.	.



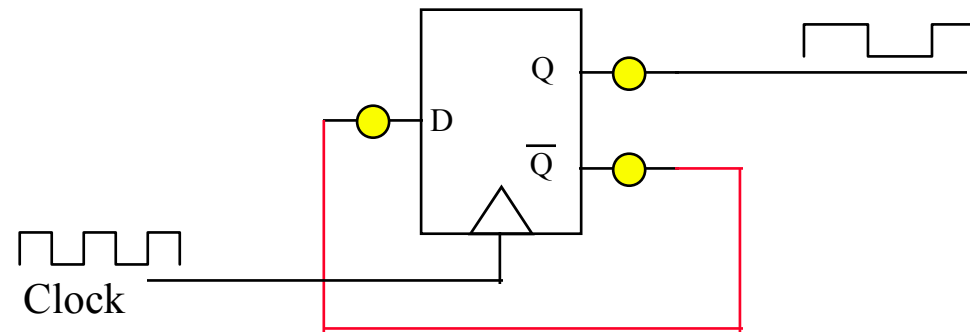
The Controller Board.

A	B	W	X	Y	Z
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1



● = 0
● = 1

The Controller Board.







“D” Type configured as a “T” (Toggle) type Flip/Flop
Each Clock Pulse causes the Flip/Flop to change state.

This circuit acts as a divide by two circuit.

The Controller Board.

- The D (Data) Type Latch Truth Table.

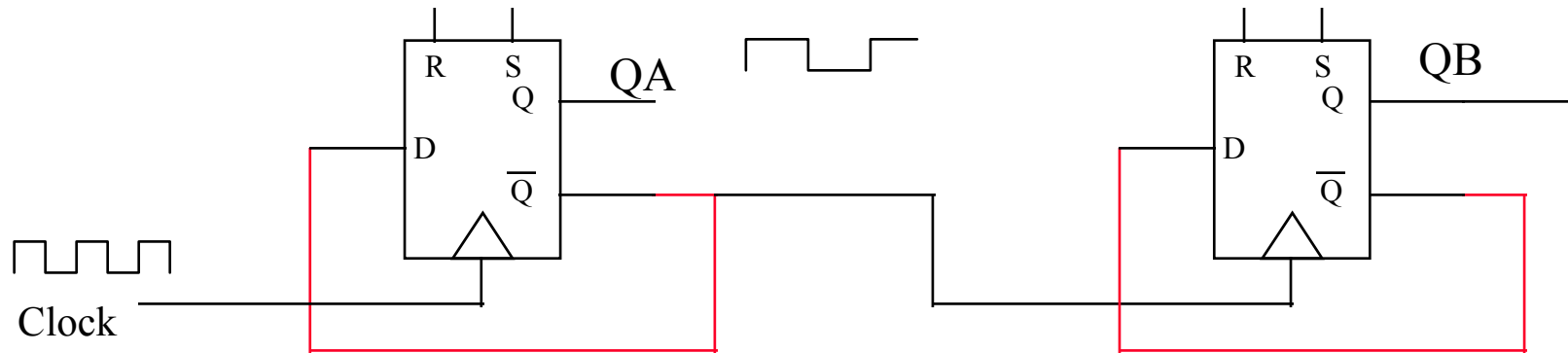
D	Clk	Q
0		0
0		Q_0
1		1
1		Q_0

Summary.

Positive Edge Triggered D Type

Q_0 indicates the state Q was in before Clock Pulse

Logic Functions.

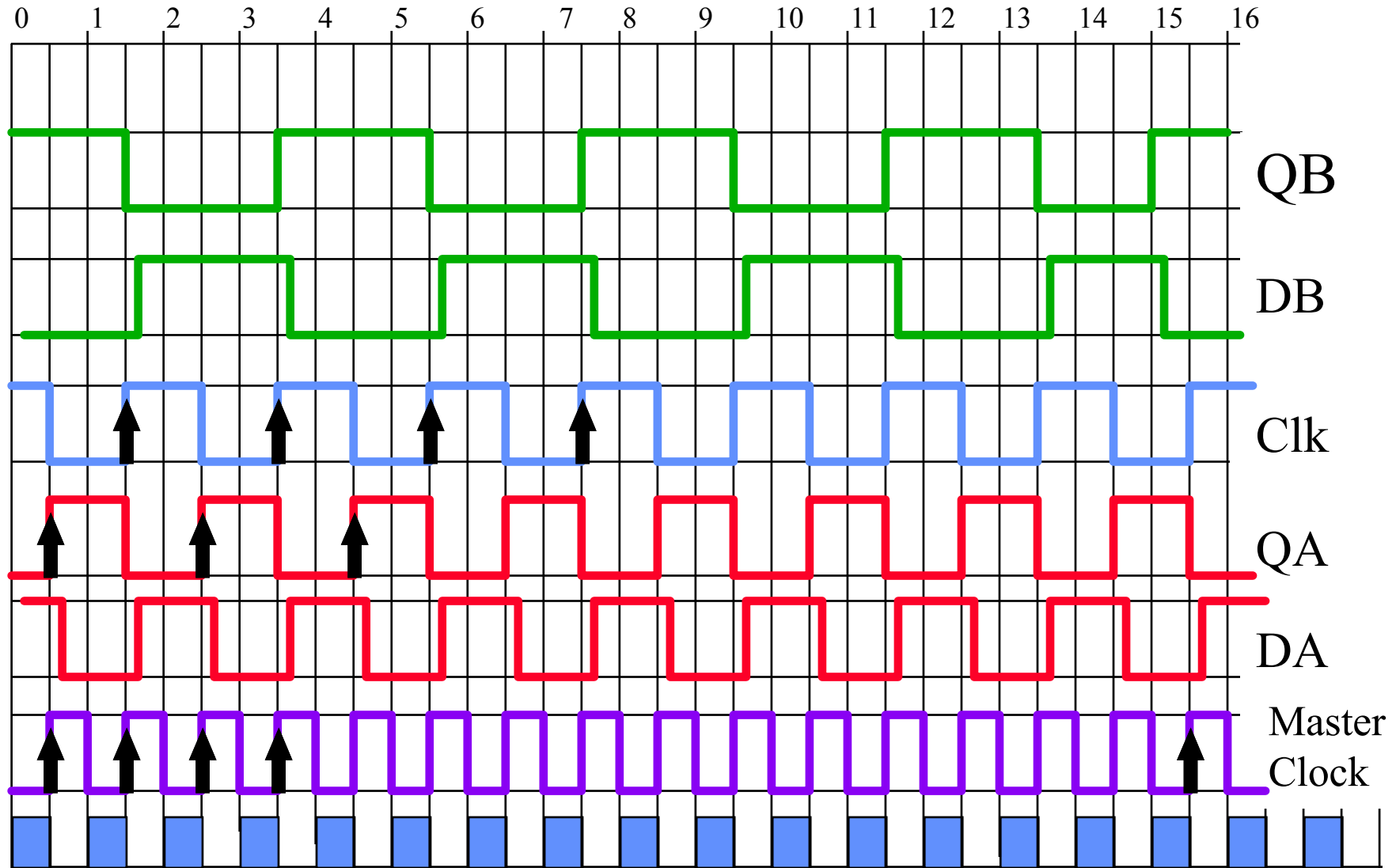


D Type Flip/Flops + RS as a Divide by 4 Divider.

↑ Clock Edge

The Controller Board.

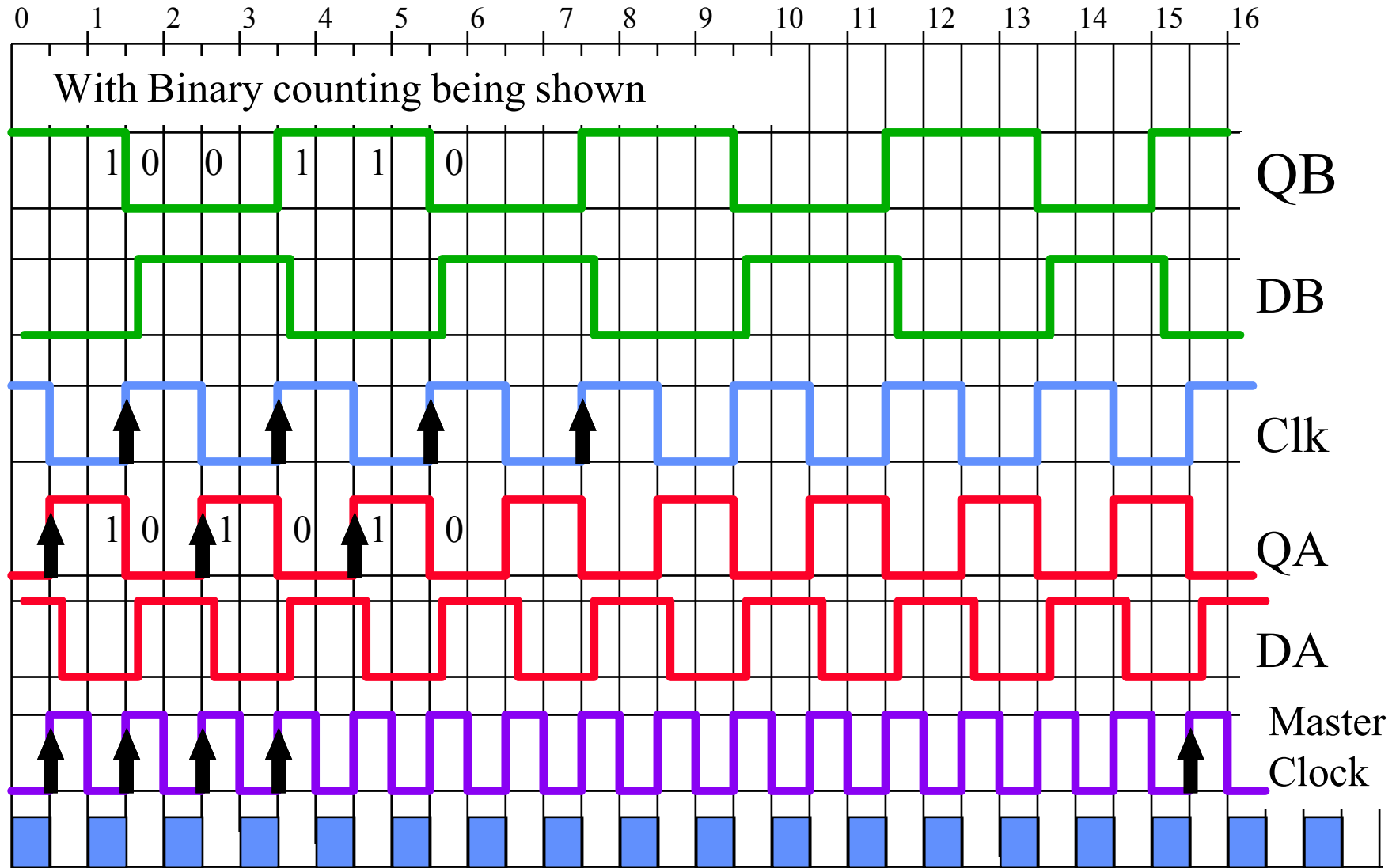
Using **Positive**
Clock Edges



↑ Clock Edge

The Controller Board.

Using **Positive**
Clock Edges



Transistors and Diodes

Transistors and Diodes.

The Basic Diode.

The Basic diode is built from a sandwich of two types of semiconductor material.

Transistors and Diodes.

The Basic Diode.



The Basic diode is built from a sandwich of two types of semiconductor material.

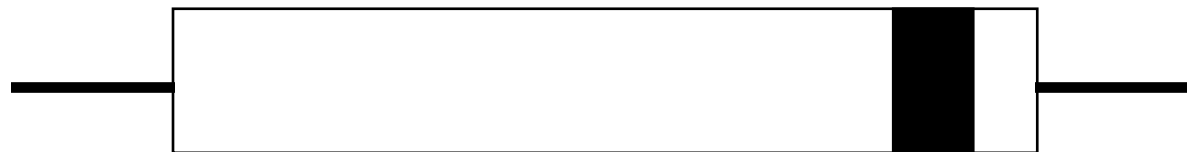
The diode will allow current to flow in only one direction through the device.

Transistors and Diodes.

The Basic Diode.



The **Bar** on the physical diode usually indicates which end must be connected to the most **negative** voltage for the device for it to **conduct** electricity.



Anode

Most Positive End

Cathode

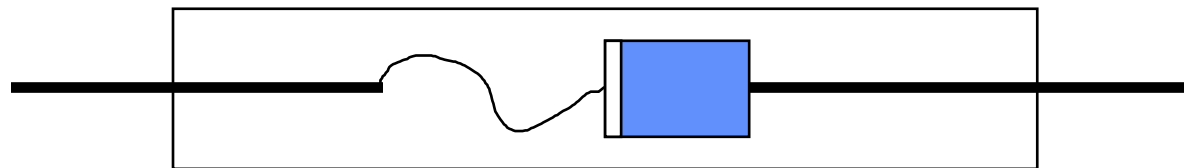
Most Negative End

Transistors and Diodes.

The Basic Diode.



The typical internal construction may look as follows :-



Anode

Most Positive End

Cathode

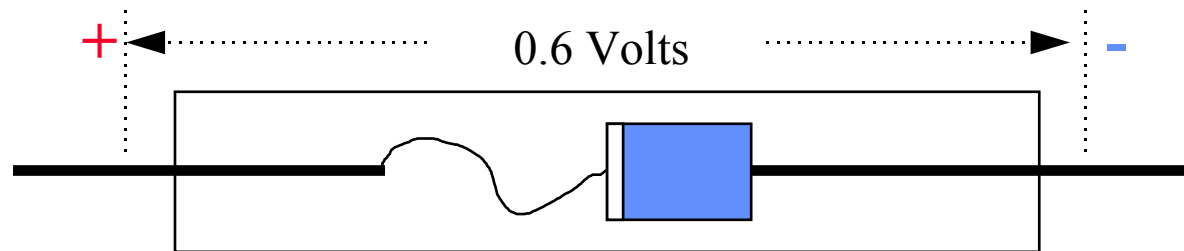
Most Negative End

Transistors and Diodes.

The Basic Diode.



When a Silicon diode is conducting electricity you can measure a voltage of about 0.6 volts across the device.



Anode

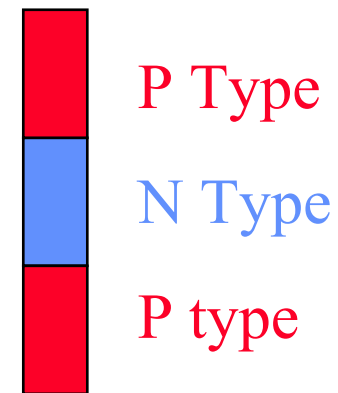
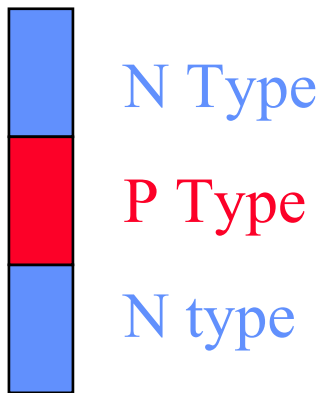
Most Positive End

Cathode

Most Negative End

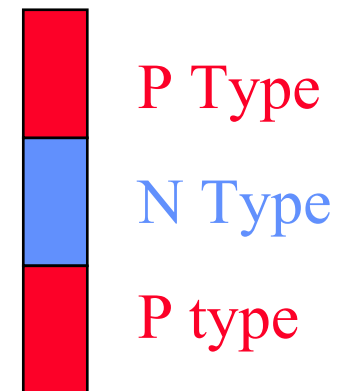
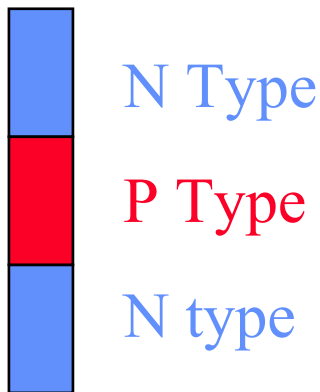
Transistors and Diodes.

- The next development phase was to build three layer semiconductors and this gave the possibility of two variants.



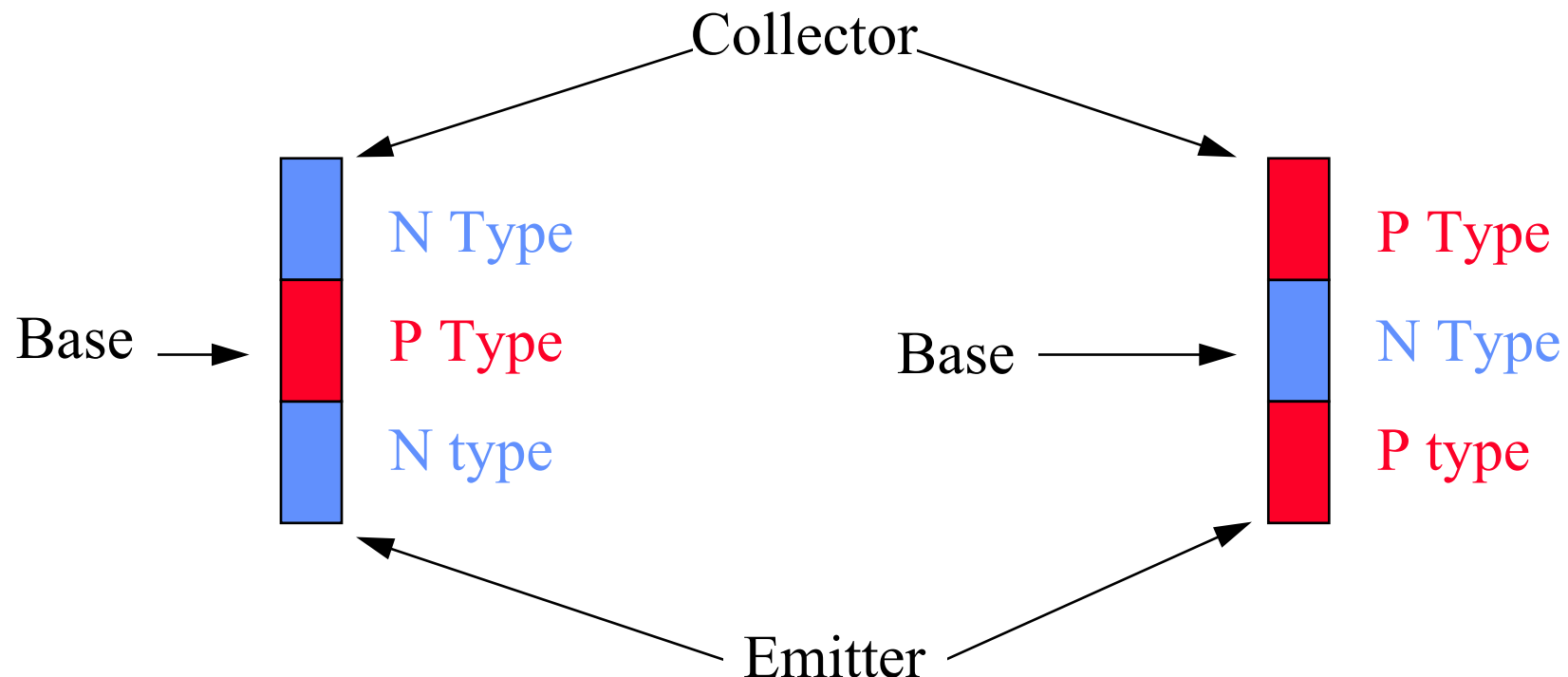
Transistors and Diodes.

- The next development phase was to build three layer semiconductors and this gave the possibility of two variants.
- The variants were identified from their construction i.e. PNP and NPN.



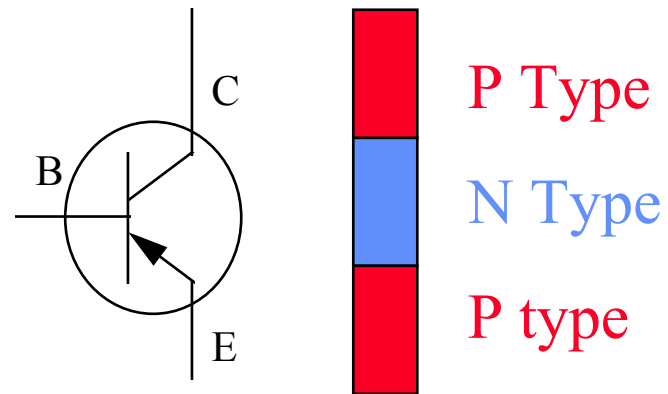
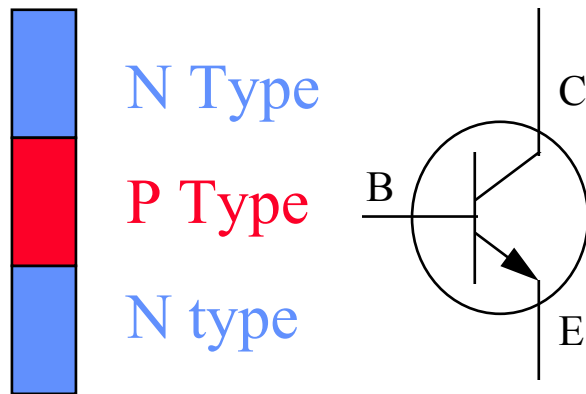
Transistors and Diodes.

- The sections of each construction were also named (partially based on their function)
i.e. Collector, Base and Emitter.



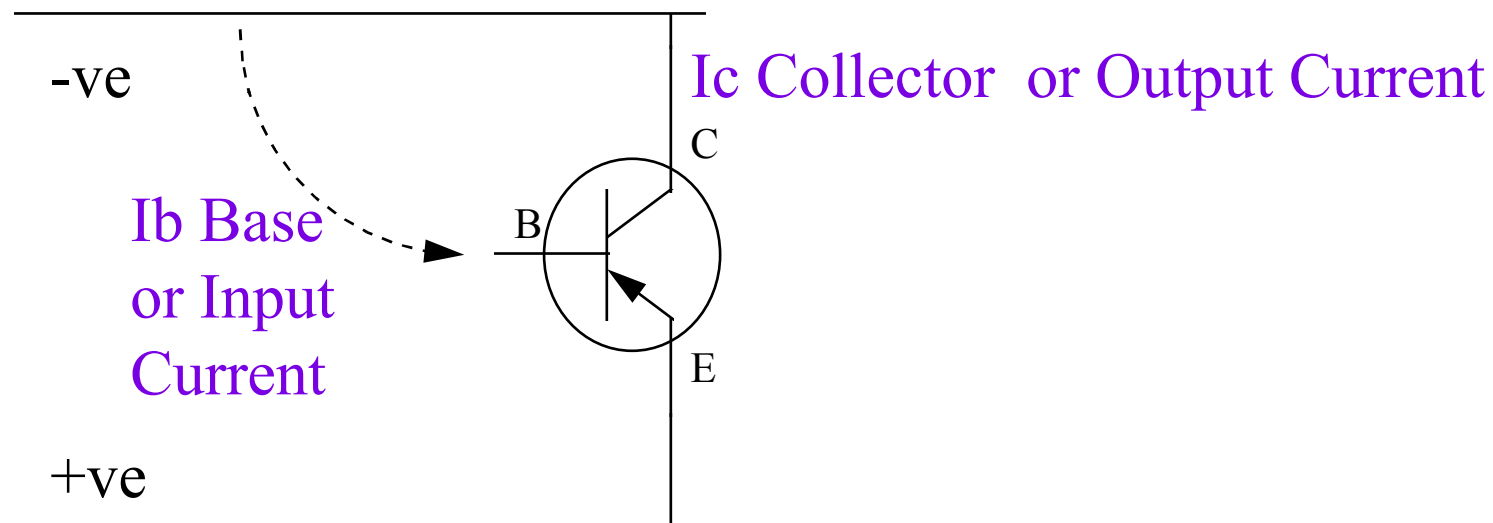
Transistors and Diodes.

- The devices were given the following circuit symbols.



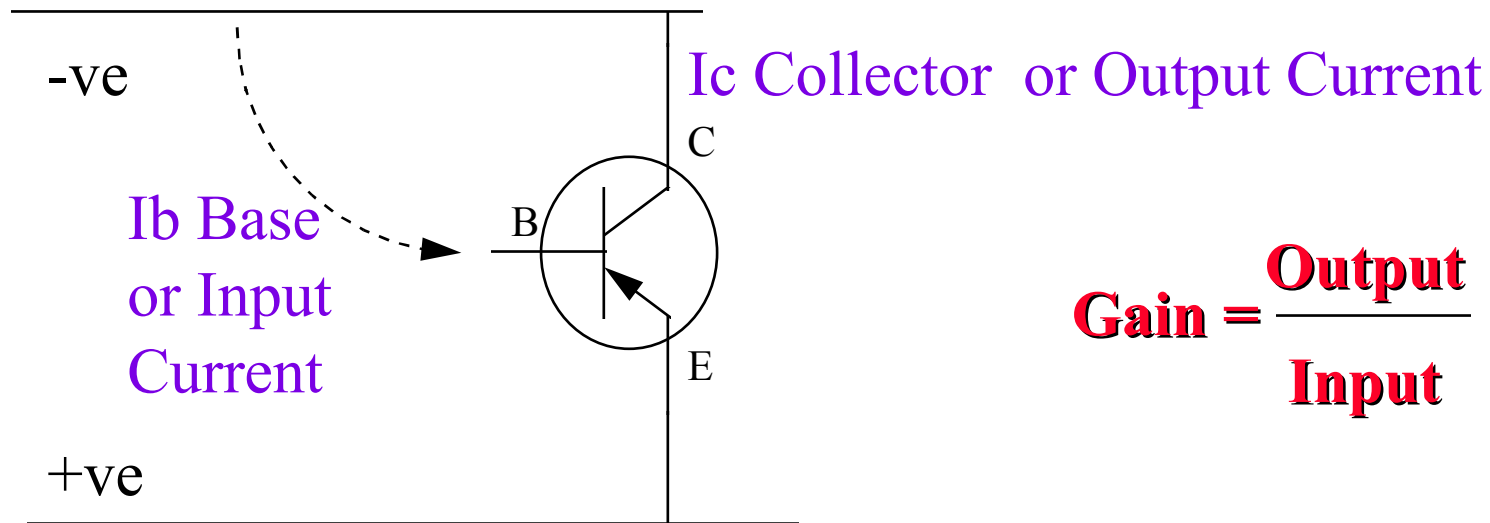
Transistors and Diodes.

- With this circuit configuration was used it was noticed that you only needed a **small** amount of Base current to enable a **large** amount of Collector current to flow.



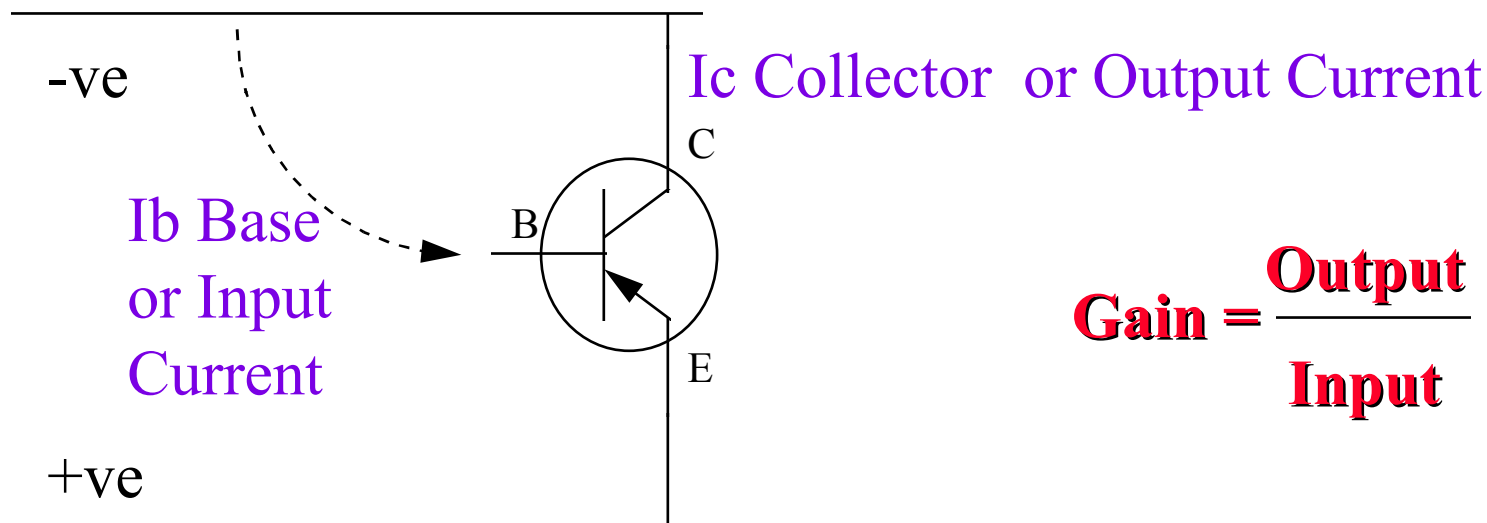
Transistors and Diodes.

- **Definition:** Gain is a measurement of the improvement of Output with respect to Input.



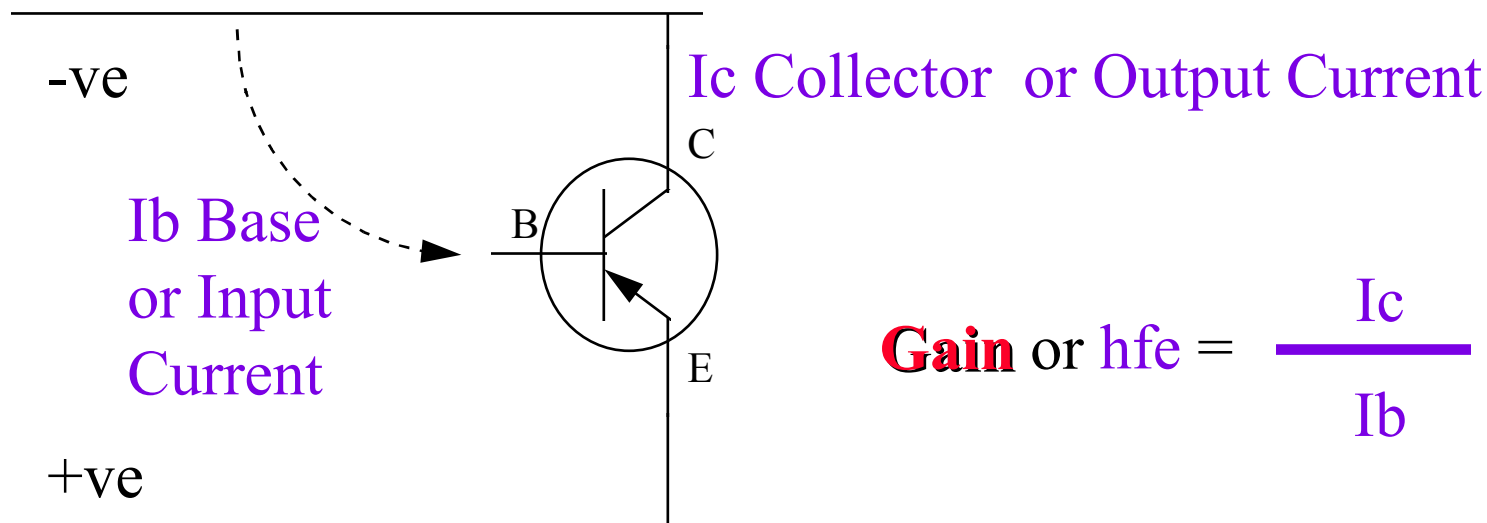
Transistors and Diodes.

- Gain is a measurement of the improvement of Output with respect to Input.
- Specifically **I_c** (the Collector Current) and **I_b** (the Base Current).



Transistors and Diodes.

- Gain is a measurement of the improvement of Output with respect to Input.
- Specifically **I_c** (the Collector Current) and **I_b** (the Base Current).



End Slide

Revision Page

Title

BTEC Coursework

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Edit

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