Index to Book Pages.

Index to Book Pages.

Index to Book Pages.

Index to Book Pages.

Index to Book Pages.

SOLDER

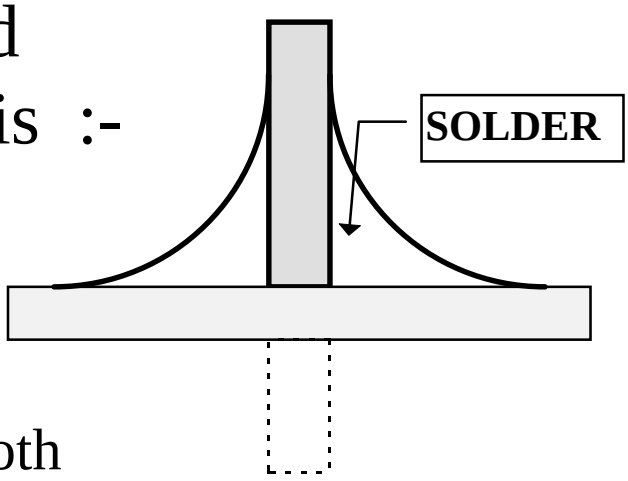
An Alloy of

Tin = 60%

&

Lead = 40%

The Good Soldered Connection is :-



1. SHINY & Bright
2. CONCAVE & Smooth
3. No Spikes Lumps , Bumps or Holes

FLUX

Two Types

Corrosive **(Used for Plumbing)**

CLEANS

and also ↓

Non Corrosive **(Electrical Work)**

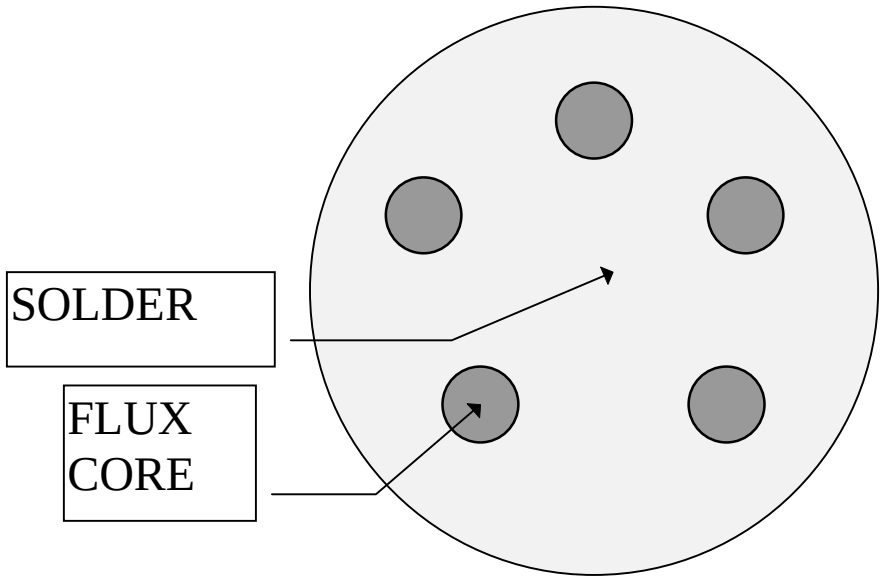
AIDS HEAT TRANSFER

PREVENTS OXIDISATION

MULTI - CORE SOLDER

How Do We Apply the Flux ?

Example of 5 Core Solder



WIRES.

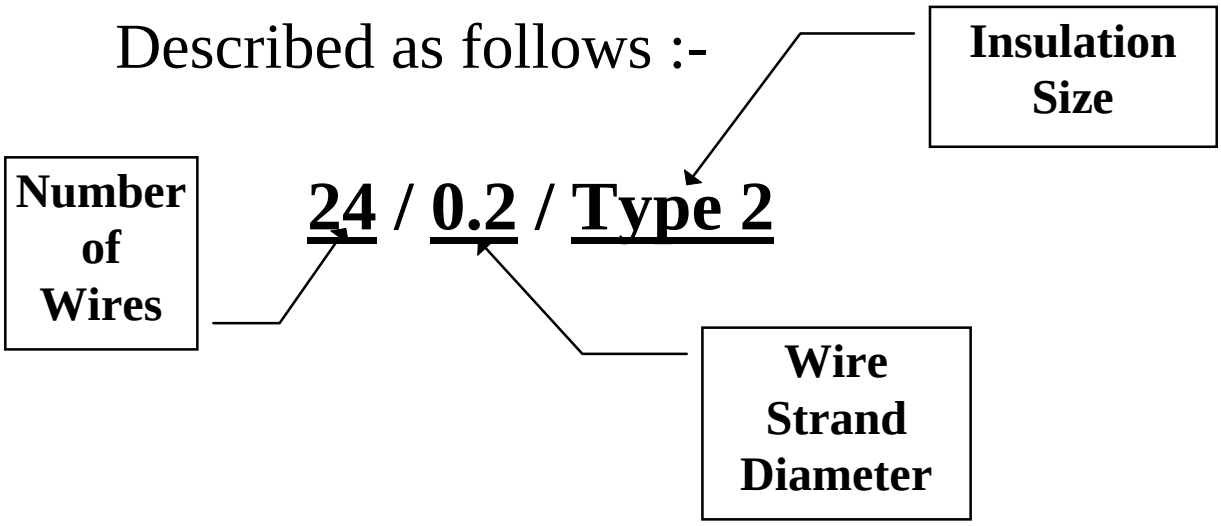
Three Types

Single Strand Bare.

Single Strand Insulated.

Multi-Strand Insulated.

Described as follows :-

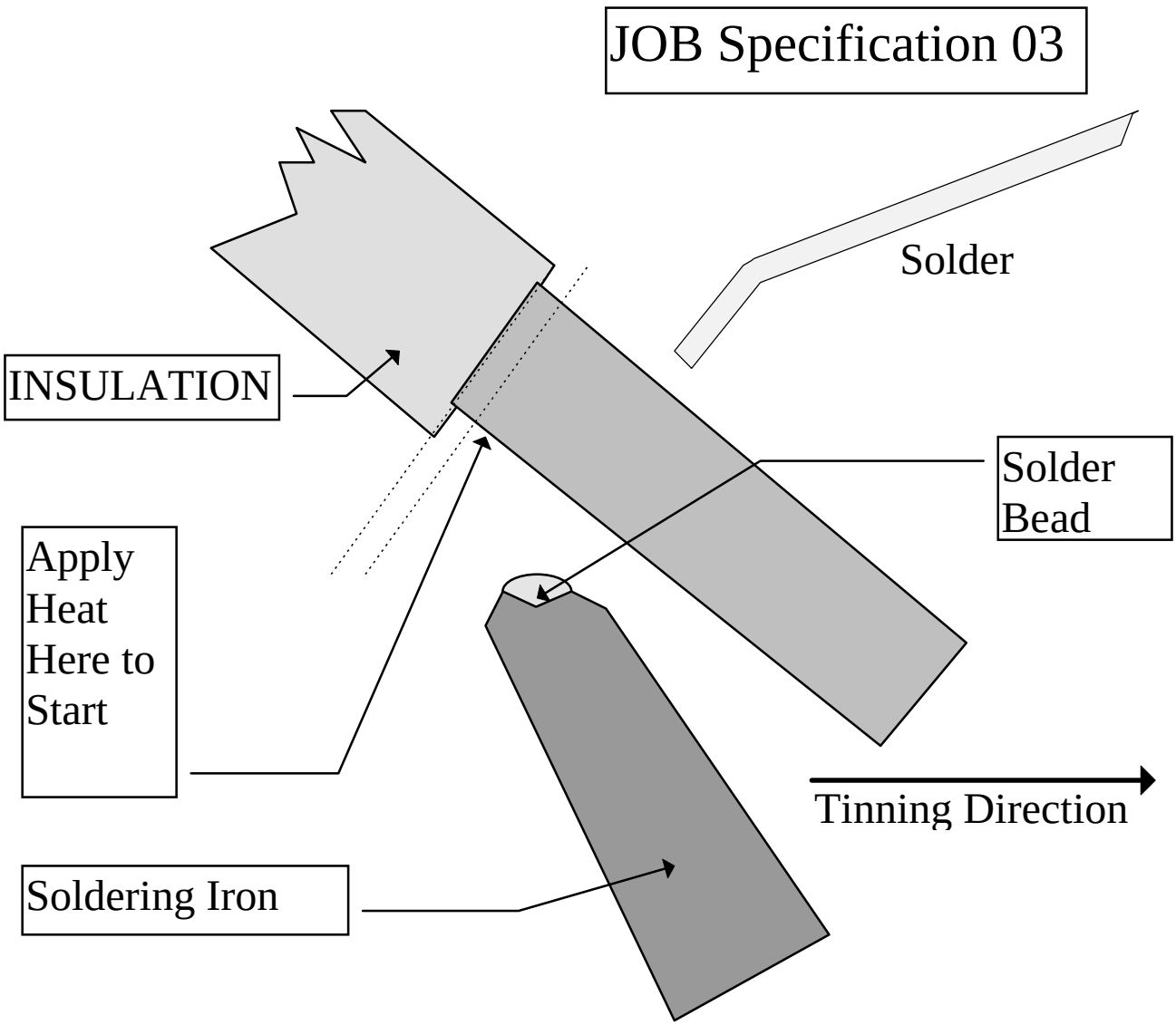


Information Only

0.20mm	Strand	≅	92.2Ω/Km	≅ 0.2A
0.28mm	Strand	≅	64.1Ω/Km	
0.50mm	Strand	≅	36.0Ω/Km	

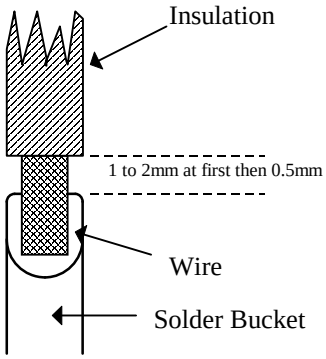
TINNING.

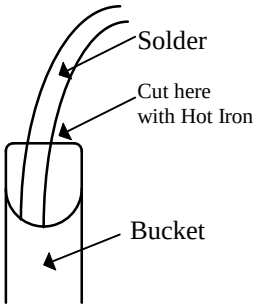
1. Twist Wires , After removing the Insulation.
2. Coat wires with solder.
3. Ensure Individual strands can still be seen.
4. Ensure Insulation is **NOT** Damaged.
5. Cut wire to size.



Solder Bucket

(1) Cut Wire to Size.

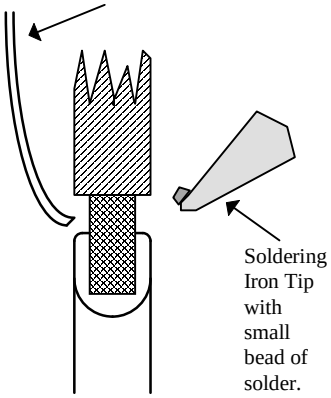




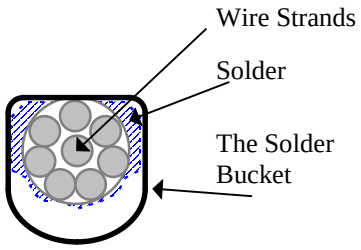
(2) Prepare Bucket with correct amount of Solder.

Only add extra solder if bucket NOT pre-loaded

(3) Apply Heat.



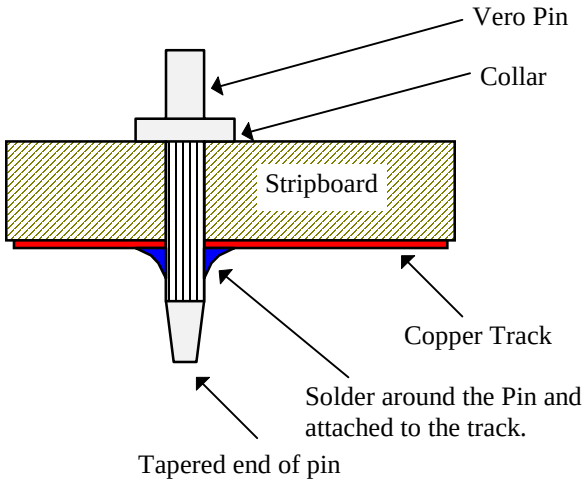
Cut through Section

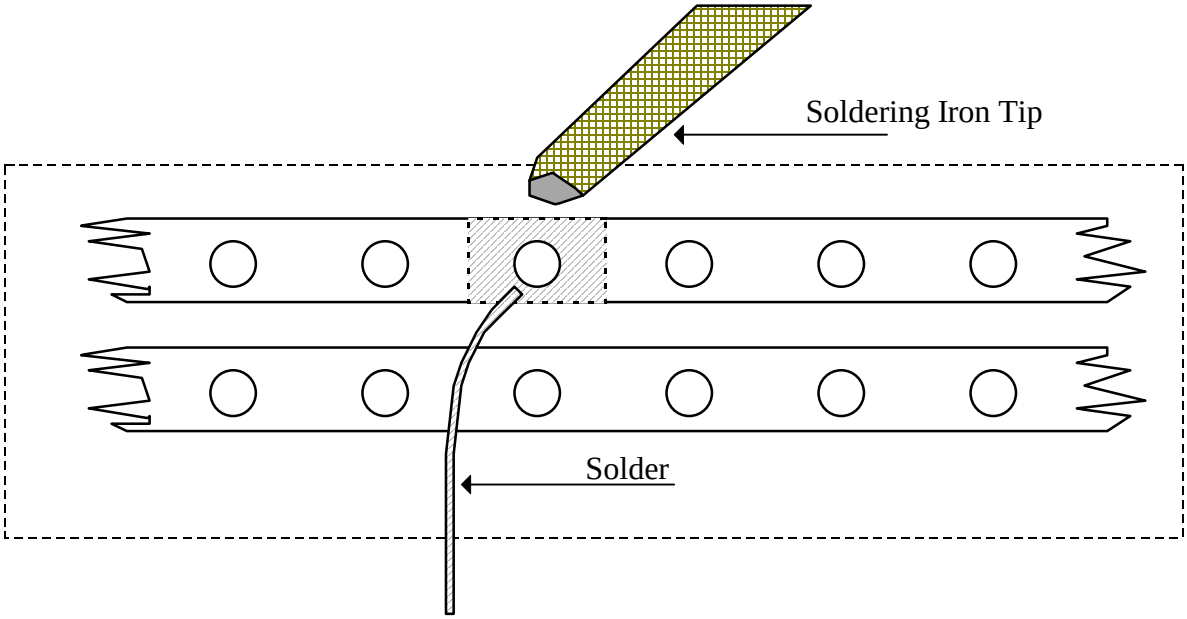


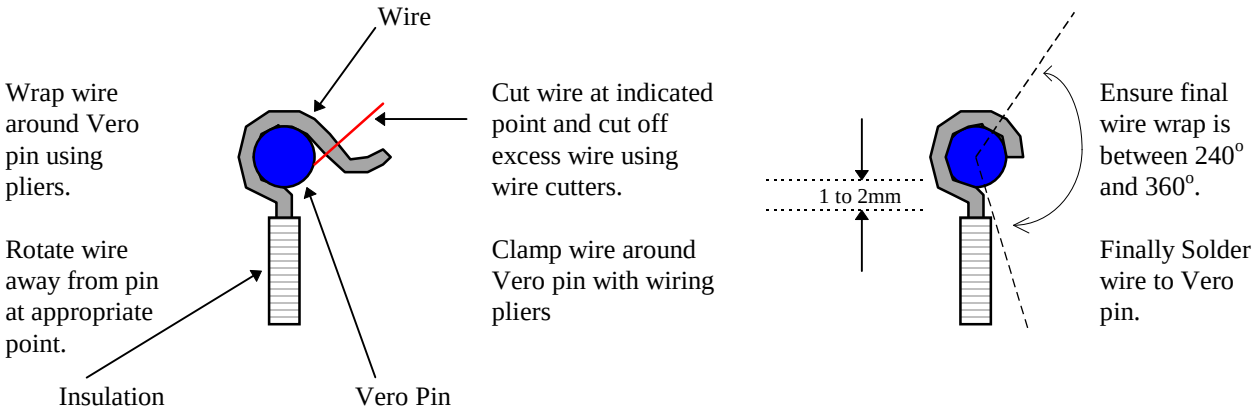
(A) Ensure wire is correctly tinned.
(B) Ensure bucket is clean.
(C) Ensure wire is still visible after heat and solder have been applied.

JOB 04 Specification

STRIPBOARD Soldering.

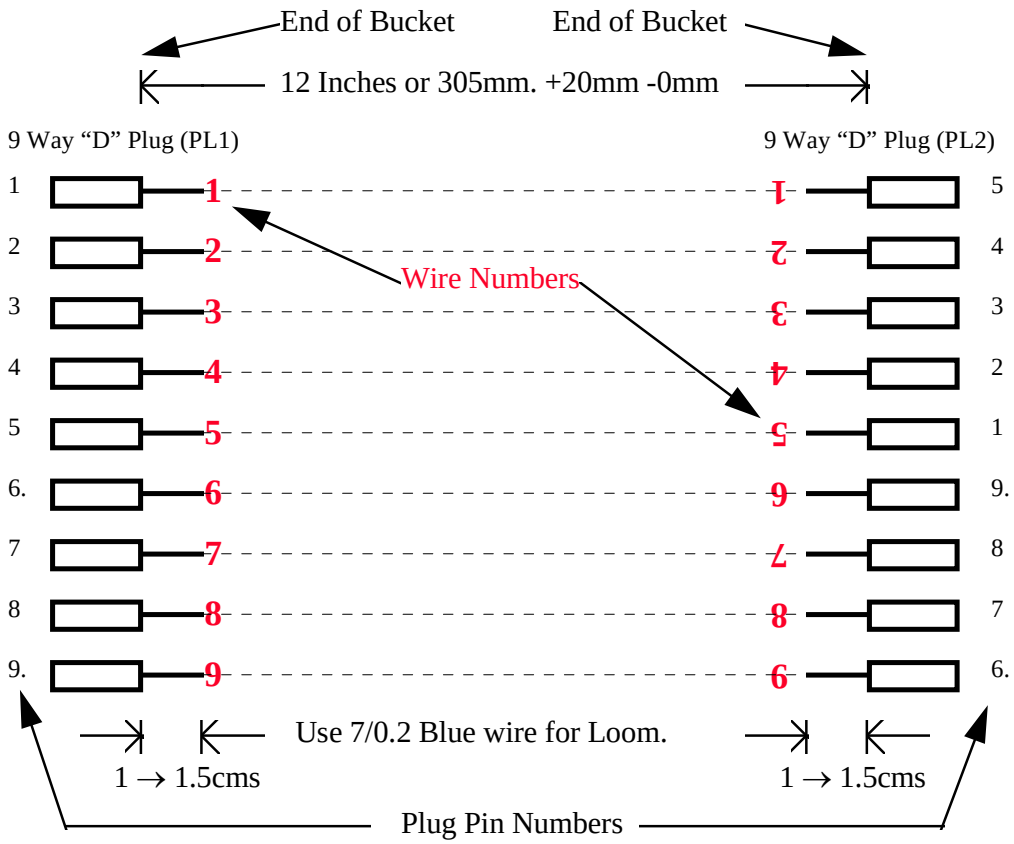


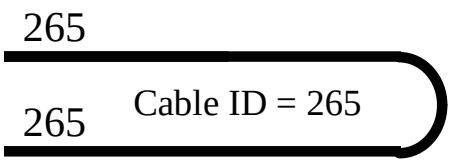




JOB 06 Specification Part 1

SLEEVING EXERCISE



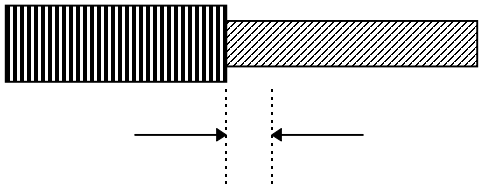


1) All wires to remain parallel.
2) Bind with lacing cord using spot ties every 1.5 to 2 cms
3) Sleeves Read from END to MIDDLE and correct way up when viewed from LHS.

JOB 09 Specification.

Tinning and Joining Exercise.

Tinning Exercise



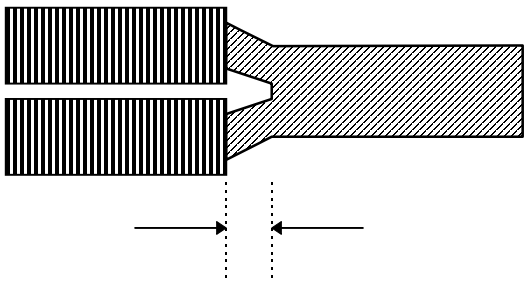
Tin to about 0.5mm from Insulation

TWIST
TIN
TRIM

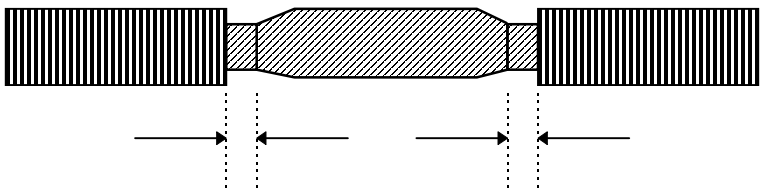
Use Various Wire Sizes

7/0.2 ..... 24/0.2
32/0.2
64/0.2

Joining Exercise



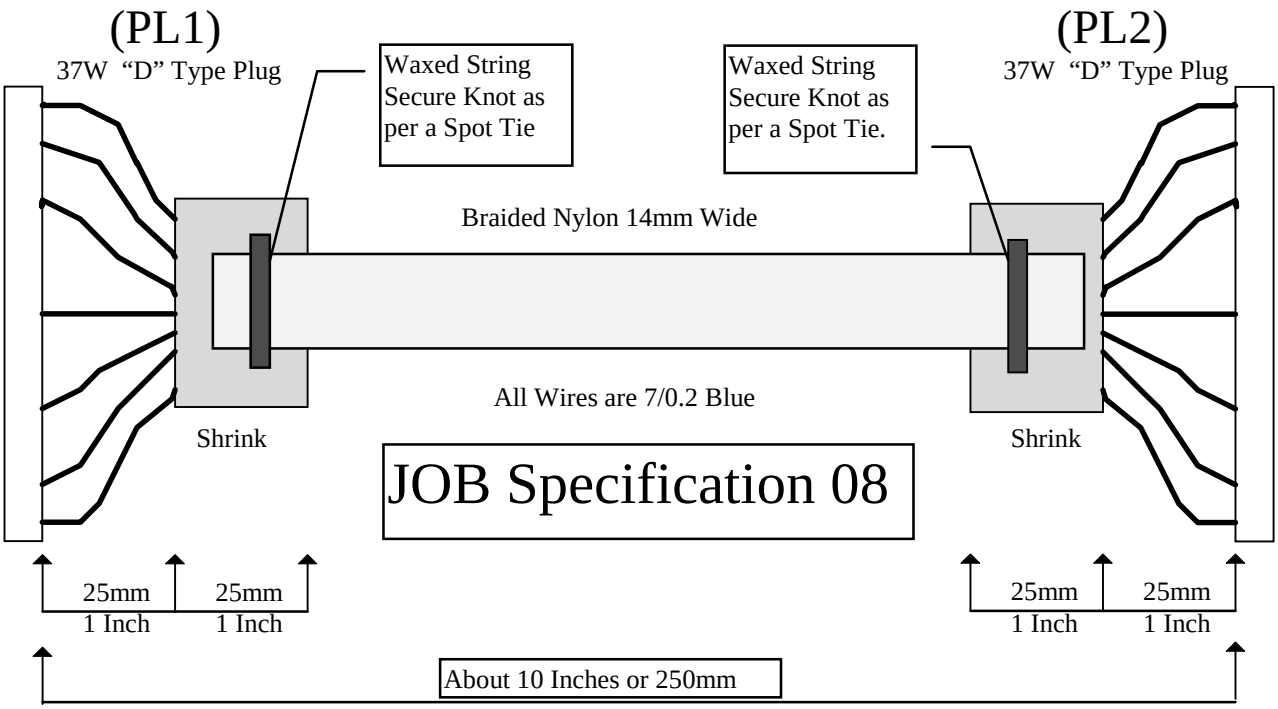
Tin to about 1mm from Insulation



Tin to about 0.5mm from Insulation

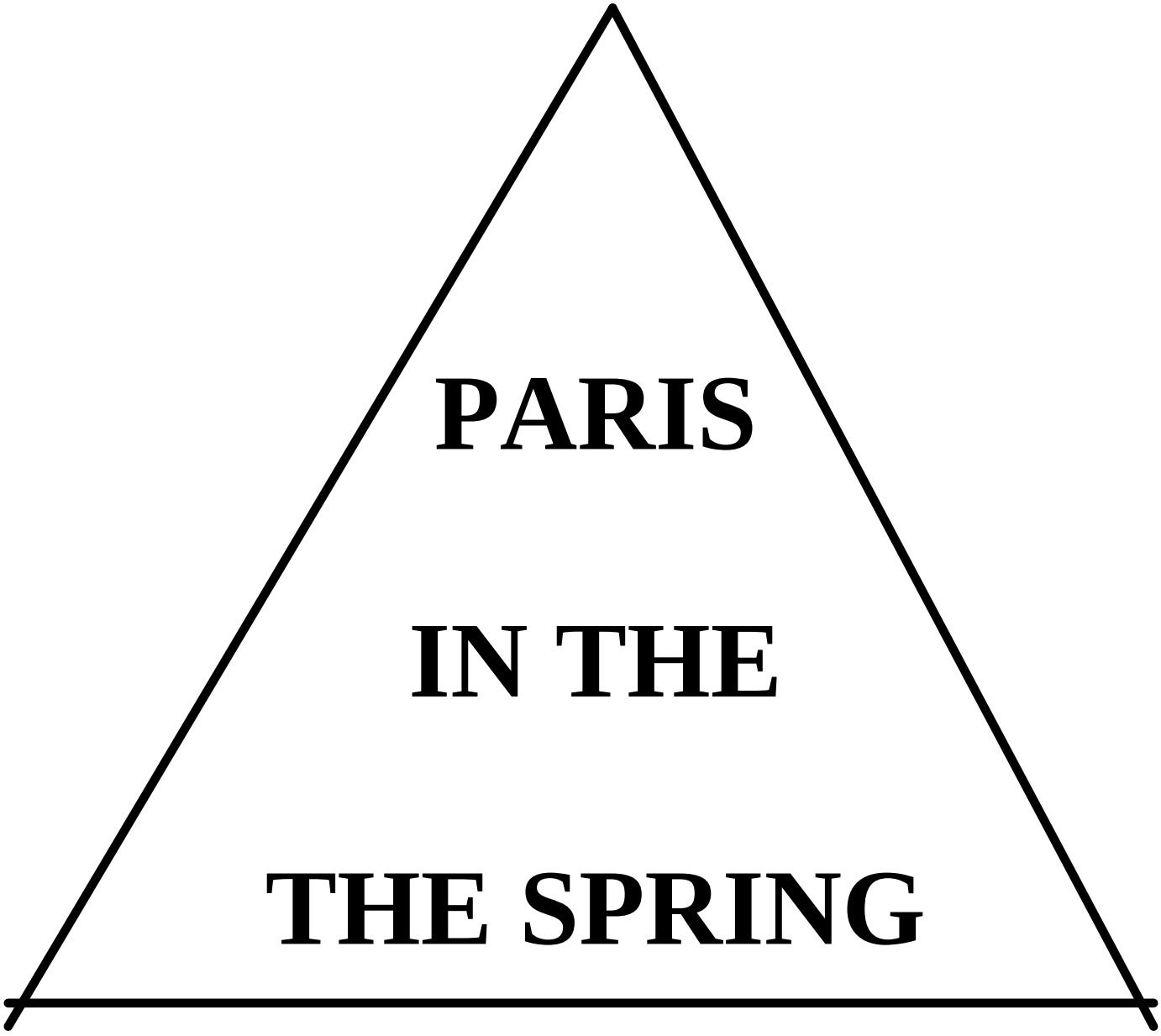
JOB 03 Specification Part 2

37 WAY LOOM.

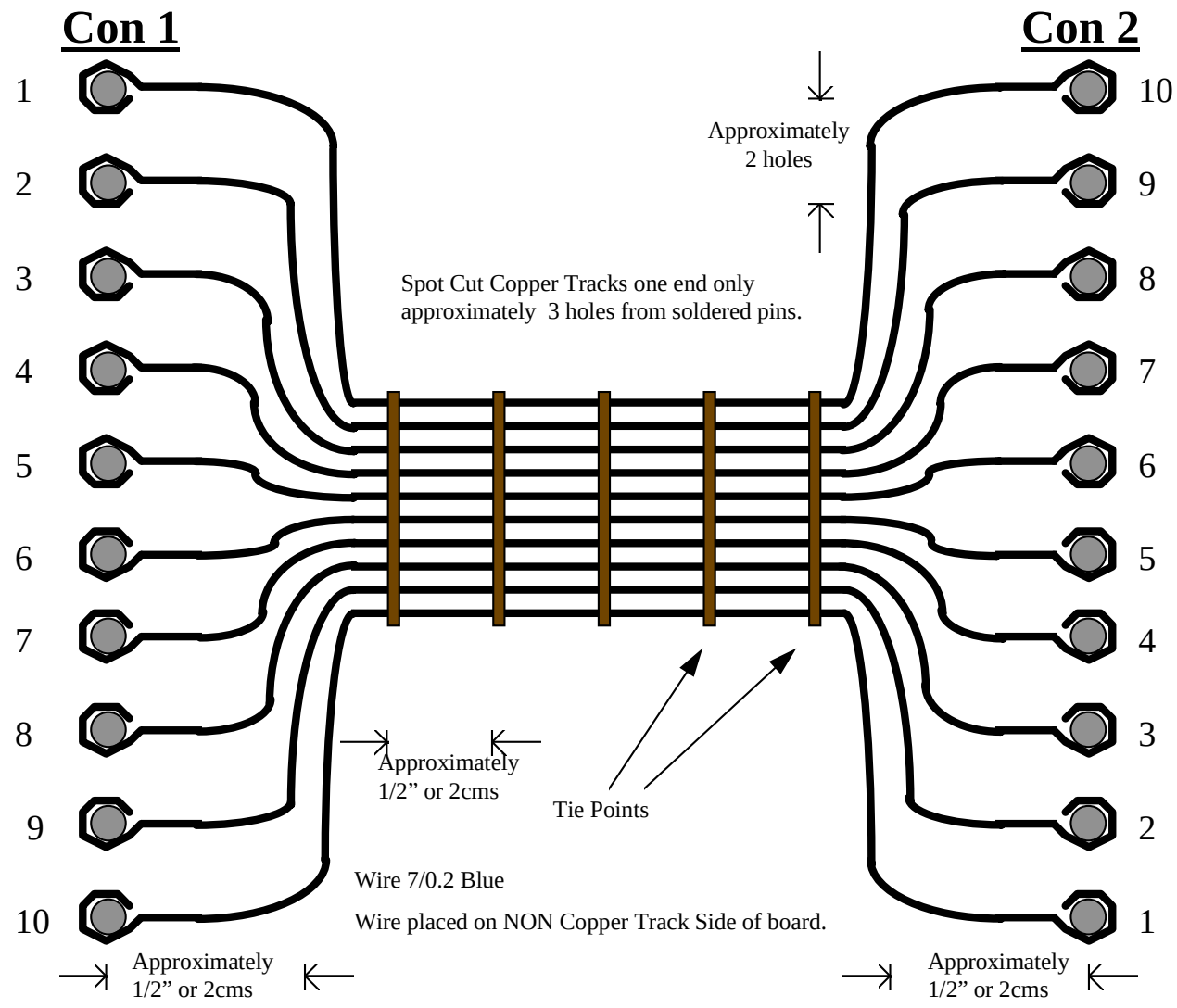


All Wire Pin to Pin e.g. 1 to 1 etc.

1. Wire 37 Way. Tape Ends To Grip Bundle Together.
2. Feed on Braiding , Tie with Waxed String.
3. Stretch , Release & Trim Braid.
4. Feed on Heat Shrink for **Both** Ends.
5. Secure Soldered End.
6. Solder Free End , Adjust Length for even termination.
7. Secure Braiding and Heat Shrink.


PARIS
IN THE
THE SPRING

STRIPBOARD LOOM

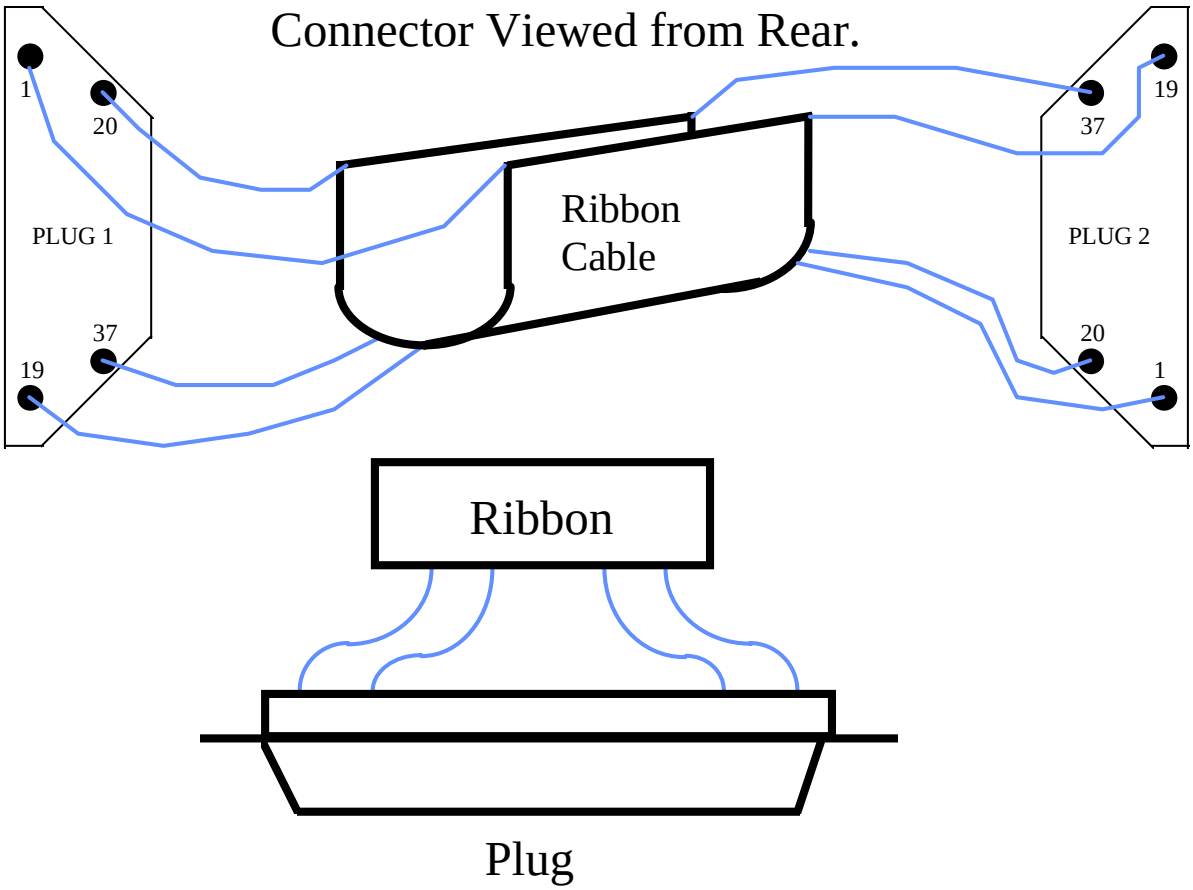


Notes

1) Pin 1 for both CON1 and CON2 is at the Top of the Veroboard. Use natural bend of wire and Full Eurocards size board.
2) Check Point to Point wire continuity.
   ie. Pin1 → Pin 10, Pin 2 →Pin 9 etc.
3) Keep Loom Symmetrical and regular.
   Mark the board with your Job Number and Name
4) Pins are 2 holes apart, centered on the board, Keep Pin rows 3 holes from the end of the board.

JOB Specification 06 part 3

RIBBON CABLE LOOM



1) Connect Pins 1,19,20 and 37 first to set your anchor points and to prepare for even wire termination distribution.
2) Use Ribbon cable folded. Fan out wires approximately 4 → 5 cms from either end of cable.
3) All wires are Point to Point so that :-
   Pin 1 → Pin 19 .... Pin 20 → Pin 37.
   Note All Pins are facing each other as per the wiring schedule.

JOB Specification 23 & 32

SOLDER.

LEAD	100%	63%	50%	40%	30%	0%
TIN	0%	37%	50%	60%	70%	100%
LIQUID	450°F 232°C	359°F	414°F	460°F 238°C	496°F 258°C	620°F 327°C
SOLID	450°F	359°F	359°F	359°F 180°C	359°F	620°F
PLASTIC RANGE	0°F	0°F	55°F	101°F	137°F	0°F

The Above information is for background ONLY.

Soldering Iron Tip Numbers.

TIP No.7 = 700°F > 350°C

TIP No.6 = 600°F < 350°C

Note The Larger the TIP the Better the Heat Transfer.

SWG:: Standard Wire Gauge.
Larger Number = Thinner wires

EDUCATION

1) **A RELATIVELY PERMANENT CHANGE IN ATTITUDE FOR THE REST OF YOUR LIFE.**

2) **LEARNING IS A VOLUNTARY PROCESS.**

3) **QUALITY BEFORE SPEED**

BS 5750 ISO 9000 EU 9000

PLAN AHEAD

COLOUR CODE

Wire code	Value	Name	Link Word	Colour	Value
K				Pink	
B	0	Zero	Zerro	Black	0
N	1	One	Bun	Brown	1
R	2	Two	Shoe	Red	2
O	3	Three	Tree	Orange	3
Y	4	Four	Door	Yellow	4
G	5	Five	Alive	Green	5
U	6	Six	Sex	Blue	6
P	7	Seven	Heaven	Violet Purple	7
S	8	Eight	Gate	Grey Slate	8
W	9	Nine	Line Wine	White	9

Bye **B**ye **R**osie **O**ff **Y**ou **G**o **B**ut **V**ia **G**reat **W**estern.

Note The Wire code letters are for information purposes only.

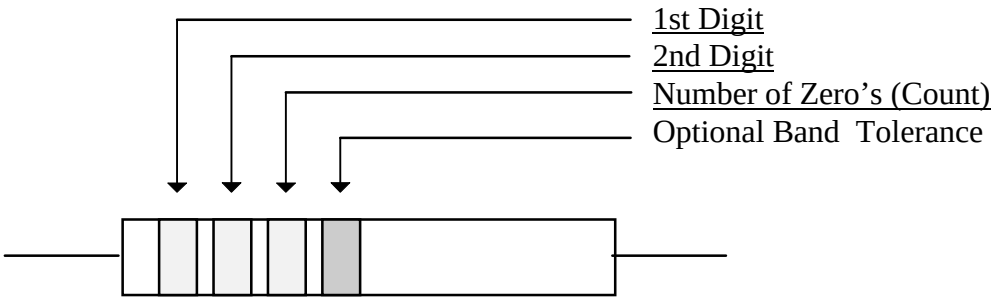
RESISTORS.

Symbol

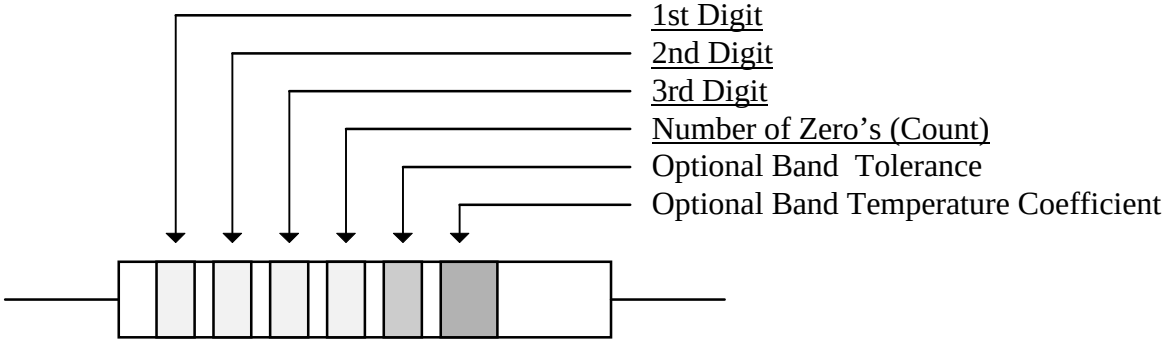
or

Value Measured in OHMs Ω

Values Type 1



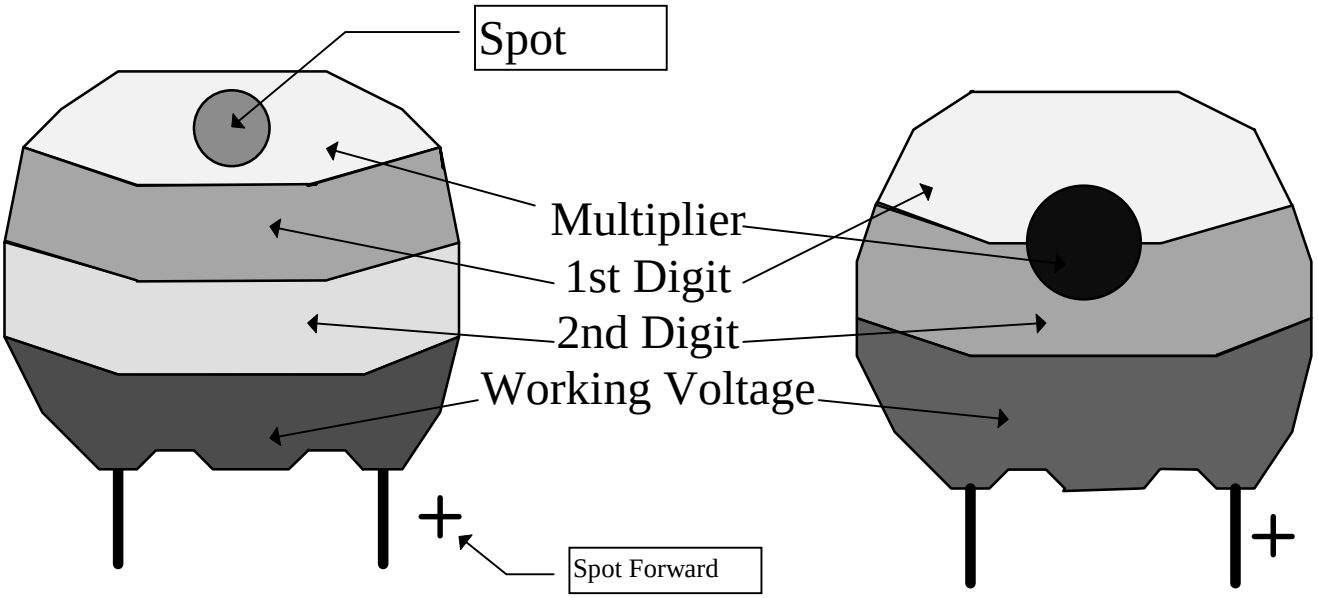
Values Type 2



Tolerance

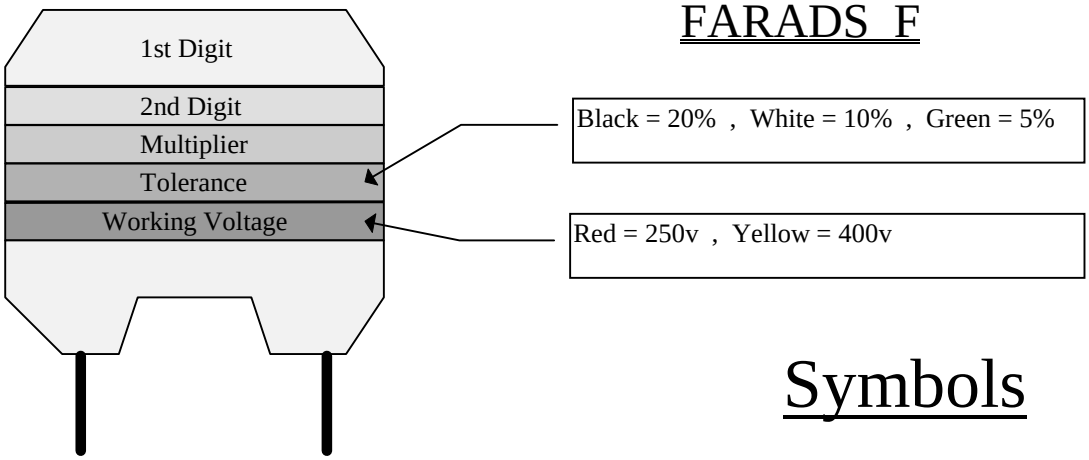
Brown = 1% = F
Green = 0.5%
Blue = 0.25%
Violet = 0.1%
None = 20% = M
Silver = 10% = K
Gold = 5% = J
Red = 2% = G

CAPACITORS.



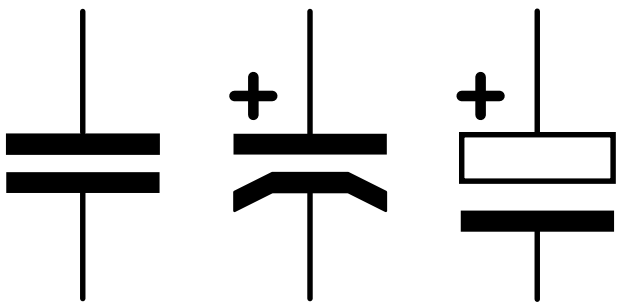
Values in μF

Values measured in
FARADS F



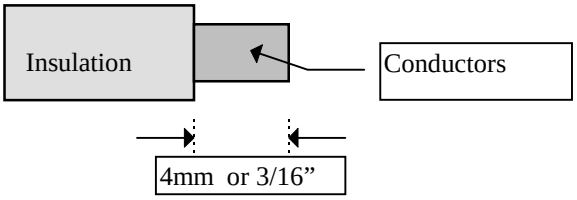
Value in pF

Symbols



CRIMPS.

A Mechanical Crushed Electrical Connection

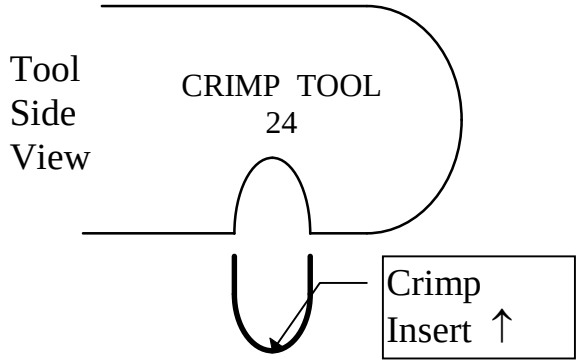


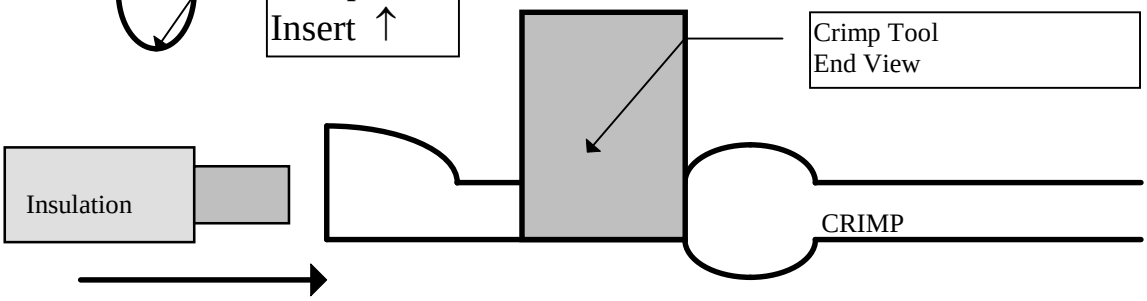
QM Crimps Size 24

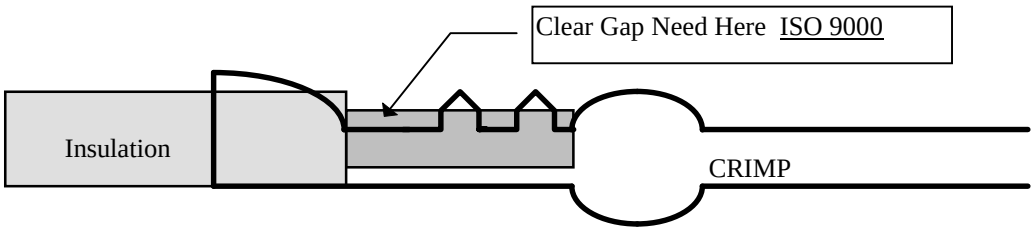
Using 7/0.2 Wire Stripped ONLY
DO NOT TIN

1. Place Crimp in Tool.

2. Clamp/Crush Wire.



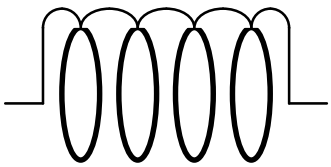




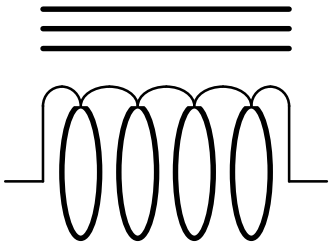
3. Insert in the “INS” Jaws and clamp the Insulation to the Crimp.

INDUCTORS.

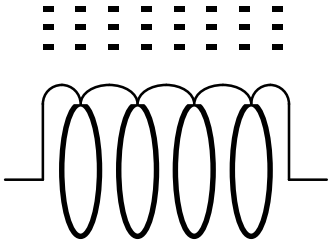
SYMBOLS



AIR Core



IRON Core



FERRITE Core

Values measured in
HENRYS H

NUMBERS

10^9	One Thousand Million	G	Giga
10^6	One Million	M	Mega
10^3	One Thousand	K	Kilo
10^0	One	Units	
10^-3	One Thousandth	m	Milli
10^-6	One Millionths	μ	Micro
10^-9	One Thousandth Millionth	n	Nano
10^-12	One Millionth Millionth	p	Pico

1K = 1,000 = 1,000,000m

Moving ↑ times a 1000 , Moving ↓ divide by 1000

THREE CHARACTER/DIGIT CODE

This is a common used shorthand.

This system uses the first two digits of a number and either a count of the number of zero's that follow the two numbers or a standard metric multiplier letter.

Example

5600000 Translates to 5,600,000 or 5.6million this can also be written as 5.6M
Note that the decimal point could be easily missed or erased so the metric multiplier letter is used to replace the decimal point.
e.g. 5M6

Alternatively

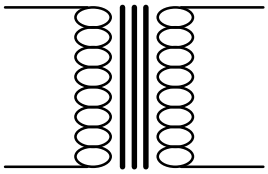
5600000 translates to 5 , 6 and 5 zero's giving the three digit code 565

Number		**3 Character**		**3 Digit Option**
2700	=	2K7	=	272
27000	=	27K	=	273
270000	=	270K or 0.27M or M27		

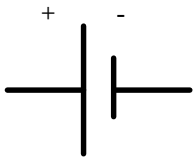
Examples

100Ω	Resistor	=	100		
10Ω	Resistor	=	10R	or	10Ω
1Ω	Resistor	=	1Ω0	or 1R0	
1000Ω	Resistor	=	1K0		
1000pF	Capacitor	=	1nF	or	102
22μF	Capacitor	=	22μ		
2.2μ	Capacitor	=	2μ2		

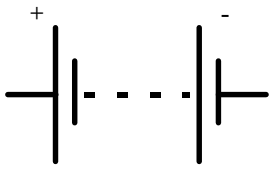
Circuit Symbols.



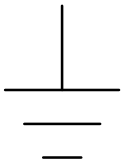
Transformer



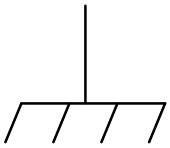
Cell



Battery



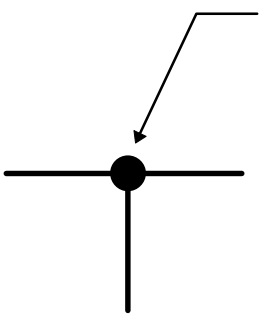
Earth



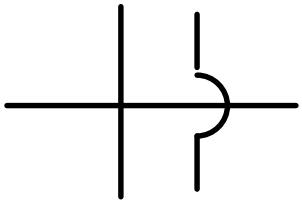
Chassis

Switch

Connecting Wire

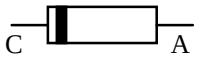


Wires Joined



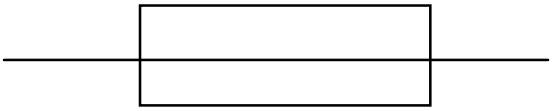
Wires Crossing

Circuit Symbols.

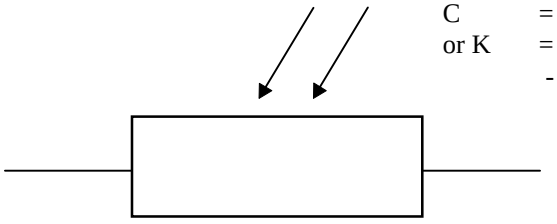


A = Anode
= Positive
+ End

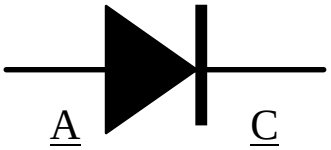
C = Cathode
or K = Negative
- End



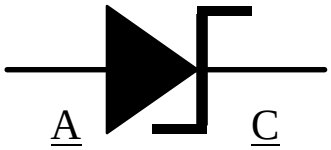
Fuse



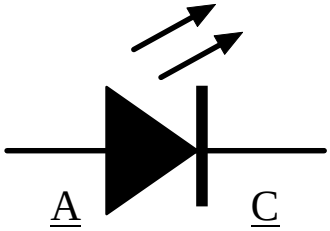
Light Dependant Resistor (LDR)



Diode

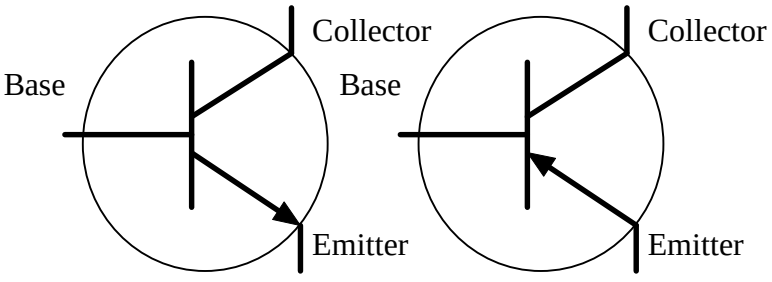


Zenner Diode

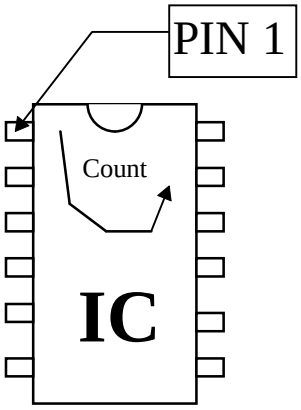


LED Light Emitting Diode

TRANSISTORS



NPN PNP

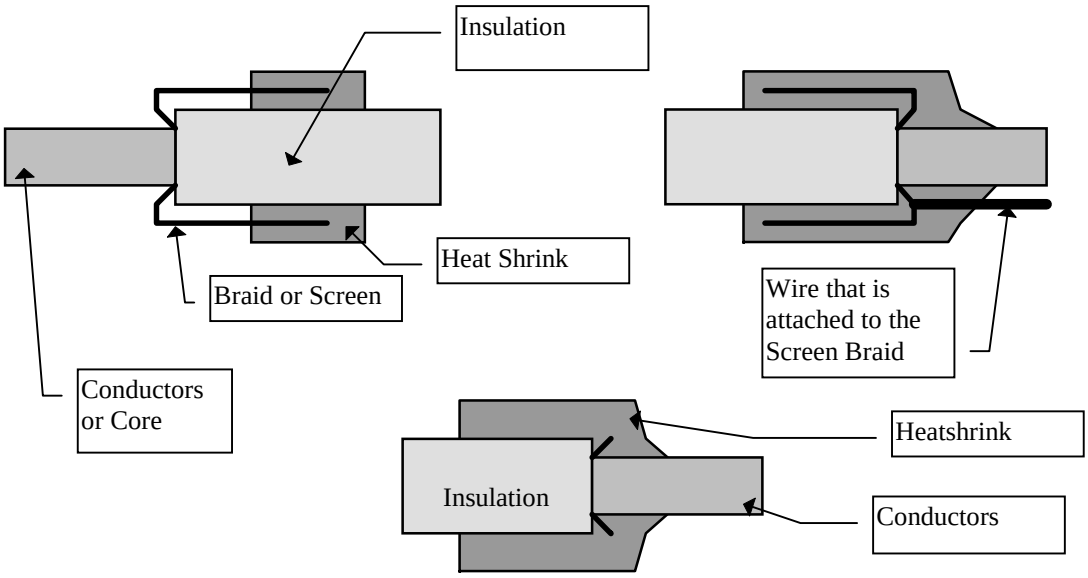


DIL Dual In Line
IC Integrated Circuit

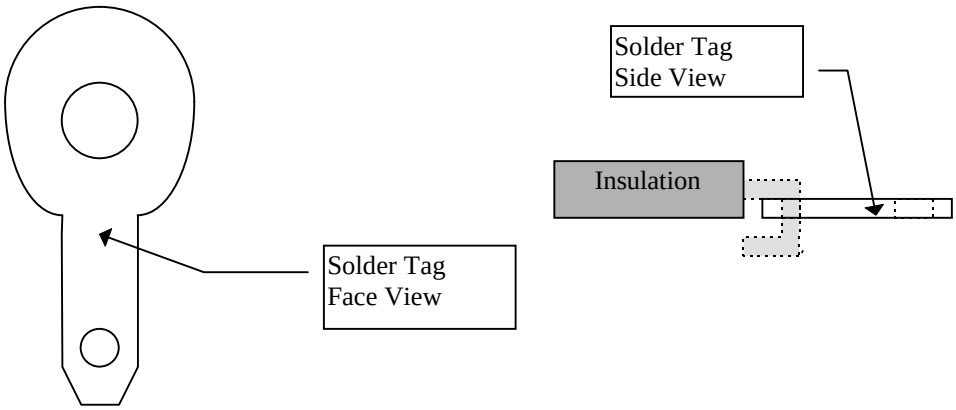
LOOMS.

Note that a PLUG = PINS

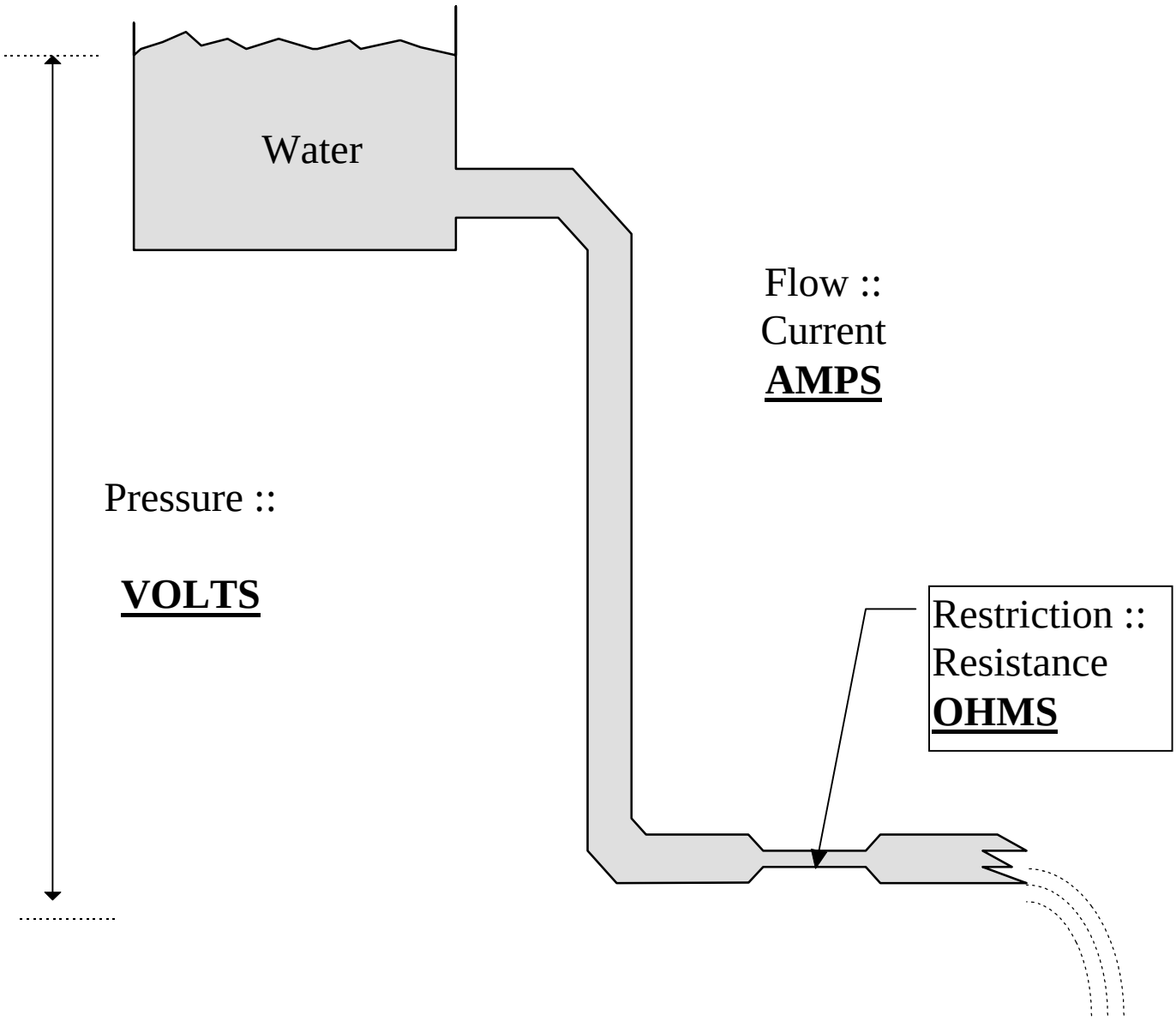
Various methods of terminating a Screened Cable



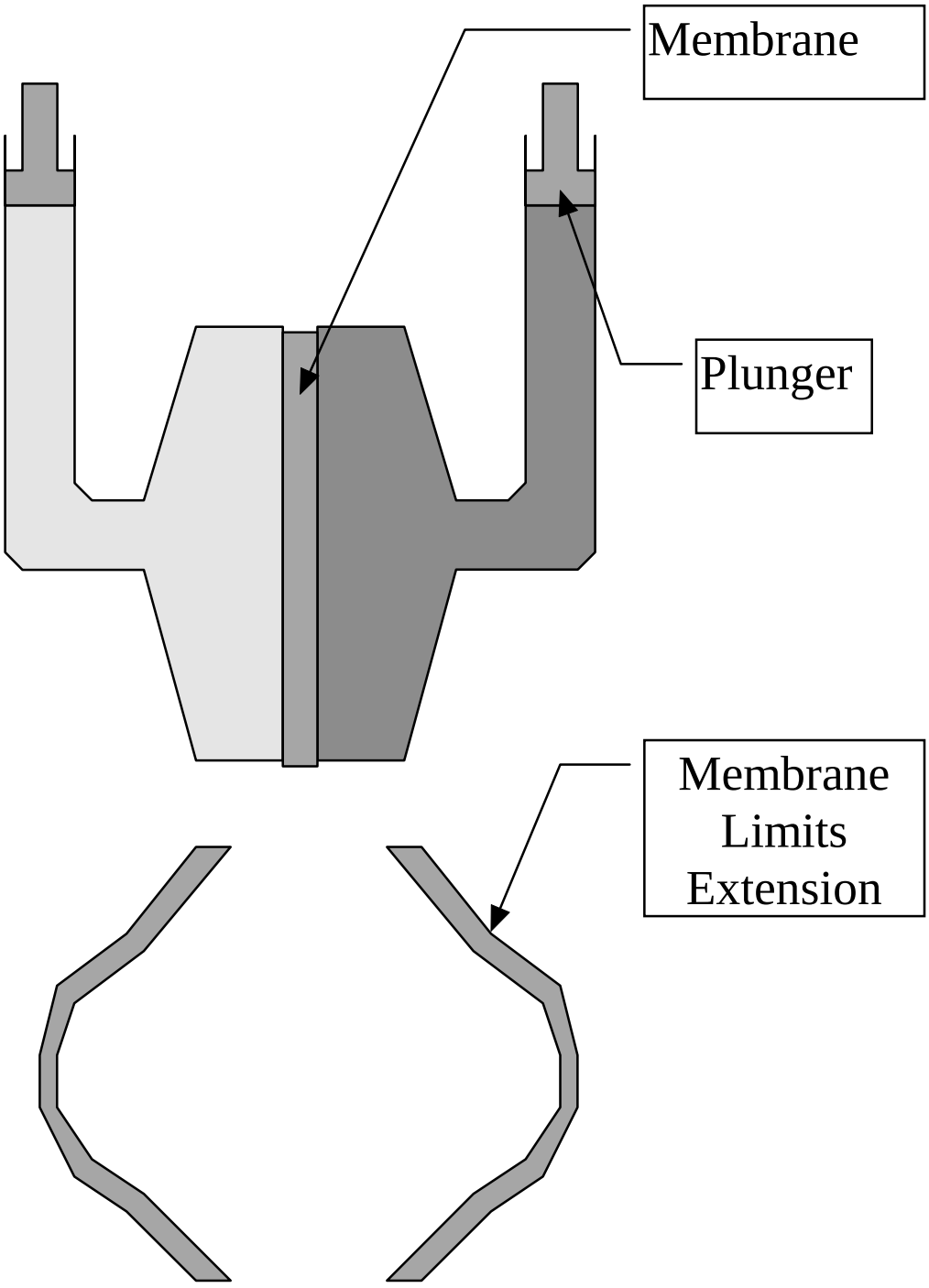
The Solder Tag.



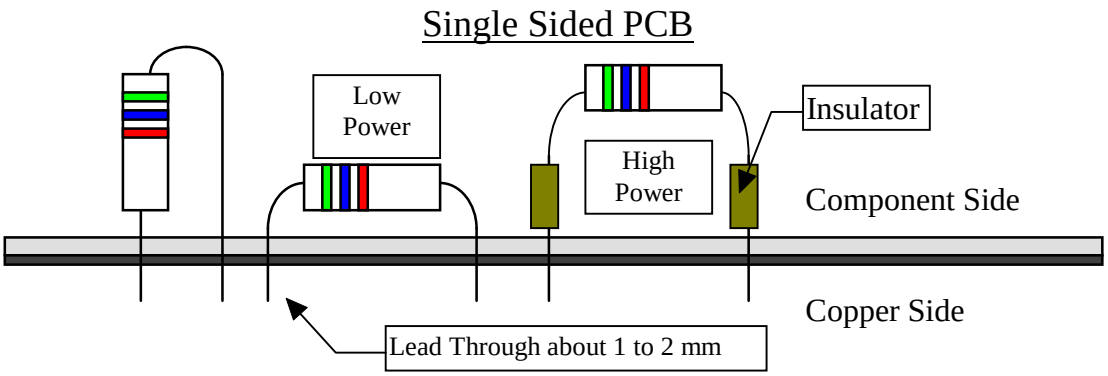
VOLTS Etc.

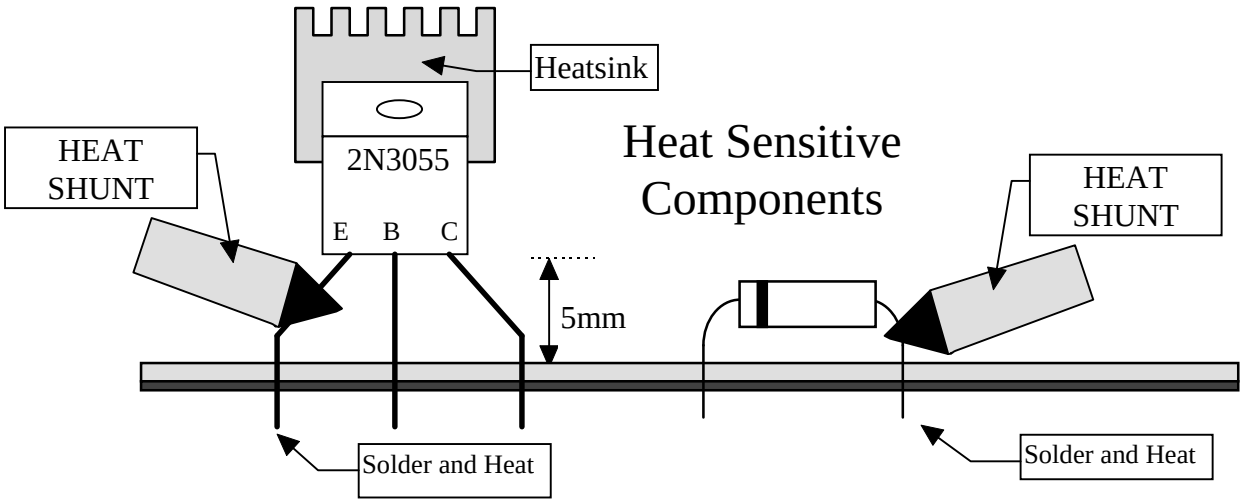

Water
Flow ::
Current
AMPS
Pressure ::
VOLTS
Restriction ::
Resistance
OHMS

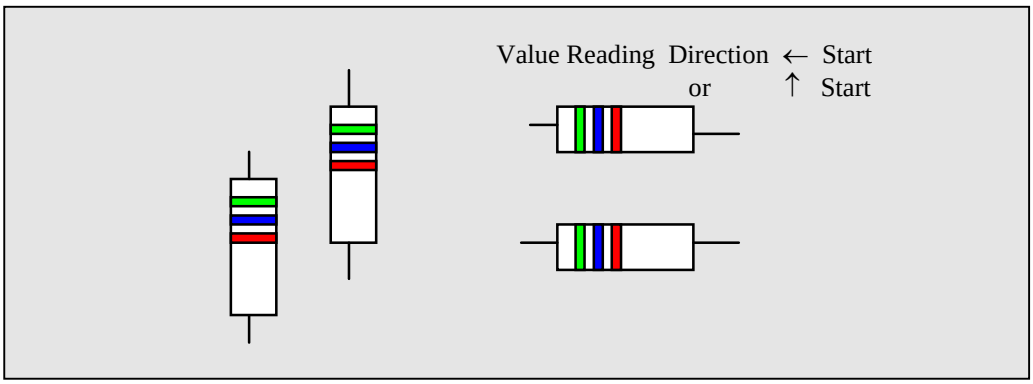
ENERGY TRANSFER.

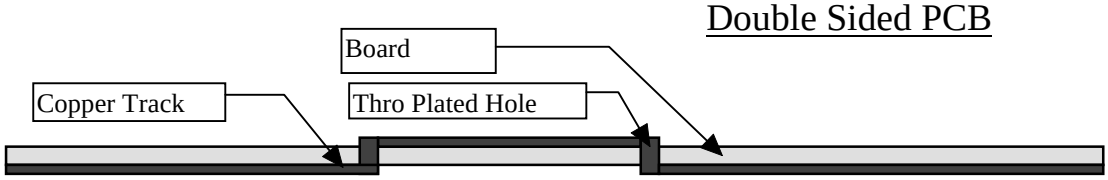


PCB Printed Circuit Board.

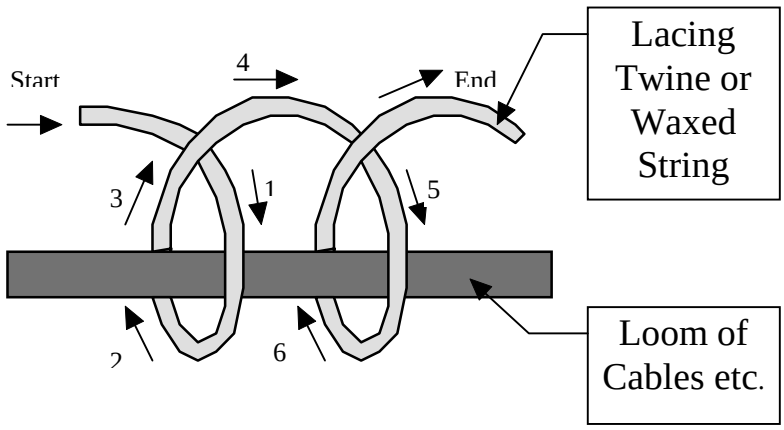




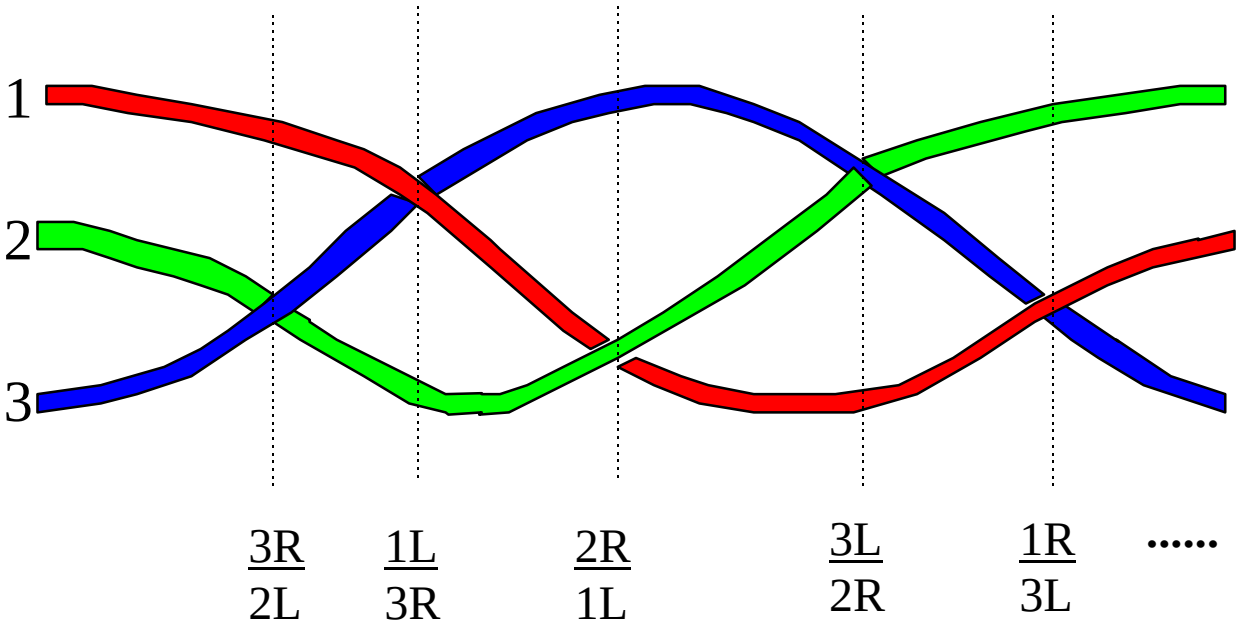




KNOTS

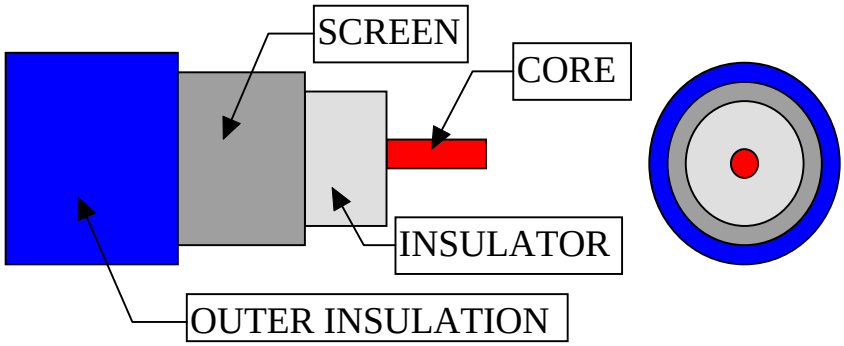


The Clove Hitch



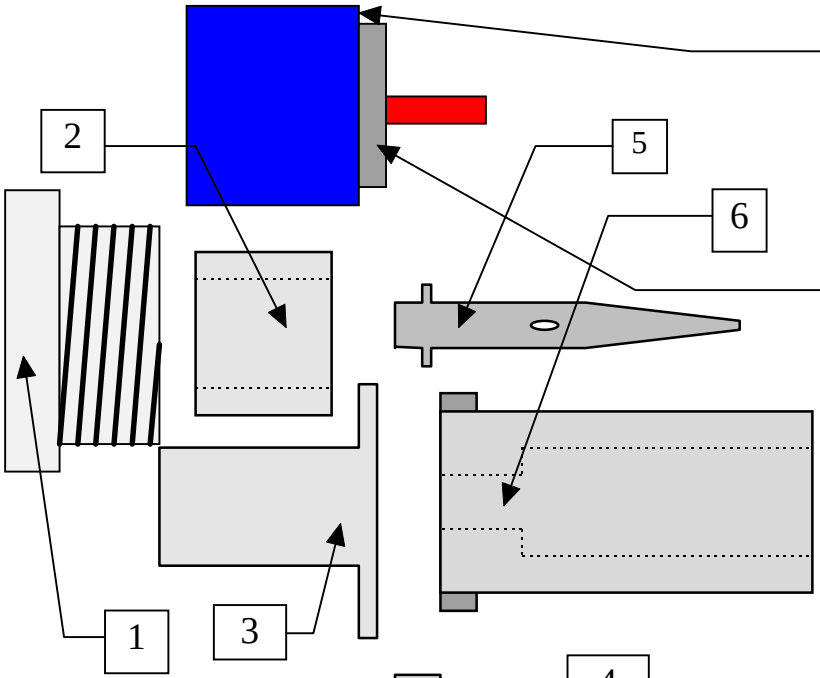
The Wire Plait

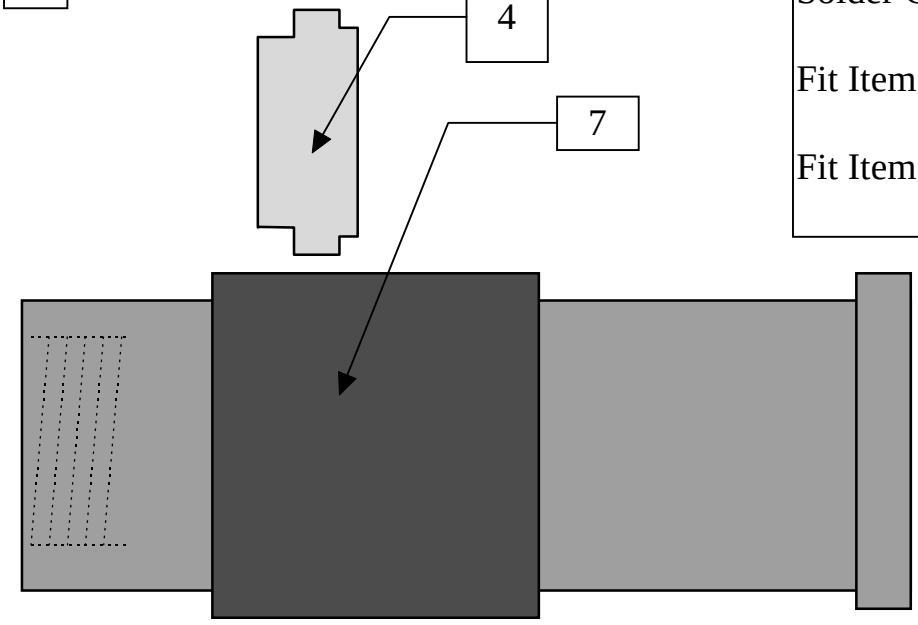
COAXIAL CABLE.



Side View of Cable.

End View of Cable.





Trim Screen

Fit Items1 , 2 and 3

Trim Insulation

Tin Core Wire

Fit Item 4

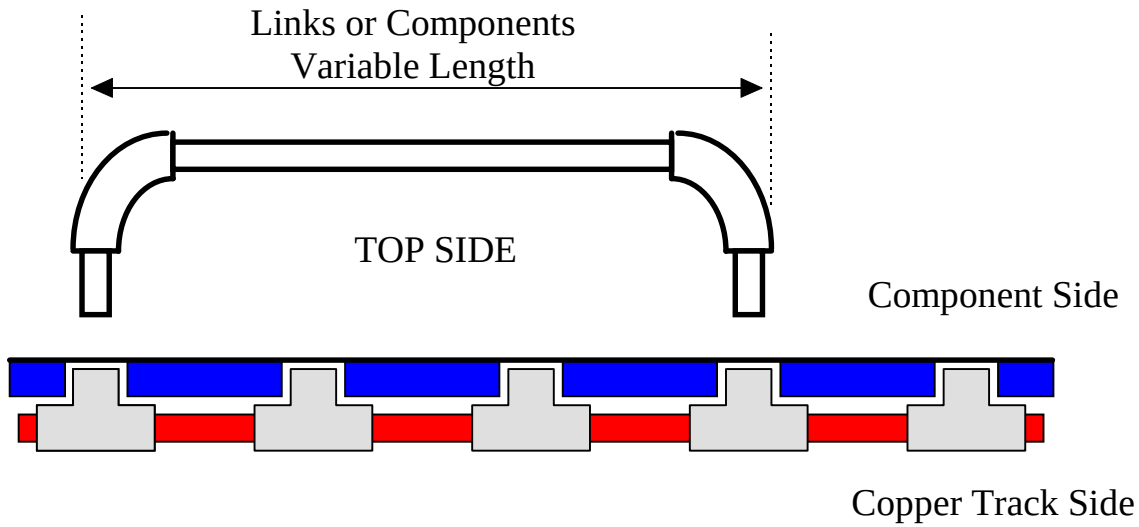
Trim Core Wire

Solder Core Wire to Item 5

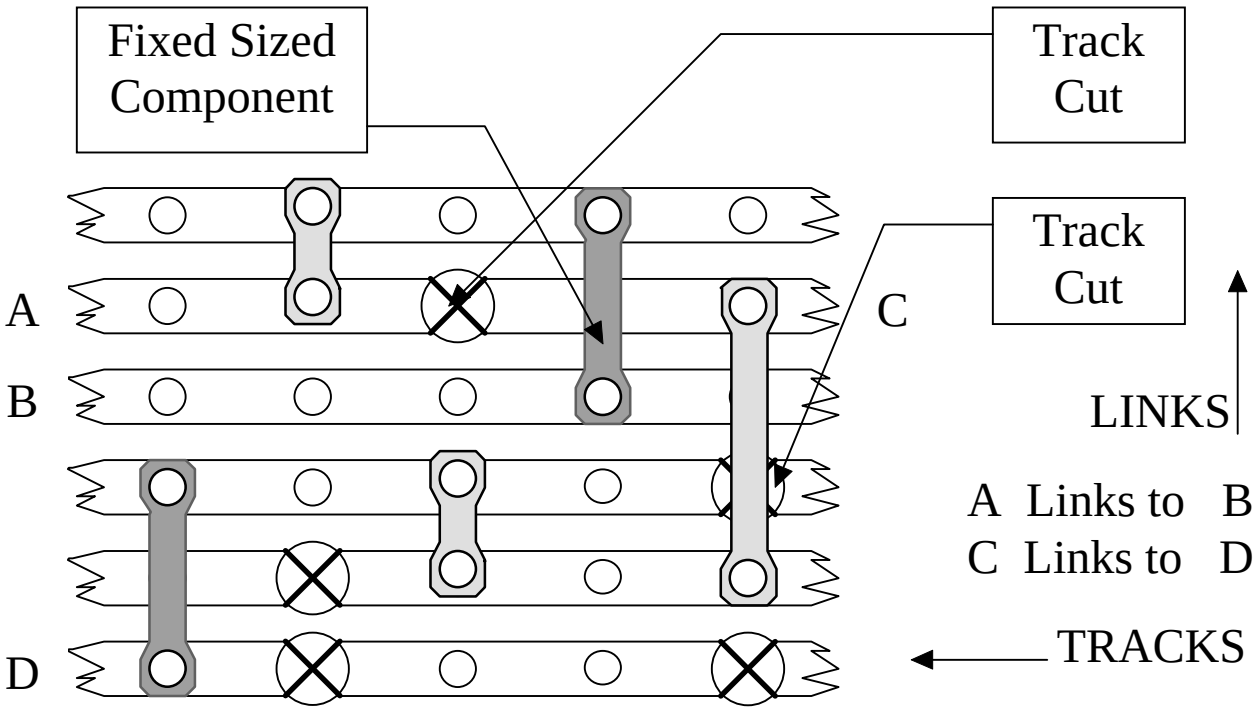
Fit Item 6

Fit Item 7

VERO BOARD



Another View



QUALITY

ISO 9000 The Quality System.

Consists of :-

ISO 9001 Document Control.

ISO 9002 The Processes.

Other Systems

BS5750 **EU9000**

Checking

Techniques

Sample Random Grab of Items.

Batch A Group of product Items

e.g. $\sqrt{\text{ITEMS}}$

100% Everthing (as per course)

OHMS LAW

$$\mathbf{R} = \frac{\mathbf{V}}{\mathbf{A}} = \frac{\mathbf{V}\text{OLTAGE}}{\mathbf{C}\text{URRENT}} = \mathbf{R}\text{ESISTANCE}$$

Symbol	Measurement	Units	
V	Voltage	Volts	V
I	Current	Amps	A
Ω	Resistance	Ohms	R

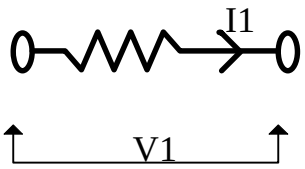
POWER

POWER = **V**OLTAGE * **C**URRENT

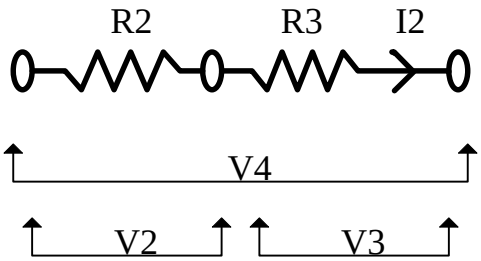
W = V * A

Symbol	Measurement	Units	
V	Voltage	Volts	V
I	Current	Amps	A
W	Power	Watts	W

RESISTORS

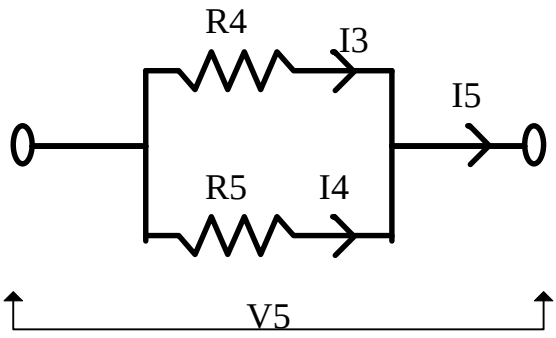


$$\frac{V1}{I1} = R1$$



$$R(\text{total}) = R2 + R3$$

$$V4 = V2 + V3$$

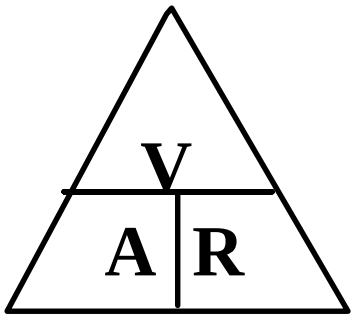


$$\frac{1}{R(\text{total})} = \frac{1}{R4} + \frac{1}{R5}$$

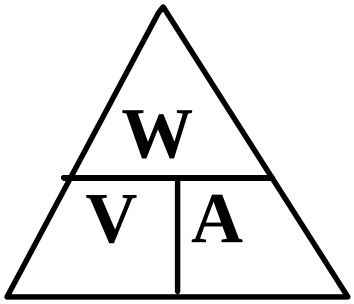
$$I5 = I3 + I4$$

CALCULATIONS

$$\frac{V}{A} = R \quad \text{or} \quad V = A * R \quad \text{or} \quad \frac{V}{R} = A$$



$$\frac{W}{V} = A \quad \text{or} \quad W = V * A \quad \text{or} \quad \frac{W}{A} = V$$



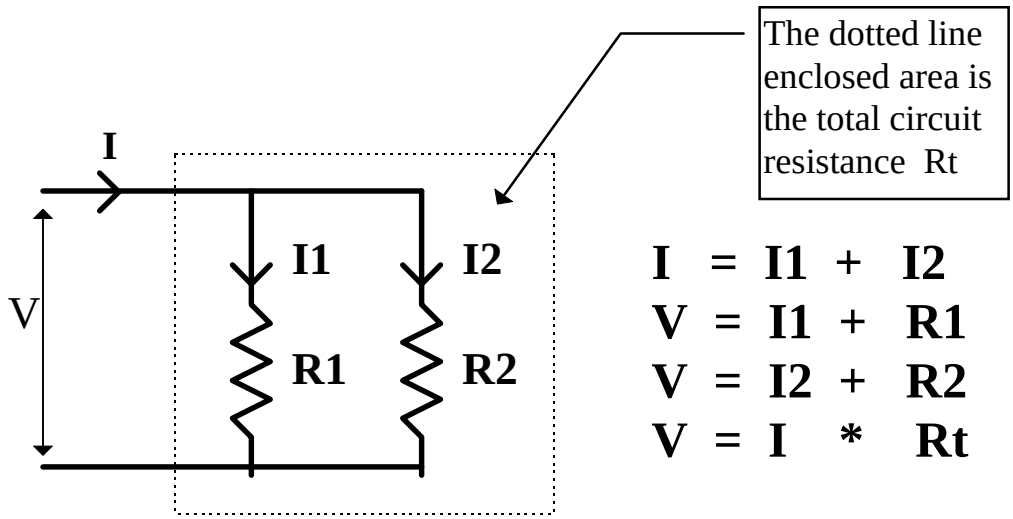
Exercises

1) Define W in terms of R

2) What is the resistance of two lamps in Parallel 60W + 100W in a mains circuit.

   Mains Voltage is assumed to be 240vac.

PROOF.



I = I1 + I2
V = I1 + R1
V = I2 + R2
V = I * Rt

This Gives

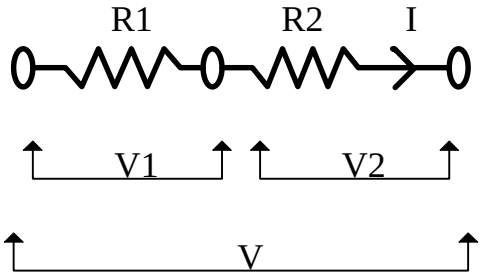
$$\frac{V}{R} = I \quad , \quad \frac{V}{R1} = I1 \quad , \quad \frac{V}{R2} = I2$$

Therefore If **I = I1 + I2** **THEN**

$$\frac{\cancel{V}}{R} = \frac{\cancel{V}}{R1} + \frac{\cancel{V}}{R2} \quad \text{.....} \quad \text{(and Dividing by } \mathbf{V} \text{ gives)}$$

$$\frac{1}{R} = \frac{1}{R1} + \frac{1}{R2} \quad \text{.....} \quad \text{etc}$$

PROOF.



$$\frac{V}{I} = R$$

As "I" is Common through both R1 & R2

∴ V = V1 + V2

V1 = I * R1

V2 = I * R2

V = I * R(Total)

∴ I * R(Total) = I * R1 + I * R2

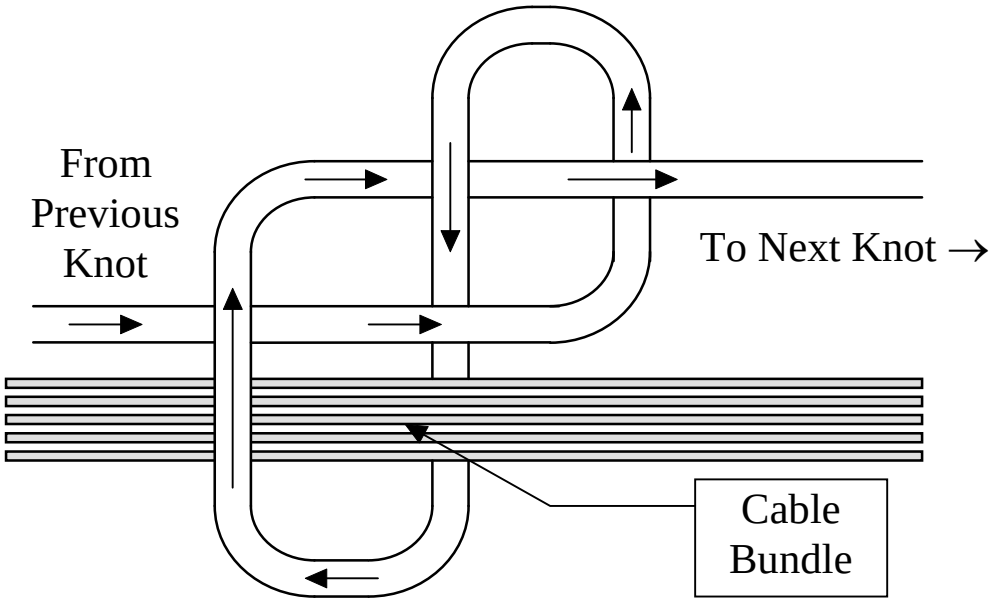
Now divide through by "I" gives

~~I~~ * R(Total) = ~~I~~ * R1 + ~~I~~ * R2

giving :-

R(Total) = R1 + R2 + ... etc

LOOM LACING KNOTS.



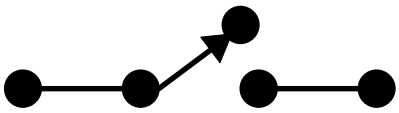
1. Start with Clove Hitch Plus and Extra Hitch.

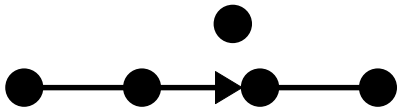
2. Lace Bundle.

3. Lock Bundle with Reversed Lacing Knot.

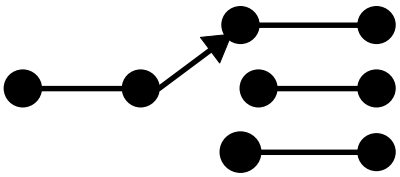
SWITCHES & RELAYS.

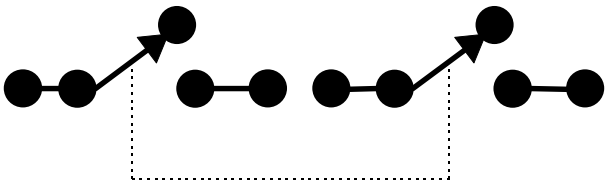
Contacts





NO = Normally Open. NC = Normally Closed.





Single Pole 3 Way 2 Pole 2 Way (Ganged)

The Relay