04 LED Strip

LED Strip Design an Installation

04 LED STRIP - PART 4 DESIGN AN INSTALLATION

LESSON PLAN

Outline / Application:

This part can only be completed once the attendee has completed LED strips Part 1 through 3, in this design course we take 3 very different scenarios and design an LED lighting system based around a customer's requirements and expectations.

Objective

Our objective is to ensure upon completion of this lesson you have a clear understanding of how LED strip installation and components list.

Equipment required / provided

Required:

- Basic needs - writing implement and paper

Provided:

- You will be proved basic information to enable you to design an LED strip install
- There will be a handout available and handed out for reference
- There will be a questionnaire to complete at the end

Course information and reference Material

Lesson information

During this lesson we will discuss the following items in the following order:

1. How do I know what is required?
2. What is the available range of LED strip and accessories?
3. Case Studies
4. Assessing voltage drop
5. Wiring examples
6. Work sheet #1
7. Work sheet #2
8. Work sheet #3

Reference Material:

1. Power point presentation
2. Handout

Lesson Questionnaire and attendance sheet

Fact Sheet

LED Strip – Designing an installation
This Fact sheet is aimed at providing a suitable reference source available on line for staff, wholesalers and contractors in the understanding of how to design and LED Strip installation and what is required based on the information supplied.

How do I know what is required?

This quest is one of the most common questions I am asked and the answer is really quite simple – ask the customer what their needs and expectations are, understand the environment, why are they choosing to go this way? In most cases they will have some idea but will want to rely on your expertise and knowledge and that is why it's important you complete the next section with a good understanding of LED Strip.

Step 1.
This may sound difficult but it's not as hard as you think but it does come down to asking the right questions of your customer at the very beginning:

- Why are you looking to install LED Strip?
- Where are you looking to install the strip?
- What kind of effect are you looking for, RGB coloured or white variants
- How would you like to control it, Remote, wall switch, dimmable, APP or as part of a Smart Home System?

Step 2.
Once you have asked the questions above you now have an idea of what's to happen, now let's make it work and look at the componentry

- What type of LED strip is required and how much
- What will be the power consumption of the Strip I intend using
- How am I going to power the strip, do I need?
  - a normal power supply or
  - a dimmable power supply?
- How am I going to control the LED strip?
  - If its RGB I will need a WiFi/RF Controller (1009FAWI)
  - If its white, I can use a Trailing Edge wall dimmer or a switch but only if you use a dimmable power supply

Note: if you want to control your White LED strip by remote you can use the WiFi/RF Controller and use a single channel allowing up to 4 channels If I am using a WiFi/RF Controller (1009FAWI) I will still need a power supply (it must be non-dimmable).

Note: You can't dim the 1009FAWI using a dimmable power supply as the WiFi/Rf Controller (1009FAWI) is a dimmable unit itself

I will now also need a remote to pair with the WiFi/RF Controller.

When we talk about Controllers we speak about a device which is more commonly used with LED Strip in the form of Red, Green, Blue (RGB) and in some instances white or variations off. If we are using a single colour in some instances no controller is required unless we are looking for RF, Wi-Fi or some form of digital control.

What is the available range of LED Strip and accessories?

	PRODUCT	DESCRIPTION
LED CONTROLLERS	ML-3002	Power repeater 4*8A
	ML-2819T8	1-8 zones and works with ML-1009FAWI Works with 1 or multiple ML-1009FAWI. Simple operation and setup.
	ML-1009FAWI	Strip Receiver WIFI 4 channel 12-36V input, constant voltage
	ML-2820-US3	3 Zone Wall mount RGBW/WW Controller
	ML-2830	Wall Mount W Controller 230Vin, wireless output, gloss white finish
	ML-2819S	4 Zone RGBW Hand Remote
	ML-2819SDIM	4 Zone Single Colour Hand Remote
LED STRIP	ML-SMDF-4.8-WW50	4.8w/m, DC12V, IP20, SMD3528, 50m/reel, 3M double sided tape, 5 strip to power connectors
	ML-SMDF-4.8-NW50	4.8W/m, DC12V, IP20, SMD3528, 50m/reel, 3M double sided tape, 5 strip to power connectors
	ML-SMDF-4.8-W50	4.8w/m, DC12V, IP20, SMD3528, 50m/reel, 3M double sided tape, 5 strip to power connectors
	ML-SMDF-9.6-WW50	9.6W/m, DC12V, IP20, SMD2216, 50m/reel, 3M double sided tape, 5 strip to power connectors included
	ML-SMDF-9.6-NW50	9.6W/m, DC12V, IP20, SMD2216, 50m/reel, 3M double sided tape, 5 strip to power connectors included
	ML-SMDF-9.6-W50	9.6W/m, DC12V, IP20, SMD2216, 50m/reel, 3M double sided tape, 5 strip to power connectors included
	ML-SMDF-11.5-WW50	11.5W/m, DC12V, IP20, SMD3014, 50m/reel, 50 strip to power connectors, 3M double sided tape
	ML-SMDF-11.5-NW50	11.5W/m, DC12V, IP20, SMD3014, 50m/reel, 50 strip to power connectors, 3M double sided tape
	ML-SMDF-17.2-NW50	17.2W/m, DC12V, IP20, SMD3014, 50m/reel, 50 strip to power joiners, 3M double sided tape, max length should not exceed 3m
	ML-SMDF-17.2-W50	17.2W/m, DC12V, IP20, SMD3014, 50m/reel, 50 strip to power joiners, 3M double sided tape, max length should not exceed 3m
	ML-SMDF-12-RGBW-W50	12W/m RGBW, DC12V, IP20, SMD2110, 50m/roll, 3M double sided tape, 50 strip to power connectors, maximum length should not exceed 5m
	ML-SMDF-28.8-RGBHY50	RGB+W+WW 28.8W/m, DC12V, IP20, SMD5050, 50m/roll, 3M double sided tape, 50 strip to power connectors, maximum length should not exceed 3m
POWER SUPPLIES	ML-PS20	CVPS, 20W, 12V DC output
	ML-PSWP30	CVPS, 30W, 12V DC output, IP65. Suits LED strips, 24W max
	ML-PSWP60	CVPS, 60W, 12V DC output, IP65. Suits LED strips, 48W max
	ML-PSWP100	CVPS, 100W, 12V DC output, IP65. Suits LED strips, 80W max
	ML-PSWP150	CVPS, 150W, 12V DC output, IP65. Suits LED strips, 120W max
	ML-PSWP200	CVPS, 200W, 12VDC output, IP65 Suits LED strips, 160W max
	ML-PSWP300	CVPS, 300W, 12V DC output, IP65. Suits LED strips, 240W max
	ML-PSD10	CVTD, 10W, 12V DC output, IP20 suits LED strips, 6-10W max
	ML-PSD20	CVTD, 20W, 12V DC output, IP20 suits LED strips, 12-20W max
	ML-PSD30	CVTD, 30W, 12V DC output, IP20 suits LED strips, 18-30W max
	ML-PSD80	CVTD, 80W, 12V DC output, IP20 suits LED strips, 48-80W max
	ML-PSD200	CVTD, 200W, 12V DC output, IP20 suits LED strips, 10-200W max

Case studies

LET'S INVESTIGATE OUR FIRST SIMPLE CASE STUDY

Mrs Jones wants RGB under her kitchen bench and in behind her overhead cupboards, she wants to control it via remote control wall mounted as 2 separate zones. The details are as follows:
Kitchen Bench is 4.7m long so what do we require?
- LED Strip ML-SMDFH-RGB @ 14.4w/m (1 x 5m pack)
    - o Total load 4.7 x 14.4 = 67.68 watts total
- Power supply ML- PSWP100 (Dimming not required)
- WiFi/RF Controller ML-1009FAWI (Set as master)
- Remote Control wall mounted ML-2820-US3 as we want 2 zones

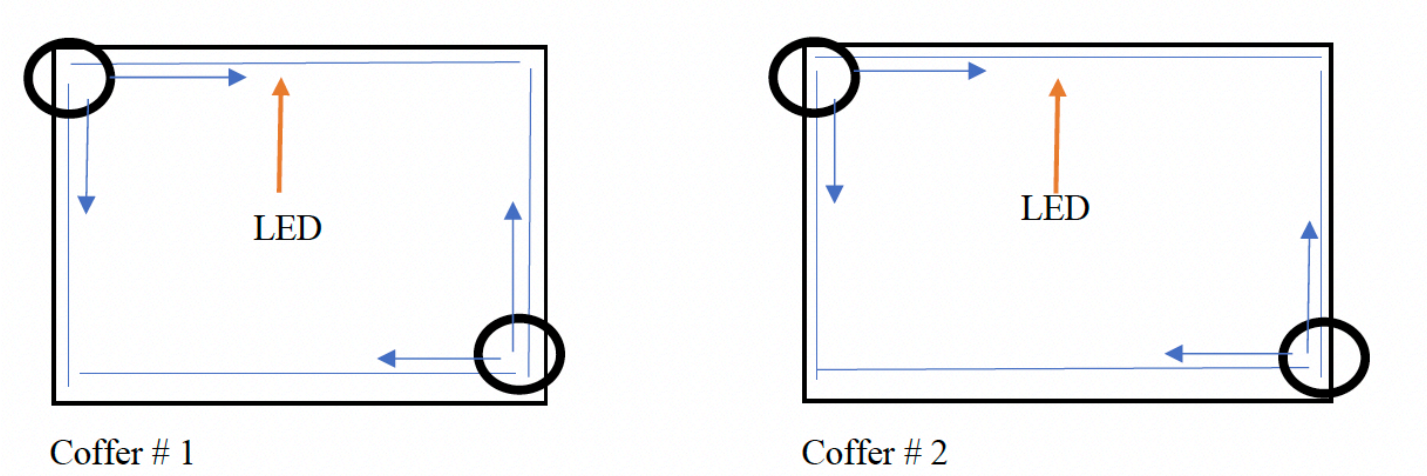
Overhead cupboards are 3.4m long so what do we require
- LED Strip ML-SMDFH-RGB @ 14.4w/m (1 x 5m Pack)
    - o Total load 3.4 x 14.4 = 48.96 watts total
- Power supply ML- PSWP100 (Dimming not required)
- WiFi/RF Controller ML-1009FAWI (Set as master)

As you can see in this instance we have treated the two locations as separate areas controlled by a common controller as each area is a ZONE.

This could have been done as a single Zone simply by making on 1009FAWI a master and the other a slave and they would have aligned themselves after a short period of operation.

CASE STUDY # 2

Mrs Jones wants RGB under her kitchen bench and in behind her overhead cupboards, she wants to control it via remote control wall mounted as 2 separate We have to quote and design LED Strip RGBW to be installed in a ceiling coffer in 2 conference rooms separated by a removeable wall. Each coffer is 4.5m x 5m x 4.5m x 5m and are situated approximately 4m apart.



So if we install the strip as per the above drawing how do we wire and control it especially if it is to be considered two separate areas?
The bold circles indicate the point of connection and the arrows indicate the Strip involved in that connection, in this instance we will use the ML-1009FAWI as a Master to control the strip from one corner in each of the coffers however due to the proximity of the two (2) coffers we can't use the ML-1009FAWI as a slave as it will try to control the opposing coffer.

In this instance we will use the ML-3002 Power Repeater to control the opposing corner in each coffer so our list of equipment would be as such.

Coffer # 1
1 @ ML-1009FAWI (set as master)
1 @ MI-3002 Power Repeater
4 @ ML-SMDF-RGBW 5m bags
LED Strip
LED Strip
2 @ ML-PSWP200 Power supplies (14.4w/m x (5m+4.5m) = 136.8w total per corner)
1 @ 30m roll of ML-RGBW cable
1 @ wall mounted RGBW wall controller ML-2820-US3

Coffer # 2
1 @ ML-1009FAWI (set as master)
1 @ MI-3002 Power Repeater
4 @ ML-SMDF-RGBW 5m bags
2 @ ML-PSWP200 Power supplies (14.4w/m x (5m+4.5m) = 136.8w total per corner)
Assumption: the 30m roll of cable will be sufficient to cater for both coffers between the ML- 1009FAWI and the ML-3002 as the ML-3002 will have its own driver and will be able to step up the DC Voltage to the LED Strip.

Assessing Voltage Drop

Remember to complete the following: Taken from Part 1: Like with any electrical cable there is an element of resistance in each and every strand, it's not much but depending on the load in watts or amps and the voltage it can have a huge effect.

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Voltage drop is extremely important, and the biggest element missed in most lighting designs causing long term issues with the operation of the fittings attached to those cables.

This is due to the simple fact very few take the time to check the Voltage Drop of the cable being installed.

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Voltage drop is the decrease of electrical potential along the path of a current flowing in an electrical circuit. ...

Voltage drops in the internal resistance of the source, across conductors, across contacts, and across connectors are undesirable because some of the energy supplied is dissipated.

An example of this is if you were to take our SC30 single colour 30m roll of cable which is a 17/0.155mm diameter cable (17 strands @ 0.155mm) which isn't a big cable at all and has a current carrying capacity of 3A, so it's clearly not unlimited and the length of the cable and the load on the cable has a major impact on the functionality of the cable.

The area in mm2 of the cable can be calculated as follows:
A = 1/4πd2 (.25) of (3.14 x 0.155 x 0.155) = 0.0189 x 17 = 0.32mm2

Example #1: The following example is based on 5m of Melec SMDF-7.2W (36w/12v = 3A) with 7.5m tails of 17/0.155mm, 0.32mm2 cable.

Volts = Length x Current x 0.017 (Area)
Volts = (7.5 x 3 x 0.017) divided by 0.32 = 1.19
Result: Which means if we have 12V DC input we will only have 10.81V DC at the LED Strip

Example #2: The following example is based on 5m of Melec SMDF-RGBW-12W (60w/12v = 5A) with 10m tails of 17/0.155mm, 0.32mm2 cable.

Volts = Length x Current x 0.017 (Area)
Volts = (10 x 5 x 0.017) divided by 0.32 = 2.66
Result: Which means if we have 12V DC input we will only have 9.34V DC at the LED Strip.

So if you increase the load and length of tail you increase the voltage drop along the cable resulting in a lower output voltage and a dimming of the LED Strip.

How can this be rectified? Simply increase the cable size for example say we were to use a 14/0.20 with a current carrying capacity of 11A, to work the area of the cable in mm2 use the following formula:
A = 1/4πd2 (.25) of (3.14 x 0.2x0.2) = 0.031 x 14 = 0.44mm2

Example #3: The following example is based on 5m of Melec SMDF-RGBW-12W (60w/12v = 5A) with 10m tails of 14/.2mm, 0.44mm2 cable.

Volts = Length x Current x 0.017 (Area)
Volts = (10 x 5 x 0.017) divided by 0.44 = 1.93
Result: Which means if we have 12V DC input we will have 10.07V DC at the LED Strip.

So in conclusion if a long tail is required we simply provide the standard 150mm tail and advise the customer to use a larger cable connected via a small terminal strip to ensure voltage is sufficient to operate the Led Strip.

OPTIONAL DRIVERS AND THERE APPLICATION
If this system was to operate from a building management system using 0/1-10v, Dali or DMX you would simply replace the ML-1009FAWI with the applicable driver

- Dali – use the 4 Channel Dali Dimmer ML2303BEA
- 0/1-10v – use the 0-10v 4 channel dimmer ML-2002
- DMX – use the DMX Multi output dimmable driver ML-2106
-

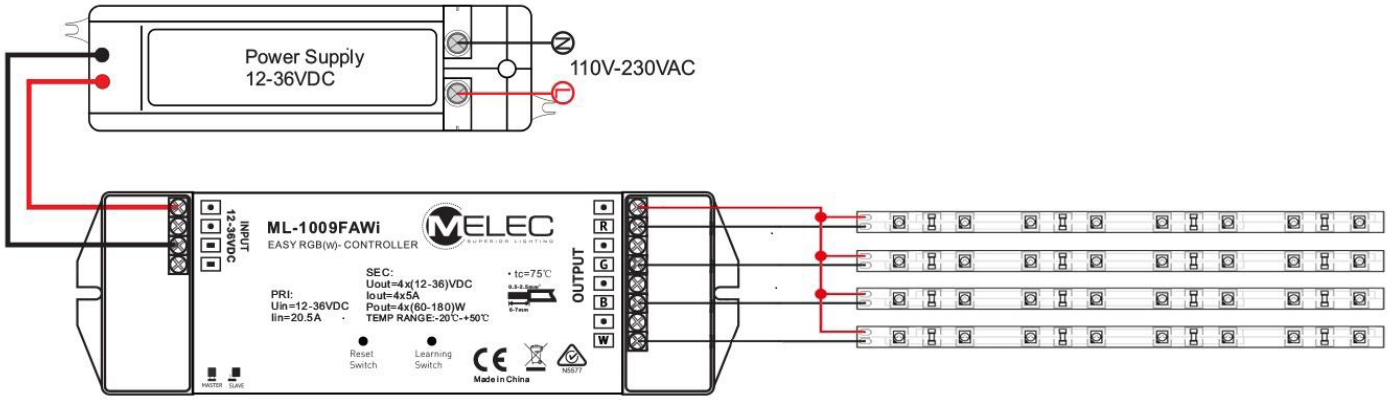
There other drivers available however their application requires the contractor to specify the exact application the strip is connected to.

There are many different applications for LED Strip, this fact sheet is designed to give you an overview of how to assess an installation and how to identify the equipment required.

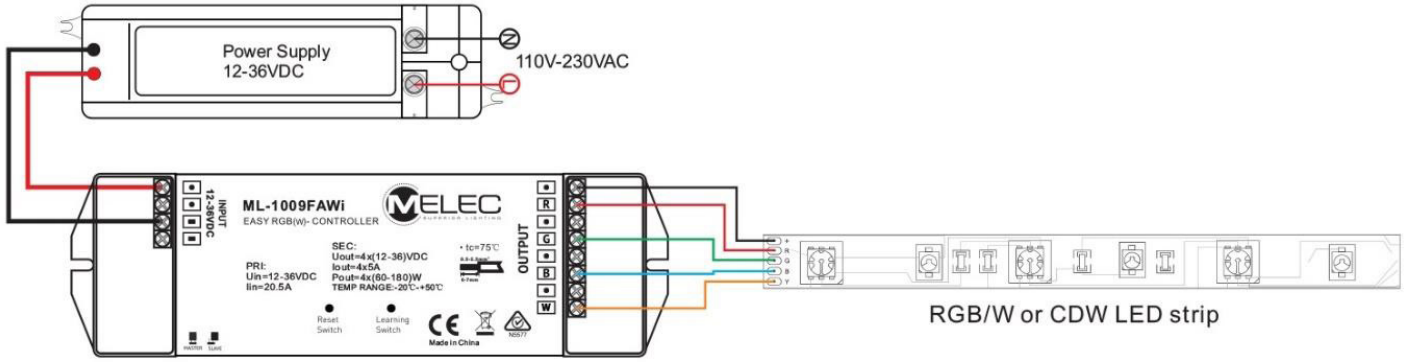
Examples of how they are wired

ML-1009FAWI

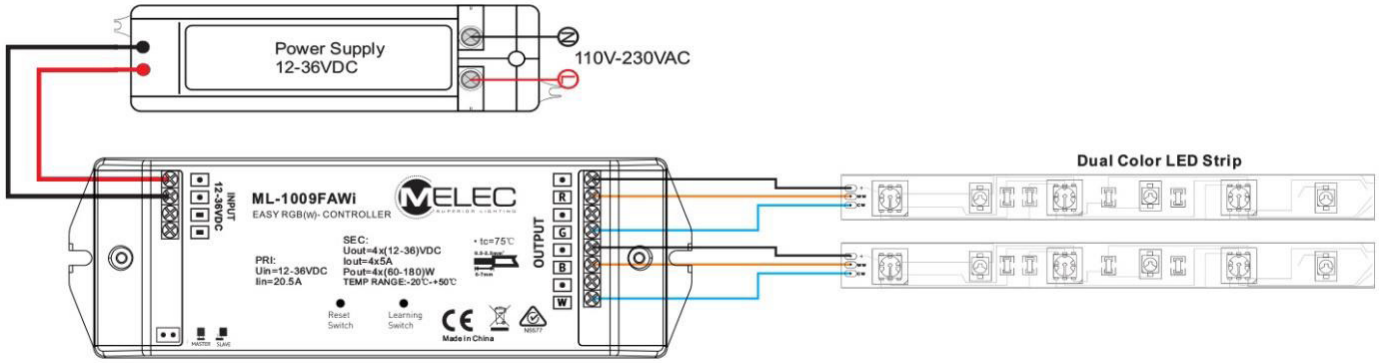
Single Colour Connection Diagram



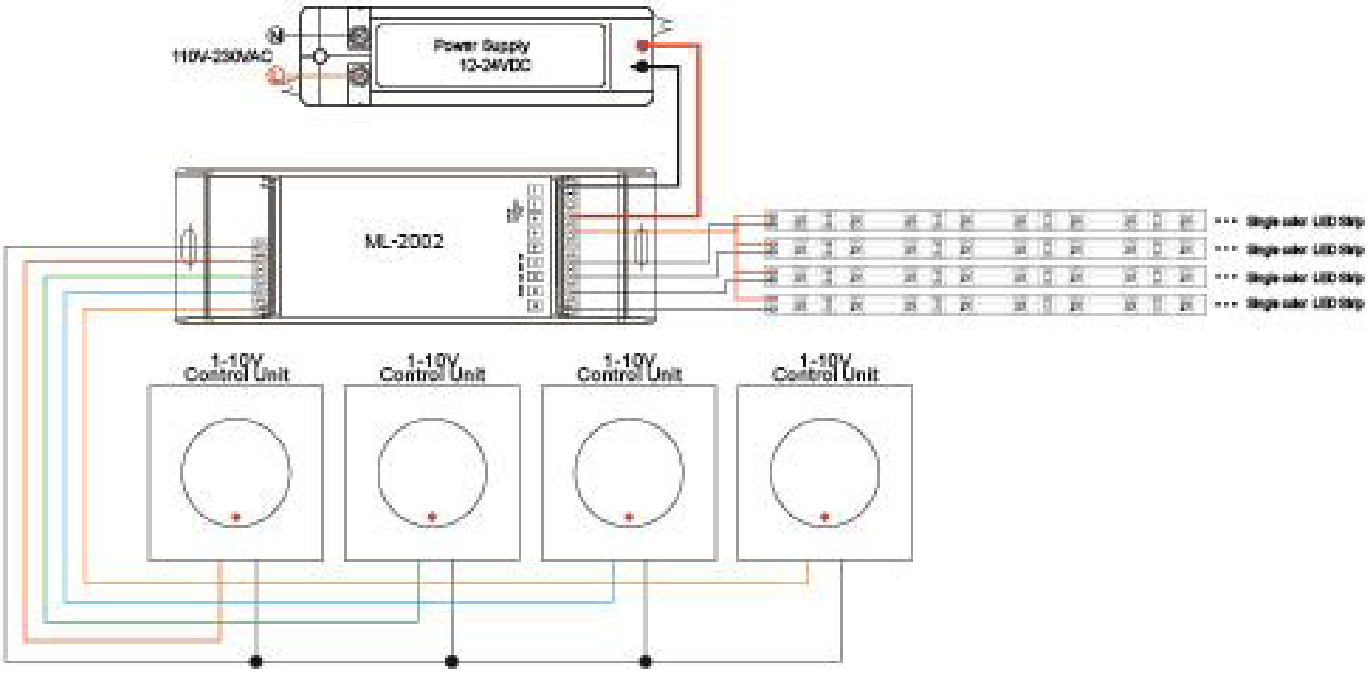
RGBW Connection Diagram



Dual Colour or Hybrid LED Strip



ML-2002
0-10V Wiring Diagram



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