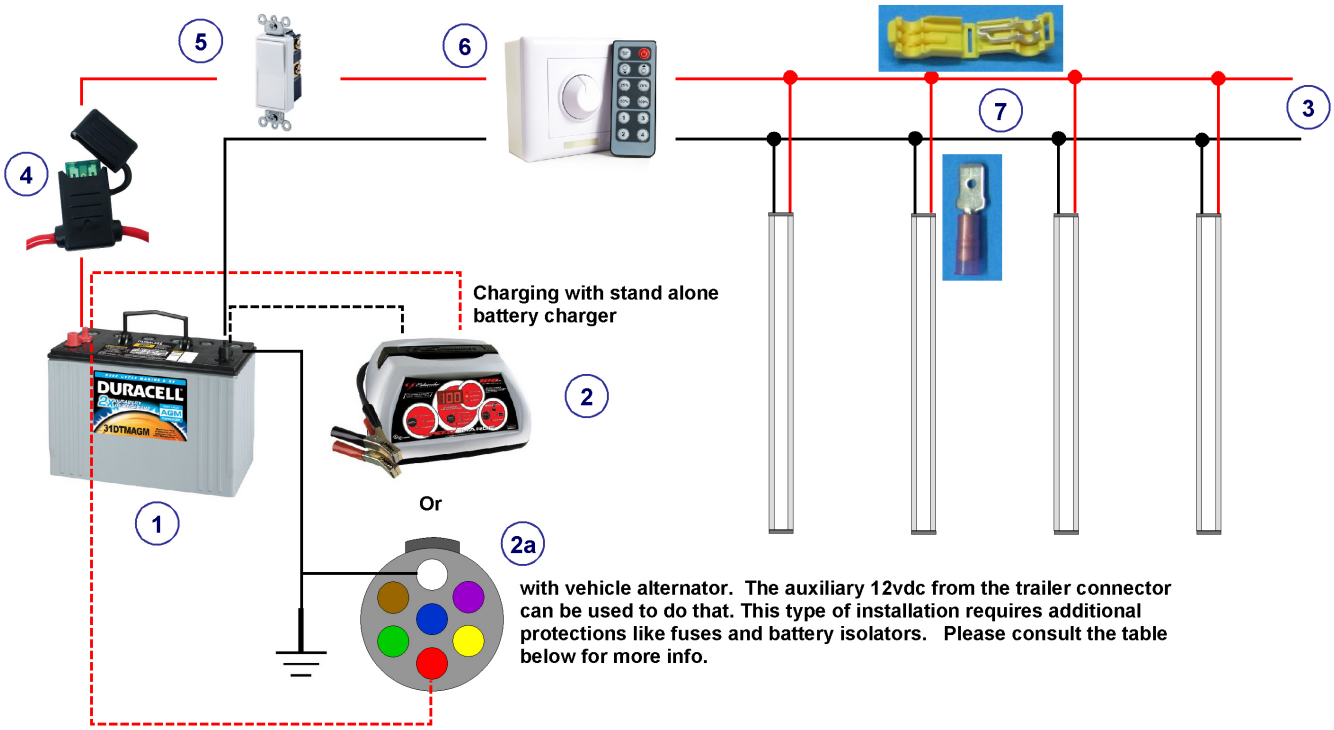
Installation recommendations

Solution A

Powered by a stand alone battery

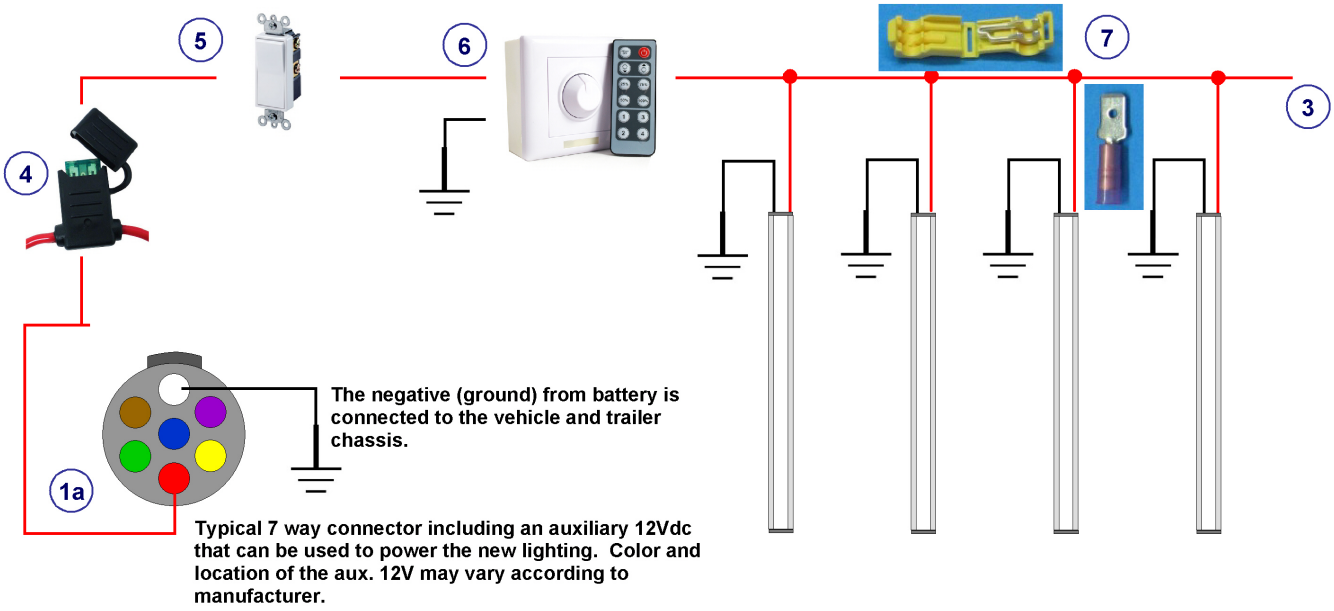
For long duty cycle



Solution B

Powered by the vehicle starting battery

for short duty cycle

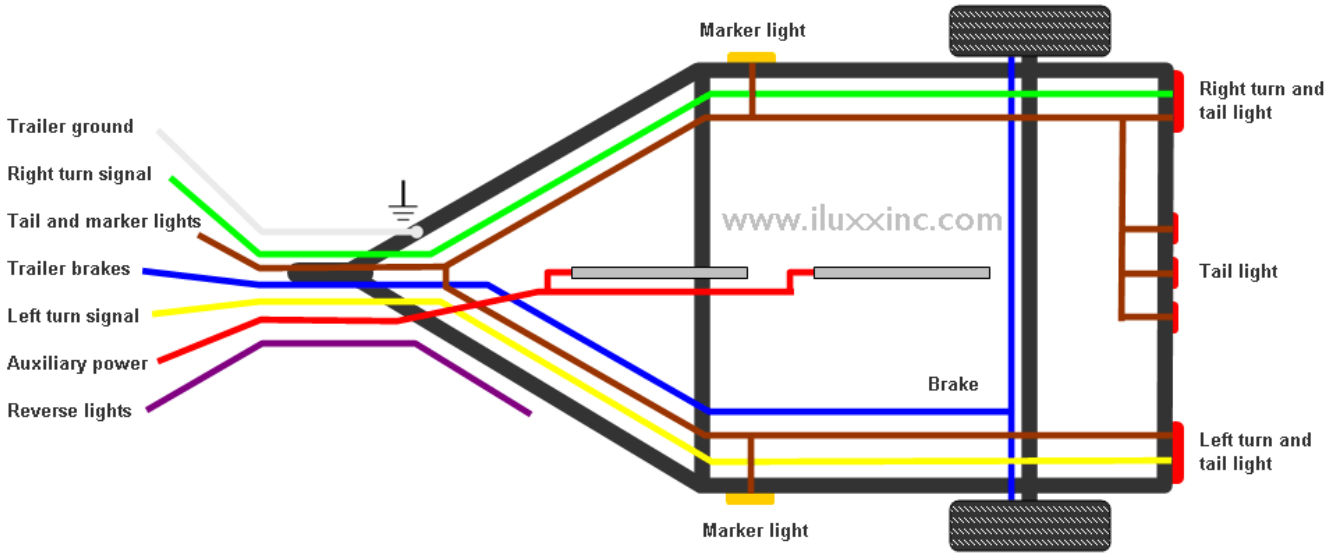


Additional Info

Trailer Wiring - Color Code Chart

Connector	Color	Function	Suggested minimum wire gauge		Where to attach	
			4 & 5 Way	6 & 7 Way	Vehicle side	Trailer side
4 Way / 5 Way / 6 Way / 7 Way	Green	Right turn signal	18	16	Right turn wiring harness	Right turn signal
	Yellow	Left turn signal	18	16	Left turn wiring harness	Left turn signal
	Brown	Tail / Marker lights	18	16	Tail light wiring harness	Tail / Marker lights
	White	Ground	16	12	Grounding point	Grounding point
	Blue	**Trailer brakes**	**18**	**12**	**Brake controller / power for brakes**	**Break away switch / brakes**
	Red/Black	**Battery**		**12**	**Battery cable with a fuse**	**Battery charger / auxiliary lights**
	Purple	**Reverse lights**		**16**	**Reverse / Backup wiring harness**	**Reverse lights / hydraulic coupler**

This chart is a typical guide; wire colors or functions may vary based on manufacturers. Use a circuit tester to verify connections



Use the following as a guide only

1- Stand alone battery – Long duty cycle		
Type 	Deep Cycle	Better adapted than a starting battery because it is designed to be regularly deeply discharged using most of its capacity and it will last longer in this type of application.
Size	Group 31	Common size that packs a lot of Amp / Hr for the $
Capacity	Based on total load	For example if capacity is 100 A / Hr and total load is 5 A it means you get 20 hours of useful energy before it is considered discharged.
Operating voltage 1: *If not coupled to the alternator or the engine is not running*	12,6 V	After full charge, the terminal voltage will drop quickly to 13.2 V and then slowly to 12.6 V. Consider 12.6V to be your normal operating voltage at the battery terminals.
Operating voltage 2: *If coupled to the alternator and the engine is running*	13,5 à 14,5 V	Typically 13,8 V
Fully discharged	11,8 V	Usually considered a safe level of discharge (not detrimental to battery life)
Charge with	13,2 – 14,4 V	Managed by the alternator or the battery charger
Continuous preservation charge	13,2 V max	“Trickle charge” mode
For more info : http://www.solar-electric.com/deep-cycle-battery-faq.html#Starting, Marine, and Deep-Cycle Batteries http://batteryuniversity.com/learn/article/lead_based_batteries		
1a- Vehicle starting battery – Short duty cycle		
Getting the power from the main starting battery is an option if the extra lighting is used for short period of time. The risk is obviously that you can drain the starting battery but if the application fits (delivery trucks for example), it’s a simple solution.		
2- Battery charger		
Many models available on the market		Safe and simple solution because completely independent from the towing vehicle. To ensure a long life to the battery It is best to charge slowly with a low current (between 2 and 5A for example)
2a- Vehicle alternator as battery charger		
Practical solution but having 2 batteries or more on the same alternator requires a suitable installation. For example, isolating the starting battery from the others would be a good idea to prevent drainage of the starting battery. You could achieve the same result by disconnecting the connector between vehicle and trailer but there is a risk to forget. Please review the following links to learn more.		
Useful links: Battery combiner vs isolator https://www.youtube.com/watch?v=CGD8HAeg5UA (shows the functionality of a battery isolator but the voltage drop factor is not considered) https://www.youtube.com/watch?v=lZ2q5BHo8Bw (installation without an isolator)		

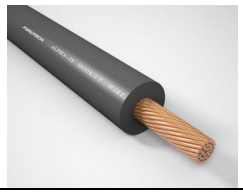
3- Wiring		
Type	Stranded wires 	Automotive wire is stranded because it's more flexible than solid wire and will not break under continuous vibration.
Size	14 – 12 AWG *See Fig 1*	Voltage drop is an important factor in 12V systems. Wire gage, load and length of distribution line are all factors influencing the actual voltage you will get at the end of the circuit. Bigger the wire size lower is the voltage drop
Using vehicle chassis as common ground (negative side of the battery)	Yes if done properly	It's standard practice for the manufacturers to use the chassis as common ground mainly because it saves them a lot of wires. But remember, especially on a trailer that the no 1 reason for wiring problem is the quality of the ground. Test your installation to make sure you get the full voltage. Note: if using a PWM dimmer a negative wire will need to be connected to the device

Fig 1

Voltage drop @ 12,6 Vdc if wire size is 12 AWG

Length of circuit (ft)	Circuit total load		
	5 Amp	10 Amp	15 Amp
10	12,44	12,28	12,12
20	12,28	11,96	11,65
30	12,12	11,65	11,17
40	11,96	11,33	10,69
50	11,81	11,01	10,22

Voltage drop @ 12,6 Vdc if wire size is 14 AWG

Length of circuit (ft)	Circuit total load		
	5 Amp	10 Amp	15 Amp
10	12,35	12,09	11,84
20	12,09	11,59	11,08
30	11,84	11,08	10,33
40	11,59	10,58	9,57
50	11,34	10,07	8,81

Get precise results for your application with this calculator
http://www.calculator.net/voltage-drop-calculator.html

4- In-line fuse		
Type	Automotive 32V	
Value	Total load x 1,35	If load is 10 A then the fuse value should be = 10 x 1,35 = 13,5 A; select the nearest standard value which is 15 A
5- Mechanical switch		
Type	Standard household switch will work	The mechanical switch ensures a clean cut-off which is not the case with an electronic switch/dimmer where residual voltage can draw a small amount of current from the battery.

		
Capacity	Based on total load	The standard household switch is rated at 15A which will be sufficient for a lot of applications. Do not exceed the maximum rating of the device
6- PWM dimmer		
Type 	PWM	If you don't need the full power all the time: 50% less light = 50% less power from the battery which is a good way to maximize battery autonomy.
Capacity	Based on total load	Do not exceed the maximum rating of the device

7- Hardware

Using the right material will payoff in the long run. Here's a few recommendations:
1- This is a lot better than regular wire tap especially with wires of different sizes. It is used with a .250" quick disconnect
http://www.molex.com/pdm_docs/sd/192160010_sd.pdf
available in small quantity at: http://www.digikey.com/ or http://www.digikey.ca/

2- Use dielectric grease on all your connections to maintain a good electrical contact over time. Here are a few examples. Available at your local auto parts store