ADDING INDICATORS TO STOCK MARKER LIGHTS AND TAIL LIGHTS ON A CJ2A

How to use SPDT relays to modify your CJ2A wiring to add indicator functionality to your single filament front marker lights, and to your dual filament tail lights, while still keeping the original functions intact.

Written by Mike Udal, with assistance from Terry Hackney

Acknowledgement: This guide was only made possible through the original design passed on to me by Terry Hackney. I have updated it to suit one of the common aftermarket indicator levers available through many of the Jeeps parts suppliers, and written it up into this guide, but acknowledgement for the original basic concept and design must go to Terry.

1. Background

The Willys Jeep CJ2A model originally left the factory with only one tail light at the bottom of the left hand rear panel. This was fitted with a dual filament bulb, and was wired to display lights and braking. A single reflector was fitted to the right hand rear side.

The front grill carried single filament marker lights, and headlights with high and low beams.

Noticeable by their absence were indicator lights, and it was expected and required that the driver would use hand signals to display his intentions.

Service Form 643650 covered the installation of a second tail light in place of the right rear reflector, however Willys never amended the design for the inclusion of indicators in the CJ2A.

To some enthusiasts, it is important to remain 100% faithful to the original design, and to others it is important to modernise the vehicle for enhanced safety and ease of use. Only the individual owner can make that decision.

For those that have decided to add indicators to their Jeeps, there are a number of options, including:

1. Adding additional indicator lights front and rear.
2. Modifying the existing light socket or housings to accept dual filament lights in the front.
3. Repurposing the marker lights to function as indicators.

All of the above methods have their advantages and disadvantages.

Option 1 meets the goal, but interferes with the stock look, and is not easily reversible once holes have been drilled for the new lights. Many folk

don’t want to be the ones to modify or cut into on original tub or grill.

Option 2 has been done by various folk, with varying success. The marker lights in the front, be they the early bullet style or the later grill mount style, won’t accept a dual filament socket without modification of some kind. Additionally, the grill mounted lights do not have enough space behind the lens to take the dual filament bulb, and so the socket needs to be set back behind the grill on a custom made mount. Again, some modifications are required to sockets and grill, but in the front at least, the stock look can be maintained. In the rear, I am not aware of any NACO tail light modification to take dual bulbs /three filaments to service the functions of tail lights, stop lights and indicators.

Option 3 also allows the owner to keep the stock look at the front by sacrificing marker light functionality, but again there is no good option for the back.

There is another option, which is a solution that combines many of the advantages CJ2A owners want, without many of the drawbacks. It delivers full functionality with a completely stock look at both the front and at the rear, no cutting or modifications to your jeep or the light sockets, and full reversibility if you ever want to return to the 100% original stock configuration. It took me a while to research all the options before settling on this one, and now that I have done it myself, and proven that it works, I have written this guide to assist other CJ2A owners who might be interested in doing it themselves.

To put your mind at rest, I am not an auto electrician, or an electronics engineer - I don’t believe that you need to be either to understand the wiring involved, or to actually complete the project. Anyone can understand and do this modification if you take the time to go through this guide carefully.

2. The Concept

The basic concept is to share a filament in a bulb, so that it serves two purposes.

In the front, the marker lights still use a single filament bulb, but the filament is shared between the light function and the indicator function, with the indicator function taking preference. In practice, if the marker lights are off and you indicate left, the left marker light will flash, and if you indicate right, the right marker light will flash. If the lights are turned on, both marker lights will come on, and if you then indicate left, the left light will flash while the right light will stay on, and if you indicate right, the right light will flash while the left light will stay on.

In the back, the dual globes perform three functions. The small filament is dedicated to the lights, so that if the lights are on the tail light is dimly illuminated. The brighter filament is shared between the brakes and the indicator, with the indicator function taking preference. In practice, if you are not braking and you indicate left, the bright filament will flash, and if you indicate right, the bright filament light will flash. If you are braking, both brake lights will come on, and if you then indicate left while braking, the left brake light will flash while the right light will stay on, and if you indicate right, the right brake light will flash while the left light will stay on.

So yes, for the short time that you are indicating while the lights are on, one of the front marker lights is repurposed to flash, and if you are simultaneously braking then one of the brake lights is repurposed to flash. This lasts only as long as you are indicating, which is normally a few seconds. If this makes you uneasy, or you think that it is somehow unsafe (more unsafe than not having indicators or using handsignals!) then this option is not for you. But if you like having indicators that work just like regular indictors, without having to modify your lights or

your tub or your grill, and accept that for a few seconds one side may be lit while the other side is blinking, then this option may be your solution.

3. How it works – basic theory

The heart of how this works is a small device called a relay. There are many types of relay, so we need to be a bit more specific and call it a single pole double throw (SPDT) relay. Don't get put off by the name - Just think of it as a basic electro-mechanical switch that allows you to run one circuit in the default position and then disconnect that circuit and bring another circuit when you decide to do so.

The circuit diagramme is really simple and it looks as shown in Figure 1:

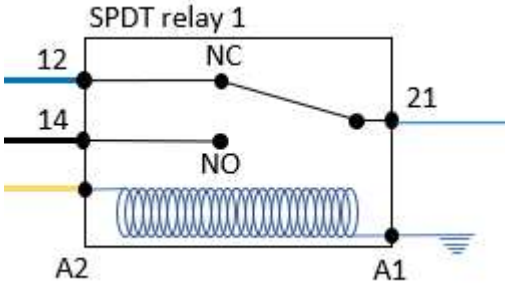

Figure 1: SPDT relay with coil unenergised

The relay has two possible inputs, labelled here as 12 and 14, and one possible output, labelled here as 21. A switch ensures that either 12 OR 14 are connected to 21 at any one time, but not both. The switch is normally closed "NC" between 12 and 21 and held this way by a small spring. The connection between 14 and 21 is normally open "NO".

When power is supplied at A2, the current flowing through a coil between A2 and A1 sets up a magnetic field, and the metal switch is literally pulled off its contact with 12 and now makes contact with 14, as shown in Figure 2:

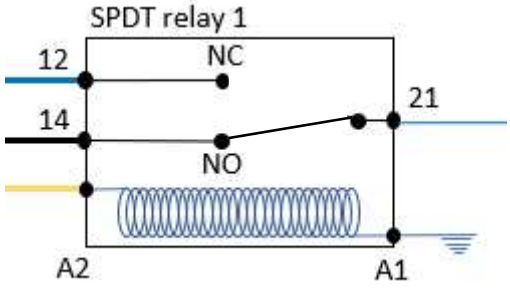

Figure 2: SPDT relay with coil energised

Now the circuit between 12 and 21 is open, and the circuit between 14 and 21 is closed. Note that this is not the "normal" position, as it is only held in this position as long as the coil is pulling the switch down. As soon as power is removed from A2 the coil loses its magnetic field and a small spring returns the switch back to its original "normally closed" position.

So this is a really simple way of having one output (21) behave in two different ways according to whether circuit 12 or circuit 14 is connected. Whether A2 has power or not can be manually switched by the user.

So lets extend the concept to our front marker light: If the lead at 12 comes from the headlight switch so that power is supplied at 12 when the light switch is turned on, and 21 runs to our front marker light, then in the normally closed position (ie the default situation) the marker light will come on when the light switch is pulled. If the driver now supplies power to A2 by pulling the indicator lever to the left, then the switch will move to the NO position and two things will happen. Firstly the power from the light switch will be disconnected, and so the marker light will go off. But at the same time, 14 is now connected to 21. If 14 is power coming from our flasher unit, then the front marker light will start to flash as long as the indicator lever remains activated. As soon as the indicator is cancelled, power to A2 is lost and the switch reverts to the NC position, the marker light will stop flashing, and will remain

permanently on, fed by power from the headlight switch. If our light switch (12) is never on in the first place this doesn't matter – the marker light will simply remain off until the indicator lever is activated and then it will flash for as long as the indicator lever is activated.

It is important to understand that the indicator lever only serves to connect 14 to 21 through energising the coil, and therefore only selects which function you want at that time. The actual power at 14 is delivered via the flasher unit itself, which is your normal shiny silver "tin can" – this power is delivered to 14 in an intermittent fashion from the flasher, which is what makes the bulb connected to 21 flash. Again, it is not the switch that flip-flops between 14 and 12 to make the flash when indicating, but the intermittent power delivered via the flasher unit that makes the bulb flash. The switch is permanently connected to 14 when indicating.

4. The Hardware

The hardware used in this guide relates to items which may or may not be identical to what you have available. I used the 7 wire aftermarket indicator lever available from Walcks, and "Rele" brand SPDT 12V Automotive relays, but any SPDT automotive relay and the universal turn signal indicators sold on EBay and Amazon should work just as well. If your wire colours are different to the ones I have shown, or the pin number references on the relays, then you need to understand the principles in this guide, look closely at your lever and relays and relay holders, and modify the wiring diagramme to suit. Exactly the same principles apply, but the numbering of the contacts may be different for your brand of relay for example, and the wire colours coming from your indicator unit may be different.

A SPDT relay should look similar to that shown in Figure 3:

Figure 3: Typical SPDT relay

Note that this is a 220V AC relay, so it is not designed for use in 12V DC. But it is a nice clear picture and the principle remains exactly the same. If you are running 6V in your Jeep you need to find 6V relays.

You can clearly see the coil on the left, and the metal switch at the top that is pulled down by the coil when it is energised. The pins at the bottom of the relay are the various numbered contacts. It is possible to solder wires directly to the pins, and some types also accept spade connectors, but it is much easier to buy a relay holder, which looks like the one in Figure 4:

Figure 4: Typical relay holder

The relay loads into the top of the holder which means that connection with the pins can now be made via the numbered screwed connectors in the base. The wiring of the base and relay are shown in the small diagrammes on the side of the

holder, and these numbers in the circuit relate to numbered screws on the holder. (There are two circuit diagrammes on this one because this base can accept more than one type of relay). It really is a simple as loading the relay into the holder, and then connecting your wires into the numbered screws. Your relay will then be wired as per your circuit diagramme.

The numbers referenced in this guide all refer to this brand of relay and holder and may therefore be different to your brand. If you can find “Rele” brand and the correct relay and holder, then you can simply connect the wires to the screws referenced in this guide and it will work.

You need four relays because you have four lights that you are controlling. These can simply be lined up next to each other and wired as per the wiring diagramme. I found it easiest to use a DIN rail to keep the bases together. A DIN rail is shown in Figure 5 below:

Figure 5: Typical DIN rail

Each base simply clips onto the DIN rail via a spring loaded clip, and the rail can be cut to length sufficient for the four bases. Mine is shown in Figure 6. You can see the black spring loaded clip that holds each base onto the lip of the rail. You can detach each base by pulling on the clip. The base of the rail is conveniently already slotted and recessed, and I found a ¼” bolt fitted perfectly into the space available.

Figure 6: Relays loaded onto DIN rail

The DIN rail with the bases and relays attached can then be fixed to your CJ2A. I fitted mine to the upper side of the dash to firewall support bracket with a ¼” nut and bolt, which also provided a useful ground post to ground the A1 connection of each relay. It doubled as a ground post for my fuel gauge that also needed grounding as it is one of the modern reproductions.

Figure 7: Dash to firewall support bracket, with 1/4" bolt for securing DIN rail and relays

So the entire relay set can be tucked away out of sight under the dash, and securely bolted in place.

Figure 8: Relays bolted to top of support bracket underneath the cowl

I still need to tidy up the final wiring and bind it into a loom of sorts.

5. Wiring of the relays

The full wiring diagramme is provided in Figure 9 on the last page of this guide. I have wired mine exactly according to this diagramme, and it works exactly as I have described. The following notes are relevant:

- 12V or 6V systems should have the same wiring diagramme, just make sure that all your components are rated accordingly, including the relays.
- The wire colours of the indicator lever are correct for the seven wire indicator sold by Walcks. If you have a different brand then you will need to adapt accordingly.
  Red with fuse = Hot power to flasher unit X
  Black = hot power in to indicator unit
  Yellow = front left
  Green = front right
  Orange = back left
  Brown = back right
  } Connect to A2 on each relay respectively
  Blue = flashing light on indicator unit. Connect to P terminal on 3 pin flasher, or L terminal on two pin flasher
  Red = brake light (not used)
- Connect L on flasher unit to terminal 14 on each relay. This provides the alternating power to whichever relay is switched to the NO position.
- Each relay must be grounded at post A1.
- Wire in post 12 for the front two relays to the relevant connection on the headlamp switch.
- Wire in post 12 for the back two relays to the wire coming from the brake switch. When the connection at the brake switch is made by pressing the brake pedal, power will go to post 12 if the indicators are not activated.
- Wire the tail lights at the back as per normal. They are not shown on this wiring diagramme.
- Tail light colour is red due to the lens colour. If you prefer amber indicators in front instead of white, you can try painting your bulb orange with glass paint from your nearest hardware.

6. Summary

This guide is intended to help the average CJ2A owner understand how to wire in direction signals to the stock marker and tail lights, by using SPDT relays to share a filament for lights and indicator function on the front, and indicator and brake function at the rear. The **default** circuit is marker lights at the front and brake lights at the rear as and when these are switched on or activated, but the indicator circuit takes priority over these functions on the side for which it is activated. The non-activated side remains on the default circuit. Cancelling the indicator cancels

the indicator priority and returns the circuit on that side to the default circuit.

This is not the only way of installing indicator functionality on your jeep, but it is one of the neatest ways while still maintaining an absolutely stock look, and it is completely reversible at any stage. From a distance, or even sitting in the drivers seat, the only give-away that you have non-stock indicators installed is the presence of the indicator unit on the steering column!

I do not profess to be an expert on anything Jeep or automotive electrics related, but having successfully completed this modification, I wanted to show others how this can work and therefore improve safety for both ourselves and other road users while driving our Jeeps, while still remaining faithful to the stock look. I hope I have achieved that!

Yours in Jeepin'!

Mike (JeepSaffer)

13 March 2018

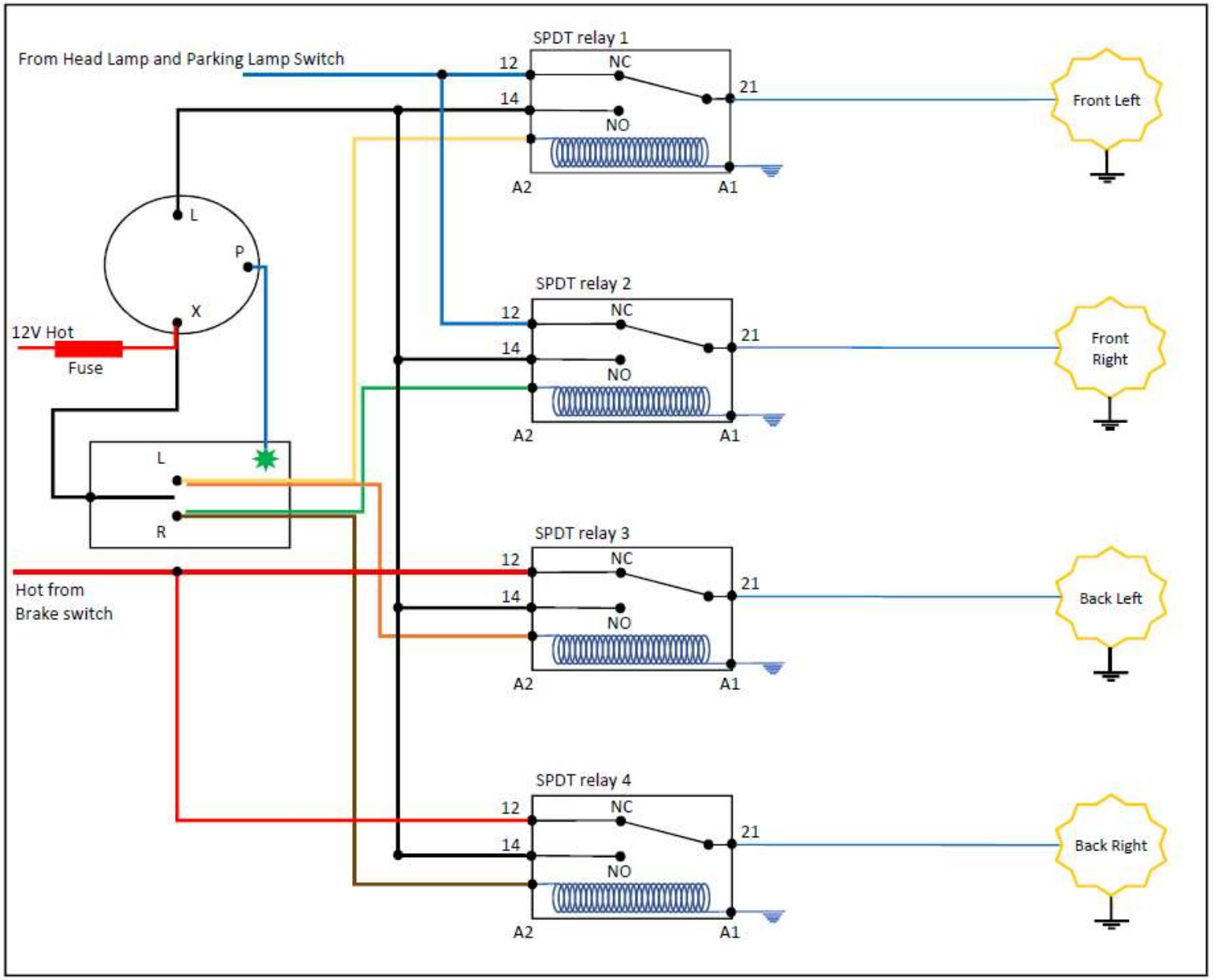

Figure 9: Wiring diagramme for turn signals on a stock CJ2A using SPDT relays and an aftermarket turn signal kit