BCM | Technical

Bus to Trailer/Toad Wiring Conversion System Using Standard Relays

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Most buses have separate brake and turn lights, while virtually all towed vehicles and trailers have combined brake and turn lights. This condition requires some sort of conversion system that is commonly called a 5 to 4 wire converter. Fig. 1 shows a commercial unit where five wires from the bus are connected to one side of the converter and 4 wires from the converter are connected to the trailer connector.

The five wires from the bus are:

1. Ground
2. Tail Light
3. Left Turn
4. Right Turn
5. Brake

The wires exiting the converter are:

1. Ground
2. Tail Light
3. Left Turn/Brake
4. Right Turn/Brake

My experience with commercially made converters is that they are not very reliable. I have just experienced my second failed unit in less than three years and 50K miles. They are not expensive, but it is still a pain to find one and replace it when you are on the road.

Figure 1: Commercial 5 wire to 4 wire converter.

There are other issues when wiring a bus for towing. First is the fact that buses were not designed for towing and the wiring might have marginal current capacity to handle the additional trailer/toad lights. Second, some buses are 24-volt and conversion to 12-volts must be accomplished. A properly designed relay conversion system address both issues.

On the Bus Conversion Bulletin Board, there have been several threads discussing the 5 to 4 wire conversion issues. I recalled that some folks had accomplished the conversion with standard relays. Relays are used extensively in our buses for a large number of applications. They are very reliable and relatively easy to obtain. The converter system made with these relays is easy to repair – simply replace one of the relays.

In my fire suppression system, I use the same Bosch-type automotive relay that is used in Eagle buses (perhaps others) and many over-the-road trucks. I decided to design my system around these relays. My electronic skills are a bit limited, so I searched for ideas after spending a few hours designing the system only to find that it did not function properly for all conditions. The first site I went to was: http://www.gumpydog.com/bus/MC9_WIP/Electrical/Tail_Light_Converter/tail_light_converter.htm. Craig Shepard has documented a system that does the 5 to 4 conversion and the 24-volt to 12-volt conversion using MCI relays. **Fig. 2** is Craig's wiring diagram. Craig has built some of these systems for other bus folks who did not feel comfortable building their own. If you would like to contact Craig, his email address is craig@gumpydog.com. As a side note, Craig's bus project pages contain a huge amount of great ideas for the conversion process.

I worked my way through Craig's schematic and built my own using four Bosch-type relays and the system works very well. **Fig. 3** is a wiring diagram furnished by Sean Welsh. Many of you know Sean from the Bus Conversion board, since he is the resident electrical expert who has bailed many of us out. I found Sean's diagram after I spent hours making a complex drawing for my system. His is very straight forward and much easier to visualize. Again, as a side note, Sean and Louise publish a fabulous blog about full-timing life on the road in their very unique Neoplan bus (http://ourodyssey.blogspot.com/)

Before we talk about the relay based converter system, let's talk about the Bosch-type automotive-type relay. It is a standard relay used extensively in the bus and heavy truck market. Several manufacturers make this relay and most rate them for a one million mechanical cycle life, minimum. The relay is typically described as an ISO standard automotive relay. They are very

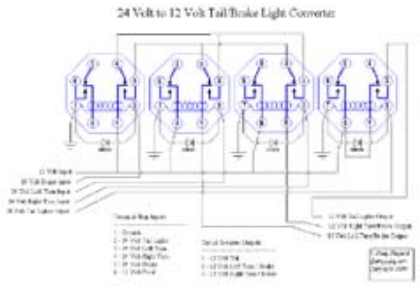

Figure 2