

# Multi-Point Switching System

## DESIGN & INSTALLATION MANUAL

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The Intellitec Multi-Point Switching system has been created for use on vehicles to communicate switching and indication signals. It uses Intellitec's popular, proprietary multiplexing protocol. Intellitec's multiplexing protocol is a time division multiplexing that divides time into a number of repeated segments, which are used by various signals to "talk to each other". The time segments repeat on a periodic basis to ensure more constant and accurate data. Each of these time segments is used to transmit unique data over a single wire, known as the multiplex "bus".

In Intellitec's Multi-Point Switching System, time is divided into 16 address groups (labeled A through P) of 10 signals each, for a total of 160 segments or channels. Each of these channels can be used for a unique signal. In this system, they repeat about 25 times per second. The channels are created by a Multiplex Control Master which puts a signal on the multiplex "bus", which is simply the wire that carries the signal to all the modules of the system.

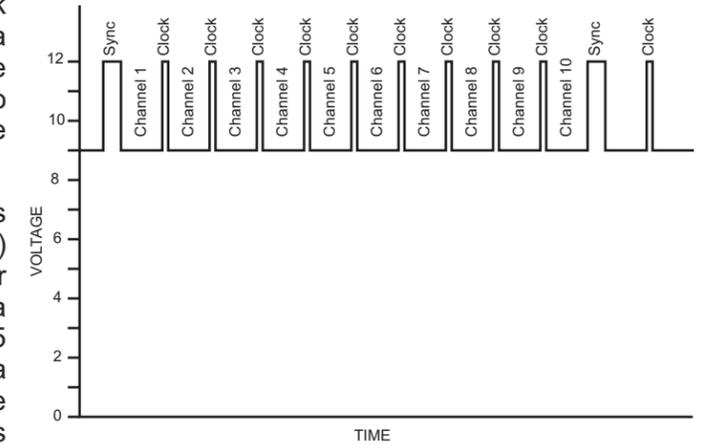


Figure 1

Figure 1 diagram is an example of the clock and sync signals created by the Multiplex Control Master. You can see that a module group of ten signals starts with a sync pulse, which is wider than the clock pulses. This sync pulse "alerts" all the modules in the system that the next group of ten signals is about to begin. If this is the first group, it is referred to as the "A" group; the first channel of that group is referred to as "A1". The next signals, or channels are called "A2, A3, A4, etc.". When the "A" group is finished, the "B" group is next.

Once this framework is set up, communications can begin. Input or switch modules put signals on the bus, then output modules respond to them. To put a signal on the bus, a switch panel or an input module "pulls" the bus low for the time of that channel. As long as the button on a switch panel is pressed, it will continue to put out a signal on the bus.

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Figure 2 shows what the signal would look like with inputs on channels 1, 3, and 7. These signals are called level "A" signals. They tell the latching output modules to change state from OFF to ON, or ON to OFF. The output modules respond to these signals.

Once the output modules turn ON, they send out a level "B" signal, on the same channel, to drive the indicators on the switch panels. (see Figure 3)

There are a number of different output modules available with both non-latching and latching outputs. When a *latching* output module "sees" a momentary signal at its address, it will turn ON. The next time it "sees" a momentary signal at its address, it will turn OFF. This would be a typical function to turn a light ON, or OFF. This signal can be generated by any number of input or switch modules. In this way, a light can easily be switched from many locations without any complicated wiring, or switching. Once a latching modules output is ON, it sends out a level "B" signal on the same channel to signal the indicators on the switch panels to turn ON. Figure 3 shows level "B" signals on channels 3 and 7 with a level "A" on channel 1.

To send a signal over the system, a *non-latching* output module can be used. When a non-latching module is used, the output corresponding to that channel will turn ON as long as there is a signal from an input, or switch module. This function is useful for controlling motor-driven devices, or signal lights that operate as a function of a switched input. With the motor-driven device, the motor will run as long as a switch button is pressed, or in the instance of the indicator light, the light will be ON as long as the input signal is ON.

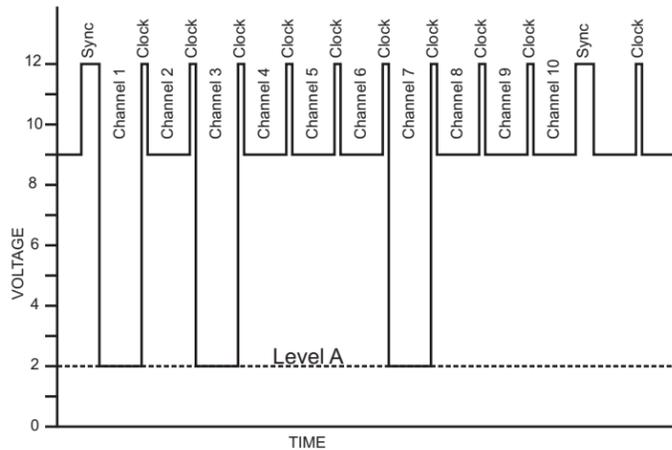


Figure 2

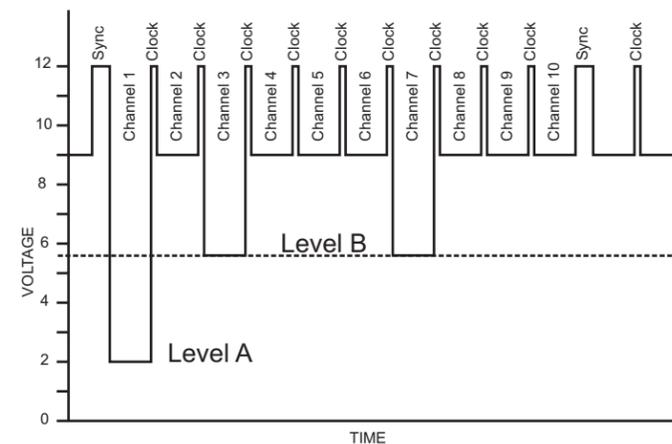


Figure 3

# Multi-Point Switching System

# Multi-Point Switching System

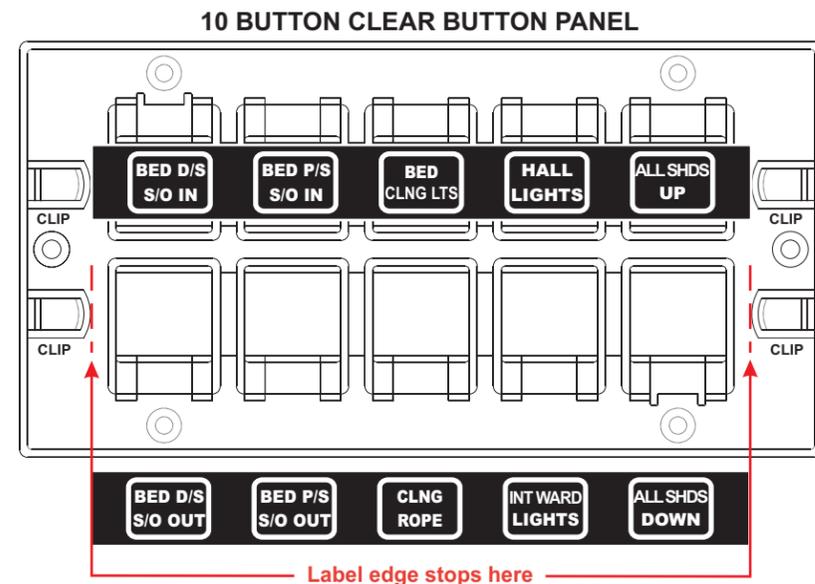
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### SWITCH PANEL DISPLAY - LABEL ORIENTATION

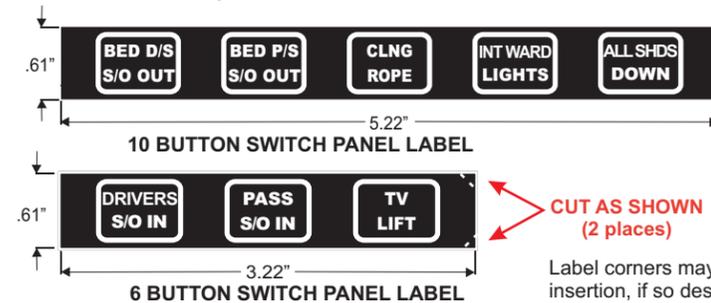
After printing labels, SLIDE label UNDER each raised button spanning from one edge of the clear button panel to the other, from left or right, whichever is easier for you. Label corners may be clipped for ease of insertion, if so desired (See 6 button diagram). Label edge should butt up against edge of clip from one side of the clear button panel to the other.

#### NOTE:

**Clips are not designed to hold the label in place, but intended as a “stop” for the label edge.** Clips on edge are for holding Switch Panel Cover on AFTER labels have been installed. **WARNING: If label is placed under clip, the label will not lay flat when switch panel cover is installed.**



**NOTE:** Recommended Label Material: Mylar Poly 0.015" thick  
If label will not slide in, check your label dimensions.  
Width may need to be trimmed.



**\*\*Orientation of the label is the same for 6 button switch panels.**

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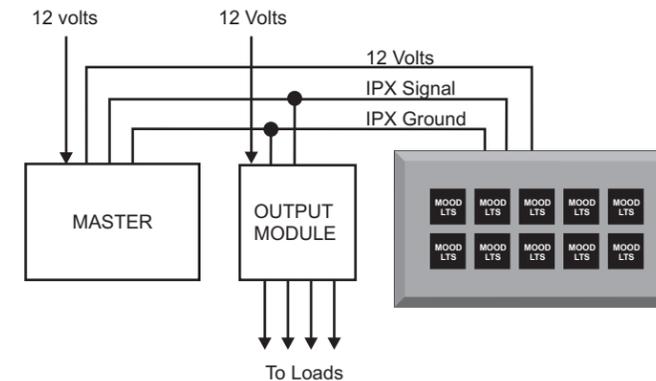
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### THE SIMPLEST SYSTEM

The simplest system would include:

- ✎ Multiplex Control Master (Intellitec P/N 00-00837-000)
- ✎ A ten channel latching output module (I.e., Intellitec P/N 00-00844-120)
- ✎ A ten button switch panel

These would be wired together as shown in the following diagram:



The output module's address would be set to a given Address, such as "C". The switch panel buttons would be set to be channels C1 through C10. This would provide a ten channel system, with each being a dimmer. This example is not a very good use of the system; however, demonstrates the principles.

The next step in adding to the system, would be to incorporate an additional switch panel with all the buttons addressed as the first one. This would offer "three-way" switching and dimming. As the requirements of the system demands additional switch panels, output modules can be added.

### SETTING UP A SYSTEM

The first step in setting up a practical system is to determine what loads will be controlled by the system. This might include: light fixtures, motor loads such as water pumps, fans, slide-out rooms, or appliances such as water heaters. The next step is to choose the output modules best suited to drive

these loads. Intellitec's website has a catalog of output modules that can be used. Most of these modules are usable in both the Multi-Point Switching System, as well as the Programmable Multiplexed Control (PMC) systems.

Typically, a latching output module, such as the Intellitec P/N 00-00844-120, would be used for controlling up to ten loads. This module can be set to be a ten channel dimmer, or six channel dimmer with four non-dimming channels, or a four-channel dimmer with six non-latching channels. Another slightly less expensive alternative would be the ten-channel latching relay module, Intellitec P/N 00-00838-000. This module will provide up to ten latched outputs.

Other momentary functions, such as bi-directional motor control, can also be a part of the system by using the Quad "H" Bridge module (Intellitec P/N 00-00916-120). This module can drive up to four, bi-directional motors individually, or all as a group. This module's outputs can also be used to drive up to 8 individual outputs, or any combination in between. (For a ten out put non-latching application, use the Intellitec P/N 00-00838-410.)

Once these modules have been selected, you will have to set their address. This is done by setting the address dip switch on the module. Each output module must have a different address, or it will react to the same signals as any others with that address. The settings of the addresses are shown on each module.

If you are using the system with the Intellitec Energy Manager, remember that modules A through C are already used by the energy management system. Therefore, you should start with module D. The modules can be in alphabetic order, or you can skip around as you like.

The system is limited to a total of 25 modules by the loading of the clock and sync generator. Each output module represents a load and each switch panel represents a load. Be sure not over load the system as it will begin to act sporadically.

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### THE MASTER MODULE

The system must start with the Master module. This can be the Multiplex Control Master (Intellitec P/N 00-00837-000) or if the vehicle already is using one of Intellitec's Energy Management Systems, it can be used for this function. Just remember that the Energy Management system uses modules A through C to communicate; therefore, these module addresses must be avoided by the rest of the system.

### SWITCH PANELS

The next step is to determine the number and placement of the switch panels. There are three switch panels to choose from and four cover plates. There is a ten button, a six button, and a six button with four external inputs. The ten, and the six with the external inputs, are the same size, but use a different cover plate.

The Six button panel with the external inputs can be used for a variety of functions. It can be used to allow a nearby remote switch to be an input to the system without the need to use an entire additional switch panel at that location. It can also be used as an input point for an indicator function that wants to be displayed at a remote switch panel location.

The part numbers for these panels are as follows:

Ten Button	00-00841-010
Six Button with ext inputs	00-00841-006
Six Button	00-00854-060

There are two cover plates available for the ten button panel, one with ten openings and one with six openings. There are two cover plates available for the six button panel, one with six openings and one with four openings.

The part numbers for these cover plates are as follows:

Description	PREFIX	BLACK	WHITE	PUTTY
10 BTN	64-00272	- 000	- 100	- 200
10/6 BTN	64-00274	- 000	- 100	- 200
6 BTN	64-00277	- 000	- 100	- 200
6/4 BTN	64-00276	- 000	- 100	- 200

### SIX BUTTON WITH EXTERNAL INPUTS

The Six Button panel with external inputs can be used to in a couple of different ways to allow inputs into the system from external switches. As an example, if you want a single switch into the system at a location that does not want a full six button panel, the four inputs on this panel can be used to input that switch.

There is a six pin plug on the back of the panel that allows access to the four inputs, the common ground lead and a source of power for backlighting of the remote switch. The maximum load on this on. source should not exceed 200 milliamps. This backlighting power will be turned on whenever the backlighting or the panel is turned on.

The connections to the module are made through a 6-pin, MOLEX Mini-fit, JR. Connector. The mating plug number is Molex 39-01-2060. The connections are as follows:

Pin No	Function
1	Remote Backlighting
2	Remote Switch 3
3	Remote Switch 4
4	Remote Switch 7
5	Remote Switch 8
6	Common Ground

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### PROGRAMMING THE SWITCH PANELS (continued)

The configuration can be stored on your computer for future use by clicking on "SAVE CONFIGURATION FILE". The program will take you through the steps to save the file to the location you want it on your computer. You can retrieve this file later, to program another panel with the same configuration.

You can also read the configuration from a programmed switch panel to duplicate its function by clicking on "READ CONFIGURATION FROM SWITCH PANEL". Once the program has been read, the button assignments will show up on the screen. This program can then be used to program a duplicate switch panel.

### TROUBLE SHOOTING THE SYSTEM

Should the system not perform as expected, trouble shooting is a usually a simple matter. You can begin to locate the trouble by localizing it to a given area. If the entire system is not operating, be sure that 12 volt power is at each output module and the Multiplex Control Master. The Multiplex Control Master includes a green LED that indicates the presence of power to the module and that the multiplex bus is not shorted. If the voltage is less than 11.0 volts, charge the battery before further trouble shooting.

Then, check the 12 volt power feeding the switch panels. This voltage is fed from the 5 Amp fuse on the Multiplex Control Master.

Check the addressing of the modules to be sure they are set correctly.

Next check that the communications signal is reaching the output modules by observing the communications fault LED's on each module, including the Multiplex Master. If any or all of them are on, it indicates the communications bus is shorted or open. If the signal is not at the switch panel, the back lighting will blink ON and OFF. To localize the trouble, unplug the communications wires from the Master to see if it is putting out a good signal. The green communications light should light. If not check for 12 volts and ground to the module. If the green LED is still out, replace the module.

If everything is OK, begin plugging the communications wires back into the system one at a time to determine which one causes the problem. Once the problem has been localized, it must be repaired.

Each output module also includes diagnostic LED's on each of the outputs. These LED's should go ON and OFF when a switch button for that channel is pressed. If they don't, check the fuse associated with that output channel. If the fuse is open, replace it. If the LED is going ON and OFF, but the associated load is not, check the load and the wiring going to the load.

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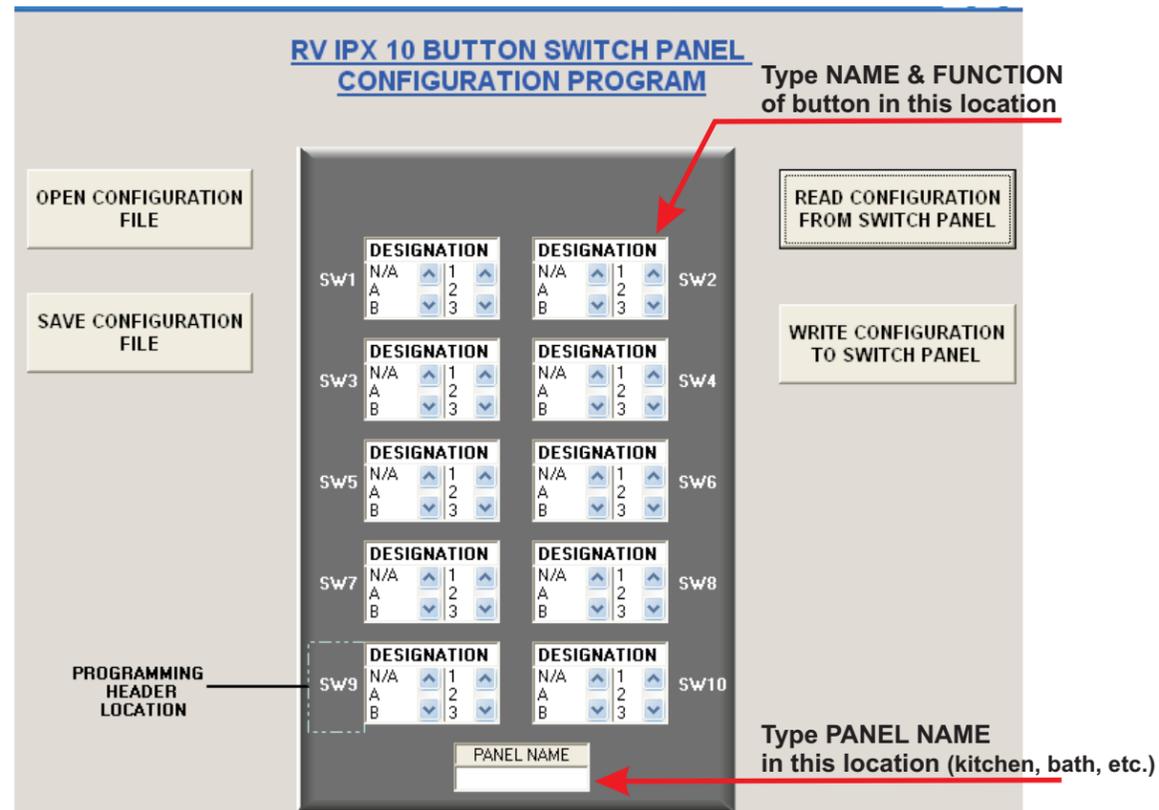
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### PROGRAMMING THE SWITCH PANELS

Each of the buttons on the switch panels is programmable, to put out a signal on any of the 160 channels of the system. This programming is done using a Windows™ based GUI program that can be down-loaded from the [www.intellitec.com](http://www.intellitec.com).

The figure below shows the screen for the ten button switch panel program:



In addition to the program, you will need a Universal Programming adapter (Intellitec P/N 10-00936-120), to make connection to the switch panel. The plug from this kit plugs into the front plug on the lower left of the switch panel. Then you are ready to program the switch panel.

Once you've decided what you want each switch to do, you can program the panel. This is easily done by simply using your computer mouse to drag and select the channel designation for each switch on the panel. (**NOTE** the PROGRAMMING HEADER LOCATION to be sure you get the panel in the proper orientation.) Once this is done, you should type the Panel name in the box provided to identify this file. Then, click on "WRITE CONFIGURATION TO SWITCH PANEL". The "write to" the panel will only take a couple of seconds. If you want another panel programmed with the same button assignments, unplug the first panel and plug in the next. Click on "WRITE CONFIGURATION FILE TO SWITCH PANEL". This can be repeated as often as necessary.

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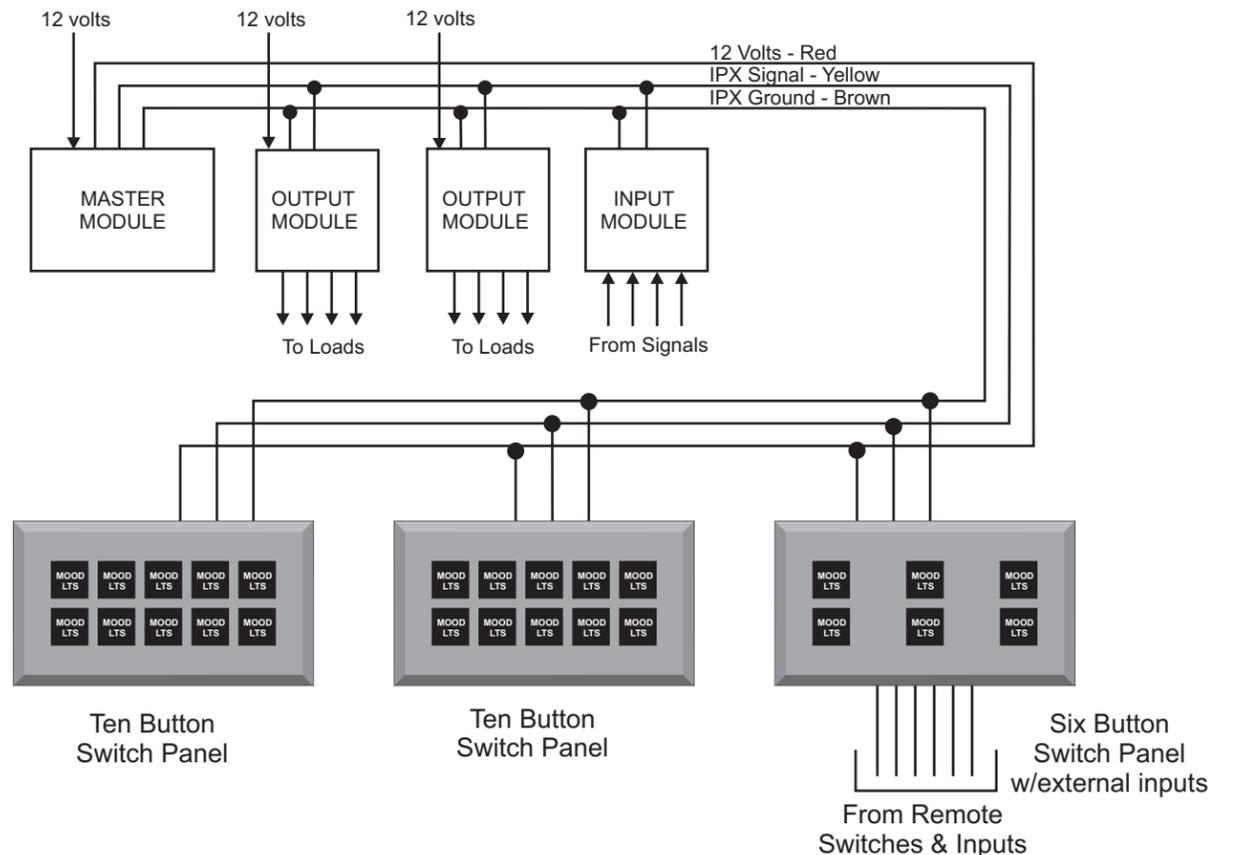
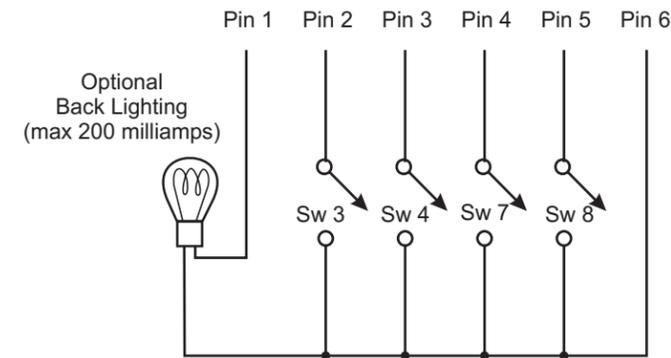
To program the functions of the switches, is programmed in the same way as a standard switch panel, with there assignments being done as Switches 3, 4, 7, & 8.

### CONNECTING THE MODULES

Once the modules have been selected, the next step is connecting them together. This is a relatively easy procedure. Each module in the system must be connected to the multiplex bus in either a star or daisy-chain configuration. The order of connection is not important. Some designers prefer to put all of the output modules in a single location to make future trouble shooting easier, while others find by distributing the modules, considerable wiring can be saved.

In either case, the thing that is important is to be sure all the modules get connected properly. For wire runs in excess of 50 feet, we suggest using at least a #16 gauge wire for the ground and for runs in excess of 100 feet, we suggest using at least a #14 gauge wire for ground. The other two wires can be as small as #18 gauge.

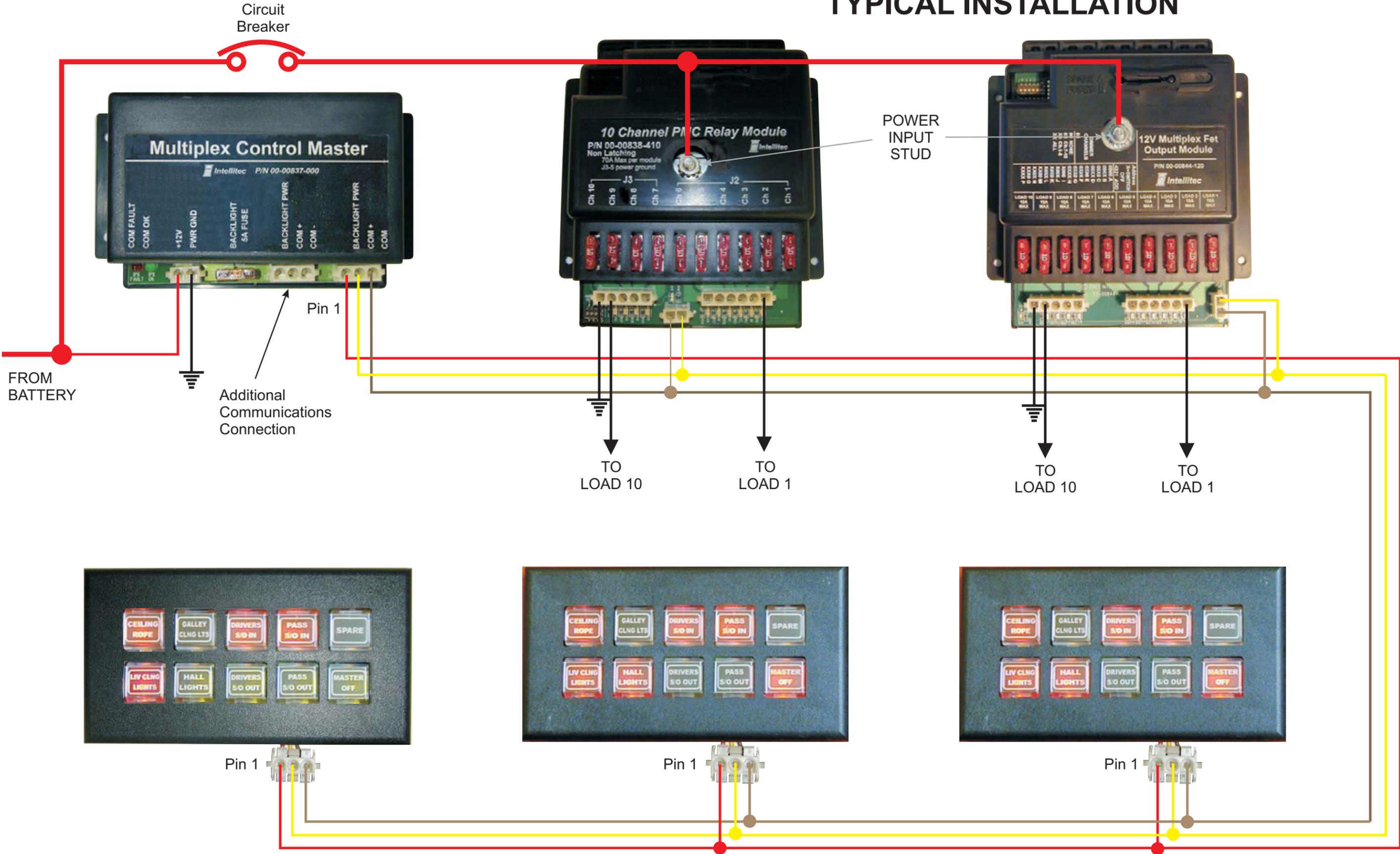
### TYPICAL REMOTE SWITCH WIRING



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# TYPICAL INSTALLATION



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Over the years of running a mobile RV repair service, having a dedicated place to access service manuals for all the different appliances and components found on RVs was something that I always had a desire to create.

I hope this resource makes your RV repairs easier, as it has mine, but please be careful and follow proper safety practices when attempting to repair your own RV.

If in doubt, please consult with a professional RV technician!



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