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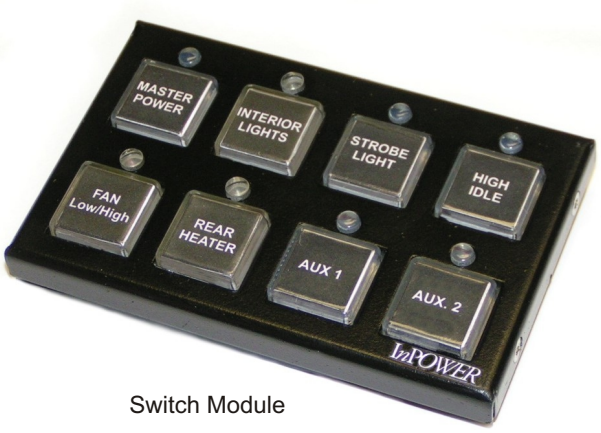
VCM Systems

Vehicle Control Module Systems

HARDWARE MANUAL

Remote Power Module



Switch Module

1. *VCM Systems Concept*

This document provides an overview of InPower's *VCM Systems* product family. This configurable control system is a natural extension of InPower's Vehicle Control Module (VCM) products. The VCM products are a family of individual modules used by vehicle control systems designers to solve specific application tasks (time delays, latching functions, alternating lamp flashers, low voltage disconnects, etc.). The *VCM Systems* (VCM-S) product family is a *system* configuration that allows multiple modules to work together via a logic cable communications link. This natural progression allows system designers more flexibility to implement larger control configurations at a low cost. A high value solution is therefore achieved by:

- High flexibility and functionality
- Ease of installation
- InPower's traditional high product quality
- System simplicity
- Low cost

This hardware manual will introduce the system concept, define and explain the individual system modules and accessories, and explain the system operation.

2. *System Configurations and Operation*

A simple VCM-S system configuration is shown in Figure 1. The system consists of a Switch Module (SM) connected to a Power Module (PM) via a 4-wire communications logic cable. The SM contains six pushbuttons (other configurations are available), and the application program memory. The PM contains six 12 volt output power switches for operating customer devices such as dome lights, strobe lights, high idle engine throttles, etc. The PM also contains four digital inputs that can be activated by remote devices such as ignition switch power, limit switches, relay contacts, etc. In this example, the modules are programmed to operate as follows. Pressing SM pushbutton switch #1 will cause PM output #1 to activate. SM pushbutton #2 will cause PM output #2 to activate, and so on. The SM monitors the pushbutton switches, and when one is activated it sends a signal to the PM to activate the appropriate output. Upon acting on a SM request the PM sends a signal back to the SM to activate that pushbutton's status LED.

Each SM pushbutton can be set up to be either momentary, latching, or 3-step (Off-On1-On2). In the momentary configuration the PM output will be activated only for the duration that the pushbutton is activated, and the pushbutton's status LED will be on for the same duration. In the latching configuration, pressing a pushbutton once will cause the PM output to activate (and the status LED) and stay on. When the pushbutton is pressed the second time the PM output (and the status LED) will go off. The 3-step function uses two PM outputs. Pressing the pushbutton the first time sets the first PM output. Pressing the pushbutton the second time turns off the first output and sets the second output. Pressing the pushbutton the third time turns off the second output.

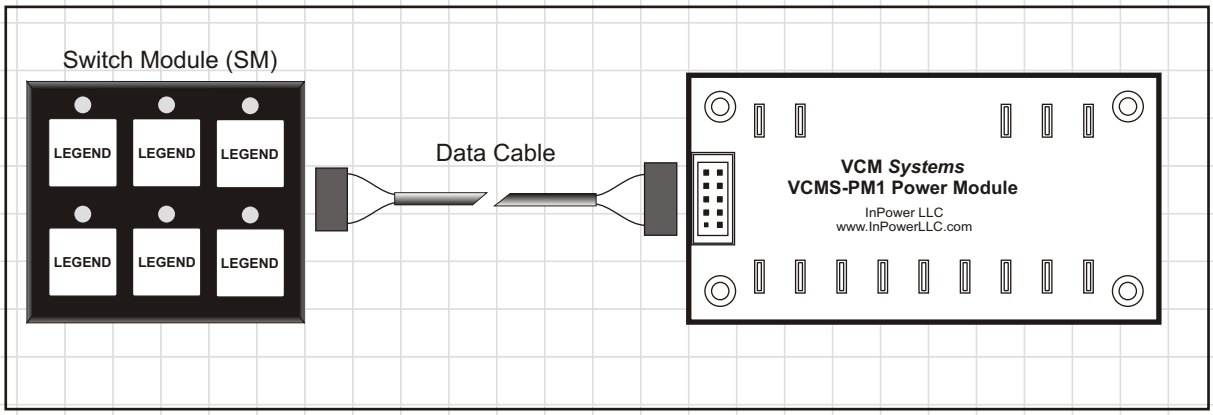


Figure 1

2. *System Configurations and Operation*

The system can be expanded by using a switch module with more pushbutton switches and adding power modules. The configuration shown in Figure 2 contains an eight position switch module and two power modules. The communications logic cable contains three connectors, one for each module. The system is programmed to have the first six switch module positions operate the six outputs on power module #1 and the 7th & 8th switch positions operate the first two outputs on power module #2. The operation is essentially the same as the system shown on Figure 1, but expanded. With this expandable system architecture a wide variety of configurations are available to meet customers' needs.

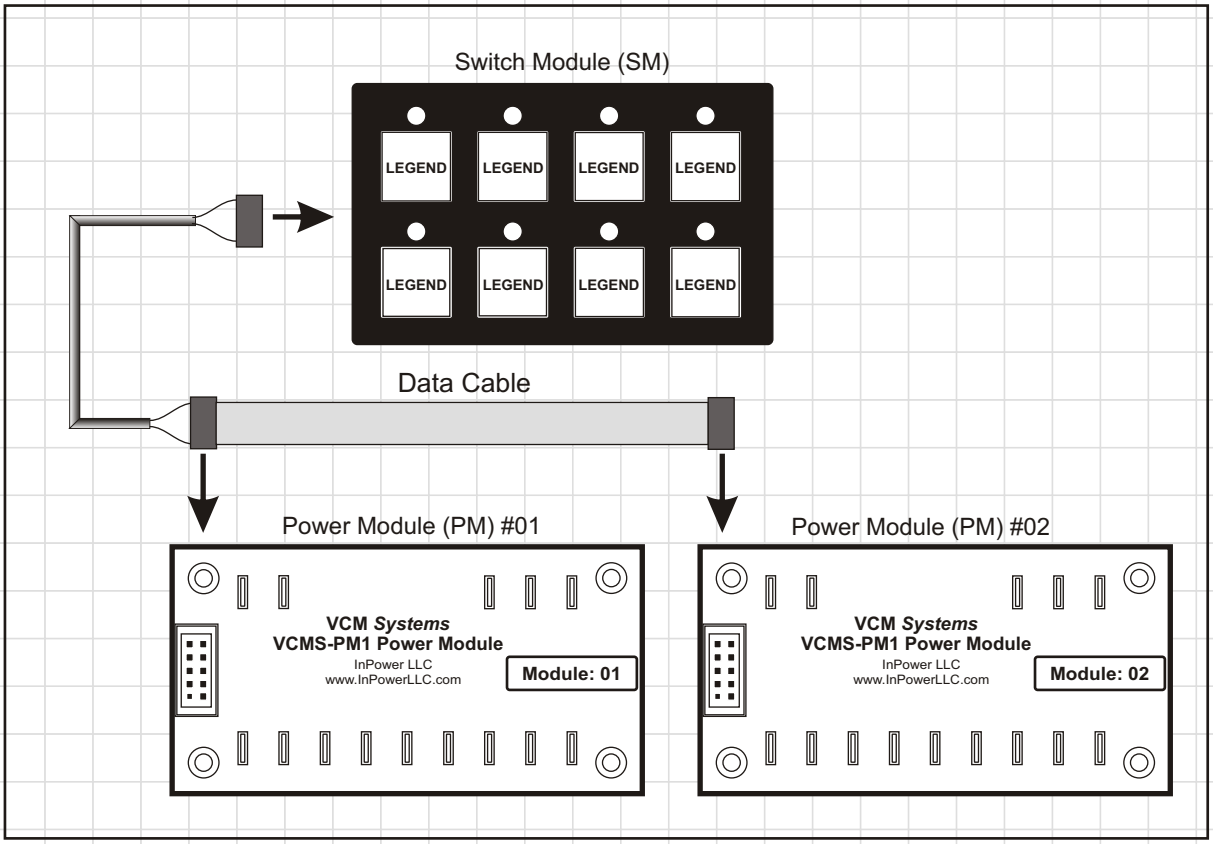


Figure 2

3. *VCM System Modules*

3.1 Switch Modules

3.1.1 General Description

Switch modules are available in configurations of six, eight, ten and 12 switch positions. Custom configurations are also available. The switch positions are identified as Sw1, Sw2, Sw3, etc. Each switch position contains a pushbutton switch and a status LED indicator directly above the switch as shown in Figure 3. The switches contain custom legends that are backlit for night viewing.

The layout of the standard switch modules is shown in Figure 4. Dimensional details are shown in the Appendixes.

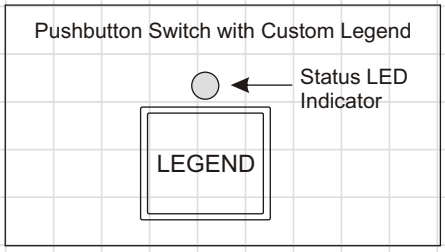


Figure 3

3.1. General Description (Continued)

Each switch module position can be set up to be momentary, latching, or 3-step (Off-On1-On2). The switches are continuously monitored by the switch module's controller. When a switch is depressed the controller sends the status of that switch to the power module via the communications logic cable. The power module then carries out the task of activating the appropriate output, then sends an acknowledgment back to the switch module. Thus, the LED becomes a fault detection for the switch activation signal. This scheme provides a feedback that the switch activation function was carried out. If the switch was programmed as a momentary function the power module output and the status LED will remain activated for the duration that the switch is activated. If the switch was programmed as a latching function, pressing the switch the first time sets the power module output and status LED. Pressing the switch the second time turns off the power module output and status LED. If the switch was programmed as a 3-step function, pressing the switch the first time sets the first power module output. Pressing the switch the second time turns of the first output and turns on the second output. Pressing the switch the third time turns of the second output.

3.1.2 Switch Legend

InPower has developed a library of standard switch legends that is intended to fit most customers' applications. If a standard InPower switch legend cannot be found a custom legend can be manufactured. Contact InPower for details.

3.2 Power Module - Model: VCM-S-PM1

3.2.1 General Description

The Model VCMS-PM1 Power Module contains six 12 volt power outputs, four digital inputs and a communications interface. The outputs are set from incoming signals on the communications interface,

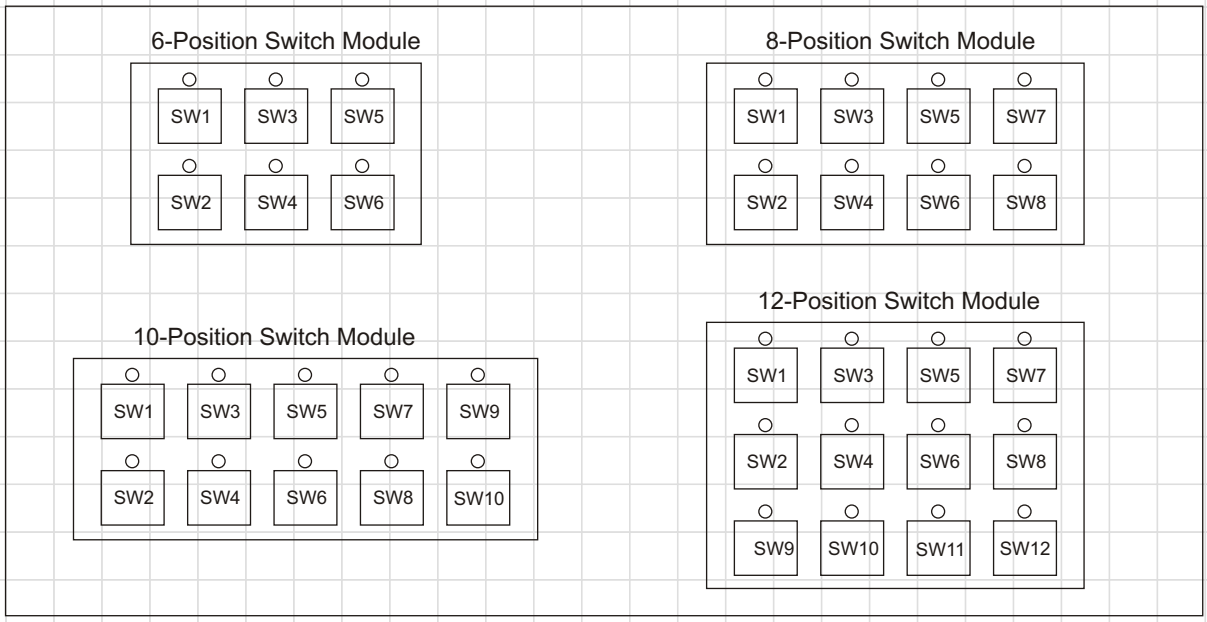


Figure 4

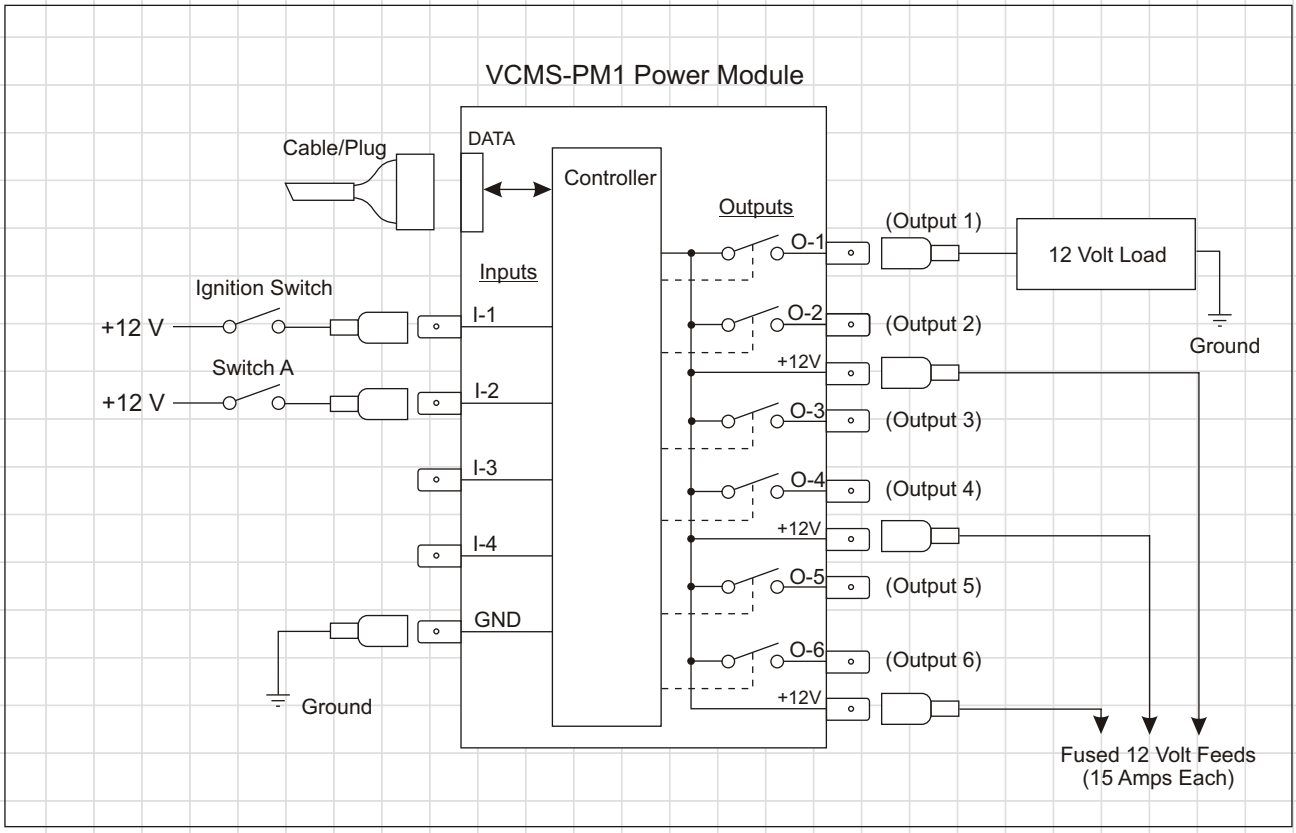


Figure 5

3.2.2 Digital Inputs

Four digital Inputs digital inputs are provided in the power module. Inputs I-1 and I-2 include a pull down resistor to ground, and are activated by a contact closure to +12 volts (Figure 6). Input I-1 is typically used to monitor the ignition switch, so input I-1 is activated when the ignition switch is on. Inputs I-3 and I-4 can be programmed to pull down to ground or pull up to +12 volts (Figure 7). This way the program can determine if the input requires a contact closure to ground or to +12 volts to activate the input.

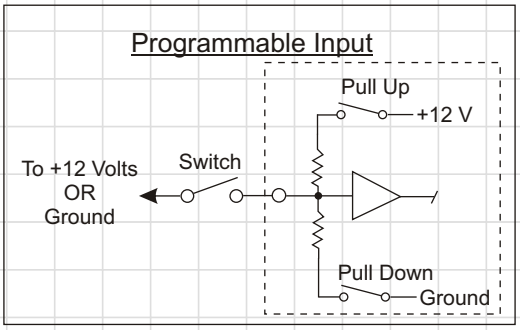


Figure 7

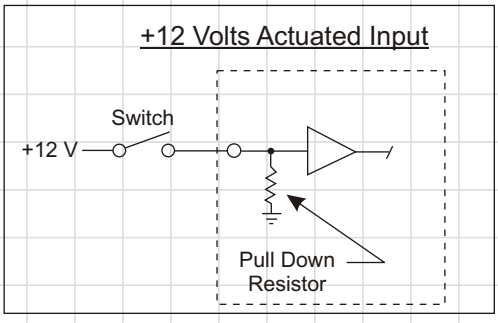
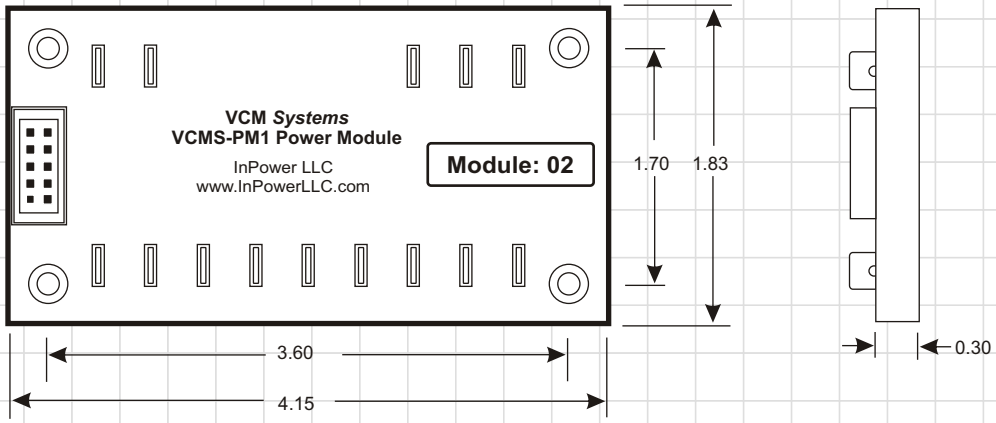


Figure 6

3.2.3 Communications Interface

The power module contains a communications interface with a 10-pin ribbon cable connector. The power module is connected to other VCM system modules such as a switch module and other power modules via this data interface cable system. As VCM Systems may contain more than one power module a method of distinguishing power modules is required. Therefore power modules will be supplied with a module number assignment (Module: 01, Module: 02, etc.).

3.2.4 Mechanical



5. Configuring System Hardware

This manual contains worksheets to aid in configuring the VCM-S hardware. These can be found in the Appendix.

Step 1 - Identify the 12 volt devices you want the system to operate. Create a list of the output functions, along with the amp draw of each load. It is recommended to list the vehicle wire numbers of each load. Use the power module worksheet in Appendix B.

Step 2 - Identify the switches required on the Switch Module. List the switch functions, identification legends, and switch type (momentary, latching or 3-step). Use the Switch Module Design Worksheet in Appendix A.

Step 3 - Identify the 12 volt system inputs that will be needed by the control system to perform the necessary logic functions.

Step 4 - Complete the VCM-S System Input/Output Diagram in Appendix C from the information collected in Steps 1, 2 and 3. This is a very important document as it will greatly assist in creating the system application program.

You have now completed the necessary steps to configure and order the project's VCM-S hardware. The next phase of the system design is to determine the functional logic and write the application program.

4. System Programming

4.1 Overview

Functional operation of the VCM-System is controlled by the application program. This software program resides in the switch module and controls the logic and operation of the entire system. The VCM-S Development System is used to create and modify the Application programs. It is also used to transfer the application program into switch module via the switch module's data connector. If logic changes are required after system testing these edits are performed on the development system. The edited application program is saved and then loaded into the system hardware for further testing to verify the logic changes. Note that the power modules are preprogrammed, and are identical except for the power module ID number (Module 01, Module 02, etc.). For ordering purposes these power modules carry different part numbers. However, the ID numbers can be changed by the VCM-S Development System.

4.2 Getting Started

The first step is to have an accurate VCM-S System Input/output Diagram (see Appendix C). This is a key reference document for creating the application program as well as for system troubleshooting. Next, determine the exact logic function associated with each system output. This will include identifying

system inputs associated with that system output as well as any Switch Module push button used. Now write a concise logic statement describing how the system output will be controlled. This logic statement is an important link to the task of writing the application program code so be sure to accurately describe it. We recommend creating a table of this information as shown in the example in Table 1. Note that this example shows the program code.

4.3 VCM-S Development System Hardware

The VCM-S Development System consists of three components:

VCM-S-PC Programming Computer
VCM-S-PP Programming Pod
VCM-S-APS Application Development Software

The application development software resides in a USB flash drive and is used to transfer the software into the computer. It is also used by InPower to provide software updates to customers.

The programming pod is a small module with a USB cable and a ribbon cable. The programming pod is used to transfer the application program into the VCM-S hardware from the computer. The USB cable connects to the computer and the ribbon cable connects to the VCM-S Switch Module. (The application program resides in the Switch Module.)

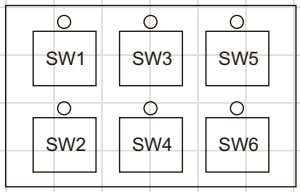
Table 1

Output:	O-1	O-2	O-2
Module #;	1	1	2
Name:	Interior Lights	Front Destination Sign	Floor heater
Logic:	Turn on interior lights when Ignition Switch input I-2 (M1) is on AND when either the Interior Light Switch (S1) is activated OR when the Door Open input I-3 (M1) Is on.	Turn on Front Destination Sign anytime Ignition Switch input I-2 (M1) is on.	Turn on Floor Heater when Floor Heater Switch (S4) is activated AND Ignition Switch input I-2 (M1) is on.
Code:	If_S1 On1 Or_I3 Mod 1 And_I1 Mod 1 Then_O1 Mod 1	If_I2 Mod 1 Then_O2 Mod 1	If_S4 On1 And_I2 Mod 1 Then_O2 Mod 2

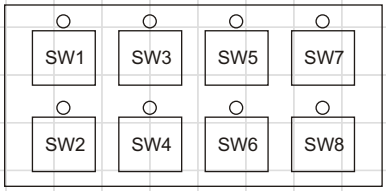
APPENDIX A

Switch Module Design Worksheet

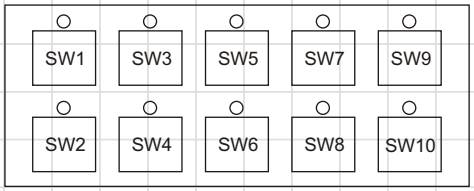
☐ 6-Position Switch Module



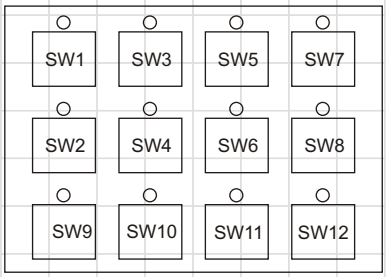
☐ 8-Position Switch Module



☐ 10-Position Switch Module



☐ 12-Position Switch Module



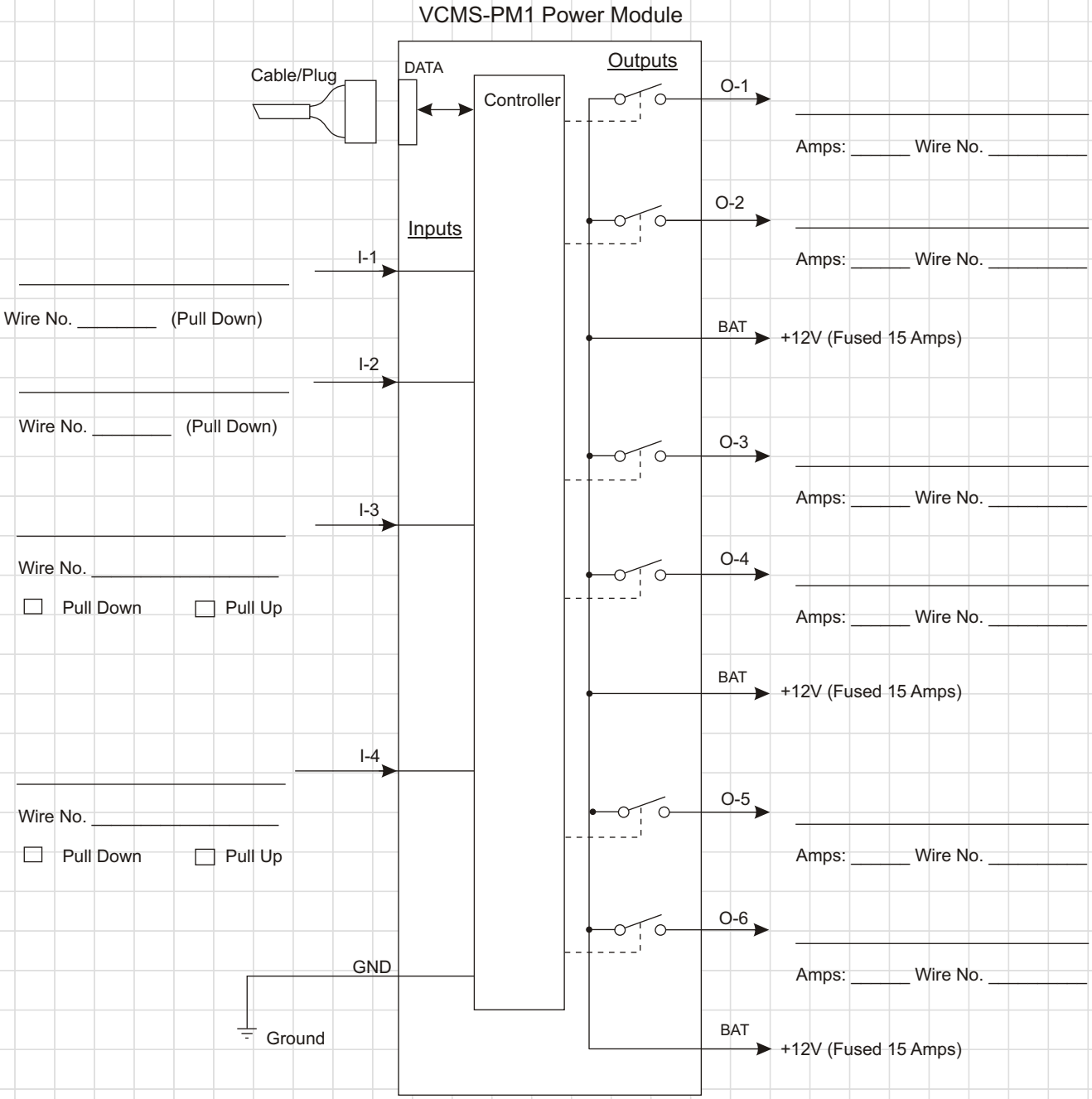
Switch Position	Legend	Function
SW1		
SW2		
SW3		
Sw4		
SW5		
SW6		
SW7		
SW8		
SW9		
SW10		
SW11		
SW12		

APPENDIX B

VCMS-PM1 Power Module Application Worksheet

Project: _____ Module ID: _____

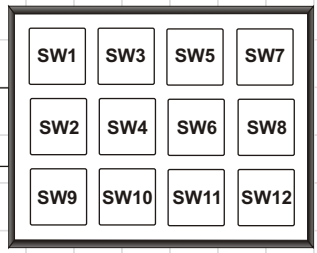
Date: _____



APPENDIX C

VCM-S System Input/Output Diagram

Switch Module (SM)

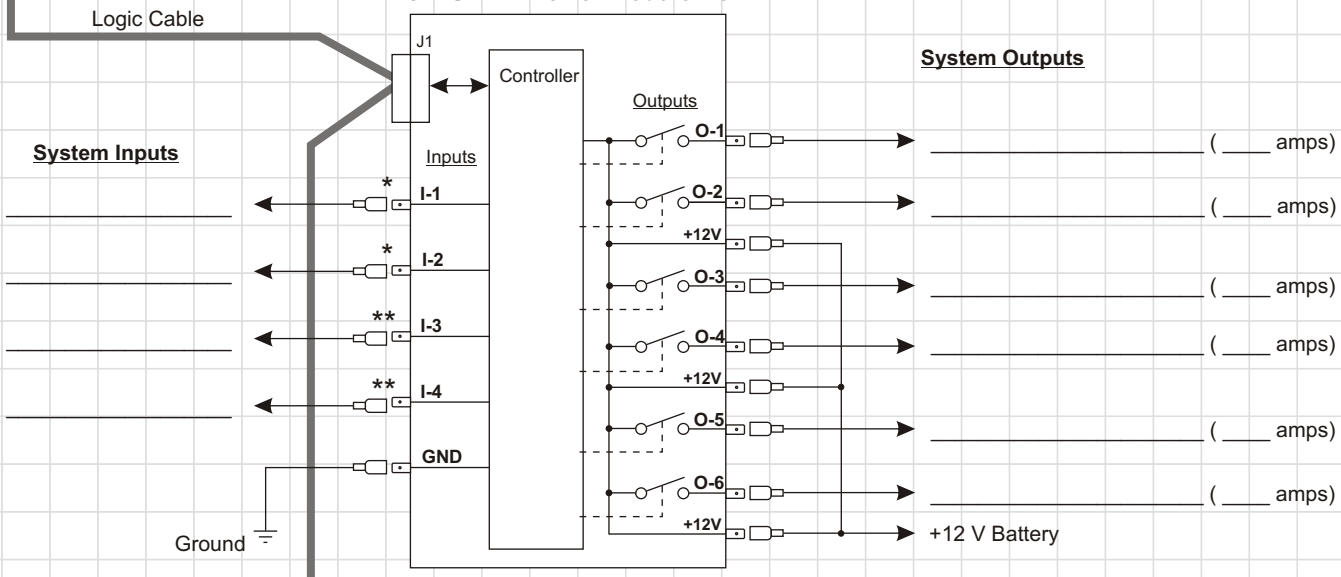


SM Configurations: 6, 8, 10 & 12

Switch Functions/Legends

SW1	SW3	SW5	SW7
SW2	SW4	SW6	SW8
SW9	SW10	SW11	SW12

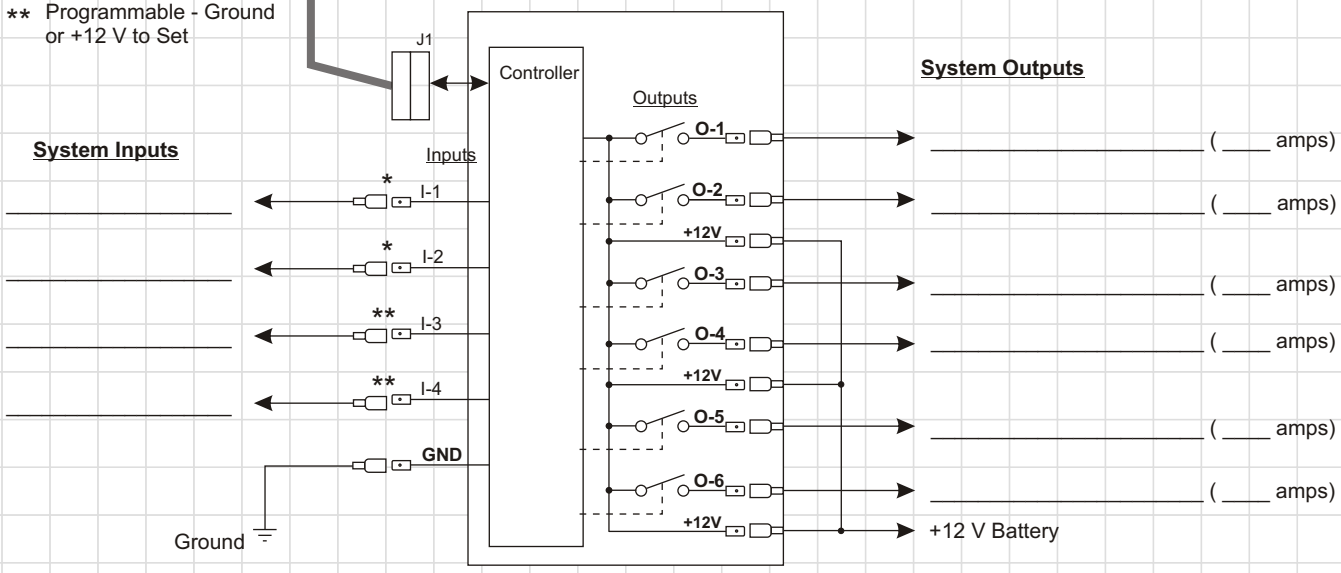
VCM-S-PM1 Power Module No. 1



* +12 V to Set

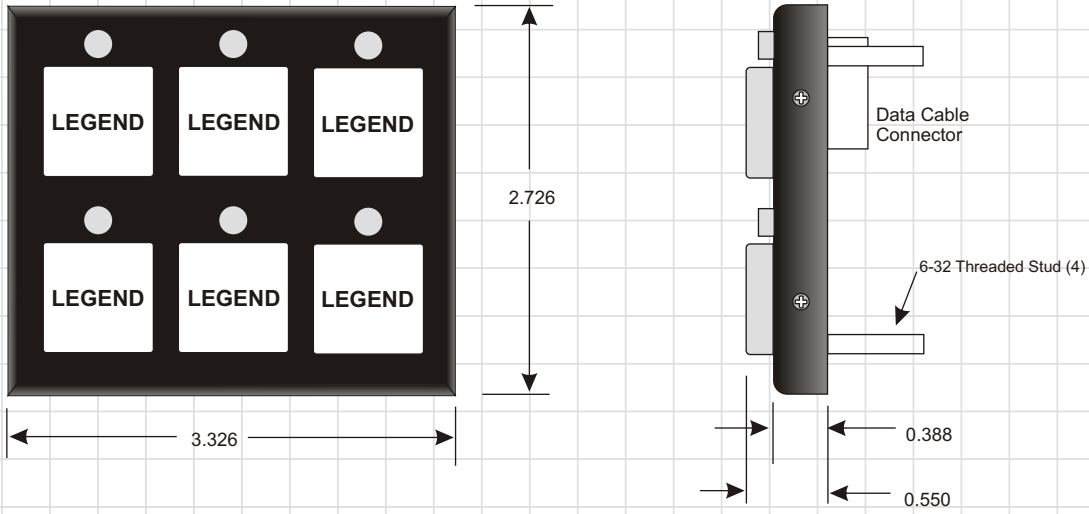
** Programmable - Ground or +12 V to Set

VCM-S-PM1 Power Module No. 2



APPENDIX D

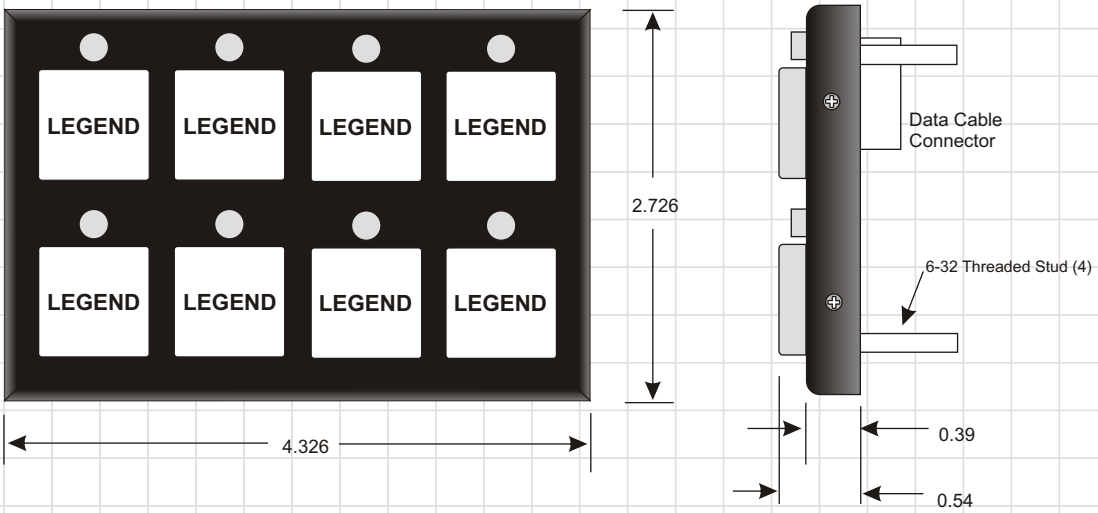
6-Position Switch Module



Notes:
1. All dimensions in inches. Not to scale.
2. Contact InPower for detailed switch panel drawing.

APPENDIX E

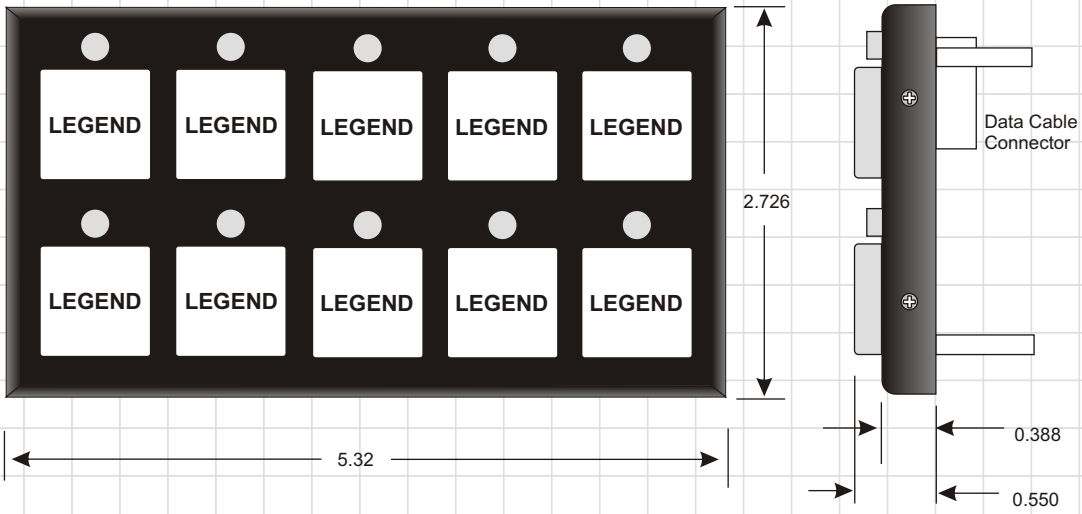
8-Position Switch Module



Notes:
1. All dimensions in inches. Not to scale.
2. Contact InPower for detailed switch panel drawing.

APPENDIX F

10-Position Switch Module



Notes:
1. All dimensions in inches. Not to scale.
2. Contact InPower for detailed switch panel drawing.