

Automotive Applications

Products:

L12-SS-GG-VV-C

PQ12-GG-VV-C

This note is supplied to provide further information about the use of Firgelli Actuators in an automotive environment. Firgelli Actuators can be used in a variety of automation related automotive projects; however there are a number of areas where special attention is required to get the most out of your actuator. The most basic wiring instructions are outlined to provide a starting point for many projects. This note is general and covers the range of Firgelli Micro Linear Motion Devices, not all circuit examples will be applicable to every model.



A few things to Note:

- An inline fuse should be added to help protect your vehicle in the event of a short circuit. A good value is 0.25A or 0.5A. This varies with the actuator used and the type of fuse. A good value to start at is the stall current given on the datasheet.
- If you plan to use a rocker switch, put the fuse before the switch and not between the switch and the actuator. This will then protect from shorts in the switch as well as the actuator.
- Older vehicles do not regulate the 12V system very well. The voltage can range from 12V-13.5V as the battery discharges. Fluctuations can also be caused when the alternator or Battery charger is charging the battery.
- To help protect your actuator from over-voltage, a linear regulator is recommended to be fitted between the switch and the actuator. However this is not always necessary.



Firgelli Technologies Inc.

4585 Seawood Tce.
Victoria, BC V8N 3W1
Canada

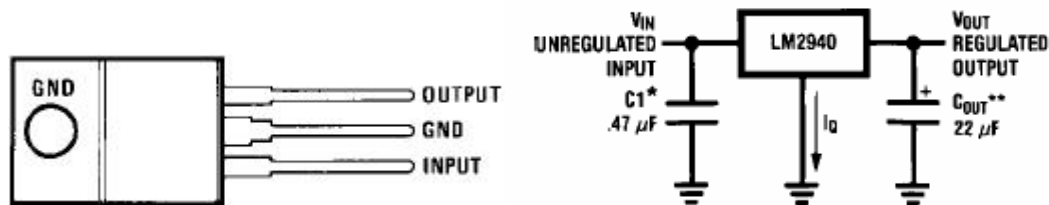
1 (206) 347-9684 phone
1 (888) 225-9198 toll-free
1 (206) 347-9684 fax

sales@firgelli.com
www.firgelli.com

- The Linear regulator is also recommended for L12 -I and -R type actuators when used in the automotive environment since voltage fluctuations here will change the actuator's position.

The Linear Regulator:

Some older vehicles do not provide a stable 12V from the battery. The alternator can introduce noise and voltages above 13.5V. To ensure your new actuator is not damaged a Linear regulator can be added to ensure a steady 12V is supplied to the actuator. The LM2940CT 12 Volt 1 Amp Low Dropout Regulator is a good choice for Firgelli's micro actuators.



Two capacitors are recommended by the LM2940CT datasheet but may not be necessary. The Input (Pin 1) of the LM2940CT goes to your vehicles 12V and Output (Pin 3) goes to your actuator. Ground (Pin 2) is connected to your actuator's ground and to your vehicle ground.

Powering Firgelli Actuators with a 12V battery:

As in the automotive case there are some conditions that can cause damage to your actuator. Some battery chargers apply higher voltages during charging to try to recondition the battery and extend its life. This can be good for the battery but can cause actuator failure. Any voltage over 20V for any period of time can cause damage to the actuator. The LM2940CT can take up to 26V continuously and 45V for less than 1ms. You can roughly check your system using a multimeter, however if you have access to an oscilloscope this will give you a definitive answer. The rating plate on you charger may also give you this information.

Potentiometer Control of L12 I:

A simple circuit to control the position of the L12 I actuator is shown below. This is by no means the best circuit but it is a simple way to get started.

The main thing you need is a stable 5VDC supply for the potentiometer to divide. If it is noisy or changes with battery voltage then the actuator may move when you don't want it to. You may also want to refer to the data sheet for the LM7805 Linear regulator to see if any additional components are required. Sometimes two capacitors are recommended but often this will work satisfactorily without.



Firgelli Technologies Inc.

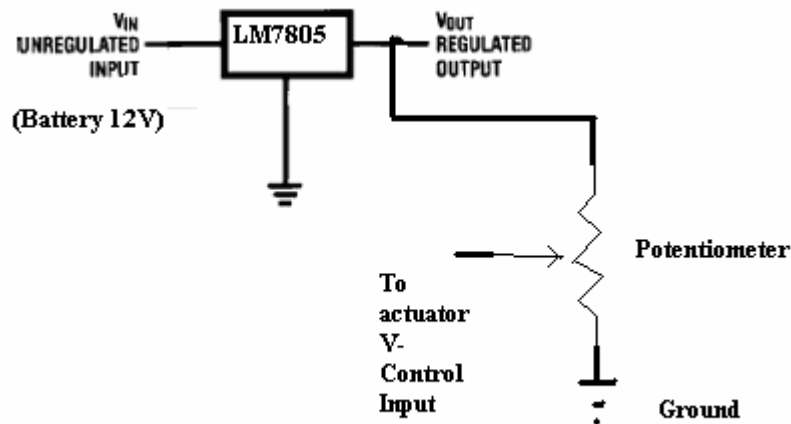
4585 Seawood Tce.
Victoria, BC V8N 3W1
Canada

1 (206) 347-9684 phone
1 (888) 225-9198 toll-free
1 (206) 347-9684 fax

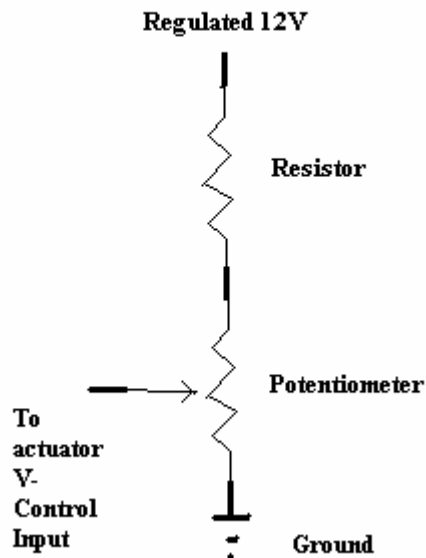
sales@firgelli.com
www.firgelli.com

For the actuator connections:

- The potentiometer wiper connection (Usually the middle of the 3 pins) connects to the V-Control input (Pin 2-Blue).
- The 12V battery positive connects to pin 5-Red.
- The 12V battery ground connects to pin 6-Black.



The alternative is to use only the 12V Regulator described in the previous section. However, you will then need to add an extra resistor to make sure the potentiometer does not output more than 5V to the actuator. Input voltages over 5.5V can damage the actuator. If you have a 10kohm potentiometer you will need a 14kohm resistor.



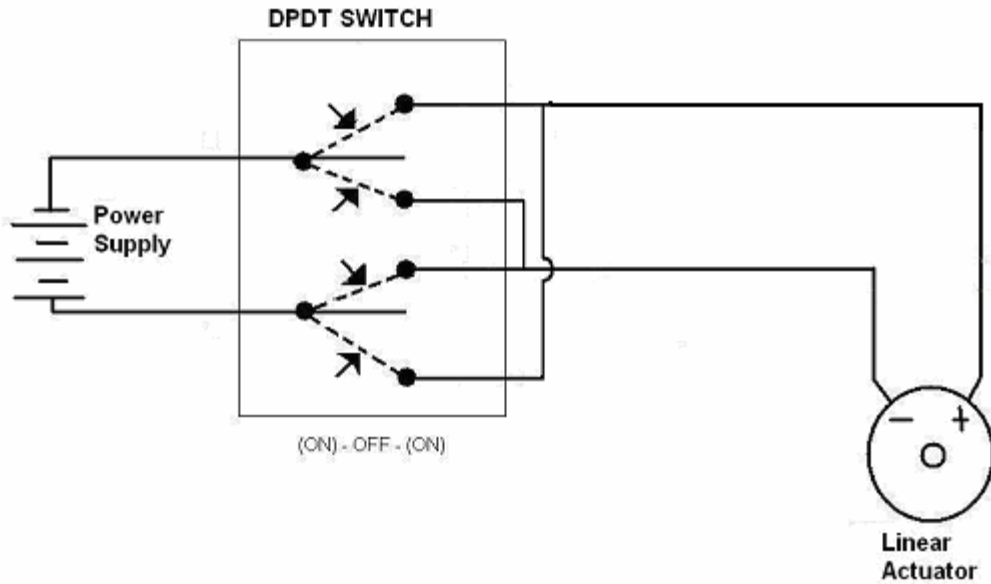
If you have a different potentiometer value, plug that into R2. Vin should be 12V, and Vout should be 5V.

$$R_1 = \frac{R_2 \cdot V_{in}}{V_{out}} - R_2$$

If you don't care about the actuator moving a little bit as the voltage changes you can use unregulated 12V, but make sure you choose a worst case 13.5V for Vin when calculating the required resistor. Check this with a voltmeter before connecting the actuator to make sure you chose the right value.

Rocker Switch Control of L12 - S:

Linear Actuator Schematic:
for PQ12, L12-B, -P and -S



Firgelli Technologies Inc.

This works best with the actuators that have built in limit switches, however you can add external limit switches if desired. This will also work with -B and -P versions, but the actuator will not stop by itself when it reaches an end stop.



The double pole, double through switch allows you to change direction.



Firgelli Technologies Inc.

4585 Seawood Tce.
Victoria, BC V8N 3W1
Canada

1 (206) 347-9684 phone
1 (888) 225-9198 toll-free
1 (206) 347-9684 fax

sales@firgelli.com
www.firgelli.com

Microcontroller Control:

Your options are to design your own H-Bridge and Control Circuit, use Firgelli's actuators with integrated controller model, or the –P model with a CIB controller. To Control the –I or CIB with a microcontroller, all that is required is a 6V or 12V supply for the actuator and a free digital pin on the microcontroller. Make sure the microcontroller's ground and the actuator's ground are connected together, otherwise performance will be erratic. Connect the digital pin to the actuator or CIB's V or RC input. Then program your microcontroller to output a PWM signal or 1-2ms RC signals respectively.

For more project ideas and build instructions visit www.firgelliforum.com .

Related Documents:

- Extending actuator life

Technical assistance and design support services — Disclaimer of Warranties; Release of Claims

Firgelli offers technical assistance and design support services as a convenience to Firgelli customers. Firgelli personnel strive to provide useful information regarding Firgelli products. Firgelli does not guarantee that any information or recommendation provided is accurate, complete, or correct, and firgelli shall have no responsibility or liability whatsoever in connection with any information or recommendation provided, or the customer's reliance on such information or recommendation. The customer is solely responsible for analyzing and determining the appropriateness of any information or recommendation provided by firgelli personnel, and any reliance on such information or recommendation is at the customer's sole risk and discretion. Accordingly, the customer shall release and hold firgelli harmless from and against any and all loss, liability, and damage incurred by the customer or any third party as a result of any information or recommendation provided to the customer or the customer's reliance on such information or recommendation.



Firgelli Technologies Inc.

4585 Seawood Tce.
Victoria, BC V8N 3W1
Canada

1 (206) 347-9684 phone
1 (888) 225-9198 toll-free
1 (206) 347-9684 fax

sales@firgelli.com
www.firgelli.com