

DC MOTOR CIRCUIT WITH LIMIT SWITCHES

What Is Desired To Be Achieved

1. A dc motor needs to be driven forward or backward.
2. Should it reach a predetermined position it should be prevented from going any further. A mechanical stop could be applied either by slipping clutch or a disconnection of drive. However this circuit shows a very common simple way of doing this electrically.

Benefits Of This Circuit

1. Power is removed from motor when it triggers a defined limit.
2. This stops damage to the motor and/or mechanism around it.
3. This arrangement saves power and wear-n-tear compared with leaving the motor slipping on a clutch or mechanical disconnection of the drive.
4. Reset of the circuit is immediate upon reversal of the input current.

What Is Shown Here

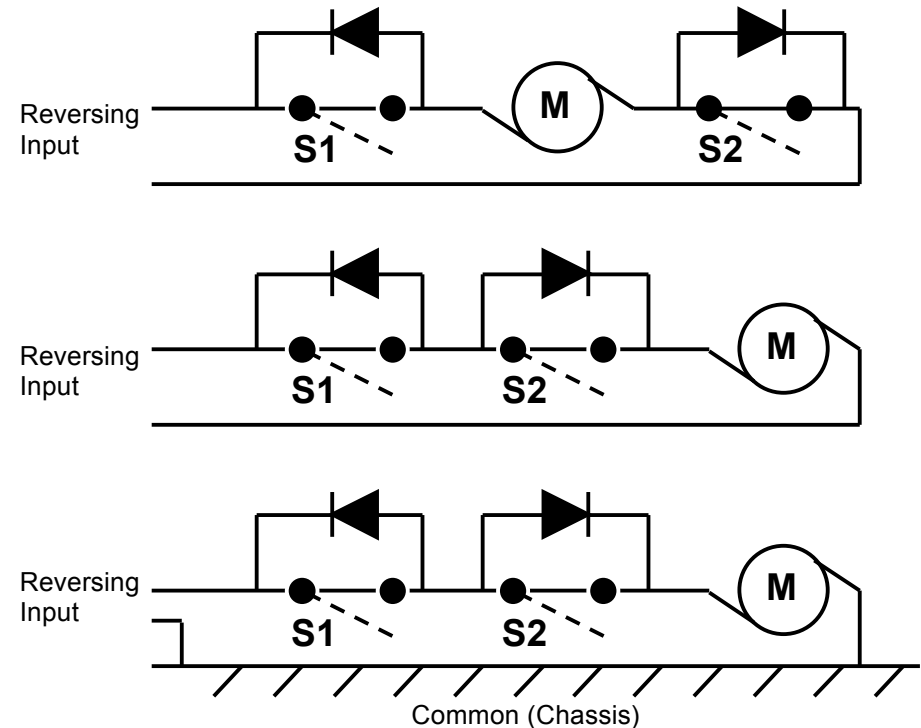
- 1 The three circuits shown to the right are equivalent. That is the switches and motor are all wired in series.
- 2 The two switches are normally closed. That is the motor is free to be driven in either direction by the input.
- 3 In normal operation the diodes are short circuited by the switches and play no part in the circuit.
- 4 Each diode must be able to carry the full load current of the motor at start up.

What Is Not Shown Here

This explanation assumes that the motor is free to turn in either direction. However if it continuously turns in one direction a mechanical arrangement will eventually cause one of the two switches to be opened. Likewise if it turns in the other direction continuously the other switch will be opened.

How This Circuit Works

1. As stated above in the middle of the normal range of use of the motor it follows the current offered to it from the input.
2. However, also as stated above, if the motor goes beyond its normal range a mechanical arrangement will cause one of the two switches to be opened.
3. When this occurs the motor must stop. If the switch were there on its own, without any diodes present, this would be the case. However once this has occurred it is permanent until something is done to return the motor back to its "normal" unlimited operating range.
4. If a diode is put across the switch, with its polarity chosen correctly, then in normal operation the diode plays no part in the limiting action. However when limit does occur merely reversing the current will allow current to flow through the diode and cause the motor to turn in the opposite direction and the mechanical arrangement (not shown here) will allow the switch to close again. The operation is back to stage one.
5. This is what is desired at one end of travel. Conversely a similar arrangement is made at the other end of normal travel with a diode the other way around. Thus the motor will be stopped correctly and again be able to only travel back towards the normal range of travel.



Common Chassis Wiring – Take Care

The third circuit above is very attractive because connecting one side of the motor to the chassis means that only a single wire need be looped through the switches and on to the motor. However care should be exercised when multiple motors are used which all connect to the common chassis. This is perfectly feasible as long as the reversing input is actually based upon a split supply eg +9v and -9V about a common centre (normally 0v) which is connected to the chassis.