


# AC Motor Speed Controller

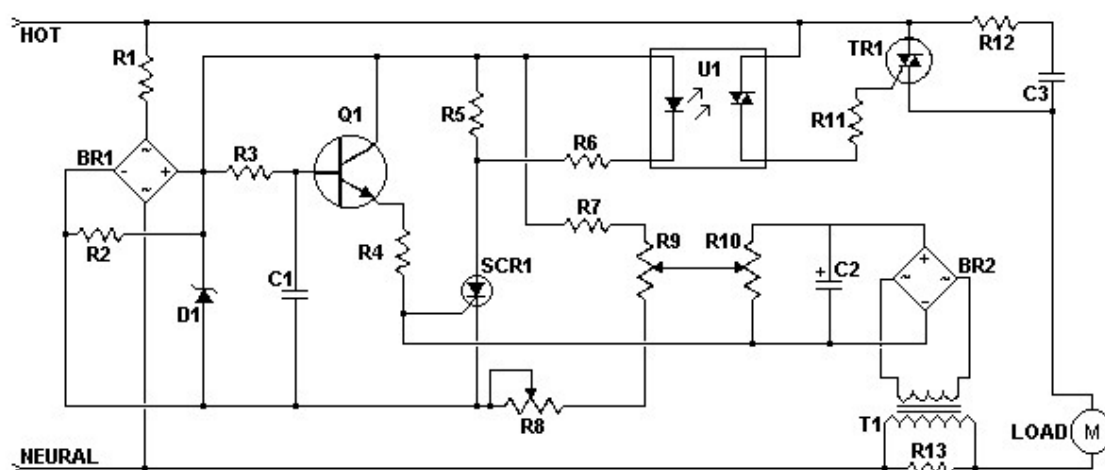
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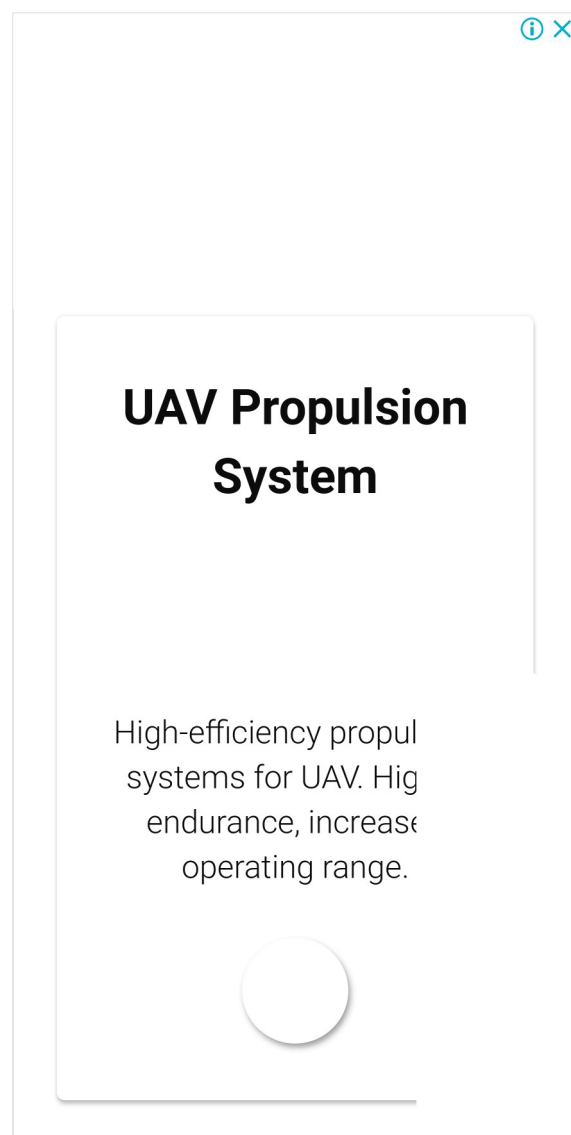
This AC motor speed controller can handle most universal type (brushed) AC motors and other loads up to about 250W. It works in much the same way as a light dimmer circuit; by chopping part of the AC waveform off to effectively control voltage. Because of this functionality, the circuit will work for a wide variety of loads including incandescent light bulbs, heating elements, brushed AC motors and some transformers. The circuit tries to maintain a constant motor speed regardless of load so it is also ideal for power tools. Note that the circuit can only control brushed AC motors. Inductive motors require a variable frequency control.

## Schematic



## Parts

Part	Total Qty.	Description	Substitutions
R1	1	27K 1W Resistor	
R2	1	10K 1/4W Resistor	
R3	1	100K 1/4W Resistor	
R4	1	33K 1/4W Resistor	
R5	1	2.2K 1/4W Resistor	
R6	1	1K 1/4W Resistor	
R7	1	60K Ohm 1/4W Resistor	
R8	1	3K Linear Taper Trim Pot	
R9	1	5K Linear Taper Pot	
R10	1	4.7K Linear Taper Trim Pot	
R11	1	3.3K 1/4W Resistor	
R12	1	100 Ohm 1/4W Resistor	
R13	1	47 Ohm 1W Resistor (See Notes)	
C1, C3	2	0.1uF Ceramic Disc Capacitor	
C2	1	100uF 50V Electrolytic Capacitor	
D1	1	6V Zener Diode	
Q1	1	2N2222 NPN Transistor	2N3904
SCR1	1	ECG5400	
TR1	1	TRIAC (See Notes)	
U1	1	DIAC Opto-Isolator (See Notes)	
BR1, BR2	2	5A 50V Bridge Rectifier	
T1	1	Transformer (See Notes)	
MISC	1	PC Board, Case, Line Cord, Socket For U1, Heatsinks	



## Notes

1. TR1 must be chosen to match the requirements of the load. Most generic TRIACs with ratings to support your load will work fine in this circuit. If you find a TRIAC that works well, feel free to leave a comment.
2. U1 must be chosen to match the ratings of TR1. Most generic DIAC based opto-isolators will work fine. If you have success with a specific part, feel free to leave a comment.
3. T1 is any small transformer with a 1:10 turns ratio. The circuit is designed to run on 120V so a 120V to 12V transformer will work. Alternately, you can wind T1 on a transformer core using a primary of 25 turns, a secondary of 200 turns, and 26 gauge magnet wire.
4. R9 is used to adjust motor speed. R10 is a trim pot used to fine tune the governing action of the circuit. R8 fine tunes the feedback circuit to adjust for proper voltage at the gate of SCR1. It should be adjusted to just past the minimum point at which the circuit begins to operate.

5. R13 must be chosen to match the load. Generally, larger loads will require a smaller value.
6. Since this circuit is not isolated from mains, it must be built in an insulated case.

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## Comments

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**anonymous**

AC Motor Speed Controller

Friday, September 26, 2014  
10:20:34 PM

please im also interested in the above project. ac motor speed controller. can anyone provide notes on how the circuit works. thanx in advance

**Mohammed Ali**

AC Motor Speed Controller

Thursday, December 20,  
2012 7:58:28 AM

The project is very good and i like it but it lacks notes on how the circuit operates,can any one pliz sent me the circuit operation. Thank u in advance.

**Bakos Gy**

R13 AC Motor Speed Controller

Thursday, November 01,  
2012 7:12:29 PM

Is R13 not 0.47Ohm? I mean on full steam the written 250W motor consumes more than one amper, counting that through with this 1ampere  $U=I \cdot R=1 \cdot 47=47\text{Volt}$  ,  $P=U \cdot I=47 \cdot 1=47\text{Watt}$  ?????!!!

**ebony**

AC Motor Speed Controller

Saturday, May 19, 2012  
8:17:06 AM

The project is ok and i like it but it lacks notes on how the circuit operates,can u pliz sent me the circuit operation notes on my e-mail. Thank u in advance.

**anush**

AC Motor Speed Controller

Saturday, March 12, 2011  
9:51:30 PM

wonderful circuit. is it feasible to use this circuit for 220V?

**tomal**

AC Motor Speed Controller

Tuesday, March 01, 2011  
10:02:27 PM

I suppose number of turns for T1 transformer should be half for 220V. Pls correct me if I'm wrong. I trying to build for 220V...

**Selwyn**

AC Motor Speed Controller

Thursday, February 17,  
2011 6:03:42 AM

Someone asked a question re this project on converting circuit to 220v. Any suggestions on component values?

**sandeep**

AC Motor Speed Controller

Tuesday, January 04, 2011  
12:14:40 PM

dear sir,i have an ac induction motor drive and also have a input circuit (i use previously to operate a dc motor),but the problem is it not works on ac drive.can u suggest on it. i can provide technical detail and pictures of entire system. waiting for ur early reply.

**wind tech from Pine Ridge**

AC Motor Speed Controller

Saturday, July 31, 2010  
11:54:57 PM

About the diac used in the speed controller( to the person looking for a match to the triac) Diacs are not much different depending on the part # they only severe to allow the triac to trigger symetrically in both polarities of gate signal. They will not pass current until the gate trigger signal rises above the mid twenty volt range in either +/- voltage.

**madhu**

AC Motor Speed Controller

Tuesday, March 02, 2010  
8:26:13 AM

this site is very useful for all the persons not only for techno grads but also for every one who are interested in electrical machines which is one of the challenging subject it also helps in improving knowledge

**Walter C. Van Choate**

AC Motor Speed Controller

Saturday, January 30, 2010  
2:38:39 AM

I was referred to your site. I wanted to please ask if you could show me how to add the AC motor controller to a vacuum cleaner that is way to fast to clean floor rugs, blinds, and counter tops.... Please be sure that your help with this matter will be very much appreciated for sure. Will be looking in the email for your reply. Yours Respectfully, WC

**angel**

AC Motor Speed Controller

Wednesday, November 25,  
2009 12:08:06 AM

Very impressive design! but i want a circuit like this to operate in 220V AC. What should i do? i need your immediate response. Thanks..

**S P Naik**

AC Motor Speed Controller

Tuesday, June 30, 2009  
10:35:55 AM

its a very informative site. Thank you to the persons who made this possible its really helping

**vijay**

AC Motor Speed Controller

Tuesday, June 30, 2009  
7:39:04 AM

hi sir i choosen this ac motorn speed controller as my project details of this project is very less so please kindly send to a mail to me about all details and cost and another my main doubt is ratings motor so please mentioned the ratings of motor

**Bent Ears Audio Laboratories**

AC Motor Speed Controller

Wednesday, June 24, 2009  
4:14:25 PM

Great design! Took me about 2 hours to assemble and tweak. Works just as I wanted it to; took my studio exhaust fan down to a nice slow rotation - just enough to pull a gentle draft out of the room. Tom

**fieroboom**

AC Motor Speed Controller

Tuesday, June 09, 2009  
2:27:34 AM

Hey all, I just stumbled on this schematic, and headed off to eBay... I found a BTA12-600B (600V, 12A max) TRIAC 2-pack for \$2.50 shipped... The only problem is I'm not finding any DIACS that are anywhere near my needs (120V, 300W motor), much less being anywhere close to matching the TRIACS as mentioned in the notes. Anyone have any suggestions? Thanks.

**farhan elahi**

AC Motor Speed Controller

Monday, May 25, 2009  
6:04:31 AM

i studeid the controll system and i found it more sute able for all technicians.Thnk you for this.

**vimal**

AC Motor Speed Controller

Wednesday, April 22, 2009  
6:20:52 AM

sir plz tell me what should i do to made the model of ACmotor speed controler

**RAYMOND EUGENE  
SIEGLER,PART TIME MAD  
SCIENTIST**

AC Motor Speed Controller AND  
OTHER CIRCUIT DIAGRAMS

Sunday, February 22, 2009  
3:45:47 AM

THANK-YOU;ITS SO NICE TO SEE SITES ON INTERNET THAT ARE FREELY SHARING INFORMATION(AS IT SHOULD BE)SO MANY SITES "ARE IN IT FOR A QUICK BUCK".....KNOWLEDGE IS POWER....I HOPE SOMEDAY(HOPEFULLY SOON);I WILL BE ABLE TO SHARE SOME OF THIS"POWER"WITH OTHERS SO I MAY BE ABLE TO ENRICH OTHERS AS YOU HAVE FOR ME.KEEP UP THE GOOD WORK!

**JACK**

AC Motor Speed Controller

Thursday, October 16, 2008  
4:46:46 PM

Well im busy with this project and i kinda have a problem its not running as it should. Ive used a BT139 triac do you think this might be a problem, anybody please.

**Asumadu Seth Sarfo**

AC Motor Speed Controller

Wednesday, September 24,  
2008 10:37:30 AM

Mr. Aaron I like youe AC Motor Speed Controller and I want to build it for my project work. Sir my problem is, the power I wuold like to use is 220 volt but you said the circuit works with 120 volt. please tell me what to do. My exams is very close.help me

**anonymous**

AC Motor Speed Controller

Tuesday, September 16,  
2008 3:56:21 AM

This circuit is radical!

**joeM**

AC Motor Speed Controller

Saturday, September 13,  
2008 5:03:22 PM

Some strange comments here. Love your circuit, much better than most triac circuits posted. I haven't tried it yet, but I will. Always looking for a better triac circuit to try. I'll let you know if it doesn't work.

**bilel**

AC Motor Speed Controller

Friday, March 07, 2008  
3:03:27 PM

please help me to do my project,its very important to me to continue my high education,i would like to know exactly how to release the 3 phase gradator command card for AC speed controller?THANK U.

**anurag tomar**

AC Motor Speed Controller

Tuesday, February 05, 2008  
3:42:09 AM

tell me about the project cost and programming criteria

**reema**

AC Motor Speed Controller

Wednesday, January 09,  
2008 7:30:27 AM

what will be cost of project

**paul brown**

AC Motor Speed Controller

Friday, December 21, 2007  
6:34:46 AM

a 3 phase motor is really just a large stepper motor, which uses the ac sinewave phases as it's timing source. essentially to reverse a three phase motor , all you need to do is reverse two of the legs (phases) this can be done with a reversing motor contactor or a dpdt relay wired as an h-bridge. BE VERY CAREFUL 3 phase industrial electricity can kill you,and I've come darn close! that may result if you don't know what you are doing, you could have a real mess on your hands

**kamesh**

AC Motor Speed Controller

Monday, December 10,  
2007 3:06:04 AM

can you please give the specific rating or number of the TRI(TRIAC) and U1(DIAC).

**Mustafa Edries**

three phase motor

Saturday, November 10,  
2007 6:07:24 AM

i need the automatic circuit diagram for a three phase motor turning clockwise and counterclockwise by changing the order of phases.I need the circuit which has a timer and turns the motor CW for 5 minutes then stop for 1 minute and then again turns the motor CCW for 5 minutes.

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