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VRIS

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[|StartPage](#) [|WikiPages](#) [|UploadedFiles](#) [|RecentChanges](#) [|TrashBin](#) [|FullTextSearch](#) [|Extra](#) [|About](#) |

| **VRIS**: [Reload](#) - [Edit](#) - [QuickEdit](#) - [History](#) - [BackLinks](#) - [Erase](#) |

Goto:

prepend insert append

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Click to add a snippet: [\[DAT\]](#) [\[!ADD\]](#) [\[!CHN\]](#) [\[!REM\]](#) [\[http://\]](#) [\[Addr.\]](#)

[-Explanation of Requirement](#)

[-Methods](#)

[-Parts Sourcing ready built](#)

[-Parts Sourcing build your own](#)

[-Ignition Pulse Frequency](#)

[-Frequency Table \(Hertz -cycles per second \)](#)

[-The Comparators](#)

[-A suitable circuit](#)

[-Test and Calibration](#)

[-Pulse Generator](#)

[-Frequency Generator frequency table](#)

[-Tachometer circuit component and supplier list](#)

[-Frequency Gen. circuit component and supplier list](#)

This page is under construction.

Explanation of Requirement

The Variable Resonance Induction System is described here:

»http://www.rs-productions.com/RSP_Motors/tech/sae-920677/sae-920677.htm

alternative if above link broken

»<http://www.incony.org/webpics/920677.doc>

Mikey`s most excellent web page on the **VRIS**

»http://www.geocities.com/mikey9t6/car_uvwxyz_vris.htm

In principle, two solenoids are energised (12V DC) at set points in the RPM range. The solenoids each control an air switch.. in this case switching vacuum. When a solenoid energises, the air switch is opened, allowing vacuum to pull an actuator connected to the **VRIS** valve in the inlet manifold. Energising or de energising the solenoid opens or closes the valve in the inlet manifold. The valve closes under return spring

pressure when the solenoid is de energised. The **KL** engine has different set points from the KLZE. Normally, the PCM would take care of the switching points for the **KL** engine. If The KLZE **VRIS** uses the **KL** PCM to control it, the switching points will be in the wrong place in the RPM range, therefore a PCM independent method of controlling the **VRIS** solenoids is needed.

Methods

The solenoids need to be switched at set points in the RPM range. This can be achieved by using an independent tachometer to monitor engine RPM coupled to window comparators driving relays to switch each solenoid.

A window comparator is just a name for an electronic circuit that monitors a varying voltage and causes the relay to operate when pre determined voltages are present.

In this case one window comparator turns on a solenoid at 3250 RPM and off at 6600 RPM The other comparator turns on a solenoid at 4250 RPM and off at 6600 RPM.

the \"window\" refers to the opening and closing points ie 4250 to 6600 is the \"window\" though the comparators window is actually a varying DC voltage.

The varying voltage is output by the tachometer, which monitors the engine RPM, as it is coupled to the ignition circuit via the green wire in the Distributor (1994 Probe)

Parts Sourcing ready built

The tachometer circuit and window comparator can easily be bought from:

»<http://www.msdisignition.com>

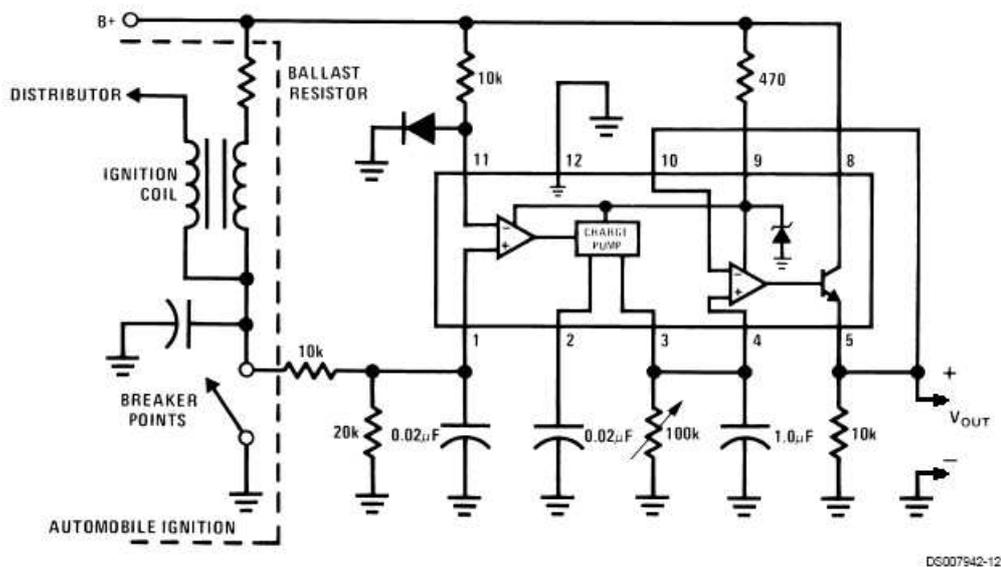
see a view here:»<http://www.msdisignition.com/pdf/pn8956.pdf>

Maplin electronics have a tachometer kit. Though it would need some investigation to find the variable DC voltage output to supply the window comparators as there is not one available on this tacho. »<http://www.maplin.co.uk/products/module.asp?CartID=040429174843102&moduleno=3169> »<http://www.velleman.be/common/product.aspx?id=9060>

Alternatively its possible to build your own more accurate circuit if you have an electronic construction ability.

Parts Sourcing build your own

The core of a tachometer is the integrated circuit that converts the frequency of the ignition pulses into a DC voltage that varies as the pulses increase and decrease in frequency.. its an F to V convertor. A suitable integrated circuit is the LM2917 »<http://www.farnell.com/datasheets/19447.pdf> refer to page 9



Ignition Pulse Frequency

The 24V Probe is a 6 cylinder engine. below is the frequency of the ignition pulses (6 per revolution as monitored at the distributor green wire) converted to Hertz(cycles per second)

Frequency Table (Hertz -cycles per second)

RPM	6 CYL
1000	50
2000	100
3000	150
4000	200
5000	250
6000	300
7000	350
8000	400

The Comparators

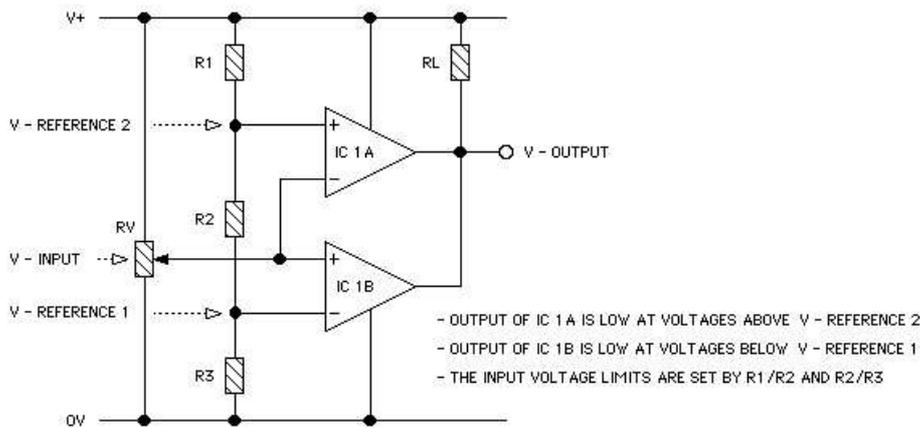
Using a window comparator like the LM339 or LM139 a window switch that takes its input from the above tachometer is easily realised:

»<http://www.farnell.com/datasheets/45152.pdf> refer to "limit comparator" page 11

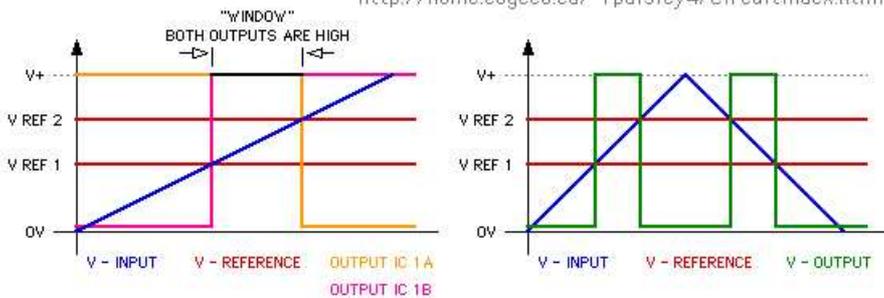
VOLTAGE WINDOW DETECTOR CIRCUIT

©ROB PAISLEY 2003

Comparator Window

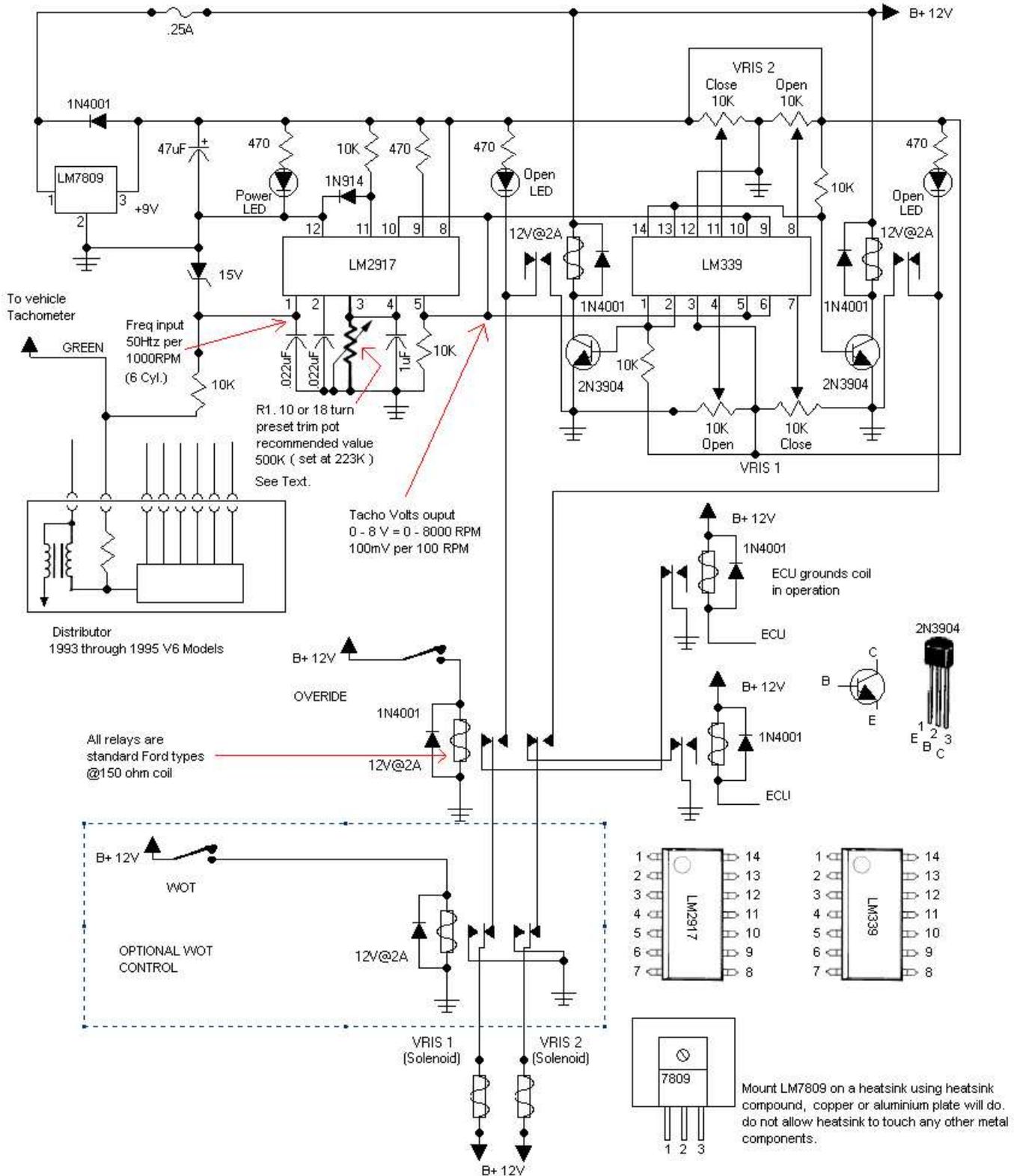


<http://home.cogeco.ca/~rpaisley4/CircuitIndex.html>



A suitable circuit

Incony thanks all at ProbeTalk involved in making this circuit



Voltage output from the tacho feeds the comparators.. it is defined in the data sheet for the 2917 as:

$$VO = VCC \times f_{IN} \times C1 \times R1 \times K$$

VCC = 9V set by the 7809 regulator

f_{IN} = engine RPM frequency in

C1 we have as 1uF

R1 we have as 100K

K = 1 (gain constant defined in data sheet)

This would give a voltage output from the tacho of .45V per 1000 RPM or 50Hz

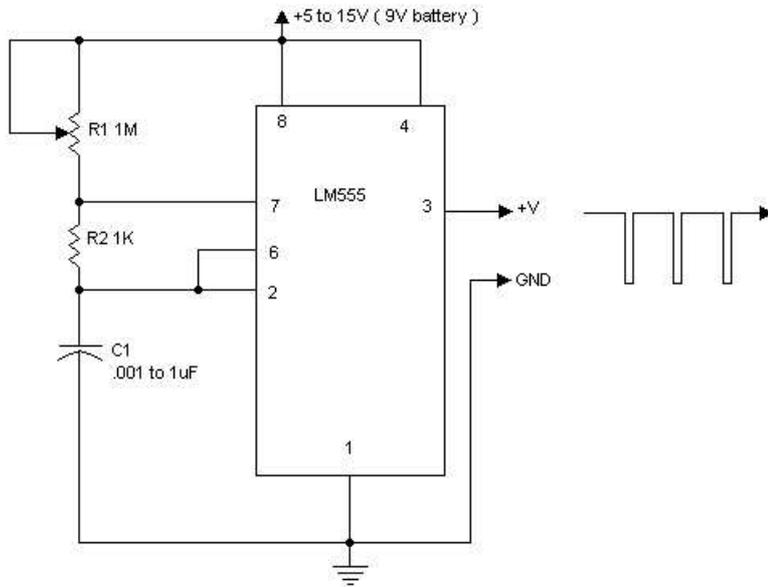
Using a 500K pot for R1 enables 1V per 1000 RPM or 50 HZ with R1 set at @ 223K or midway in its travel

I recommend a multiturn preset pot is used for R1

Test and Calibration

In addition to the above **circuits** a method of calibrating the Tacho/comparator circuit off the car before installation is required. The LM 555 timer IC can be configured as a variable rate frequency generator and can be used to inject a known frequency into the tacho and therefore enable precise calibration.

Pulse Generator



Frequency Generator frequency table

Capacitor	Resistor	Values		
C1 (uF)	R1=10K	R1=100K	R1 = 1M	
.0022	42,470	5,240	520	
.0033	30,490	3,740	371	
.0047	21,522	2,630	261	
.0068	16,300	1,987	197	
.01	11,622	1,414	140	
.015	7,210	876	87	
.022	4,959	601	60	
.033	3,530	428	42	
.047	2,351	285	28	
.068	1,737	210	20	
.1	1,139	138	14	
.15	804	97	10	
.22	540	65	6	

It can be seen from the above table, with C1 set at .033uF and R1 = 100K the pulse generator covers the RPM frequency shown in the earlier table. Other values are shown in case you do not have the ideal values to hand.

Tachometer circuit component and supplier list

Tolerances are suggested. The lower the tolerance value the more precise the component and therefore better performance.

NOTE.. Radio Spares (RS) »<http://rswww.com> is a major UK electronic parts supplier, most of its small items are sold in multipacks, the part numbers here are for reference. you may be able to buy individual parts locally.. ie Radio Shack. Parts referenced were available at 23 May 2004.

Component	Value	Quantity	Supplier1 Pt No.	Supplier2 Pt No.
Resistors				
R1	Potentiometer, multi turn, 10mm sq, sealed, Cermet, top adj, 64Y, 500k Manufacturer SPECTROL Part No. 64Y-504	1	RS Stock No. 154-2482	
R2 - R5	Resistor, metal film, 0.25W, 1%, 470R Manufacturer TYCO ELECTRONICS Part No. 016224861	4	RS Stock No. 148-427	
R6 - R9	Potentiometer, multi turn, 10mm sq, sealed, Cermet, top adj, 64Y, 10k Manufacturer SPECTROL Part No. 64Y-103	4	RS Stock No. 154-2432	
R10 -R14	Resistor, metal film, 0.25W, 1%, 10k Manufacturer TYCO ELECTRONICS Part No. 016224961	5	RS Stock No. 148-736	
Capacitors				
C1 - C2	Description Capacitor, tantalum, radial wire ended, 5mm pitch, 35V, 1uF Manufacturer KEMET ELECTRONICS Part No. T356A105K035AS	2	RS Stock No. 262-5027	
C3 - C4	Capacitor, polypropylene, metallised, radial, MKP1837, 1%, 100Vdc, 0.022uF Manufacturer VISHAY COMPONENTS Part No. MKP1837-322/011	2	RS Stock No. 166-6443	
C5	Capacitor, electrolytic, 16V, 47uF Manufacturer RUBYCON NETHERLANDS Part No. 16YXF47MY0511	1	RS Stock No. 224-4167	
Diodes				
D1 - D8	Diode, Rectifier, 1N4001 Manufacturer GENERAL SEMICONDUCTOR Part No. 1N4001 NATO No. 5961992081983	8	RS Stock No. 261-148	
D9	1N914	1		
D10	Description Diode, Zener, axial, BZX79, 15V Manufacturer PHILIPS SEMICONDUCTORS Part No. BZX79C15A26A	1	RS Stock No. 446-8775	
LED's	LED, indicator, 5mm, reflector, high eff red Manufacturer - Part No. -	3	RS Stock No. 247-1432	
Transistors				
T1 -T2	Transistor, Bipolar, NPN, 2N3904 Manufacturer ST MICROELECTRONICS Part No. 2N3904 NATO No. 5961997249848	2	RS Stock No. 294-312	
Integrated circuits				
IC1	Voltage Regulator, 3 Terminal, 9V, MCT7809CT Manufacturer ON SEMICONDUCTOR Part No. MCT7809CT	1	RS Stock No. 177-5288	
IC2	LM2917 Tachometer	1	Maplin WQ38R	
IC3	Amplifier, Comparator, quad, LM339N Manufacturer NATIONAL SEMICONDUCTOR Part No. LM339N	1	RS Stock No. 302-429	Maplin UH31J
Relays				
RL1 - RL4	12V 2A SPCO	4		
RL5 - RL7	12V 2A DPCO	3		
Switches				
SW1 - SW2	SP NO type as req.	2		
Fuses				
F1	.25A Fast acting	1		
Misc.				
IC Sockets	socket, DIL, stamped pin, low profile, 14 way, 1437546-7 Manufacturer TYCO ELECTRONICS ANSLEY Part No. 1437546-7	2	RS Stock No. 351-9658 (Multipack)	

Fuse Holder to suit F1		1	
PCB , stripboard, breadboard, Veroboard, SRBP, Manufacturer APW ELECTRONIC Part No. 053939D NATO No. 5999997195217	hole pitch 0.1in, 95x292x1.6mm	1	RS Stock No. 433-826
Connection wires minimum size 16/02 (16 strands @.02mm)			

Frequency Gen. circuit component and supplier list

Tolerances are suggested. The lower the tolerance value the more precise the component and therefore better performance.

Component	Value	Quantity	Supplier1 Pt No.	Supplier2 Pt No.
Resistors				
R1	Potentiometer, multi turn, 10mm sq, sealed, Cermet, top adj, 64Y, 100k Manufacturer SPECTROL Part No. 64Y-104	1	RS Stock No. 154-2460	
R2	Resistor, metal film, 0.25W, 1%, 1k Manufacturer TYCO ELECTRONICS Part No. 0-1622360-1	1	RS Stock No. 148-506	
Capacitors				
C1	Capacitor, metallised polyester, 5mm, 5%, 100V, 0.033uF Manufacturer ARCOTRONICS Part No. R82EC2330DQ50J	1	RS Stock No. 312-1504	
Integrated circuit				
IC1	Description IC, Timer, KA555 Manufacturer FAIRCHILD SEMICONDUCTOR Part No. NE555N	1	RS Stock No. 268-0052	
Misc.				
IC Sockets	8 pin dual inline	1		
PCB , stripboard, breadboard, Veroboard, SRBP, Manufacturer APW ELECTRONIC Part No. 053939D NATO No. 5999997195217	hole pitch 0.1in, 95x292x1.6mm	1	RS Stock No. 433-826	
Connection wires minimum size 16/02 (16 strands @.02mm)				

In addition.. to check the frequency output of the Pulse generator and the varying voltage output of the tacho and the switching points of the comparators, a multimeter capable of displaying frequency and DC volts is required.

In the UK, Argos supply such a meter, that has all the functions needed including frequency measurement (though its not listed, i know it has.. i got mine there)

The Argos part number is 701/5603 and the last price i have was £24.99

See: [»http://www.argos.co.uk/webapp/wcs/stores/servlet/Search?storeId=10001&catalogId=1751&langId=-1&searchTerms=701%2F5603+&go.x=7&go.y=15](http://www.argos.co.uk/webapp/wcs/stores/servlet/Search?storeId=10001&catalogId=1751&langId=-1&searchTerms=701%2F5603+&go.x=7&go.y=15)

and also:

[»http://www.quasarelectronics.com/mm219.htm](http://www.quasarelectronics.com/mm219.htm)

Quasar do some very usefull kits that can be adapted for this project.. for example the comparator/ relay board. [»http://www.quasarelectronics.com/3156.htm](http://www.quasarelectronics.com/3156.htm)

[|StartPage](#) [|WikiPages](#) [|UploadedFiles](#) [|RecentChanges](#) [|TrashBin](#) [|FullTextSearch](#) [|Extra](#) [|About](#) |

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