

FEATURES

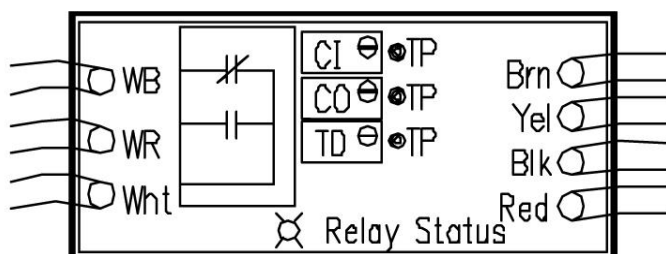
- Operates over a wide DC power range
15 to 35VDC and 24VAC
- Adjustable thresholds for cut in and cut out points
between 1 to 60VDC and 0 to 150VAC
- 12 Amp SPDT relay contact
- Automatic reversible action with the cut in and cut out adjustments
- Adjustable 0 to 255 seconds time delay on cut in
- Compact size eliminates mounting problems

DESCRIPTION

The VRDC 24V-60 is an adjustable voltage relay for DC applications. The VRDC 24V-60 can be used in applications where a varying DC voltage is used to switch an adjustable relay such as in generator control or a low battery voltage load disconnect. The cut-in voltage, cut-out voltage, and the time delay value are adjusted on multi-turn potentiometers by measuring the respective test points and adjusting the potentiometers per the set-up instructions and chart on the last page.

OPERATION

The VRDC 24V-60 uses a half-wave rectifier filter circuit which allows the VRDC 24V-60 to operate from a range of 10 to 35VDC power source. The VRDC 24V-60's input is internally scaled so that a 0 to 60VDC signal equals 0 to 5VDC as shown in the chart on the back side of this page. An LED lights when the relay is pulled in.

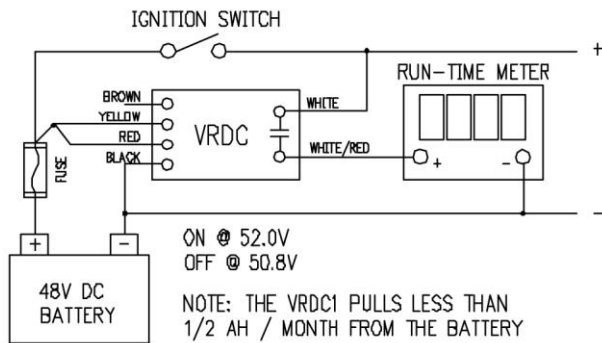
PHYSICAL CONFIGURATION

The test points shown are for field calibration of the cut-in, cut-out, and time delay potentiometers.

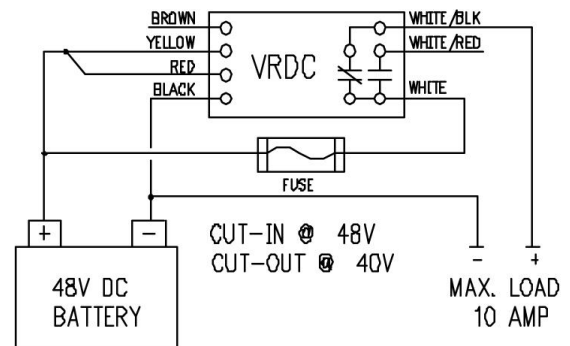
**SPECIFICATIONS**

Size & Weight:	3.2 x 1.2 x .75 inches
Enclosure:	Epoxy potted in PVC plastic
Mounting:	Double stick tape
Power:	15 to 35VDC
Mounting:	Double sided stick tape
Load Capacity:	12 Amps @ 28VDC, SPDT 12 Amps @ 120VAC, SPDT HASCO KLT1C12DC12
Input Signals:	0 to 60VDC, 0 to 150VAC
Thresholds:	Cut in @ 1 – 60VDC Cut out @ 1 – 60VDC 0.25VDC minimal differential
Time Delay:	0 to 255 seconds delay on energize
Action:	Direct – energizes on increase Reverse – energizes on differential
Signal Filtering:	>2Hz
Current Draw:	Continuous – less than 1mA Relay energized – 30mA
Indication:	LED indicates relay is energized
Temperature:	-20 to 75°C
Relay Life:	100 million plus mechanical operations

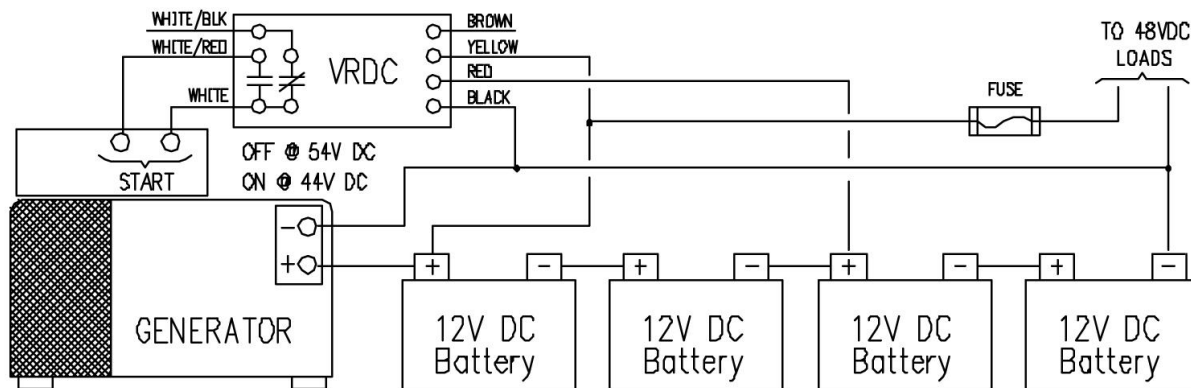


APPLICATION 1 RUN TIME METER CONTROL

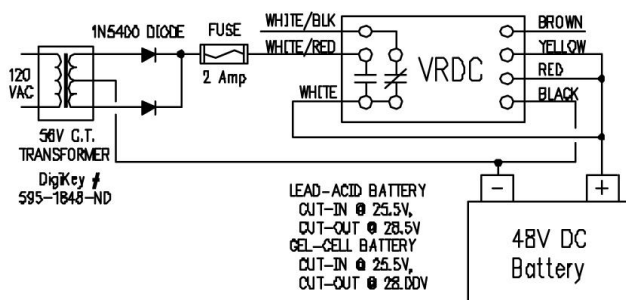
The VRDC 24V-60 senses the alternator output and energizes the run-time meter only when the engine is running and the ignition is on. This prevents the meter from running needlessly when the ignition is left on as is often the case with recreational boats.

APPLICATION 2 LOAD DISCONNECT

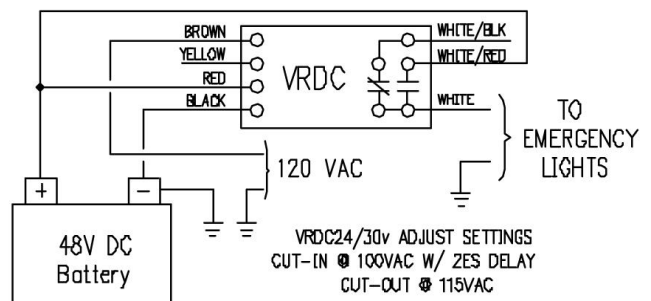
The VRDC 24V-60 energizes and disconnects the load (with time delay) below the off voltage point to prevent further battery discharge. Use N.O. contacts for de-energize on low battery voltage condition.

APPLICATION 3 GENERATOR CONTROL – BATTERY CHARGING

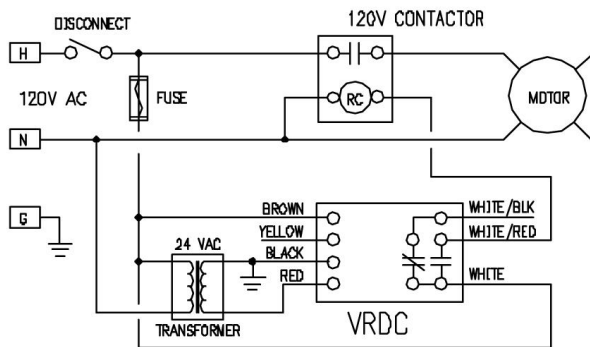
The VRDC 24V/60 senses when the battery bank is being discharged below a threshold point and starts the generator to charge the batteries. It shuts off the generator when the desired battery voltage is achieved. The time delay prevents the generator from starting on temporary battery voltage drops.

APPLICATION 4 BATTERY CHARGE CONTROLLER

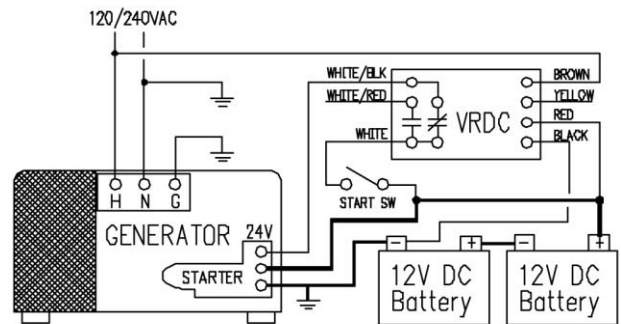
The emergency battery needs to be charged in a reasonable time after use. The VRDC 24V-60 senses the battery voltage, starts the charging current when the voltage drops below a threshold and disconnects the charging current when the battery is fully charged.

APPLICATION 5 AC POWER – EMERGENCY LIGHTS

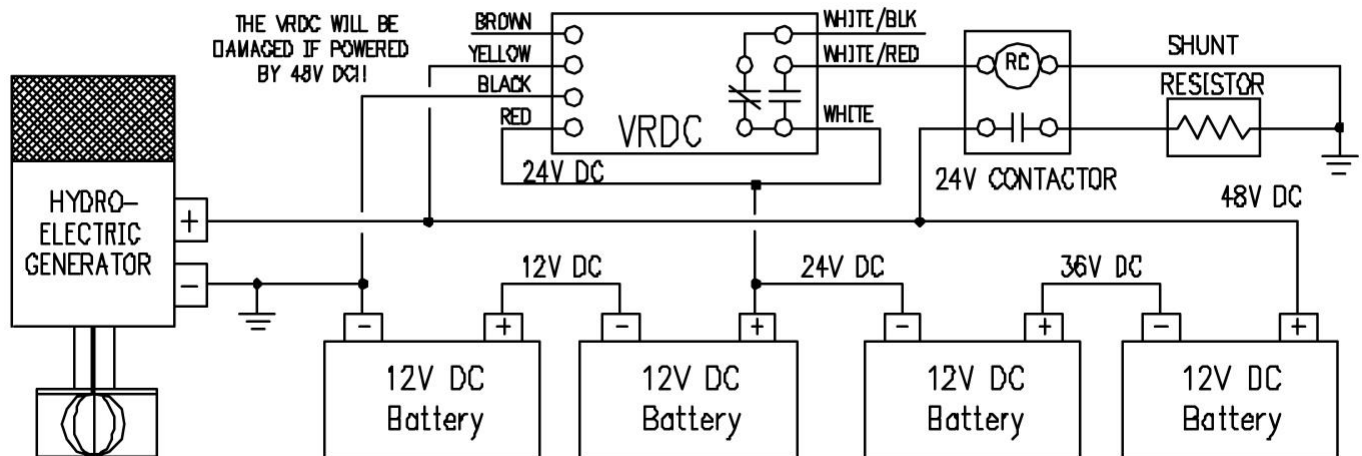
The VRDC 24V-60 senses the 120VAC line voltage and switches on the emergency lights with a 2 second delay upon sensing a power failure. The emergency lights turn off when power returns.

APPLICATION 6 LV BROWN OUT PROTECTION

The VRDC 24V-60 senses the AC line voltage and disconnects a motor or other sensitive load if the low voltage condition persists past the time delay period. The time delay prevents the VRDC from dropping out the motor due to normal inrush current draw. Cut out below 105VAC, cut in @ 112VAC.

APPLICATION 7 GENERATOR CRANK DISCONNECT

The VRDC 24V-60 senses the AC voltage output from a generator and when the desired threshold is reached, disconnects the starter circuit to prevent excessive cranking. Even though the AC voltage adjustment is 150VAC maximum, the module is not damaged by seeing 240VAC on the voltage input wire.

APPLICATION 8 48VDC EXCESSIVE POWER SHUNT

The VRDC 24V-60 senses the battery voltage and activates a contactor to shunt the excessive power thru a load resistor to prevent an over voltage condition. The VRDC 24V must be powered by 12V DC from the battery bank even though it senses a higher voltage level thru the series input resistor.

ADJUSTMENT FORMULAS

0 TO 30VDC - $V_{adj} = V_{in} \times 0.1667$
 0 TO 60VDC - $V_{adj} = V_{in} \times 0.0833$
 0 TO 150VAC - $V_{adj} = V_{in} \times 0.0333$
 TIME DELAY - $V_{adj} = \text{Time Delay (sec)} \times 0.01961$

V_{adj} - Adjustment voltage at cut-in & cut-out test points
 V_{in} - Input voltage signal
 Min. Resolution - 0-5V Adjust voltage / 255 steps = 0.02V DC

ADJUSTMENT TABLE

Input Voltage Ranges			Time Delay	cut-in/out & delay Tp volts
1-30VDC	2-60VDC	5-150VAC	0-255 Sec	0-5VDC
1.0v	2.0v	5.0v	8.5 sec	0.167v
2.0v	4.0v	10.0v	17 sec	0.333v
3.0v	6.0v	15.0v	25.5 sec	0.500v
4.0v	8.0v	20.0v	34 sec	0.667v
5.0v	10.0v	25.0v	42.5 sec	0.833v
6.0v	12.0v	30.0v	51 sec	1.000v
7.0v	14.0v	35.0v	59.5 sec	1.167v
8.0v	16.0v	40.0v	68 sec	1.333v
9.0v	18.0v	45.0v	76.5 sec	1.500v
10.0v	20.0v	50.0v	85 sec	1.667v
11.0v	22.0v	55.0v	93.5 sec	1.833v
12.0v	24.0v	60.0v	102 sec	2.000v
13.0v	26.0v	65.0v	110.5 sec	2.167v
14.0v	28.0v	70.0v	119 sec	2.333v
15.0v	30.0v	75.0v	127.5 sec	2.500v

Input Voltage Ranges			Time Delay	cut-in/out & delay Tp volts
1-30VDC	2-60VDC	5-150VAC	0-255 Sec	0-5VDC
16.0v	32.0v	80.0v	136 sec	2.667v
17.0v	34.0v	85.0v	144.5 sec	2.833v
18.0v	36.0v	90.0v	153 sec	3.000v
19.0v	38.0v	95.0v	161.5 sec	3.167v
20.0v	40.0v	100.0v	170 sec	3.333v
21.0v	42.0v	105.0v	178.5 sec	3.500v
22.0v	44.0v	110.0v	187 sec	3.667v
23.0v	46.0v	115.0v	195.5 sec	3.833v
24.0v	48.0v	120.0v	204 sec	4.000v
25.0v	50.0v	125.0v	212.5 sec	4.167v
26.0v	52.0v	130.0v	221 sec	4.333v
27.0v	54.0v	135.0v	229.5 sec	4.500v
28.0v	56.0v	140.0v	238 sec	4.667v
29.0v	58.0v	145.0v	246.5 sec	4.833v
30.0v	60.0v	150.0v	255 sec	5.000v

ADJUSTMENT PROCEDURES

1. The cut-in, cut-out and time-delay pot adjustments are measured on the respective test points by a DC voltmeter. The cut-in/out 0 to 5VDC represents 0 to 30VDC, 0 to 60VDC, 0 to 150VAC input signal. The time delay 0 to 5VDC represents 0 to 255 second delay on energize.
2. If the cut-in pot is greater than the cut-out pot then the relay energizes when the signal voltage is greater than the cut-in point and de-energizes when the signal voltage drops below the cut-out point. If the cut-in point is less than the cut-out point then the relay energizes when the signal voltage drops below the cut-in point and de-energizes when the signal voltage rises above the cut-out point. If the signal voltage differential between the cut-in and cutout adjustments is not at least 0.25VDC in the 0 to 30V range then the relay will not operate.
3. The time delay pots 0 to 5VDC represents 0 to 255 seconds of time delay for the relay to energize on cut-in for either reverse or direct mode. The input signal must exceed the cut-in point for the time delay value or the timing action will start over. The cut-out action is instantaneous.
4. After adjusting the VRDC module, interrupt power to insure that the module operates properly. This re-sets the circuitry.