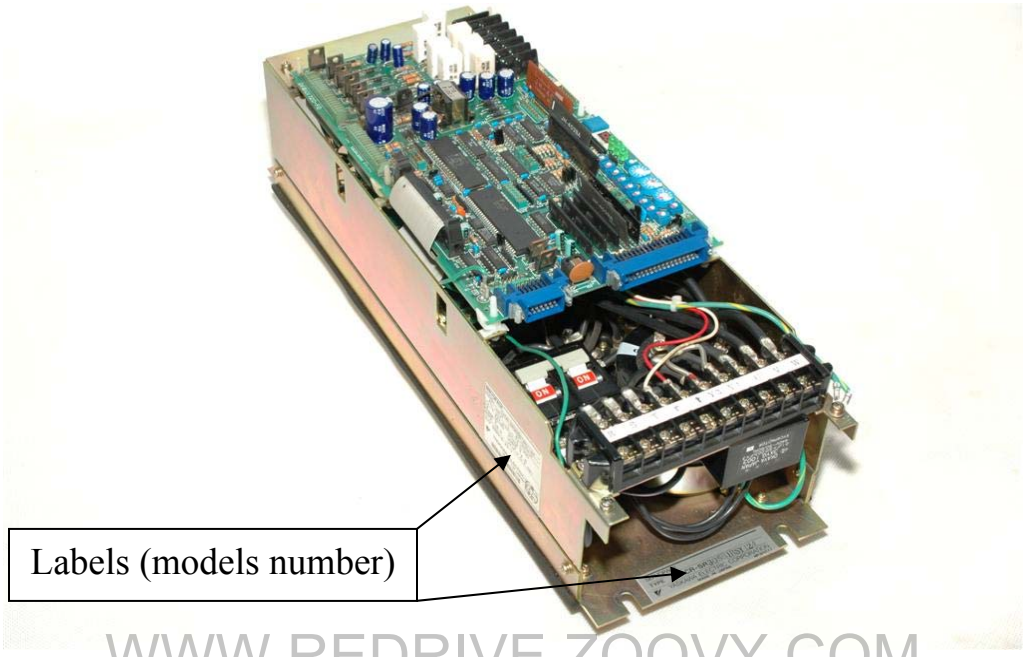
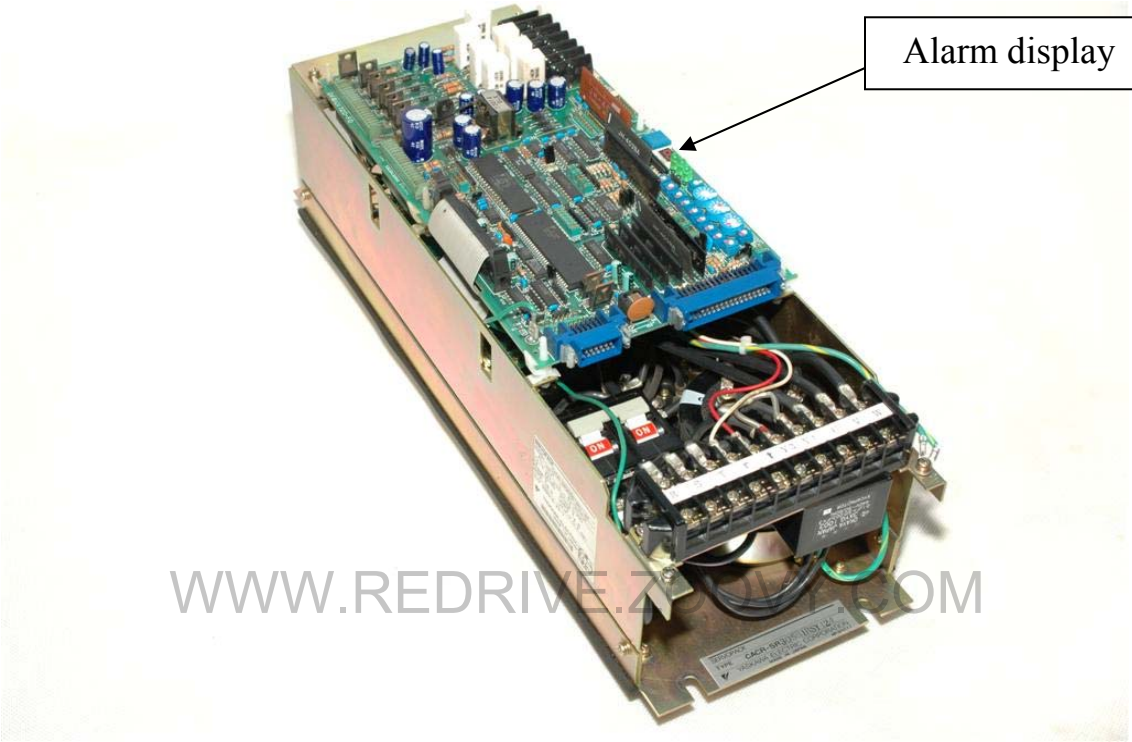
HOW TO CHECK SERVOPACK:



1. Write down the model number of the drive. The model number starts with **CACR-SR*******

2. Before turning off the power, check what numbers or letters appear on the alarm display



3. Fault Codes

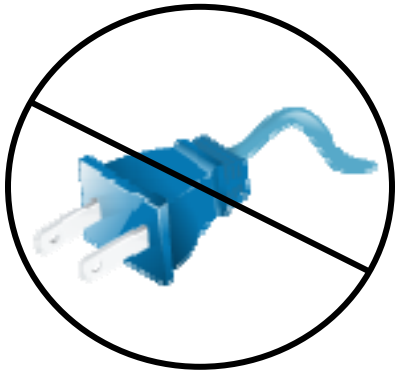
The fault code indicator is a **LED** display located on the control board. There are eleven possible codes – **1-7**, **A**, **B**, **C**, and **F**.

Fault Codes

LED	Detection	Lighting Condition	Probable Cause	Corrective Action
1	Over Current	Goes ON when power is supplied to the control circuit.	* Defective control circuit board (1PWB)	Check 1PWB
		Goes ON when power is supplied to the main circuit and servo power is turned ON. * MCCB does not trip	* Defective current feedback circuit. * Defective main circuit transistor module. * Motor Grounding.	* Check the PTM * Check the current transformer DCCT. * Check grounding
		Goes ON when power is supplied to the main circuit and servo power is turned ON. * MCCB does not trip	* Defective motor grounding * Defective main circuit transistor module.	* Check the PTM. * Check the grounding.
		Goes ON when power is supplied to the main circuit.	* Defective main circuit transistor module.	* Check the PTM.
		Goes ON when the motor accelerates or decelerates.	* Incomplete (1PWB) VR8 adjustment.	* Check 1PWB
2	Circuit protector tripped	Goes ON when power is supplied to the control circuit.	* Defective control circuit board (1PWB)	* Check Thyristor.
		Goes ON when power is supplied to the main circuit.	* Defective main circuit Thyristor-diode module	
			* MCCB trips.	
		Goes ON during operation.	* Defective main circuit	
3	Regenera-tive trouble	Goes ON when power is supplied to the control circuit.	* Defective regenerative transistor.	* Check Regen transistor and resistor.
			* Regenerative resistor disconnection.	
		Goes on approximately 0.5 to 1 second after power is supplied to the main circuit.	* No regenerative resistor connection (SR60BB)	
4	Over-voltage	Goes ON when the motor accelerates or decelerates.	* Load inertia JI (GD^2) is too large.	* Check the inertia of the machine with the value converted to the motor shaft.
			* Defective regenerative circuit.	* Check Regen transistor and resistor.
5	Over-speed	When the reference is input, the motor runs fast and 5 goes on.	* Motor connection error. * Optical encoder connection error.	* Correct motor connection. * Check pulses in phases A, B, C, U, V, and W on 2CN, and correct wiring.
			* The reference input voltage is too large.	* Decrease the reference input voltage.
6	Voltage drop	Goes ON when power is supplied to the main circuit.	* Defective main circuit Thyristor-diode module.	* Check the Thyristor.

LED	Detection	Lighting Condition	Probable Cause	Corrective Action
7	Overload	Goes ON when power is supplied to the control circuit.	* Defective control circuit board (1PWB).	* Check 1PWB.
		Goes ON during operation. * When power to the control circuit is turned OFF and then ON again, the operation starts.	Operation with 105% to 130% or more of the rated load.	* Check and correct the load (may be overload)
A	Heat sink overheat	Goes ON during operation. * When power to the control circuit is turned OFF and then ON again, 7 and A goes ON again. When reset later, the operation starts.	Fan has stopped.	Check the fan. (where applicable)
			* Temperature around the servopack exceeds 55 degrees Celsius.	* Decrease the temperature below 55 (the heat sink may be overheated)
		The motor rotates, but the torque is unavailable. When power to the control circuit is turned OFF and them ON again, the operation starts, but the torque is still unavailable.	* Motor circuit error connection, such as U-V, V-W, W-U, or single-phase connection.	* Correct the connection.
b	A/D error CPU error	Goes ON when power is supplied to the control circuit.	* Defective control circuit board (1PWB).	* Check 1PWB.
		Goes ON during operation.	* Faulty internal elements.	* Resume after reset operation.
			* Defective internal elements.	* Check servopack.
F	Open phase	Goes ON when power is supplied to the control circuit.	* Defective control circuit board (1PWB).	* Check 1PWB.
		Goes ON when power is supplied to the main circuit	* Poor connection to 3-phase power supply.	* Check 1PWB.
C	Overrun prevention	Goes ON when power is supplied to the control circuit.	* Defective control circuit board (1PWB).	* Check 1PWB.
		The motor starts momentarily, then C goes ON.	* Motor connection error.	* Check the motor connection.
			* Optical encoder connection error.	* Check and correct pulses in phases A, B, C, U, V and W with 2CN.

4. The power must be **OFF** in order to check out the servo chassis by using a multi-meter.



5. Test Equipment

The basic tool used for troubleshooting a Yaskawa servo is:

Digital Multimeter

6. Main Circuit Test Procedure

This test procedure must be performed before replacing a servopack.

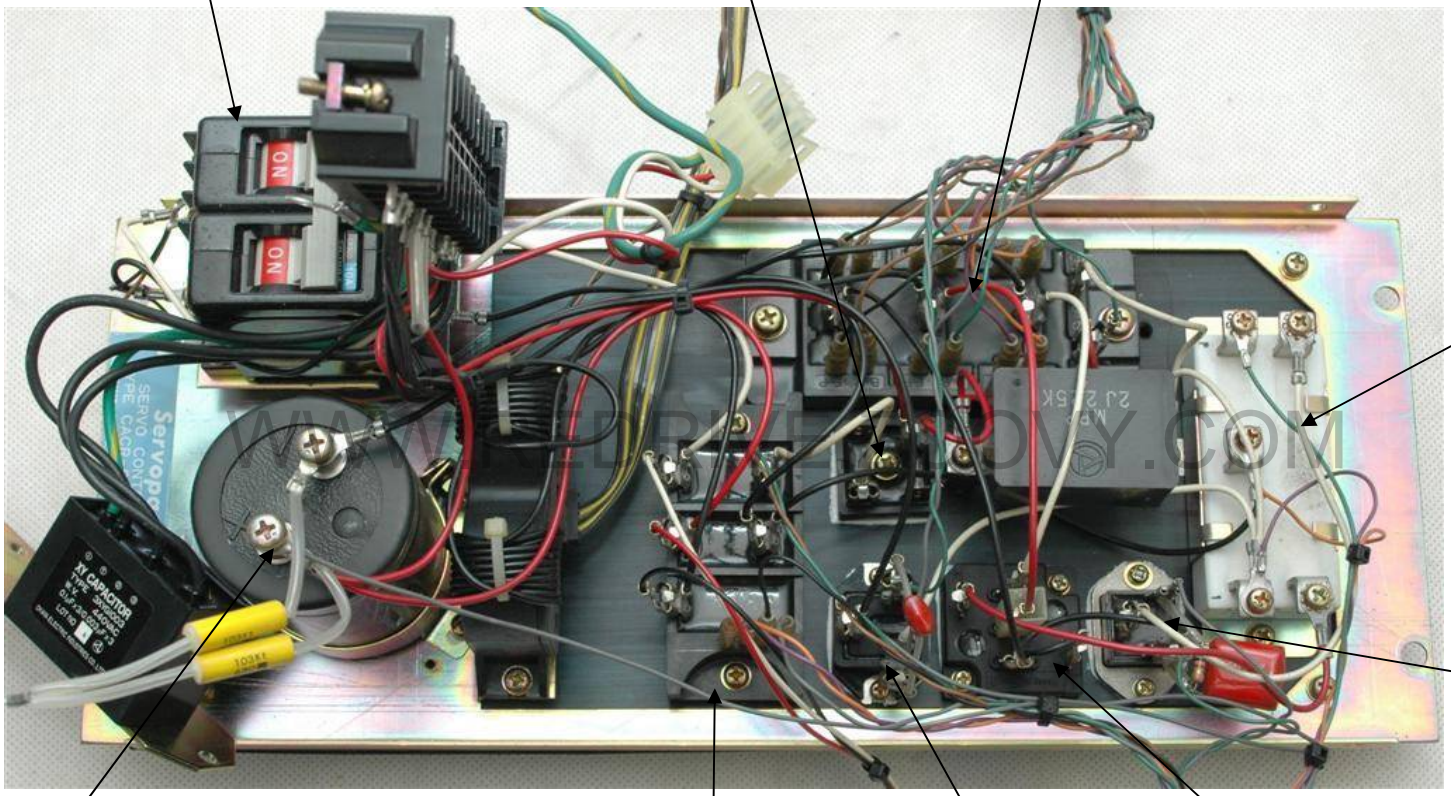
Test Procedure Checklist

Completed

- ☐ Check **RSTUVW** on the terminal block.
- ☐ Check the regen (regenerative) transistor.
- ☐ Check the diode bridge # 1.
- ☐ Check the diode bridge # 2.
- ☐ Check the braking transistor.
- ☐ Check the resistor module.

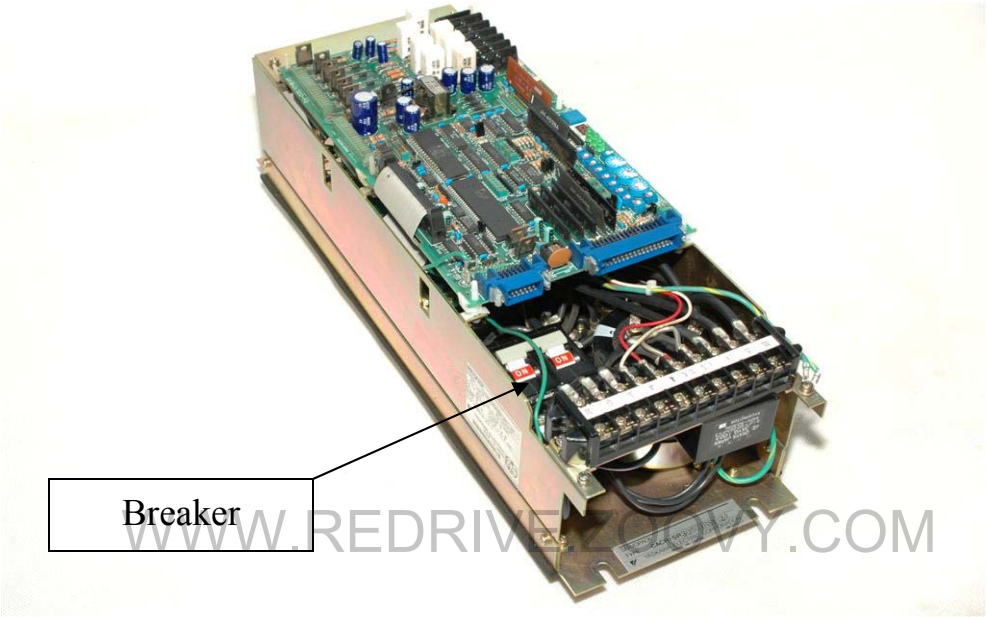
- ☐ Check the thyristor module.
- ☐ Check the cooling fan.
- ☐ Check the Regen resistor.

7.


Breaker
Diode Bridge # 2
Power Transistor Module - PTM
Resistor Module
Braking Transistor
Capacitor
Thyristor Module
Regen Transistor
Diode Bridge # 1

8. Power the power **OFF**.

9. If breaker is tripped, do not reset and power on, check terminals.



10. If breaker is blackened (burnt), need to replace servopack and check contactor (power supply to the servopack), it may need to be replaced too.

11. Terminal Block

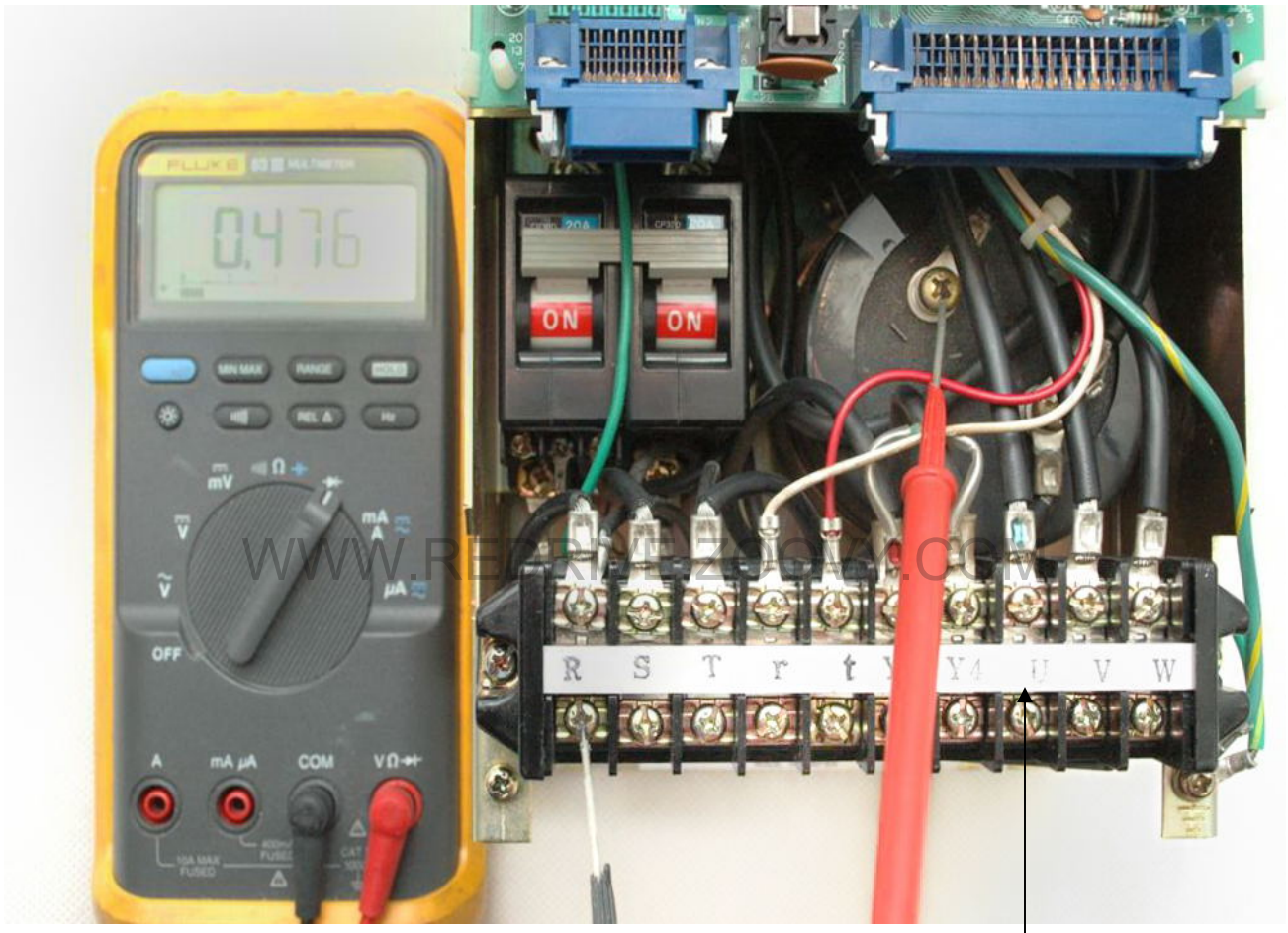
Make sure the circuit breaker is **ON** for the following tests

R S T U V and **W** are checked on the terminal block to give an initial overview of what may be wrong with servo. Place the positive lead of the meter onto the negative lead of capacitor . Check **R, S, T, U, V**, and **W** with the negative lead of the meter. Then put the negative lead of the meter on the positive lead of the capacitor and repeat. A table with the results is located on the following page. If **U**, **V**, or **W** readings are bad, then their respective parts on the **PTM** are bad and the **PTM** needs to be replaced. If the **R**, **S**, or **T** readings are bad, this implies that the thyristor is bad. Do not replace the thyristor without checking. A digital multimeter is used to check the terminal block.

Note: Measured values (excluding 0L) vary with the power rating of the servo. Check for consistency.

12. Remove all wires from **bottom** of terminal strip (R-W)

13. Set your multimeter to a diode symbol and measure as follows: (your test leads form meter are the red and black)



Red	**Black**	**(V)**
-	R	≈.500

14. Terminal Block

R	S	T	r	t	Y3	Y4	U	V	W

15. Terminal Block Check

Test Equipment – Digital Multimeter

Step #	Multimeter Positive Lead	Multimeter Negative Lead	Expected Reading (Diode Check)
1	Negative capacitor terminal	R, S, T	Approximately 0.5 Volts must be consistent with each other.
2	Negative capacitor terminal	U, V, W	Approximately 0.4 Volts must be consistent with each other.
3	R, S, T	Positive capacitor terminal	0L displayed
4	U, V, W	Positive capacitor terminal	Approximately 0.4 Volts must be consistent with each other.

16. Regen Transistor

When the servomotor is turned off, there is still a voltage present across the main bus of the servo. The regen transistor acts as a switch with closes when the servo is turned off to allow this voltage through to the Y3 and Y4 terminals. Here it is dissipated across resistors 1 and 2. When checking the regen transistor, you are making sure it hasn't been shorted across the emitter and collector.

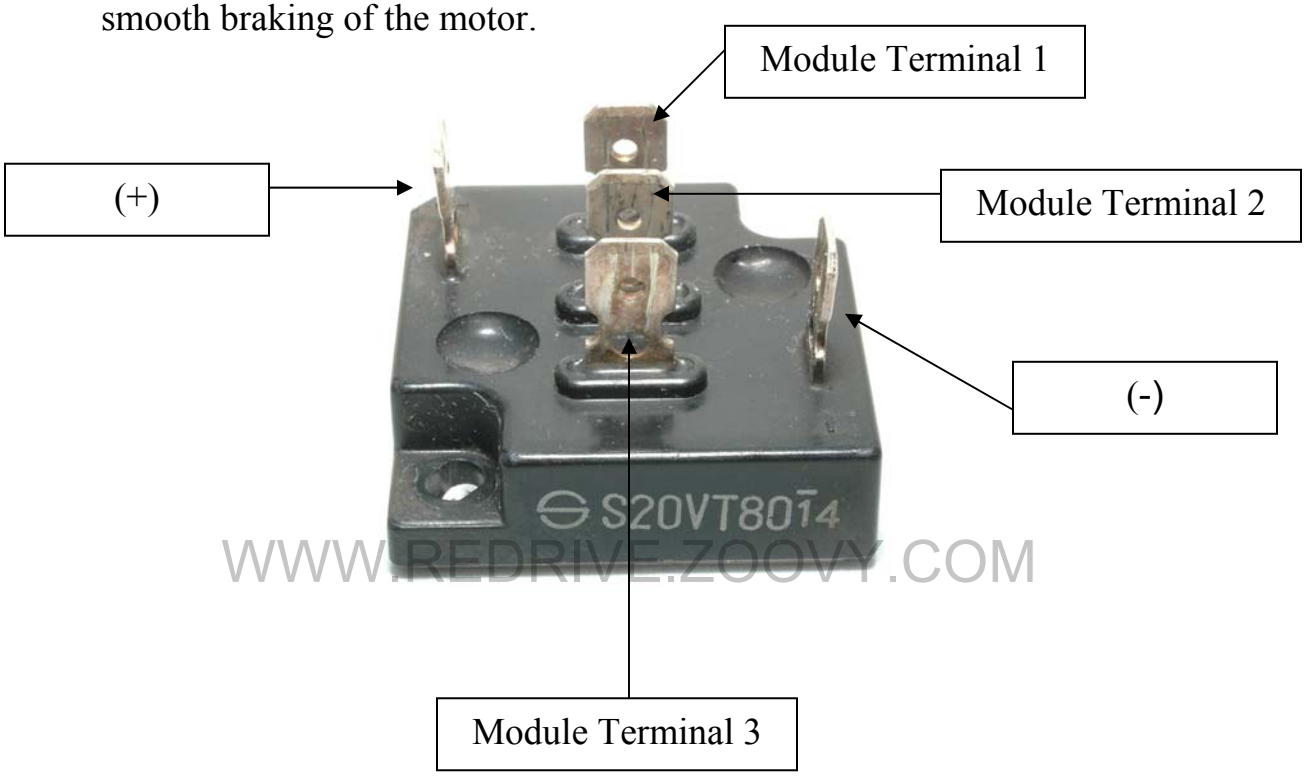
17. Regen Transistor Check

Test Equipment – Digital Multimeter

Step #	Multimeter Positive Lead	Multimeter Negative Lead	Expected Reading (Diode Check)
1	Base	Collector	Approximately 0.5 Volts.
2	Emitter	Collector	Approximately 0.4 Volts.
3	Emitter	Base	Approximately 0.7 Volts.

18. Diode Bridge #1

The diode bridge #1 is a component in the braking circuit. When the servomotor is turned off, the continued spinning of the motor generates a voltage across U, V, and W. The diode bridge directs the current from this voltage to the braking resistor to be dissipated. This results in a smooth braking of the motor.



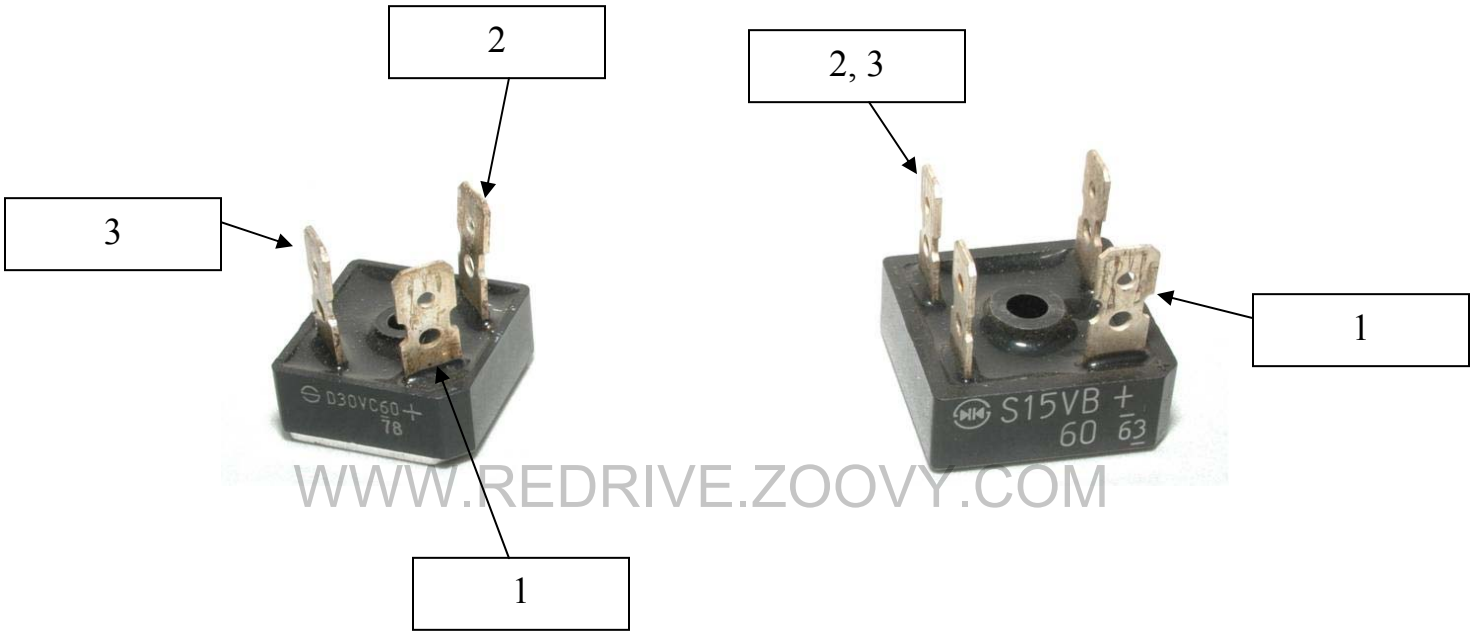
19. Diode bridge #1 Check

Test Equipment – Digital Multimeter

Step #	Multimeter Positive Lead	Multimeter Negative Lead	Expected Reading (Diode Check)
1	Negative module terminal	Module terminal 1, 2, 3	Approximately 0.5 Volts must be consistent with each other.
2	Module terminal 1, 2, 3	Positive module terminal	Approximately 0.5 Volts must be consistent with each other.

20. Diode Bridge #2

Diode bridges are used to rectify voltage wave patterns. In this case, the input voltage is the three phase AC voltage RST. In order for this voltage to be useful to the PTM, it must first be converted to a DC voltage pattern. The diode bridge #2 further rectifies the voltage out of the Thyristor into DC voltage, which is then sent to the power transistor module.



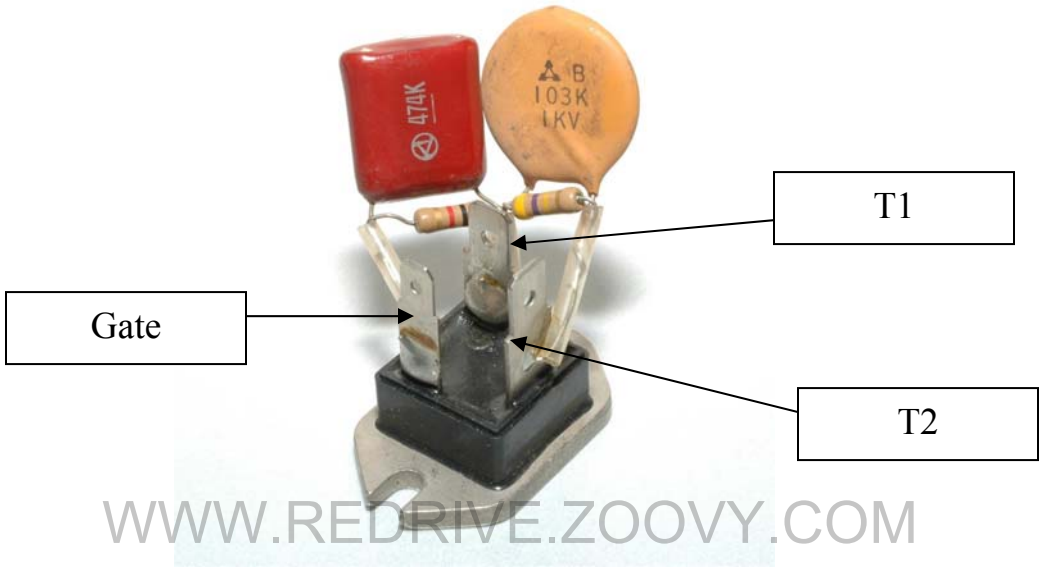
21. Diode Bridge #2 Check

Test Equipment – Digital Multimeter

Step #	Multimeter Positive Lead	Multimeter Negative Lead	Expected Reading (Diode Check)
1	Terminal (2)	Terminal (1)	Approximately 0.5 Volts must be consistent with terminal (2).
2	Terminal (3)	Terminal (1)	Approximately 0.5 Volts must be consistent with terminal (3).

22. Braking Transistor

The braking transistor is actually a triac. A triac acts like a diode except that it can conduct in both directions. The braking transistor rectifies and provides a return path through the braking resistor for the UVW voltage from Diode Bridge #1.



23. Braking Transistor Check

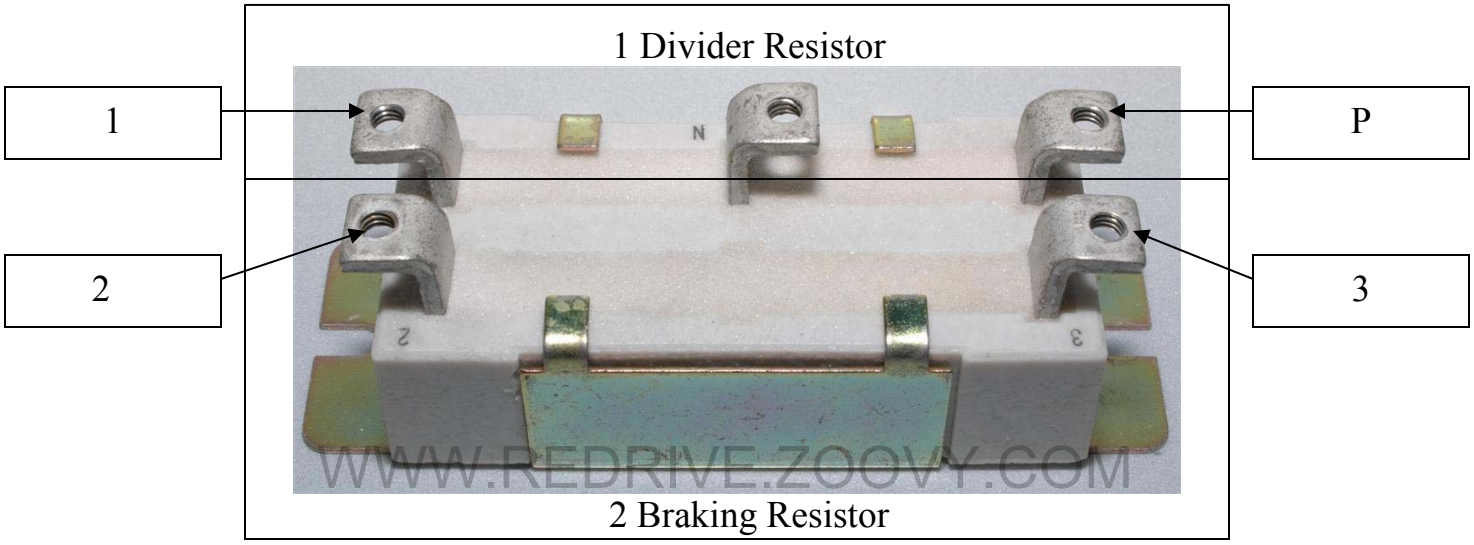
Test Equipment – Digital Multimeter

! <u>Multimeter must be in Ω (Ohm) Position</u> !

Step #	Multimeter Positive Lead	Multimeter Negative Lead	Expected Reading (Ohm Check)
1	Gate	T2	Approximately 1.65 M Ω.
2	T2	T1	Approximately 1.65 M Ω.
3	T1	Gate	Approximately 50-90 Ohm.

24. Resistor Module

The braking resistor is primarily used to dissipate the current created by the voltage which is generated by the spinning servomotor after the servo has been shut off. Usually this resistor needs to be replaced if it is cracked or physically damaged in a similar way.



25. Resistor Module Check

Test equipment – Digital Multimeter

! <u>Multimeter must be set to 200k ohm and 200 ohm</u> !

Step #	Multimeter Position	Multimeter Positive Lead	Multimeter Negative Lead
1 Divider Resistor	200k Ω (Ohm)	(P) module terminal	Module terminal (1)
2 Braking Resistor	200 Ω (Ohm)	Module terminal (3)	Module terminal (2)

26. Thyristor Module

The Thyristor module is composed of both diodes and silicon-controlled rectifiers. The Thyristor is the main component which contributes to the conversion of the AC input voltage to the DC voltage used to power the servomotor.

27. Thyristor Module Check

Test Equipment – Digital Multimeter

! Multimeter must be in Diode position !

The Thyristor module is checked using the connector end of its wiring harness. Make sure you check the wires corresponding to the Thyristor module (i.e. gray and green)

Step #	Multimeter Positive Lead	Multimeter Negative Lead	Expected Reading (Diode Check)
1	R, S, T	P	OL
2	N	R, S, T	0.5

28. Cooling Fan

Only the SB 60 and BB 20+ units have a cooling fan that blows air across the heat sink on the back of the unit. If the cooling fan is not working properly, the servo will trip on an overheat fault. Visually check the cooling fan to make sure it turns freely. If there is no physical evidence that the fan is bad, the motor can be checked with an ohmmeter. Using an ohmmeter, measure across the fan motor terminals. If the measured value is 0 ohms, we can conclude that the motor is shorted, or if the measured value is infinite ohms, we can conclude that the motor is burned open. If the fan is not working, then replace the fan.

29. Regen Resistor Check

On some of the BB models only, the Regen resistor is found underneath the heat sink. If the resistor is in metal case, it should be checked to ensure that there isn't leakage from the lead to the metal casing. Excluding SB models, the value of the Regen resistor is measured at terminals Y3 and Y4. The Regen resistor is external on the SB models.

Model: BB, BZ	Resistance
3	100
5	100
7	100
10	50
15	50
20	25
30	12.5
44	12.5

If you find that these readings are different than what you measure call us, you may need to replace the servopack.