



MAGNETEK
MATERIAL HANDLING

Regenerative Power Module

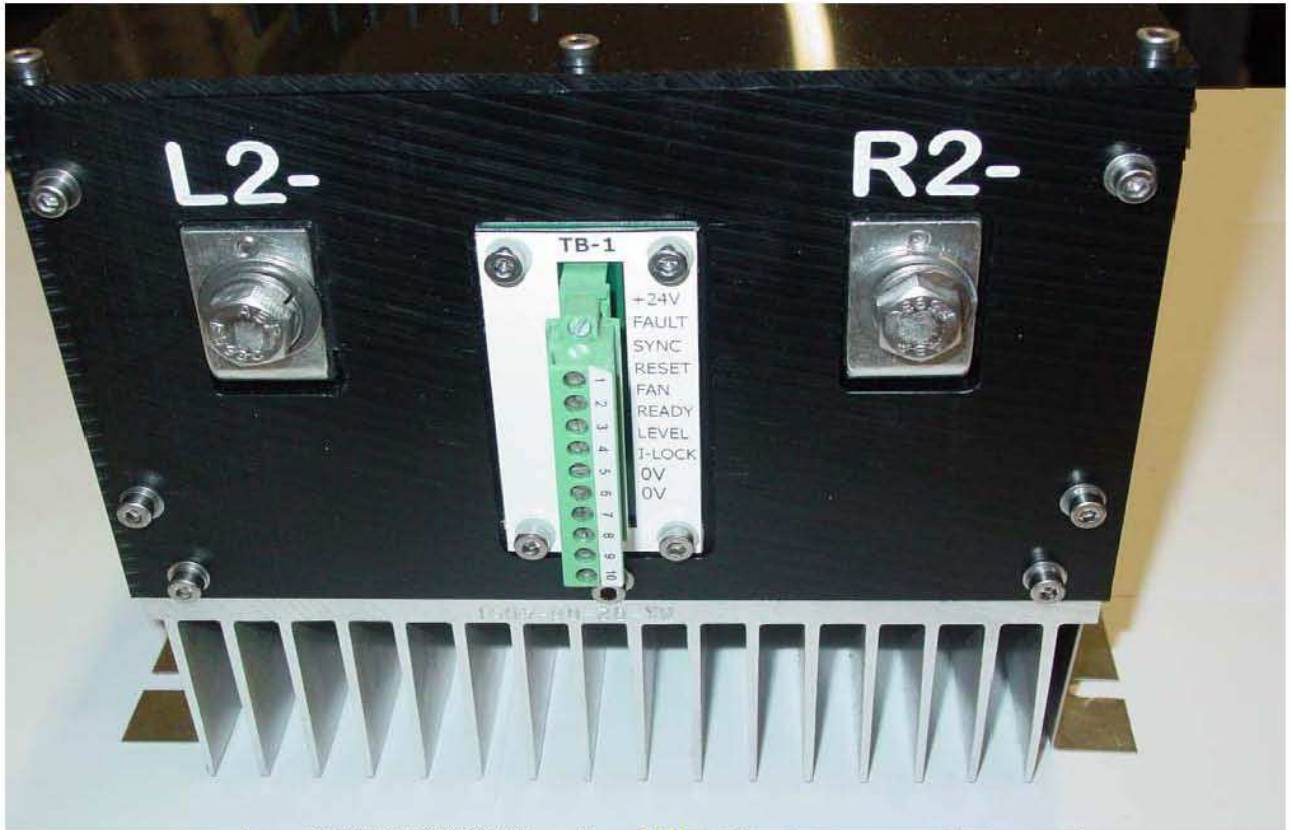
Instruction Manual



Part Number 144-45117-R1

December 2007

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Disclaimer of Warranty

Magnetek hereafter referred to as Company, assumes no responsibility for improper programming of a drive by untrained personnel. A drive should only be programmed by a trained technician who has read and understand the contents of this manual. Improper programming of a drive can lead to unexpected, undesirable, or unsafe operation or performance of the drive. This may result in damage to equipment or personal injury. Company shall not be liable for economic loss, property damage, or other consequential damages or physical injury sustained by the purchaser or by any third party as a result of such programming. Company neither assumes nor authorizes any other person to assume for Company any other liability in connection with the sale or use of this product.



WARNING

Improper Settings of this product can lead to unexpected, undesirable, or unsafe operation or performance of the controls.

General Description

The Regenerative Power Module (RPM) is a universal brake chopper circuit designed to dissipate regenerative energy produced by a motor into a fixed resistor load. The universal module covers the DC supply voltage range from 200V to 600V. The voltage selector link located on the outside front cover of the unit configures the module for LOW voltage (200V to 300V), MED voltage (300V to 500V) or HIGH voltage (500V to 660V).

The module is powered from the DC bus and requires no additional power supplies. The module can either be connected behind the M contactor of each drive or can be connected to the incoming DC bus using a separate mounted controller that includes additional protective components and line capacitance.

This module is required whenever the main power supply cannot receive the regenerated power being return to the line. The voltage on the Responder DDC bus rises rapidly during regeneration (100 mille seconds). Bus feed rectifier units that do not have a dump circuit or have slow reacting circuits require the use of the RPM module and dump resistor.

RPM Features

Ratings

Input Voltage Range	Minimum 200VDC Maximum 660 VDC
Brake Level Adjustment Range	Minimum 256 VDC Maximum 800 VDC
Rated Amps Peak Brake Current	400A 800A
Duty Cycle (800A peak)	10% (40 deg C ambient) 5% (60 deg C ambient)
Minimum connected dump resistor	1 ohm
Maximum Operating Temperature	60 deg C
Minimum Operating Temperature	-20 deg C

Universal Module (Voltage selector link, located on the front of the unit, configures module to DC Bus voltage)

LINK SETTING	DC BUS RANGE
330 V (Low)	200 – 300 VDC
495 V (Medium)	300 – 500 VDC
660 V (High)	500 – 660 VDC

Voltage Display

A 10-LED Switch Level bar graph provides a visual display of the approximate bus voltage level when the brake transistor turns on.

Simplified Switching Level Selection

An 8-position DIP switch provides transistor turn on switching level selection in 15 steps.

LINK SETTING	ADJ RANGE	VOLT/STEP
330	256 – 400 VDC	16
495	384 - 600	24
660	512 - 800	32

Choose the appropriate setting for the voltage link set up and set the appropriate corresponding DIP switch position on. All other DIP settings must be off

- **Mode Switches**

A 4-position DIP switch provides the following configuration selections:

DIP Position	Off Setting	On Setting
1	2-Term Res	3-Term Res
2	Auto Reset	Remote Reset
3	Enable Ext Intlk	Disable Ext Intlk
4	Not Used	Not Used

The External Interlock may be used for the connection of a normally closed temperature switch mounted at the power resistor.

- **Overheat Protection**

The thermistor mounted on the heat sink is used to protect against failure caused by excessive duty combined with excessive ambient temperatures. The unit is shut down when the heat sink temperature exceeds 95 deg C.

- **24V Output for Fan**

A +24V Fan output is available for supplemental cooling. The Fan output is capable of delivering up to 5W for the addition of an external fan separately mounted from the RPM unit. The output becomes active when the heat sink temperature exceeds 65 deg C.

- **LED Fault and Status Indicators**

LED status indicators provide the following indications:

COLOR	MARKING	DESCRIPTION
GREEN	POWER	Indicates that the brake chopper power supply is present
GREEN	INTERLOCK	Indicates that the external contact is closed when the interlock is enabled or that the interlock is in the disabled position
GREEN	READY	Indicates that no fault condition exists and that the external interlock is not open
AMBER	ACTIVE	Indicates that the brake chopper is conducting
AMBER	RESET	Indicates that the reset circuit is activated
RED	OVERTEMP	Indicates that the heat sink temperature has reached 95 deg C and the module has shut down to protect the transistor.
RED	IGBT FAULT	Indicates that the module is shut down on short circuit IGBT detection

External Control Terminals

A pluggable Phoenix screw terminal connector is provided to facilitate additional functionality:

TERM	Signal Name	Function
1	External +24V Supply	Allows control circuit of the brake module to be powered from an external supply. (Eliminates 25ms delay for control power to become established from main DC bus power.)
2	Fault	24 volts between this terminal and terminal 9 or 10 indicates that the brake module is in a fault condition. This can be used for remote fault annunciation.
3	Sync	Connect to same terminal of other brake modules to synchronize switching in order to balance brake load between two or more modules. The 0V pins of synchronized modules must also be connected together.
4	Reset	Apply positive pulse between 10V and 24V to remotely reset a brake module fault.
5	Fan	The 24-volt DC Fan output is capable of delivering up to 5W of power for the addition of an external fan separately mounted from the RPM unit. The output becomes active when the heat sink temperature exceeds 65 deg C. Connect between terminals 5 and 10.
6	Ready	
7	Level	Brake level switching allows the switching voltage turn on level to be reduced by as much as 100 volts. The voltage input can to terminal 7 can be fixed or variable and needs to be connected to the 0V circuit common. See FIGURE 1 for a graphic representation of the dynamic adjustment capability.
8	I-Lock	Connection point for resistor overheat protection switch. Normally-closed switch: Connect between terminals 8 and 9. Input has a 50 ms filter to reduce noise.
9	0V	Control circuit common.
10	0V	Control circuit common

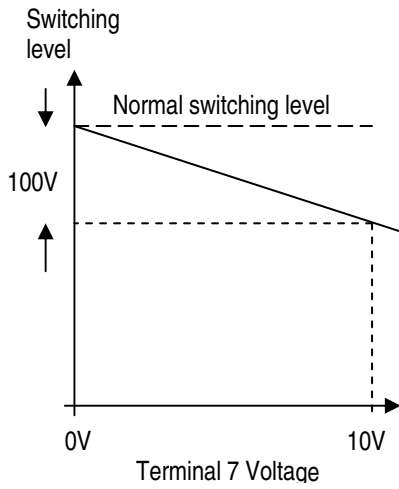


FIGURE 1
Turn On Dynamic Adjustment

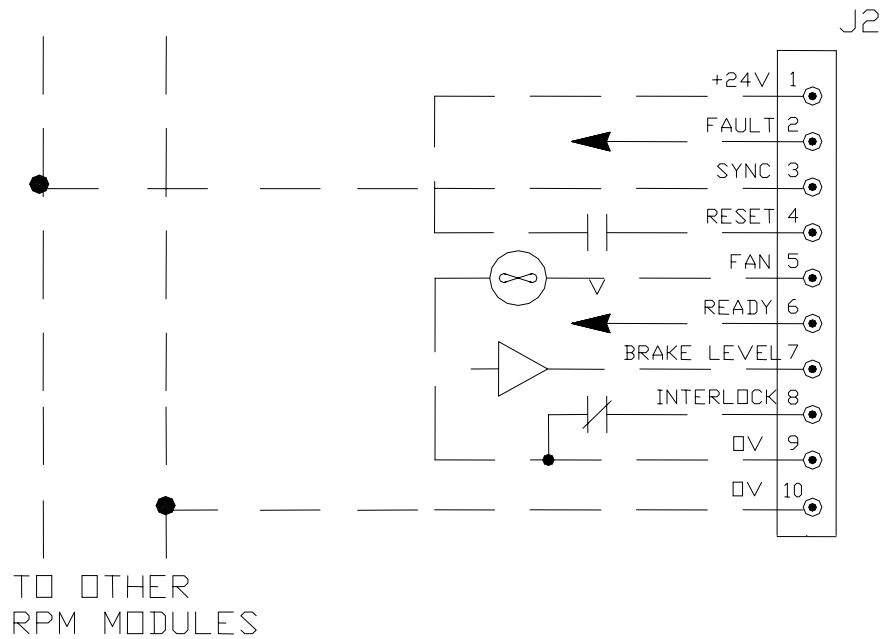


FIGURE 2
Synchronization Connection

Power Terminal Connections

L1+	DC Bus Positive
L2-	DC Bus Negative
R1+	Resistor Positive (Same potential as DC Bus Positive)
R2-	Resistor Negative (Switched Output)
R3+	Terminal must be connected to the external resistor whenever the separate mounted RPM panel with the required additional protective components is connected directly to the DC bus. See FIGURE 4 for example connections.

External Power Connection

An external 24V supply may be connected to the brake chopper at pins 1 and 10. The internal 24 and 15 volt power supplies of the brake chopper is derived from the main DC bus input and takes approximately 50ms to start up. If it is necessary for the brake chopper to be active within less than 50ms of applying the DC bus voltage an external power supply should be provided.

The external 24-volt DC supply is not needed on crane applications using the Responder DDC.

Synchronization

Synchronization equalizes the power dissipation in the braking resistors.

When two or more brake chopper modules are connected to the same DC bus they should be synchronized by linking together all of the SYNC signals on all modules and linking together a 0V common from each module. See FIGURE 2 for connection.

When the DC bus voltage exceeds the voltage threshold of any of the brake choppers the SYNC signal will turn all of them on. The DC bus voltage must fall below the voltage threshold of all choppers in order for the synchronized modules to turn off.

Resistor Sizing

The minimum connected resistor to the standard RPM module is 1 ohm. The resistor value can be greater than this but never lower. Use the following procedure to calculate the continuous current rating of the resistor chosen.

1. Tabulate all motion FLA

- ½ hour FLA for hoist motion
- 1 hour FLA for travel motions

2. Calculate Regen Current for simultaneous motion operation

$$I_{REGEN} = \left(\sum FLA_{HOIST} * .8 \right) + \left(\sum FLA_{TRAVEL} * .3 \right)$$

3. Size RPM Unit(s) and external resistors as close as possible to calculated value.

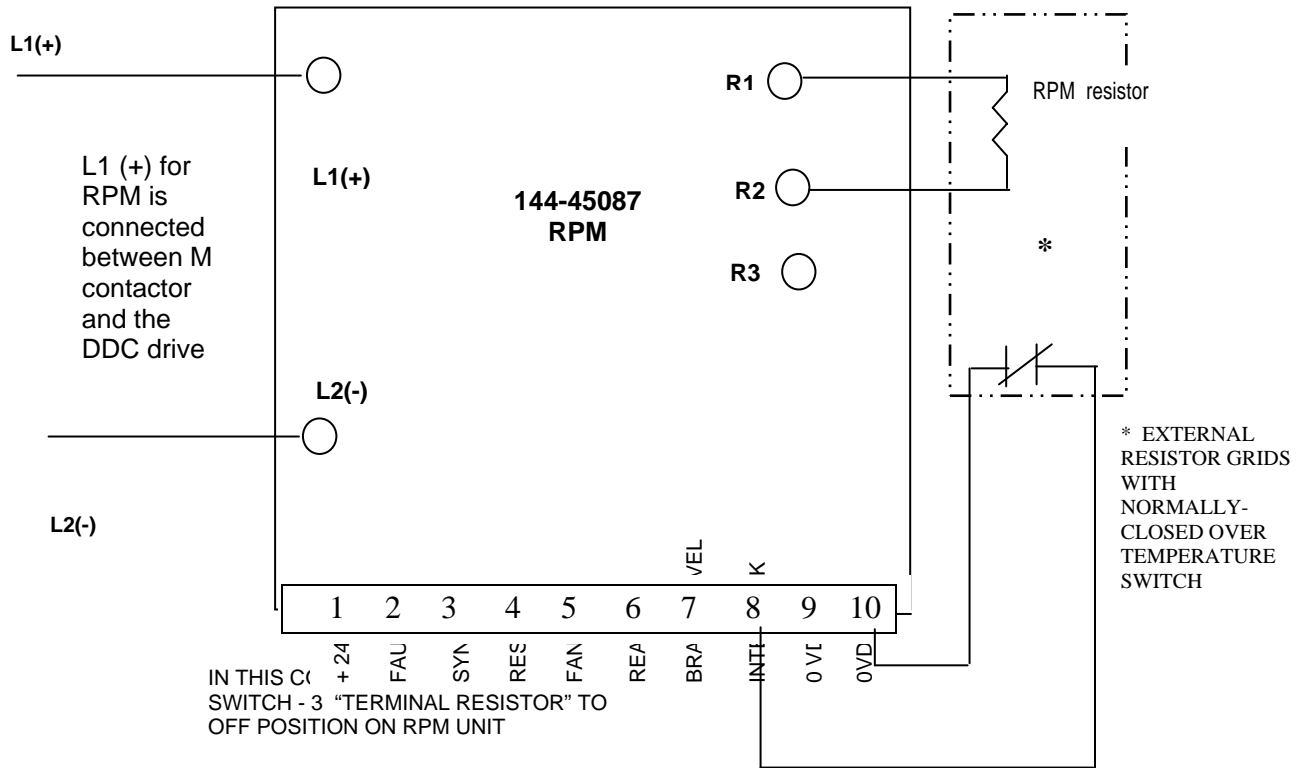


FIGURE 3
400 AMP Single RPM Unit

The connection shown in FIGURE 3 is a single 400 AMP RPM Unit that is connected to the DDC bus after the M contactor. This is the simplest connection possible and requires no additional protective components.

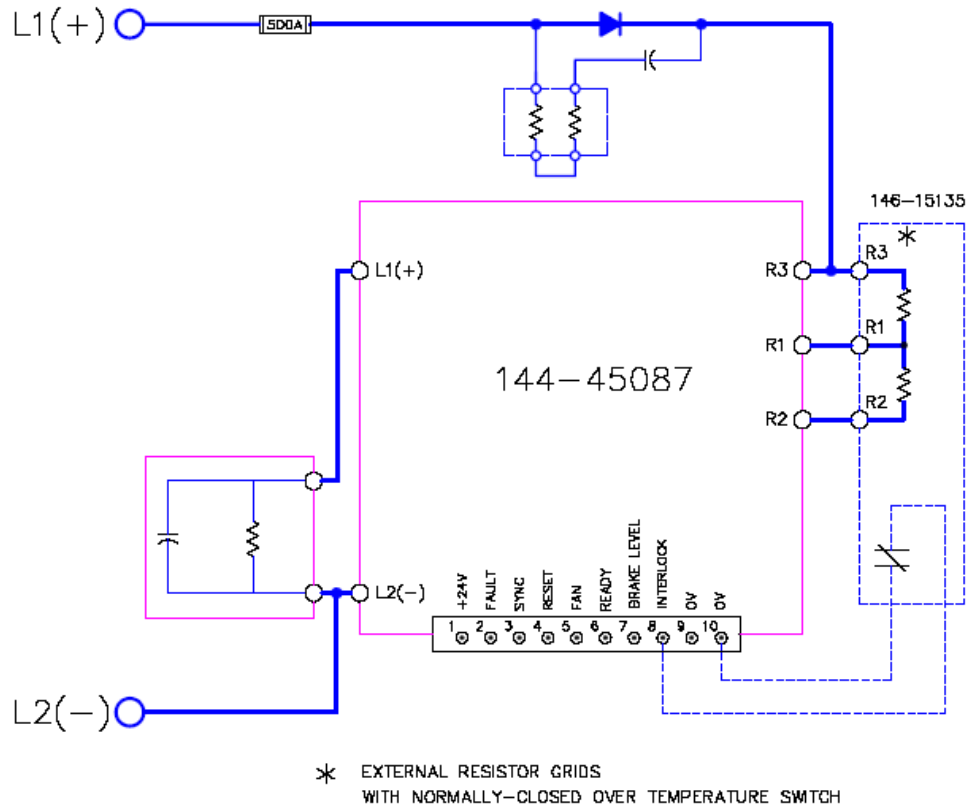


FIGURE 4

400 AMP 230-320V Common Bus RPM Panel

The connection in FIGURE 4 shows a separately mounted 400 AMP RPM Panel that is connected across the 230-320V. The panel is generally connected on the load side of the Manual Magnetic Disconnect Switch. Connections direct to the DC Bus require additional protective components that are included on the separately mounted RPM panel.



Warning Connecting the RPM Module directly to the DC Bus without the additional components shown above can result in damage to the RPM unit and other equipment on the common bus.

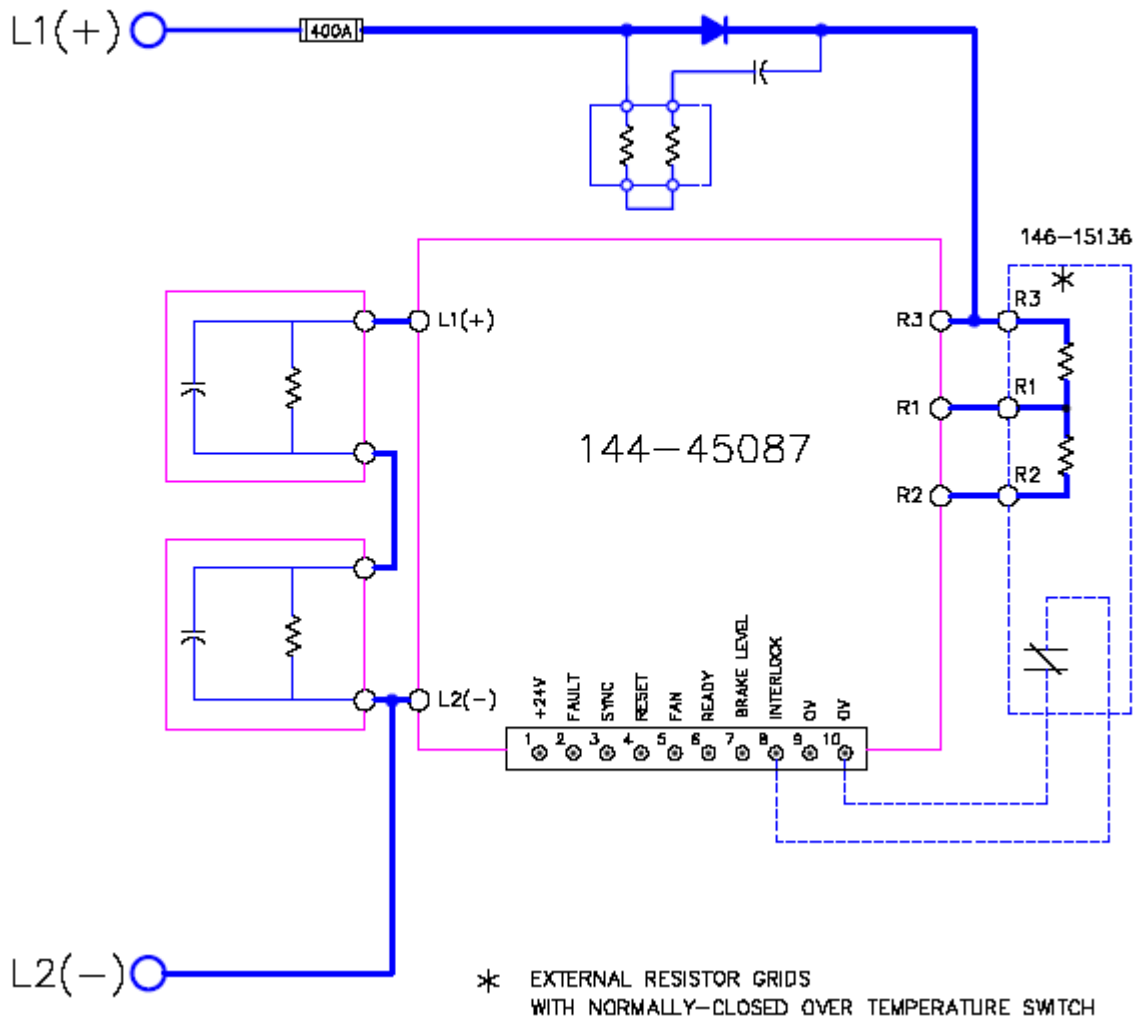


FIGURE 5

400 AMP 360-720V Separate Mounted

The connection in FIGURE 5 shows a separately mounted 400 AMP RPM Panel that is connected across the 360-720V. The panel is generally connected on the load side of the Manual Magnetic Disconnect Switch. Connections direct to the DC Bus require additional protective components that are included on the separately mounted RPM panel.

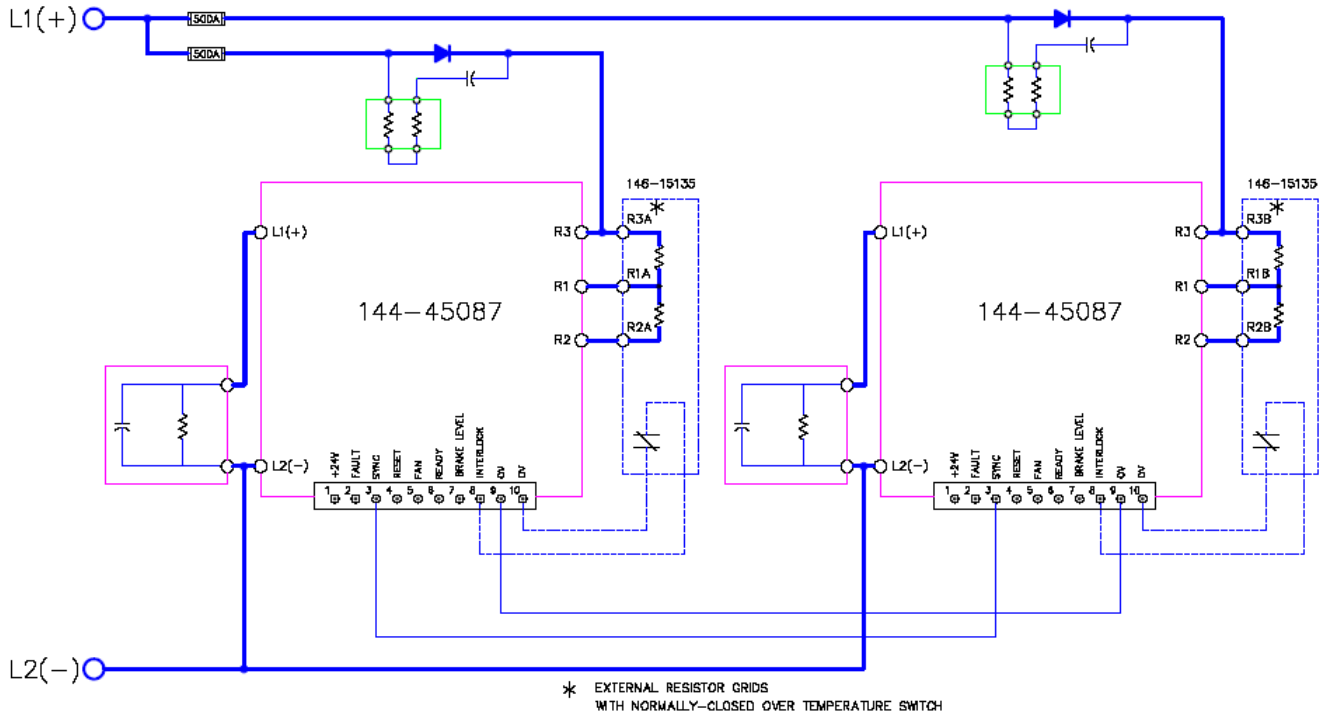


FIGURE 6

800 AMP 230-320V Separate Mounted RPM Panel

The connection in FIGURE 6 shows an 800 AMP RPM Panel that is connected across the 230-320V. The panel is generally connected on the load side of the Manual Magnetic Disconnect Switch. The Synchronization line is connected between both RPMs in order to have proper load sharing.

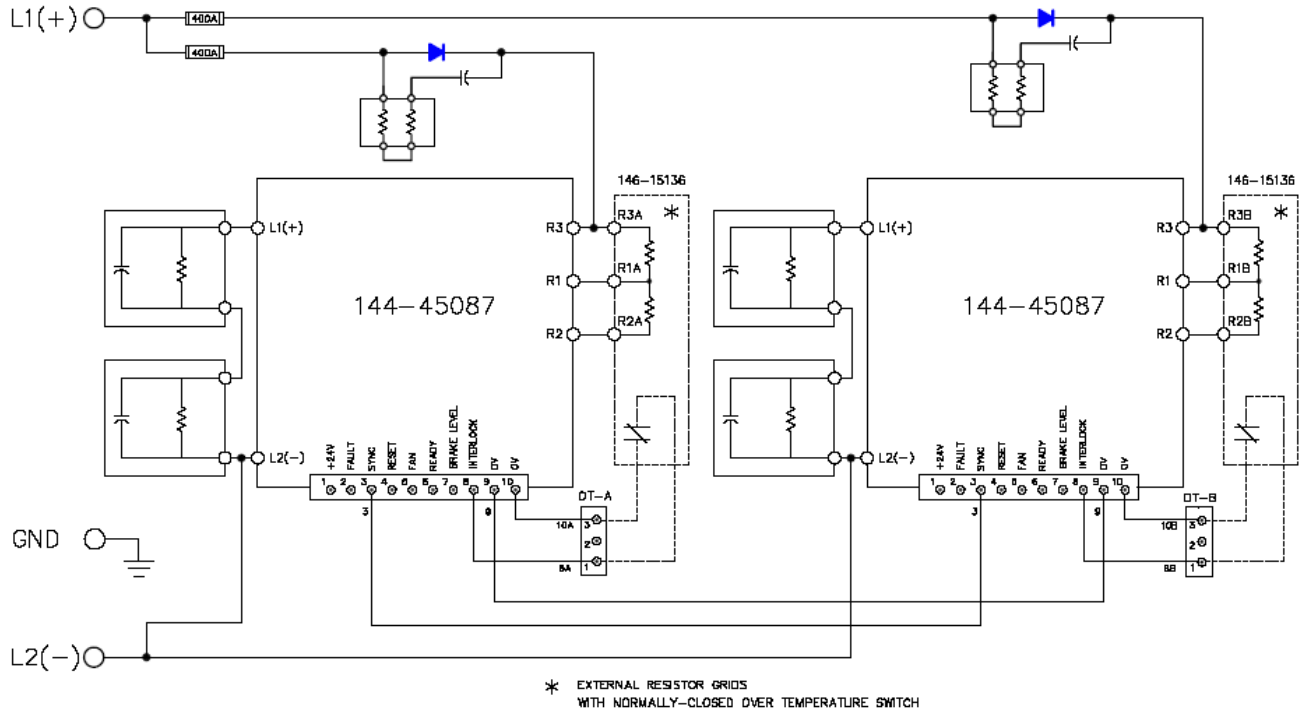


FIGURE 7

800 AMP 360-720V Separate Mounted RPM Panel

The connection in FIGURE 7 shows an 800 AMP RPM Panel that is connected across the 360-720V. The panel is generally connected on the load side of the Manual Magnetic Disconnect Switch. The Synchronization line is connected between both RPMs in order to have proper load sharing.

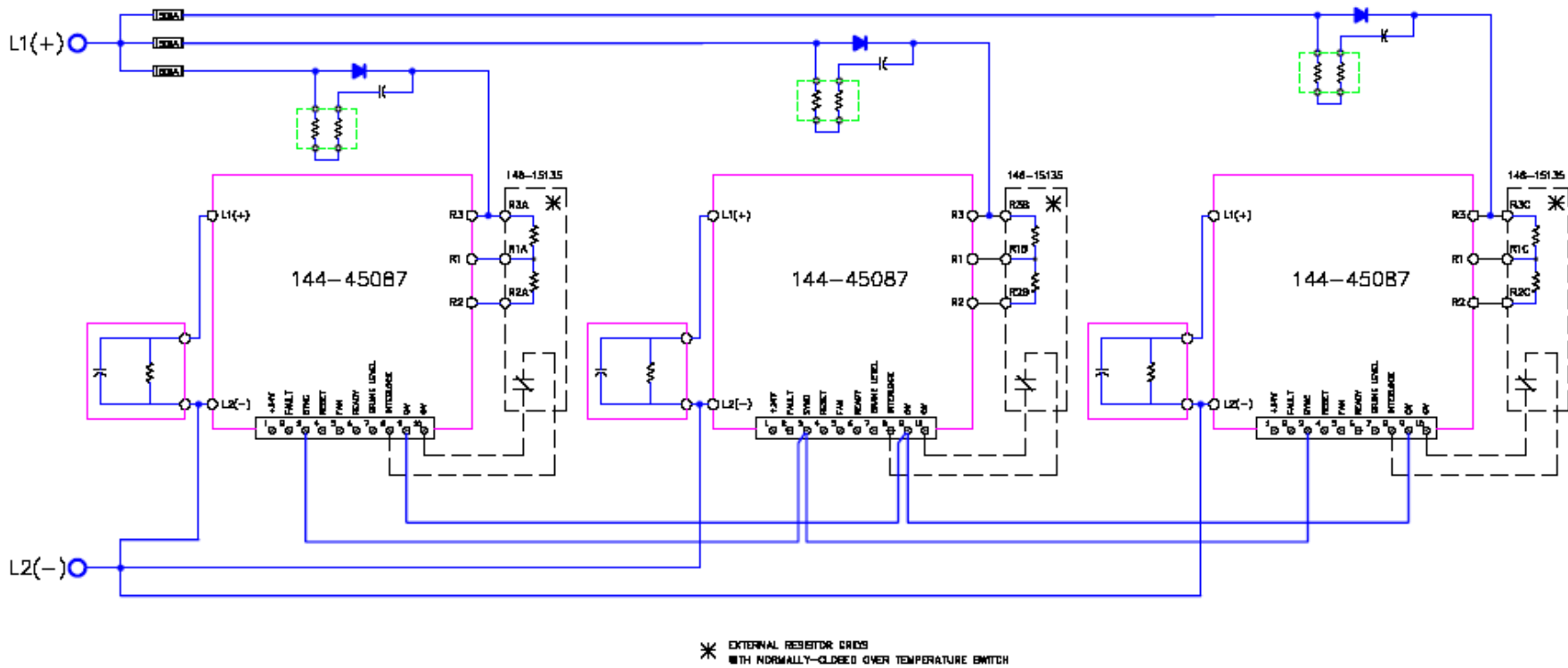


FIGURE 8
1200 AMP 230-360V Common Bus RPM Panel

The connection in FIGURE 8 shows an 1200 AMP RPM Panel that is connected across the 230-360V. The panel it is generally connected on the load side of the Manual Magnetic Disconnect Switch. The Synchronization line is connected between both RPMs in order to have proper load sharing.

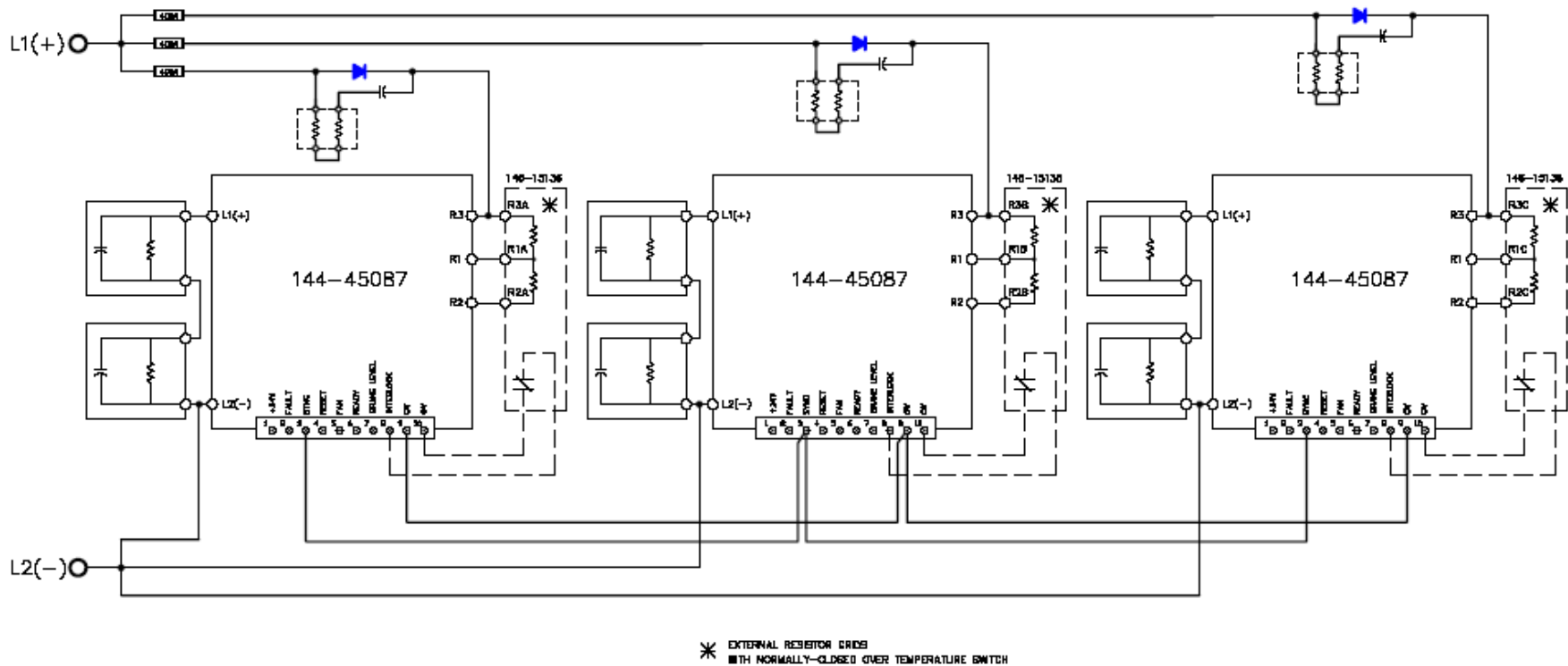


FIGURE 9

1200 AMP 360-720V Common Bus RPM Panel

The connection in FIGURE 9 shows an 1200 AMP RPM Panel that is connected across the 360-720V. The panel it is generally connected on the load side of the Manual Magnetic Disconnect Switch. The Synchronization line is connected between both RPMs in order to have proper load sharing.

Troubleshooting

Taking the following measurements can check the transistor and diode.

Q1	POSITIVE PROBE	NEGATIVE PROBE	READING
DP	R2	L1	.312
DN	L2	R2	.312
QP	L1	R2	> .6
QN	R2	L2	> .6

TRANSISTOR AND DIODE CHECK USING D.M.M. SET ON DIODE SCALE

FIGURE 10

If the Green POWER indicator light on the front cover is out make the following checks.

1. Check for the supply voltage between L1+ and L2-
2. If the supply voltage is present replace the entire RPM unit.

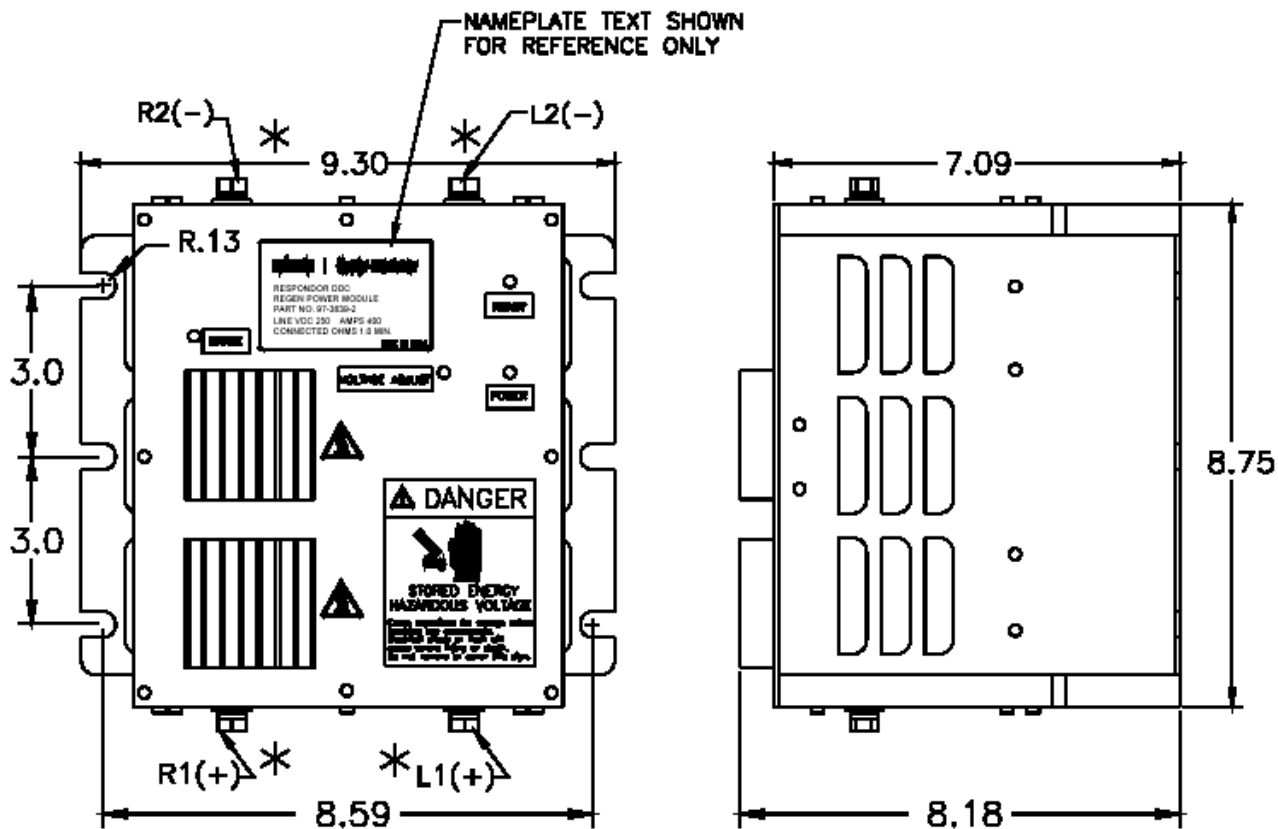


FIGURE 11
Dimensions 400 AMP RPM Unit