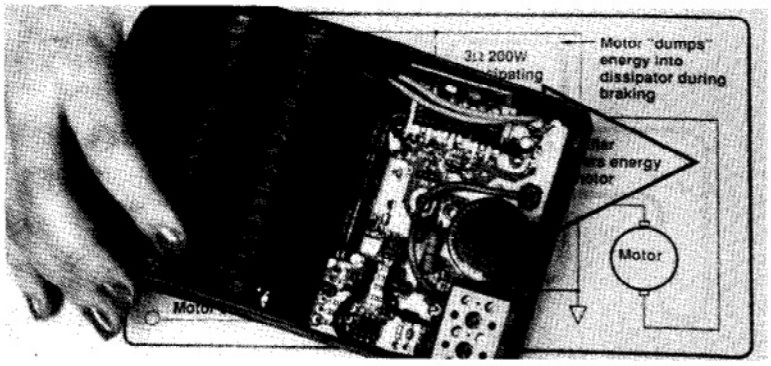
## MODEL 121
**Peak Current 50A @ 150V**
**Single Pulse: 1200 Joules**

### FEATURES
- **Parallel operation: up to 3 units**
- **Small size.**

### PRODUCT DESCRIPTION
The Reverse Energy Dissipator Model 121 is a switching shunt regulator which limits the rise in power supply voltage to a safe value during motor braking. When a motor is decelerated by a switching servo amplifier, energy is transferred from the motor to the power supply causing an increase in voltage. In high power systems it may be impractical to use sufficient capacitance across the supply to absorb this energy without causing an power voltage condition. Model 121 can be used to dissipate this energy when the voltage reaches a set limit.

Each Model 121 shunt regulator operates by switching a resistive load across the power supply whenever the voltage rises to a set trigger level. When the voltage drops by 2% the load is opened. In conjunction with the power supply output capacitor which must be over a specified value, the regulator oscillates in the frequency range from 100 to 5 kHz, producing a pulsewidth modulated load equivalent to an extremely high power zener diode. The peak current capability of the Model 121 is 50A @ 150V.

Under normal forward running conditions the Model 121 is inoperative. Only when braking action runs up the power supply voltage does the regulator come into operation, maintaining the power

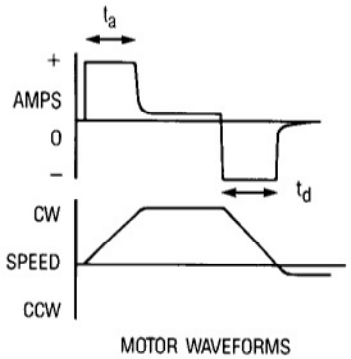



supply voltage within ±1% of the set operating voltage. Each dissipator is intended for intermittent duty operation only. The Model 121 can dissipate 200 W average up to A peak and can dissipate 1200 Joules during a motor reversal. To absorb 1200 Joules using a capacitor alone and allowing a power supply voltage rise from 120 V to 150 V would otherwise require 300,000 uF.

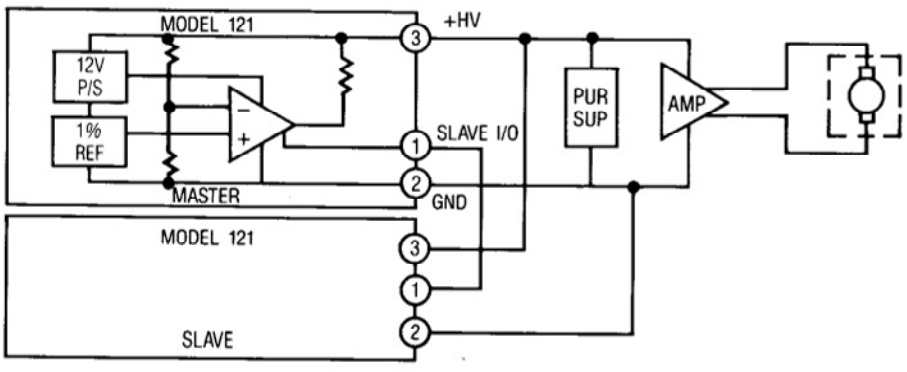
The minimum power supply output capacitor required is determined primarily by the high frequency ripple currents of the servo amplifiers. It is important to note that the duty factor of the braking energy dissipation must be very low—no more than 1.67% since the peak power dissipated in the Model 121 is up to 7.5 KW. Therefore, these units should never be used for continuous shunt regulation of a power supply. They may be used only to dissipate energy fed back into the power supply during occasional motor reversals. In very high power systems requiring more than 50 A peak current capability, up to three Model 121 units can be paralleled for simultaneous operation. By connecting the PARALLEL terminals of the units together all the power transistor drive signal occur simultaneously and are controlled by the unit having the lowest voltage setting. Whenever a unit draws current, a CURRENT LED on the circuit board lights and its apparent brightness is proportional to the average current drawn.

### CALIBRATION
Normally, Model 121 operates at 160 V and is factory set. However, a VOLTAGE adjustment permits a trip range from 75 to 160 V. Trip levels other than 160 V can be provided. Contact factory for ordering information. This setting is generally made at minimum power supply loading at nominal line voltage. A high line voltage condition must not cause continuous high power dissipation in the Model 121.

### FUNCTIONAL DIAGRAM - MODEL 121



MOTOR WAVEFORMS



# KEY SPECIFICATIONS

Typical at 25 C. Shunt capacitance 4000 $\mu$F (Model 121).

| MODEL | 121 |
|---|---|
| **PEAK CURRENT** | 50 A @ 150 V |
| **PULSE (Note 1)** | 1200 J |
| **MAXIMUM DISSIPATION** | 200 W |
| Measurement interval | 10 S |
| **OPERATING VOLTAGE** | 150 |
| Trip point | 160 (Note 2) |
| Stability | 1% |
| **PARALLEL OPERATION** | 3 units max |
| **QUIESCENT CURRENT** | 40 MA |
| **MINIMUM SUPPLY CAPACITOR** | 4000 uF |
| **THERMAL REQUIREMENTS** | |
| Forced air | 100 fpm |
| Temperature | 0° to 60° C |
| Storage | −30° C to 85° C |

**NOTES:**

1. This unit may be damaged if the single pulse energy rating is exceeded in the measurement interval. The maximum time that the peak current may be applied is obtained as follows:

$$t = \frac{1200 \text{ joules}}{(5 \text{ amp})(150 \text{ volts})} = \frac{1200 \text{ watt-sec}}{7500 \text{ watts}} = 160 \text{ msec}$$

   Thus a system having 1200 joules of kinetic energy may be stopped in 160 msec drawing peak current without damaging the unit. This may be done every 10 sec or more. Additional capacity may be obtained by paralleling units. This is done by connecting the slave I/O pins together as shown on the functional diagram.

   The kinetic energy, K, of a motor driven system may be calculated as follows:

   K (joule) = ½ J$\omega^2$ (1.356 Joule/lb-ft)

   J = lb-ft-sec, system inertia as seen by the motor shaft.

   $\omega$ = rad/sec, angular velocity.

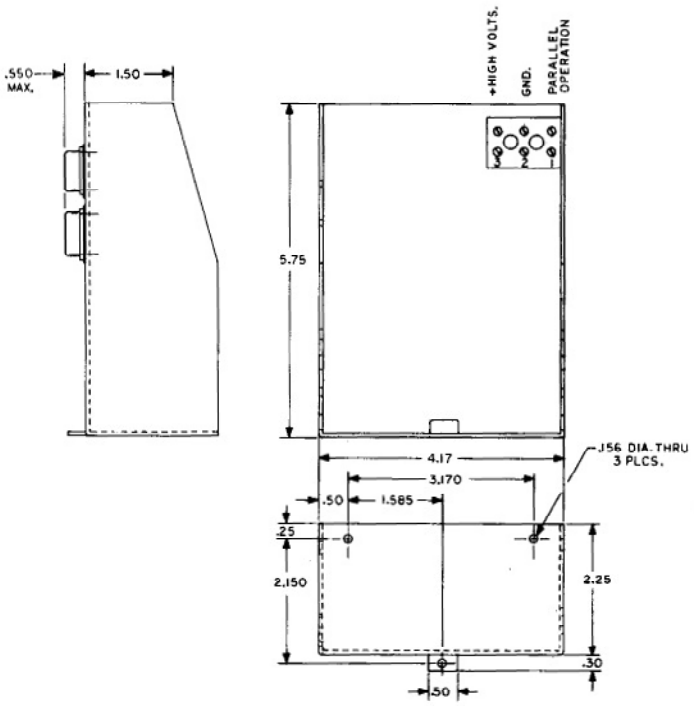
   If the value of J is not known, an estimate for K may be obtained from the product of the peak serve amplifier current, the supply voltage, and the deceleration time $t_d$. See the motor waveforms diagram. The value of $t_d$ should note exceed 160 msec per unit.

2. The trip point has been set to be between the highest HV voltage (155V) and the over voltage cutout point of the amplifier (165V). Consult factory for units with other settings.

   This unit has neither overtemperature or maximum pulse width protection. If the HV voltage exceeds the trip point either during turn-on or during a line voltage surge and the ratings are exceeded, then catastrophic damage will result

3. For parallel operation, consult factory

# OUTLINE DIMENSIONS
## DIMENSIONS IN INCHES




**NOTES:**

1. The Reverse Energy Absorber should be placed between the amplifier and the motor power supply. Connections should be made as close to amplifier as possible.
2. Trip voltage is preset at the factory. This is not adjustable by user.
3. This is an optional connection for future use—DO NOT CONNECT ANYTHING HERE OR DAMAGE TO THE UNIT WILL RESULT. Consult factory for parallel operation.