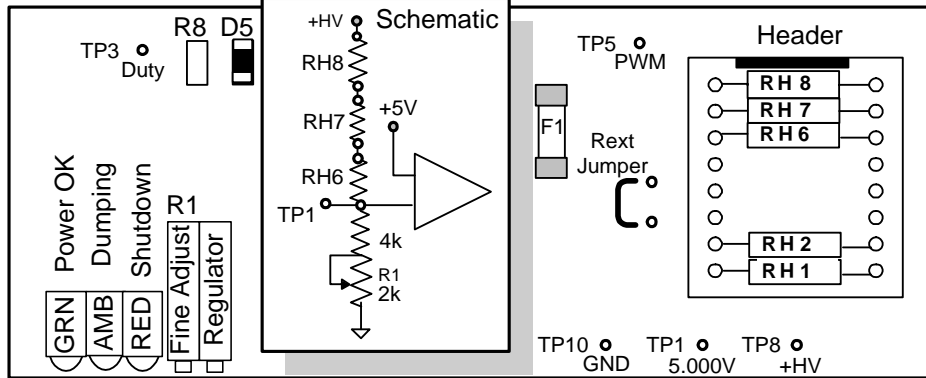


PWM REVERSE ENERGY DISSIPATOR

SIGNAL BOARD AND HEADER SOCKET LAYOUT



The header socket holds the resistors that set the voltage trip point. Typically RH8 is a short, RH6 and RH7 are calculated and verified to dissipate less than ¼ Watts (typical rating). The fine adjust potentiometer can be used in conjunction with the test points TP10, TP8, and TP1 to fine tune the voltage trip point. The regulator potentiometer is factory set and should not be adjusted.

FORMULA

The values of RH6, RH7, and RH8 can be determined from the below equation. For the best accuracy use 1% resistors and, if the power dissipation over the selected resistors is OK then use the 0Ω resistor installed in RH8.

$$RH6+RH7+RH8 = V_{trip}-5 = R \text{ total k}\Omega$$

Remember to check the watts in each resistor.

TRIP VOLTAGE AND RANGE

Model	Trip (V)	Range (V)	For use with	RH6, RH7, RH8 (Ω)
145	375	390	5424,742X	124k, 124k, 124k
145	220	229	432,5321	
125	187	194.5	5224,722X	0, 90.9k, 90.9k
125	174	181	Accelus ASx-180-xx, Junus JSP-180-xx 421,422,423,5211,5221,5231,513	53.6k, 57.6k, 57.6k
125	158.5	165	312,314,315,240,241	0, 76.8k, 76.8k
125	123	128	4212	39.2k, 39.2k, 39.2k,
125	94	98	303B,306B,306AB	
125	87	90.5	Accelus ASx-090-xx, Junus JSP-090-xx 412,413,4122,4113,5121,5131,	0, 41.2k, 41.2k
125	79	82	303,306,306A	0, 36.5k, 36.5k
125	50	52	Acceuls ASx-055-xx, 403,405,503,505	0, 22.6k, 22.6k

Note:

- 1) RH6, RH7 and RH8 are 1% ¼ Watt resistors.
- 2) Default values of RH7 and RH8, for the Model 145 and 125, are in bold and italic.

PWM REVERSE ENERGY DISSIPATOR

USING THE EXTERNAL RESISTOR: MODEL 125X & 145X

The 125 and 145 can be configured to operate with an external resistor for dissipation of larger amounts of energy. The "X" option specifies that an external resistor will be used to dissipate the energy. The **internal resistor is removed** from the circuit, the **Rext Jumper is installed**, and the **F1 fuse** may be removed and replaced with a jumper. **C5** changed for 3.3kHz, **R8 removed** and **RH2 installed** for variable peak time.

EXTERNAL RESISTOR SELECTION

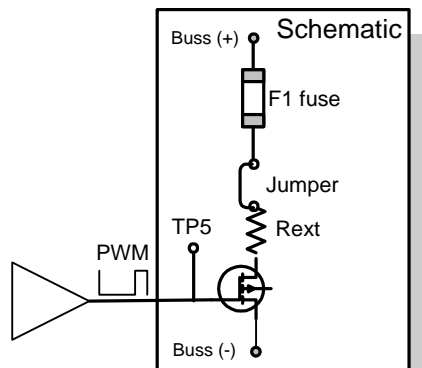
The value of R_{ext} should be chosen to limit the worst case instantaneous current. Not to exceed the dissipater's peak rating of 30 Amps.

$$R_{ext} \geq V_{max}/I_{peak}$$

The Watts rating of the resistor should be able to handle the rms. current.

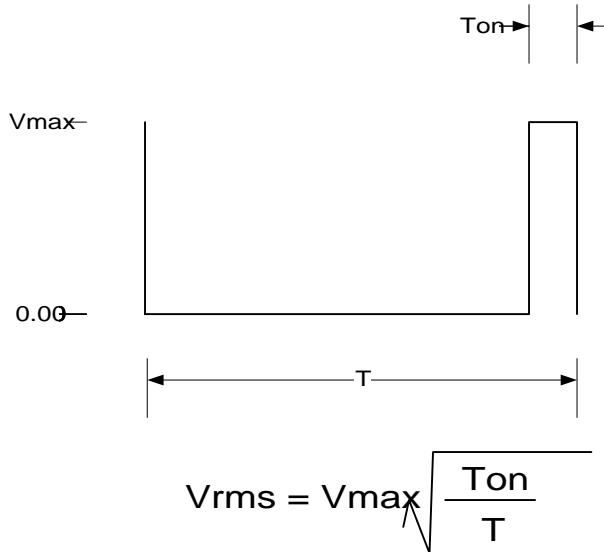
$$R_{ext} \text{ Watts} = I_{rms}^2 * R_{ext}$$

Suggested source: OHMITE www.ohmite.com "Powr-Rib Series"



METHOD FOR LIMITING THE PWM DUTY CYCLE.

Use the formula derived from the rms voltage of a PWM waveform to calculate the Irms limiting Duty cycle:



Rearranging:

$$T_{on} \text{ (duty cycle \%)} = (I_{rmsA} * R_{ext} / V_{max})^2 * 100\%$$

1. Remove R_{ext} from circuit. (Temporary removal of D5 will defeat the foldback circuit if required.)
2. Adjust the voltage to simulate trip voltage.
3. Monitor TP5 for proper duty cycle %
4. Adjust RH1 for proper duty cycle %

Proper selection of the duty cycle will insure limiting of the rms current protecting both the FET and the R_{ext} .

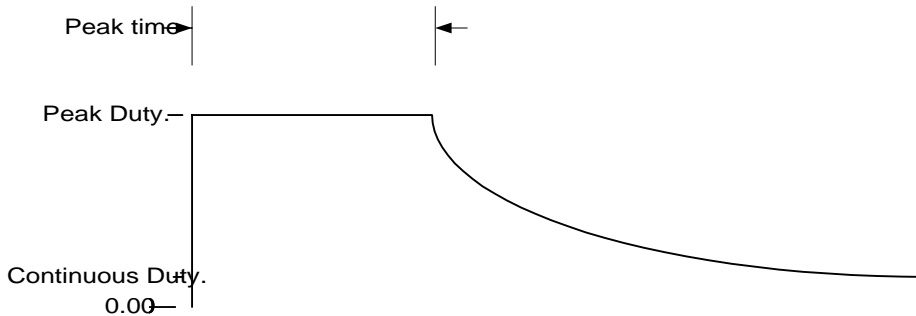
Table values for RH1 to limit the Duty cycle.

RH 1 in Ohms	Duty Cycle %
15k	85%
10k	75%
6.8k	65%
4.7k	55%
3.3k	40%
2.2k	25%
1.5k	10%
1.4k	9%
1.27k	5%
1.21k	4%

PWM REVERSE ENERGY DISSIPATOR

INCREASING THE PEAK TIME

After removing R8, by increasing the peak time resistor RH2 from 177k Ohms, the peak time can be extended beyond the 200ms default. The peak time will be extended if the pwm duty cycle is less than 100%. Also, the peak time will be inversely proportional to the value of RH1 if used. After the peak time has expired the pwm duty cycle will fold back to the continuous pwm limit set by D5, about 2% duty cycle.



5. Remove Rext from circuit (**R8 is removed and RH2 is initially set to 177k Ohms**)
6. Adjust the voltage to simulate trip voltage.
7. Monitor TP3 for peak time.
8. Adjust C15 for proper peak time.

Table values for RH2 to extend peak time.

Model 125 & 145	
RH2	Time
177k Ω	0.2s
249k Ω	0.3s
350k Ω	0.4s
470k Ω	0.5s
680k Ω	0.8s
1M Ω	1s
1.5M Ω	1.5s
2.2M Ω	3s
2.3M Ω	5s
6.8M Ω	10s

Model 125X & 145X	
RH2	Time
178k Ω	0.2s
301k Ω	0.3s
402k Ω	0.4s
499k Ω	0.5s
806k Ω	0.8s
1M Ω	1s
1.5M Ω	1.5s
3M Ω	3s
4.99M Ω	5s
10M Ω	10s

FUSE SELECTION

The default fuse is a 6A (model 145) or 10A (model 125) slow blow fuse. If longer than 200ms-peak time is required, the internal fuse can be replaced with a jumper and an external fuse must be used line with the external resistor. (This is not for UL compliance but for fail safe operation in the event of equipment failure.)

Suggested source: Bussmann "Time-Delay Class G Fuse" type: SC-30

Rev: 2 12/1/99