Selecting a diversion load for the TriStar is not difficult or complicated, but some simple rules must be strictly followed to prevent damage to either the TriStar control or the battery.

The TriStar will handle load current safely up to its rating, but will limit and then reduce current if too much is being drawn. The most important rule is to NOT put too high a load on the control!

1) Compute minimum load resistance that will not exceed the TriStar's rating.
(note: if not using equalize, use Vreg instead)

$$Vb_{MAX} = V_{EQ} + TC \times \left(25°C - Tb_{MIN}\right)$$

$$R_{MIN} \geq \frac{Vb_{MAX}}{60A}$$

Note: Article 690.72(B)(2)(1) of NEC 2002 requires that "The current rating of the diversion load shall be rated at least 150 percent of the current rating of the diversion charge controller." Therefore, the chosen load must be capable of handling 60A*150%=90A (45A*150%=67.5A for the TS45). This does NOT mean that the load must draw this amount of current. It simply means that the load must be rated to handle the current without damage. The NEC minimum power dissipation capability of the load is then the product of the maximum possible battery voltage and 150% of the TriStar limit.

Select a load resistance R larger than Rmin.

Compute the maximum current draw of the load.

$$I_{MAX} = \frac{Vb_{MAX}}{R}$$

Compute the minimum current draw of the load.

$$I_{MIN} = \frac{Vb_{MIN}}{R}$$

2) Minimum current draw

$$V_{MIN} = Vb_{MIN} - TC \times \left(Tb_{MAX} - 25°C\right)$$

$$I_{MIN} = \frac{Vb_{MIN}}{R}$$

3) Maximum charge current

$$I_{CHARGE} \leq \frac{I_{MIN}}{DeratingFactor}$$

Diversion Load Example and Worksheet

	Design Parameters	Example	Worksheet
1	System Voltage	24V	
2	TriStar current limit (45A or 60A) **I_{LIMIT}**	60A	
3	Highest battery voltage setpoint **Vb_{MAX}** (usually V_{EQ})	30.2V	
4	Lowest battery voltage setpoint **Vb_{MIN}** (usually V_{FLOAT})	17.4V	
5	Maximum battery temperature **Tb_{MAX}**	55°C	
6	Minimum battery temperature **Tb_{MIN}**	-20°C	
7	Temperature compensation **TC** (use zero if no RTS is connected) $12V \Rightarrow TC = 0.030\frac{V}{°C}$ $24V \Rightarrow TC = 0.060\frac{V}{°C}$ $48V \Rightarrow TC = 0.120\frac{V}{°C}$	$0.060\frac{V}{°C}$	
	Calculations		
8	Compute maximum temperature compensated battery voltage. $V_{MAX} = Vb_{MAX} + TC \times (25°C - Tb_{MIN})$	$= 30.2V + 0.060\frac{V}{°C} \times (25°C - (-20°C))$ $= 30.2V + 0.060\frac{V}{°C} \times 45°C$ $= 30.2V + 2.7V$ $V_{MAX} = 32.9V$	

9	Compute minimum temperature compensated battery voltage. $V_{MIN} = Vb_{MIN} - TC \times \left(Tb_{MAX} - 25°C\right)$	$= 27.4V - 0.060\frac{V}{°C} \times \left(55°C - 25°C\right)$ $= 27.4V - 0.060\frac{V}{°C} \times 30°C$ $= 27.4V - 1.8V$ $V_{MIN} = 25.6V$	
10	Compute minimum resistance $R_{MIN} \geq \frac{V_{MAX}}{I_{LIMIT}}$	$\geq \frac{32.9V}{60A}$ $R_{MIN} \geq 0.55\Omega$	
11	NEC required load rating $P_{LOAD} \geq Vb_{MAX} \times 1.5 \times I_{LIMIT}$	$\geq 32.9V \times 1.5 \times 60A$ $P_{LOAD} \geq 2961W$	
12	Select a load, **R**, with resistance larger than R_{MIN} and power rating greater than P_{LOAD}	Ten 300W 6.3Ω resistors could be paralleled to result in a 0.63Ω 3000W load. R = 0.63Ω	
13	Compute current draw at maximum voltage $I_{MAX} = \frac{V_{MAX}}{R}$	$= \frac{32.9V}{0.63\Omega}$ $I_{MAX} = 52.2A$	
14	Compute current draw at minimum voltage $I_{MIN} = \frac{V_{MIN}}{R}$	$= \frac{25.6V}{0.63\Omega}$ $I_{MIN} = 40.6A$	
15	Compute maximum safe charging current from PV,wind,hydro. $I_{CHARGE} \leq \frac{I_{MIN}}{DeratingFactor}$	Using a 130% derating factor. $\leq \frac{40.6A}{130\%}$ $I_{CHARGE} \leq 31.2A$	