B-5 Battery Bank Sizing Worksheet

Complete the steps below to determine the battery bank size required to power your AC loads:

1. Determine the daily power needed for each load.

a) List all AC loads required to run
b) List the watt-hours for each load (see Table C-1 for common loads/wattage)
c) Multiply by how many hours per day (or a fraction of an hour) each load will be used
d) Multiply by how many days per week you will use the listed loads
e) Divide by seven = **Average Daily Watt-Hours Per Load** (Total Power).

Average Daily Watt-Hours Per Load				
AC Load	Watt-Hours	(x) Hours per Day	(x) Days per Week	(÷7) = Total Power

2. Determine the total power needed each day for all the loads.

- Add all Average Daily Watt-Hours Per Load values = **Total Daily Watt-Hours**.

Total Daily Watt-Hours

3. Determine the battery Amp-Hour capacity needed to run all the loads before recharging.

- Divide Total Daily Watt-Hours by the nominal battery voltage of the inverter (i.e., 12, 24, or 48v); and then
- Multiply this by how many days the loads will need to run without having power to recharge the batteries (typically 3 to 5 days of storage) = **Storage Amp-Hours**.

(inverter battery voltage)
÷ ____ =

(days of storage)
x ____ =

4. Determine how deeply you want to discharge your batteries.

- Divide Storage Amp-Hours by 0.2 or 0.5 to get the **Total Amp-Hours**:
  a) 0.2 = Discharges the batteries by 20% (80% remaining), this is considered the optimal level for long battery life; or
  b) 0.5 = Discharges the batteries by 50% (50% remaining), this is considered a realistic trade-off between battery cost and battery life.

Total Amp-Hours

Additional compensation:

Low battery temperature: If the batteries are installed in a location that will be exposed to low temperatures, the output current will be less. In these instances, you will need to determine the lowest temperature the battery bank will experience and multiply the Total Amp-Hours by the multiplier below.

Temperature	80F/27C	70F/21C	60F/15C	50F/10C	40F/4C	30F/-1C	20F/-7C
Multiplier	1.00	1.04	1.11	1.19	1.30	1.40	1.59

Inverter efficiency: When the inverter is used in a back-up power application the inverter efficiency will not be a large concern; however, if the inverter is the primary AC source for the calculated load, the Total Amp-Hours should be multiplied by 1.2 to factor in an average 80% inverter efficiency.

B-6 Battery Wiring

The battery bank must be wired to match the inverter's DC input voltage. In addition, the batteries can be wired to provide additional run time. The various wiring configurations are:

Series Wiring

Wiring batteries in series increases the battery bank's output voltage. A series connection combines each battery in a string until the total voltage matches the inverter's DC requirement. Even though there are multiple batteries, the capacity remains the same. In Figure B-1 below, two 6 VDC, 200 AH batteries are combined into a single string resulting in a 12 VDC, 200 AH bank.

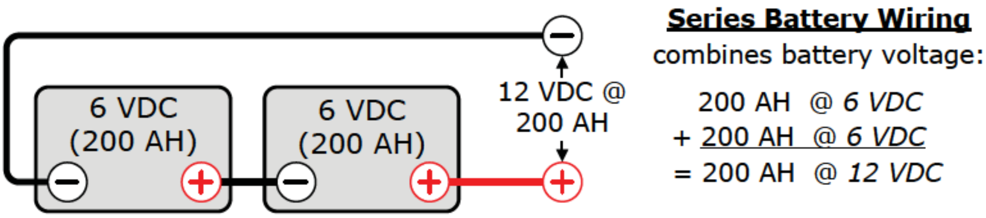

Figure B-1, Series Battery Wiring

Parallel Wiring

Wiring batteries in parallel increases the battery bank's amp-hour capacity, which allows the AC loads to operate for a longer time. A parallel connection combines the number of batteries in the string to increase overall battery capacity; however, the voltage remains the same. In Figure B-2 below, two 12 VDC, 100 AH batteries are combined into a single 12 VDC, 200 AH battery bank.

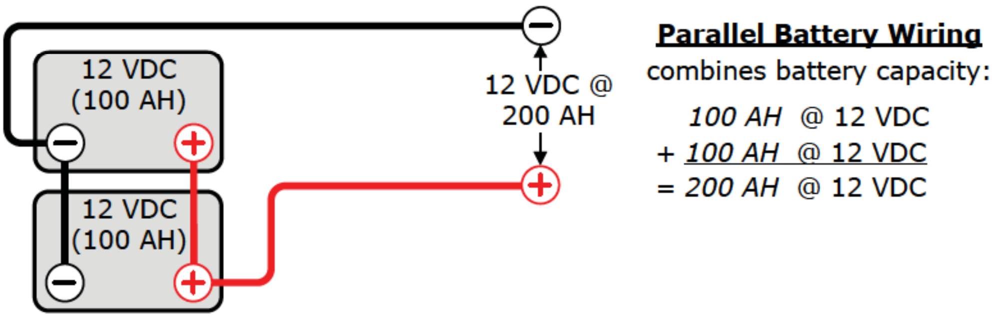

Figure B-2, Parallel Battery Wiring

Series-Parallel Wiring

A series/parallel configuration increases both voltage (to match the inverter's DC requirements) and amp-hour capacity (to increase run-time for operating the loads) using smaller, lower-voltage batteries. In Figure B-3 below, four 6 VDC, 200 AH batteries are combined into two strings resulting in a 12 VDC, 400 AH battery bank.

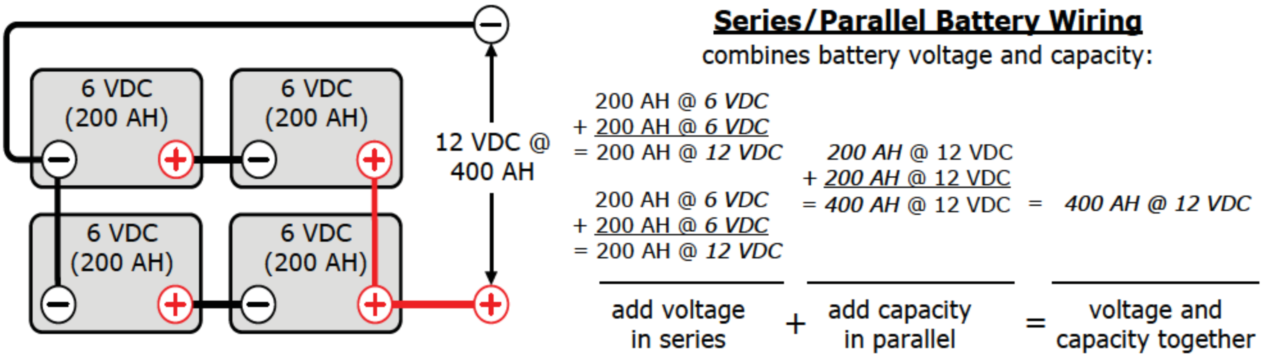

Figure B-3, Series-Parallel Battery Wiring

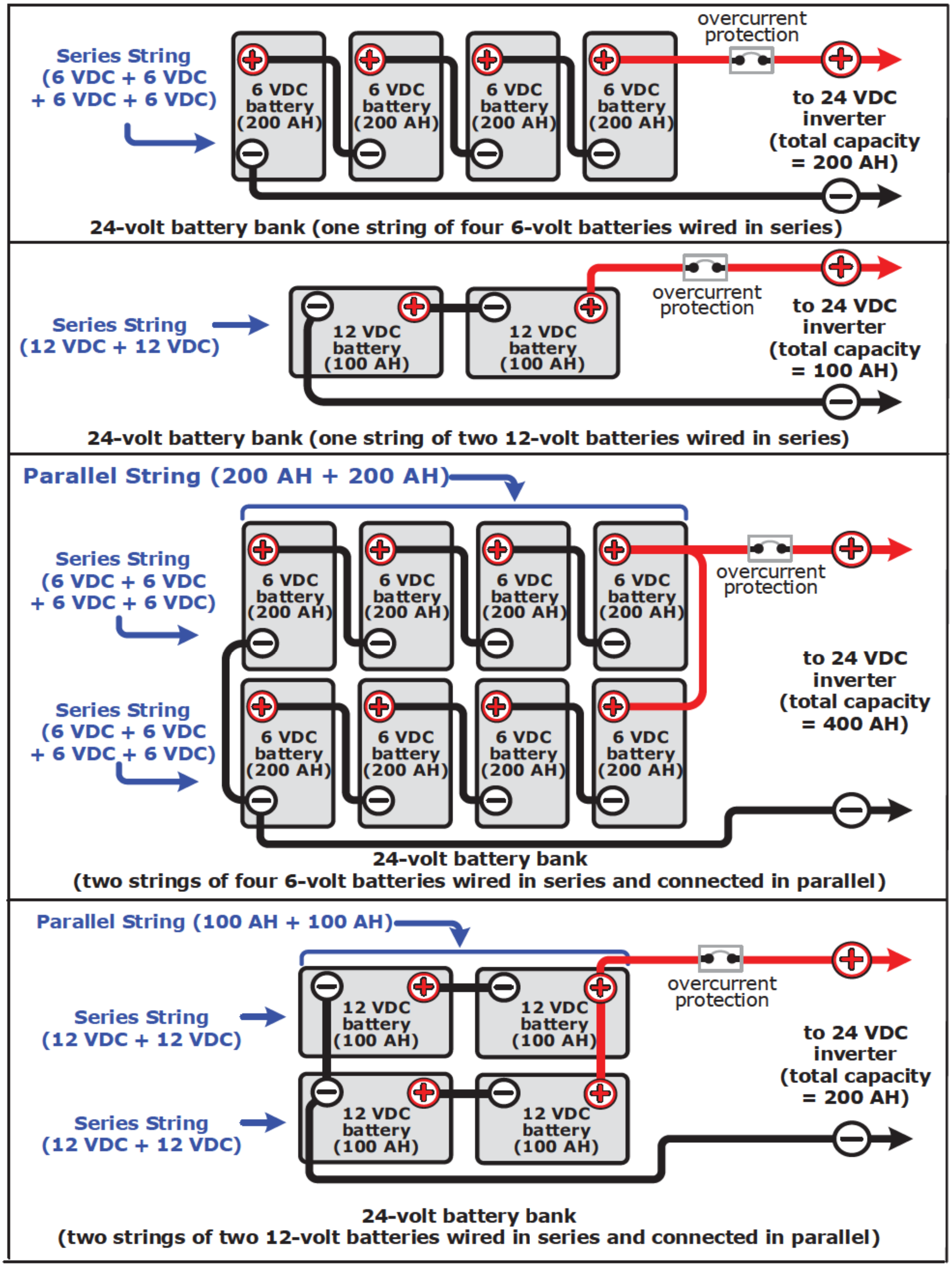

Figure B-4, Battery Bank Wiring Examples (24-volt)

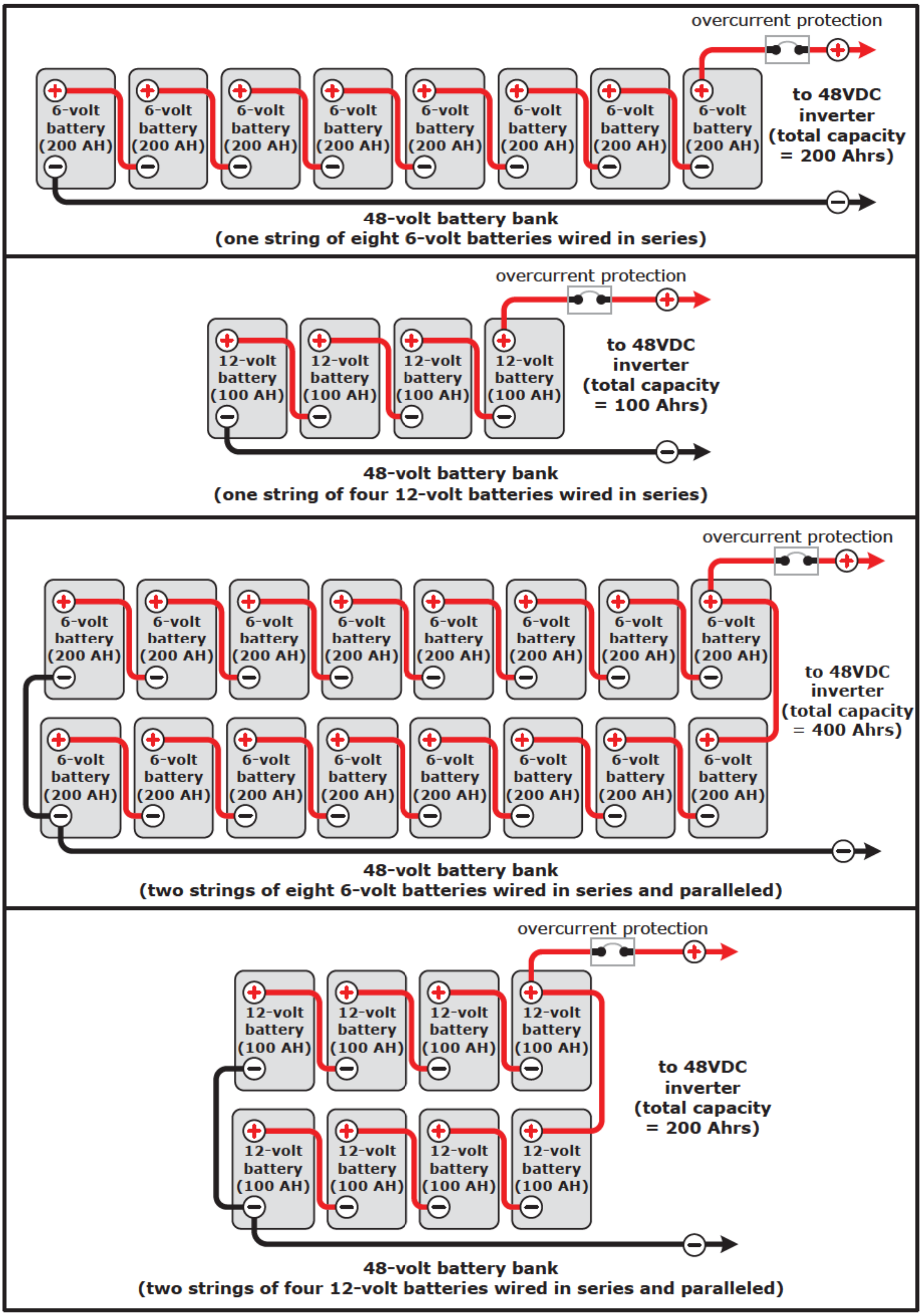

Figure B-5, Battery Bank Wiring Examples (48-volt)