

POWER BUDGET CALCULATIONS

POWER BUDGET CALCULATION NOTE

Remember this equation:

$$\text{POWER} = \text{CURRENT} * \text{VOLTAGE}$$

Keep the units uniform. If current is in milliamps, then power is in milliwatts.

The power budget is an analysis of how much power a data collection site requires. Analysis is required to determine how long a data recorder or Remote Telemetry Unit (RTU) will operate from the battery without recharging and what size solar panel (or charging source) should be used. The Model 8200A Data Recorder is used in the following example.

The 8200A's power requirements vary with the task it is performing. A power budget is determined by calculating how much time the 8200A spends in each of its tasks and how much power is used. The following list shows the power used by the 8200A in some typical tasks. Please note power consumption is approximate:

Quiescent (basic model):	0.25 mA
Transmitting GOES:	3500 mA
Quiescent GOES:	10 mA
Transmitting LOS:	2500 mA
Quiescent LOS:	30 mA
Telephone OFF HOOK:	50 mA
Measuring:	5-30 mA

To determine the power needed by a site, sum the power required by each of the tasks, taking into account the relative % of time dedicated to each task. A convenient way to do this is to make a table (or spreadsheet) listing each of the tasks, current consumption, and times.

Example: GOES 8200A collecting data every 15 minutes and transmitting once every 4 hours.

TASK	CURRENT	PERCENT TIME	AV. CURRENT
COLLECTING	30mA *	5 sec/900 sec =	0.2mA
(5 sec to collect data every 15 minutes)			
TRANSMITTING	2500mA *	45 sec/14400 sec =	10.9mA
(45 second transmission every 4 hours)			
QUIESCENT	10mA *	100% (always) =	10mA
TOTAL AVERAGE CURRENT =			21.1 mA
TOTAL AVERAGE POWER (current * 12VDC) =			253 milliwatts

NOTE - ADD IN THE POWER REQUIRED BY SENSORS.

It is necessary to estimate the amount of time spent collecting and transmitting data, as well as the power required for collecting data. It is best to obtain these numbers using actual measurements of power consumption for an operating 8200A. Once a value for the average consumption is determined, record it and use it as a reference when troubleshooting a station. A site that shows a marked change in power consumption warrants a closer look.

Once a station's average power usage is determined, two other important calculations should be made:

BATTERY LIFE AND SOLAR PANEL SIZE

BATTERY LIFE

Battery life is computed in two steps.

1. Compute the theoretical battery life. To do this, divide the battery capacity by the average power required by the 8200A, as follows:

THEORETICAL BATTERY LIFE

$$\text{Battery Capacity} / 8200 \text{ Average Current}$$

Example: Compute the theoretical battery life for a 24 amp-hr battery powering an 8200A with average power consumption of 50 mA.

THEORETICAL BATTERY LIFE

$$24000\text{mA-hr}/50\text{mA} = 480 \text{ hrs}$$

2. Compute the actual battery life. Since it is not possible to use 100% of any battery the actual life will be less. We recommend planning on using 75% of the capacity of a battery. This reduces the theoretical life by 25%. In our example, the 480 hrs duration would become $480 * 0.75 = 360$ hours.

SOLAR PANEL SIZE

The size of the solar panel needed for the site depends on both the average power needed and the location of the site. Generally, use a panel that provides at least 10 times the average power needed.

Example: Size a solar panel for a site with average current of 50 mA

POWER NEEDED

$$10 * (\text{current} * \text{voltage}) = 10 * (50\text{mA} * 12 \text{ volts}) \\ = 6000 \text{ mWatts (6 Watts)}$$

The minimum size panel should have an output of at least 6 Watts. A standard 9-Watt panel will work great for this example site.

Note that the internal charger in the 8200A has a maximum output of 0.75 amps or 9 Watts. If a panel larger than 9 watts is used with the 8200A an external regulator is required. The 8210 can accommodate panels up to 20 Watts.

Sutron offers a Microsoft Excel Power Budget Spreadsheet that computes power consumption, 15 day reserve, and required solar panel size. Contact Customer Service for a copy. (703)406-2800.