Can you hear me now? or, Power For Your Intercom System

by Dick Ray WM M9 #67

Maybe it was the previous booming economy that was responsible for some of the motorcars that I see resembling rolling electronic shows. I see boom boxes, GPS units, radios, cell phones, and intercom units. Several years ago I did get an intercom system and scanner so I could have conversations with my passenger, and to know that the cars ahead are stopping for a major road crossing. After extensive usage I have decided that it is the second best accessory that a person can have on a motorcar. The most valuable accessory is the windshield, of course.

Prior to buying one I had noticed several intercom systems where the owner paralleled several 9–volt transistor radio batteries to get through a long day. Evidently aircraft intercoms do not have a big enough internal battery capacity, because they are intended to run from the aircraft 12–volt battery. This article addresses how much battery capacity is needed and how to best attain that capacity. I have no data on anything but my Flitecom intercom unit and Radio Shack scanner, but there is no reason to believe that a Sigtronics intercom or other scanners will be any different.

The Flitecom unit accepts a 9–volt transistor radio battery inside. There is a jack on the side for an external battery which should be a nominal 12–volt source. You can power your system from the motorcar battery, but I chose to totally isolate my system from the car. This is so that it can be used in other cars when I am riding with someone else. In addition any electrical noise originating from the vehicle power source is eliminated. Finally, my motorcar has a 6–volt electrical system.

I measured the drain of my two–person Flitecom system and found that it draws about 30 mA independent of volume or squelch. It does not draw more when someone is talking which was a bit of a surprise. Probably the four person units will draw a bit more current. Then I investigated the capacity of common batteries to see which external battery system would provide enough capacity for a long trip, or to last a full season of day trips. I expected to package a set of eight battery cells in series to provide the 12 volts. Several local electronics stores carry battery holders so the work would be only in mounting the system. You need eight cells because at the end of the service life the voltage of the package will be approaching 9 volts, and if it falls below the voltage of the internal 9–volt battery then that internal battery will start to discharge.

Flitecom
Radio Shack
Sigtronics
Duracell
Leclanche
Home Depot
Harbor Freight

From the Duracell web site I obtained the capacity of various batteries, which are listed below. Capacity is measured in amp–hours or AH. I have also listed the approximate usage time for each battery at a 30 mA drain. The time depends to a great deal on the rate of discharge, however:

9 volt radio battery:	0.36 AH or 12 hours usage
AA batteries:	1.8 AH or 60 hours usage
C cells:	6 AH or 200 hours usage
D"cells:	9 AH or 300 hours usage

Some of you might expect from the advertising that alkaline batteries are superior to the regular, cheap batteries. Actually it depends

on the application. Our intercom application will get the same battery life from cheap batteries as it will from alkaline in the C size or larger. In a low drain application the alkaline cells have no advantage in capacity. Low drain means that the battery is discharged over a long period of time such as 100 hours. Alkaline batteries do have an advantage in a high current drain application though, where their chemistry allows discharging the full stored energy in a shorter period of time. In addition they do not deteriorate when sitting on a shelf. The traditional (Leclanche carbon–zinc dry cells) cheap flashlight batteries lose capacity when on the shelf. They also deteriorate faster at higher storage temperatures, which is the reason for the old custom of storing batteries in the refrigerator. Finally the cheap batteries can leak acid and will corrode whatever they are installed in if neglected. I suggest using only alkaline cells for that one reason.

Duracell sells a battery called "Ultra" in the smaller sizes at a 20% premium price. This battery has at least 20% more capacity when discharged at high rate, but offers no advantage at very low drains. If you are going backpacking and take a Maglite, they are the best. For our usage you can stick to regular alkalines.

Even though my scanner has a set of AA batteries inside, it also accepts an external 12–volt source. I checked the current drain of it while it was plugged into the intercom and I was listening to the weather frequency. It also used 30 mA. When both the intercom and scanner are powered, the total drain is 60 mA and the usage time in the table above is cut in half.

If you build a battery package do not neglect to install a 1/4–amp fuse in series, as Flitecom recommends. The necessary connectors to plug into your intercom and scanner are available in electronics stores or Radio Shack, although you may have to buy a complete cable and cut the end off. Also note that the inner conductor (tip) is positive and the outer (sleeve) is negative, at least with Flitecom and the Radio Shack scanner. One final item needed in a battery pack is an ON/OFF switch. I discovered to my surprise that the intercom drew nearly as much current from the external battery package when turned off as it did when on. The scanner had a small 5 mA drain when off also. The intercom and scanner do not draw current from the internal batteries when they are turned off.

Some may want to use rechargeable batteries such as Ni-Cds. Compared to dry cells, rechargeable cells have at best one half of the capacity, but cost much more. Their advantage lies in the fact that they can be recharged several hundred times. Or so they say. My experience with cordless drills is that they lose capacity long before that in typical homeowner usage.

Two big disadvantages of Ni-Cds are that they have to be charged just prior to use, and you will need ten cells because their voltage is only 1.2 volts per cell. The very best cells get as much as 1.8 amp hours from sub–C cells which will run your intercom and scanner for 70 hours or so. They are available from a hobby shop that caters to the RC car racing crowd and can cost $6-$8 per cell. However they come with tabs and have to be soldered together. Regular Ni-Cd C cells from Radio Shack have a 2.0 AH capacity and cost about $4 per cell, or $40 for a 12–volt assembly. There is no point in getting the bigger D cells because they have the same capacity as the C cells.

The most advanced batteries available are the Ni-MH batteries found in the top line power tools and recently in the RC car racing fields. In the sub–C cell size they get around 3amp hours capacity. That will run your intercom and scanner for 100 hours or so. The AA size preferred for digital cameras have a 1.6 amp–hour capacity that approaches the capacity of non-rechargeable batteries. However they are extremely expensive at $5 per cell and make sense only when you use them up every week or so. Some are available from an e-Bay store with a 2.0 AH rating for $47 for 12 cells.

The current price of alkaline C cells at Home Depot is $1 per cell. You can get regular D cells from Harbor Freight for $0.33 per cell, but those may be past their shelf life, and may be very low quality. When they leak, and they will, and destroy your expensive intercom you will certainly review the economics of the situation.

Any rechargeable battery system requires a charger. I make my own by never throwing out the plug–in transformer power supply that comes with many small electrical items such as cordless phones, CD players, and the like. If it is marked 14 volts DC it will do, but you have to remember to disconnect it after charging is complete. Typically you will have to cut the connector off the end and solder on a new one. Radio Shack has several models of automatic chargers for Ni-Cd and Ni-MH cells, but they typically charge only four cells at a time and require a 12-14 hour charge time. Perfect for digital cameras but a big disadvantage for intercom and scanner usage.

In summary, I recommend a package of eight alkaline C cells to power your intercom and scanner. You will have at least 15 full days of usage by actual on–rails test with no need for charging prior to each run. If it is for only an intercom then a package of eight AA cells will last four to five days. You can get replacements anywhere, and if you come to the end of the capacity of those cells, the internal batteries of your scanner and intercom will take over and get you through the day.