

Equipment Alternatives for Using SAGIS

By Harvey Fleet

As more and more of you out there become interested in GIS and, in particular, in running SAGIS, the Geographic Information System we use in our Digital Cartography Program here in Denver, I am frequently asked for advice and recommendations on appropriate equipment. In this article I will attempt to explain hardware alternatives, as I see them, as of January, 1987.

Before I do so, however, let me emphasize that this discussion is only relevant for those of you who anticipate using SAGIS, either as a possibility or a certainty. If you are interested in GIS but have no interest in SAGIS, then you probably should not read further.

Alternatives 1, 2a and 2b assume you are going to tie into SAGIS running on a remote host computer located away from your park. I know that many of you are reluctant to go this route, because of time-sharing and telephone costs, relatively low-speed, poor quality communication lines, and a feeling that somehow you are not "close" to your data (they are not in the same room with you).

A couple of pending developments may cause you to reconsider this set of alternatives, at least as an interim measure: (i) we have acquired a mainframe Prime computer here in Denver; your remote use of this machine will cost you nothing. (The bad news: we will only be able to accommodate about 8 to 12 remote users at one time.) (ii) We intend on becoming

a GEONET node, which means most of you can dial us up via a local, or perhaps *nearly* local, telephone call. This will both eliminate long distance telephone charges and provide high quality communications lines. Data transmission rates will still be relatively slow (1200 baud), but 2400 baud may be available a little later. Your costs for using the GEONET network will either be nothing or nominal (a few tens of dollars per month at the most).

Alternative 3 describes an attractive stand-alone configuration you may wish to consider.

Terminals

To display mapped information from SAGIS at a computer terminal, you need either a Tektronix device or Tektronix emulation running on some other device, usually a PC. While you *can* use SAGIS without Tektronix compatibility, I do not recommend it, because you are essentially working blind – you have no way to see, to plot, what you are working with. In addition, you have no way to zoom in, and you cannot use the crosshairs, which are required for a whole variety of operations. Here are some alternative possibilities:

1. Acquire a new Tektronix terminal, which range in price from about \$4,000 to \$25,000. The \$4,000 terminal has most of the features of the high-end terminals, except it has lower resolution (640 x 480) and is considerably slower. In general, this alternative gives the best performance and greatest ease of use.

- 2a. Acquire monochrome Tektronix emulation for your PC. Monochrome emulators run in the \$100 to \$200 range. In Denver we use VTEK, which is available from Scientific Endeavors, Route 4, Box 79, Kingston, TN 37763 (615-376-4146) at a cost of \$150. These emulators will enable you to get basic displays, use crosshairs, and get hardcopy plots, depending on your plotter or printer. They will open to you a limited range of SAGIS's display capabilities but the *full* range of SAGIS's analytical capabilities. If you want only to try out SAGIS and see what it can do, and whether it would be useful to you, this is probably a good place to start. Before ordering any emulator, call the manufacturer to make sure it will run on your PC.

- 2b. Acquire color Tektronix emulation for your PC/XT or PC/AT. There are several color Tektronix emulators around, but the type I recommend should provide "4107" emulation, which includes much more than simply line color recognition and selection. Only one package that I know of does this, and it seems to provide about 90 percent of the capabilities of the native Tektronix device, although it is considerably more difficult to use. It is called TGRAF07, and a list of retail outlets in your area can be obtained from Grafpoint, 4340 Stevens Creek Blvd., San Jose, CA 95129 (408-249-7951). TGRAF07 sells for \$995. To use TGRAF07 you must have an EGA graphics board (about \$440) and accompanying monitor (about \$580). Check with the manufacturer or dealer before you buy. If you already have an AT or equivalent and want to try or use SAGIS, this alternative, for about \$1,000 to \$2,000, is quite attractive. It will give you access to about 90 percent of SAGIS's interactive display capabilities and all of SAGIS's analytical capabilities.

3. Acquire a 32-bit coprocessor board for your PC, which will allow you to run SAGIS locally, i.e., in stand-alone mode, without dialing up a remote computer. These boards run between \$3,000 and \$5,000 and, essentially, divide your PC into two separate, but com-

muting machines: the standard PC and a co-resident mainframe. SAGIS runs on the mainframe board under UNIX and sends its output to the standard PC board for display. Therefore, the PC also must be equipped with either a monochrome Tektronix emulator or a color Tektronix emulator, as described in 2a and 2b, respectively, above. Alternatively, you could send the SAGIS output from the 32-bit board to an external, stand-alone Tektronix terminal.

Any way you do it, you should have at least 30 megabytes of fixed storage (for data) in your PC. (You may also consider adding additional, removable, external mass storage. Bernoulli cartridges, at about \$2,000 a throw, are attractive considerations.)

Printers, Plotters

Most people, quite correctly, want some kind of hardcopy capability, preferably in color. What you can get will in large measure depend on the kind of terminal and software emulation you use. The situation is very complicated; there are many options, and I do not know all of them. I can, however, give some guidance, as follows: a dot matrix printer, which you may already have attached to your PC, can probably be used, *if your Tektronix emulation software supports it*. A dot matrix printer will give satisfactory draft-quality black-and-white plots.

Pen plotters, which run between \$1,000 and \$10,000 will give very high quality, scaled plots. They are unexcelled for line-work, but not so good for solid-color fill (i.e., filling in regions of the map with a solid color), and completely unable to produce solid fill using repeating symbols. SAGIS supports several pen plotters, and your Tektronix terminal emulator may also provide its own pen plotter support.

Ink-jet plotters, which run between \$1,000 and \$7,000, can also give high quality, scaled plots. They are unexcelled for solid-color fill, but not as good as pen plotters for line-work. They are very easy to use, because all you have to do is push a button and the contents of your display screen will be dumped to them. I like them because of this feature, and because "what you see (on the terminal's screen) is what you get (on the plotter)." In this price range, scaling all but the smallest plots (8.5" x 11") requires that you piece together individual sections. It's tedious, but it gets the job done, and done well. I recommend ink-jet plotters as the best overall compromise (unless all you want to plot is line-work). The make and model you will get will depend on the terminal or terminal emulator you are going to use.

Digitizing Tablets

Most people want their own capability to enter data into their GIS data bases. You will need a digitizing tablet to do this. Digitizing tablets run between \$1,000 and \$6,000, depending on size and features. I recommend that their active surfaces be no smaller than two feet by three feet in size. Necessary features include scale translation, variable output format, RS232 communications, and 0.001 inch resolution and accuracy. **WARNING!** Do not attempt to use a digitizing table to build an entire GIS data base. This is a complex, tedious, labor-intensive, and very technically and administratively demanding operation. I strongly urge you to use the digitizing tablet only for minor updates and additions to your *existing* data base, rather than for bulk, production digitizing.

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