

From earlier experiences with display screen monitors, we concluded that color CRTs are essential for ease of operation of a CADs workstation, enabling and aiding the visualization of the 3-dimensionality of most design work. For this hardware necessity, we chose 14" color CRT monitors, together with the required video driver boards, in the medium resolution format-640 x 400 pixels. This was again a cost-effective and affordable introduction; better in resolution than the so-called standard IBM Extended Graphics Applications boards (at 640 x 350 pixels) but not in the pricey stratosphere of the high resolution screens (1024 x 1024 pixels) which were of the order of 5 times more expensive.

For the input device, besides the already included keyboard which is not very convenient for graphics design use, we chose an 11" x 11" digitizer with a four-button cursor. It has proven to be very reliable and is easily accommodated on most work desks.

Each of the computer setups has a floppy disk drive, which allows for fairly easy backups of drawings, and also provides the main link in our CADs "network" - which requires each designer to carry his own personal design, on his own personal floppy, to his own personal destination. This has eased much of the usual difficulties in communicating over so-called RS-232C standard ports, (which never are), or waiting for the right node/fileserver connection to be made, and so on. Although we are investigating the possibilities at this time, no obvious or easy choices for networking are yet at hand.

Aside from the "normal" setup delays, such as defective hard-disk controller cards, jittery video drivers, wrong cable terminations, subtle software ambiguities, etc., the multiple users of CFHT's CADs have progressed rapidly up the learning curve, and the customizing of such a generalized tool to our kind of work has been an interesting and gratifying creative exercise.

## APPLICATIONS

What have been the fruits of these labors? Starting from the "digitizing" of a few existing drawings to incorporate recent "As-Built" conditions, we soon found the basic incompatibility between "drawing" on a digital screen and using the earlier, hand-drafted, printed-on-paper drawings. For example, dimensions as drawn did not match the physical scales defined on the drawings; orthogonality was not preserved; the paper stretched, or shrank, depending upon the ambient humidity in the office, so that the same dimensions input from one day to another were not constant. The task of digital copying with the use of a hand-operated 4-button cursor is tedious and slow; however, for some projects, there just is no other way at this time. Nonetheless, inputting from existing drawings does have the advantage of providing a quick-learning tool for the basic CAD features of layering, changing,

moving, incorporating text amongst the figures, easily erasing and improving layouts, and so forth. From this point, the methodology of the design process changes.

Creating a physical piece of machinery or electronics, manipulating its three dimensions on a 2-D TV screen, having the ability to locate with ease some part or point to an accuracy range unachievable by manual drafting, having the freedom to move, rotate, enlarge, decrease, replicate, draw in a variety of colors, can all be a bit intimidating at first. Still, when the facilities become more natural, the interactive design process is felt to be on a "roll", when the mind, the machine and the output seem to merge into one self-reinforcing succession of right decisions. That's when it all begins to be fun!

Shown here are copies of a few of the projects that have been "CADDED" by some of the designers at CFHT, illustrating better than any words that such work can be beautiful, useful, creative and right the first time!

J. Sovka

## DOME COMPUTER CONTROL

A hardware interface has been installed which allows computer control of the dome hydraulics and dome rotation. The computer will monitor dome and telescope position, calculate misalignment, and move the dome for correct alignment. With computer control, the telescope operator will no longer be burdened with the task of continuously updating dome misalignment. This will eliminate the problem of accidental occultation of the telescope by the dome, thus improving the photometric reliability of the telescope. Computer control will help reduce wear on the dome drive units and hydraulic pumps.

This interface enables the TCS computer (HP 1000) to monitor the status of hydraulic oil temperature, level, pressure, and to check for a hydraulic blockage at six oil filters located throughout the system. The computer can also monitor the status of the interface hardware and perform tests to check hardware integrity. All of these inputs are monitored via one channel of a two-channel CAMAC module (IR-1). Output from the computer to start and stop hydraulic pumps is done via the same module. The second channel of this module receives the input from the dome absolute position encoder, which is able to resolve dome position to within 0.1 degrees. Dome velocity is commanded by the computer via one channel of an eight channel digital-to-analog converter (DAC).

John Kerr and Simon Willett of the software group are now writing the code to run the dome and hope to have the computer control implemented during the first semester of 1987.

M. Barbour