Setting up their equipment

Surveys, Surveying System

which offers fast, angles and rod systems that employ transit, from conventional surveying equipment, however, differs for

of Sunrise Geodetic

illustrates of microwave towers. This il-

rise employees

by processing signals from orbiting satellites.

Below, and at right, Sun-

n in areas of dense

ning the line of sight pathways between two siting points that are essential for operating conventional systems. The 70-pound ISTAC system can easily be back-

packaged or helicopter-trans-

nted into remote locations and its only requirement is a line of sight to the sky.

Satellite-referenced position-

ing data is stored on site in a portable data recorder and later downloaded into the of-

ce computer for analysis (far right).

The ISTAC Model 2002 is manufactured by ISTAC, Inc., Pasadena, California, and sold or leased to survey-

ng companies. It is based on technology developed by California Institute of Tech-

nology’s Jet Propulsion Lab-

atory under NASA sponsor-

ship. Inventor of the technology was Peter MacDoran, now president of ISTAC.

Working on a way to pro-

vide highly precise measure-

ments of Earth’s crust for tectonic studies and earth-

quake prediction, MacDoran conceived SERIES, a package consisting of satellite receiv-

ng hardware and signal processing software that pro-

duces positioning data with accuracies as fine as five centimeters (two inches).

MacDoran was subsequently granted a NASA waiver assigning him commercial rights to the technology. He formed ISTAC to develop the technology further and

adapt it as a surveying tool using reference signals from the U.S. Air Force Navstar Global Positioning System (GPS).

The Navstar GPS is a network of navigation satel-

ites intended to provide superaccurate position fixes for military aircraft, ships or land vehicles anywhere on Earth. It is currently operat-

ing as an interim, part-time Block I system for testing and user familiarization; civilians are authorized to use the Block I system.

Beginning next year, the USAF will begin to replace the Block I satellites with more advanced Block II Navstars in what will ultimately be an 21-satellite constellation. However, the advent of Block II will pose a problem for civilian users. The Block II Navstars will send signals on two channels, the superaccurate Precise Positioning Service (PPS) and a less accurate Standard Positioning Service (SPS). For reasons of military security, PPS signals will be encrypted and the code will not be available to civilian users except by special approval of the Department of Defense. The SPS channel will be available to civil users, but its accuracy will be intention-

ally degraded.

The special utility of the ISTAC Model 2002 is that it can provide positioning of the highest accuracy from Navstar PPS signals because it requires no knowledge of the secret codes. It operates by comparing the frequency and time phase of a Navstar signal arriving at one ISTAC receiver with the reception of the same set of signals by another receiver. The data is computer processed and translated into three dimen-

sional position data—lati-

tude, longitude and eleva-

tion. This technique does not
compromise military security and is, in fact, welcomed as a viable means of civil use of the GPS.

The ability of ISTAC Model 2002 and other codeless receivers to use the military network opens up a broad range of civil applications. ISTAC Model 2002 is used by a number of surveying firms in the U.S. and the United Kingdom for city surveys, construction surveys, and geodetic surveying. A future application (when 24-hour global satellite coverage is available), is seismic surveying for exploration of hydrocarbon resources. ISTAC receivers—one on the seismic ship, one on a trailing buoy and one on land—can acquire position data from four different Navstar satellites; positioning computations are handled by a computer aboard the seismic vessel.