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# **ELECTRONIC SURVEYING INSTRUMENTS**

## **A Review of Principles, Problems and Procedures**

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This text evolved from advanced undergraduate and postgraduate courses taught by the author as well as from continuing professional development courses on electronic theodolites and digital (bar code) levels. It covers theoretical and practical aspects of modern field surveying instruments (digital levels and theodolites and the like), their operating principles and their differences from traditional (non-electronic) field surveying equipment. The principles of electronic distance measurement are not covered. However, some specialised instruments using EDM are discussed, as is reflectorless distance measurement.

This text was written for readers with previous exposure to field surveying. It suits professionals, who went through tertiary courses before the widespread introduction of electronic surveying instruments, current students who wish to broaden their understanding of field instruments, and readers of standard textbooks on 'surveying', who are not satisfied with the, usually very limited, information on instruments and procedures in these texts. This book aims at improving the understanding and use of electronic surveying equipment.

A number of hand-held instruments, such as hand-held distance meters, compasses, clinometers and electronic barometers are discussed as is barometric heighting. The discussion of digital (bar code) levelling instruments and rotating laser levels concentrates on the various errors that may occur and provides useful advice for precise levelling with digital levels. Different types of electronic theodolites and tacheometers, including gyro, laser, tracking, scanning and reflectorless instruments, are introduced. Electronic circle reading systems and electronic level sensors are discussed in some detail, as are their inherent errors. Some advice on the use of these instruments is given. A number of specialised instruments and techniques are presented last. Reflectorless EDM is discussed in some detail, highlighting some of the problems that can occur and giving some advice on its use. Laser scanners and motorised levelling are mentioned as are airborne laser profilers, laser trackers and a laser measurement system. The latter two are employed in metrology.