

## **CRITERION 400 SURVEY LASER FOR SURVEYING FORESTRY ROADS**

### **BACKGROUND**

Surveying forest roads using a cloth tape, clinometer and compass, and manually recording data can be costly and time consuming. Hand-held survey laser devices may provide a cost-effective alternative, by simplifying field measurement and data transferral. Moll (1993) highlighted the potential time savings (20 % saving in field survey and 81% in data inputting times) when surveying and designing forest roads.

One such survey laser is the Criterion 400 Survey Laser developed by the San Dimas Technology and Development Centre (SDTDC) and Laser Technology Incorporated. This device makes measurements of bearing, distance and slope simultaneously at the pull of a trigger (Figure 1). Survey measurements are electronically stored for subsequent downloading to appropriate road design software.



*Figure 1 - Criterion 400 Survey Laser with  
a data recorder*

### **CRITERION 400 SURVEY LASER**

The Criterion laser contains a laser range sensor, an electronic compass, and a fluid tilt sensor. Sensors and components are integrated by menu driven programmes, accessed and controlled through the key-pad and display. These programmes provide rapid and accurate in-field solutions for a wide variety of applications.

There are programmes for tree measuring, area calculations, basic survey measurements, coordinate locating, positioning, and storing survey measurements. The Criterion can be used as a effective offsetting tool for mapping areas when linked to a GPS receiver. In addition, Walkabout™ software on an external data recorder provides rapid acquisition of feature locations for transferral into Geographic Information Systems (GIS).

Survey information can be stored internally by the Criterion, or transferred to an external DOS based data recorder. The criterion can be interfaced with several DOS-based data recorders, including the SDR33.

Recording data in the Criterion is very quick. Also, the device is easily portable as an additional data recorder is not required. Software is provided for downloading data from the Criterion for conversion into road design software, such as Roadeng™. However, recording data internally does not allow notes to be assigned to individual



shots. This is where an external data recorder has an advantage.

The Hewlett Packard 100LX palmtop (Figure 1) running Lasersoft™ is capable of recording 1530 individual shots, allowing up to 3 km of surveying at 20 m spaced stations. A DOS based data recorder programmed with Lasersoft™ software can record shots from the Criterion, allowing additional information to be recorded, such as peg numbers and culvert positions.

The Lasersoft™ software also enables the target height to be changed and change points for side shots to be specified. Stored data can be converted to produce x,y,z coordinates that can be imported into road design packages, such as Roadeng™.

## FIELD USE

The Criterion can be hand-held but ideally is supported using a monopod to ensure steady measurements (Figure 1). Traverse shots from station to station should be measured to a reflective prism with a filter lens cap placed on the Criterion. This ensures that the laser beam is hitting the correct target. Provided the line of sight is clear, side shots can be measured to trees, eliminating the need for a second person holding a reflective prism. Typically, 1km of proposed road line can be surveyed per day.

## LIMITATIONS

- Slope angles exceeding 60° are not measured. This is rarely a problem.
- To record side shots on slopes greater than 15°, two shots are necessary: a shot horizontal but in line of the target to record a azimuth; and one to the target for measuring slope distance and slope angle.

## SPECIFICATIONS

The manufacturer's specifications shown

below are confirmed by independent accuracy tests (Uren and Garner, 1994).

Weights: Total	2.77 kg
Yoke for pods	0.45 kg
Range: Minimum	3.7 m
Max. (building)	457 m
Max. (reflector prism)	9144 m
Accuracy: Azimuth	± 0.3°
Range	± 9.4 cm
Vertical angle	± 0.2°
Sealing:	Water resistant
Safety:	No damage to eyes
Battery: Type	9.6V Nicad
Life	8 hrs. per charge

## ACCESSORIES AND COSTS

The New Zealand distributor of the Criterion and accessories is Labsupply Pierce Limited, Auckland. The following prices are exclusive of G.S.T.

Criterion 400 Survey Laser	\$22,980
Criterion 300 Survey Laser	
(tree options removed)	\$19,980
Yoke for mono- and tri-pods	\$ 691
Mono-pod	\$ 568
Tri-pod	\$ 375
Filter lens cap	\$ 350
Pole and prism	\$ 700
(or use bicycle reflector)	
External data logger	
(HP100LX, DOS, 1MB RAM,	
500k disk)	\$ 1,100
Lasersoft™ software	\$ 800

For further information on the Criterion, contact LIRO or the supplier.

## REFERENCE

- Moll, J. (1993): Low-Volume Roads Survey Laser. Forest Service Technology and Development Center. June.
- Uren, J. and Garner, J. (1994): Criterion 400 Hand-Held Laser a Break with Tradition. Civil Engineering Surveyor Journal, Vol. XIX. 4pp.

Greg Arnold,  
Researcher.  
August, 1995