MOBILE AUTOMATION

USER MANUAL

PIPEGUIDE PIPELAYING LASER

- LS.140.B
- LS.140.G

This manual is an important part of your purchase. Please read it thoroughly before using your new equipment.

We recommend that you record details of your purchase here so that the information is readily available if you ever need to contact your supplier.

Serial number	
Date of purchase	
Purchased from	
Telephone	
Email	

Published by:

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MOBA MOBILE AUTOMATION

MCE Lasers was acquired by MOBA in 2018, bringing 40 years of Australian development and manufacturing together with MOBA's globally recognised and trusted expertise in mobile automation technology.

MCE LASERS

WARRANTY

STATEMENT OF LIMITED WARRANTY

MOBA Mobile Automation Australia Pty Ltd (MOBA Australia) warrants all equipment it manufactures and sells to be free of defects in material and workmanship for a period specified below. This warranty period is from the date of sales invoice. All other components not manufactured by MOBA Australia and not specified below, such as hydraulic or electrical components, hoses, fittings and clamps, will carry the original manufacturer's warranty. The warranty covers only equipment sold by MOBA Australia and it's authorised dealers and does not cover parallel imports, which are also known as grey or direct imports. Proof of purchase will be required before claiming warranty.

The warranty does not cover normal wear and tear or deterioration. Any evidence of negligence or abnormal use, accident, improper installation or an attempt to repair equipment by anyone other than factory authorised personnel even when using MOBA Australia's certified or recommended parts, automatically voids the warranty.

The warranty shall only be in force for the benefit of the Purchaser, not any third parties, including without limitation the Purchaser's customers, unless warranty transfer has been approved by MOBA Australia in writing.

Warranty period:
- Pipeguide pipelaying lasers: 12 months
- Rechargeable batteries: 3 months
- All cords and cables: dead-on-arrival only, must be returned within 7 days of receipt
- Repairs and replacements made under warranty: warranty expires at the same time as original equipment warranty
- Repairs made out of warranty: 3 months

MOBA Australia or its authorised service centre will repair or replace, at its option, any defective part or component of which notice has been given during the warranty period. If service in the field is necessary to repair machine-mounted equipment under warranty, MOBA Australia may authorize on-site repairs at no charge for parts and labour. Travel time, accommodation and other expenses incurred to and from the place where repairs are made will be charged to the purchaser at the prevailing rates. If warranty service can be done at a factory authorised service centre, the customer will pay only one-way freight charges.

The foregoing states the entire liability of MOBA Australia regarding the purchase and use of its equipment. MOBA Australia will not be held responsible for any consequential loss or damage of any kind.

This warranty is in lieu of all other warranties, expressed or implied, except as set forth above, including any implied warranty of merchantability or fitness for a particular purpose which are hereby disclaimed.

SAFETY INFORMATION

Please become familiar with the important safety information in this section. Improper use or installation of the MOBA Laserguide may result in personal injury or damage to the receiver unit.

1 Read and become familiar with the manufacturer's operating manual for your machine, including safety information, before installing or using your Laserguide receiver.

2 A construction site can be hazardous and working around heavy construction equipment can be dangerous. Always exercise extreme caution when on a construction site.

3 The Laserguide is externally mounted on your machine. Do not install or adjust the unit while your machine is running.

4 Do not let any part of the unit protrude into traffic or limit the visibility of the operator.

5 Always use eye protection when welding, cutting or grinding is being done on the machine.

6 Hydraulic lines can be under extreme pressure, even when the machine is not running. When working on or near hydraulic lines, protect yourself at all times and wear protective clothing.

Warning:
Do not weld near any hydraulic line or on any equipment while it is in operation. It is best to remove any electronic gear near a welding job.

Caution:
All mounting bracket welds must be strong and secure enough so as to prevent the Laserguide from vibrating excessively or from breaking at the weld while the machine is operating

7 Any external power supply must be rated between 12 and 24 Volts DC.

Caution:
Be sure your hands are dry before handling the machine battery terminals or power cables.

8 The internal battery pack of the Laserguide should be fully recharged before each use (internal battery models only).

Warning: Do not expose the internal batteries to intense heat.

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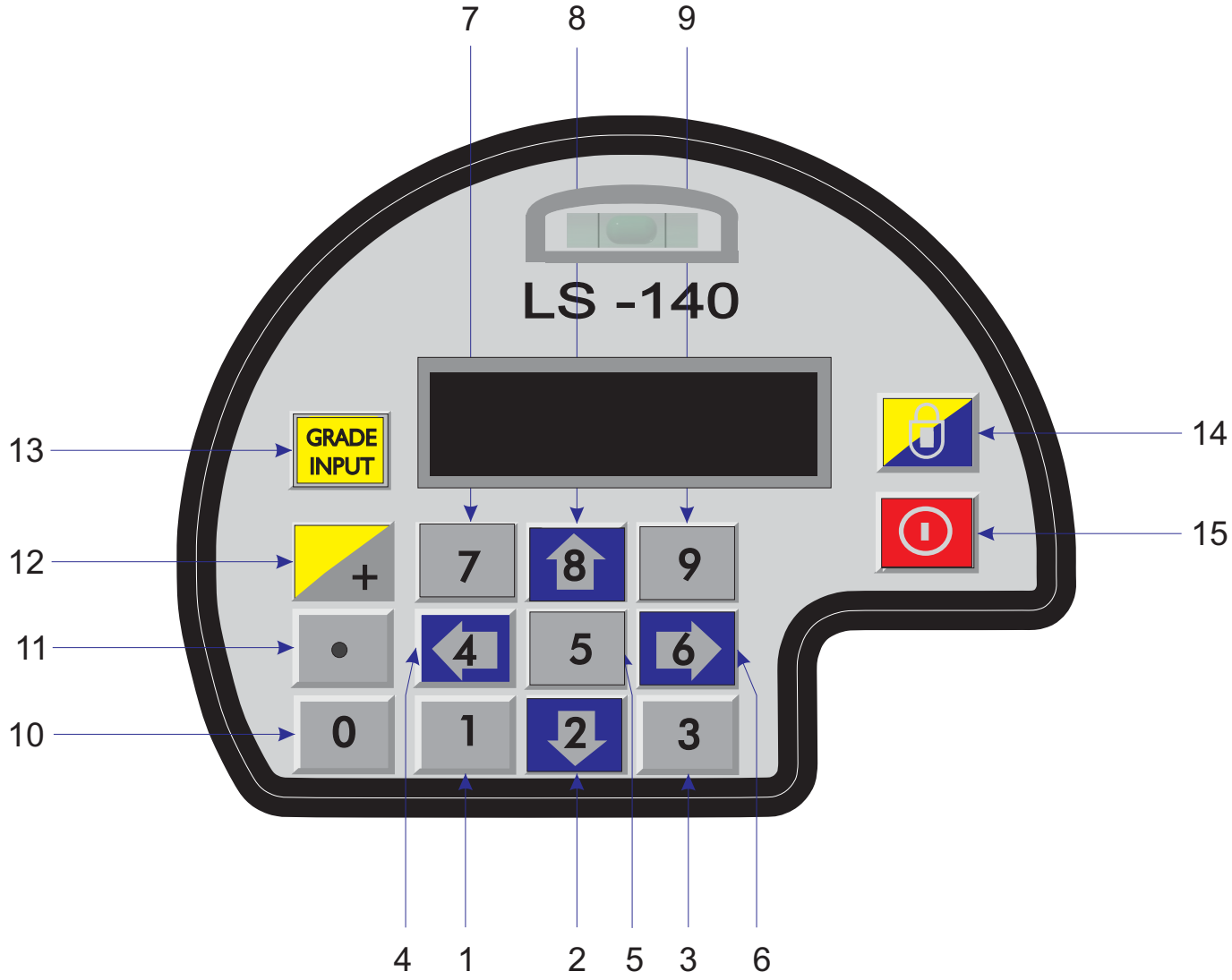
6. Line Remote Control Receivers
7. Laser Beam Exit Point
8. Support Leg (Pair)
9. On/Off Switch
10. Cable Connector (Waterproof)
11. Support Leg (Single)
12. Carry Handle

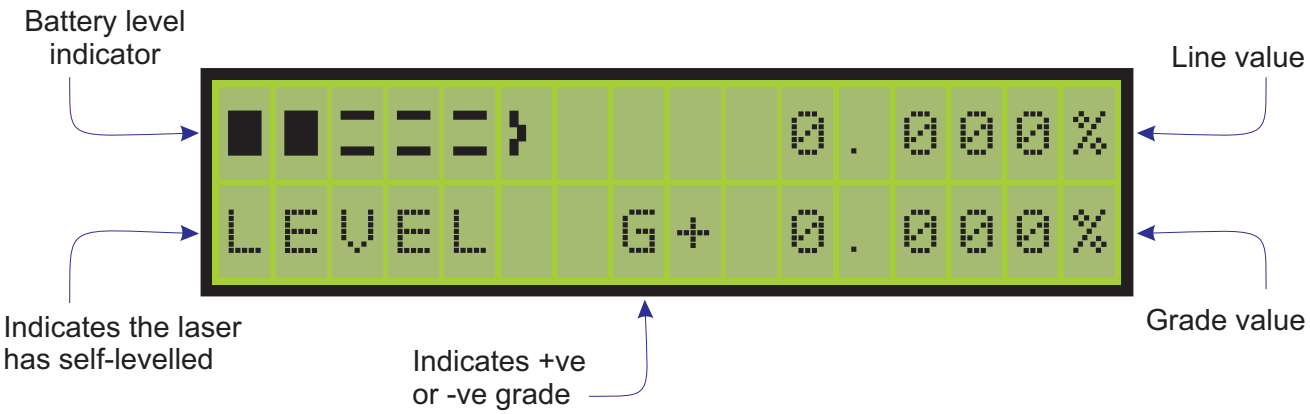
2. SWITCH PAD DEFINITIONS



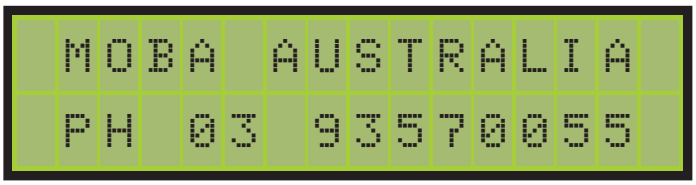
1. Switch 1
2. Switch 2 / Negative grade control switch
3. Switch 3
4. Switch 4 / Left line control switch
5. Switch 5
6. Switch 6 / Right line control switch
7. Switch 7
8. Switch 8 / Positive grade control switch
9. Switch 9
10. Switch 0
11. Decimal point switch
12. +/- switch
13. Grade input switch
14. Lock function switch
15. On/Off switch

3. LIQUID CRYSTAL DISPLAY

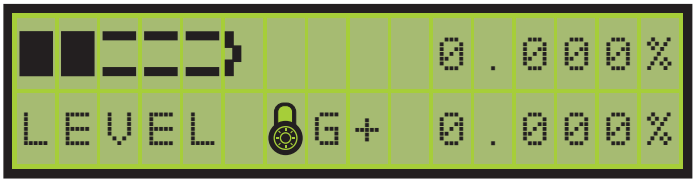
The LCD is a total information centre indicating all functions of the Pipeguide. During normal operation, the LCD display should read similar to the below example:



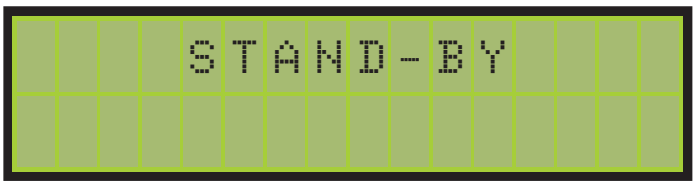
3.1 EXPLANATION OF DISPLAY GRAPHICS



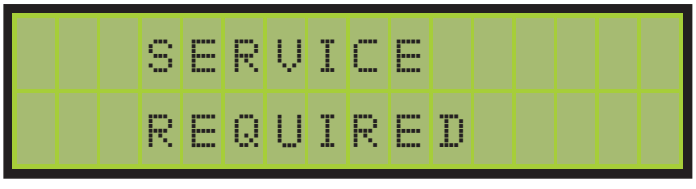
The MOBA AUSTRALIA phone number appears when the laser is first switched on. Should you require help just call this number. Alternatively, owner details may be displayed here.



Lock Function Indicator. Indicates that the Lock Function is set. See page 16.

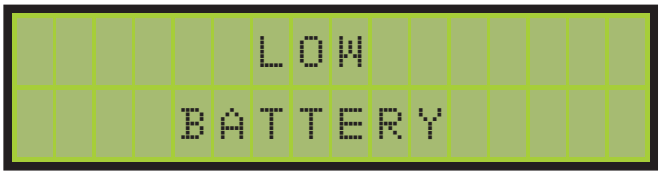


When the laser is in standby mode, this message will appear and the LCD back-light will blink approximately every 2 seconds.



If this message appears, please recalibrate the instrument by following the instructions for “Calibration” on page 22.

3.2 BATTERY CHARGING INDICATORS

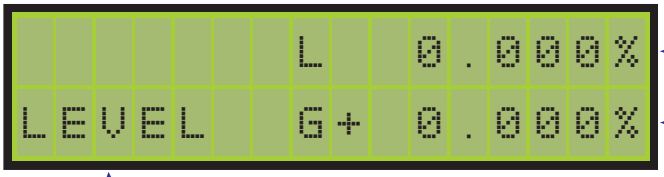


Should this message appear when the laser is switched on, the internal battery voltage is too low for accurate operation.

If the Pipeguide is connected to an external power source and is powered off,, the internal batteries will start to charge and this message will appear. The LCD back-light will remain on during the charging process.

When the battery has been charged for 5 hrs or the internal voltage is greater than 10.0 V, the fast charging ceases and trickle charging commences.

3.3 LEVELLING INDICATORS

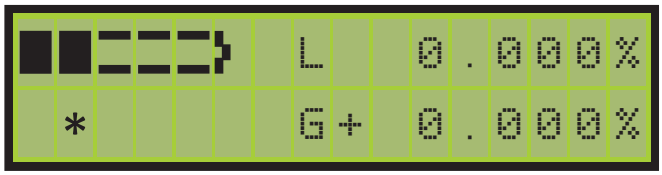


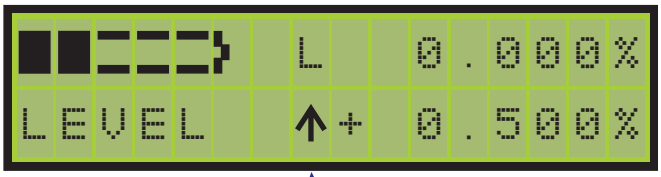
Indicates % of distance line is left (L) or right (R) of centre

Indicates % of grade (G).

Indicates that laser has self-levelled.

Levelling Indicator * blinks on and off while laser is self levelling.

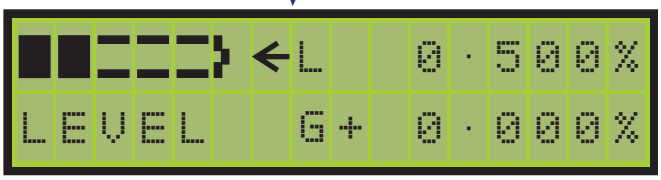




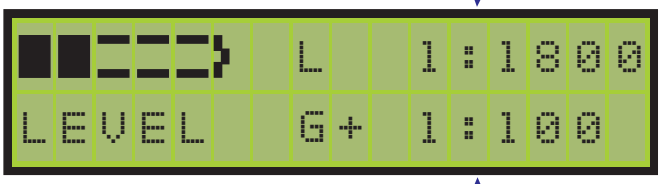
Indicates direction the beam is moving and the % grade of current position.
eg: Beam moving up,
Current position +0.500%.

3.4 TRAVERSING BEAM INDICATORS

Indicates the direction laser beam is traversing and if left (L) or right (R) of centre.
eg: Beam traversing left



3.5 GRADE RATIO DISPLAY



Indicates in ratio format the distance the line is to left (L) or right (R) of centre.

Indicates grade in ratio format.
See page 12.

4. BASIC OPERATION - SET-UP

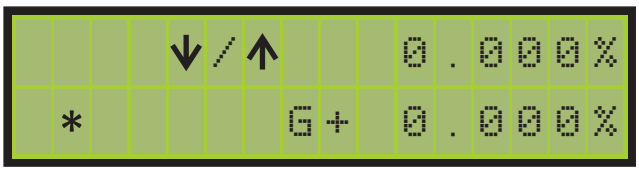
There are only 4 basic steps to setting up the pipeguide.

4.1 Step 1: Rough Levelling

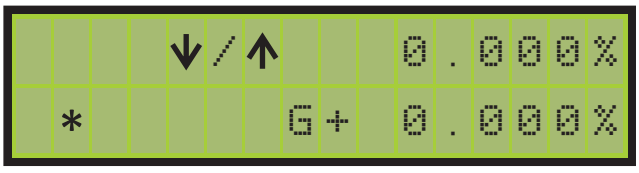
HORIZONTAL AXIS

It is important that the pipeguide is horizontally level. Two features are built into the pipeguide to assist in horizontal levelling:

1. A simple spirit level vial (p. 7, no. 2) is built into the back face of the unit. Ensure that the bubble is central to the vial.
2. When arrows appear, the laser is horizontally out of level.



Indicates Pipeguide is tilted to the right.



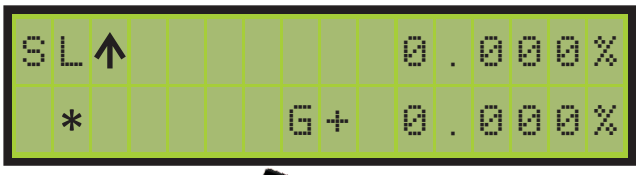
Indicates Pipeguide is tilted to the left.

VERTICAL AXIS

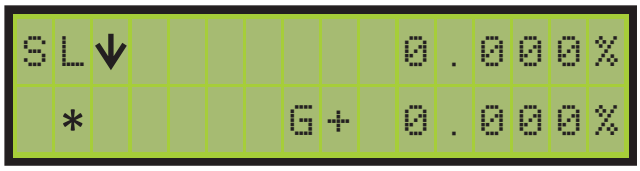
Ensure that the pipeguide is within its self levelling range (-20% and +35%) in the vertical axis. While the laser is levelling, the beam will blink on and off together with the levelling indicator on the lcd.

When the blinking ceases, the beam is on the correct grade and the levelling indicator will be replaced by the word level.

Should the beam continue to blink, then the unit is out of its self levelling range and needs to be repositioned. Check for self level limit range.



Self levelling at maximum
Indicates the Pipeguide is tilted excessively upwards and needs to be lowered or positioned within range.

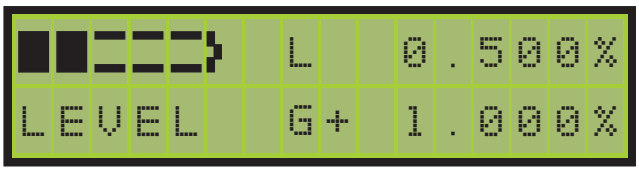


Self levelling at minimum
Indicates the Pipeguide is tilted excessively downwards and needs to be raised or positioned within range.

4.2 STEP 2: SETTING THE GRADE

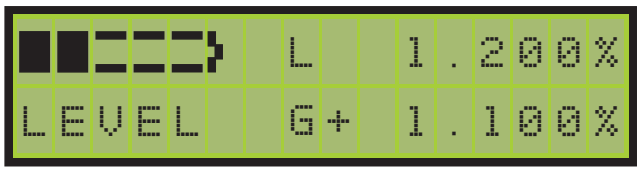
The Pipeguide laser is able to display the grade as either percentage format or ratio format. The Pipeguide can automatically convert between formats. The LCD will display the grade, whether it is positive or negative and will indicate (with the word LEVEL) when the beam has reached the indicated grade.

Percentage Grade Format



Indicates % of grade (G) and if positive (uphill) or negative (downhill). The word ‘LEVEL’ indicates that laser has selflevelled.

Ratio Grade Format



Indicates grade (G) in ratio format. The word ‘LEVEL’ indicates that the laser has self levelled.

SWITCHING BETWEEN FORMATS
The ratio grade format is activated by simply pressing the up and down grade keys or the left and right line keys simultaneously.
To revert to percentage grade format, press the same keys simultaneously again.

ENTERING THE REQUIRED GRADE
Grade values may be entered using the arrow keys on the keypad or by using the 'GRADE INPUT' key.
Grade Input - see page 14 for details.

GRADE CONVERSION FORMULA

When using the formula, any units can be used as long as they are the same.

Formula: To Find Percentage Grade (%)

$$\frac{\text{Amount Of Fall} \times 100}{\text{Distance}} = \%$$

Eg. A grade of 1 in 174 expressed as percentage is:

$$\frac{1 \times 100}{174} = 0.575\%$$

USING THE HANDS-FREE COUNTING FUNCTION

The Pipeguide features an automatic counting function for selecting larger grade ranges.

To activate:

1. Press and hold the desired "arrow key"
2. While holding the arrow key, press the "lock key"
3. Release the "lock key" and then the "arrow key"
The counter will now operate automatically.
4. When approaching the desired grade, press the "lock key" again to stop the automatic counting function.

The automatic counting function operates in either display mode and also works for aligning the beam in the horizontal direction.

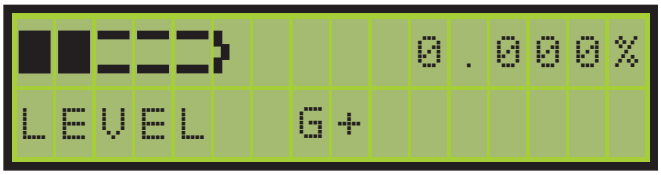
Note: Both the grade and the line control are programmed to stop when they reach the 0.000% or the limits in the hands-free mode.

GRADE INPUT EXAMPLE

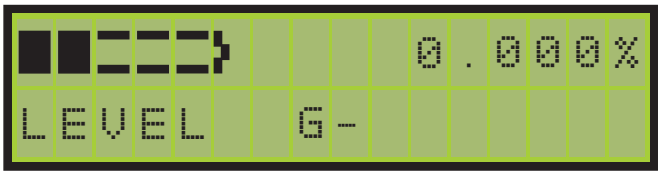
For this example set the format to percentage grade.

1. To set grade to -2.500%, first press the ‘Grade Input’ key.

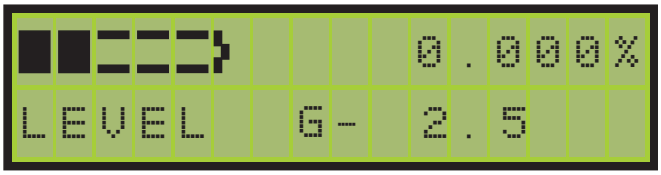
Note: To cancel function press the ‘Grade Input’ key again



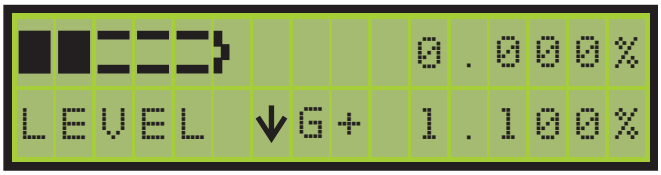
2. Press the +/- key to set grade to negative (-)



3. Using the numerical keypad, key in the required grade (in %) eg 2.5.

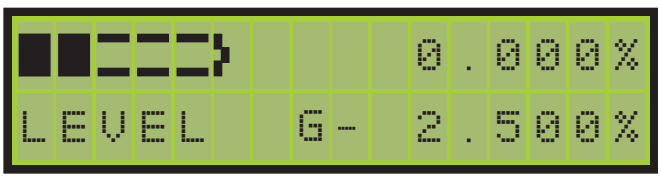


4. Press the Grade Input key again and the laser will begin to adjust to the desired grade.



Note: If an error is made when entering the grade then cancel this function by entering additional digits so that the display reverts to normal.

5. After grade adjustment and self levelling is complete, the LCD will display the new grade.



4.3 STEP 3: ALIGNING THE BEAM

All grade and line controls are referenced off a Pivot Point on top of the Pipeguide (see Pivot Point on page 6).

Use the Pivot Point and a plumb bob, “fishing line” or optical instrument (such as a transit or theodolite) with the laser beam set on the centre line at the start of the trench.

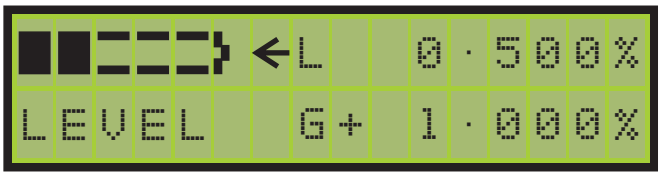
To align the beam with the next point along the trench, use the Line Control keys (4 or 6) on the numerical keypad or use the remote control. An optical instrument can be used to align the beam along the trench. DO NOT VIEW BEAM DIRECTLY VIA AN OPTICAL INSTRUMENT.

BEAM ALIGNMENT DISPLAY

When the beam is moving in the horizontal direction it is said to be 'traversing'.
The LCD will indicate in which direction the beam is traversing (either left or right) and the percentage or ratio of movement left or right of centre.

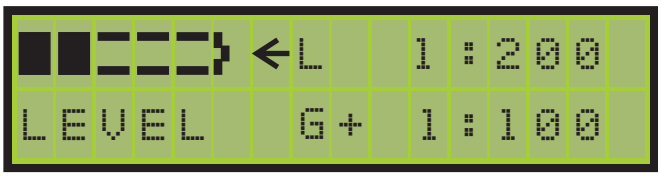
To switch between percentage and ratio format, simply press the two arrow keys simultaneously (keys 4 and 6).

PERCENTAGE LINE FORMAT



Indicates the direction laser is traversing and whether left (L) or right (R) of centre.
eg: Beam traversing left,
Current position 0.500% left.

RATIO LINE FORMAT



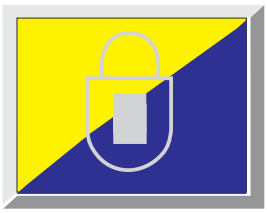
Indicates in ratio format, the distance line is to left (L) or right (R) of centre.
eg: Beam traversing left,
Current ratio 1:200 left.

4.4 THE LOCK FUNCTION AND HEIGHT ALERT

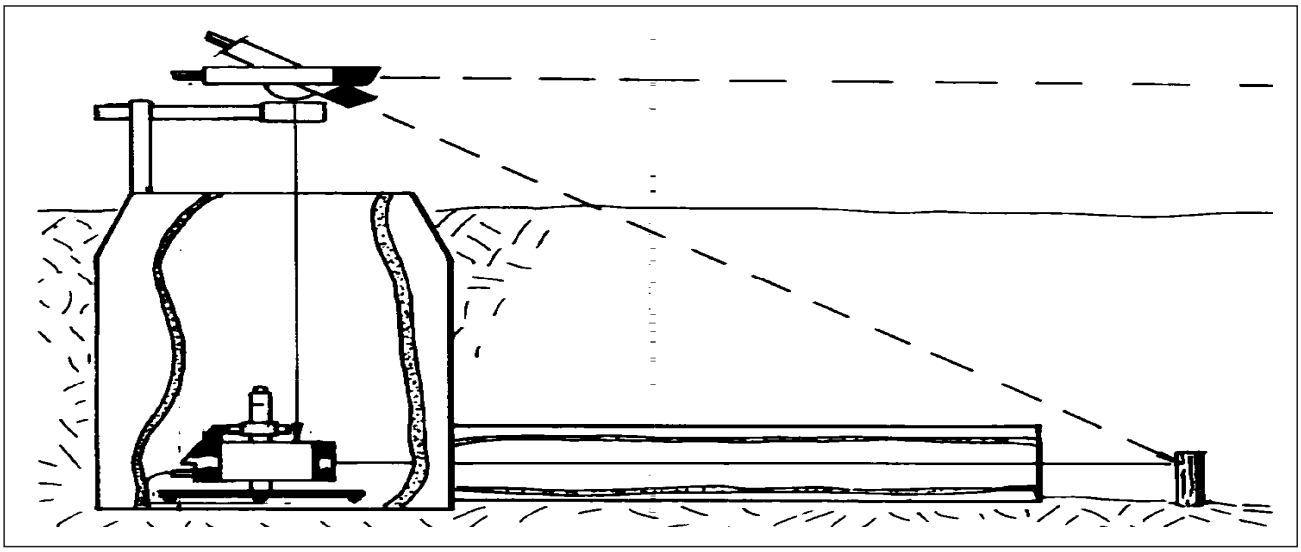
The “Lock Key” activates both the lock function and the height alert.

Activate the function by pressing the “lock key” for 4 seconds. When active the Lock Indicator appears in the LCD, see page 8.

Should the laser be knocked, bumped or sink on unstable ground, the laser will re-level but the beam will blink continuously to warn the operator. The lock function also locks all the control keys on the laser.

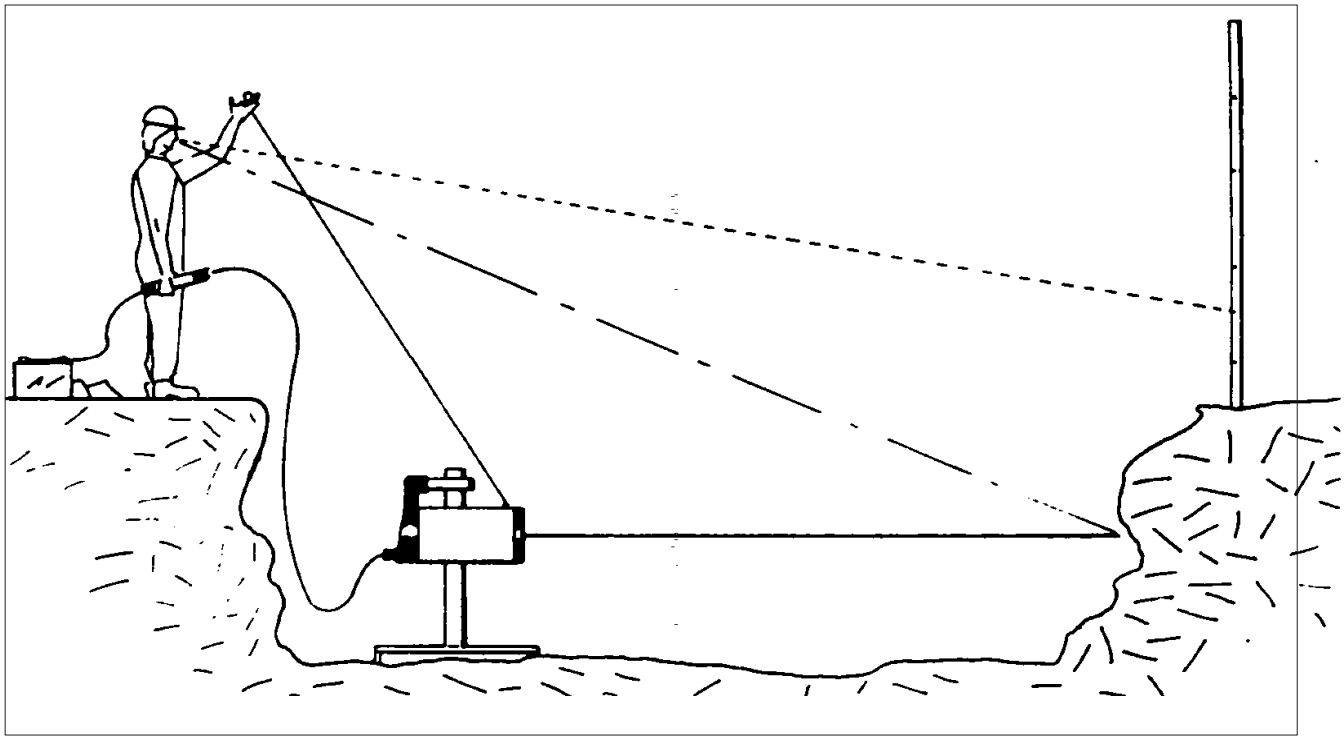


The following descriptions give a guide to the common types of line control:



1. Plumb optical instrument over a known point or line of trench.
2. View range pole at next manhole.
3. Lock line on optical instrument.
4. View pivot point on laser.
5. View beam on stake.
6. Adjust beam to suit.
7. Adjust pipe alignment if necessary.

4.5 STRING-LINE ALIGNMENT



1. Dial the required percentage grade (%) into the Pipeguide.

2. Position the laser at the correct height.

3. Attach a length of string to the Plumbing Point on the Pipeguide.

4. Position 3m range rod (exactly vertical) at the next manhole, or put down a chalk-line.

5. Place the Pipeguide on the centreline of the proposed pipeline.

6. Align the string to the centre of the range rod or chalk-line and then use the 'L' and 'R' switches on the controller (or remote control), to bring the beam in line with the string.

Note: A piece of 'fishing line' will give a more accurate result than string will because it is finer.

4.6 STEP 4: THE FINAL STEP

The final step in the set-up process is to ensure that the height from the invert (or overt) of the pipe to the centre of the beam is the same as the invert (or overt) to the centre of the target.

Using the adjustable target in the standard PIPEGUIDE kit:

1. Set the grade and alignment as in steps 1, 2 and 3. See pages 10 to 15.
2. Loosen the wing nuts which hold the target in place.
3. Adjust the height of the target until the beam is central to the target
4. Tighten the wing nuts to fix the target in place.

5. SPECIAL SETUPS

Sometimes it is better to shoot the laser over the pipe rather than through it, e.g. where the trench is filled with water.

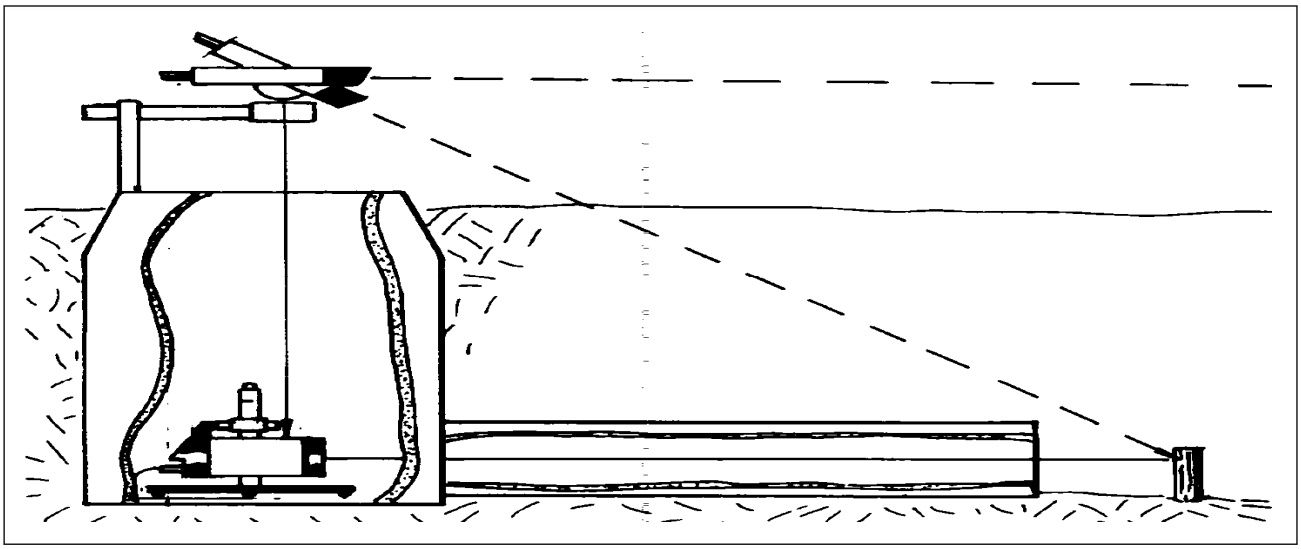
Use the tripod mount and the tripod as shown in the diagram on the next page. Shoot the Pipeguide over the pipe and align as in steps 1, 2, 3 and 4 in the section on basic set-ups.

Care must be taken to ensure that the line and grade of the pipe is trans-ferred accurately to the position of the pipe.

5.1 OVER THE TOP MOUNT

The simplest way to achieve this is using a staff pole. Using a staff pole, measure the distance from the invert of the pipe to the centre of the beam where it exits the Pipeguide. Then transfer this distance to the pipe to be laid. Steps must be taken to ensure that the staff is kept vertical. A simple way of achieving this is with a level vial or plumb bob.

5.2 MANHOLE SETUP



1. Choose the correct mount for the application.
2. Select the required grade.
3. Use a transit to establish the proper line and elevation of the pipeline.
4. Use a plumb bob to position the Pipeguide plumbing point directly below the transit
5. Sight the transit on the centre line of the next manhole and lock it on line.
6. Align the sight of the transit scope with a stake placed in the ground about 5m from the manhole.
7. Roughly align the beam so that it hits the stake.
8. Sight through the transit scope and adjust the line of the beam so that it aligns with the direction of the scope.
9. You are now ready to lay pipe.

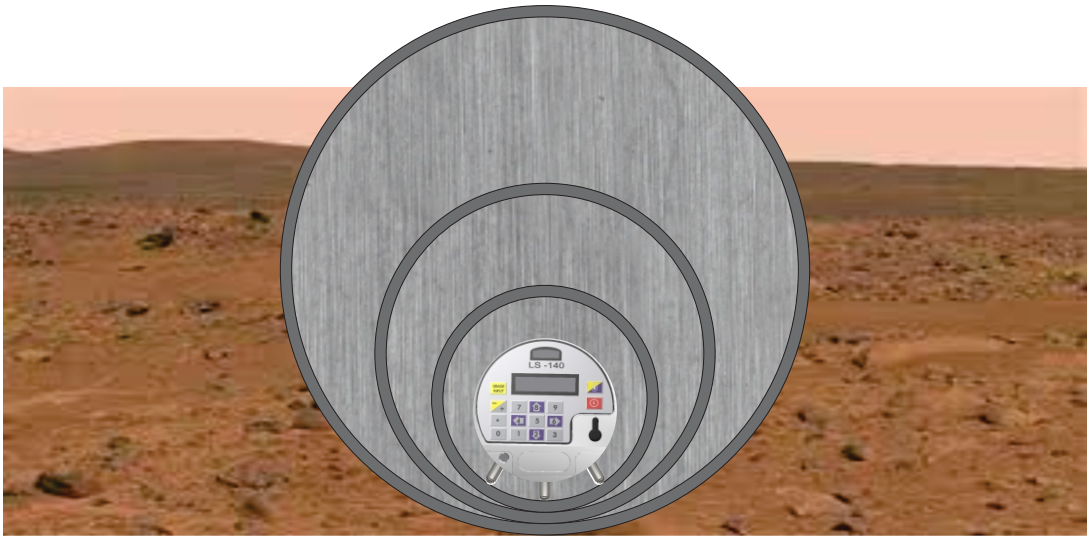
5.3 TOP OF PIPE SETUP

1. When using the top of pipe set-up, the correct feet must be chosen so that the Pipeguide sits firmly and is parallel with the pipe.
2. The set-up is the same as for basic set-ups (steps 1 - 3). See pages 11 to 15

5.4 INVERT/IN PIPE SET-UP

Pipeguide will fit inside 150 mm (6") pipe and poured inverts.
The standard Pipeguide kit contains feet for 150, 225 and 300mm pipe diameter.

1. Choose the correct feet size.
2. Dial in the required grade.
3. Insert the Pipeguide into the pipe and align to the next manhole.

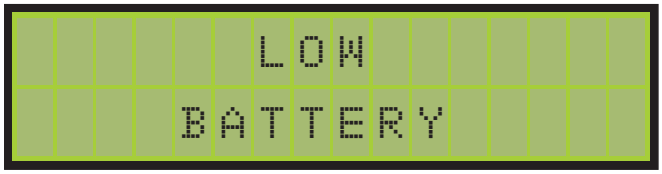


6. CHARGING THE INTERNAL BATTERY

The Pipeguide incorporates a nickel-metal hydride battery which gives a normal operating time of approximately 10 to 20 hours, depending on laser model. This battery can be recharged by connecting an external power source to the cable connector socket.

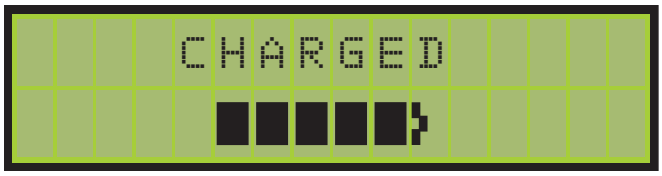
The Pipeguide battery can be charged regardless of whether the laser is being used or not. Initially a fast charging circuit is activated, and once the voltage reaches the required charge level, it will display BAT CHARGED.

Input charging voltage: 12 -16 V DC. **Maximum input current:** 1.0 Amp.
Charging time: 6 hrs. max. for Red and 12 hrs. max. for Green module.

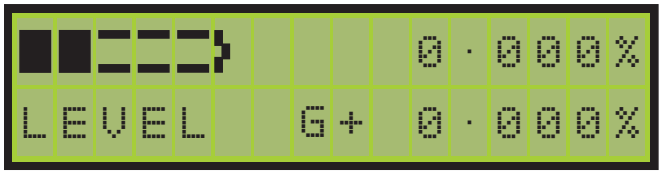


LOW BATTERY. This appears when the battery voltage drops below safe operating level while the laser is being used.

If the PIPEGUIDE is connected to an external power source and the on/off switch is off, the internal batteries willl start to charge and this message will appear. If the PIPEGUIDE is connected to an external power source and is powered off the internal batteries will start to charge and this message will appear.



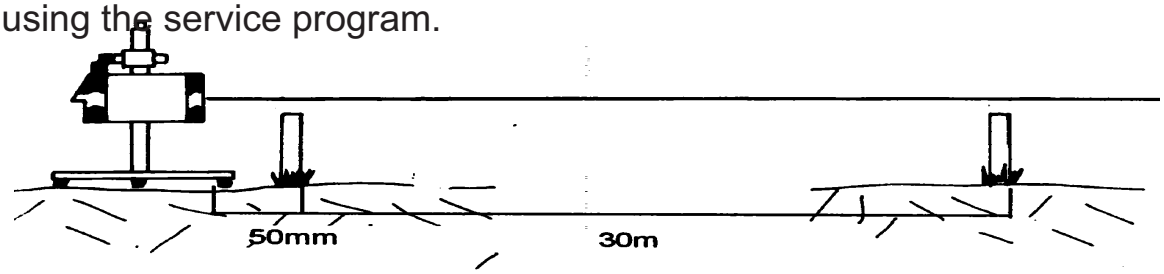
When the battery has been charged for 6 hours it will display CHARGED.



Internal battery voltage indicator. Indicates the charging status of the internal rechargeable battery.

7. CALIBRATION

The Pipeguide can be calibrated on site using an automatic level, two pegs and by using the service program.



To recalibrate the grade control switches:

1. Position two pegs in the ground at least 30 metres apart, with the first peg close to the laser beam exit point (say 50 mm).
2. Level the tops of the pegs using an automatic level.
3. Dial 0.000% grade into the Pipeguide and shoot the beam over the pegs.
4. The beam should be the same height above each peg. If not, recalibrate.
5. To recalibrate, adjust the beam until it is in the correct position relative to the pegs.
6. The LCD will now read the amount of % the laser is out of level.
7. Enter the Service Program (see section 8) and use the arrow keys to scroll to item 1 - 'Reset Grade'.
8. Press the 'Grade Input' key to reset the grade counter to 0.000%.
9. Scroll down to item 9 'Exit'.
10. Press the 'Grade Input' key to exit the Service Program.

To calibrate the line adjustment:

10. Use an optical instrument such as a theodolite, transit or string alignment adjusted to be parallel to the body of the Pipeguide.
2. If, once the body is aligned, the line readout on the LCD is not 0.000%,
3. Enter the Service Program and scroll down to Item 2 'Reset Line'.
4. Once you have the line adjusted correctly with the body of the Pipeguide, press the Grade Input key to reset the line counter to 0.000%.
5. Scroll down to Item 9 in the menu to exit the program. Calibration is now complete.

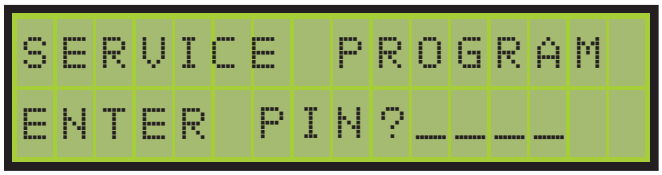
NOTE: If "CALIBRATION REQUIRED" message still appears after you have followed the above steps for calibrating the laser, the laser unit needs to be returned to the supplier for service.

8. SERVICE PROGRAM

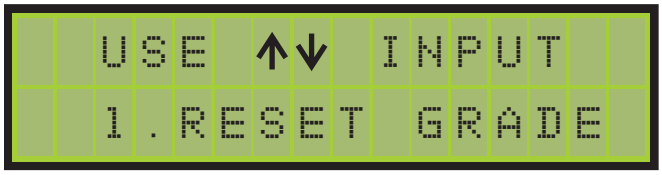
The service program can be used to:

- Calibrate grade 0.000% position.
- Calibrate line 0.000% position.
- Test Limits.
- Encode the owners name.

To select the service program, operate the +/- key once and then press the decimal key 4 times.

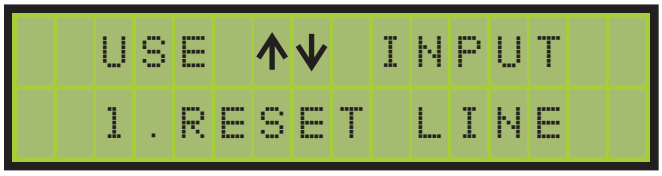


A four digit PIN number must be entered to continue. Correct PIN 1234 must be entered within 5 seconds or LCD will return to normal mode.



Operate the “GRADE INPUT” key to reset grade counter to 0.000%. The LCD will display “EXECUTED” when this occurs.

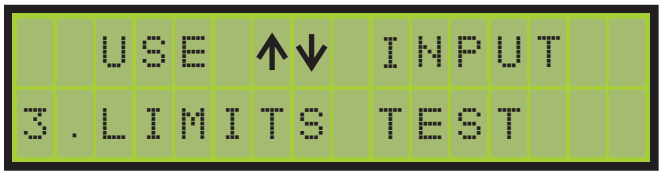
Press 2 key to move to next menu item



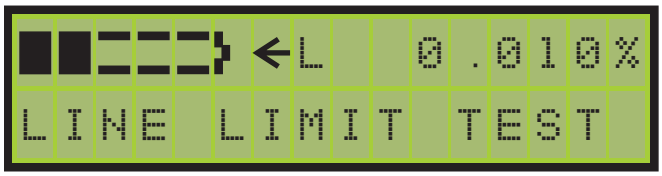
Operate “GRADE INPUT” key to reset the line counter to 0.000%. The LCD will display “EXECUTED” when this occurs.

Press 2 key to move to next menu item

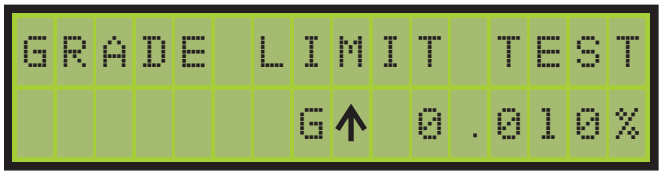
Note: In case of an “Out of CAL range” message appearing on the LCD the unit should be returned to supplier for service.



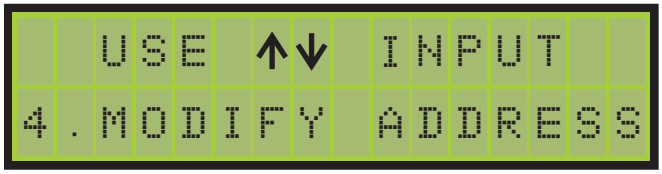
Operate the “Grade Input” key to execute Limits Test. LCD will display grade and line counters in standard format and laser will automatically test all limits. This process can be interrupted at any time.



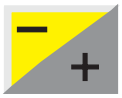
However, if laser is left undisturbed it will finish test by positioning grade and line counters in zero position, displaying limit test screen



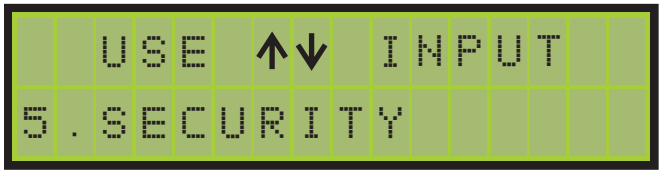
Press  key to move to next menu item.



Press  to start changing the current startup message. To write a new character, enter the codes according to the character table in chapter 10. For example, the letter ‘A’ would be entered by pressing the ‘6’ key and then the ‘5’ key.

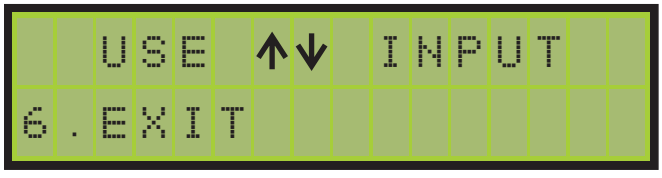
Use  and  to move back and forth on the screen.

Press  to exit back to main menu screen. New message will be available on next power up.



Press  key to move to next menu item.

Press  to enter Security setup menu.
See section 10. Laser Security for more details.



Press  key to move to next menu item.

Press  to exit from service menu

9. LASER SECURITY

Pipeguide units with serial numbers 006xx424 and higher are equipped with a built-in Laser Security feature, designed to prevent unauthorised use of your pipelaying laser. With the Laser Security disabled, the unit will display a greeting message on power-up and will commence its normal operation. When the Laser Security is enabled, however, the laser will not commence operation until the correct personal identification number (PIN) is entered.

When you purchase a new Pipeguide unit, the Laser Security feature is disabled and the security PIN is set to default “0000“. We recommend enabling the security feature as soon as you receive the unit as well as setting your own PIN. You should keep your PIN recorded in a safe place. Should you forget your PIN, you will need to send the laser back to your authorised dealer/manufacturer to have the PIN reset to the factory default.

9.1 ENABLING/DISABLING THE LASER SECURITY FEATURE

1. Enter the service program by operating the +/- switch once and the decimal point switch 4 times. Enter “1234” as a PIN using the keypad.

2. Using the up/down switches, scroll through to the menu item “5. Security”. Confirm by operating the Grade Input switch and then enter the PIN within 15 seconds (factory default PIN is “0000”).
3. The LCD screen should read “5.1 Security OFF” indicating that the security feature is disabled.

4. Operate the grade input switch to enable/disable the laser security feature.

5. To confirm your selection, use the up/down switches to scroll through to “6. Exit” and confirm by operating the grade input switch. The laser will now return to its normal operation.

9.2 CHANGING THE SECURITY PIN

1. Repeat steps 1-2 from the above procedure.
2. Using the up/down switches, scroll through to "5.2 Change PIN" and confirm by operating the grade input switch.
3. Using the keypad, enter a 4 digit PIN within 15 seconds. When all 4 digits have been entered your new PIN will be saved and effective immediately.

4. Operate the grade input switch to exit the service program.

NOTE: Keep a record of your PIN in a safe place. Should you forget your PIN, you will need to send the laser back to your authorised dealer/manufacturer to have the PIN reset to the factory default.

10. CHARACTER TABLE

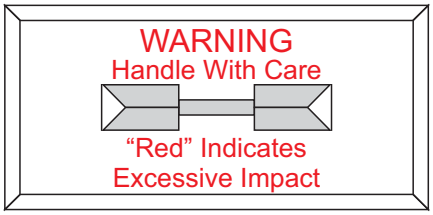
CODE	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
CHARACTER		!	“	#	$	%	&	‘	(	)		+	,	-	.	/	0	1
50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
2	3	4	5	6	7	8	9	:	;	<	=	>	?	@	A	B	C	D
69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106
X	Y	Z	[	¥	]	^	-	`	a	b	c	d	e	f	g	h	i	j
107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	{	|	}

11. TROUBLESHOOTING

If you experience difficulties with your laser the following suggestion solve the problems.

No beam	Check for Low Battery Indicator. Check for obstruction in pipe.
Blinking beam	Check for self level limit indicator. Still self levelling The unit may have been dropped while the laser was in “Lock”
Weak beam	Clean beam output window using a soft damp cloth. Check for spider webs inside the pipe. Very bright direct sunlight can make the beam appear weak.
Beam too big	Clean beam output window using a soft damp cloth. Check for spider webs in pipe. Water drops on window. Clean with a damp cloth.
Grade not correct	Check calibration of laser.

Impact Indication - Red indicates excessive impact. Please return for servicing if this occurs.



12. SAFETY PRECAUTIONS

- Never open the laser.
- Always adhere to the classification instructions
- Do not stare into beam or view directly with optical instruments

13. MAINTENANCE AND SERVICE

GENERAL

The Pipeguide has been specially developed to withstand the normally rugged conditions in which lasers are used. However, as with all electronic/optical equipment, excessive abuse will cause problems.

NEVER DROP THE LASER.

Always use a separate battery for the laser and NEVER START A VEHICLE ON A BATTERY TO WHICH THE PIPEGUIDE IS CONNECTED.
DO NOT STORE IN A WET CONDITION INSIDE CASE.

CLEANING

1. Always keep your equipment clean and dry, free from mud, dirt etc.
2. Clean the beam output window periodically. Do not use any abrasive substance or material. A damp tissue is the easiest solution.
3. Never wipe a dusty beam exit window or LCD with a finger or dry cloth.
4. Always store the Pipeguide in its carry case.

SERVICING

The easiest way to keep your Pipeguide accurate and trouble free is to have it regularly serviced. Every 12 months, take your laser to an authorised dealer for a complete check up.

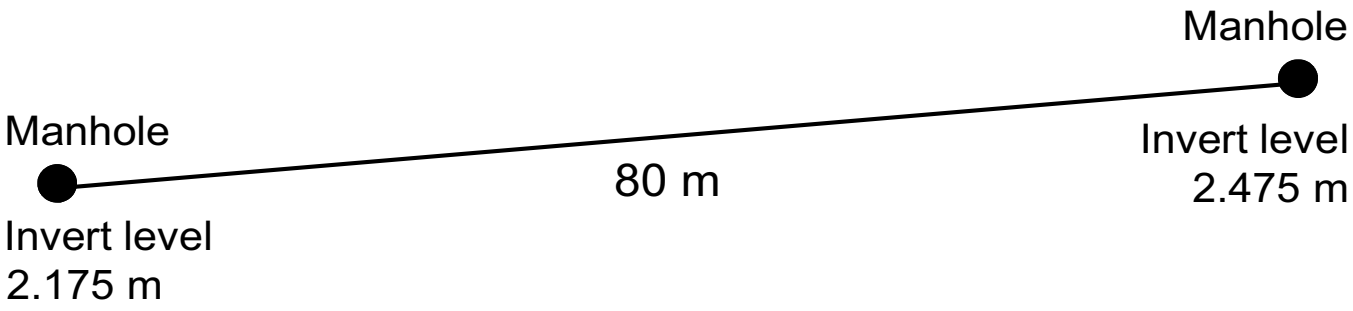
14. GRADE CHART

GRADE CONVERSION CHART
RATIO - PERCENTAGE

1:x	%	1:x	%	1:x	%	1:x	%	1:x	%	1:x	%	1:x	%	1:x	%
1	100.00	40	2.50	79	1.27	118	0.85	157	0.64	196	0.51	375	0.27	950	0.11
2	50.00	41	2.44	80	1.25	119	0.84	158	0.63	197	0.51	380	0.26	975	0.10
3	33.33	42	2.38	81	1.23	120	0.83	159	0.63	198	0.51	385	0.26	1000	0.10
4	25.00	43	2.33	82	1.22	121	0.83	160	0.63	199	0.50	390	0.26	1050	0.10
5	20.00	44	2.27	83	1.20	122	0.82	161	0.62	200	0.50	395	0.25	1100	0.09
6	16.67	45	2.22	84	1.19	123	0.81	162	0.62	205	0.49	400	0.25	1150	0.09
7	14.29	46	2.17	85	1.18	124	0.81	163	0.61	210	0.48	410	0.24	1200	0.08
8	12.50	47	2.13	86	1.16	125	0.80	164	0.61	215	0.47	420	0.24	1250	0.08
9	11.11	48	2.08	87	1.15	126	0.79	165	0.61	220	0.45	430	0.23	1300	0.08
10	10.00	49	2.04	88	1.14	127	0.79	166	0.60	225	0.44	440	0.23	1350	0.07
11	9.09	50	2.00	89	1.12	128	0.78	167	0.60	230	0.43	450	0.22	1400	0.07
12	8.33	51	1.96	90	1.11	129	0.78	168	0.60	235	0.43	460	0.22	1450	0.07
13	7.69	52	1.92	91	1.10	130	0.77	169	0.59	240	0.42	470	0.21	1500	0.07
14	7.14	53	1.89	92	1.09	131	0.76	170	0.59	245	0.41	480	0.21	1550	0.06
15	6.67	54	1.85	93	1.08	132	0.76	171	0.58	250	0.40	490	0.20	1600	0.06
16	6.25	55	1.82	94	1.06	133	0.75	172	0.58	255	0.39	500	0.20	1650	0.06
17	5.88	56	1.79	95	1.05	134	0.75	173	0.58	260	0.38	510	0.20	1700	0.06
18	5.56	57	1.75	96	1.04	135	0.74	174	0.57	265	0.38	520	0.19	1750	0.06
19	5.26	58	1.72	97	1.03	136	0.74	175	0.57	270	0.37	530	0.19	1800	0.06
20	5.00	59	1.69	98	1.02	137	0.73	176	0.57	275	0.36	540	0.19	1850	0.05
21	4.76	60	1.67	99	1.01	138	0.72	177	0.56	280	0.36	550	0.18	1900	0.05
22	4.55	61	1.64	100	1.00	139	0.72	178	0.56	285	0.35	560	0.18	1950	0.05
23	4.35	62	1.61	101	0.99	140	0.71	179	0.56	290	0.34	570	0.18	2000	0.05
24	4.17	63	1.59	102	0.98	141	0.71	180	0.56	295	0.34	580	0.17	2500	0.04
25	4.00	64	1.56	103	0.97	142	0.70	181	0.55	300	0.33	590	0.17	3000	0.03
26	3.85	65	1.54	104	0.96	143	0.70	182	0.55	305	0.33	600	0.17	3500	0.03
27	3.70	66	1.52	105	0.95	144	0.69	183	0.55	310	0.32	625	0.16	4000	0.03
28	3.57	67	1.49	106	0.94	145	0.69	184	0.54	315	0.32	650	0.15	4500	0.02
29	3.45	68	1.47	107	0.93	146	0.68	185	0.54	320	0.31	675	0.15	5000	0.02
30	3.33	69	1.45	108	0.93	147	0.68	186	0.54	325	0.31	700	0.14	5500	0.02
31	3.23	70	1.43	109	0.92	148	0.68	187	0.53	330	0.30	725	0.14	6000	0.02
32	3.13	71	1.41	110	0.91	149	0.67	188	0.53	335	0.30	750	0.13	6500	0.02
33	3.03	72	1.39	111	0.90	150	0.67	189	0.53	340	0.29	775	0.13	7000	0.01
34	2.94	73	1.37	112	0.89	151	0.66	190	0.53	345	0.29	800	0.13	7500	0.01
35	2.86	74	1.35	113	0.88	152	0.66	191	0.52	350	0.29	825	0.12	8000	0.01
36	2.78	75	1.33	114	0.88	153	0.65	192	0.52	355	0.28	850	0.12	8500	0.01
37	2.70	76	1.32	115	0.87	154	0.65	193	0.52	360	0.28	875	0.11	9000	0.01
38	2.63	77	1.30	116	0.86	155	0.65	194	0.52	365	0.27	900	0.11	9500	0.01
39	2.56	78	1.28	117	0.85	156	0.64	195	0.51	370	0.27	925	0.11	10000	0.01

15. NOTES

The following notes will assist when checking the correct grade has been selected where drawings show not grades but invert levels only.



First we find the amount of fall between the two manholes:

H = 2.475m – 2.175m
H = 0.3 m

This information is shown on the drawing below:

To find the percentage grade use the following formula:

$$\text{Percentage grade} = \frac{\text{Amount of fall x 100}}{\text{Distance}} = \frac{0.3 \text{ x } 100}{80} = 0.375\%$$

16. ACCESSORIES AND OPTIONS

The standard Pipeguide kit (LS.140.G/B.K) includes:

Pipeguide red or green beam	LS.140.B/G
Carry Case for LS.140	A.140.043
IR Remote for LS.140	A.140.052
Pipeguide feet and T-piece	A.140.014
Universal target, small with 2 inserts	A.140.023
Battery charger (100-240V mains power supply)	A.MCE.049
Battery charger (car cigarette lighter plug)	A.MCE.050
Battery charger (12-24V cord with clips)	A.MCE.051
Grade chart & Allen key	A.140.030
Operator's manual	OM.LS140B/G

16.1 ACCESSORIES

Plastic Case A.140.043

Sturdy and lightweight, rubber inserts keep the Pipeguide secure with all the standard equipment.

Infra-Red Remote Control A.140.052

Allows operation of most of the Pipeguide functions from a distance of up to 150 m (500 feet).

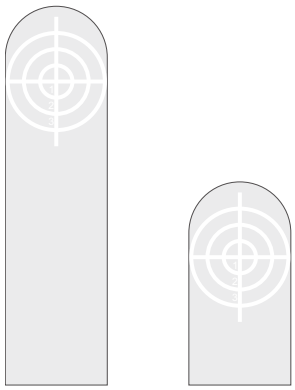
Targets

The targets for the Pipeguide range from those small enough to fit inside a 150mm pipe to large adjustable models.

A.140.009

A.140.006

A.140.023



P.140.050.W9 P.140.050.W5

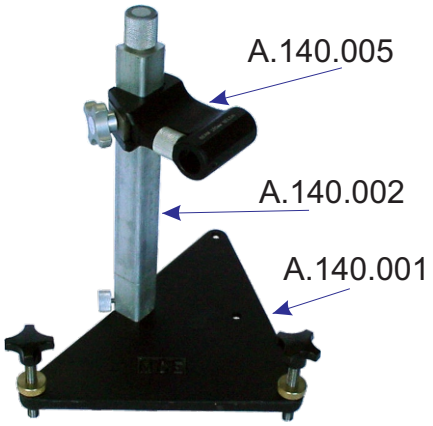
Fixed Target 6“ (150 mm)	A.140.006
Fixed Target 9“ (225 mm)	A.140.009
Universal Target Small - 2 Inserts	A.140.023
White Inserts: Universal Target	P.140.050

A.140.042

The Back Support A.140.042 & A.140.701

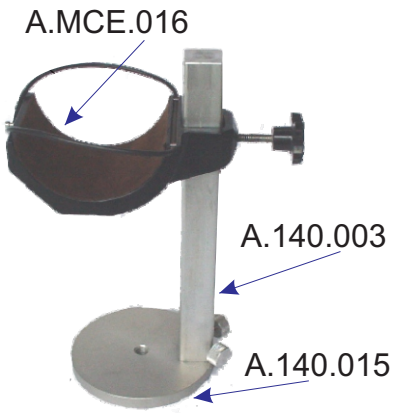
The Back Support allows MCE Pipeguide to be set up on top of a standard 100 mm and 150 mm plastic sewer pipe, without slipping.
The nylon foot fits firmly into the lower carry handle as seen on the photo on the left.

A.140.701



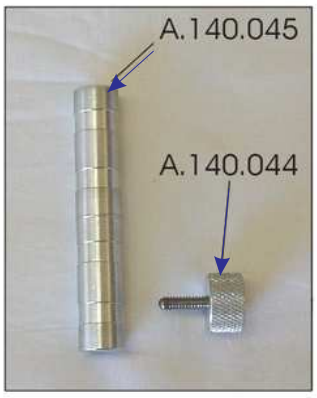
The Trivet Plate assembly provides the Pipeguide with a stable yet adjustable platform.

Height Adjustable Pole
A.140.002
Base Plate for Pipeguide
A.140.001
Rod Mount: MCE Pipeguide
A.140.005



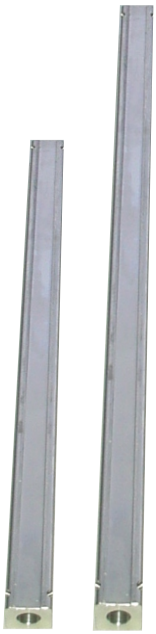
The Tripod Mount allows the laser to be used with a tripod or with either the manhole mount or the trivet plate. The laser attaches to the mount with a simple rubber strap.

Rod Mount with strap
A.MCE.195
Tripod Mount LS.140
A.140.015
Plain Pole for Base Plate
A.140.003



Plain Pole Lock Nut
A.140.044

Plain Pole Pin
A.140.045



700 mm Plain Pole
A.140.700

1050 mm Plain Pole
A.140.1050

Pipeguide Feet & T-Piece
A.140.014 & A.140.032

Magnet for Calibration
A.MCE.090

Adapter
3.5" External to 5/8" Internal
A.220.001

17. TECHNICAL SPECIFICATIONS

Laser Type	658 nm red Laser Diode 532 nm green Laser Diode
Laser Power	3 mW Nominal
Grade Range	-20% to +35%
Grade Range Option	Any maximum 55% range
Accuracy	10 arcseconds
Self Levelling Range	-22% to +37%
Line Adjustment Control	± 2.25m @ 30m
Operating Power Source	Internal Rechargeable Battery or External 12 V DC.
Battery Type	Ni-Mh
Input Charging Voltage	12 to 16 V DC
Input Charging Current (max)	1.0 Amp
Charging Time	Red beam approx. 6 Hrs Green beam approx. 12 Hrs
Reverse Polarity Protection	Yes
Operating Time when Fully Charged	20 Hrs Nominal
Charging Capable when Laser Operating	Yes
Design Characteristics	Fully machined aluminium body
Waterproof/Fog-proof	Yes - purged with dry nitrogen
Length	270 mm
Diameter	140 mm
Mass (laser with handle only)	5 kg

Specifications subject to change without further notice.