MCE LASERS

LASERGRADER

LS.230.E, LS.230R.E

Operator's Manual

MCE

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

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 _____

Facsimile _____

Email _____

Published By:

MOBA Mobile Automation Australia Pty Ltd
90 Willandra Drive
Epping 3076
Victoria, Australia

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Warranty

Statement of Limited Warranty

The Lasergrader is warranted to be free from defects in performance and workmanship for a period of twelve months from date of purchase. The warranty covers all costs of repair or replacement at the manufactures option.

LIMITS AND EXCLUSION:
The warranty will not apply to any damage resulting from negligence, accident, damage, misuse, repair or storage, or in case of abnormal use.

The warranty is considered void absolutely, if any attempt is made to repair, modify or recalibrate the unit whatsoever. In these circumstances the manufacturer reserves the right to charge for costs incurred in repair or replacement of the unit.

MOBA AUSTRALIA is not liable for:
1. Freight charges incurred in return of defective unit to manufacturer.
2. Loss of income or inconvenience relating to defect in performance of the unit.
3. Leasing charges of alternative equipment during repair of a defective unit.

MOBA AUSTRALIA requires that the customer makes reasonable attempt to inform MOBA AUSTRALIA of problems with the product prior to returning the unit for repairs.

WARNING:
Starting or operating a vehicle, compressor, portable welder etc. on a battery that is powering the Lasergrader will void warranty.

Safety Information

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

1. Read and become familiar with the manufacturer's operating manual for your machine, including safety information, before installing or using your Lasergrader.
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. 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.
4. Do not weld the holder, tripod, mast or trailers while the Lasergrader is in operation. It Is best to remove any electronic gear near a welding job.
5. All mounting bracket welds must be secure, stiff and sufficiently strong to prevent the Lasergrader from vibrating excessively or from breaking at the weld while the machine is operating.
6. Any external power supply must be rated between 12 and 24 V DC.
7. The internal battery pack of the Lasrgrader should be fully recharged before each use.
8. Do not expose the Lasergrader internal batteries to intense heat.
9. Never open laser equipment.
10. Do not stare into the laser beam.
11. Always adhere to classification instructions.
12. Provide adequate notice for the public if they are to be exposed to a laser beam. Ensure the safe use of laser levelling instruments in accordance with the occupational Health and Safety Regulations of your state, and "Australian Standards AS2211 and AS2397".

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1. Introduction

The MOBA Lasergrader is a touch control dual or single grade rotating laser, specially designed for agricultural, construction, earthmoving and land levelling applications. The Lasergrader (transmitter) emits a thin 360° rotating beam of visible light. This beam forms a constant grade reference over the job site. The light beam can be either horizontally level or at an incline (grade). With accurate electronic self levelling capabilities, this ensures a correct and reliable grade references at all times.

When used with a compatible laser receiver, the Lasergrader can help you significantly reduce your work time, and dramatically improve the quality of your work by assisting you to deliver perfect accuracy each time.

1.1 Principles of Operation

The MOBA Lasergrader is designed to operate in conjunction with a receiver. The receiver detects the laser beam and provides a highly visible indication of the height of the blade or bucket of the machine relative to the reference plane delineated by the rotating laser beam. The features and versatility of the Lasergrader allow it to be adapted to many different types of machines and applications.

The Lasergrader incorporates sophisticated electronic circuitry which allows it to offer an exceptional operating range (up to 700 metres radius or 1.4 km diameter) while maintaining the user selected resolution for the centre band (accuracy).
All user selected settings are retained at power down sand are automatically restored the next time the unit is powered up.

The Lasergrader can operate from its own internal batteries or from an external power source.

1.2 Operational Features

The Lasergrader exhibits the following features:

Rugged construction able to withstand harsh operating environments.
Operation from internal batteries that can be fast charged.
Able to operate while internal batteries are charging.
Automatic saving and restoration of user selected settings.

1.3 Product Versions

The Lasergrader is available in various versions:
LS.230.E, LS.230R.E
LS.230.A, LS.230R.A & LS.230.AHG

LS.230.E

Dual grade rotating laser with range up to 700 m radius (1.4 km diameter)

LS.230R.E

Dual grade rotating laser with range up to 700 m radius (1.4 km diameter) and full function radio remote control with range up to 700 m radius (1.4 km diameter)

2. Lasergrader Switchpad

Lasergrader switchpad is laid out as shown below along with explanations of the functions for each of the switches.

PLEASE NOTE: Switches can have 2 different functions depending on how and when they are operated. Please refer to specific parts of this manual for instructions on how to correctly operate your laser unit's switchpad.

Grade A switch

Grade B switch

ON/OFF switch

Grade A up switch
or
Number 7 switch

Grade B up switch
or
Number 8 switch

Lock switch
or
Number 9 switch

Grade A down switch
or
Number 4 switch

Grade B down switch
or
Number 5 switch

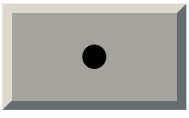
Rotating speed switch
or
Number 6 switch

Number 1 switch

Number 2 switch

Mode switch
or
Number 3 switch

Number 0 switch
(other function not
available)



Decimal point switch
(other function not
available)

+/ - switch

3. Operating Instructions

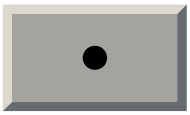
3.1 Turning the Unit ON/OFF

To turn the unit on, press and hold the ON/OFF switch until you hear a beep and the LCD backlight switches on.

To turn the unit off press and hold the ON/OFF switch until you hear a beep and the LCD backlight switches off.instructions on how to correctly operate your laser unit's switchpad.

3.2 Inputting the Grade

Select the desired grade by pressing the corresponding grade select switch, either A or B.



Dial in the required grade using the numerical switches and the decimal point switch.

Press the grade select switch again to start counting to the selected grade.

Alternatively:

Use the grade up/down switches for the required grade to select the desired grade value.

Press the "A" key again to accept the selection.

"INPUT GRADE OUT OF RANGE" will be displayed if grade value input is greater than +20.000% or less than -5.500%.

3.3 Grade Display Format

The grade value can be displayed either as percentage or a ratio. To switch between the two, press two grade select switches simultaneously.

RATIO

PERCENTAGE

3.4 Adjusting the Rotating Head Speed

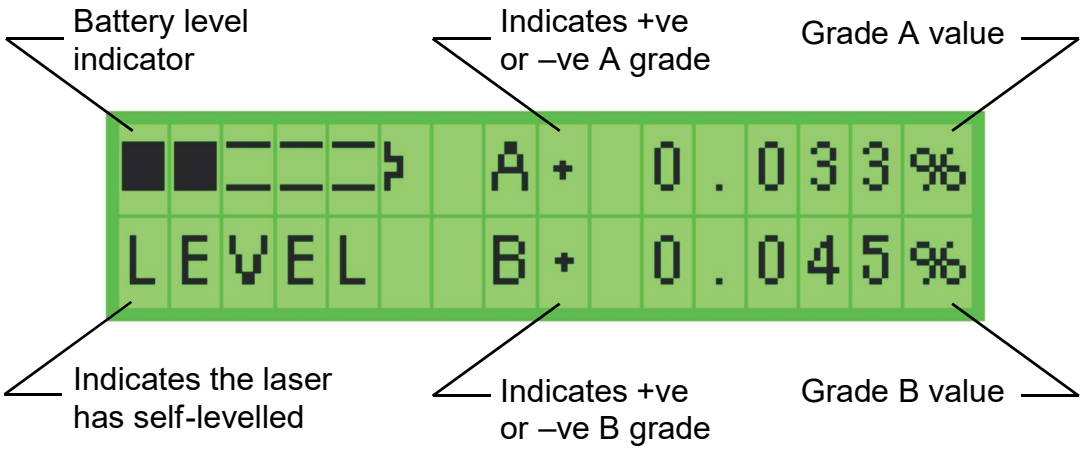
The rotating head speed can be adjusted using the rotating head speed switch. Press the rotating head speed switch to select the desired rotating speed. The available options are MIN, MID and MAX (approximately 600 and 900 revolutions per minute). The chosen speed will be briefly displayed on the LCD.

3.5 Sleep Mode

The LCD incorporates an internal light that will illuminate when any switch is pressed. The light will remain on for 60 seconds and then switch off automatically to save power.

3.6 The Liquid Crystal Display (LCD)

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

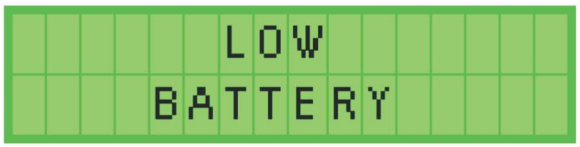


The most common LCD messages and their meanings are explained below:

Flashing asterisk means that the laser is currently self levelling.

Once the laser has self - levelled the word LEVEL will be displayed on the LCD.

If the battery voltage drops below the required level, LO_BAT message will be displayed and the laser will stop rotating.

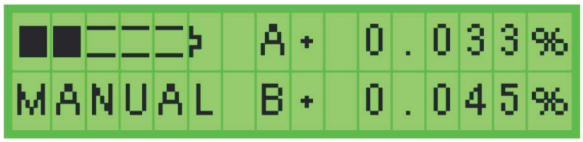


If the battery voltage is below the required level when the laser is powered up, this message will be displayed briefly before the laser is automatically switched off.

This message will be displayed if the laser has reached the self - levelling limit.

Indicates the lock function has been activated.

Indicates the unit is in Over Ride mode. In this mode the unit will self - level without stopping the rotating head or switching the laser beam off.



Indicates the unit is in Manual mode. In this mode the unit will not self - level.

Indicates the speed of the rotating head in revolutions per minute. Shown briefly after the rotating head speed switch is operated.

3.7 Grade Memory

When the Lasergrader is turned off, it will remember the last grade setting used and will display that setting the next time it is powered up, e.g. for next day setup.

3.8 Lock Function/Height Alert Function

To activate the lock/height alert function, keep the lock switch pressed for 3 seconds. A padlock symbol appears on the LCD to signal that the function has been activated.

While the unit is locked, you will not be able to operate any switches. Furthermore, the height alert function will also be activated. Should the laser unit be knocked, bumped or sink on unstable ground when the lock function is on, the laser will stop operating and the padlock symbol on the LCD will blink to warn the operator of a possible problem with the position of the laser unit.

To deactivate the lock height alert function simply press the lock switch.

3.9 Override and Manual Modes

The Override function is particularly useful on extremely windy days. When activated, the laser will self-level without stopping the rotating head or switching the laser beam off. It allows the operator to continue working while the laser is self -levelling.

When in Manual mode, the laser will not self-level. This allows the operator to manually set the grade by tilting the laser unit or setting the unit on its side for a vertical beam projection.

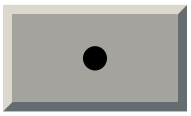
To switch between Normal, Override and Manual modes:

To switch the unit to Over Ride mode, press the Mode Switch button once. The LCD will display “O RIDE” signalling the unit is in Override mode.
Press the Mode Switch button again to enter the Manual mode. The word “MANUAL” will be displayed on the LCD.
Press the Mode Switch once more to switch back to normal mode. The LCD will display “LEVEL” if the unit has finished self - levelling or a flashing asterisk ‘*” if the unit is self - levelling.

3.10 Adjusting Wind Sensitivity

Windy conditions or unstable surfaces may cause frequent start-stopping of the rotating. This happens because the shaking/vibrating take the unit out of its level Dead Band and the unit needs to stop and re-level. By increasing the Dead Band setting the unit becomes more robust in windy or shaky conditions at the cost of accuracy. The user can choose a setting between 0.01% and 0.10%.

To adjust the dead band:



Enter the service program by pressing the +/ - switch once followed by pressing the decimal point switch 4 times. You will then be asked to enter the PIN. Correct pin 1234 must be entered within 15 seconds or the unit will return to its normal operation.

Operate the grade A up/down switches to select “6. Dead Band”.

Press the grade A switch repeatedly to select a setting between 0.01% and 0.10%.

Operate the grade A up/down switches to select ‘Exit’ and press ‘A’ to exit the service program.

3.11 Standby Mode

The standby mode puts the laser unit into low power consumption mode from which it can be returned back to normal operation via a button press either on the laser unit or on the remote control (LS.230R.E only). Leaving the unit in standby mode allows the work to be continued at a later time without the need to access the laser unit.

To put the laser unit to standby mode:

While the laser is in normal operating mode, press the MODE key on the switch pad of the remote control 3 times to select STANBY mode.

To exit the STANDBY mode operate the MODE key once.

3.12 Full Function Radio Remote Control (LS.230R.E only)

The Full Function Radio Remote Control (FFRRC) allows complete control of the Lasergrader LS.230R.E laser unit from a distance of up to 700 metres.

A.230.006

3.12.1 Turning the laser unit OFF

Press and hold the ON/OFF switch on the remote control for 10 seconds to turn the laser unit off. The remote control LCD display will show Communication Error to indicate that the laser unit has been switched off.

PLEASE NOTE: the laser unit can not be turned ON from the remote control.

3.12.2 Calibrating the laser unit

With the laser unit switched on and in normal operating mode, follow instructions from section 6. Lasergrader Calibration Instructions to calibrate the laser unit using the radio remote control.

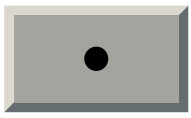
The service menu will be displayed on the remote control LCD display however the LCD display on the laser unit will continue to display normal operating screen.

To exit from MENU screen select EXIT option or switch the remote control unit off.

3.12.3 Changing the Radio Channel

For normal operations, the same radio channel for both remote control and Lasergrader LS.230R.E laser unit should be selected.

To change the radio channel on remote control:



Enter the service program by pressing the +/- switch once followed by pressing the decimal point switch 4 times.
You will then be asked to enter the PIN. Correct pin 1234 must be entered within 15 seconds or the unit will return to its normal operation.

Operate the grade A up/down switches to select “Radio Channel xx”.

Press the grade A switch to select one of the 6 available channels.

Once finished, operate the grade A up/down switches to select ‘Exit’ and press ‘A’ to exit the service program.

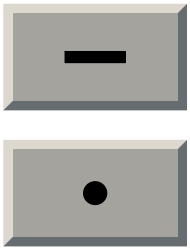
The 6 available channels correspond to the following frequencies:

Channel	Frequency [MHz]
01	417.92
02	420.92
03	423.92
04	428.92
05	433.92
06	438.92

To change the radio channel on Lasergrader LS.230R.E laser unit, follow the same instructions as above on the laser unit.

3.12.4 Changing the Radio Power

To change the radio power on remote control:



Enter the service program by pressing the +/- switch once followed by pressing the decimal point switch 4 times.
You will then be asked to enter the PIN. Correct pin 1234 must be entered within 15 seconds or the unit will return to its normal operation.

Operate the grade A up/down switches to select “Radio Power xx”. Select suitable power depending on your desired operating distance (Higher power, longer distance).

Press the grade A switch to select one of the 8 available radio power levels.

Once finished, operate the grade A up/down switches to select ‘Exit’ and press ‘A’ to exit the service program.

The 8 available options correspond to the following power levels:

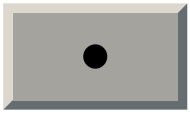
Option	Power
01	-10
02	-6
03	-1
04	-3
05	8
06	12
07	17
08	20

To change the radio power on Lasergrader LS.230R.E laser unit, follow the same instructions as above on the laser unit.

The radio power for Lasergrader LS.230R.E laser unit can be different to that of remote control, however it is advised to have the same configuration on both remote control and Lasergrader LS.230R.E laser unit.

4. CUSTOM GREETING MESSAGE

A greeting message is displayed briefly on the unit's LCD screen when it is powered up. The message consists of 2 lines with 16 characters each and can be modified as per the procedure outlined below.



Enter the service program by pressing the +/ - switch once followed by pressing the decimal point switch 4 times.
You will then be asked to enter the PIN. Correct pin 1234 must be entered within 15 seconds or the unit will return to its normal operation.

Operate the grade A up/down switches to select "4. Modify address".

Press the grade A switch and then use the character table below to enter the desired message.

Once finished, press the B grade switch to store the new message and exit.

The +/ - switch moves the cursor to the next position.

The decimal point switch moves the cursor to the previous position.

Press and hold the A grade switch to reset to default address.

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	{	|	}

5. Charging the Internal Batteries

The Lasergrader internal batteries should be fully re-charged before each use. Different types of battery chargers are available. The standard kit includes the following three:

Charger that operates from the AC mains
Cigarette lighter plug and cord
Power cord and clips

5.1. Charging the Internal Batteries from AC Mains

Plug the charging lead from the MOBA battery charger into the connector on the back of the Lasergrader then plug the battery charger into a mains outlet and switch on the mains power.
The red led will turn on indicating that the batteries are charging.
Once the batteries are fully charged, the LED will turn off.

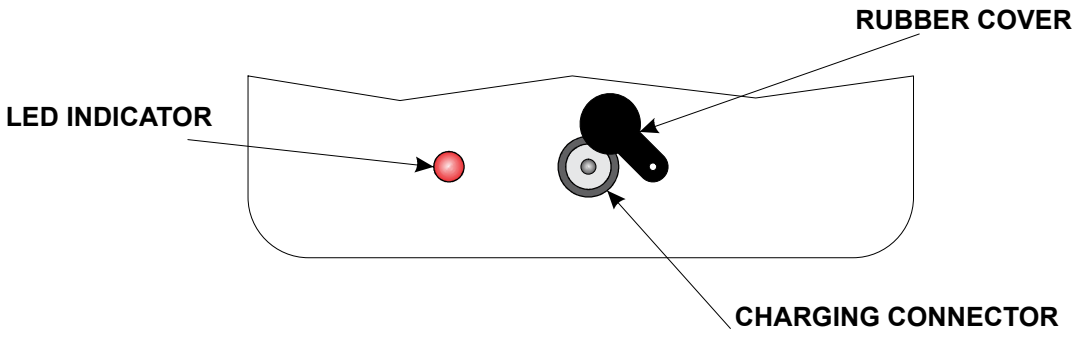
5.2. Using MCE 12 - 24 Volt Cigette Lighter Plug

Plug the charging lead from the MOBA cigarette lighter cord into the connector on the back of the Lasergrader and connect the MOBA cigarette lighter cord to a machine's or vehicle's 12 - 24 volt cigarette lighter socket.
The red led will turn on indicating that the batteries are charging.
Once the batteries are fully charged, the LED will turn off.

5.3. Using Power Cord with Battery Clips

Connect the charging connector of the power cord to the back of the unit, and connect the power cord clips to a 12- 24 volt battery (DC).

The red LED will turn on indicating that the batteries are charging.
Once the batteries are fully charged, the LED will turn off.



6. Lasergrader Calibration Instructions

Please remember that the laser is a precision instrument, therefore it is important that you keep it calibrated and in proper condition. The accuracy of your work is completely your responsibility. MOBA recommends that a qualified technician performs calibration and it is also important that the laser is checked regularly. The following are a few simple procedures that can be preformed on the job site.

6.1 Horizontal Check

1. Place the Lasergrader on a firm base, e.g., concrete floor, work bench, solid table or tripod.
2. Align one grade axis (say A axis) towards a fixed target 30 to 40 metres from the laser unit (as shown on diagram 5.1).
3. Switch the laser on and allow it to operate for 30 seconds. Set both grades to zero and allow 1 - 3 minutes for the self-levelling system to level the laser.
4. With a suitable hand sensor, mark the laser position (X) on the fixed target.
5. Rotate the Lasergrader unit by 180° on its base.
6. Allow the laser to self-level, and then mark the laser position (Y) on the fixed target.
7. The two marks (X & Y) should be close to each other (within 2.4 mm over 30 metres).
8. If this is not so, clearly mark the midpoint (M) between the two marks you made earlier and proceed to calibrate the unit as per “6.2 Calibration instructions”.
9. Repeat the above steps to check the other axis.

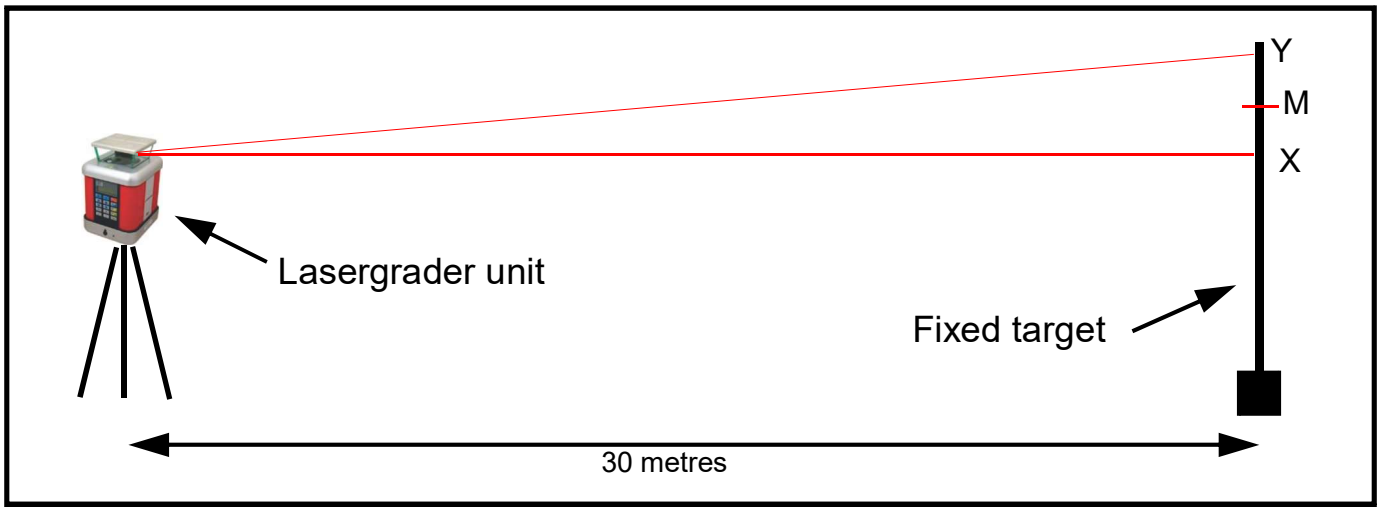
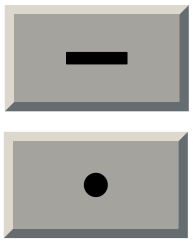


Diagram 5.1

6.2 Calibration Instructions

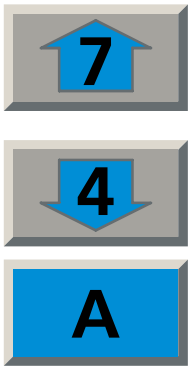
Operate the appropriate grade switch until the laser beam hits the midpoint (M) you marked when performing the horizontal check" (in this case grade A switches).



Enter the service program by pressing the +/- switch once followed by pressing the decimal point switch 4 times.
You will then be asked to enter the PIN. Correct pin 1234 must be entered within 15 seconds or the unit will return to its normal operation.

Operate the grade A up/down switches to select "Reset A Grade" or "Reset B Grade" depending on which grade you are calibrating (in this case grade A).

To confirm the resetting of the grade, press the A grade switch once. The grade has now been calibrated.



To exit from the service program, operate the grade A up/down switches to select "6. Exit" and confirm by pressing the A grade switch.

Note: In case of an "Out of CAL range" or "SERVICE REQUIRED" message appearing on the LCD the unit should be returned to supplier for service.

6.3 Cone Error Check

1. Place the Lasergrader unit on a tripod in the centre between two walls 40 to 50 metres apart.
2. Set both grades to zero, and mark the laser beam position with a suitable sensor on both walls.
3. Now, set up the laser unit on the tripod near wall A, say 1 to 2 metres from the wall, without changing the laser orientation. Allow 1 - 3 minutes for the self leveling system to level the laser, and then mark laser beam position on wall A and B.
4. If the difference between the readings is less than ± 4 mm (allowing for a datum change) there is no problem with cone. If greater than ± 4 mm, return the Lasergrader unit to your nearest MOBA dealer for correction.

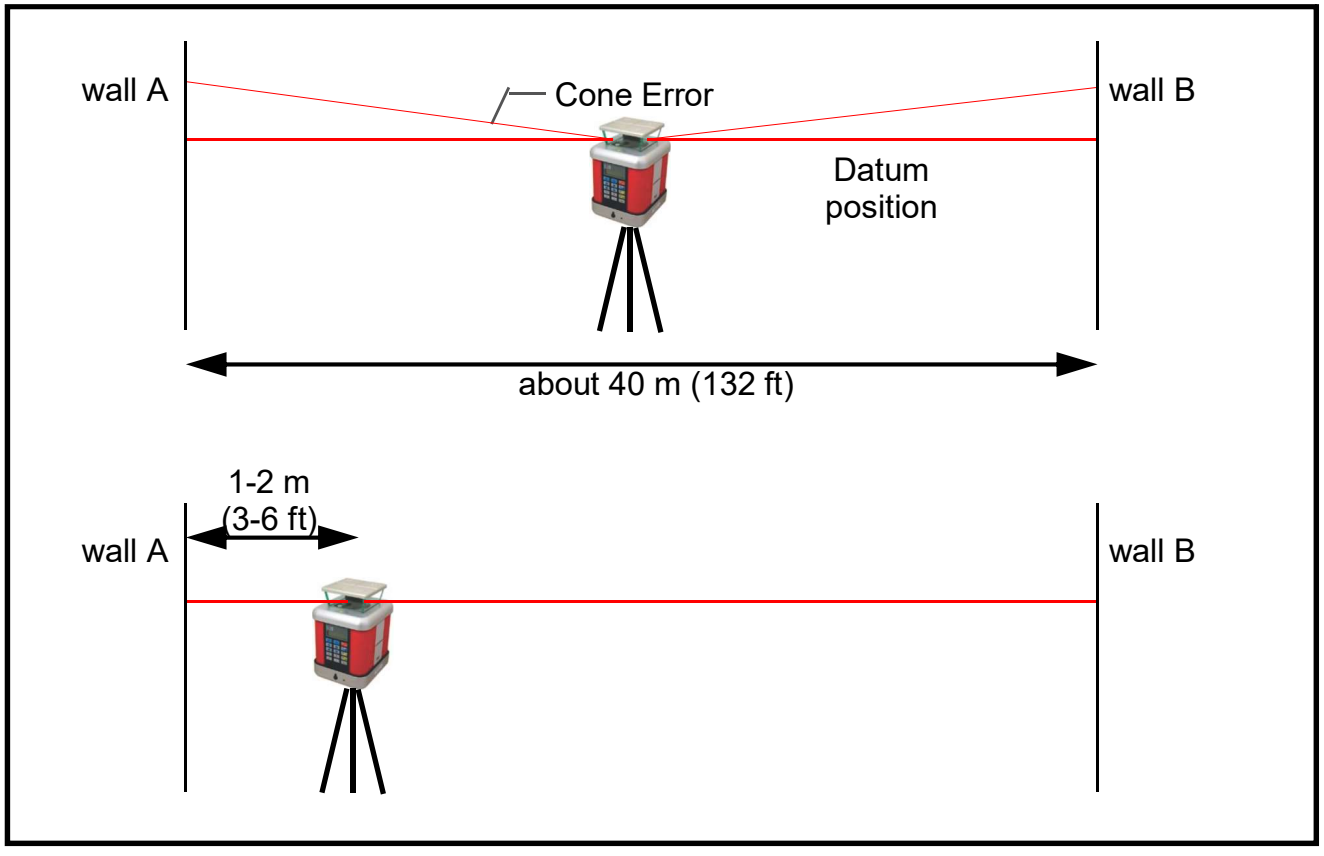


Diagram 5.3

7. Maintenance and Servicing

1. Always keep your laser equipment clean & dry.
2. Clean windows periodically. Do not use any abrasive substance or material to clean. A soft tissue or an air jet from an air compressor can be used to blow away the dust from the windows.
3. Always store the Lasergrader in its carry case. Positioning the laser correctly in its carry case is very important.
4. Periodically (every 12 months recommended) take your laser to an authorised dealer or service centre for a complete check up.
5. Check calibration periodically.
6. When transporting in a vehicle, use a safety belt to secure the Lasergrader, do not carry unsecured on a truck tray.
7. Ensure carry case latches are securely closed before lifting the case. (Remember to bend your knees when lifting).

8. Troubleshooting

Problem	Remedy
No beam (when visible beam supplied)	Check low battery message (flat battery). Check cable connectors. Check if laser is within its self leveling range. Laser still self leveling - wait for LEVEL to be displayed in the LCD.
No distance	Clean windows on laser. Clean window on sensor.
Erratic signals on panel	Clean optics on laser. Clean window on sensor. Check connectors on cables. Check for breaks in cables. Cracked sensor window. Dust, fog, and heavy rain may cause problems. Wait to clear.
Grade not correct	Check calibration.

9. Machinery Control Equipment

The machinery control equipment consists of a 360° sensor, control panel and cables. This system is designed to receive the reference plane of the rotating laser beam. This then gives an accurate indication to the operator of the position of the machine's blade relevant to the plane.

9.1 Operation of Machinery Control Equipment

Once the sensor, panel and cables have been placed in their relevant positions on the machinery and the laser has been set up in the correct manner, it is time to adjust the machinery control equipment to be relevant with the reference plane of laser beam.

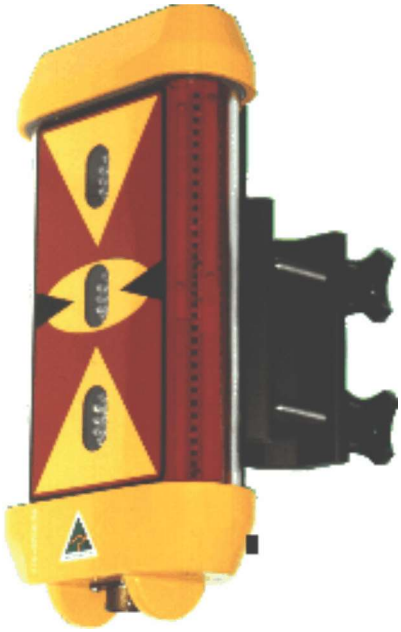
1. The machine must be moved to a predetermined datum point (reference point).
2. The blade of the machine is placed on the datum by normal operator control
or the up/down switch on the panel when connected to hydraulic solenoids.
3. The panel is placed on manual mode and accuracy switch is moved to fine.
4. The height of the sensor must be adjusted up or down until green (on grade) light appears and is constant. This has now established the machinery control equipment relevant to the reference plane of laser light, and the finished plane required in the earthmoving or levelling operation.
5. Select the on grade accuracy required for the application, i.e. Fine, Normal or Wide.
6. If connected to hydraulic solenoids, switch to Auto. This will ensure the blade of the machine will remain on grade at all times.

9.2 Operation of MCE 360 Degree Sensor

The sensor receives the impulses of light from the laser via four arrays of photo sensitive cells. The signals are then processed and transmitted to the control panel.

The sensor is manufactured in such a way that laser spot size, flashing of the laser light or distance do not effect its performance in providing consistent and accurate signals to the panel. The photo cells are specifically arranged to read whether the reference plane is high, low or central on the sensor.

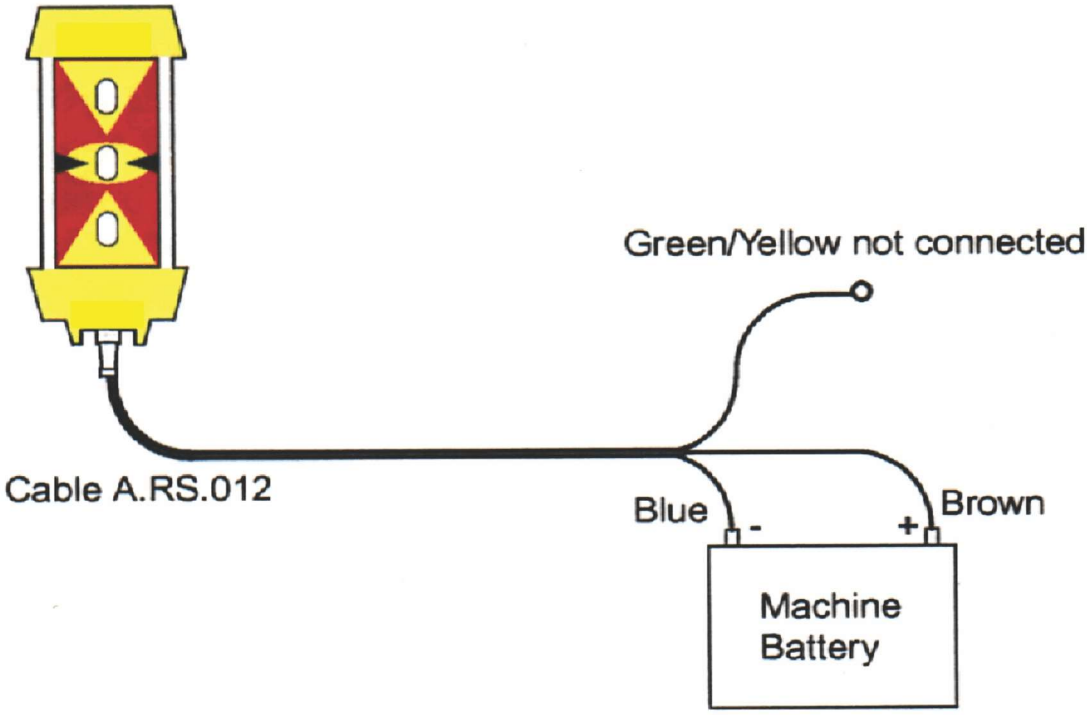
9.3 MCE 360 Degree Sensors



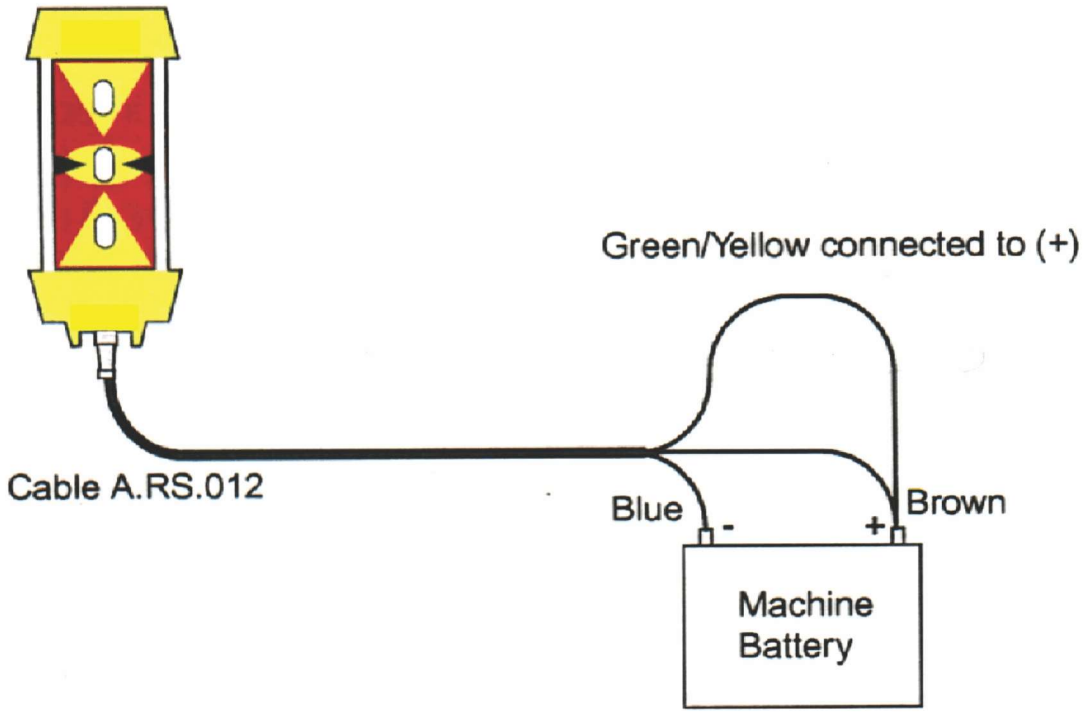
Laserguide R.3CHS		Laserguide R.5CHP	
Mass	3 kg (inc. bracket)	Mass	2.8 kg (inc. bracket)
Size	300 x 150 x 70 mm (w/o bracket)	Size	300 x 150 x 70 mm (w/o bracket)
Operating temp.	-20°C to + 50°C	Operating temp.	-20°C to + 50°C
Input voltage	11 to 30 V DC	Input voltage	12 to 24 V DC
Detector length	200 mm	Detector length	200 mm
Operating radius	700 m (tested with MCE LS.230)	Operating radius	700 m (tested with MCE LS.230)
Mounting post diameter	52 mm	Mounting post diameter	52 mm
Detected lasers	Visible or invisible	Detected lasers	Visible or invisible

9.4 Operating Laserguide R.3CHS as Stand-Alone

Normal centre band resolution



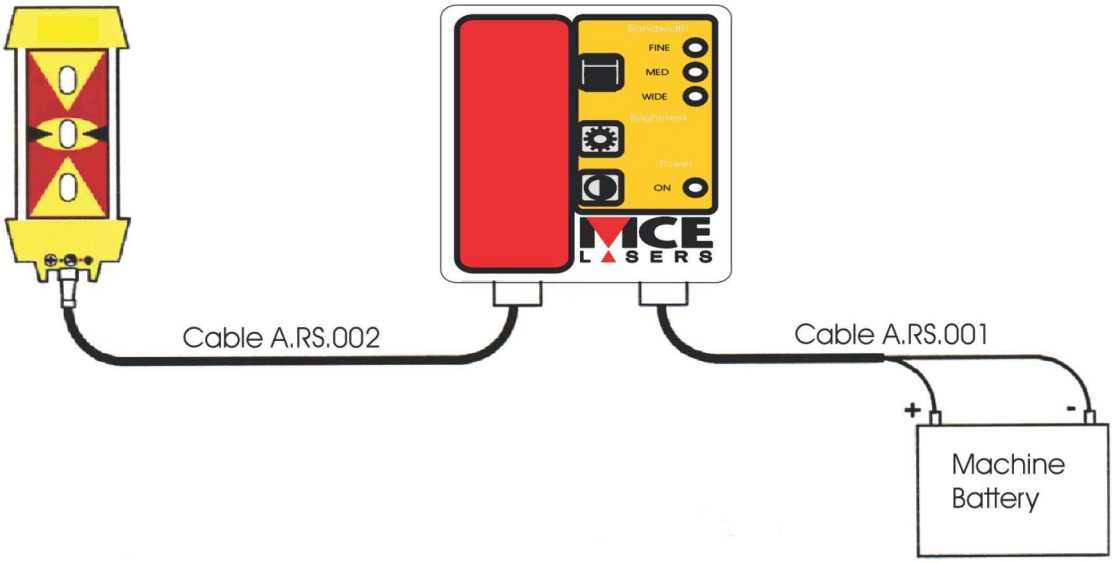
Fine centre band resolution



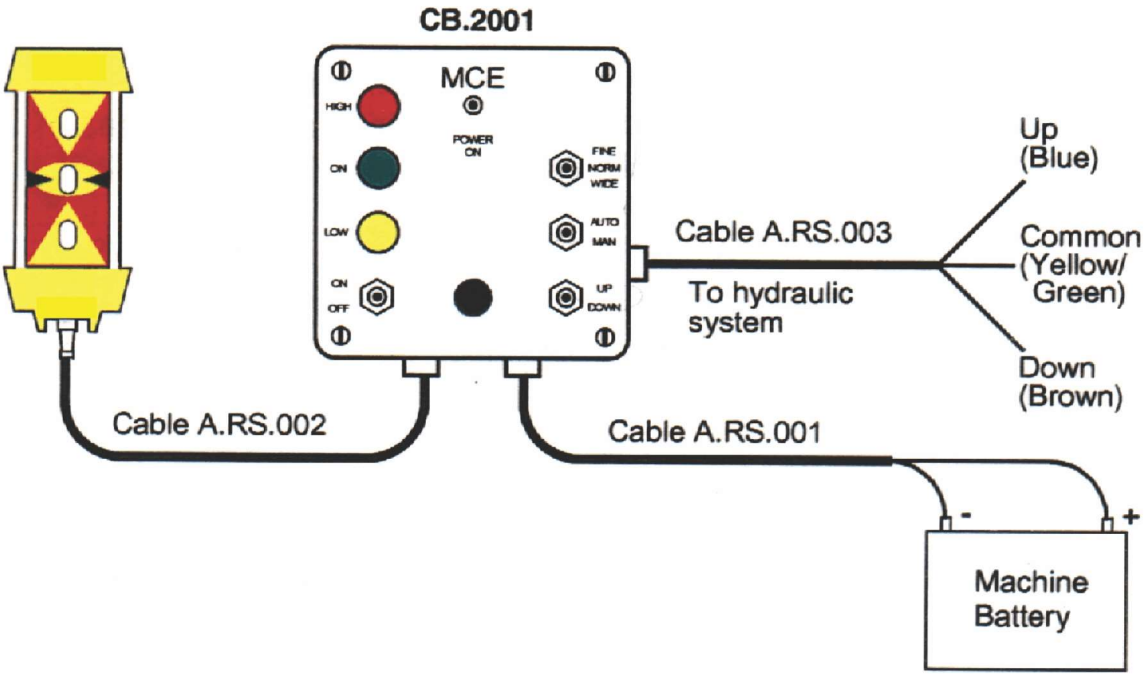
9.5 Operating Laserguide R.3CHS with an MCE Control or Display Panel

The panel is wired to the R.3CHS by a cable attached to the connector at its base as shown in the diagram below. The control panel must be integrated with the machine's hydraulic system as appropriate for the application.

Display Panel (Manual Control)



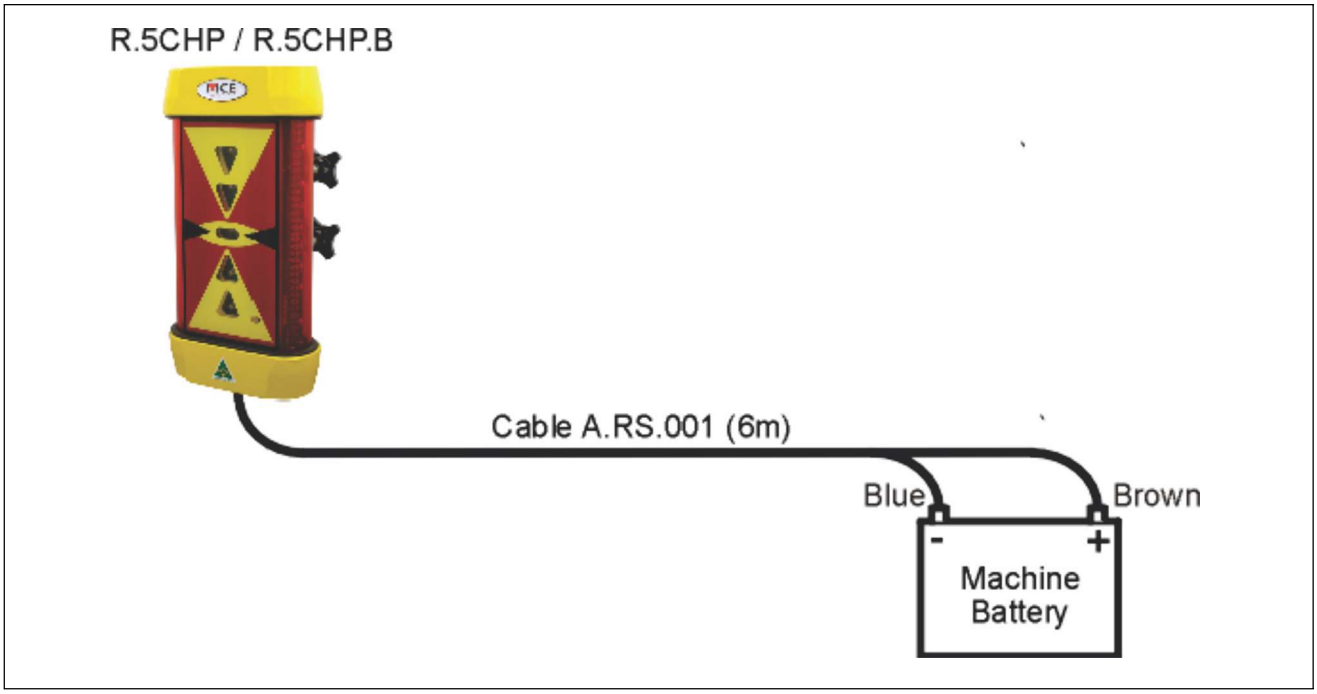
Control Panel (Automatic Machinery Control)



9.6 Operating Laserguide R.5CHP as Stand-Alone

The 3-pin socket of the A.RS.001 cable is to be connected to the 3 pin connector on the base of the Laserguide and the wires protruding from the other end of the cable should be connected to the machine's battery as shown in the diagram below.

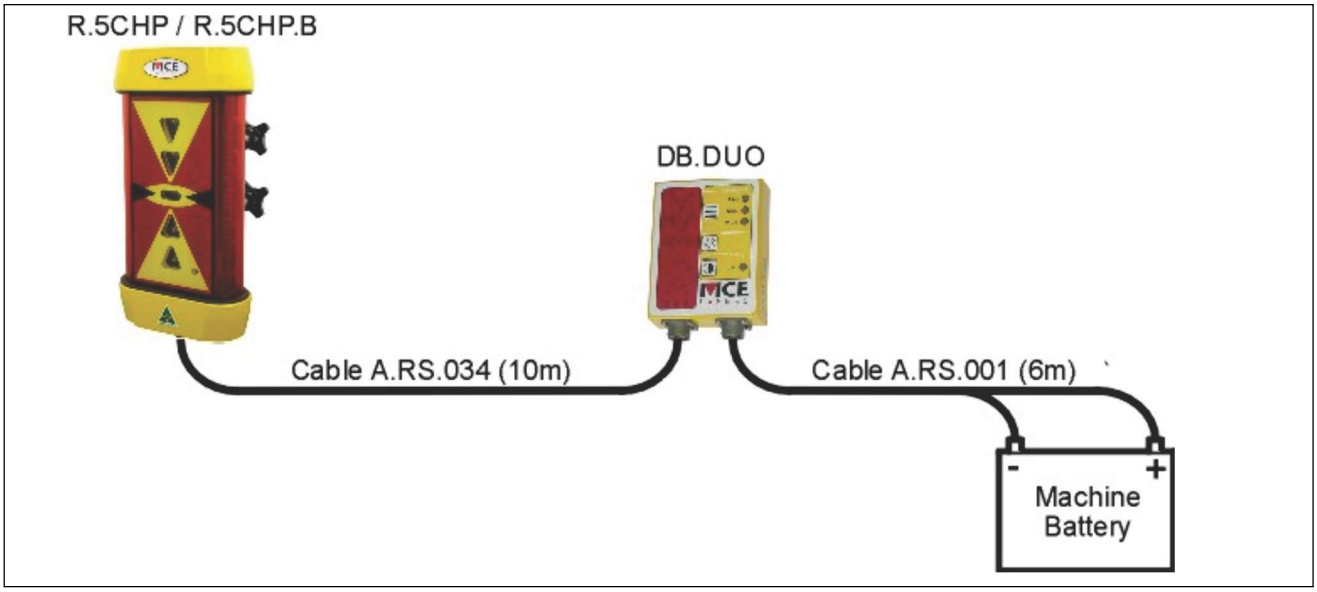
The MCE Infra -red Remote Control (A.RS.014) can be used to set the centre band resolution and adjust the brightness of the LED clusters.



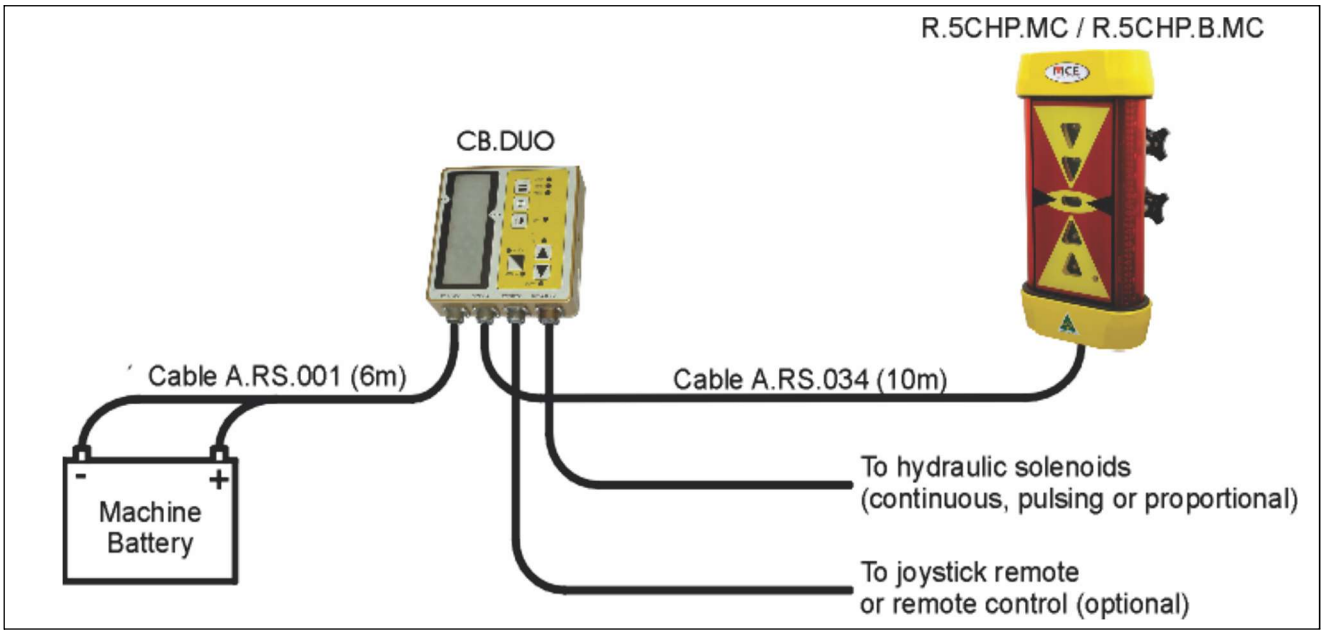
9.7 Operating Laserguide R.5CHP with an MCE Control or Display Panel

The display/control panel is connected to the Laserguide by a cable attached to the 3 pin connector on the base of the unit as shown in the diagrams below. When a control panel is used, it must be integrated with the machine's hydraulic system as required for the application.

Display Panel (Manual Control)



Control Panel (Automatic Machinery Control)



9.8 Display and Control Panels

DB.DUO (Display Panel)	
Size	135 x 95 x 35 mm
Mass	0.35 Kg
Input power	12 V DC
Operating temperature	-20°C to +50 °C
Mounting	Velcro strip

CB.2001 (Control Panel)	
Size	160 x 160 x 90 mm
Mass	2 Kg
Input power	12 V DC
Operating temperature	-20°C to +50 °C
Mounting holes	140 mm width centre to centre 110 mm height centre to centre 4 No X 3/8 BSW or M10

CB.DUO (Control Panel)	
Size	160 x 160 x 90 mm
Mass	2 Kg
Input power	12 V DC
Operating temperature	-20°C to +50 °C
Mounting holes	140 mm width centre to centre 110 mm height centre to centre 4 No X 3/8 BSW

9.8.1 Operation of Control Panel CB.2001

The control panel receives the signals from the 3 channel sensor and translates these into operator friendly terms. The panel has three control lights, red for above grade, green for on grade and yellow for below grade. When the sensor is receiving the laser beam, the relevant light is under constant illumination. Should the receiving area of the sensor move too high or too low (out of sensor range), the last reading is memorised and the relevant light will blink on and off - thus the operator has indication at all times as to his last reading. Nine different models of control panels are made by MOBA AUSTRALIA.

There are four switches on the MCE control panel - (example model CB.2001)

1. **On/Off** - to switch power on.

2. **Fine, Normal, Wide** - for on grade accuracy.
   Fine is ± 5 mm
   Normal is ± 10 mm
   Wide is ± 18 mm

(These are approximates only).
This switch instructs the sensor as to the accuracy required for the relevant application.

3. **Auto/Manual** - for hydraulic control of machinery. When the switch is in manual mode, operation of the machine must be done by operator control. On Auto, signals are transmitted to hydraulic solenoids which will control the up and down movement of the machine's blade automatically.

4. **Up/Down** - used when hydraulic solenoids are used. The operator can lift or lower the blade by this switch. Auto mode can also be overridden by this switch.

The CB.2001 also has an electrical output (2-3 Amps) to control the hydraulics valve solenoids.

9.8.2 Operation of Control Panel CB.DUO

The CB.DUO has all the functions for the above CB.2001 panel, plus:

- 5 channel mode of operation for smoother flow of hydraulics
- Change between “5CH” mode to a “DEPTHGUIDE” mode sensor

The CB.DUO uses the electrical output by variable voltage, for controlling the machine through electrically operated solenoid valves inserted into the machine’s hydraulic system.

10. Grade Conversion Formula

Use the following formula to calculate the percentage grade. Any distance units can be used as long as they are consistent.

$$\frac{\text{Amount Of Fall} \times 100}{\text{Distance}} = \text{Percentage Grade (\%)}$$

Example:
A grade of 1 in 174 expressed as percentage is:

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

11. Specifications

Laser unit	
Laser beam	Laser diode , visible or invisible
Classification	2M
Accuracy	± 10 arc seconds (LS.230.E) ± 15 arc seconds (LS.230.A)
Self-leveling	± 7.5%
Grade range	-5% to +20% (LS.230.E) -5% to +55% (LS.230.A)
Rotating head speed	230, 360, 600 rpm approximately
Calibration	Can field calibrate electronically, without disturbing the seals
Power Supply	Internal: rechargeable batteries External: 12 -24 V DC
Dimensions	270 x 175 x 200 mm (LS.230.E without handle) 365 x 175 x 200 mm (LS.230R.E without handle)
Weight	8.25 kg
Battery operating time	30 hrs
Charging time	12 hrs
Working range	700m Radius LS.230.E, 500m Radius LS.230.A (Tested with LASERGUIDE sensor)
Operating temperature	-20ºC – 50ºC
Full function radio remote control (LS.230R.E only)	
Range	700 m radius (1.4 km diameter)
Power source	2 x AA batteries
Dimensions	165 x 100 x 38 mm (without antenna) 250 x 100 x 38 mm (including antenna)
Weight	0.75 kg (including batteries)

12. Options and Accessories

12.1 Standard Lasergrader Kit (LS.230E.K)

The standard Lasergrader kit is made up of following components.

Dual grade rotating laser	LS.230E
Carry case	A.230.004
Battery charger 100 - 240V/12V;3A	A.MCE.049
Power/charge/cigarette lighter cord	A.MCE.050
Power/charge cord with clips	A.MCE.051
Grade chart and owner's manual	OM.LS.230E

LS.230.E

A.230.004

A.MCE.049

A.MCE.050

A.MCE.051

OM.LS.230E

12.2 Optional Accessories for the Lasergrader

Electric Mast
Strong, electrically controlled mast. To remove unwanted sections of excavation to a known depth and then replace the exact removed section with suitable material of known finished level. Example would be to remove a salt effected patch of land (ME.14).

Scope
for accurate aligning of the axis (A.MCE.084)

Flaps
for blocking the beam in two or more directions (A.230.003)

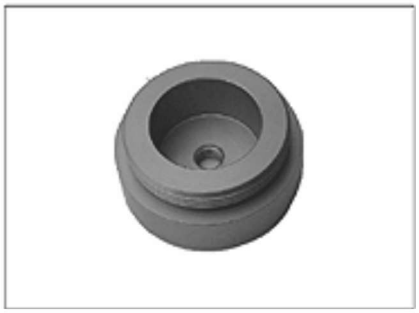
Quick Release Mount (A.220.002)
3 locking bolts, comes with adaptor ring with 3.5“ thread. (A.220.027)

Laser Mount
3.5“ external thread (A.220.005) Cast aluminium, 2 locking knobs, suit 2“ pipe

Universal Quick Release (A.220.014)
Spring loaded lever, comes with one of two mounting rings: (A) 5/8“ external thread universal laser level mounting ring (A.220.026) or (B) Spectra Physics (SP) laser

Adaptor
3.5“ internal thread, 5/8” external thread. (A.220.001)

Adaptor
3.5“ external thread, 5/8” internal thread (A.220.016)



Adaptor
3.5“ external thread, 5/8" internal thread (A.220.040)

Adaptor
with 3.5“ internal and 3.5” external thread, knurled finish. (A.220.038)

Adaptor
5/8“ internal to 1/4” external (A.MCE.030)

Tangent adjustable mount
5/8“ internal base and 5/8” external thread top. (A.220.003)

Tilt adaptor
Made from cast metal, for 10% to 50% slope adjustments. (A.220.025) Used with laser when grade is steeper than leveling range. Three mounts: 10% to 24%; 24% to 38% & 38% to

Adaptor
5/8“ external to 1/4” external (A.220.042)

Adaptor
5/8“ external to 1/4” internal (A.220.041)

Steel post
3.5“ threaded, 300 mm long (A.220.039)

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