

GradeMaster

..... Operation Manual



- *Easy Step-By-Step Procedures*
- *Hydraulic Diagrams*
- *Laser Setup and Operation*
- *Troubleshooting Guide*



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Dear Valued Customer,

We at Laser Leveling would first like to thank you for your purchase of the GRADEMASTER Laser Grading System. We believe our products to be on the cutting edge of both technology and value. Since Laser Leveling was founded in 1983 the cornerstone principle has been customer service, not only in the weeks after your purchase but years after. The GRADEMASTER is the newest edition to our line of laser controlled box blades, and we believe that it is our most effective design yet. With the GRADEMASTER, you will be able to work more efficiently and more economically. The sturdy construction and proven performance of the products assures that this investment will be one which will last for many years.

Once again, I would like to thank you for purchasing the GRADEMASTER and we hope that you will find it to be as reliable and efficient as we believe it to be.

Sincerely,

A handwritten signature in cursive script that reads "Bill Crowley".

Bill Crowley
General Manager

Safety Information



As with all heavy machinery, safety is imperative. As the operator, all guidelines and precautions must be carefully obeyed. Please read the following precautions carefully and understand all warnings before beginning to use the GRADEMASTER Grading System. In this manual there are two types of precautions:

- **Warning-** A potentially dangerous situation which can cause serious bodily injury or death if not handled properly.
 - **Caution-** A potentially dangerous situation which can cause serious damage to the equipment if not handled properly.
-

- Always set remote hydraulics to “relief pressure” before attaching quick disconnects.
- Always set the Automatic/Manual switch on the control panel to “Manual” before leaving the operators seat or whenever the machine is not moving.
- Never manually adjust the laser sensor when the Control Panel is set in “Automatic”.
- Never adjust the hydraulics while the machine is in “Automatic”.
- Never compromise the use of all safety precautions supplied with your heavy equipment.
- Stay clear of blade and all moving parts when it is in operation.
- Keep all people clear when operating machinery.
- As with all heavy machinery, use extreme caution and common sense.
- Read and comply with all safety recommendations made by your machine’s manufacturer in the operator and service manuals, as well as all precautions outlined in your Laser Alignment manuals.

Chapter 1

GRADEMASTER Setup



This chapter will illustrate the correct assembly of the GRADEMASTER Grading System. It will also contain the proper procedure when attaching the GRADEMASTER to your tractor. It is imperative to read and fully understand this chapter before attempting to install your GRADEMASTER.

If you have any questions or difficulties first consult the troubleshooting section in this manual, if the problem persists please call Laser Leveling at 1-800-622-5777.

Important- If you have received GRADEMASTER by motor-freight, please check to make sure that no visible damage has occurred in shipping, if so, please contact Laser Leveling immediately.



Caution- Failure to follow the procedures outlined in this chapter can cause serious damage to the GRADEMASTER Grading System.

II. Attaching the GRADEMASTER

- Carefully remove the packaging straps from the pallet.
 - Insert Mast into GRADEMASTER. (Figure 1.1)
 - Align 3-point hitch of tractor with GRADEMASTER hitch.
 - Insert pins in the 3-point hitch assembly.
 - Slowly raise hitch and remove GRADEMASTER from pallet.
 - Place on level ground.
- GRADEMASTER is now properly attached to your tractor.

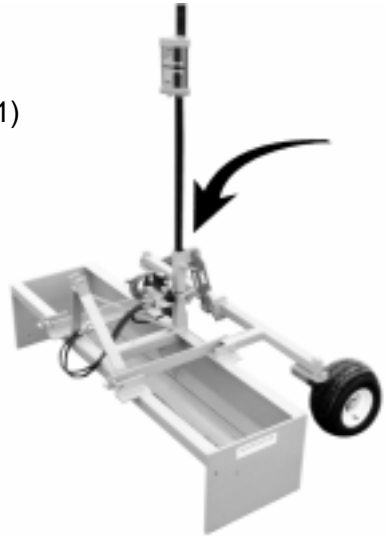


Figure 1.1

Chapter 2

Electrical System Installation



This chapter outlines the correct procedures for installing the electrical components which GRADEMASTER requires to operate. Also included is a brief overview of the Laser Alignment Machine Control system installation. This should merely be considered a quick start guide with regards to the Laser Alignment systems. If you have any questions with regards to the electrical installation, please call Laser Leveling. The diagrams in this chapter are provided to simplify the wiring process, allowing for at-a-glance overview of the GRADEMASTER's electrical control system.



Warning- Before attempting any electrical work, please disconnect the “Positive” volt battery terminal

Electrical System Installation

I. AUTO PANEL INSTALLATION

- The auto panel must be installed in an area which is both accessible and functional.
- We recommend attaching the panel to the tractor's wheel well as shown in Figure 2.2.
- Once a location has been decided upon, mount the panel using the supplied brackets.
- After securing the Auto Panel, ensure that it does not interfere with any of your tractor's moving parts.

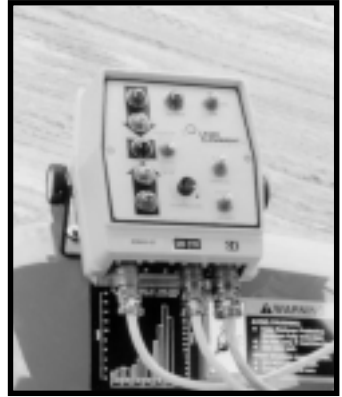


Figure 2.2

II. RUNNING THE MAIN POWER WIRE

To provide power to the GRADEMASTER, a constant 12v power source to the Auto Panel is required.

- Locate the battery compartment on your tractor.
- Using the supplied power cable, run the cable from the battery to auto panel. Be sure to avoid moving parts and high temperature areas and secure the power cable with wire-ties once you have finished.

Warning- Do not connect the battery connector, to the Auto Panel until the installation is complete. Failure to do so can cause an electrical short and/or damage to your GRADEMASTER.

- Connect the eyelid connectors on the power cable to the battery on your tractor. Double check polarity (White-positive, Black-negative).
- Connect the power connector to the auto panel. Figure 2.3
- Switch the auto panel power "On" to ensure that the system has been installed correctly.

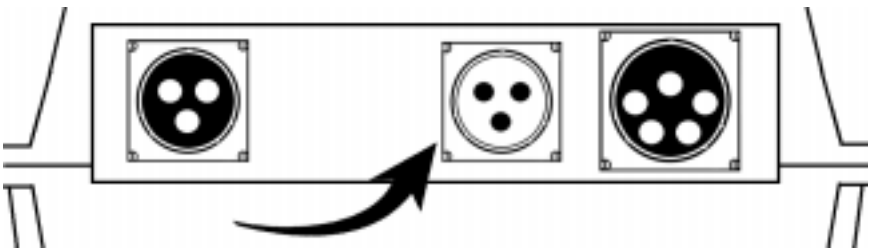


Figure 2.3

III. INSTALLING THE 360° SENSOR

The 360° is connected to the Auto Panel v the sensor cable provided. In a 5-light system the sensor connectors resemble Figure 2.4.



Figure 2.4

To setup the Sensor:

- Attach the 360° Sensor securely to the mast of the GRADEMASTER. See Figure 2.5.
- Attach the sensor cable to the Auto Panel. Figure 2.6
- Run the sensor cable from the Auto Panel to the 360° Sensor. It is recommended that any extra wire that is left over be wire tied and placed behind the operators seat.



Figure 2.5

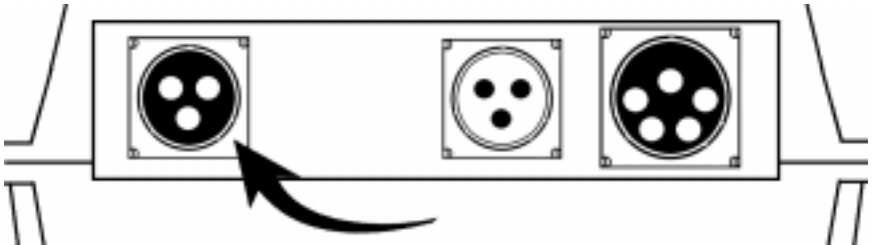


Figure 2.6

Caution- Ensure that the sensor cable does not interfere with the 3-point hitch or any other moving parts.



- After connecting the 360° Sensor, turn the Auto Panel “On”. The sensor lights on the Auto Panel should flash briefly. This indicates that the sensor has been installed correctly. If the sensor lights do not flash, please refer to the trouble shooting guide at the back of this manual.

III. INSTALLING THE SOLENOID CABLE

The solenoid cable sends the signal from the Auto Panel to the GRADEMASTER. It is a five prong male connector which comes from the valve assembly and resembles Figure 2.7.

To connect the Solenoid Cable:

- Run the solenoid cable from the valve assembly to the Auto Panel.
- Wire-tie the solenoid cable to the sensor cable. Allow enough slack in wire for full box blade movement.
- Connect the solenoid cable to the Auto Panel. Refer to Figure 2.8.
- Place excess cable behind the operators seat.



Figure 2.7

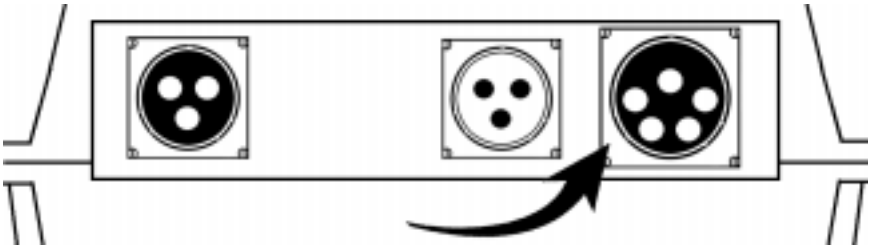


Figure 2.8

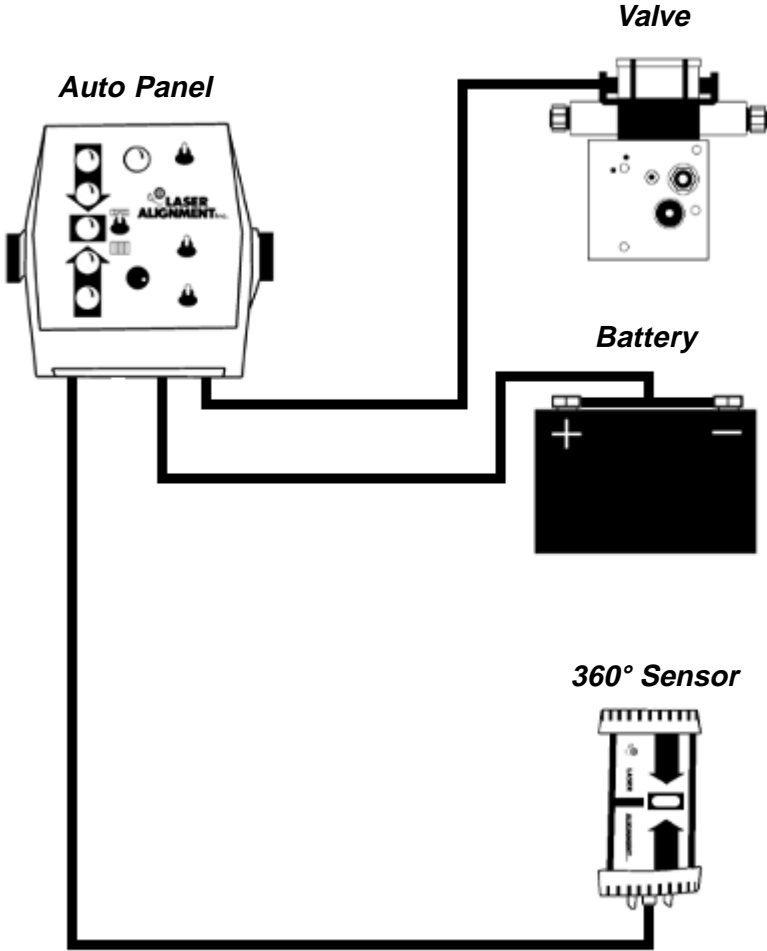
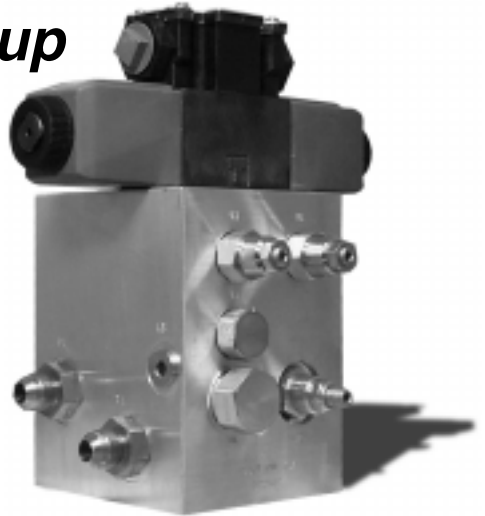


Figure 2.9 illustrates the connections discussed in this chapter.

Chapter 3

Hydraulic Set-up



Your GRADEMASTER's PILOT hydraulic system is designed and manufactured exclusively by Laser Leveling, Inc. PILOT stands for **Proportional Integrated Leveling Override Technology**. Using this system, your box scraper is able to operate, more efficiently, and more accurately, allowing you to finish the job in less time with minimal material waste. This allows GRADEMASTER to operate more efficiently and more reliably. It is imperative that you read this chapter before attempting to connect the hydraulic assembly.

If you have any questions or problems while connecting the hydraulic systems, please refer to the Troubleshooting Guide in this manual, if the problem persists, contact Laser Leveling at 1-800-622-5777.



Warning- Before connecting the hydraulic system, ensure that the tractor has been turned "Off" and the remote hydraulics have been set to "float" to relieve pressure.

Hydraulic Setup

I. CONNECTING MAIN HYDRAULIC HOSES

- Attach the hose which is connected to the “P1” port on the GRADEMASTER valve to the “Pressure” connector on your tractor. See Figure 3.2.
- Attach the hose which is connected to the “T1” port on the GRADEMASTER valve to the “Return” connector on your tractor. See Figure 3.3.
- Pull slightly on the hose, to ensure that a secure connection has been established.

Warning- Reverse flow for an extended amount of time will cause serious damage to the GRADEMASTER and your tractor’s hydraulic system.

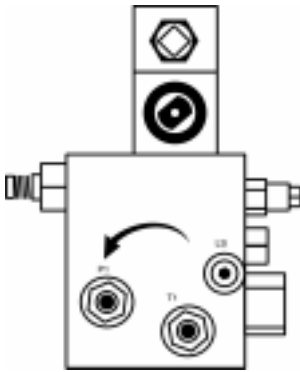


Figure 3.2

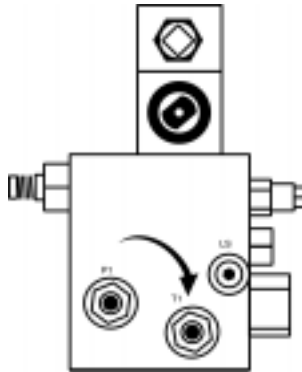


Figure 3.3

II. CHECKING FOR PROPER OPERATION

The following steps will ensure that GRADEMASTER is operating correctly.

- Start your tractor.
- Switch the Auto Panel to the “On” position.
- Activate your remote hydraulics for constant flow.
- Adjust the height of the blade using the “Raise/Lower” switch located on the Auto Panel. See Figure 3.4. When the switch is in the “Raise” position, the cutting edge will also raise. Likewise, if the switch is in the “Lower” position the cutting edge should also lower.
- If the blade does not respond correctly, please refer to the Troubleshooting Guide at the back of this manual.



Figure 3.4

III. ADJUSTING THE LOAD HOLDING VALVES

With the addition of the PILOT hydraulic system, your GRADEMASTER will no longer require adjustments to the valve flow controls. These controls (Figure 3.5) are electronically set at the factory and do not require further field adjustment. Please note, V1 and V2 are load holding valves, not speed adjustments. If you feel that an adjustment to the flow controls is required please contact Laser Leveling.

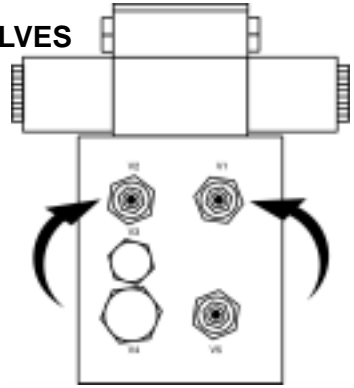


Figure 3.5

IV. ADJUSTING YOUR HYDRAULIC SPEED

The PILOT system is the only system which utilizes the electronic speed function located on your auto panel. This feature enables you to increase the speed if your GRADEMASTER is not responding quickly enough, or decrease the speed if your blade is “jumping” to stay on grade, all from the seat of your tractor.

To adjust the speed of your GRADEMASTER’s Hydraulics:

- Turn the Hydraulic speed dial clockwise to increase hydraulic flow. See Figure 3.6.
- Turn the Hydraulic speed dial counter clockwise to decrease hydraulic flow. See Figure 3.7.



Figure 3.6



Figure 3.7

V. MOVING THE VALVE SPOOL MANUALLY

While adjusting the GRADEMASTER hydraulic systems you may require a quick way to verify the corrections you have made. This can be done by manually depressing the valve. By depressing the valve spool you are simulating the “Raise/Lower” switch on the Auto Panel. This can be very helpful in fine-tuning the GRADEMASTER.

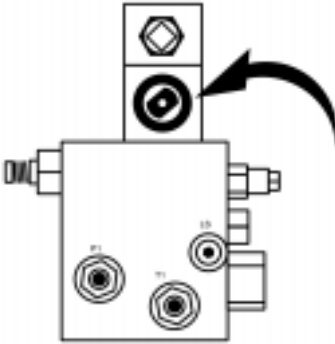


Figure 3.9

To Control the Valve Spool Manually:

- Determine the direction you would like the GRADEMASTER to move. “Up” is left. “Down” is right. See Figure 3.9.
- Insert an allen wrench or phillips head screwdriver into the end of the spool and push inward. The blade will begin to move.

V. ADJUSTING THE PRESSURE RELIEF VALVE

Your GRADEMASTER has been designed with a pressure relief valve located on port V5. See Figure 3.10. This valve has been preset at the factory and should not require field adjustment. However, if you feel this flow control needs adjustment please contact Laser Leveling before attempting to alter this setting.

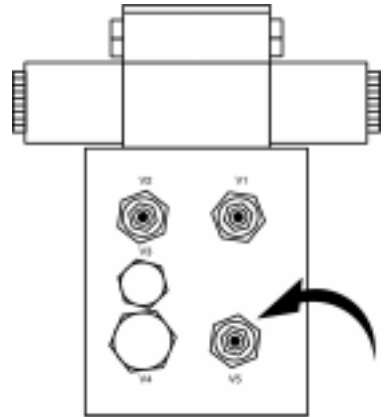
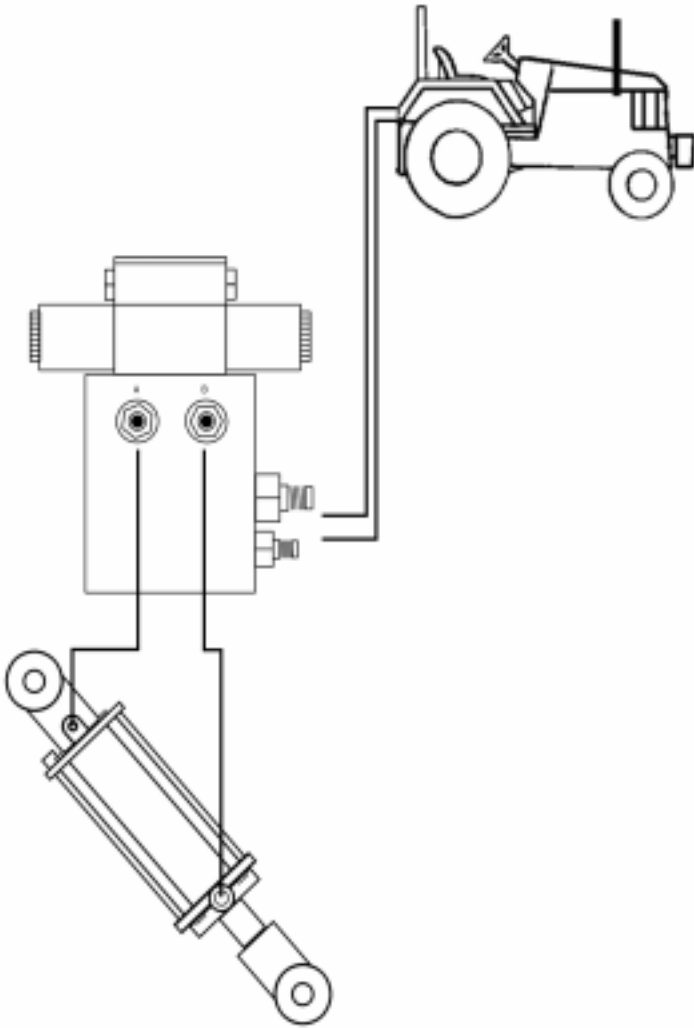


Figure 3.10

Hydraulic Setup

The following diagram illustrates the hydraulic system and the location of connections located on the GRADEMASTER.



Chapter 4

Setting Up Your Laser



The Laser is one of the most important facets of the GRADEMASTER Grading System. With proper setup and preparation the Laser can eliminate hours, even days on your job. The procedure for setting up your Laser with the GRADEMASTER is explained in the following chapter. This chapter is intended to give a brief overview of the LAI Laser Beacon line of lasers. This chapter be considered a “quick-start” guide and cannot be substituted for the manual provided with your Laser.



Warning- Never Look Directly into the beam of any Laser product. Doing so can cause serious eye injury. Always use extreme discretion and caution when using any Laser product.

Important- Before adjusting the Laser, be sure to secure the Laser to the tripod. Refer to the Operator’s Manual supplied with your laser.

Setting Up Your Laser

I. LASER SETUP

Please refer to your the Operation Manual provided with your laser when setting up the laser. Because Laser Leveling cannot determine the type of laser used we cannot illustrate the correct methods with which to setup your particular laser. Once your have finished setting up the laser you are then prepared to continue.

II. SENSOR SETUP

The height of the sensor is one of the most important aspects of the entire setup procedure. Every time that the sensor is taken down (i.e. overnight, work stoppages, etc.) the following procedures must again be repeated to ensure consistent grading by the GRADEMASTER System.

To Setup The Sensor:

- Ensure that the GRADEMASTER is in the operating position (hitch arms down, blade perpendicular to ground). See Figure 4.2.

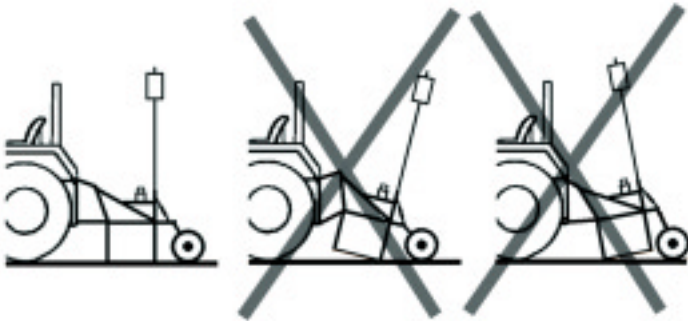


Figure 4.2

- Set the Auto Panel into “Manual” mode.



Warning- Failure to set the Auto Panel into “Manual” will cause the blade to move erratically and can cause serious injury.

- Position the GRADEMASTER over an area where the cutting edge can reach final grade.
- Lower the blade using the override so that the cutting edge is resting at final grade as shown in Figure 4.3.

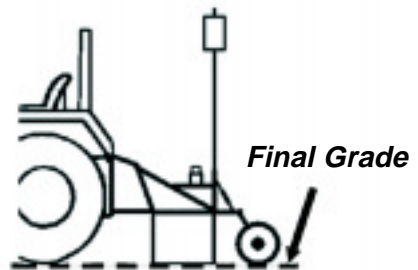


Figure 4.3



Setting Up Your Laser

- Switch the Auto Panel to “Narrow” band.
- Adjust the 360° Sensor up and down on the mast until the sensor reads “On Grade” (Center Light ON) See Figure 4.4.
- Securely tighten the sensor to the mast.
- The 360° Sensor is now set at the proper height.

GRADEMASTER Is Now Ready To Operate.



Figure 4.4

Chapter 5

GRADEMASTER Operation



Years of experience and engineering have been devoted to the development of the GRADEMASTER Grading System. Numerous new techniques and ideas were implemented in the design of this laser controlled box blade. For this reason, some very basic techniques and skills are required to run the GRADEMASTER efficiently. This chapter has been devoted to the explanation of these new methods. By using these few guidelines the GRADEMASTER Grading System will prove to be the most efficient and productive attachment for grading that you have ever used.

As you work your way through this chapter you will find that it is less like an instruction manual and more like a checklist. This is a result of the fact that all of these techniques are equally important, and one should not proceed the other in importance. If you have any questions regarding any of the techniques mentioned in this chapter contact Laser Leveling at 1-800-622-5777.



Warning- Be sure to always adhere to all safety precautions outlined in both your tractor's operating guide and the safety section at the beginning of this manual.

STARTING THE JOB IN “WIDE” BAND

As you begin a job, make sure that the Auto Panel is set to “Wide” band. See Figure 5.2. This allows you to get a general idea of the layout and elevation of your jobsite. You can then easily identify problem areas. This will also cut down on some unnecessary movement while the grade is roughed in.



Figure 5.2

KEEPING YOUR TIRES ON THE GROUND

It is imperative that the wheels of your GRADEMASTER stay on the ground at all times. When the actual elevation is much higher than the finished elevataion the wheels of the GRADEMASTER will come off of the ground. This then takes the tires more time to return to the ground to raise the GRADEMASTER. By keeping the tires rolling the blade then has a much quicker response time and will increase productivtv. See Figure 5.3.

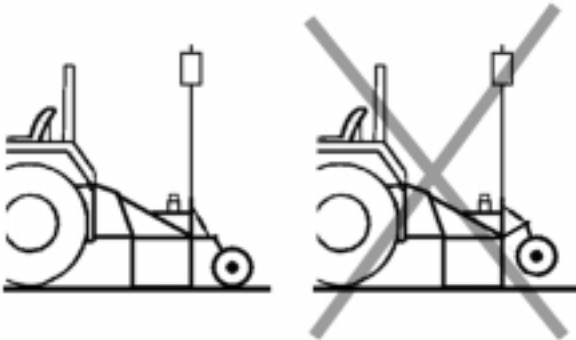


Figure 5.3

To keep the tires on the ground use the override located on the Auto Panel (Figure 5.4).



Figure 5.4

PLANE OF THE BLADE

Your GRADEMASTER has been designed operate with the cutting edge 90° to the horizon (Figure 5.6). We recommend taking several steps away from the unit and viewing the horizon with respect to the mast. Then use the top link on your tractor's 3-point hitch to adjust the blade. Also, make sure that your hitch is completely lowered. Ignoring this procedure will lower the accuracy and performance of your GRADEMASTER.

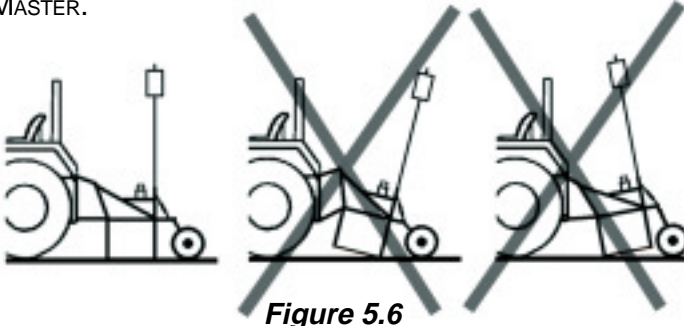
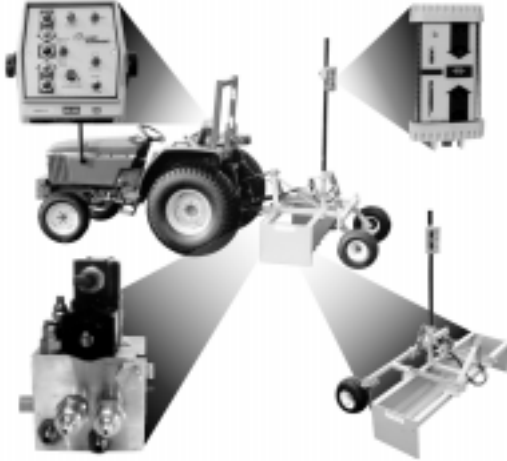


Figure 5.6

Chapter 6

Troubleshooting Guide



This chapter has been designed as a reference guide which will cover the questions and possible problems commonly associated with the start-up and operating procedures. The solutions cited in the proceeding pages are the common remedies to these problems. However, in some instances they are not practical. Please use common sense and good judgement. If your problem is not answered in this guide please contact Laser Leveling at 1-800-622-5777.



Caution- Before attempting any service on your GRADEMASTER, please carefully read all instructions and procedures, if you are not completely comfortable with the procedure please contact Laser Leveling.

Troubleshooting Guide

<i>Problem</i>	<i>Solution</i>
Blade will not move up of down when using the "Raise/Lower" switch on the Auto Panel	<ul style="list-style-type: none">• Make sure the hydraulic flow is switched to the remote coupling• Check all electrical connections• Make sure the Auto Panel Power Light is "On"• Move valve spool manually (Section 3-4), if the blade does not move please contact Laser Leveling
Blade moves opposite the desired direction	<ul style="list-style-type: none">• Ensure that pressure side of hydraulics is coming into port "P1" port of valve
Blade moves slow or not at all	<ul style="list-style-type: none">• Foreign objects lodged in valve spool, move valve spool manually to dislodge matter (Section 3-4)
Blade Jumps	<ul style="list-style-type: none">• Ensure that hydraulics are not set too fast• Sensor has bad photocell, contact Laser Leveling for more details• Check for reflective surfaces in area (i.e. glass, vehicle windshield, etc.)• Jobsite strobe light is causing false signal• Another laser operating in the same area
360° Sensor will not receive laser	<ul style="list-style-type: none">• Check for laser beam• Use a hand-held receiver (i.e. Rod-Eye 4) to make sure the 360° Sensor is in the path of the beam

Appendix A

Maintaining Your GRADEMASTER

Your GRADEMASTER has been designed to provide you with years of service and reliability. In order to keep your investment in like new condition we recommend the following maintenance procedures.

Maintenance	Frequency
Check cutting edge for damage, replace when necessary	Daily
Keep tires inflated to proper pressure (35psi)	Weekly
Check Hoses, replace if scaved or damaged	As Required

By following this simple schedule your GRADEMASTER will be able to work efficiently for years to come. If you have any questions regarding this maintenance schedule, please feel free to contact Laser Leveling anytime at 1-800-622-5777.

Appendix B

GRADEMASTER Specifications

Blade Type	Laser Controlled 3-Point Hitch Grading Attachment
Hitch Type	Category I, II
Hydraulic Valve:	
Valve Type	Infinite Proportional
Max Flow	Maximum 30 GPM
Max Operating Pressure	3500 PSI
Max Valve Output	1 to 12 GPM
Cylinder:	
Bore	2.25"
Stroke	4"
Bearings:	
Wheel Bearings	1" Inside Diameter
Castor Bearing Size	Heavy Duty Roller Bearing 1" Inside Diameter
Tires:	
Tire Size	18.5x850x8
Nominal Pressure	35 PSI

Appendix C

Warranty Information

Warranty

Your GRADEMASTER is guaranteed against defects in materials and workmanship under normal use and service for a period of 12 months provided that the GRADEMASTER has been properly cared for. Any evidence of an attempt to repair the GRADEMASTER by other than Laser Leveling, Inc. will automatically void the warranty.

Laser Leveling's liability under this warranty is limited to repairing or replacing any product returned to Laser Leveling, Inc. for that purpose. The foregoing states the entire liability of Laser Leveling, Inc. in connection with the GRADEMASTER Grading System, and they shall not be held responsible for any consequential damage of any kind. The foregoing is in lieu of all other warranties expressed or implied.

The user of the GRADEMASTER is expected to follow all operating instructions, periodically checking the system and the work as it progresses. Maintaining the safe operating conditions of the GRADEMASTER is the responsibility of the user. General maintenance is not covered by the above warranty.



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"We're Taking the Grading Industry to a New Level"

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