

Level Best

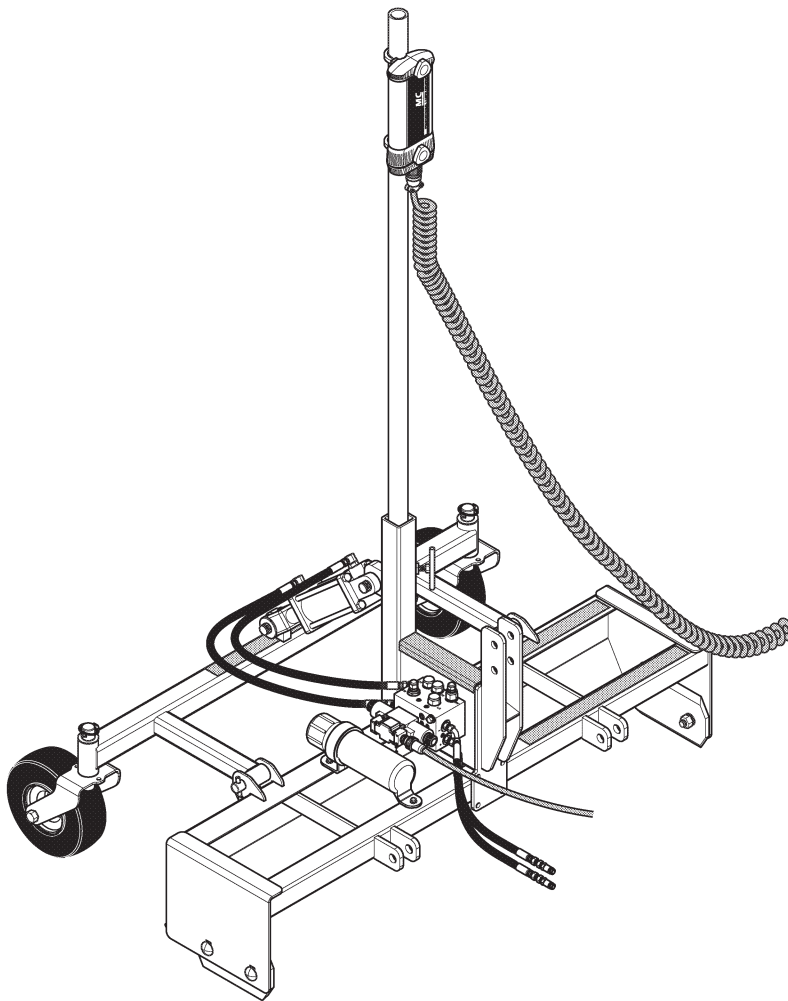
LASER GRADING BOX

OPERATORS MANUAL

FOR

COMPACT - SINGLE

APACHE



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DISCLAIMER

THE INFORMATION IN THIS MANUAL IS PROVIDED TO PROMOTE THE SAFE USE OF, AND ASSIST THE OPERATOR IN ACHIEVING THE BEST PERFORMANCE FROM, THE PRODUCTS DESCRIBED HEREIN WHEN USED FOR THE INTENDED APPLICATION.

MODELS

Part Number	Model Number	Description
315-070-000	SC48	Box, Grader, Tractor, Single, 48", Cylinder Only
315-071-000	SC54	Box, Grader, Tractor, Single, 54", Cylinder Only
315-072-000	SC60	Box, Grader, Tractor, Single, 60", Cylinder Only
315-073-000	SC66	Box, Grader, Tractor, Single, 66", Cylinder Only
315-074-000	SC72	Box, Grader, Tractor, Single, 72", Cylinder Only
000-166-452		Kit, Hydraulic, Single, Apache, Includes Valve Assembly, Hoses, Fittings & Solenoid Cable
000-200-095		Kit, Laser Controls, Single Tractor, Includes Single Panel, 360 Degree Sensor & Cables (Power, Sensor & Solenoid)

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NOTE: The Drawbar Kit with Wheel Locks Installation and Parts Manual can be obtained from ATI Corporation or download from web site, www.level-best.com.

SAFETY INFORMATION

This manual is furnished to you, the owner/operator, as a guide to get the greatest benefit from your Grading Box. ATI Corporation wants you to be able to get the most use out of your Grading Box through safe and efficient operation.

Before attempting to operate the Grading Box, carefully read all sections of this manual. Be sure that you thoroughly understand all of the safety information and operating procedures.

SAFETY PRECAUTION DEFINITIONS

Dangers, Warnings, Cautions, and Notes are strategically placed throughout this manual to further emphasize the importance of personal safety, qualifications of operating personnel, and proper use of the grading box in its intended application. These precautions supplement and/or complement the safety information decals affixed to the unit and include headings that are defined as follows:

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a potentially hazardous situation or practice which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation or practice which, if not avoided, will result in damage to equipment and/or minor injury.

NOTE: Indicates an operating procedure, practice, etc., or portion thereof, which is essential to highlight.

- Always use caution and safe operating practices when operating this equipment.
- Always set the Automatic/Manual Switch on the Control Panel to MANUAL before leaving the operator's seat or whenever the machine is not moving.

- Always allow for clearance under the cutting edge of the machine when tuning the system or when switching to automatic control. Insufficient clearance could cause the machine to lift itself off the ground as its cutting edge attempts to achieve the programmed slope.
- Never adjust the position of the Laser Sensor when the system is in automatic control.
- Never perform service work on your machine or the Automatic Control System when the system is in automatic control.
- Install all safety panels and guards before operating your equipment.
- Stay clear of all moving parts when the machine is in operation.
- Keep all people clear of the machine when it is running.
- Keep feet and other body parts from under the cutting edges of the machine at all times.
- Read and comply with all safety recommendations of your Tractor/Skid Steer manufacturer, as outlined in its operator and service manuals.

NOTE: References made to left, right, front, and rear are those directions viewed from behind the power unit and grading box.

NOTE: Some equipment depicted in illustrations may not reflect exact production model configurations.

NOTE: All safety, operating, and servicing information reflects current production models at the time of publication of this manual.

NOTE: ATI Corporation reserves the right to discontinue models at any time, change specifications, and improve design without notice and without incurring obligation on goods previously purchased and to discontinue supplying any part listed, when the demand does not warrant production.

WARRANTY

This Laser Grading Box is designed and manufactured to high quality standards. ATI Corporation, therefore, guarantees this Laser Grading Box to be free from defect in workmanship and materials for one (1) year from purchase date. If the machine is used for rental purposes, the warranty is limited to ninety (90) days.

Laser Controls, Vended Components and Control Valve Parts are warranted separately by their respective manufacturers.

Does not cover normal wear or failure due to hydraulic oil contamination.

Misuse, abuse, misapplication, and unauthorized alterations will void this warranty.

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SYSTEMS FEATURES AND BASIC OPERATION

PURPOSE

The Level Best Laser Grading Box is a cost-efficient method for fine grading. Various capacities sized to fit your tractor with a choice of Automatic Control Systems are available. This manual is for the compact series of Laser Grading Box with a single cylinder and equipped with an Apache Technologies, Inc. Automatic Control System.

Laser-guided depth control provides unmatched measurement of plane from a single Rotating Laser. Grade information from the Rotating Laser is processed and automatically directs the grading box's hydraulics to maintain the elevation of the cutting edge.

The Grade Position LEDs on the Laser Sensor indicate the location of the box's cutting edge relative to the required finished grade (The Control Panel has a set of LEDs that mimic the Laser Sensor's LEDs).

- In manual control, the operator watches the Grade Position LEDs and uses the box's controls to keep the center LEDs lit, thereby keeping the box "On Grade".
- In automatic control, the Automatic Control System controls the box's hydraulic cylinder to keep the center LEDs lit, thereby keeping the box "On Grade".

COMPONENTS

The control system consists of 4 components:

Rotating Laser – Provides a reference Plane of Laser Light over the entire job site (refer to Figure 1). The Laser Light plane may be level, single-slope, or dual slope to match the slope of the ground.

Laser Sensor – Mounted at a specific height on a mast on the Laser Grading Box, it determines the difference in depth based on the Plane of Laser Light. The Apache Technologies product is called the BULLSEYE 5MC.

NOTE: Apache Technologies has available other Laser Sensors that function with the Control Panel. This manual covers the BULLSEYE 5MC only although the function may apply to other BULLSEYE models.

Control Panel – Mounted on the tractor within easy reach of the operator, the Control Panel processes data received from the Laser Sensor and from the operator. LEDs indicate the location of the box's cutting edge relative to the desired finish grade. If set to Automatic, it provides a signal to the Valve Assembly to either raise or lower the Laser Grading Box.

Valve Assembly – Wired to the Control Panel, the valve meters hydraulic oil to the hydraulic cylinder for depth control.

In addition, wires and cabling to connect the components are included with the unit.

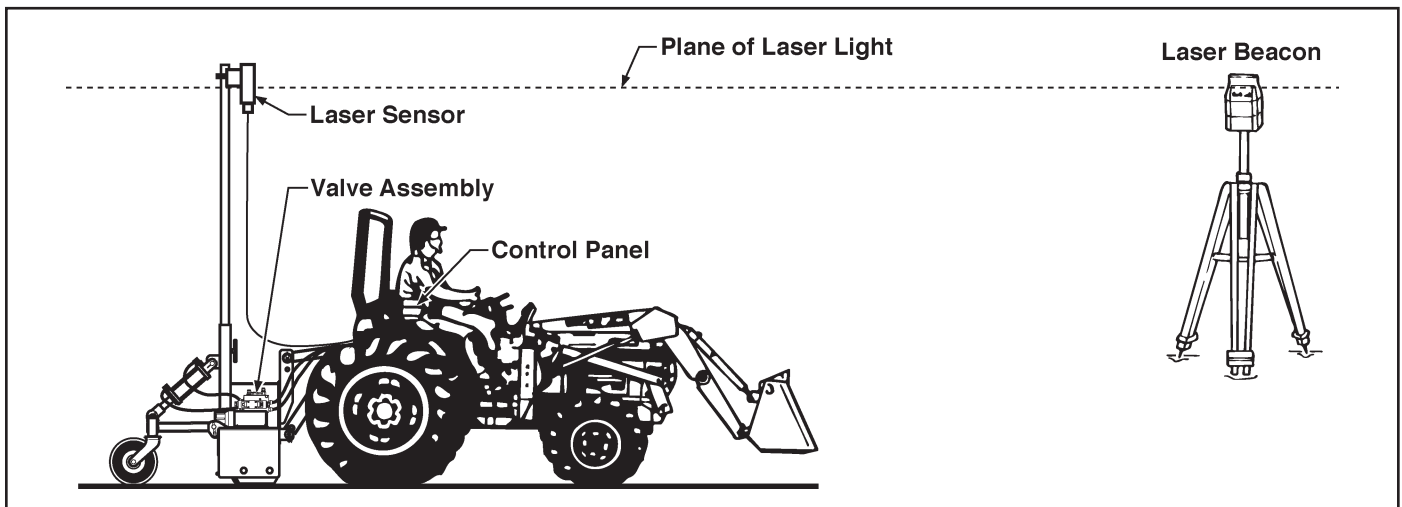


Figure 1. Plane of Laser Light with Components of the Automatic Control System

SYSTEMS FEATURES AND BASIC OPERATION

Control Panel

The Control Panel is essentially a computer with built-in logic for the inputs and outputs connected to it. The Control Panel provides many adjustments to allow compatibility with different machinery and application requirements.

The settable functions on the Control Panel can be categorized as Operation or Installation. Installation functions configure communication with the Laser Sensor and valve and other items which, once configured, never require modification. Operation functions are typically adjusted often, either on a job site basis or during operation.

Functions which are typically changed during operation are accessible on the face of the Control Panel while other switches which do not require frequent adjustment are under an access cover.

The following identifies the indicators, switches and type of switch on the Control Panel.

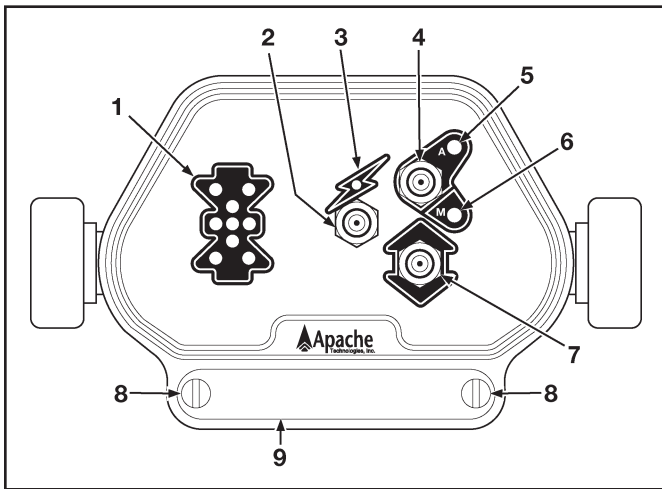


Figure 2. Control Panel Model 26, Front View

1. LED Grade Display
2. Power ON/OFF Switch
3. Power ON Indicator
4. Automatic/Manual Switch
5. Automatic ON Indicator
6. Manual ON Indicator
7. Raise/Lower Switch
8. Access Cover Thumbscrews
9. Switch Panel Access Cover

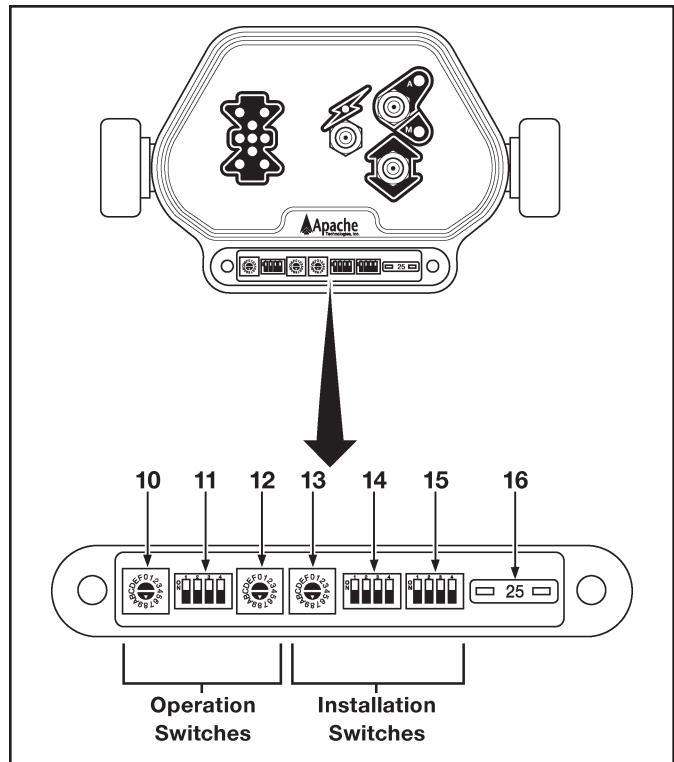


Figure 3. Switch Panel (Access Cover Removed)

Operation Switches:

The 3 Operation switches (10, 11, 12) are used by the operator to set operating functions.

10. On-Grade Deadband - 16-Position Rotary Switch (Default setting is "8")
11. Performance Selections - 4-Way DIP Switch (Default setting is all in the OFF position.)
12. Gain Selection - 16-Position Rotary Switch (Default setting is "8".)

Installation Switches and Fuses:

13. Valve Balance (Raise/Lower) - 16-Position Rotary Switch
14. Valve Set-Up - 4-way DIP Switch
15. Valve Drive Selection - 4-way DIP Switch
16. Fuse, 25 amp

CAUTION

Do not change or modify the Installation switch positions. Installation switches are set at the factory before shipment.

The 3 Installation switches (13, 14, 15) are used during installation for specific valves and machine

SYSTEMS FEATURES AND BASIC OPERATION

settings. *These should not be changed by the operator.* Contact the installation technician for additional information if required.

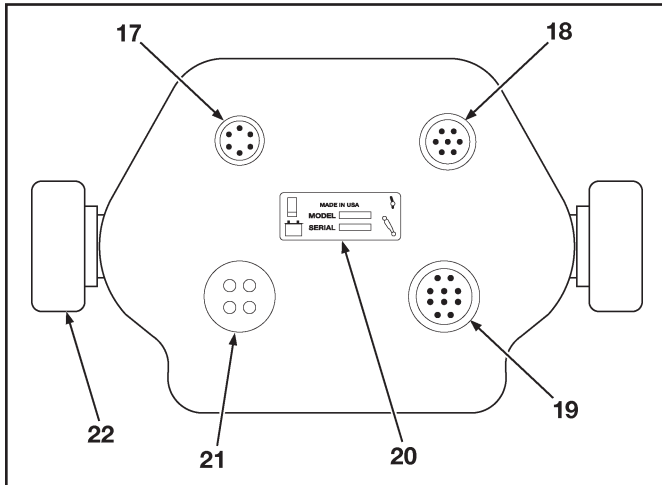


Figure 4. Control Panel, Model 26, Rear View

- 17. Laser Sensor - 6-pin connector
- 18. Optional Remote Switch - 7-pin connector
- 19. Hydraulic Valve Outputs - 10-pin connector
- 20. Identification/Serial Number Label
- 21. Power Input - 4-pin connector
- 22. Mounting knobs for bracket

Configuration

Two rotary switches are provided for selecting the On-Grade Deadband (10) and the Gain (12), while a DIP switch (11) provides for LED display selections. These switches are located behind the access cover on the bottom front of the control panel. Turn the 2 thumbscrews counterclockwise and remove the access cover from the control panel housing to access these switches.

On-Grade Deadband (Accuracy) Selection Switch (10):

The On-Grade Deadband rotary switch (10) provides 16 positions of deadband selection with “0” being the smallest and increasing clockwise to “F” which is the largest. Adjustments can be made for deadband or accuracy from 0 to 1.50 inches (3.8 cm) in 1/10 inch (0.25 cm) increments.

⚠ CAUTION

Setting the deadband too narrow may cause the Grading Box to become unstable. If this happens, increase the deadband or decrease the gain setting.

The table below lists the corresponding on-grade deadband for each switch position. Each number or letter setting represents an increment of one-tenth inch (0.10 inch) or approximately 2.5 mm.

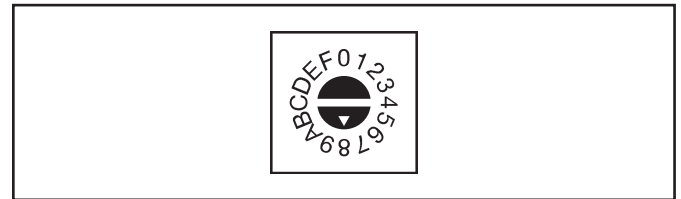


Figure 5. On-Grade Deadband (Accuracy) Selection Switch

Table 1. On-Grade Deadband Accuracy

	0	1	2	3	4	5	6	7
in.	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7
mm	0	2.5	5.1	7.6	10.2	12.7	15.2	17.8

	8	9	A	B	C	D	E	F
in.	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
mm	20.3	22.9	25.4	27.9	30.5	33.0	35.6	38.1

Examples:

The deadband setting of “5” would correspond to 1/2 in. (12.7 mm).

The deadband setting of “A” would correspond to 1.0 in. (25.4 mm).

The default on-grade deadband is set to “8” or 0.8 in. (20.3 mm).

DIP Switch (11) Settings:

The DIP switch panel consists of 4 individual switches. The up position is ON and the down position is OFF. The function of each switch and their factory default settings are as follows:

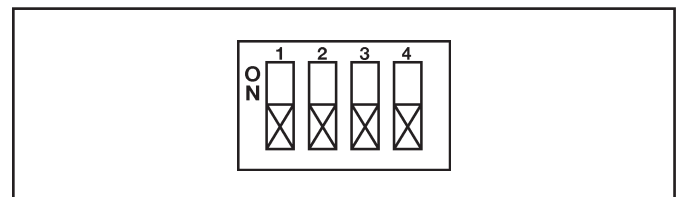


Figure 6. Dip Switch Panel

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1. Laser strike averaging - This switch is normally in the OFF position. It is turned ON only when required for long range applications where the rotating laser may be relatively unstable due to environmental or jobsite conditions.
2. Sensor LED disable - The sensor LED's will be displayed when the switch is in the default OFF position. There will be no display on the sensor LED's when the switch is in the ON position.
3. Control Box LED's - The default OFF position and normal operating setting for the control box are LED's "bright". The control box LED's can be set to dim by changing this switch to the ON position. This may be preferred at night or in low light conditions.
4. Linear or exponential gain is usually set depending on the characteristics of the spool in the hydraulic valve. ATI Corporation recommends setting this Switch to Linear Gain, or "off" position.

Table 2. DIP Switch Functions

SWITCH NO	FUNCTION	POSITION	DEFAULT
1	Laser strike averaging off	OFF	OFF
	Laser strike averaging on	ON	
2	Receiver LED's enabled	OFF	OFF
	Receiver LED's disabled	ON	
3	Control Box LED's bright	OFF	OFF
	Control Box LED's dim	ON	
4	Linear Gain	OFF	OFF
	Exponential Gain	ON	

Gain Selection Switch (12):

The gain selection rotary switch (12) provides sixteen positions with "0" being the slowest reacting and increasing clockwise to "F" which is the fastest reacting.

When the sensor is in the on-grade deadband, no correction signals are sent to the valve. Immediately after the sensor moves outside of the on-grade deadband, signals are sent to correct the elevation. As the sensor moves further away from

the on-grade deadband, the valve continues to open until the valve is in the 100% open state. The distance between this initial opening of the valve and the 100% open state is controlled by the gain. The default gain setting is "8". Field adjustments may be necessary due to the many other variables in the system operation and jobsite requirements. When operating in sandy, or looser materials, you will want to decrease the gain setting for a slower hydraulic speed. When operating in clay, dirt, or tighter materials, increase the gain setting for a faster hydraulic speed. If the system becomes unstable, overreacting between above grade and below grade, increase the deadband setting or decrease the gain setting.

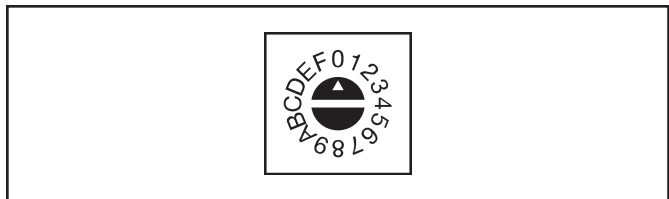


Figure 7. Gain Selection Switch

Operation

Power ON/OFF Switch (2) & Indicator (3):

Push the power switch (2) once to turn the system on. All LED's on the box will turn on for a brief period. The red power on indicator LED (3) will stay lit to indicate the power is on. Turning the box on will also turn the receiver on. Push the power switch again to turn the system off.

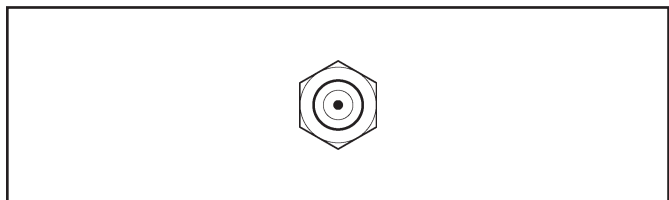


Figure 8. Power ON/Off Switch

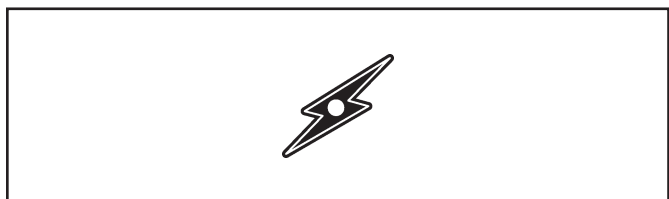


Figure 9. Power Indicator

SYSTEMS FEATURES AND BASIC OPERATION

LED Grade Display: When a laser is striking the sensor, there are 5 possible positions of grade information indicated.

High Coarse - 3 top red LEDs forming down arrow.

High Fine - 3 top red LEDs and 3 green on-grade LEDs.

On Grade - 3 green LEDs forming horizontal bar.

Low Fine - 3 bottom red LEDs and 3 green on-grade LEDs.

Low Coarse - 3 bottom red LEDs forming up arrow.

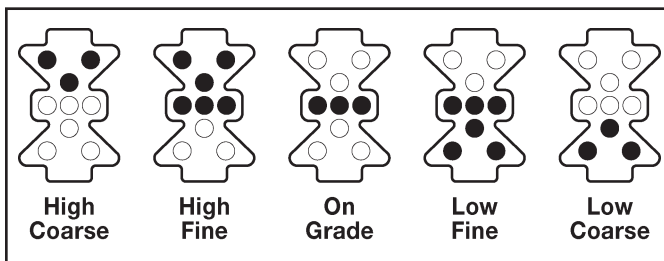


Figure 10. LED Grade Display

If the laser moves off the reception range of the sensor, an out-of-beam will be indicated on the LEDs. If the last laser reception was on the bottom of the sensor, the top 3 LEDs will flash indicating to move the sensor down. If the last laser reception was on the top, the bottom 3 LEDs will flash indicating to move the sensor up. The out-of-beam indication lasts for 2 minutes.

Automatic/Manual Toggle Switch (4):

Automatic: Push the switch to the top (up) position for automatic mode, which is indicated with an “A”. The switch will return to the neutral position.

The green LED will turn on confirming that the box is in the automatic mode. When the BULLSEYE receives a laser strike, the control panel will send the appropriate signals to the valve to raise or lower the grading box to obtain and maintain an on-grade position. If the sensor is not receiving a laser strike, it must be moved within the reception range to begin corrections.

Manual: Push the switch to the bottom (down) position for manual mode, which is indicated with an “M”. The switch will return to the neutral position.

The amber LED will turn on confirming that the Control Panel is in the manual mode. When the BULLSEYE receives a laser strike, the Control Panel will display the grade information on the LEDs but will not send signals to the valve. The operator may use the raise/lower toggle switch, or the optional remote raise/lower switch, to raise or lower the grading box.

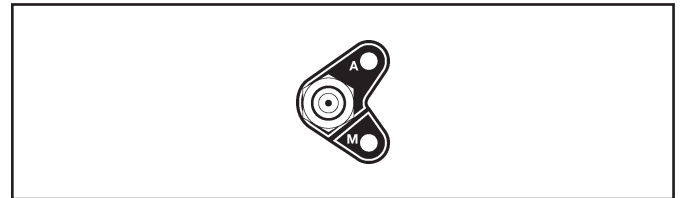


Figure 11. Automatic/Manual Toggle Switch

Raise/Lower Toggle Switch (7):

This switch raises or lowers the grading box. To raise the grading box, push the switch up. To lower the grading box, push the switch down. When released, the switch will go back to the center neutral position.

When the system is in the automatic mode the manual raise and lower switch will override the automatic setting when it is activated and raise, or lower, the grading box. When it is released, the automatic mode will resume normal operation.

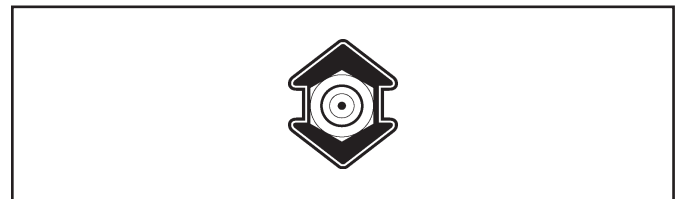


Figure 12. Raise/Lower Toggle Switch

Rotating Laser

The Automatic Control System can operate with many models of Rotating Lasers. The beacon must have a 360° rotating head with invisible or red beam and a speed of 8-40 RPS (Revolutions per Second). The faster the beacon's speed the more optimally the system will perform.

The Rotating Laser is mounted on a tripod, which is located on the job site near where the box is operating. The Rotating Laser is the unit that creates the plane of laser light detected by the Laser Sensor.

SYSTEMS FEATURES AND BASIC OPERATION

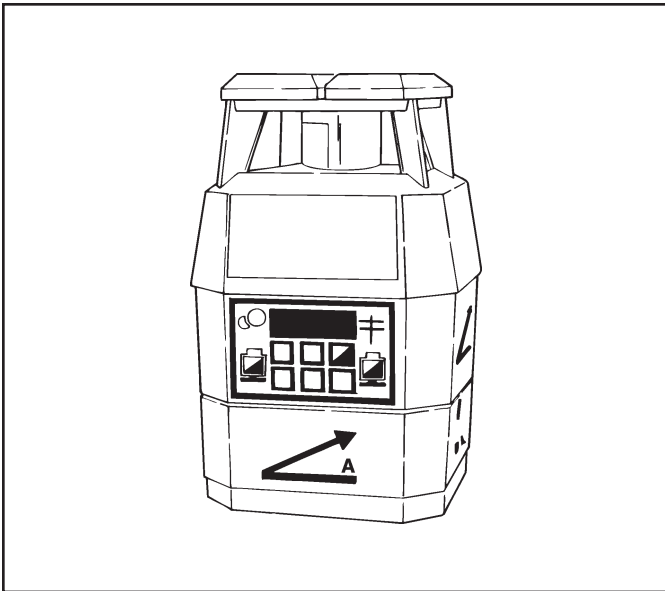


Figure 13. Rotating Laser

The Rotating Laser transmits a focused plane of laser light approximately 1000 feet (300 meters), optimal range for most Rotating Lasers, as it rotates.

Rotating Lasers are available in single grade, dual grade, and steep slope versions. They can be quickly and easily aligned to job site requirements without complicated calculation of angles.

A dual slope Rotating Laser can be configured for level, single slope, or dual slope applications. Simply enter the required percent of grade and align the Rotating Laser to the axis (direction) to be graded.

- Percent of Grade. The change in elevation for every 100 feet (30 meters) graded.
- Slope. The change in elevation per foot (meter).

WARNING

Never look directly into a laser light or serious injury to the eye may occur. In general, incidental exposure of the laser to the eye will not do damage. However, avoid looking into the beam whenever possible. Use a target for viewing the laser spot.

WARNING

Use of any laser on a worksite is controlled by OSHA regulations found at 29 CFR 1926.54. Be familiar with these regulations before using any laser beacon used in conjunction with this system. Review and understand all literature provided with the Laser System before operating.

WARNING

Laser protection devices must be provided to all workers in the area if the laser system exceeds five (5) milliwatts. Refer to the literature provided with the system to determine the power output. If unsure of the strength of the laser system, anti-laser eye protection should be provided to all workers.

Laser Sensor

The Apache BULLSEYE 5MC laser sensor is a rugged, 360° electronic sensor that detects laser light generated by rotating lasers. The unit is designed to work with all common rotating laser beacons and detects both visible and invisible beams.

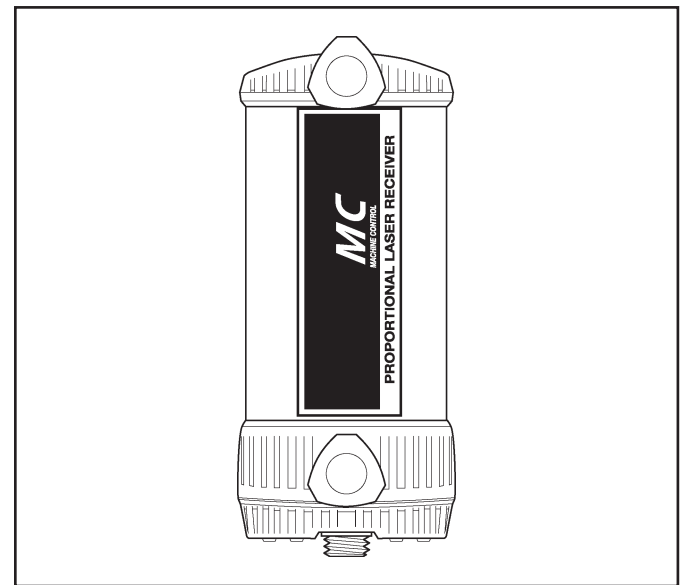


Figure 14. Bullseye 5MC, Front View

The sensor does not have any on-board switches, All settings are made on the Control Panel. Power to the BULLSEYE 5MC sensor also comes from

SYSTEMS FEATURES AND BASIC OPERATION

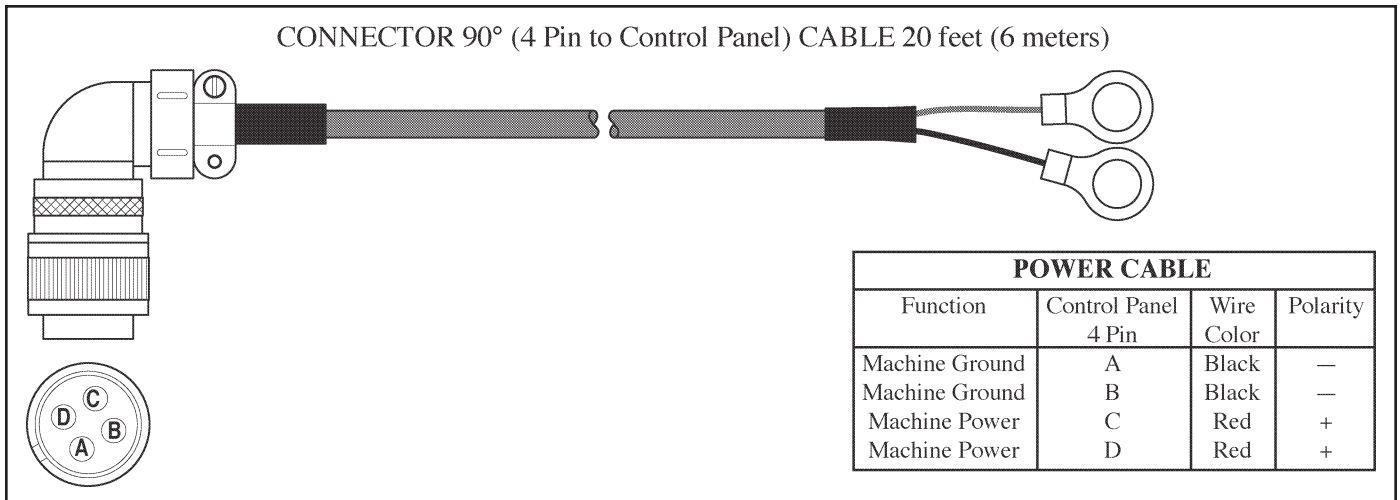


Figure 15. Power Cable

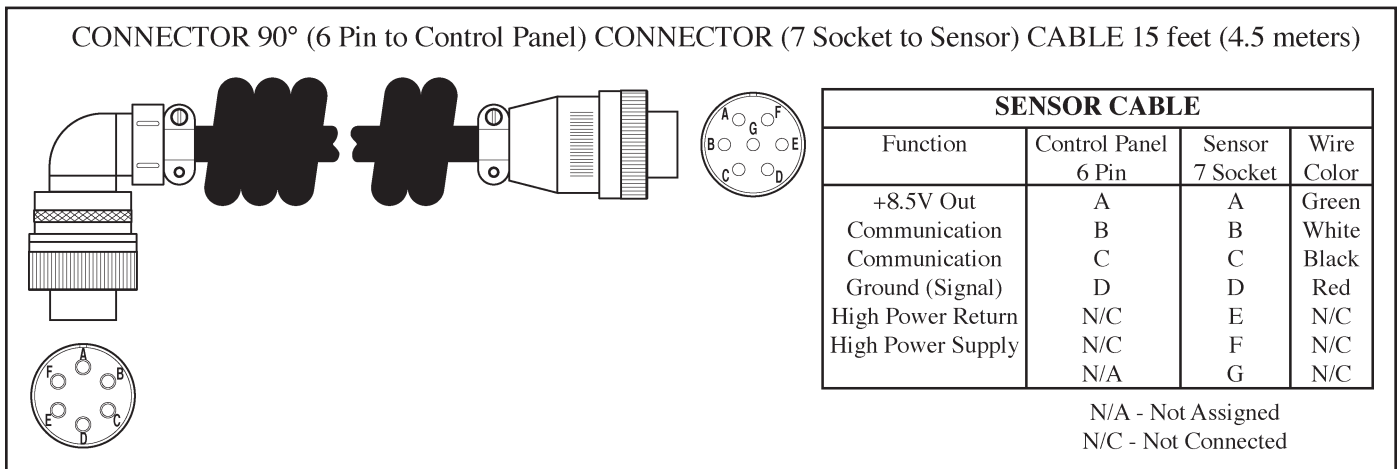


Figure 16. Sensor Cable

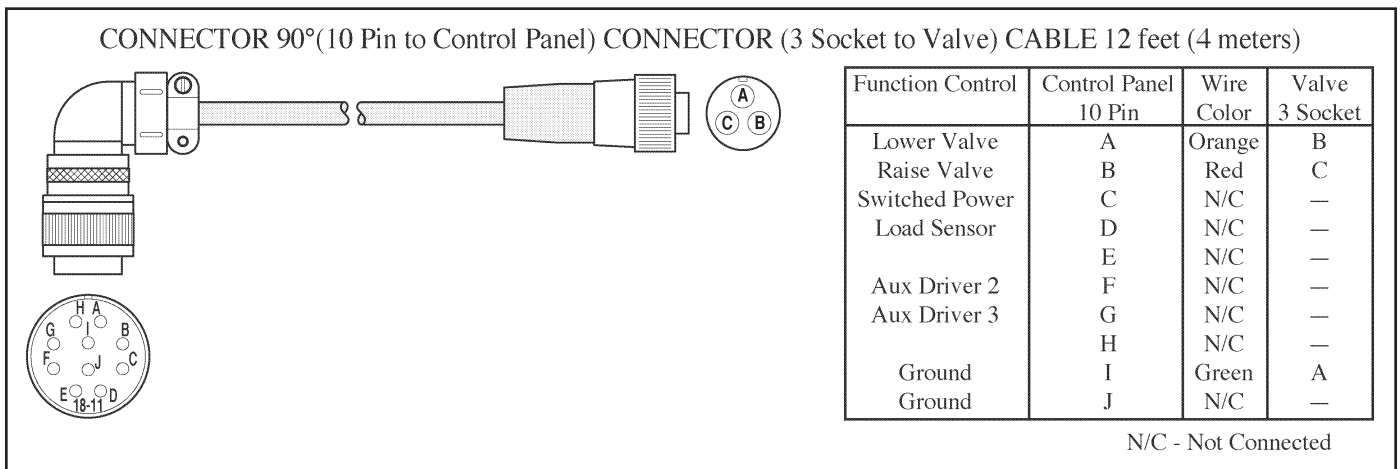


Figure 17. Solenoid Cable

SYSTEMS FEATURES AND BASIC OPERATION

the Control Panel. A small, built-in LED display provides grade elevation position, plus high and low lost beam indication.

The Laser Sensor is mounted on the mast pole directly above the cutting edge of the box. The sensor is the unit that detects the plane of laser light produced by the Rotating Laser. The Laser Sensor sends to the Control Panel the location of the plane of laser light. The Control Panel then has the valve assembly drive the Grading Box's hydraulics accordingly.

Cables

Cables are provided to connect the various components together into a system. Each connector uses a unique number of pins or sockets to prevent the components from being connected incorrectly.

⚠ CAUTION

Never force a connector into a socket.

⚠ CAUTION

All cables must be secured with adequate cable length to avoid pinching, stretching and tight bending. Do not clamp cables to pipes or hoses that may generate high heat.

Cable Configurations:

Sensor Cable - powers the sensor and communicates grade information between the Laser Sensor and Control Panel. The Control Panel end uses a 90° connector to differentiate it from the Laser Sensor end. This is a coiled cable that can hang freely between the Control Panel and Laser Sensor mounted on the mast.

Power Cable - supplies power to the system. The Control Panel supports both 12 and 24 volt machine systems.

Solenoid Cable - communicates grade information between the control panel and the hydraulic valve.

EQUIPMENT SET-UP

1. Connect the Power Cable to battery power supply. Place the connector end of the cable near the driver's seat for later connection to the Control Panel.

NOTE: Red wire is positive and black is negative.

2. Position the Laser Grading Box on a level area for attaching to the tractor. Start the tractor and back up to Laser Grading Box. Attach the unit with the hitch pins supplied.
3. After attaching, ensure the Laser Grading Box is level by adjusting the top link and lower link arms. The front of the Laser Grading Box (closest to tractor) should be approximately 1/2" higher than the rear of the Laser Grading Box which should be level with the ground. Turn off tractor.
4. Mount the Control Panel bracket on the right rear fender of the tractor using the necessary hardware (not supplied). Install the Control Panel on the bracket using the side knobs to secure the unit.

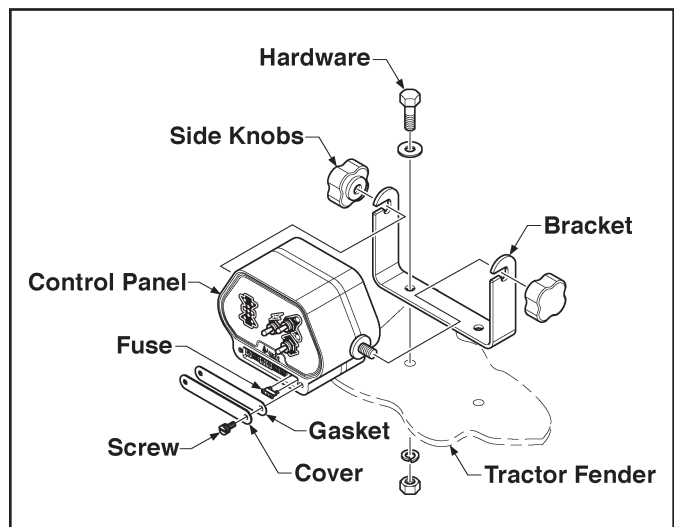


Figure 18. Control Panel Mounting

5. Connect the Laser Grading Box's hydraulic hoses with quick couplers to the tractor quick couplers. The Laser Grading Box's hydraulic manifold is marked with a "P" and a "T" where the pressure and return (tank) hoses enter.

SYSTEMS FEATURES AND BASIC OPERATION

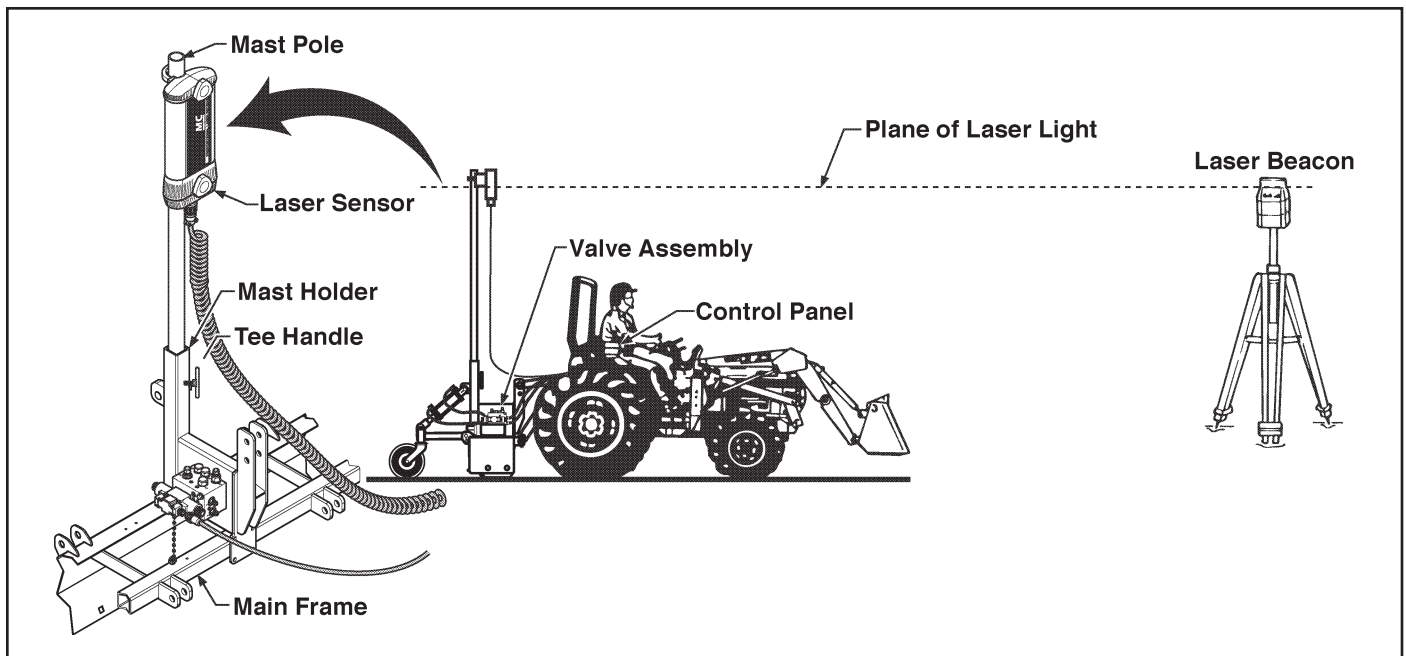


Figure 19. Components of the Automatic Control System

NOTE: "P" means pressure (supply) and "T" means tank (return). Refer to the Tractor Owner's Manual for identifying the "P" and "T" auxiliary hydraulic ports.

6. Insert the Mast Pole into the holder until it rests on the bottom of tube and tighten the tee handle to secure. Clamp the Laser Sensor near the top of the Mast so it is higher than any local obstructions including the tractor cab or fall protection devices. (Refer to Figure 20).
7. Connect the straight end of the Sensor Cable to the base of the Laser Sensor and the 90° end to the Control Panel. Cables will only attach to the proper connectors.
8. Connect the straight end (molded) of the Solenoid Cable to the directional valve and the 90° connector (10-pin) to the back of the Control Panel.
9. Connect the 90° connector end of the Power Cable to the back of the control panel. The terminal end was previously wired to the battery.
10. Set the On-Grade Deadband Switch to a wide band (8 to 10), Set the Automatic/Manual switch to MANUAL.

WARNING

Always have system in MANUAL when not operating the tractor.

JOB SITE SET-UP

The following are guidelines for setting up the Rotating Laser for both level job sites and sloped job sites:

- Choose a location for the Rotating Laser where obstructions, such as trees and buildings, can not block the plane of laser light. The Laser Sensor needs to be able to sense the plane of laser light at all times.
- Whenever possible, set up the Rotating Laser and the Laser Sensor at a height above the machine's cab. This prevents the cab or roll-over structure from blocking the plane of laser light as the machine moves around the job sites.
- The recommended head speed for the Automatic Control System is 20 RPS (Revolutions per Second). At 20 RPS, the Rotating Laser updates the Laser Sensor 20 times per second.

SYSTEMS FEATURES AND BASIC OPERATION

Set-Up for Level Grading

If the job site is to be level, the set-up of the Rotating Laser is simple. Since no slope is required in either axis, the Rotating Laser does not need to be aligned. The Rotating Laser will provide a level plane of laser light in all directions.

1. Locate the Rotating Laser following the previously stated guidelines.
2. Apply power to the Rotating Laser. Level the Rotating Laser (some Rotating Lasers will automatically level, others will need manual adjustment).
3. Set the counters for both axis at 0.000% (If needed, see the Rotating Laser Operation Manual).
4. Bench the machine. See the “Benching and Operating” procedure in this section.

Set-Up for Sloped Grading

If the job site is to be graded for a single or dual slope, the Rotating Laser requires its axis to be aligned for the job site. The Rotating Laser will then provide a plane of laser light at the required slope(s).

The following procedures are for two typical examples of job sites requiring sloped grades. Remember, each job site is unique, so consider the following methods as guidelines and not as the only methods possible.

Method One:

1. Set a minimum of two grade stakes exactly in line with one of the axis to be graded.
2. Place the Rotating Laser in line with the two grade stakes.

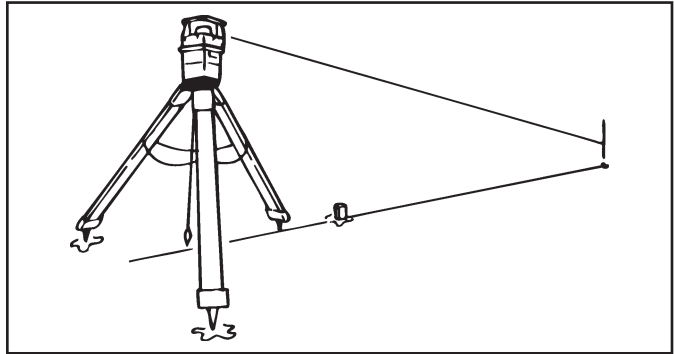


Figure 21. Method One: Align Rotating Laser with Grade Stakes

3. Switch on the Rotating Laser. Level the Rotating Laser (some Rotating Lasers will automatically level, others will need manual adjustment).
4. Set the counter on the Rotating Laser for both axis to 0.0000% (If needed, see the Rotating Laser Operation Manual).
5. Roughly align one of the axis to the grade stakes by sighting over the top of the Rotating Laser (Refer to Figure 20).

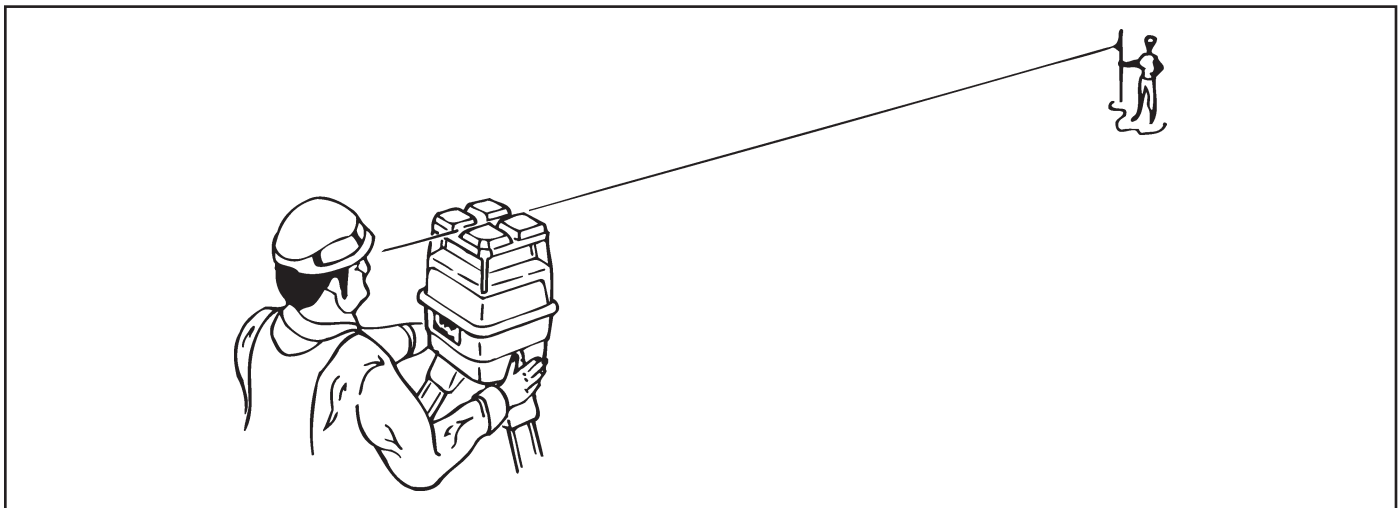


Figure 20. Sight over Rotating Laser

SYSTEMS FEATURES AND BASIC OPERATION

6. Align the plane of laser light.
 - a. Set a grade Rod with Rod Eye Receiver on the far grade stake and adjust the rod until the Rod Eye Receiver indicates “On Grade.”
 - b. On the axis not aligned with the stakes, enter on the Rotating Laser: 5.000%. Allow the Rotating Laser to level itself to this new position, if needed.
 - c. Check the Rod Eye Receiver again.
 - If the Rod Eye Receiver indicates “On Grade”, the plane of laser light is aligned correctly.
 - If the Rod Eye Receiver indicates the plane of laser light is too high or too low, have a second person rotate the Rotating Laser on the tripod in small steps until the Rod Eye Receiver indicates “On Grade.”
7. Enter on the Rotating Laser the required percent of grade for each axis and allow the Rotating Laser to level itself again.
8. Bench the machine. See the “Benching and Operating” procedure in this section.

Method Two:

1. Set a minimum of two surveyed grade stakes. The stakes must have elevation information (Refer to Figure 22).

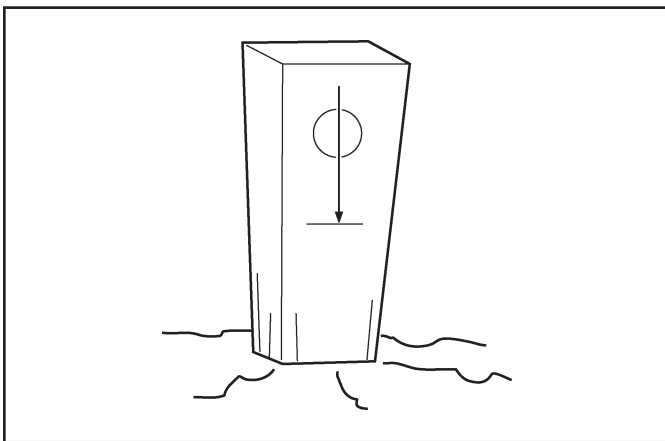


Figure 22. Grade Stake with Elevation Mark

NOTE: This procedure requires that the elevation of the grade stakes are correct and aligned to the slope or percent of grade required.

2. Place the Rotating Laser a few feet (meters) behind the first grade stake and in line with one of the far grade stakes (It is not critical to align the Rotating Laser exactly) (Refer to Figure 23).

NOTE: Follow the guidelines at the beginning of this section when placing the Rotating Laser.

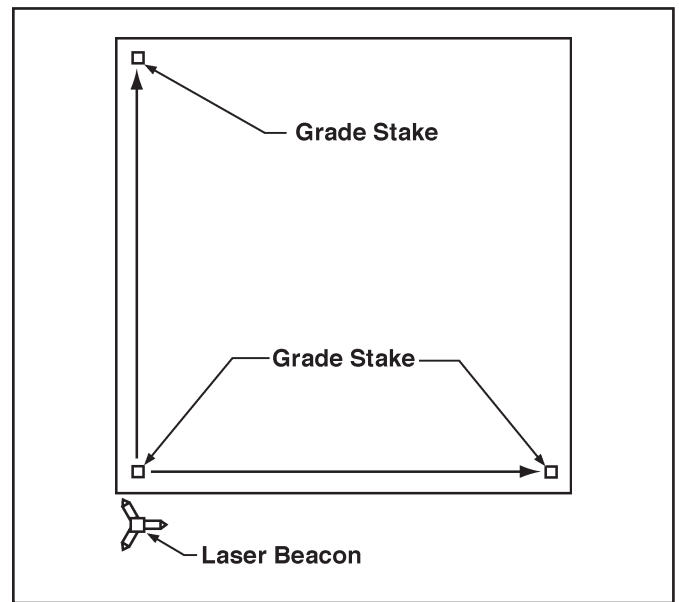


Figure 23. Method Two: Align Rotating Laser with Grade Stakes

3. Switch on the Rotating Laser. Level the Rotating Laser.
4. Roughly align one of the axis to the grade stakes by sighting over the top of the Rotating Laser (Refer to Figure 20).
5. Set both the counters on the Rotating Laser to the required percent of grade (If needed, see the Rotating Laser Operation Manual).

NOTE: The Grade Rod must be held plumb for each of the readings taken in the following steps.

SYSTEMS FEATURES AND BASIC OPERATION

6. Establish the H.I. (height of the instrument) for the plane of laser light.
 - a. Align the bottom of the Grade Rod to the mark on the near grade stake.
 - b. Adjust the Rod Eye Receiver up and down until it indicates "On Grade."
 - c. Adjust the Rod Eye Receiver for any cut or fill amount indicated by the grade stake.
 - If the grade stake shows a cut, extend the Grade Rod and Rod Eye by the amount shown as a cut.
 - If the grade stake shows a fill, lower the Rod Eye by the amount shown as fill.
7. Align the plane of laser light.
 - a. Align the bottom of a Grade Rod to the mark on the far grade stake.
 - b. Check the Rod Eye Receiver.
 - If the Rod Eye Receiver indicates "On Grade," the plane of laser light is aligned at the correct slope.
 - If the Rod Eye Receiver indicates the plane of laser light is too high or too low, have a second person rotate the Rotating Laser on the tripod in small steps until the Rod Eye Receiver indicates "On Grade."

NOTE: If it was necessary to rotate the Rotating Laser a significant amount at the far stake, then the original reading at the near stake may be out of tolerance. Check the setting again and make minor adjustments as required.

8. Bench the machine.

NOTE: If needed, check the elevations on both the plane of laser light and the grade stake elevations by setting the bottom of the Grade Rod at any stake's grade mark and checking the Rod Eye Receiver for the "On Grade" indication.

BENCHING AND OPERATING

Before benching, the plane of laser light must be set at its proper slope. Benching is the process of setting the relationship between the Laser Sensor and Rotating Laser, or benchmark. Failure to properly bench the system before grading will result in an unacceptable grade.

The goal is to have the Laser Grading Box approximately 1/2 full during operation. If, during rough grading, a lot of material needs to be removed from a site, the Laser Sensor should be set several inches higher than finished grade. As material is removed, the Laser Sensor can be lowered and the site regraded. This may need to be repeated several times until finished grade is achieved.

Benching

1. Move the machine to an area which is close to finish grade or, using the manual controls on the control system, grade a small area close to finish grade.

NOTE: Finish grade can be checked several times during the grade process to "zero" in on final grade.

2. Set the Auto/Manual Switch to MANUAL.
3. Turn the Laser Sensor and Rotating Laser ON.
4. Set the On-Grade Deadband Switch to the narrowest band "1" (Refer to Figure 5) for the "On Grade" tolerance.
5. Adjust the height of the Laser Sensor until its center (On-Grade) Grade Position LED cluster is lit. For:

Telescoping Masts, loosen the locking knob on the mast and raise or lower the Laser Sensor. Tighten the locking knob when correct.

Non-Telescoping Masts, loosen the mounting knob for the Laser Sensor and raise or lower the Laser Sensor. Tighten the mounting knob when correct.

SYSTEMS FEATURES AND BASIC OPERATION

NOTE: Most materials graded must later be compacted. To compensate for the compacting distance, lower the Laser Sensor. This raises the box's cutting edge by the same distance. The distance the Laser Sensor is lowered depends on the material.

Benching with a Rod Eye

To bench the Laser Sensor using a Rod Eye, follow the process listed below:

1. Turn on the Rotating Laser. Attach a Rod Eye to a measuring pole and turn on. Set the base of the measuring pole on the benchmark and adjust the measuring pole so the Rod Eye emits a solid "On Grade" tone (compensate for slab thickness and compaction if needed).
2. Find an area to be graded that is close to specified grade. Start the tractor, engage the auxiliary hydraulics and move the unit to that location. Raise or lower the Laser Grading Box's cutting edge until it is even with the bottom of the measuring pole when the Rod Eye is emitting the "On Grade" tone or resting on the ground if already at grade.
3. Making sure the Control Panel's Automatic/Manual Switch is on Manual and the On-Grade Deadband switch is set to narrow (1 or 2), move the Laser Sensor to a height on the Mast Pole where it indicates the beam in the "On Grade" position and is unobstructed by any object.

NOTE: Operator may prefer to turn the face of the Laser Sensor towards the operator for easy viewing.

The Laser Grading Box Automatic Control System is now calibrated.

Operation

After the Laser Grading Box is connected and the Automatic Control System is calibrated, operation can begin.

The operational goal is to drive over the area to be graded with the box 1/2 full of material and the Control Panel's green light always illuminated.

1. When seated in the Operator's seat, start the tractor and move the Auto/Manual Switch to AUTO.
2. Turn the On-Grade Deadband Switch to a wider band, 8 - 10.

NOTE: Most materials graded must later be compacted. To compensate for the compacting distance, lower the Laser Sensor. This raises the box's cutting edge by the same distance. The distance the Laser Sensor is lowered will depend on the material.

3. Drive the machine forward. The Automatic Control System constantly senses the plane of laser light, raising and lowering the grading box to maintain the cutting edge at the required elevation. Note the following during operation:
 - In some situations, the Automatic Control System may require a cut deeper than the machine can handle. The machine may lose traction, stall the engine, or the wheel frame will be lifted off the ground to the maximum stroke of the cylinder as the cutting edge tries to reach finished grade. If this occurs, set the Auto/Manual Switch to MANUAL and use the Raise/Lower Switch to raise the cutting edge until the machine can push the material. Make multiple passes to cut the area to closer to finished grade and then go back to AUTO control. This allows the high spots to be gradually removed.

SYSTEMS FEATURES AND BASIC OPERATION

- If one of the Control Panel or Laser Sensor grade lights are blinking, it indicates the direction of the last elevation prior to passing out of the laser beam. Readjust the height of the Grading Box until signal is found. The Laser Sensor or Rotating Laser height may need to be adjusted if this situation continues to occur or switch to MANUAL operation until you get closer to grade.
4. After several passes with the Laser Grading Box, stop and turn off the skid steer or tractor. Place the base of the measuring pole on the graded area and check grade elevation.
 5. After a rough grade is achieved, the On-Grade Deadband Switch may be changed to a narrower setting as required to meet the job tolerance requirements. With a tighter deadband, the speed of the tractor needs to be decreased for optimum finish.

NOTE: In rough grading situations, use the Automatic Control System as an “Indicate Only” system and operate the machine under manual control. After the area has been rough graded, switch to automatic control.

TROUBLESHOOTING

SYMPTOM	POTENTIAL CAUSE	REMEDY
Control Panel lamps do not light.	<p>Control Panel not turned on.</p> <p>Power Cable not connected to Control Panel.</p> <p>Power Cable not providing power to the Control Panel.</p> <p>Fuse blown.</p> <p>Electrical short.</p>	<p>Push the Power ON/OFF Switch.</p> <p>Connect power cable to Control Panel.</p> <p>Check that the Power Cable is connected to the battery. The red wire connects to the positive (+) post and the black wire connects to the negative (-) post.</p> <p>Remove the Power Cable from the Control Panel and use a volt meter to check for 12 volts DC.</p> <p>Check the fuse.</p> <p>Disconnect all cables except the Power Cable. If the lamps still do not cycle when the Control Panel is turned on, contact the local Apache Technologies dealer.</p>
Laser Sensor does not display grade.	<p>No Rotating Laser in range.</p> <p>Laser beam blocked.</p> <p>Laser Sensor not receiving power.</p> <p>Electrical short.</p>	<p>Ensure Laser Sensor is within operating range of Rotating Laser.</p> <p>Ensure beam is striking middle of the Laser Sensor</p> <p>Check and clean glass covering the Laser Sensor's photo cells.</p> <p>Check for obstructions keeping Laser Sensor from seeing the Rotating Laser.</p> <p>Check Fuse in the Control Panel.</p> <p>Check Sensor Cable for damage. Use an Ohm meter to check continuity.</p> <p>Check Sensor LED disable switch (see Pages 3 & 4).</p> <p>If LEDs do not cycle when Control Panel is turned On, contact the local Apache Technologies dealer.</p>

TROUBLESHOOTING

SYMPTOM	POTENTIAL CAUSE	REMEDY
Laser Grading Box does not raise or lower.	<p>Control Panel not turned on.</p> <p>No hydraulic flow to Laser Grading Box.</p> <p>Cables not connected correctly.</p> <p>Electrical Problems</p> <p>Hydraulic problems.</p>	<p>Push the Power ON/OFF switch.</p> <p>Ensure hydraulic control handle of tractor is in correct position.</p> <p>Ensure auxiliary hydraulics are ON or in continuous flow mode.</p> <p>Check Solenoid Cable and directional valve for visible damage.</p> <p>Move directional valve spool manually using the overrides on the end of the directional valve. If the Laser Grading Box moves, refer to Electrical problems. If the Laser Grading Box does not move, refer to Hydraulic problems.</p> <p>Check the Solenoid Cable and directional valve for visible damage.</p> <p>Use an Ohm meter to check cable for continuity.</p> <p>Confirm hydraulic flow through the manifold and returning to the power source through the "T" hose.</p> <p>Contact ATI Corporation for help troubleshooting the hydraulic manifold.</p>
Laser Grading Box moves in opposite direction.	Hydraulic flow reversed.	<p>Confirm the pressure is going in the "P" port.</p> <p>Verify control handle is moving in desired direction.</p>

TROUBLESHOOTING

SYMPTOM	POTENTIAL CAUSE	REMEDY
Box has trouble staying on grade.	Rotating Laser out of range.	Ensure Laser Sensor is within specified operating range of Rotating Laser.
	Laser beam being reflected.	Ensure Rotating Laser's light is not reflecting off other surfaces (windows, windshields, mirrors, etc.) causing multiple readings by the Laser Sensor.
	Multiple laser beams.	Ensure that there are no other lasers operating on the job site or nearby.
	Laser deadband set too narrow.	Ensure the On Grade Deadband switch is set for rough grading.
	Travel speed is too fast for grade tolerance.	Slow down.
	Hydraulic response too quick.	Decrease the Gain Selection Switch setting.
	Hydraulic flow reversed.	Confirm the pressure is going in the "P" port.

SPECIFICATIONS AND MAINTENANCE

SPECIFICATIONS

Dimensions

Model	SC48	SC54	SC60	SC66	SC72
Box Width	48 in. (123 cm)	54 in. (138 cm)	60 in. (152 cm)	66 in. (168 cm)	72 in. (183 cm)
Overall Width	50 in. (127 cm)	56 in. (142 cm)	62 in. (157 cm)	68 in. (172 cm)	74 in. (188 cm)
Total Length	42.4 in. (108 cm) 76.4 in. (194 cm) with optional drawbar				
Box Capacity	4.1 ft ³ (0.11 m ³)	4.6 ft ³ (0.13 m ³)	5.1 ft ³ (0.14 m ³)	5.6 ft ³ (0.16 m ³)	6.1 ft ³ (0.17 m ³)
Weight	345 lbs. (156 kg)	365 lbs. (166 kg)	395 lbs. (179 kg)	410 lbs. (186 kg)	425 lbs. (193 kg)

Control Panel CB26

On-Grade LED's	Green
High/Low LED's	Red
Operating Voltage	10 to 30 Volts DC, reverse polarity protected
Electrical Connection	Standard military type
Valve Compatibility	Proportional Time (On/Off), Proportional Current, and Proportional Voltage
Maximum Current	5 Amps per coil
Remote Switch Option	Raise/Lower, Auto/Manual switches
Weight	5 lbs. (2.25 kg)
Dimensions	7.0 x 5.3 x 4.8 in. (178 x 134 x 120 mm)

Laser Sensor BULLSEYE 5MC

Beam Reception	360°
Operating Range	2000 ft. (610 m) radius, laser dependent
Laser RPM	Minimum - 105 ; Maximum - 1200
Vertical Reception	6.75 in. (170 mm)
Accuracy	Set at Control Box
Power	Power Cable – 10-30 VDC
LED Display	Mini display for set-up Red - Hi, Low, On Grade
Out of Beam Indication	High and Low
Dimensions (LxWxD)	13.50 x 5.58 x 5.88 in. (343 x 142 x 149 mm)
Mounting Pipe	1.66 to 2.00 in. O.D. round tube (42 mm to 50 mm) and 1-1/2 in. (38mm) square tube
Operating Temperature	-4° F to 140° F (-20° to +60° C)

SPECIFICATIONS AND MAINTENANCE

MAINTENANCE

The rugged and durable Automatic Control System is built to last, but as with all equipment, a few minutes of routine care, maintenance, and cleaning can extend the life of the system.

Storage and Transport

Most often the grading box and its hydraulic controls remain on your machine. However, you should store the Control Panel, Laser Sensor, Coiled Sensor Cable and Solenoid Cable in a safe place when not in use. Protect the cable connections by installing the covers supplied.

Cleaning

The Laser Sensor is completely sealed and purged with dry nitrogen. It requires no maintenance other than periodic checking to be sure its mounting structure is tight and secure.

The Control Panel is water resistant. It can be cleaned with mild soap and water, and a soft cloth. Do not submerge the Control Panel or direct high pressure spray at it. Do not use a dry cloth to wipe the Laser Sensor or Control Panel as scratching may occur.

Cables and Hoses

Check all cables and hoses regularly for signs of wear and damage. Keep cable connections clean and free from dirt and corrosion. If a cable has been damaged, do not attempt to repair. Incorrect or poor connections can cause damage to your Automatic Control System.

When applicable, check the hydraulic hoses. Look for areas where the hoses could rub against each other or another object as they expand and contract under pressure. Check the hydraulic fittings for tightness.

Machine

Check areas that affect the Automatic Control system function and accuracy, such as looseness or play in the cylinders or wear on the box's cutting edge. Looseness in the connection to the tractor, such as in the 3-point hitch, will cause inaccurate depth positioning.

Also check the tractor routinely for wear to its components, such as the 3-point linkage, ensuring it is operating properly.

Calibration

Perform periodic calibration checks of the Rotating Laser System, as outlined in its Operation Manual, to ensure accurate performance.

SERVICE

If the Automatic Control System is not functioning properly, the first step is to determine the problem component. Use the Troubleshooting Chart to determine possible causes and remedies. The following test equipment is needed:

- Voltage/Ohm Meter
- Rotating Laser or Laser Simulator

Use the Cable Wiring Diagrams on Page 7 to troubleshoot electrical problems.

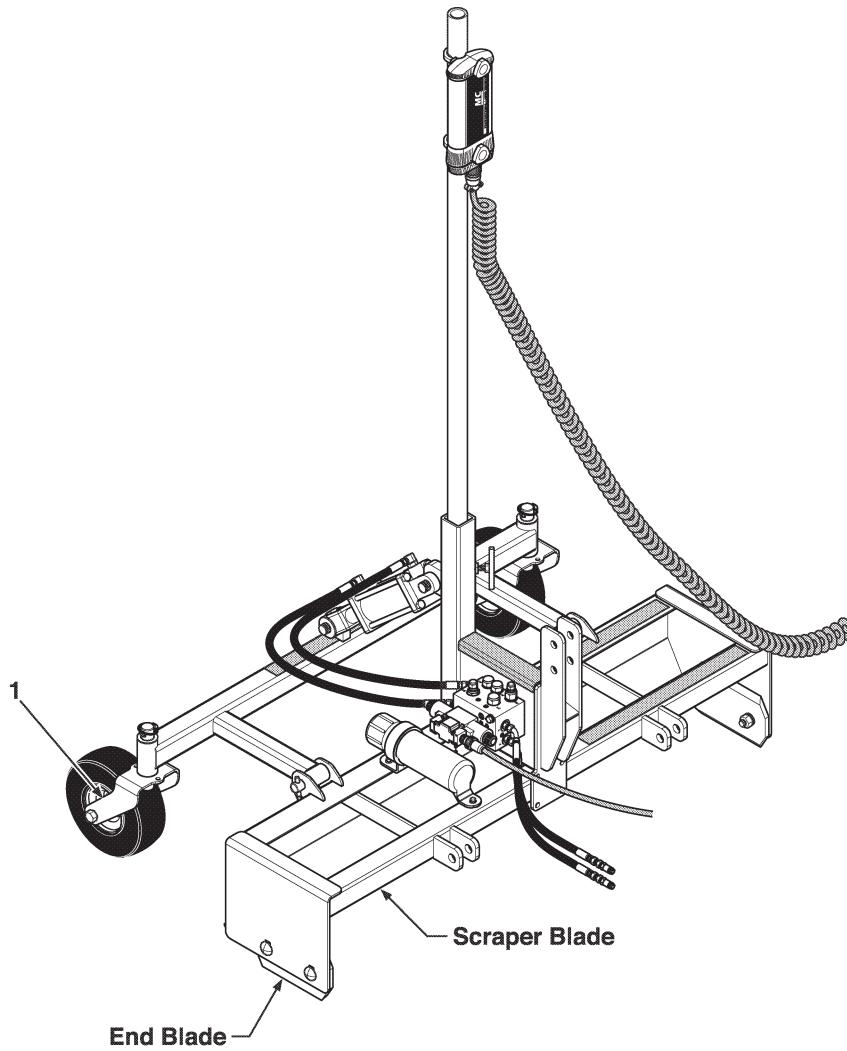
CAUTION

To prevent serious damage to the Automatic Control System, never replace a fuse with a fuse that has a higher amperage value.

CAUTION

The Automatic Control System is a highly sophisticated electronic system. Do not attempt repairs to the components. Contact Apache Technologies, Inc. or your local dealer if you have any problems.

SPECIFICATIONS AND MAINTENANCE



ITEM	NAME	FREQUENCY	LUBE TYPE
1.	Wheel Hub (2)	Annually	EP*
* EP - Multi-Purpose Grease.			

NOTES:

1. Check Hydraulic System Components for wear and/or leaks.
2. Check and tighten all bolts and nuts for scraper blade and end blades, weekly.

Figure 24. Lube and Maintenance Chart

REGISTRATION CARD

By buying this product, you, the purchaser of this product, agree to the following:

To the fullest extent permitted by law, the purchaser of this product shall indemnify and hold harmless ATI Corporation and its authorized dealer from and against claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from the use of the product, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, but only to the extent caused by the negligent acts or omissions (Including but not limited to misuse or alteration of the product) of the purchaser, anyone directly or indirectly employed by the purchaser or anyone for whose acts the purchaser may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder.

In claims against any person or entity indemnified under this agreement by an employee of the purchaser, anyone directly or indirectly employed by the purchaser or anyone for whose acts the purchaser may be liable, the indemnification obligations shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the purchaser under worker's compensation acts, disability benefit acts or other employee benefit acts.

CUSTOMER COPY

Dealer _____ Date Installed _____
Grading Box Model # _____ Serial # _____
Control Panel Model # _____ Serial # _____
Laser Sensor Model # _____ Serial # _____
Dealer Name _____
Street _____
City, State, Zip _____
Telephone _____ Fax _____
Signature _____

DETACH AND MAIL TO ATI CORPORATION • 250 EARLAND DRIVE • NEWHOLLAND, PA 17557
or FAX to (717) 354-2162



MANUFACTURER'S COPY

Dealer _____ Date Installed _____
Grading Box Model # _____ Serial # _____
Control Panel Model # _____ Serial # _____
Laser Sensor Model # _____ Serial # _____
Customer Name _____
Street _____
City, State, Zip _____
Telephone _____ Fax _____
Signature _____