

Lasiris™ Magnum Laser

INSTRUCTION MANUAL

Version 6

Updated: April 2008
STKR # 990-0013



CAUTION NOTE

PLEASE READ THE COMPLETE MANUAL BEFORE ATTEMPTING TO OPERATE YOUR LASER. **OPERATING LASIRIS LASERS USING PROCEDURES OTHER THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS RADIATION EXPOSURE.**

AVOID EXPOSURE TO DIRECT OR SCATTERED RADIATION FROM THE LASER.

It is extremely important to follow laser safety rules and wear appropriate protective eyewear when working around these lasers. As a general rule, you should avoid eye or skin exposure to direct or scattered radiation from these lasers.

All laser safety-warning labels are provided on the unit and comply with 21 CFR 1040.10 pursuant to the radiation control for the health and safety act of 1968.

All Magnum Series lasers are in full compliance with the United States CDRH and the European IEC 60825-1 Laser Safety Regulations.

CAUTION- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

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VISIT OUR WEBSITE (FAQs) FOR THE LATEST VERSION OF THIS MANUAL:

<http://www.stockeryale.com/lasers/>

1. *StockerYale's Lasiris™ Product*

Your Lasiris product is the result of extensive research and development, and customer feedback. All instructions should be read prior to operating the laser to ensure its proper functioning, and, more importantly, to ensure the safety of its users.

From the "eye safe" design of our built-in mechanical shutter and integrated focus adjustment, to the uniform intensity distribution laser light, your Lasiris structured light generating laser has been developed with the end-user in mind. The Magnum laser features high quality glass optics and a rugged housing to maximize the laser's reliability. For insured longer lifetime, all diode lasers have undergone a burn-in period and a final quality control check before shipment.

Should you have any comments or suggestions regarding a StockerYale product or service, please do not hesitate to contact us. We can be reached at (514) 685-1005, or at 1-800-814-9552, or by fax at (514) 685-3307.

Thank you for your support!

2. *Incoming Inspection*

Immediately upon receipt of your product, examine the packaging material and contents for shipment damage. Report any such instance to your receiving department or shipping company.

Your shipment should contain the following items:

- 1 laser unit
- 1 set of keys for activating the key switch
- 1 shorted interlock plug 1/8"



(1) one shorted 1/8" mono jack

In the event that any of these items are missing, please contact your StockerYale representative immediately, or contact directly the laser division of StockerYale by calling (514) 685-1005 or 1-800-814-9552. Please have your product invoice information available.

3. Laser Operation

WARNING!

The laser light emitted by this unit may be in the Infrared area of the electromagnetic spectrum. The laser light may not be visible to the human eye. Use extreme caution at all times when laser is in use.

The output power of this laser device is high enough to cause permanent damage to the human eye. You should wear appropriate laser safety goggles at all times when the laser is operational.

Hazardous radiation exposure will result if the shutter is opened while the laser is on.

NOTE

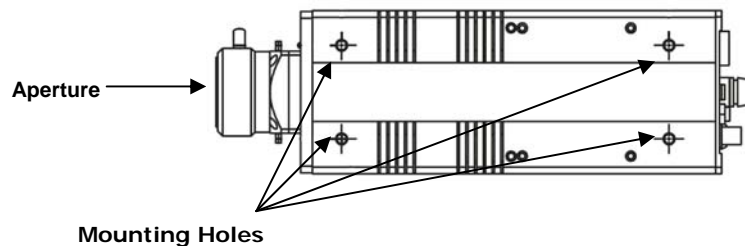
Any references in this manual to the “on” and “off” positions of the *Main Switch* or *Key Switch*, refer to the corresponding I/O button in the “I” and “O” positions respectively.

3.1 Installation

Mounting

To install the Magnum laser onto a support, mounting holes are conveniently located beneath the laser.

Bottom View



Please ensure that the support on which the laser is mounted is not made of insulating material, and that the heat of the laser can be properly transferred.

Ventilation

- The fan should not be obstructed to ensure proper ventilation of your Magnum laser.
- Operate the laser in an environment in which there is normal aeration.

3.2 Power Requirements

If the power supply is provided by the customer, please ensure that the following guidelines are followed:

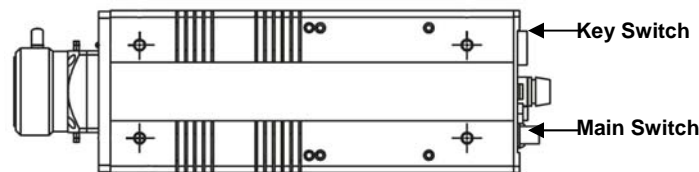
- To operate your $\lt; 2\text{ W}$ Magnum, you need a **DC** Power Supply giving **12V** at **2.5A** minimum.
- To operate your $\geq 2\text{ W}$ Magnum, you need a **DC** Power Supply giving **12V** at **4A** minimum (5A peak) for ambient temperatures, and at **6A** minimum for temperatures near the limits of the temperature range.
- It is preferable to have the shield wire of the power cable connected to the Earth of the main AC electric supply, via the DC power supply.

The diode laser is protected against over voltage. However, it is strongly recommended that a voltage of 12 ± 1 volts DC is supplied to the laser. Otherwise you may damage the unit. An internal 5A fuse is used to protect the unit against high currents.

NB: If your Magnum laser was purchased without a power supply, you must ensure that you use a power supply that is CE certified.

3.3 Connections

Bottom View



- Make sure that the Main Switch (back of laser) is in the off position.
- Make sure that the key switch is in off position.
- If the power supply is not permanently connected to the Magnum, make sure that the Power Supply is off.
- Connect the +12 Volts lead (White) to positive (+) lead of the Power Supply.
- Connect the 0 Volt lead (Black) to negative (-) lead of the Power Supply.
- Connect the Shield lead to the Ground (Earth) of the Power Supply.

3.4 Turning the Laser ON

WARNING!

Do not place any flammable objects directly in front of the free, non-extended beam (without the line generating optics). The high power beam could cause the objects to ignite.

Once the laser is properly connected to the power supply, follow these instructions to operate the laser:

- Turn the Power Supply on.
- Turn the Main Switch of the laser on. The green LED at the back of the laser will light up.

3.5 Turning the Laser OFF

- Turn the Main Switch off.
- Turn the Power Supply off.

3.6 Operating Modes

Once the laser is properly connected to the Power Supply, the following operating modes are available:

CW mode

To operate in Continuous Wave mode, simply turn the Key Switch on at the back of the unit. After a few seconds, the laser will turn on and the green LED at the front of the laser will light up. **Note that it is necessary to open the shutter to have access to the laser beam.**

NB: A number of protections have been built into the laser driver. The laser will not turn on until the thermoelectric cooling device (TEC) has brought the laser to its normal operating temperature, which is about 25°C in standard lasers.

Modulation / Synchronization

To operate in Modulation mode, first follow the procedure for CW operation, then feed a TTL pulsed signal (0-5V) or an analog signal between 0 and 5V to the BNC connector at the back of the unit. A 0V signal will produce maximum output power while a 5V signal will produce minimum output power. The output power will follow the input voltage almost linearly between about 0.7V and 4V. The green LED at the front of the unit will only light up when the laser is actually emitting. If you modulate full range at 20 Hz, the front LED will also blink at 20 Hz.

3.7 Maximum Output Power Adjustment

You can limit the maximum output power level of your Magnum laser. The limit has been set at the maximum value at the factory. If you want to limit the power to a lesser value, simply use a flat screwdriver to reduce the upper limit of the output power by turning the power adjustment potentiometer counterclockwise (on the laser back). To return the power to its original setting, simply turn the pot clockwise until it clicks. You cannot bring the output power above the factory-set limit.

3.8 Operating Environment

The Magnum laser is suitable for indoor and outdoor use and functions normally when the following environmental conditions are met:

- Altitudes of up to 2000 m
- Temperature range: -35°C to +40°C, and
- Environments where the maximum relative humidity (RH) is 80% (for temperatures up to 31°C). Note that above 31°C, the RH decreases linearly from 80% to 50% (at 40°C)

NB: In extremely cold environments, care should be taken to maintain the laser above -35°C at all times.

Magnum lasers contain a built-in heat sink and a thermoelectric cooler to minimize the heat build-up. Should the laser become too hot, the unit is designed to temporarily shut down. Full laser operation will resume only once the laser returns to normal operating temperatures. This feature is intended to provide you with the longest lifetime and the most reliable product.

Please ensure that the support on which the laser is mounted is not made of insulating material, and that the heat of the laser can be properly transferred.

To ensure proper ventilation of your Magnum laser, the fan should not be obstructed. In addition, it is suggested that you operate the laser in an environment in which there is normal aeration.

As with all semiconductor materials, avoid prolonged or repeated exposure to electrostatic charges or water, although all Lasiris lasers are designed with ESD protection.

A series of tests determined that the Magnum laser belongs to Category II with respect to *over-voltage*, and Degree 2 with respect to *pollution*.

4. Servicing Your Magnum Laser

As a general rule, please use caution around all laser products. Lasers are highly concentrated light sources, some invisible to the eye. Never point a laser beam into your, or any other person's eyes; permanent damage to the retina can occur!

W A R N I N G ! Use of controls, adjustments or performance of procedures other than those specified herein may result in Hazardous Radiation Exposure and will void the product warranty. Magnum lasers fall in the CRDH Class IIIb or Class IV category depending on output power, wavelength and fan angle. These structured light devices meet this certification only as complete assemblies. Please use extreme caution when performing these servicing operations. Never look directly into the laser beam. StockerYale will not be held liable for any injuries caused by product misuse.

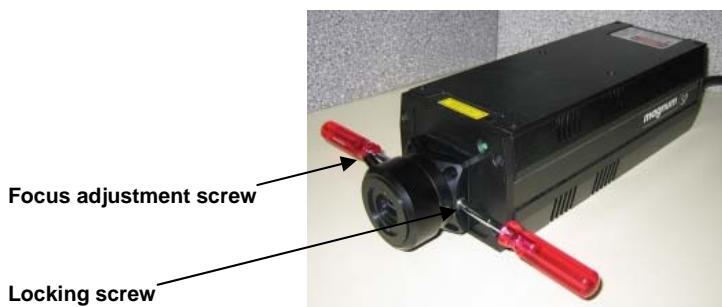
Each Magnum laser is a self-contained unit. As such, the only necessary service and maintenance steps are as follows:

4.1 Optics and Focusing

High power laser diodes do not have a very good far field beam profile. The beam is non-Gaussian and can sometimes present a "M" shaped profile. In such cases it is difficult to extend the beam into a very uniform line. At StockerYale, we match each diode with a custom made lens to optimize the line uniformity.

Lasiris Magnum Series lasers can have a built-in focus adjustment mechanism. To change the focus at a specified working distance, follow these instructions:

- 1- Loosen the **locking screw**. This will release the pressure on the focusing optics, allowing the collimator to be moved.
- 2- Turn the **focus adjustment screw** clockwise or counterclockwise to obtain the desired focus at your working distance.
- 3- Re-tighten the **locking screw**. Do not over-tighten.
- 4- Your image should now be in focus at the required target distance.



NB: Obtaining the smallest possible focus requires some equipment to measure the line thickness as you adjust it. It is not possible to adjust the focus to its very best value without proper equipment since you should never look at the laser light without protective eyewear. At StockerYale, our qualified personnel use state-of-the-art beam analysis equipment to adjust the focus to your specifications.

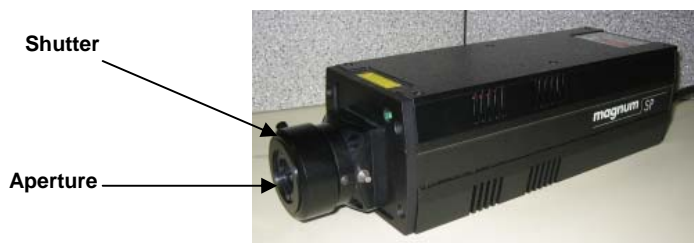
4.2 Cleaning the Optics of your Laser

If the laser pattern becomes fuzzy or unclear, please verify the following:

- Confirm if the image is in focus (if not, please follow instructions in section 4.1)
- Verify if the optical components have been contaminated

If the optical components have become contaminated, it is best to try and remove visible contamination by blowing dry air across the surface. Make sure the air product is oil-, moisture-, and contaminant-free. If this technique fails to remove the contaminants, gently wipe the glass surface with a piece of slightly damp lens tissue. We recommend a water-based mild detergent or a glass cleaner (e.g., Windex) to be applied to the tissue. **Please attempt the process only after non-contact methods have failed.**

5. Safety



WARNING!

The laser light emitted by this unit may be in the Infrared area of the electromagnetic spectrum. The laser light may not be visible to the human eye. Use extreme caution at all times when laser is in use.

The output power of this laser device is high enough to cause permanent damage to the human eye. You should wear appropriate laser safety goggles at all times when the laser is operational.

Hazardous radiation exposure will result if the shutter is opened while the laser is on.

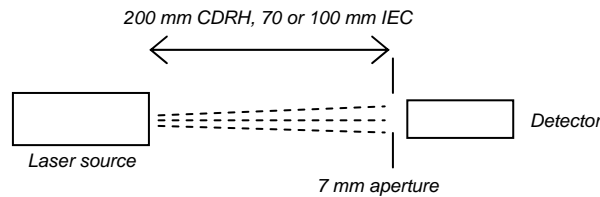
5.1 Classification

Lasers are classified according to the output power and the wavelength of a laser beam in a particular setup according to the United States Center for Devices & Radiological Health (CDRH) document 21 CFR 1040.10, and, upon demand, to the International Electrotechnical Commission (IEC) document 60825-1: 2nd edition, 2007-03. The protocol for classification described herein is a general outline of the procedures. In actual practice, the settings can differ depending on the laser. Call us for details.

The laser beam (either as a raw or modified beam) is aimed into a 7 mm aperture located some distance away from the laser. The detector placed just behind the aperture records the *highest* output power level of the laser beam. In the case of a line laser, the entire line is scanned to find the highest output power.

With conventional Gaussian line generators, it is generally the hot central spot that causes its safety rating to go up one class (e.g., from CDRH Class II to IIIa). Our patented optics produce a line of uniform intensity that does not have a hot spot at the center. Therefore, a Lasiris non-Gaussian laser can offer a safer level of exposure, in addition to more light and uniform illumination transmitted to your part.

Your laser was tested prior to shipping to determine which class it belongs to, and to provide CDRH classification (and IEC, upon request). Please consult us, or CDRH (21 CFR 1040.10) and IEC (60825-1: 2nd edition, 2007-03) norms to understand the conditions fulfilled to classify a Lasiris laser. The safety labels are affixed on top of the laser, at the opposite end of the aperture.



Setup for CDRH and IEC classification

Organization	Class	Wavelength	Maximum Power* some distance away from the laser source	Distance between laser source and detector measuring power
CDRH	II	400-710 nm	1 mW	200 mm
	IIIa	400-710 nm	5 mW	200 mm
	IIIb	400-710 nm	500 mW	200 mm
or >710 nm		500 mW	200 mm	
IEC	1	500-700 nm	0.39 mW	70 mm
	1M	500-700 nm	0.39 mW	100 mm
	2	400-700 nm	1 mW	70 mm
	2M	400-700 nm	1 mW	100 mm
	3R	400-700 nm	5 mW	70 mm
	3B	400-700 nm	500 mW	70 mm

Possible CDRH and IEC classifications for Lasiris lasers. *For the IEC, wavelengths outside of those stated have different maximum power values. Call for details.

5.2 CDRH Classification

Our Magnum lasers can comply with CDRH classification and fall in different safety classes depending on output power, wavelength and fan angle. According to CDRH 21CFR1040.10 regulations, they can be classified as Class IIIB or Class IV.

Warning / ID / Aperture Labels

Statement indicating that the laser light is emitted from the aperture. Warning statement follows.



Class IIIb - “Danger”

- Visible laser light between 5.0 and 500 mW –
- Invisible laser light less than 500 mW -

High-power visible lasers and infrared (IR) lasers. Considered dangerous to your retina if exposed. This includes looking directly into a reflection from a specular (mirror-like) surface. Normally, Class IIIb lasers will not produce a hazardous diffuse reflection. At higher levels of the class, these lasers can be skin hazards. Certification is given on lasers that have a key box and remote interlock (integrated in the Magnum). It is important to follow laser safety rules and wear appropriate protective eyewear when working around these lasers.

5.4 Classification Requirements

Classification is obtained once the laser meets the criteria established by the CDRH or the IEC. Although Lasiris lasers come standard with CDRH classification, some custom-made lasers may not qualify for compliance. However, lasers are always classified into a safety class, i.e., CDRH Class IIIb or IV, and IEC Class 3B or 4. **Lasers do not need to be classified unless the end-user requires it to be so. Please mention it at the time of order.**

CDRH Requirements	IEC Requirements
<p>Class IIIb</p> <ol style="list-style-type: none"> 1. laser radiation emission indicator (LED turning on when the laser is powered) 2. beam attenuator (a shutter) 3. Warning/ID/Aperture label affixed (sticker on the laser with all the required information) 4. instruction manual 5. removable key-actuated master control preventing lasing when removed 6. remote interlock connector that prevents lasing when removed 7. laser radiation emission indicator that turns on prior to lasing (LED that lights up 5-10 seconds before the laser lights up) 8. On/Off switch <p>Class IV</p> <ol style="list-style-type: none"> 1. all items mentioned for Class IIIb above 2. manual reset mechanism 	<p>Class 3B and 4</p> <ol style="list-style-type: none"> 1. laser radiation emission indicator (audible signal or LED turning on when the laser is powered) 2. beam attenuator (a permanently attached shutter, beamstop or switch) 3. Warning/ID/Aperture label affixed (sticker on the laser with all the required information) 4. instruction manual 5. removable key-actuated master control preventing lasing when removed 6. remote interlock connector that prevents lasing above Class 1M or 2M when removed 7. manual reset mechanism for class 4

5.5 Protecting Devices

There are two types of protecting devices on your Magnum laser, a shutter and an I/O (on/off) switch.

1. Shutter: The protective cover at the front of the optical head can be used as a beam blocker if the laser is to be left on.
2. I/O (on/off) switch: The I/O toggle switch for the Main Switch is located at the back of the laser. If the laser operation is not required for your assembly procedures, switch the laser to the off position in order to protect personnel from accidental beam exposure. The laser can be re-activated by switching the toggle switch to the on position.

5.6 Key-Activated Switch, Safety Interlock

Class IIIb and Class IV lasers require the installation of a safety mechanism to prevent exposure to the laser light. As such, your laser is equipped with a removable key and an interlock circuit.

Key feature: The laser will not operate and no laser light can be emitted without the key switch in the on position.

Interlock circuit feature: The 1/8" connector on the back of the laser is an Interlock connector. The laser will not operate without a closed circuit connected to the Interlock. This means that you can use the Interlock connector two ways.

- (1) **For General Use:** The laser was shipped with a shorted 1/8" jack. Simply plug the shorted jack into the Interlock connector for normal laser operation. The laser will automatically shut off if the shorted jack is not in the Interlock connector.



(1) one shorted 1/8" mono jack

- (2) **For Interlock System:** When the Interlock circuit is opened, the laser will automatically shut off. For example, connect the pins of a door contact switch to a 1/8" connector. Plug this connector into the 1/8" Interlock of the laser. Whenever the door is opened, thus opening the Interlock circuit, the laser will turn off automatically.

5.7 Manual Reset (Option)

In the case of Class IV Magnum lasers, a manual reset must be performed whenever the laser undergoes an unexpected loss of main electrical power for more than 5 seconds, or if the interlock circuit is interrupted (feature described right above).

After the laser has shut down automatically, simply put the key from the on position to the off position, and then back to on. The laser will power on as normally.

6. *Product Warranty and Repair*

6.1 Product Warranty

Your laser is guaranteed to be free from material & manufacturing defects for a period **one (1) year** from the date of shipment, except for the diode that is covered for a period of **90 days**. Should a product fail during this period, StockerYale will, at its discretion, repair or replace the damaged unit. Repaired or replacement units will be covered for the remainder of the original equipment warranty period. The warranty does not apply to units examined by StockerYale that are found to have failed due to abuse, acts of God, mishandling, alteration, improper installation or negligence.

6.2 Product Repair

Each Lasiris laser has been designed to exhibit proper mechanical and temperature stability. As such, no user serviceable parts are located inside the laser. **Please do not attempt to take the assembly apart. Any such action will void the product warranty.**

In the event that you should experience a product failure, please contact the factory at 1-800-814-9552 or at (514) 685-1005 during regular business hours, between 09:00 a.m. and 17:00 EST for a Return Material Authorization number (**RMA** number). This number is necessary to track your product repair accurately and efficiently. Once you have been issued an RMA number, please make sure it appears on any packing material sent with the laser. Also, make sure that the RMA number is clearly written on the outside of your shipping container.

There are three steps to take when you return a unit for repair:

1. Obtain a Return Merchandise Authorization number (RMA #).
2. Fill in the RMA card (found on next page).
3. Pack the unit properly and ship the unit to the correct address.

Ship to:

StockerYale Canada
275 Kesmark
Montreal, Quebec
H9B 3J1
CANADA

IMPORTANT: Please note that all parcels originating from outside of Canada must include a declaration for customs with the following information:

- Full description of contents
- Quantity
- Unit Price (original value)
- Total Value
- And the following statement: *Goods of Canadian Origin being returned for repair; value for custom purpose only*

The Return Merchandise Authorization Card can be found on the following page.

7. Return Merchandise Authorization (RMA) card

Ship to:

StockerYale Canada Inc.
275 Kesmark
Montreal, Quebec
Canada H9B 3J1



Type of unit returned: Lasers Phase Masks Diffracting Optics Other

Serial # _____

REPORTED MALFUNCTION: _____

FROM: _____
ADDRESS: _____

CITY / STATE: _____ **ZIP:** _____

RMA #



Please cut on dotted line and affix to package

IMPORTANT: Please note that all parcels originating from outside of Canada must include a declaration for customs with the following information:

- Full description of contents
- Quantity
- Unit Price (original value)
- Total Value
- And the following statement: **Goods of Canadian Origin being returned for repair; value for custom purposes only**



8. Appendix A – Magnum Specifications

8.1 Specification Chart

Mechanical specifications	
Weight	Approximately 5.6 lbs (2.6 kg)
Dimensions	See dimensional diagrams above
Housing material	Black anodized aluminum
Temperature regulation	Built-in bipolar thermoelectric cooling
Optical specifications	
Power	250 mW to 4 W, CW / pulsed
Wavelength	635 nm, 680 nm, 810 nm, custom
Intensity distribution	Uniform (non-Gaussian) lengthwise, Gaussian widthwise
Fan angles	10°, 15°, 20°, 30°, 40°, 45°, 55°, 60° & custom (10° and 15° not available on 4 W models)
Line thickness (focus)	User adjustable
Bore sighting	<3 mrad (collimated)
Environmental specifications	
Operating temperature	-35°C to +40°C
Diode temperature	Very stable over entire operating temperature range
Wavelength drift	Maximum ±1 nm over entire operating temperature range
Over & under temperature protection	
Electrical specifications: power supply	
Voltage	12 VDC ± 1 VDC; Optional 110/240 VAC
Current	Min. 2.5 A to 6 A, depending on model and operating temperature (see available models)
Reverse-polarity protection	Built-in
Over-voltage protection	Built-in
Diode current monitoring	On request
Electrical specifications: pulsing and power adjustment	
The laser power amplitude can be easily changed by adjusting the built-in potentiometer with a small screwdriver. The power can also be modulated or pulsed using an external signal (Input voltage of 0 VDC turns the laser “on”, 5 VDC turns the laser “off”).	
Options:	
• Standard:	DC to 10 kHz, variable amplitude, adjustable slope on modulation curve Rise / Fall time <10 µs
• TTL:	“option T”: up to 10 kHz Rise / Fall time <10 µs
• Maximum Frequency of 100 kHz on request.	

8.2 Available Powers and Wavelengths

Magnum lasers are available in a wide range of powers and wavelengths:

Wavelength	Diode Power
680 nm	500 mW; 1 W
810 nm	500 mW; 1, 2, 4 W
Custom*	

Other wavelengths and diode powers are available. Please call us for more details.

8.3 Maximum Power Required

Model	Wavelength ± 10 nm (± 20 nm for infrared)	Output power	Power required
Magnum 500	670, 810 nm	375 mW	+12 V, 2.5 A
Magnum 1 000	670, 810 nm	825 mW	+12 V, 2.5 A
Magnum 2 000	810 nm	1.75 W	+12 V, 6.0 A
Magnum 4 000	810 nm	3.6 W	+12 V, 6.0 A
Custom*			

**Please visit our website or call us for an updated list and details about our custom models.*