Model 6240H
Galvanometer Optical Scanner

INSTRUCTION MANUAL

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1.0 Introduction and Warnings

This manual was written to help the customer use the Model 6240H scanner successfully. There are several warnings and precautions written throughout this manual. Read this manual carefully. It is possible to damage the scanner by exposing it to rough handling or contaminants.

As the demand for speed and accuracy of today's optical systems increases, so does the need for high performance, high accuracy scanners. This scanner was designed for just those applications that require ultra-high speed and accuracy.

Note: Throughout this manual the terms mechanical angle and optical angle will be used. For all applications the mechanical angle refers to the angular change of the scanner shaft. For most optical systems the optical angle is the angular change of the beam. For these optical systems, the:

optical angle = 2 x mechanical angle

WARNING! Upon system shutdown or malfunction, the scanner has the ability to point the beam anywhere within ~150° optical. It is up to the end user to limit the exit window of the laser beam in order to provide laser safety.

CAUTION! **Ensure that the scanner and/or the XY mount have adequate heatsinking to allow scanner operation. Never operate the scanner without a heatsink! The scanner will suffer irreparable damage if allowed to overheat! For more information, refer to Section 3.2. The Cambridge Technology XY mount is a sufficient heatsink only if bolted to a customer supplied adequate heatsink to conduct away the heat.**

Note: These scanners are high performance devices that require some special handling. Never let them impact a hard surface especially on the front shaft. Do not pull or push with anything other than light finger pressure on the front shaft or damage to the front bearing can occur. Do not expose the scanner to extremes of temperature outside the operating limits shown in the specifications **Section 2.0**. Do not let any foreign material, e.g. dust, dirt, solvent, water, oil, etc. come in contact with the front bearing. It is located right at the front end of the scanner. Foreign material inside the bearing will reduce bearing life.

Note: As with any high performance motor, resonances created during power up, power down, normal operation, or during tuning can cause serious motor degradation or failure. Always keep the motor under proper servo control and do not let the motor swing uncontrolled into the bumper stops.

To dissipate the maximum amount of heat possible, CTI recommends the use of thermal grease between the scanner and any heatsink mount. Please see **Section 3.2** for more information.

2.0 Specifications

Note: All angles are in mechanical degree unless stated otherwise.

Scanner MODEL NO.	6240H	Tolerance	Units/Notes
Mechanical Specifications			
Rated Excursion, Rotor[1]	±20	Max	degrees p-p
Bumper stop angle, initial contact[1]	±26	±4	degrees
Optical Aperture, Two-Axis, Std	12, 15, 20	-	millimeters
Rotor Inertia	2.4	+/-10%	gm-cm^2
Recommended Load	1.2 - 24	-	gm-cm^2
Torque Constant	2.00E+05	+/-10%	dyne-cm/amp
Coil Resistance	1.03	+/-10%	ohms
Coil Inductance	350	+/-10%	μhenries
Back EMF Voltage	346	+/-10%	μv/degrees/s
Thermal Resistance, Rotor-to-Case	0.62	Max	°C/watt
Maximum Rotor Temperature	110	Max	°C
Maximum RMS Current	8.2	Max	amps
Maximum Peak Current	25	Max	amps
Maximum RMS Power	97	Max	watts
Fuse rating	10	-	amps,fast-blo
Settling time[2]	350	Typ	μsec.
Scanner Mass	380	-	grams
Case Operating Temperature[3]	0 – 50	-	degrees C

Position Detector, PD[3]

Linearity	99.9	Min	% over ±10°
	99.5	Typ	% over ±20°
Scale Drift	50	Max	ppm/°C
Zero Drift	15	Max	μradians /°C
Repeatability, Short Term	8	Typ	μradians
Output Signal, Diff. Mode	11.7	±20%	μA/° diff.@I_{COM}=155μa
Output Signal, Common Mode	155	±20%	μA@I_{LED}= 30ma
PD Power Requirements (AGC)	30	+/-20%	milliamps DC
	1.4	Nom	volts

Mounting requirements: The scanner mount must dissipate 9.7 watt/°C. for a mount temperature of 40°C. In an XY mount, it must dissipate 18.4 watt/°C for a mount temperature of 40°C. See **Section 3.2.** for more information.

Notes: 1. Std bumper. 6240HMXX bumper has a reduced angle as denoted by the scanner part number. XX denotes the operating peak-to-peak optical angle in degrees.

2. Setup for settling time: Using CTI's recommended servo, CTI's 10mm Y-mirror, moving a 0.1° step, and settled to within 99% of the final position.

3. Using the Cambridge Technology, Inc. Position Demodulator circuit.

3.0 Description of Operation

3.1 Overview

The 6240H is a moving-magnet actuator, that is the rotor or working part of the scanner is a magnet. A moving magnet motor has no saturation torque limit and very little electrical inductance. Thus extremely high torque can be generated very quickly. This is essential for systems that need short step response times.

There are two practical factors that limit the amount of torque that can be generated by a moving magnet scanner. The peak torque is limited by the mechanical failure limit of the rotor assembly due to stator current in excess of the peak current specification. The rms torque is limited by the maximum power (I^2R losses in the stator coil) the scanner can conduct away. When the maximum rms current has been reached (with adequate heatsinking) the stator has reached its maximum temperature, and thus the motor has reached maximum rms torque level. Extremely high performance can be achieved in part because both the peak torque limit and maximum power that the stator coil can dissipate are very high.

The angular position of the shaft is detected by an optical sensor located on a small circuit card, the position detector board, in the back of the scanner. The output signal of this sensor is a differential current signal that is fed back to the drive electronics, closing the servo loop, and allowing very fast and accurate mirror positioning. A typical position demodulator circuit is included with this manual. Cambridge Technology strongly recommends using this circuit to all customers that do not buy the CTI driver electronics.

3.2 Mounting Scheme

Special attention should be given to the mechanical integration of the scanner into the optical system. The customer must provide an adequate path for conducting away heat generated by the scanner body. The maximum temperature that the scanner body should be allowed to attain is 50°C. This is below the temperature at which a person feels pain; thus the scanner should **never** get too hot to touch! The XY mount should ideally have very low thermal resistance to the ambient environment. The heatsink must dissipate the full heat generation of both scanners in an XY application while only allowing the scanners to rise to that 50°C maximum case temperature. The exact amount of heatsinking required directly depends on the scanner, the customer's load, and the customer's application.

To calculate the necessary heatsinking for the 6240H, there are two approaches.

1. Worst case analysis: This assumes that there are two scanners bolted to a common heatsink and both are dissipating their full power. At 97 watts each, that is 184 watts. We must also assume that the ambient temperature is below 50°C, the maximum case temperature the scanner should ever be allowed to attain. Let's assume the ambient temperature is 40°C. Then the heatsink must have a thermal resistance from the scanner body-to-ambient equal to

$$R_{TH} = (50 - 40)°C/\ 184\ \text{watts} = \underline{0.0543°C/\text{watt}}$$

   Another representation is the thermal conductivity of the heatsink instead of its thermal resistance. This is just the reciprocal of the thermal resistance or

$$G_{TH} = 1/R_{TH} = 1/(0.0543°C/\text{watt}) = \underline{18.4\text{watts}/°C}$$

2. If it is known that the scanners will not be run at their maximum power, then the actual dissipation can be used. This will result in a smaller heatsink. The same rules apply, i.e. the scanner body cannot go higher than 50°C, but since they aren't dissipating the full rms power, the heatsink can be smaller.

   To use this method, the maximum rms power must be known. The simplest way to do this is to measure the maximum rms current and then calculate the power.

   a. Run the XY system using the application's command waveform (using an adequate heatsink. If necessary, use method 1. above).
   b. Measure the maximum rms current at the "Current Monitor" using a "true rms" voltmeter.
   c. Square this rms current, multiply this by the coil resistance (1.23 ohms), then finally multiply this by 1.4. (Note: The 1.4 is a multiplier to account for the coil's increase in resistance with temperature. It has nothing to do with the relationship between rms and peak voltages.) Thus,

$$P_{MAXRMS} = I_{MAXRMS}^2 * R * 1.4$$

The resulting number, P_{MAXRMS} can now be substituted into the above calculation in place of the 184 watts. Remember to include both the X and Y scanners if applicable when performing this calculation. Thus the thermal resistance for a heatsink with an ambient temperature of 40°C is

$$R_{TH} = (50 - 40)°C / P_{MAXRMS}$$

If any part of this procedure is not completely understood, contact CTI for technical assistance.

For the 6240H scanner, the only valid mounting surface is the long cylindrical section of the body. See the Outline Drawing in **Section 5.1** at the end of this manual. The scanner must be mounted by this surface to adequately transfer the heat out. A cylindrical, compression-style mount made of aluminum is preferred. The mount should attempt to contact as much of the mounting surface as possible to minimize the thermal resistance. The mount should then be bolted to another thermally conductive plate to finally conduct the heat away to ambient. **Never attempt to mount the scanner by its position detector or serious overheating will occur!**

Caution! Never run the scanner without a heatsink attached. The scanner body will heat very quickly and irreparable damage will occur, thus voiding the warranty.

Note: To control ground loops between the two channels of the servo electronics, the scanner body should be electrically isolated from chassis ground and from each other in the XY mount for best performance. This scanner comes with a thin mylar insulator to enable the customer to mount the scanner isolated from chassis ground. Even if the XY mount is isolated from ground, the mylar insulator must be used when using the XY mount or poor thermal contact with the mount will result.

To dissipate the maximum amount of heat possible, CTI recommends the use of a good quality thermal grease between the scanner, the mylar shim, and the XY mount. Although the XY mount will remove great amounts of heat, it may not be a sufficient heat conductor even if it is bolted to a large heatsink. It is up to the customer to monitor any system integration to ensure the maximum case temperature of 50deg C is not exceeded.

3.3 Mirrors

CTI mirrors are precisely positioned then epoxied into their slot in the mirror mount. All CTI mirror mounts use compression style clamping to grab the scanner shaft. This is the only CTI recommended method for attaching loads to the scanner shaft. **Do not use a mirror mount that drives a set screw into the scanner shaft!** Set screws will damage the shaft and not yield a solid, robust connection between the shaft and mirror mount.

There are several standard mirror sets optimized to work ideally with the 6240H motor. Contact CTI Sales for your mirror needs.

For custom mirror designs, CTI offers a mirror mount numbered the 61524-1. For a nominal mounting fee, CTI will precision mount customer supplied optics. This ensures mass balancing for high acceleration applications.

3.4 Cabling

The Model 6240H is available with three different versions of cable depending for which servo the board was designed. The scanner can either plug directly into the servo or can do so through an interconnection cable. See the chart below for board, servo, and interconnection cable combinations:

Interconnection Cable	Scanner	Board
6010-18-XXX	6240H	678, 670 servos – 9Pin-D connectors
6010-25-XXX	6240HA	671 servo – Amp and Molex connectors
6010-30-XXX	6240HB	677, 673 servo – Amp connector

The -XXX refers to the length of the cable in inches.

3.5 The 6240HM

For situations that require reduced angles, a different bumper design is employed which limits the rotation angle of the front stop pin of the scanner. These –M version scanners use a two-digit suffix, which denotes the intended use angle in peak-to-peak optical degrees. For example, 6240HM40 has an intended use angle of 40 degrees p-p optical or +/-10 degrees mechanical. The bumpers hit at an angle of ~+/-12 degrees. This allows an XY design to be optimized for this reduced angle, thus making the space between the scanners less, which allows the Y mirror to be much shorter. Thus, the primary reason for using –M bumpers is in XY systems.

Note!: When the scanner hits the bumper hard, such as during an instability, the scanner will still travel an additional 8 – 10 degrees mechanical beyond the point where the stop pin first contacts the bumper. When designing an XY system with possible interference between the mirrors, the customer must take this fact into account.

3.5.1 Field Replacement of the Bumpers

In the rare circumstance that a bumper must be replaced in the field, please refer to D06252 the 6240H Bumper Field Service Instructions drawing in **Section 5.1.** and follow the procedure below.

1.) Turn off the power to the scanner and unplug its cable if possible.
2.) Turn the rotor so stop pin is centered.
3.) Remove the first bumper by pushing in towards the shaft on the bumper tabs and out towards the outer opening of the upper bumper retainer. Use a thin but dull instrument and gently pry some of the bumper out from under the upper bumper retainer.
4.) Once enough of the bumper is exposed from the upper bumper retainer, just grasp it with your fingers and remove the bumper.
5.) Before removing the second bumper, place the new bumper into the scanner.
6.) Install the new bumper with the bumper radius up facing away from the scanner as shown on D06252 in **Section 5.1.**
7.) Push the bumper firmly under the upper bumper retainer until fully seated.
8.) Make sure the outside edge of the bumper is below the surface of the outside diameter of the scanner and two bumper tabs are completely seated through the openings in the upper bumper retainer.
9.) Turn the rotor by hand firmly to force the bumper to be fully seated. Ensure the bumper is not rubbing on the shaft.
10.) Repeat steps 2.) through 9.) for the other bumper.

After the new bumpers are installed, make sure if changes are needed in the electronics to reduce the overposition trip point that this is done before turning on the power. Please contact CTI if any part of this procedure is not completely understood.

4.0 Limited Warranty

The 6240H scanner is warranted to be free of defects in materials and workmanship for one year from the date of shipment. Cambridge Technology, Inc. will repair or replace, at our option, any part of the system which upon our examination is found to be defective while under warranty. Obligations under this warranty are limited to repair or replacement of the equipment. Cambridge Technology shall not be liable for any other damages of any kind, including consequential damages, personal injury, or the like. Opening the scanner assembly itself will void this warranty. Damage to the system through misuse will void this warranty. Cambridge Technology pursues a policy of continual product development and improvement. We reserve the right to change published specifications without prior notice.

5.0 Appendix

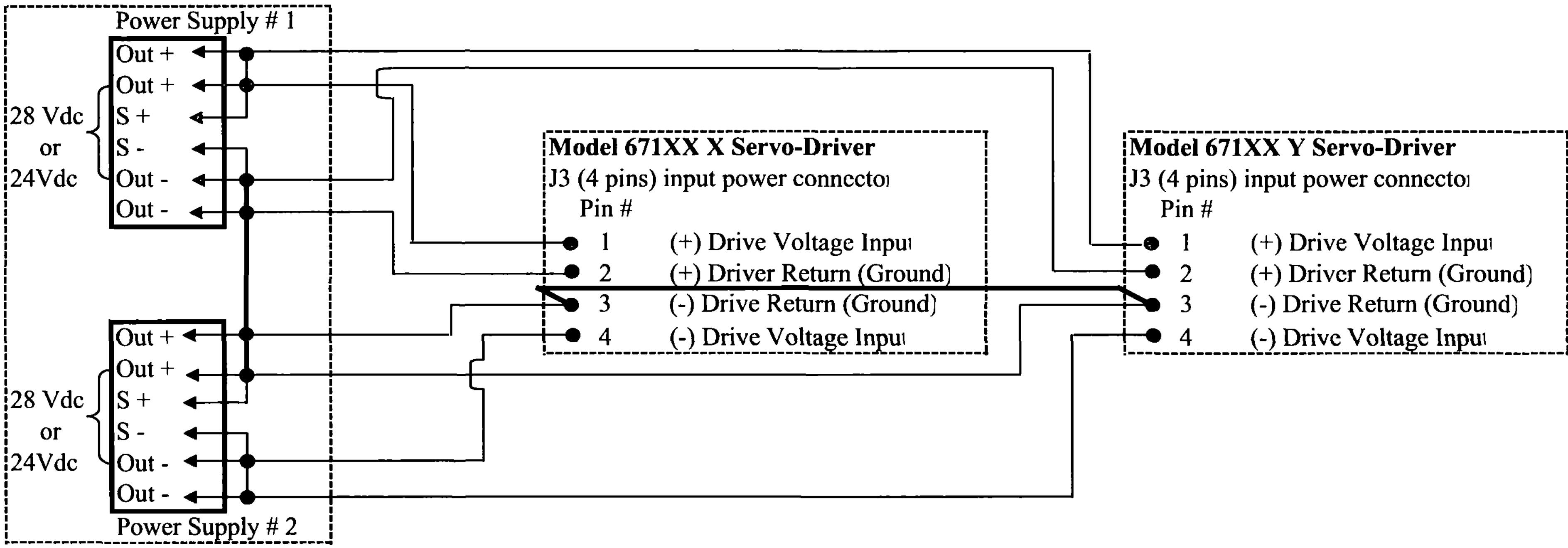
5.1 Schematics and Mechanical Drawings

The following drawings are included in this section

1. Series 6000 Position Demodulator Components	D01747
2. 6240H Outline Drawing	D06049
3. 6240HA Outline Drawing	D06048
4. 6240HB Outline Drawing	D06054
5. 6240 Preferred Mounting Block	D04747
6. 62XXH Numbering Scheme	D05950
7. 6240H Bumper Field Service Instructions Dwg	D06252

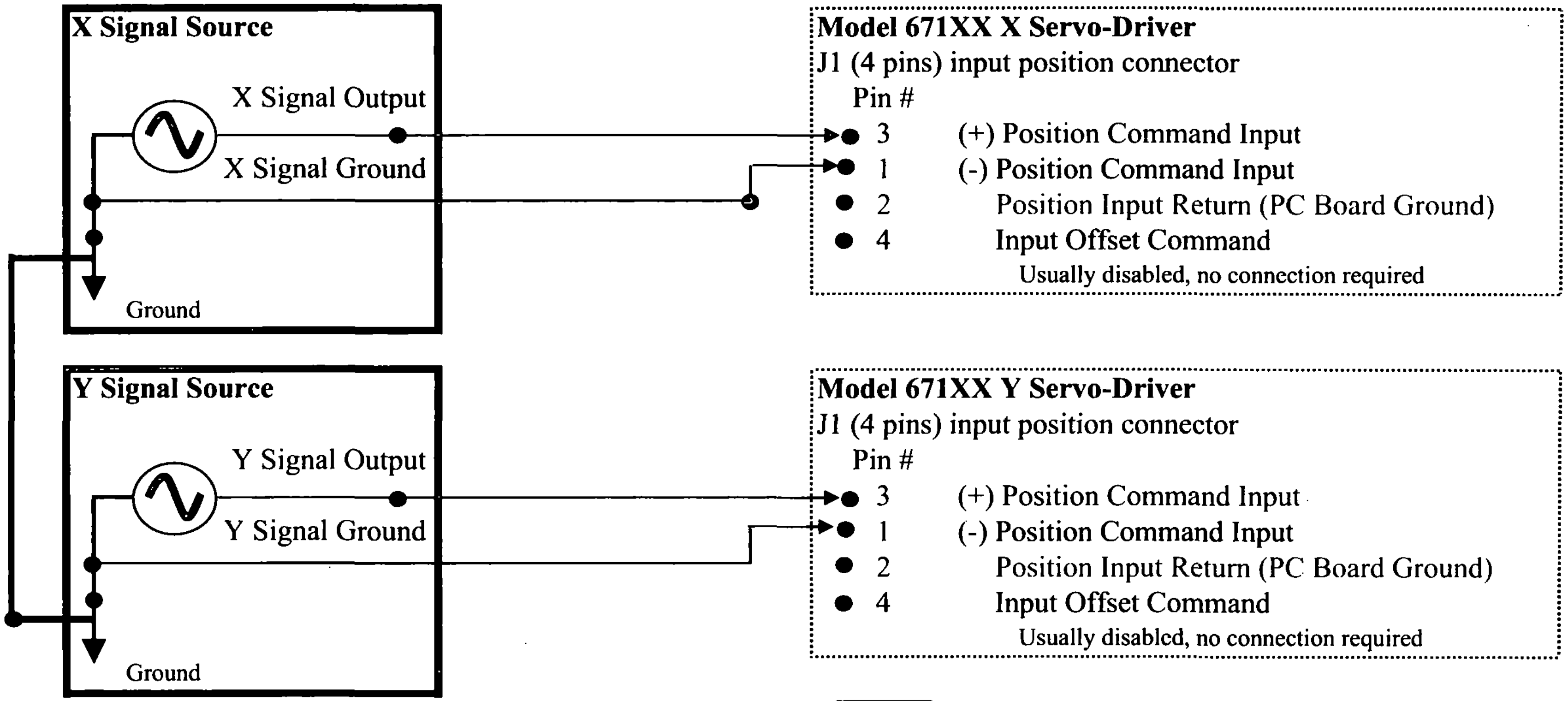
Cambridge Technology Power Supply Connections

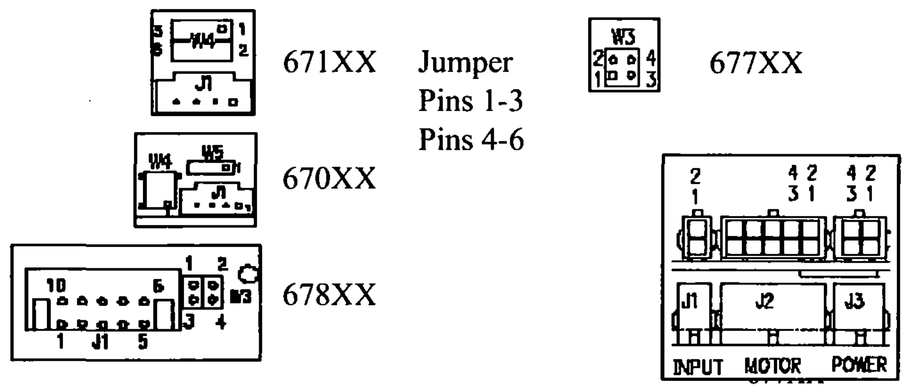
Steven Krusemark
August 7, 2007



- Depending upon how the supply is configured or the distance between the supplies and the and the driver board: the S + may have to be connected directly to Out + either right at the supply or at the driver board aı the S - may have to be connected directly to Out - either right at the supply or at the driver boar
- The ground connection between Out - and Out + and the ground connection between the two servo drive should be a very heavy gauge low resistance wirε
- The power supply ground connection is optional and is usually not connecte

Steven Krusemark
August 7, 2007





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Model 671XX Servo-Driver
Note, the 658 is the same as the 678
Single ended will work, differential is preferred

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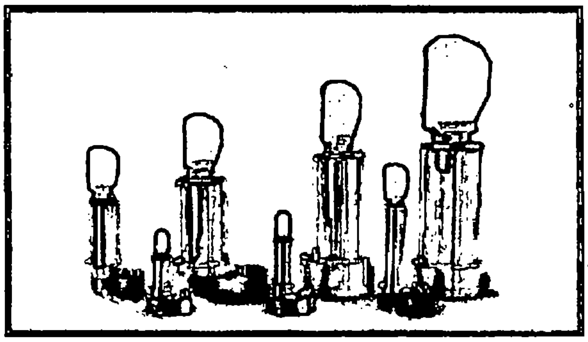
The 6200H Series Scanners

Moving Magnet Series with Advanced Optical Position Detector



The 6200H Series of closed loop galvanometer based optical scanners combines our new moving magnet actuator technology with our innovative patented advanced optical position detector design. This combination offers the highest torque per watt and closed loop bandwidths, resulting in the highest positioning speed, precision and reliability available in any compact closed loop galvanometer in today's market.

The 6200H Series compact design and material selection deliver the fastest step response times and high RMS speeds. The neodymium-iron boron rotor material allows for exceptional flux densities in the air gap. The intense magnetic field strength combined with the highest rotor and mounted mirror resonant frequencies give the 6200H Series products superior peak accelerations and the fastest step response times possible in galvo technology.

Instrumentation level accuracy and stability. Exceptional closed loop positioning accuracy and stability are achieved through Cambridge Technology's patented advanced optical position detector providing instrumentation level accuracy and stability at a very cost effective price.

The fastest step response times. Sized for the fastest step response times, high RMS speeds at wide angles and for a broad range of apertures with single and dual axis solutions from 3 to 25mm, the 6200H series provides the broadest range of choices to optimize your system price/performance for any application. It is available in several different connector and cable options to meet specific system requirements.

Designed for a wide variety of applications. The 6200H Series is the optimal choice in for laser marking and material processing, biomedical systems, imaging and printing, semiconductor processing, laser projection or any application where speed, size and accuracy are critical to system performance.

Cambridge Technology, Inc. also offers a variety of integral supporting products for the 6200H Series, including servo electronics, mirrors sets with coating options and X/Y system mounts. Custom single and dual axis optical apertures can be supported, consult the factory for more details.

Mechanical and Electrical Specifications

The 6200H Series Scanners

	6200H	6210H	6215H	6220H	Units and Tolerances
Optical Apertures Supported, Two Axis	3, 5, 6	3, 5, 6	3, 5 ,6	5. 8, 10	MM
Maximum Recommended Inertial Load	0.13	0.2	0.28	1.25	gm*cm^2, +/-10%
Mechanical Specifications					
Rated Angular Excursions	± 20	± 20	± 20	±20	Degrees
Rotor Inertia	0.013	0.018	0.028	0.125	gm*cm^2, +/-10%
Torque Constant	1.2	2.79	3.78	6.17	10^4 Dyne-cm/Amp, +/-10%
Coil Temperature	110	110	110	110	°C, Maximum
Thermal Resistance, Coil to Case	3.8	2	1	1	°C/Watt, Maximum
Electrical Specifications, Drive Armature					
Coil Resistance	2.1	3.72	2.53	2.79	Ohms, +/-10%
Coil Inductance	52	109	94	180	µH, +/-10%
Back EMF Voltage	20.9	48.7	66	108	µV/Degree/Second, +/-10%
Current, RMS	2.3	2.4	4.1	3.9	A, Maximum
Current, Peak	6	8	20	20	A, Maximum
Small Angle Step Response	130	100	130	200	µs, with appropriate CTI Y mirror
Electrical Specifications, Position Detector					
Linearity	99.9	99.9	99.9	99.9	%, minimum, over 40° optical
Scale Drift	50	50	50	50	PPM/°C, Maximum
Zero Drift	15	15	15	15	Microradians/°C, Maximum
Repeatability	8	8	8	8	Microradians, Maximum
Output Signal, Common Mode	155	155	155	155	µA, with AGC Voltage of 30mA, +/-20%
Output Signal, Differential Mode	12	12	12	12	µA/Deg., with Common Mode of 155µA,± 20%

	6231HC	6230H	6240H	Units and Tolerances
Optical Apertures Supported, Two Axis	8,10,12,15	8,10,12,15	12,15,20,25	MM
Maximum Recommended Inertial Load	8	10	24	gm*cm^2, +/- 10%
Mechanical Specifications				
Rated Angular Excursions	±20	±20	±20	Degrees
Rotor Inertia	0.82	0.97	2.4	gm*cm^2, +/-10%
Torque Constant	1.11	1.31	2.00	10^5 Dyne-cm/Amp, +/-10%
Coil Temperature	110	110	110	°C, Maximum
Thermal Resistance, Coil to Case	1	0.80	0.62	°C/Watt, Maximum
Electrical Specifications, Drive Armature				
Coil Resistance	1.2	1.07	1.03	Ohms, +/-10%
Coil Inductance	176	173	350	µH, +/-10%
Back EMF Voltage	195	229	346	µV/Degree/Second, +/-10%
Current, RMS	5.8	7.1	8.2	A, Maximum
Current, Peak	25	25	25	A, Maximum
Small Angle Step Response	250	250	350	µs, with appropriate CTI Y mirror
Electrical Specifications, Position Detector				
Linearity	99.9	99.9	99.9	%, minimum, over 40° optical
Scale Drift	50	50	50	PPM/°C, Maximum
Zero Drift	15	15	15	Microradians/°C, Maximum
Repeatability	8	8	8	Microradians, Maximum
Output Signal, Common Mode	155	155	155	µA, with AGC Voltage of 30mA, +/-20%
Output Signal, Differential Mode	12	12	12	µA/Deg., with Common Mode of 155µA, ±20%

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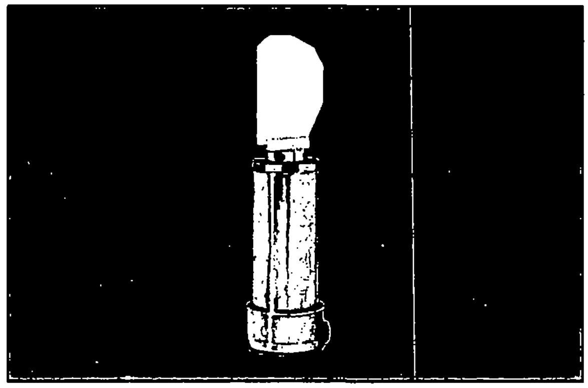
Model 6240H Optical Scanner

Mechanical and Electrical Specifications

All position detector specifications apply with Cambridge Technology servo driver after a 30 second warm-up.
All angles are in mechanical degrees.
Consult manual for complete operating instructions.



Mechanical Specifications

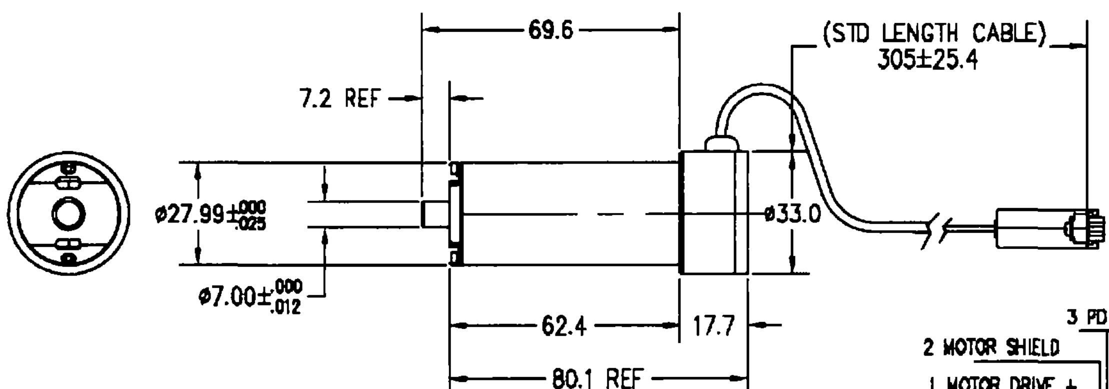
Rated Angular Excursion: 40°
Rotor Inertia: 2.4 gm*cm^2, +/-10%
Torque Constant: 2.0x10^5 Dyne-cm/Amp, +/-10%
Maxium Coil Temperature: 110 °C
Thermal Resistance, Coil to Case: 0.62°C/Watt, Max

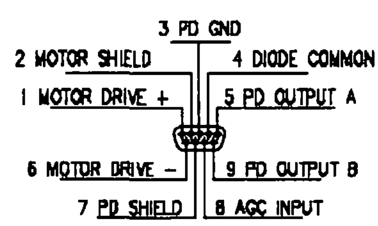
Electrical Specifications, Drive Armature

Coil Resistance: 1.03 Ohms, +/-10%
Coil Inductance: 350 µH, +/-10%
Back EMF Voltage: 346µV/Degree/Second, +/-10%
Current, RMS: 8.2 A, Maximum
Current, Peak: 25 A, Maximum
Small Angle Step Response: 350 µs, with 15mm CTI Y mirror

Electrical Specifications, Position Detector

Linearity: 99.9 %, minimum, over 40° optical
Scale Drift: 50 PPM/°C, Maximum
Zero Drift: 15 Microradians/°C, Maximum
Repeatability: 8 Microradians, Maximum
Output Signal, Common Mode: 155 µA, with AGC Voltage of 30mA, +/-20%
Output Signal, Differential Mode:12µA/°, at common mode current of 155µA, +/- 20%





Unless Otherwise Specified
Tolerances
.x = ± .3
.xx = ±.13

Specifications are subject to change without notice.

03/07

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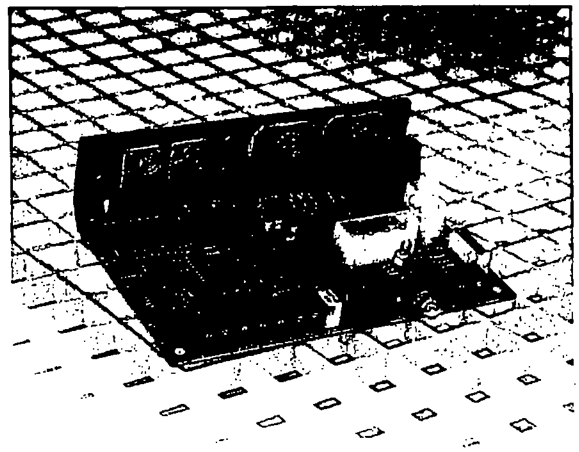
The MicroMax® Model 671XX

Board Level Single Axis Driver Electronics

Architecture and Benefits

- *Micro*radian Level Accuracy And *Max*imum Frequency Response
- Flexible For Use With All Cambridge Technology Scanners
- Compact Size for Easy Integration
- Position, Error, and Velocity Output Signals
- Input Scale And Offset Adjustment
- Analog or Digital Input
- System Conditioning and Status Monitoring



Cambridge Technology's MicroMax® Model 671XX driver provides an extremely compact, high performance and fully featured servo package at a very attractive price. Our advanced servo topology offers high bandwidth, high performance output amplification, advanced notch filter modules and power supply configurations to provide the ultimate in closed loop galvanometer system bandwidth and step response times. The 671XXHP (High Power Option) supports peak current of up to 20 amps allowing movement of large loads and angles at the highest level of speed in servo technology.

Designed with flexibility in mind, the MicroMax Model 671XX can be configured to drive most of Cambridge Technology's extensive line of precision, closed loop, galvanometer based optical scanners. Featuring automatic gain control (AGC), low noise system damping, linearity compensation and high stability components, the 671XX servo provides extremely accurate positioning for applications that demand the best repeatability, linearity and stability. Integral mounting hardware, low profile connectors, convenient placement of system tuning and setup adjustments, as well as overall servo size allow for compact system designs and ease of integration. This combination of size, performance and flexibility make the MicroMax Model 671XX the ideal choice where the highest levels of accuracy and speed are required in a compact scanning system application.

The fully featured MicroMax 671XX Servo, when used with Cambridge Technology's patented position detection galvanometer technology, provides excellent time and temperature stability - without the need for thermal compensation. System monitoring of galvanometer position, error and velocity output signals make the integration of the MicroMax 671XX easy and accurate in complex scanning system applications.

Status monitoring and system conditioning during power up, power down and all angle moves ensure complete and reliable system control to guard against potential system damage. Several error states can be detected including over-position, excess RMS power, loss of position detector signal, and loss of power. In the event that a fault is detected, the electronics will immediately signal a fault condition and shutdown the positioning system in a controlled manner throughout integration and operation. An active and fault LED is also included as an additional measure of verifying system status. Input scale and offset adjustments provide an additional level of performance customization and integration. Differential analog inputs, digital input options, flexible output amplifier and power supply configurations from +/- 15 to +/- 28 volts allow for optimization of system positioning, accuracy and speed - while keeping costs at a minimum.

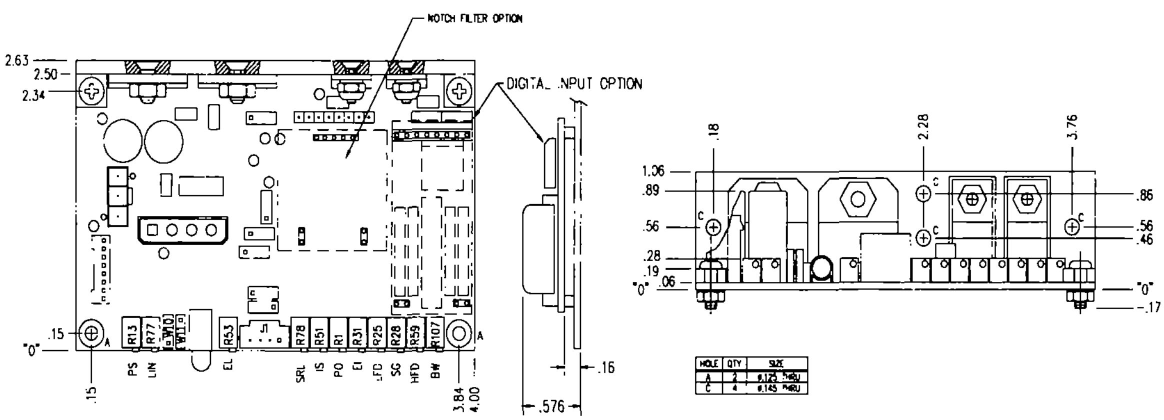
At Cambridge Technology, we take great pride in the performance of our products. Our high standards in research and development, manufacturing and customer satisfaction guarantee the performance consistency that you need to design the high quality systems demanded in today's competitive marketplace. Call us today to discuss your scanner and electronics requirements.

The MicroMax Model 671XX

General Specifications

All angles are in mechanical degrees. All specifications apply after a 1 minute warm up period.

Analog Input Impedance	200K +/- 1% ohms (Differential) 100K +/- 1% ohms (Single Ended)
Analog Output Impedance	1K +/- 1% ohms (for all other observation outputs)
Position Input Scale Factor	0.5 volt/mechanical degree (2 degrees/volt), other configurations available
Position Input Range	+/- 10 volts, maximum
Position Offset Range	+/- 2 volts
Digital Position Input Range	2^{16} dac counts
Non-Linearity of 16 Bit Digital Input	0.006% of full scale, maximum
Position Output Scale Factor	0.5 volt/degree
Error Output Scale Factor	0.5 volt/degree
Velocity Output Scale Factor	Analog output (scaled by position differentiator gain)
Fault Output	Open collector: 1K ohm output impedance (pulls down to -15V), with 10mA sink capability
Temperature Stability of Electronics:	20PPM per degree C
Power Supply Requirements	+/- 15 to +/- 28VDC configurations available, +/-24 to +/-28 VDC default
Maximum Drive Current Limit	10 amps peak 5 amps rms (power supply and load dependent)
Operating Temperature Range	0 - 50 °C
Size	4.00" x 2.5" (2.63 with heatsink bracket) x 1.07" 10.16 cm x 6.35 (6.68) cm x 2.69 cm

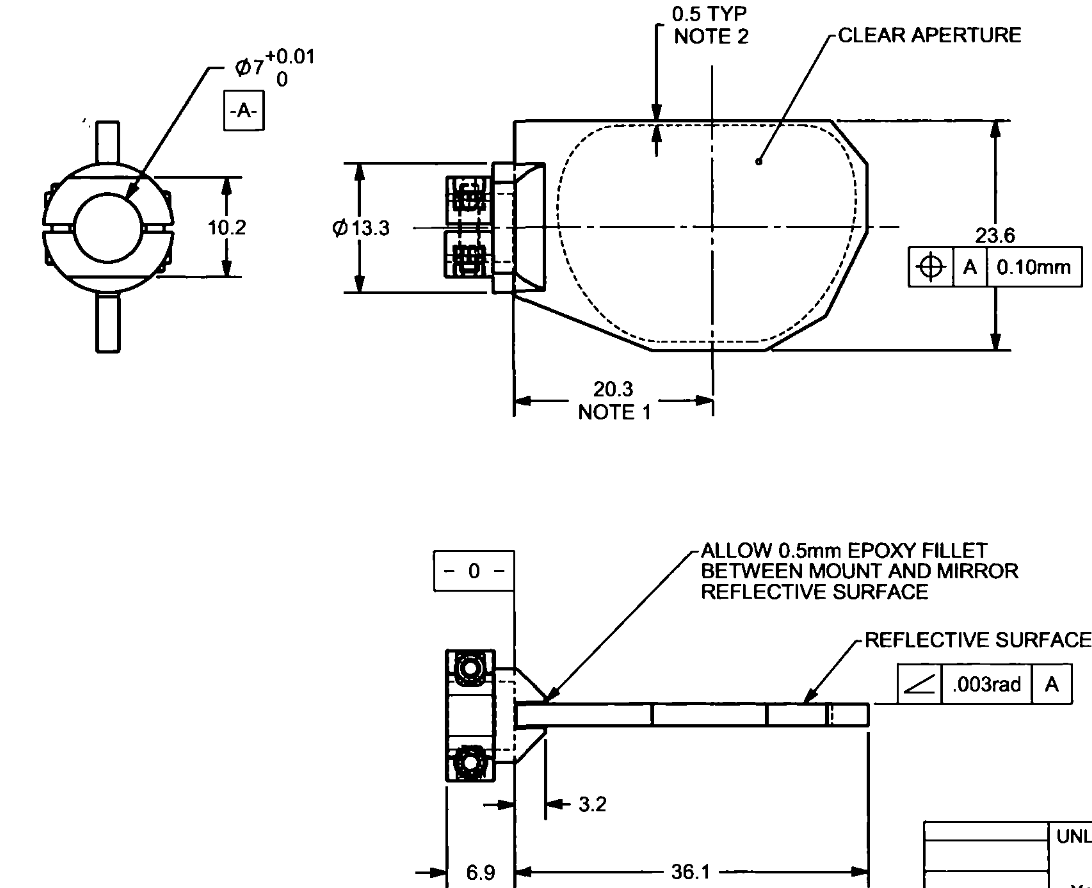


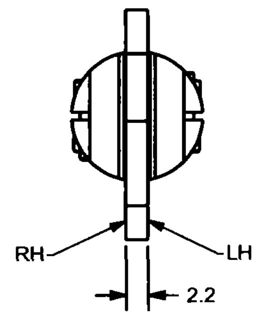
To specify configuration in ordering use servo base numerical model # followed by he central two digits of scanner model #.

Example: A MicroMax 671XX driver configured for use with a 6210 would be specified as 67121

A MicroMax 671XX driver configured for use with a 6220 would be specified as 67122

J = 2.190 g*cm2





REVISIONS				
ECO	REV	DESCRIPTION	APPR	DATE
2174	C	BLIND HOLE MOUNT SHOWN	PTH	09/02/02
3016	D	XSLOT MNT DESIGN SHOWN	PTH	05/05/05
4536	E	0.5 TYP DIM ADDED, NOTE 2 UPDATED	PTH	12/11/08

NOTES:

1. DIMENSION FROM THE END OF THR SHAFT TO THE CENTER OF THE CLEAR APERTURE
2. CLEAR APERTURE: EXTENDS TO WITHIN 0.5mm OF ANY EDGE
3. BEAM APERTURE = 15mm
4. PEAK TO PEAK INTENDED OPTICAL SCAN ANGLE = 40°
5. ANGLES OF INCIDENCE =36.5°±10°
6. SCREW SIZE = #1-72 x 1/4
7. HEX KEY SIZE = .06 IN FLAT-END ALLEN ONLY
8. RECOMMENDED SCREW TORQUE = 0.43 N*m (3.8 IN*LBS)

6240
USED ON

UNLESS OTHERWISE SPECIFIED
TOLERANCES
.X± .3mm ANGLES± 0°-30'
.XX± .13mm
[ ] INDICATES inches
SURFACE ROUGHNESS 63√
BREAK ALL SHARP EDGES

MATERIAL N/A
FINISH N/A

DRN	
ENG AA	00/00/00
APPR	

PROJECTION
DRAWING SIZE: B

CAMBRIDGE TECHNOLOGY, INC.
25 HARTWELL AVENUE
LEXINGTON, MA 02421 - USA

TITLE
MNT'D 15mm Y MIR OUTLINE DWG

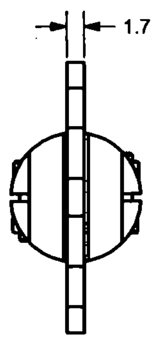
DRW. NO. **D04457** REVISION **E**

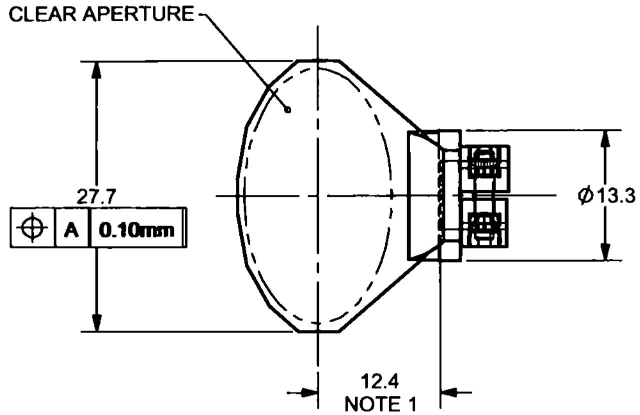
SCALE 2:1 SHEET 1 OF 1

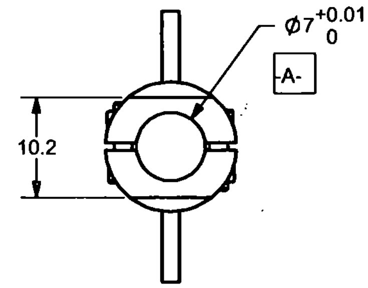
MODEL NAME: MR_MNT_XSLT

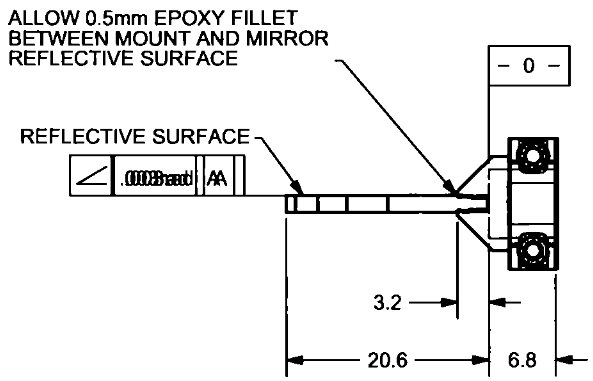
J = 1.366 g*cm^2

REVISIONS				
ECO	REV	DESCRIPTION	APPR	DATE
2174	C	BLIND HOLE MOUNT SHOWN	PTH	09/02/02
3016	D	XSLOT MNT DESIGN SHOWN	PTH	05/05/05









NOTES:

1. DIMENSION FROM THE END OF THR SHAFT TO THE CENTER OF THE CLEAR APERTURE
2. CLEAR APERTURE:
   LONG AXIS = 26.2mm
   SHORT AXIS = 15mm
3. BEAM APERTURE = 15mm
4. PEAK TO PEAK INTENDED OPTICAL SCAN ANGLE = 40°
5. ANGLES OF INCIDENCE =45°±10°
6. SCREW SIZE = #1-72 x 1/4
7. HEX KEY SIZE = .06 IN FLAT-END ALLEN ONLY
8. RECOMMENDED SCREW TORQUE = 0.43 N*m (3.8 IN*LBS)

6240 USED ON	UNLESS OTHERWISE SPECIFIED TOLERANCES ANGLES± 0°-30' .X± .3 .XX± .13 [ ] INDICATES inches SURFACE ROUGHNESS 63 BREAK ALL SHARP EDGES	DRN PTH 09/04/02 ENG APPR PROJECTION DRAWING SIZE: B	CAMBRIDGE TECHNOLOGY, INC. 109 SMITH PLACE CAMBRIDGE, MA 02138 - USA
	MATERIAL N/A		TITLE **MNT'D 15mm X MIR OUTLINE DWG**
	FINISH N/A		DRW. NO. D04456 · REVISION D
			SCALE 2:1 · SHEET 1 OF 1

MODEL NAME: MR_MNT_XSLT