



M-SERIES M24B SENSOR USER MANUAL

By

LMI Technologies Inc.

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PROPRIETARY

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LMI Technologies Inc.

1673 Cliveden Ave.
Delta, BC V3M 6V5
Canada
Telephone: 604 636 1011
Fax: 604 516 8368
www.sensorsthatsee.com

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1. Overview

The DynaVision® M24B optical scanner by LMI Technologies Inc. is a general-purpose lumber profile scanner capable of supplying a 3 dimensional profile for lumber recovery optimization. M24B sensor based scanning systems are primarily designed to provide true 3D measurements of lumber to enable computerized optimization of lumber processing centers such as edgers, trimmers, and sorters. Raw boards are fed under the scanner using a cross-transfer mechanism such as chains equipped with lugs. Each set of lugs is "pushing" a raw board (flitch) through the scanner. Travel distance is usually measured using an opto-mechanical encoder attached to the motor. While the flitch is traveling under the scanner, at each encoder pulse the scanner takes range measurements at resolution of 1.00" along the length of the target. These measurements are stored in the internal board data buffers and made available to the user (client computer) once the target board completely passes through.

The DynaVision® M24B scanner can be interfaced to many hardware and OS platforms since scanner communication is based on TCP/IP and UDP Ethernet network protocols.

LMI Technologies Inc. delivers the following components:

M24B sensor heads	Laser distance sensors.
NetPowerHub	Distributes individually fused power and serial communications to the M24B heads
MB Station	Distributes individually fused power and serial communications to the M24B heads
B-series Software CD	CD-ROM containing software libraries, system installation, diagnostic and demonstration programs, and software documentation.

The following may be ordered directly from DNA Cables of Burnaby, BC, Canada (ph: 1-604-439-1099) or LMI :

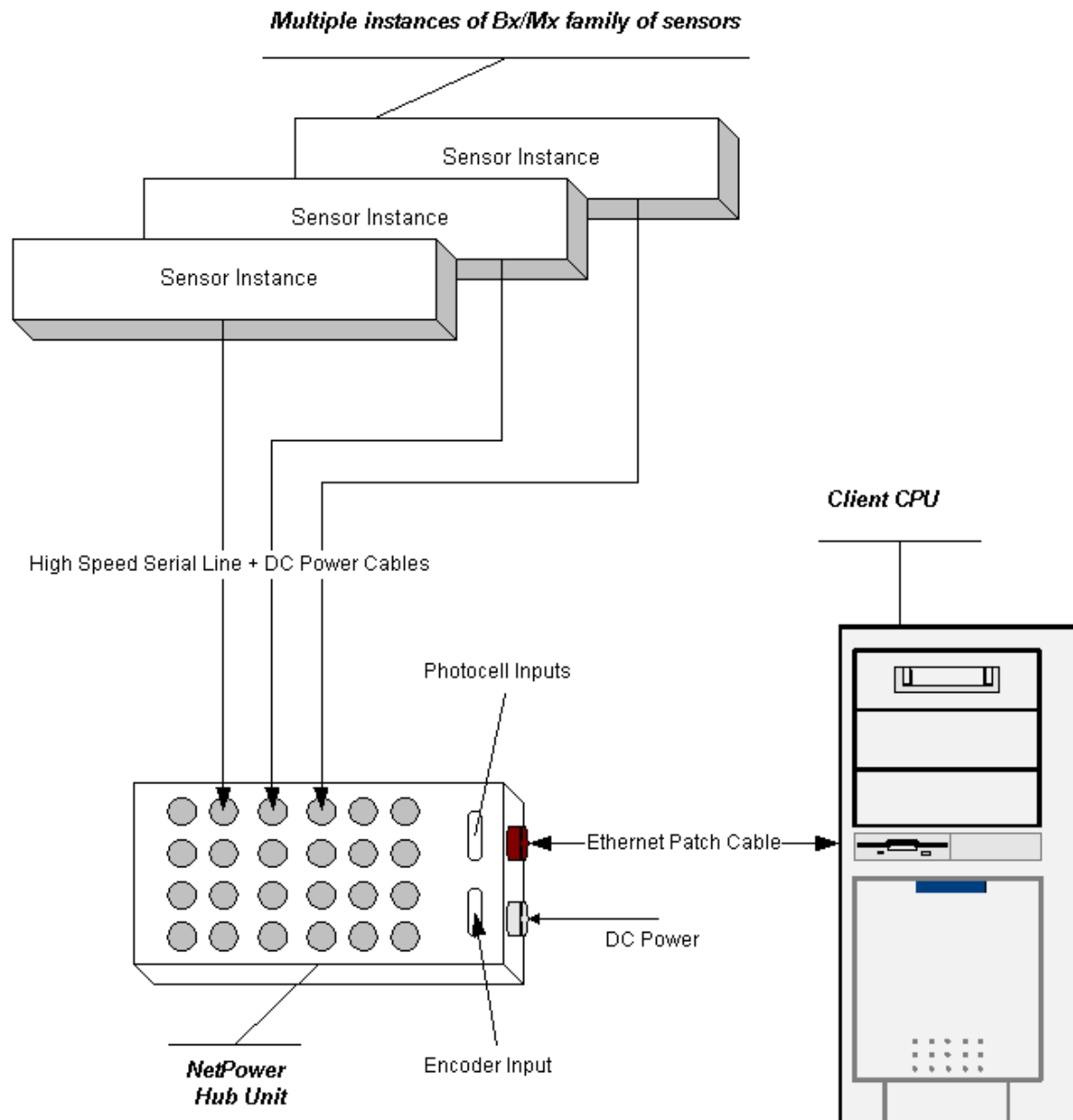
Integrated Power Cable	Connector cable for power and serial communications
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The OEM must supply the following components:

Scanner frame	A scanner frame to mount the M24B sensor heads. Guidelines to the design of the scanner frame are outlined in chapter 6.
Power supply	Power supply to provide DC power to the M24B sensor heads (24V power supply recommended, although the heads accept 14.5 to 26 Volts). Each head consumes about 24 watts of power.
Power supply cabinet	Cabinet to host the DC power supply and the Concentrator enclosure.

Encoder	A differential quadrature optical encoder coupled mechanically to the transfer chain to produce pulses in proportion to the chain travel. A recommended resolution is between 1000-1500 pulses/rotation
Encoder Cable	to connect the encoder to the NetPowerHub DB-9 encoder input connector.
Client computer	Networking capable computer to run OEM software using the M24B scanner 3D data.
UPS	Un-interruptible power supply to provide 120 VAC to the host computer and the power supply cabinet.
Calibration Bar	A 2" by 4" by "board length" profile bar to calibrate the M24B system. This bar should be painted a flat tan color and the bar should be handled with care so that it doesn't get excessively scratched.

Connection Diagram



Note: The NPH/MB Station should be connected directly to your PC via a crossover Ethernet cable. This will require you to have 2 NIC Ethernet cards in your pc if you wish to connect to a network at the same time.

2. Safety Requirements

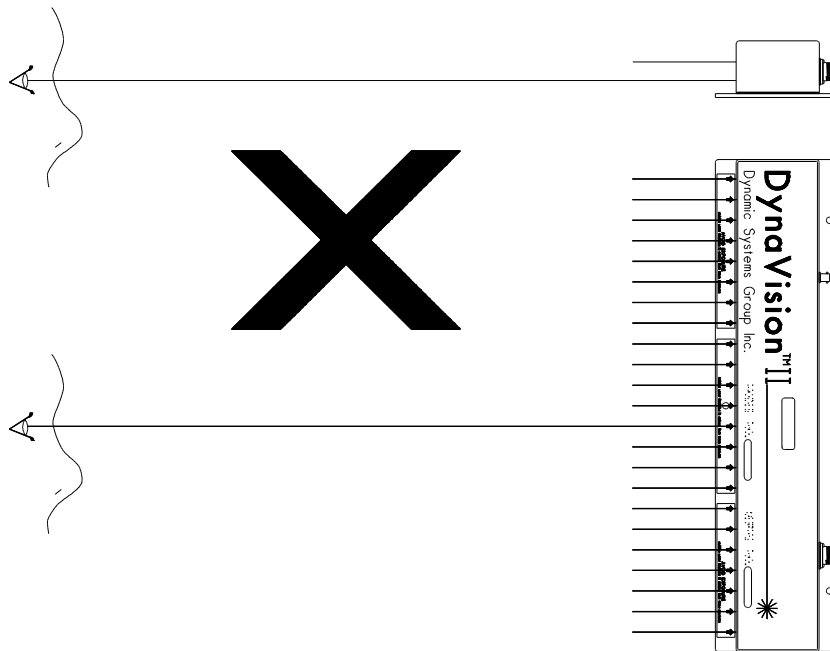
The DynaVision sensor head uses lasers for measuring ranges. This requires that specific safety precautions are taken when interacting with the M24B scanner system.

Caution! Use of controls or adjustments, or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Additional precautions need to be taken when handling sensitive electronic components to ensure the long life and reliability of these parts.

2.1 DYNAVISON SENSOR HEAD

The lasers used in the DynaVision sensor heads are near infrared (Class IIIB) units. These operate just outside the visible range of the eye (780nm) and are only visible in a darkened room. Even so, the laser's intensity is high enough to damage the eyes if viewed directly. Each DynaVision sensor head uses 23 low power, near infrared lasers to measure a two (2) foot section of material. The laser light is emitted from the 23 round windows on each sensor head. During normal operation, the lasers do not pose any hazard to the mill personnel. The only situation in which the lasers could be viewed directly may occur when personnel are working inside the throat of the scanner frame with the lasers on.



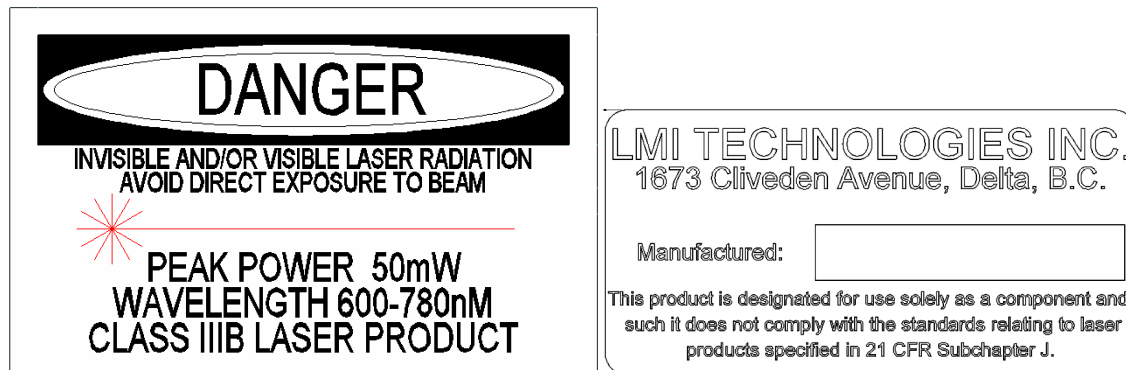
WARNING!: DO NOT look directly into the Laser Beam(s)

2.2 LASER SAFETY REQUIREMENTS

For systems which will be sold or used in the United States, the Department of Health and Human Services specifies that a number of laser safety requirements be maintained. Full details of these requirements are specified in the booklet "Regulations for the Administration and Enforcement of the Radiation Control for Health and Safety Act of 1968": HHS Publication FDA 88-8035. This publication can be obtained directly from the FDA. LMI Technologies Inc. has filed a report with the FDA to assist OEM's in achieving certification of their own applications. These reports can be referenced by their accession number which will be provided upon request.

It is recommended that the information packet be obtained from the FDA for full details on what the OEM requires to meet FDA certification. With reference to the FDA specifications, the following items should be noted:

- 1) In accordance with the HHS standards under the Radiation Control for Health and Safety Act of 1968, the following safety labels are affixed to each individual sensor head:



Warning Label

Manufacturer ID / Certification Label



Aperture Label

- Warning labels should also be attached to the scan frame where they are clearly visible.
- 2) Operator's and maintenance personnel should be aware of the potentially dangerous laser radiation and the precautions required.
- 3) Always wear proper laser safety glasses if there is a chance of being exposed to the lasers.
- 4) **Never intentionally look into the laser beam!** Even when wearing laser safety glasses, damage to the eyes can result.
- 5) Laser beams can be viewed safely using an Infrared viewing scope, or an Infrared Detector card placed to intersect with the beam.

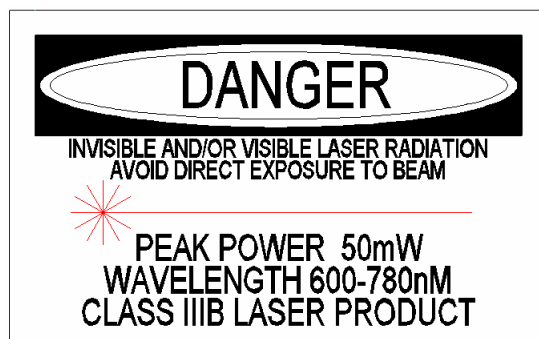
- 6) When servicing the M24B scanner frame the power to the M24B sensor heads should be removed so that the laser emission warning indicator is OFF. (Refer to section 3.2.1.2. "Laser Emission Warning Indicators")
The laser emission warning indicator comes on prior to the power being applied to the lasers to warn personnel that the lasers are about to be activated. A timer module in the scan frame power supply cabinet allows the warning duration to be adjusted to the desired amount (Refer to section 3.2.1.4 "Power-On Delays")
The warning light should always be maintained to ensure personnel are warned when the M24B sensor head lasers are on.

2.2.1 OEM Safety Responsibilities

LMI Technologies Inc. has filed a report with the FDA to assist OEM's in achieving certification of their own applications by referencing the report accession number. However, the following paragraphs outline areas which are not covered by LMI Technologies Inc. submission and need to be addressed by the OEM.

2.2.1.1 Scanner Frame Laser Warning Signs

Laser warning signs must be located in the vicinity of the scanner frame such that they will be readily observed. Refer to the following diagram for an example of the laser warning sign.



2.2.1.2 Laser Emission Warning Indicators

As specified by the U.S. Department of Health and Human Services under the Radiation Control for Health and Safety Act of 1968, it is required that the controls which operate the scanners incorporate a visible or audible signal when the lasers of the sensors are active.

Typically this consists of a warning lamp on top of the power supply cabinet which is illuminated when power is supplied to the scan frame. The DynaVision sensor heads also incorporate indicators which illuminate when power is applied to the sensors and the lasers are operating. However, if the distance between the scanner frame and the power supply cabinet exceeds 2 meters, a second power-on indicator should be mounted on the scanner frame. When mounting the warning indicator it is important not to mount it in a location which would require human exposure to the laser emissions.

Additionally, CDRH standards require that the indicator be clearly visible through protective eyewear designed specifically for the wavelengths of the emitted laser radiation.

2.2.1.3 Beam Attenuators

CDRH standards also specify that a permanently attached method of preventing human access to the laser radiation other than switches, power connectors, or key control must be employed.

2.2.1.4 Power-On Delays

For Class IIIB laser systems, a delay circuit is required which illuminates the warning indicators on the cabinet and frame for a short period of time (approximately 20 seconds) prior to supplying power to the lasers themselves.

2.2.1.5 Keylock Switch

For Class IIIB laser systems the power supply cabinets must have a keylock switch which, when in the OFF position, prevents any power from being supplied to the lasers. Additionally, the switch must not allow the key to be removed from the lock while in the ON position.

2.2.1.6 Remote Interlock Connector

A remote interlock connection must be present in all Class IIIB laser systems. This permits remote switches to be attached in serial with the keylock switch on the controls. The deactivation of any remote switches must prevent power from being supplied to the lasers.

2.3 ELECTRONICS HANDLING PROCEDURES

The DynaVision M24B optical scanner consists of several electronic components that can be easily damaged by electrostatic discharge (ESD). ESD damage normally occurs as a result of handling electronic circuit boards and components without 'grounding' the body. 'Grounding' the body of the person handling the components discharges any static to ground instead of through the components themselves.

The DynaVision optical scanner consists of several printed circuit boards and components that could be damaged without the following handling precautions:

- 1) Always ground your body using a wrist strap in contact with bare skin attached to a solid ground such as a chassis etc. Do not handle any components unless grounded first.
- 2) Printed circuit boards are usually stored and shipped in plastic conductive bags. The boards should only be removed from or placed in these bags when your body is completely grounded. Make sure spare boards are always replaced in these bags before storage.
- 3) Only after completing service replacement should the ground strap be removed.

2.4 WELDING AND THE SCANNER FRAME

DynaVision scanners are optical apparatus, and care must be taken to ensure that nothing affects their optical performance.

The camera used inside each M24B sensor head can be damaged by very intense light. Additionally, the debris generated while welding is normally hot enough to mar or imbed itself in the surface of the glass lenses covering the lasers and camera. Therefore, it is recommended that the sensor heads are shielded before any welding takes place in close proximity of the scanner frame.

3. Functional Description

The M24B scanner system is built up in 2-foot (600 mm) sections, the length of each M24B sensor head. Each sensor head projects twenty-three (23) laser beams on the target surface at 1" (25.4mm) spacing. The sensor heads may be mounted above and below the target (Top/Bottom scanning) or above the target only (Top only scanning). Top/Bottom scanning allows true thickness measurements at each laser beam. Top only scanning provides thickness profiles at each laser beam relative to a fixed reference point. The NetPowerHub (NPH) or the MB Station collects measurements from all installed heads and stores them for use by the client computers for further processing such as board optimization. Fully populated NPH/ MB Station allows for top/bottom scanners up to 24 feet (6.1 m) and 48 feet (12.2 m) for top only scanners.

The M24B sensor head generates measurement samples at 1.5 kHz. When an encoder is connected to the NPH/ MB Station, one along-frame scan line (the current range readings for all heads on the frame) is stored for each pulse generated by the encoder. The encoder is driven by the transfer mechanism which moves material through the scanner. Although the sensors are capable of scan rates greater than 1 kHz, the current NPH concentrator limits the maximum encoder frequency to 1 kHz. Should the OEM require a higher encoder frequency for a given application the MB Station would allow you to achieve better scan rate, please consult LMI Technologies for a possible solution.

3.1 M24B SENSOR HEAD

Each head projects twenty-three (23) laser beams onto a target surface at 1" (25.4mm) spacing. Each laser spot is detected by a CCD line camera and the target range is calculated using the triangulation method.

The M24B scanner head uses only solid-state components. Reliability is improved by avoiding the use of beam splitters, spinning mirrors, or other mechanical devices. All components are mounted in a solid aluminum CNC machined package which can be installed directly in the sawmill environment.

3.1.1 Measurement Range

Each M24B Canter head has a 24" range from 14"- 38" from the front surface of the head.

Each M24B Edger head has a programmable range window (8" maximum) tailored to the application. Due to the optical nature of the M24B edger sensor, the maximum possible size of the range window will depend on where it is positioned within the full range of the sensor. The following table lists the maximum range window sizes possible at different standoff distances from the face of the sensor:

Start of range window from face of sensor	Maximum possible size of range window
14"	5.6"
15"	6.0"
16"	6.6"
17"	7.0"
18"	7.4"
19"	7.8"
20"+	8.0"

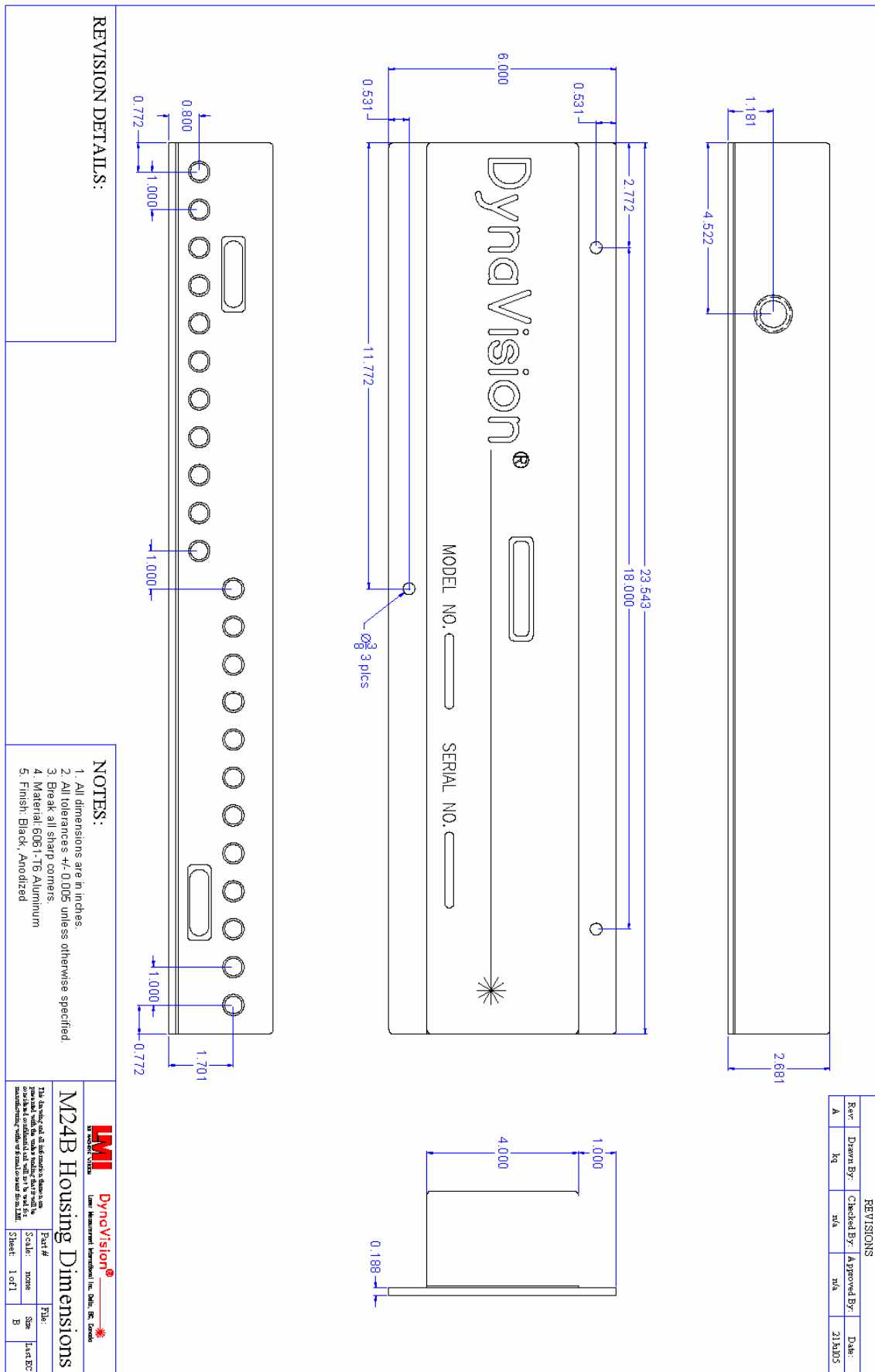
LMI Technologies will pre-program each sensor's range window prior to shipping according to your specification. The M24B edger's range window is also programmable in the field via the sensor's RS-485 serial interface. For information on how to program the range window please contact LMI Technologies.

3.1.2 Measurement Resolution

Thickness	-	$\pm 0.010"$
Length	-	$\pm 1"$

3.1.3 Electrical Power Requirements

M24B sensor	-	+15 to +24 VDC (1A @ 24VDC) each
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3.2 HUB ENCLOSURE

The **NetPowerHub** concentrator distributes individually fused DC power to each installed M24B sensor as well as provides both proprietary high speed and RS-485 serial communication. The NetPowerHub must be mounted inside on the back panel of an industrial NEMA enclosure at the scanner frame to protect the electronics. Please refer to the NPH66 manual for further details regarding actual size, connector pin out, encoder information, and photocell information.

The **MB Station** allows for up to 24 sensors to be connected via high speed serial lines, while providing each sensor with individually fused DC power. The MB Station includes Encoder Input with LED signal indicators and maximum 6 Photocell Input with LED indicators.

The MB Station supports all B-series sensors including the M24B.

- Full compatibility with existing NPH-66 external connections and cabling (sensors, photocells, encoder)
- Full compatibility with NPH-66 Ethernet protocol and existing software suite
- Hot swapping protection prevents damage to the MB Station.
- 2 kHz data sampling and streaming is supported for full B-series and M24B sensor systems
- Encoder quadrature division is supported

Please refer to the MB Station Manual for further details.



4. Maintenance

4.1 PREVENTATIVE MAINTENANCE PROCEDURES

Since the DynaVision® scanner heads operate optically, the primary maintenance procedure is keeping the heads clean of sawdust, oil and pitch. The following maintenance tasks should be performed regularly to keep the system in good working order.

- Using clean air, blow off the top and bottom head baffle plates and scanner heads. **Do not use any air which may contain water or oil as it may coat the glass lenses on the scanner heads, resulting in scanning errors.**
- Clean the glass windows on each scanner head using a soft, lint free cloth and isopropyl alcohol. **Do not pressure wash the sensors as this can cause severe damage.**

Warning: Pressure washing can cause severe damage to M24B sensors.

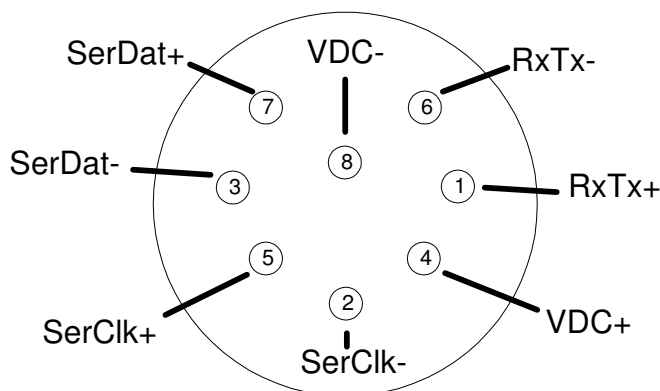
- Inspect the timing belts and sprockets to the encoder and clean them if required to ensure there is no build up of material that may affect the encoder's proper operation.
- Check the system calibration.
- Back up files from the hard drive.
- Check the scanner infeed chains and lugs for lodged debris. Ensure that the lugs are correctly aligned and that the chains haven't slipped on the sprockets.

5. Sensor Hardware

5.1 M24B HEADS

5.1.1 Cabling/Power

Power supplies to operate the heads should be mounted in a cabinet on or near the scanner frame to reduce voltage drops to each head. A single four pair plenum grade (i.e. industrial) shielded CAT5 cable is run to each head from the NPH/MB Station. The power cable connector used is a DIN 41 326 Standard 8 pin circular connector. Pin outs are below as viewed from the solder side:



Name	Description
VDC+/-	DC power (VDC+) and Ground return (VDC-)
RxTx+/-	Asynchronous 19.4 Kbaud serial bi-directional pair (RS-485)
SerClk+/-	High speed Serial Clock pair
SerDat+/-	High Speed Serial Data pair

Each of the four twisted pairs in the CAT5 cable are connected to one of the RS-485 differential or power/ground (+/-) pairs.

The M24B head has been specially designed to work with high source resistance power supplies, thus allowing more inexpensive power cabling to be used (such as CAT5 cable). Note that the use of CAT5 cable assumes a 24VDC supply, and a maximum cable length of 50 feet. The CAT5 cable DC resistance is about 25 ohms per thousand feet, or about 2.5 ohms for the 100 foot round trip on the 50 foot cable. The M24B head draws about 1A at 24 volts, so a 2.5V drop occurs on the cable. Lower voltages (such as 15V) cause the switching power supplies in the M24B head to draw more current, and will make the voltage drop on the cable larger.

5.1.2 Connector and Cable Part Numbers

The manufacturer and part number for the cable end of the power cable is Amphenol C091 31H008 101 2. The cable is 4 pair shielded CAT5 Ethernet cable, can be either solid core or stranded, and has a variety of manufacturers.

6. B-Series OEM Software Suite

6.1 OEM CD CONTENTS

Component	Requirements	Description
<u>Bx Software</u> Nbllib.dll Nbllib.lib Nbllib.h Nbtest.exe	Pentium-class processor Windows® NT 4.0/2000/XP	The Bx Software Suite includes Win32 software development libraries as well as diagnostic and display applications. Note that software relies on fully functional networking services. LMI recommends and supports Windows NT 4.0/2000/XP OS platforms.
M24B OEM Manual	Adobe® Acrobat® Reader MS Word™	Electronic version of this document.
NPH OEM Help Manual	Adobe® Acrobat® Reader MS Word™	Electronic version of this document.

Documentation and sample code for the nbllib API are included on the distribution CD.

7. System Calibration

Once all the sensors have been mounted in the scanner frame, two calibration calculations need to be performed. While the two calculations are described separately below, the recommended procedures for each calculation are the same and may be combined into one calibration sequence. The purpose of these calculations is to provide the necessary data for optimizers to transform individual range readings into a global frame of reference.

7.1 LASER ALIGNMENT OFFSET/DELAY

The first of the two calibration calculations compensates for the variations in laser placement that result from sensor mounting and manufacturing variations of the frame in the direction of a target transfer. These alignment variations need to be taken into account in order to align the data obtained during a target scan in time (z – axis).

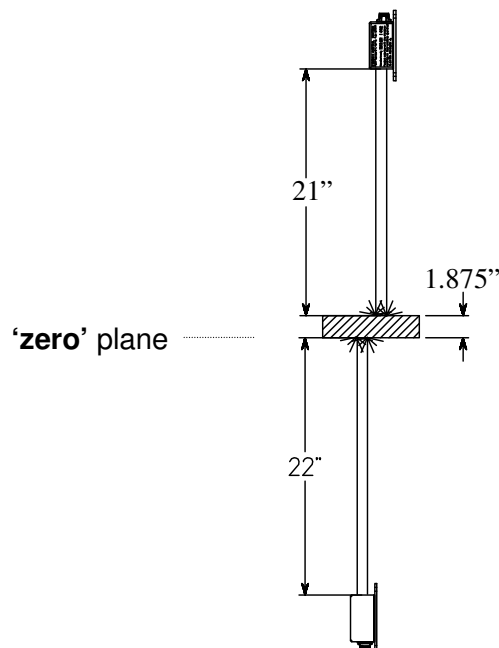
The calibration routine needs to determine the offset/delay values in encoder pulses for all the lasers on the scanner frame referenced to a common ‘zero’ plane in the direction of travel, then save the results for later use. The recommended method, which guarantees that the readings are taken from the same location, is to run a straight 2"x4" profile bar through the scanner and then examine the scan buffers.

During the calibration process, an offset value of 0 is used when reading the scan buffers. The number of blank (out of range) entries in each of the buffers corresponds to the offset value for that buffer. It is crucial that the profile bar used for calibration is straight; this ensures that the buffer offsets determined here will properly align the data obtained in subsequent board scans.

During normal operation, optimizer API software applies these offset values while reading spot buffers resulting in proper board data alignment at every laser position.

7.2 RANGE OFFSET

The second of the two calibration calculations addresses the variations in range above or below the item being scanned. It also determines how the top and bottom halves of the model data join together when the viewing areas of opposing sensors overlap.



The recommended method for determining range offsets requires a few steps:

- a) Measure the distances of all the top mounted sensors to the top of the transfer chain, then average the results to determine a 'preset' value.
- b) Repeat the process for all the sensors mounted below the transfer chain.
- c) Pass a calibration profile bar of known thickness through the scanner.
- d) For top mounted sensors, read the spot buffers of each laser and calculate the average range reading for the entire width of the piece. Compare the average with the 'preset' value less the profile bar's known thickness to determine the range offset necessary for that spot.
- e) Repeat the same process for each spot of lower mounted sensors except that the comparison is only between the 'preset' value and the range reading.

For example, referring to the diagram above, if the average reading for a top sensor laser spot was 20.00" then the range offset for that laser spot would be calculated as:

Top 'preset'	-	Calibration Thickness	-	Average Spot Reading	=	Range Offset
23.000"	-	1.875"	-	21.000"	=	0.125"

If the bottom sensor laser spot's average readings were 22.125, then the offset would be:

Bottom 'Preset'	-	Average Spot Reading	=	Range Offset
22.000"	-	22.125"	=	-0.125"

8. Optimization Implementation

The optimization procedures using the profile information are performed in the client computer. The DynaVision® M24B scanner can be interfaced to many hardware platforms (ISA bus, VME, PCI, etc.) through the industry standard Ethernet interface.

8.1 NON-INTEL BASED SYSTEMS

When transferring data from one system to the next, it is important to remember that the method of storing data in memory differs in the Intel processors from the method employed by Motorola and other manufacturers. As a result, it may be necessary to swap the MSB and LSB 16 bit segments of data before or after transferring the data streams from one machine to the next.

9. Scanner Frame Design

9.1 OVERVIEW

A general scanner frame design with dimensions is included for a guide to the critical dimensions. This is the basis for a frame design and it is recommended that the user individualize the design to match existing user equipment. Some points to consider are:

- Mount the sensor heads on the downstream side of the scanner frame so that debris travels away from the sensor heads.
- Sensor heads should be mounted on standoffs with a 2 1/4" difference between heads side to side and top to bottom. This prevents the lasers from adjacent sensors from being mistaken for laser spots within a valid sensor range.
- The heads on the bottom have the lasers mounted in the opposite direction. Therefore spot 1 on the top head is in the same plane with spot 23 on the bottom head.
- The baffle plate design included is for the exact top to bottom head spacing shown on the frame. If different spacing is desired then the center holes must be moved to allow for the angled beams from the opposite head. There are four different baffle plates with two for top heads (different standoffs) and two for bottom heads.
- The frame shown uses 6"x12" tube stock as the support beam. This may not be rigid enough over long spans. Therefore your own structural personnel should use this as a guide for the frame and not the final frame design.
- Cabling for the heads is run inside the frame support beam to one end of the frame where power supplies and conduits to the computer room are located.
- Each head is mounted at three points on standoffs to prevent distortion. Generally we have put studs in the frame for the connector side of the head to make it easier to mount the head in the field (head is heavy). The laser side of the head should use a cap head socket screw that is below the window (out of the field of view) when tightened.
- Heads are generally mounted with the first laser line 1" or 2" inside the 'zero lumber line' and continuing with a laser every inch the length of the frame. The bottom heads are usually aligned laterally with the top heads. However, other variations are possible.
- On edger and cant optimizer where pins are used to skew and offset the piece, the skew pins should be aligned as close as possible to a laser spot to guarantee skew and offset position.
- A positive air pressure (blower/purge system) should be designed into the frame for clearing the bottom heads. We have found on several installations that if the bottom heads are cleaned every 2 to 4 hours without air purge, the systems run fine. However performance can be degraded if the heads are running dirty and therefore an air purge is recommended. When installing an air purge using mill air, make sure to filter the air to remove oil and water.

9.2 CHAIN SPACING

9.2.1 New Mechanical

Mount the chains between the heads (2 foot centers) with chain-ways as narrow as possible. The idea is have no laser beams hitting any chain ways. This may be achieved by eliminating the side rails at the point that the laser would strike it and let the chain only travel on the bottom center guide.

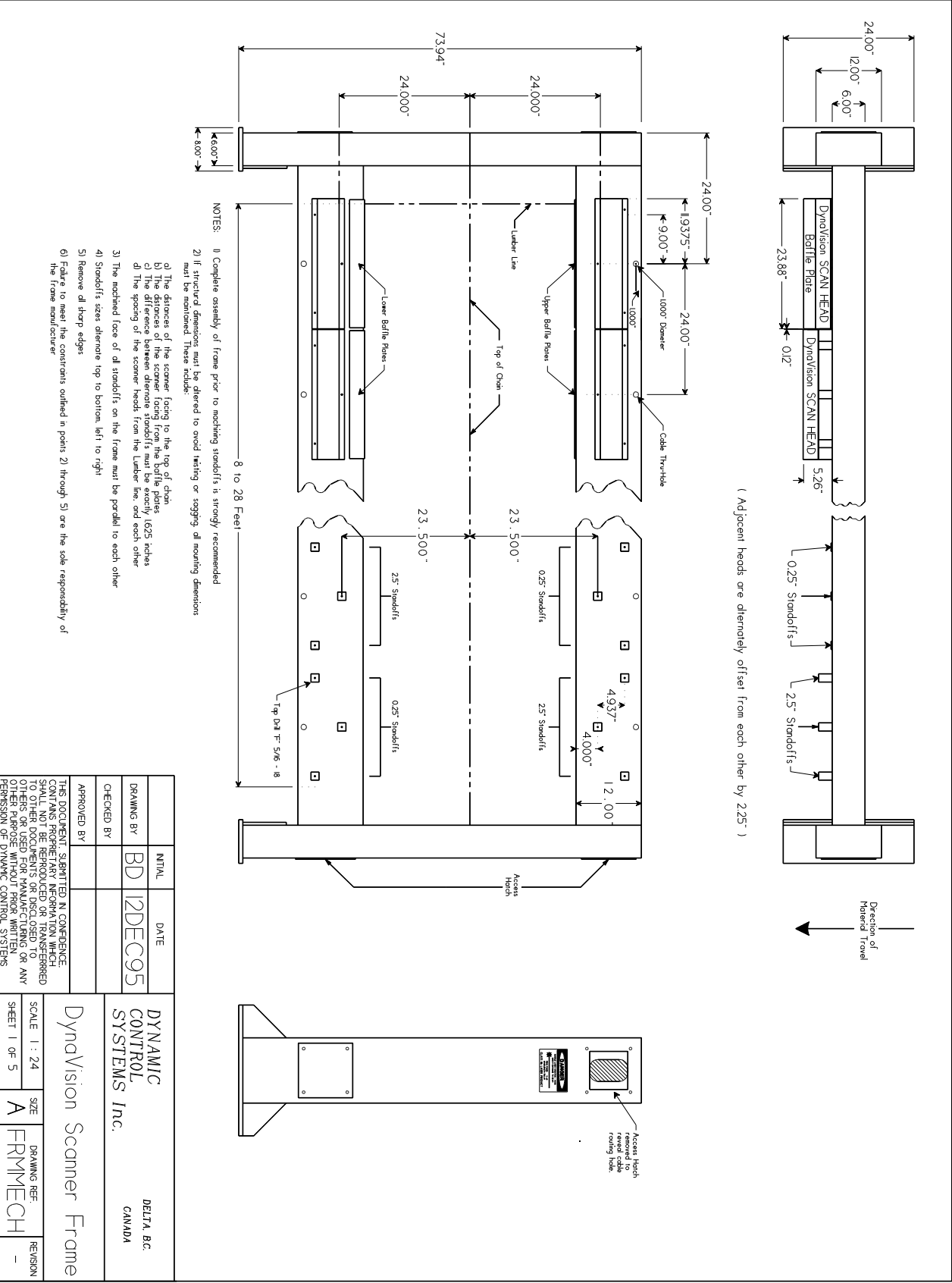
9.2.2 Retro-Fit Mechanical

If possible, mount the frame with chains between heads or with as few bottom laser spots disturbed.

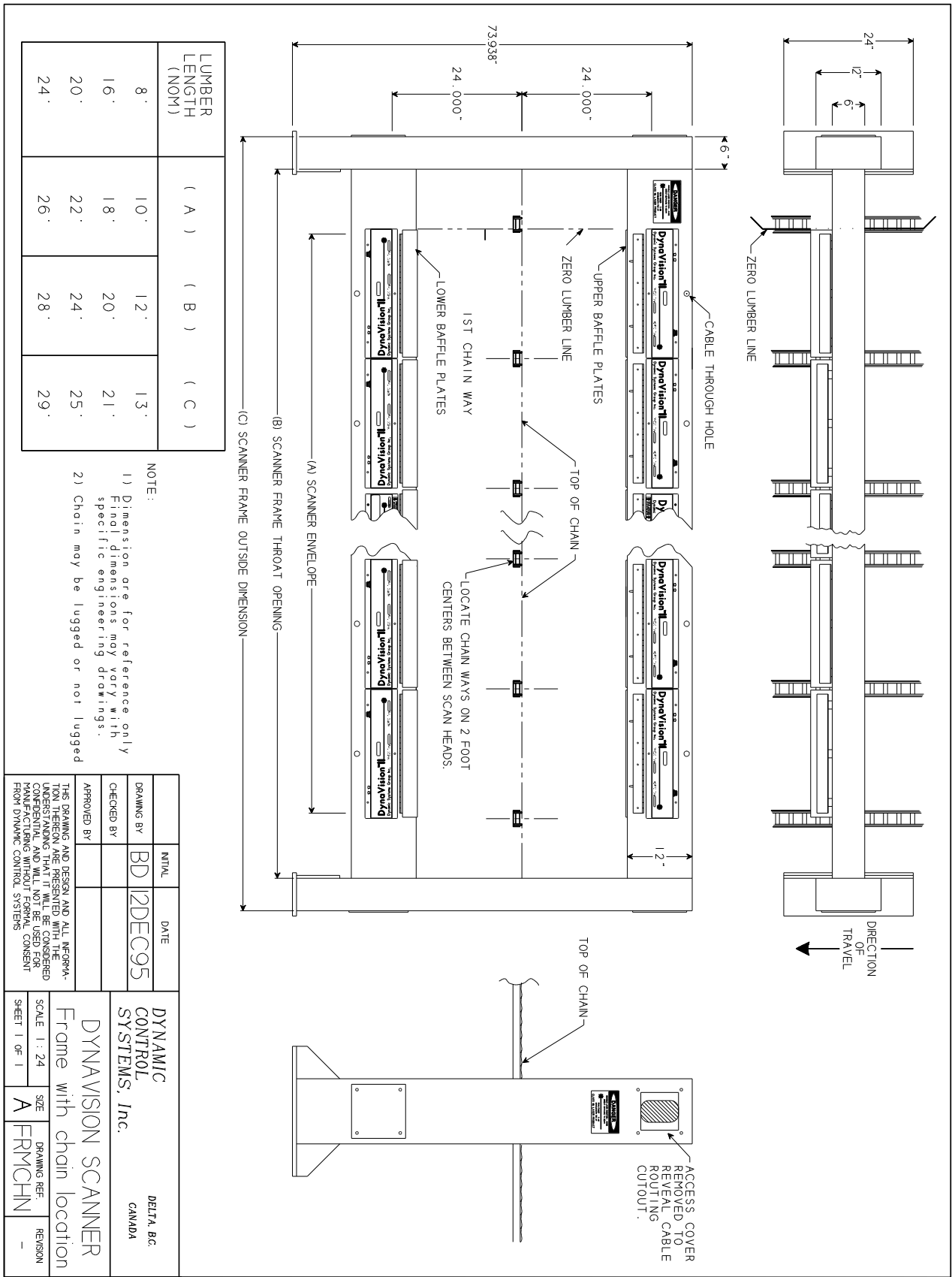
9.3 FRAME DRAWINGS

The following drawings are included:

1. Drawing Ref. #: FRMMECH - DynaVision Scanner Frame
2. Drawing Ref. #: FRMWCHN - DynaVision Scanner Frame
3. Drawing Ref. #: BFLUPR - Upper Frame Baffles
4. Drawing Ref. #: BFLWR - Lower Frame Baffle



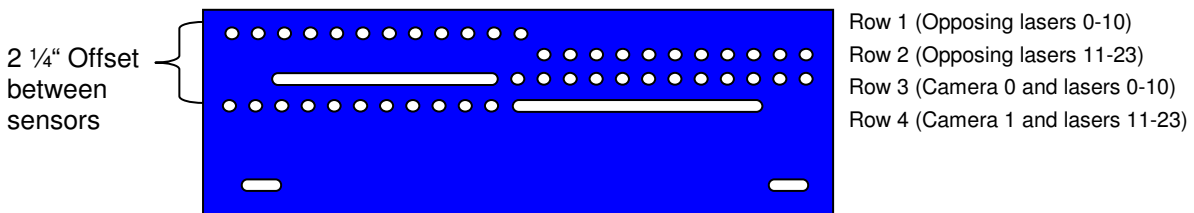
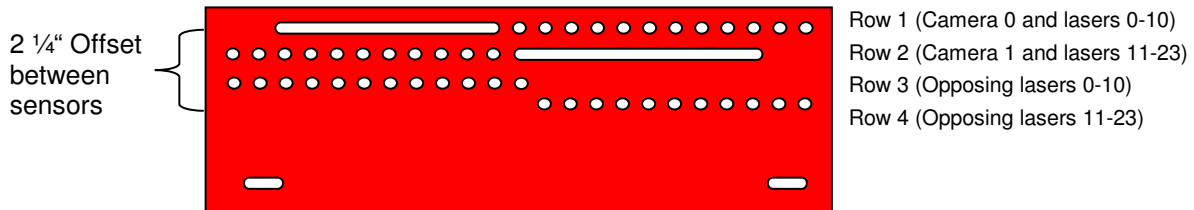
INITIAL	DATE	DYNAMIC CONTROL SYSTEMS Inc.	DELTA, B.C. CANADA
BD	12DEC95	DynaVision Scanner Frame	
CHECKED BY		SCALE 1 : 24	SIZE A
APPROVED BY		SHEET 1 OF 5	DRAWING REF. FRMMECH
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9.4 M24 BAFFLE PLATES

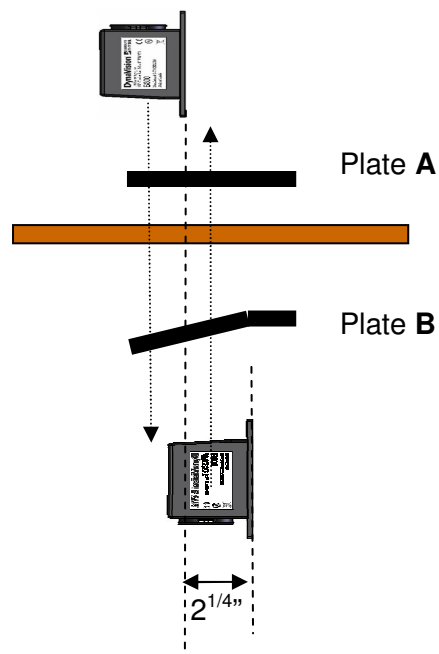
M24 baffle plates prevent interference caused by ambient light and lasers from adjacent (top and bottom) sensors.

There are total of four baffle plate configurations with two for the top sensors (different standoffs) and two for the bottom. While the placement of slits and holes is identical between the two pairs, bottom baffles are angled to prevent falling debris from blocking sensor windows.



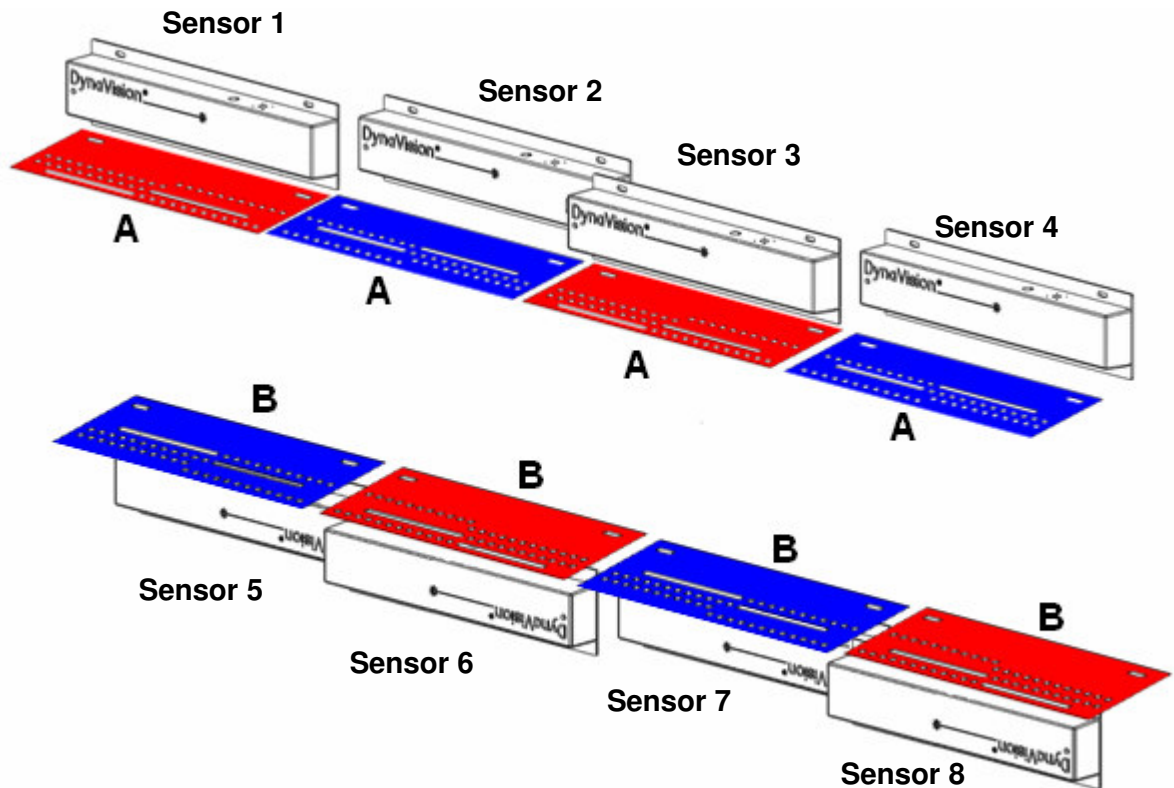
Flat baffle plates are used for the top sensors

Angled baffle plates are used for the bottom sensors to ensure debris does not build up

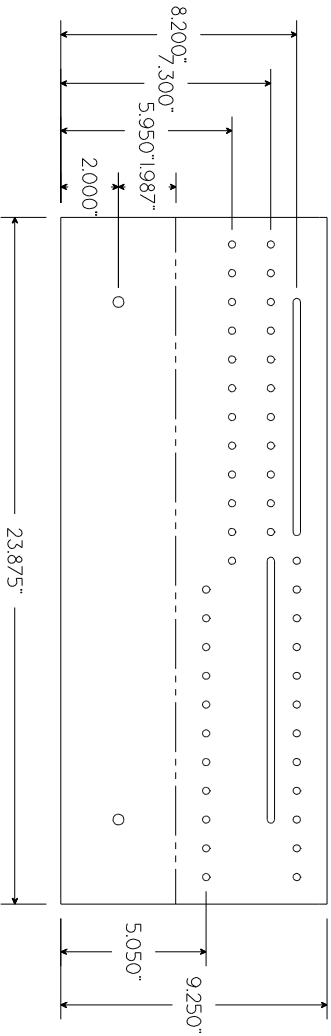


9.4.1 Top View

M24B baffle plates prevent interference from adjacent sensors. In the following configuration Sensor 1, Sensor 3, Sensor 6 and Sensor 8 are coplanar. Laser emission points of Sensor 6 are blocked from the field of view of Sensor 1 by the baffle plate of Sensor 6. The points where Sensor 3 lasers strike the face of Sensor 7 are also in the field of view of Sensor 1. They are blocked by the baffle plate of Sensor 7.



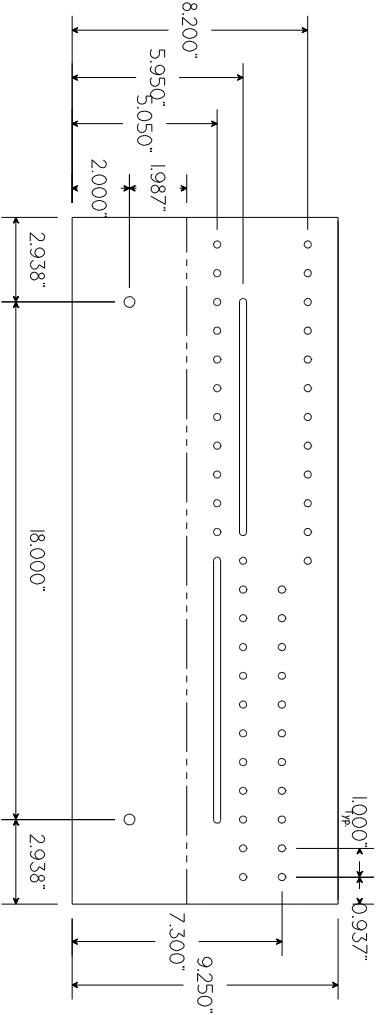
For use with 2.500" standoffs



NOTES:

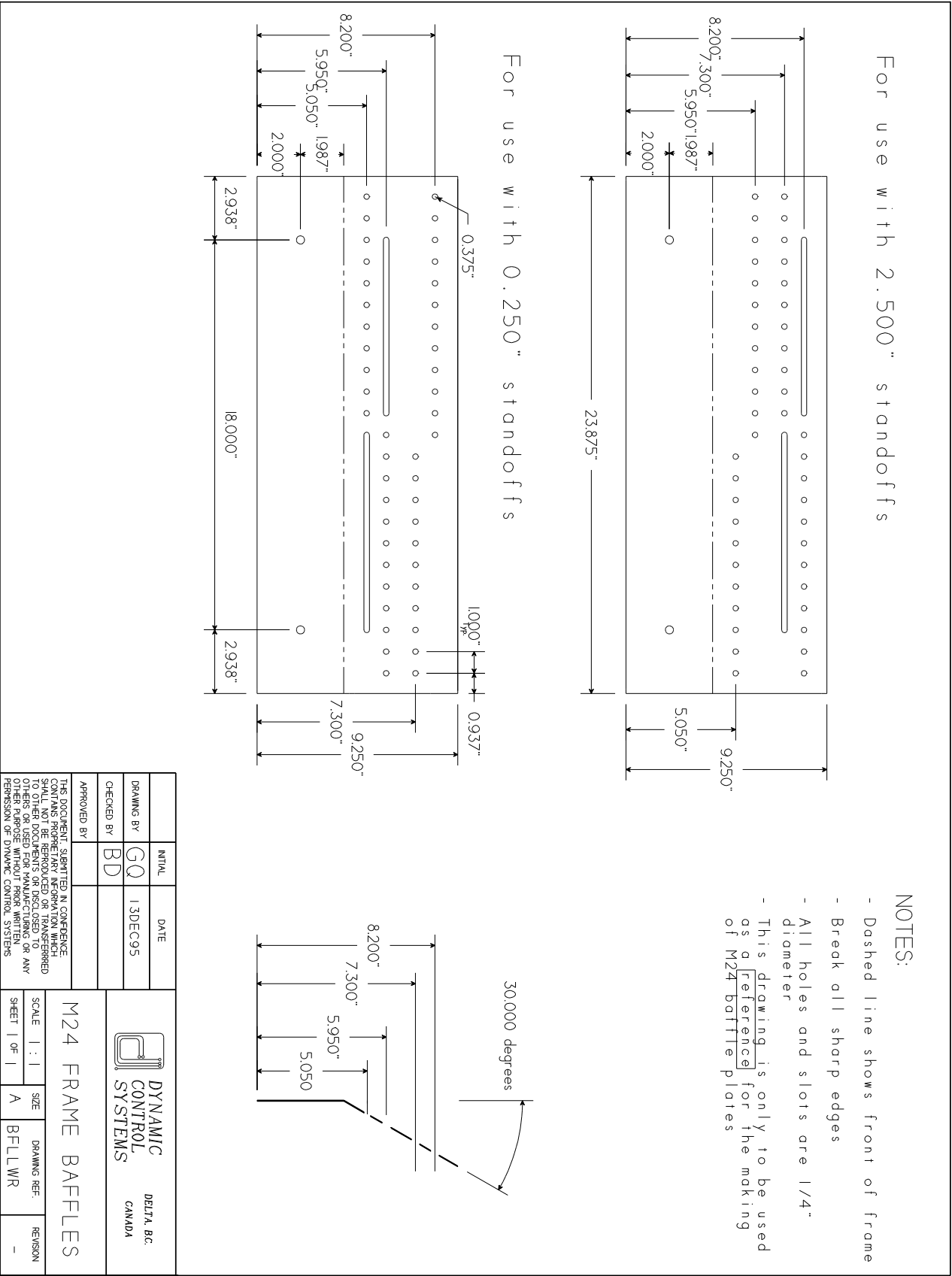
- Dashed line shows front of frame
- Break all sharp edges
- All holes and slots are 1/4" diameter
- This drawing is only to be used as a reference for the making of M24 baffle plates

For use with 0.250" standoffs



REVISIONS:

INITIAL	DATE	 DYNAMIC CONTROL SYSTEMS DELTA, B.C. CANADA
DRAWING BY GQ	13DEC95	
CHECKED BY BD		
APPROVED BY		
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M24 FRAME BAFFLES		
SCALE 1 : 1	SIZE A	DRAWING REF. BFLUPR
SHEET 1 OF 1		REVISION -



10. Scanner Installation

10.1 FRAME CONSIDERATIONS

- To isolate the scanner from mill vibration, the frame should be mounted on an independent sub-base to the mill foundation. Shock mounts should be used to mount the scanner frame to the sub-base.
- The frame height should ensure the level of the transfer chain is correct according to drawings.
- The first scan head is located inside the even ending zero lumber line. This will locate the first laser scanning line 1"-3" in from the zero lumber.
- Scan heads are numbered from the zero lumber line.
0' top head, 2' top head ... N' top head
0' bottom head, 2' bottom head ... N' bottom head etc.

10.2 POWER SUPPLY CABINET CONSIDERATIONS

- Mount the power supply cabinet on one end of the scan frame to allow proper access from the mill floor for installation and service.
- Position the cabinet on the end of the frame so there is proper clearance from the bottom access plate on the frame into the power supply cabinet to run the power cables.
- Ensure that any warning bulbs mounted on the scanner frame or power supply cabinet are not positioned where they are in direct view of any of the sensor head cameras.

10.3 DC POWER CHECK

- Connect DC power to the NPH (before connecting to heads). Turn on the DC power and verify the DC power is correct at the DC power studs, and that the NetPowerHub red light goes on. The light will not light if the power is reversed.

NOTE: Both the NetPowerHub and the M24B heads include reverse and over voltage protection. This is a severe condition, however, and should not be deliberately tested.

10.4 INSTALL NPH/MB STATION INTEGRATED POWER CABLING

- Fish the integrated power cabling through the hole in the scanner frame (adjacent to each scan head), and out of the access cutout up into the power supply cabinet.
- There is one power cable per scan head.
- Label each power cable as 0' Top, 0' Bottom, etc. so that you know where to wire them in the cabinet. Any excess cable length should be inside the frame tubing.
- Connect Integrated Power cables to the Bx NetPowerHub. Position is not significant (any cable can go to any available connector).

10.5 INSTALLING SCAN HEADS

- The scan heads are held in place at three points (mounting holes).
- Two of the points (connector side) are mounted onto studs to allow for easy installation of shims to aim the scan head in case the frame is not aligned correctly. The other point is mounted with a hex cap screw.
- The studs should be installed in the frame with Loctite and left to set to ensure studs are tight.
- Install all the baffle plates but do not tighten the mounting bolts yet (hand tight only so the plate sits flat on the scan frame. The flat baffle plates are located on the top and the angled baffle plates are located on the bottom.
- There are two types of plates for the top. Ensure that the rows of holes for the laser beams match the rows of lasers from each head.
- With the AC power OFF to the scanner frame cabinet, plug the DC power cable on each scan head. Ensure that the cables are fully pushed into place and the hold down sleeve screwed on hand tight.
- Turn on the AC power to the scanner frame cabinet. After a delay, the DC power will be supplied to the scan heads.
- Observe the LCD display on the scan heads. Each scan head will cycle through and display a checklist of external and internal DC Voltage values. The final display shows a bar graph of the range for each laser spot. The further away the object is detected the longer the bar. The next time the power is turned on, observe the voltage values displayed on that specific head for any indication of low voltage. If the voltage or the current is low ($< 1.5A$) to any of the heads then it will not function properly and appear that it is not working. If low current is suspected then check that the power supply has sufficient capacity to supply the complete frame (# of heads $\times$ 1.5 Amps) or check that the current limit adjustment for the power supply is set correctly.

Warning!

Ensure the power is off when installing or removing a power cable from a scan head.

- Using an infra-red viewing card or infra-red viewer, check that the lasers from the top heads pass through the holes in the bottom head baffle plate. Adjust the baffle plate position and tighten the mounting bolts.
- The LCD display is also useful as a final check for aligning the baffle plates. After aligning with the viewer or card, the LCD display should show that no spots are being detected. A spot being detected would appear as a longer line on one or more of the bars on the graph. If one or more lasers are being detected then check that the baffle plate is aligned or the specific hole is blocked or misaligned.
- Check that the lasers from the bottom heads pass through the holes in the top head baffle plate. Adjust the baffle plate position and tighten the mounting bolts.

10.6 INSTALLING PHOTOCELLS

Please refer to the NPH or the MB Station User Manuals for the specific unit being operated.

10.7 INSTALLING THE ENCODER

Please refer to the NPH or the MB Station User Manuals for the specific unit being operated.

10.8 WARNINGS AND SYSTEM DESIGN CONSIDERATIONS

When designing your M24B scanner system there are a few points that must be taken into consideration to avoid any scanning problems.

- At no time should welding take place near a powered scan frame. If it is necessary to weld near the frame, the scanner system should have the power turned off and disconnected and the sensors should be covered.
- When performing a system calibration you should use an aluminum calibration bar that has been painted with a flat (non-glossy) tan colored paint. The calibration bar should be handled with care so that no scratches or exposed aluminum is shown. Scratches and exposed aluminum will degrade the accuracy of your system calibration.
- When designing your frame it is important to have all chains running between heads so that the field of view of the sensors is not being disturbed. If this isn't possible then any lasers hitting chains must be physically blocked at the laser windows as they will cause spurious data.
- Sensors should be aligned so their lasers shine at 90 degrees to the chain bed or as close as possible. This will give consistent wane detection on the leading and trailing edges.
- Encoder resolution is a value that should be designed into your system and then verified once the frame is complete. A good way to find encoder resolution is to run your chain until 1500+ encoder pulses are generated, then measure the physical chain travel to the nearest 1/16" with a tape measure. The encoder resolution will then be the number of pulses over the distance traveled. The encoder resolution should not have to be calculated every time a calibration is done it should be a constant value that is found and used in your software.
- If you are designing a system that requires exact width measurement then we recommend using photocells in conjunction with the sensor data. The sensors are intended for range measurement and wane detection. Photocells will give better width accuracy.

11. Getting Help

If you wish further help on the M24B contact your distributor.

For more information on Safety and Laser classifications, contact:
Center for Devices and Radiological Health, FDA
Office of Compliance (HFZ-305)
Attn: Electronic Product Reports
2098 Gaither Road
Rockville, Maryland 20850

11.1 LIST OF AGENTS

11.1.1 Canada and the United States

Call our offices at 1-604-636-1011 for the agent nearest you, or visit our web site at www.sensorsthatsee.com

11.1.2 International

EUROPE

LMI Selcom Inc. (Sweden) ph 46-31-336-25-10
Box 250, S-433 25 fax 46-31-44-61-79
Ogardesvagen 19A
Partille, Sweden