



IDT Cameras
Specification Manual

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Products Information

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1. Terms and Conditions

1.1. Terms and Conditions

1. **TERMS** - These terms govern the sale of goods between Integrated Design Tools, Inc. ("IDT") and the Buyer ("Buyer"). This document acknowledges receipt of the Buyer's order by IDT, and confirms the sale of product evidenced by the invoice as expressly conditioned on the Buyer's acceptance of the terms and conditions set forth herein.

2. **PRICES** – All published prices are subject to change without notice. Written quotations shall expire thirty (30) calendar days from the date of quotation unless withdrawn in writing sooner. Verbal quotations are provided for budgetary guidance only. Unless otherwise specifically stated, prices are in U.S. Dollars.

3. **TERMS OF PAYMENT:**

3a. Deposits – Buyer must make a deposit equal to the amount specified by IDT at the time of the order, typically 10% of the total order value (excluding any sales tax, freight, duties, import tax and delivery charges). Camera reservation numbers and delivery estimates are provided at the sole discretion of IDT.

3b. Method of Payment – Credit card payment via VISA, MASTERCARD, AMERICAN EXPRESS or DISCOVER is provided as a convenience with valid credit card authorizations. Please contact the IDT Customer Service Department for Remit To information when transferring bank to bank payments or visit IDT's website for bank information. All orders are payable in U.S. dollars (USD).

3c. Standard Payment Terms – All orders must be paid in full prior to shipment via wire transfer, cash equivalent (such as money order, cashier's check, or personal check drawn from a United States bank), or credit card. IDT has the right to refuse any order, even after accepting payment or partial payment for such order. IDT will credit/refund any such payment made by the Buyer, if IDT rejects the order.

3d. Deposit Payments – Deposit payments may be remitted via credit card payments, wire transfer or cash equivalent (such as money order, cashier's check, or personal check drawn from a United States bank). No more than two separate credit cards may be used for payment. IDT reserves the right to reject any order. IDT will credit or refund any payments made if IDT rejects the order.

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3f. Balance Payments – Buyer must pay the full remaining balance of the invoice before the order will be processed for shipment. Balance payments may be remitted via credit card payments, wire transfer or cash equivalent (such as money order, cashier's check, or personal check drawn from a United States bank). No more than two separate credit cards

may be used per payment. IDT reserves the right to reject any order. IDT will credit or refund any payments made if IDT rejects the order.

3g. Rentals/Leasing – IDT does offer rental/leasing options for various IDT products. IDT does not affiliate, authorize, or support any other entities offering leasing options for IDT product. IDT assumes no liability for services or product offered by unauthorized third-party entities offering IDT product or services.

4. DELIVERY AND ACCEPTANCE – All product shipments shall be made from the IDT facility at Pasadena, California, at which time title and risk of loss shall pass to the Buyer. Buyer shall be the importer of record for all purchased products, if applicable. Licensing requirements for importation to non-U.S. countries is the sole obligation of the Buyer. In the absence of specific shipping instructions from the Buyer, IDT will ship by the method it deems, in its sole discretion, most advantageous. Transportation charges will be collected prior to shipment. Unless otherwise indicated, Buyer is obligated to obtain insurance against damage to the product being shipped. Unless otherwise specified, products will be shipped in standard commercial packaging. When special packaging or export instructions are requested by the Buyer, any additional costs will be the responsibility of the Buyer. IDT reserves the right to reject certain shipping or packing methods.

IDT shall use reasonable efforts to notify Buyer of any anticipated delays in delivery. IDT will not be liable for any loss, damages or penalty resulting from delay in delivery.

Acceptance of the product by the Buyer shall occur no later than fifteen (15) days after shipment. Product not rejected during this fifteen-day period shall be deemed accepted, and all returns shall be handled in accordance the Returns section below. Product cannot be rejected by Buyer based on criteria that were unknown to IDT or based on test procedures that IDT does not conduct.

5. RESTRICTIONS ON USE – Buyer will not cause or permit the modification or reverse engineering of file formats, tools, or image processing of IDT products without express written consent from IDT. Buyer will not develop tools from IDT products or use non- IDT approved tools, products, or software with IDT products without express written consent from IDT. Buyer will not cause or permit any reverse engineering of IDT products.

6. WARRANTY – IDT warrants all products will be of good quality and workmanship and free from material defects. Upon the expiration of the time periods identified below, all liabilities of IDT will terminate. In no event shall IDT be liable for consequential damages.

LIMITED WARRANTY – IDT hereby warrants that IDT’s products will be free from defects in material and workmanship under normal use according to the provisions and limitations, herein set forth. All parts, specifically EXCLUDING expendable ‘wear’ parts, that become unserviceable, due to defective material or workmanship, with one (1) year, parts and labor from date of the original retail purchase, shall at IDT’s option, be repaired or replaced.

LIMITATIONS – The obligations of IDT for breach of warranty shall be limited to products manufactured by IDT; (1) that are installed, operated, and maintained according to IDT’s instruction furnished and/or available to the purchaser upon request; (2) that are installed according to all other applicable Federal, State, and local codes or regulations; and (3) that the purchaser substantiates were defective in material and workmanship notwithstanding that they were properly installed and correctly maintained as set forth and were not abused or misused. The obligation of IDT shall be limited to replacing or repairing the defective product, at the option of IDT. IDT shall not be responsible for any labor or cost of removal or repairing or reinstallation of its products and shall not be liable for transportation costs to and from its operations in Pasadena, CA. Use of parts for modification or repair of the product or any component part thereof not authorized or manufactured by IDT specifically for such product shall void this warranty. This warranty shall not apply to any damage to or defect in the IDT’s products that is

directly or indirectly caused by; (1) FORCE MAJEURE, act of GOD, or other accident not related to an inherent product defect; or (2) abuse, misuse, or neglect of the such product, including any damage caused by improper assembly, installation, adjustment, or faulty instruction of the purchaser. **OTHER THAN AS EXPRESSLY SET FORTH HEREIN ABOVE, IDT MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO ANY OF IDT'S PRODUCTS, INCLUDED BUT NOT LIMITED TO ANY MERCHANT-ABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL IDT BE RESPONSIBLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE SUFFERED BY IDT'S PRODUCTS.** Any person or entity to whom this warranty extends and who claims breach of warranty against IDT must bring suit thereon within one year from the date of occurrence of such breach of warranty or be forever barred from any and all legal or other remedies for such breach of warranty. IDT is not responsible for and hereby disclaims any undertaking, representation, or warranty made by any dealer, distributor, or other person that is inconsistent with or in any way more expensive than the provisions of this limited warranty. This warranty grants specific legal rights and shall be read in conformity with applicable state law. In some jurisdictions, the applicable law mandates warranty provisions that provide greater rights than those provided for herein. In such case, this limited warranty shall be read to include such mandates provisions; and any provision herein that is prohibited or unenforceable in any such jurisdiction shall, as to such jurisdiction, be ineffective to the extent of such prohibition or unenforceable without invalidating the remaining provisions and without affecting the validity or enforceability of such provisions in any other jurisdiction.

6a. Standard Warranty – A standard Warranty is granted to the original purchases by IDT for a period of one (1) year, parts and labor, for the camera and camera accessories excluding Standard Warranty for Digital Media is thirty (30) days. Standard Warranty for Batteries is ninety (90) days or change cycles of less than 400, whichever comes first. The Standard Warranty covers parts and labor charges for products that have been returned pre-paid shipment to an Authorized Service Center. All warranty returns shall be done in accordance with IDT's warranty Return Merchandise Authorization ("RMA") policy, a copy of which is set forth in the Returns section and is posted on IDT's website. Any repaired or replaced product shall be warranted as set forth in this section for a period the greater of (i) the balance of the applicable warranty period relating to such product or (ii) ninety (90) days after it is received by Buyer. Only the components that were repaired or replaced will be eligible for the 90-day period as set forth above.

IDT's warranty does not include products that have defects or failures resulting from; (a) alterations, modifications or repairs by Buyer or unauthorized third parties or (b) accident, disaster, neglect, abuse, misuse, improper handling or storage by the Buyer. This includes, but is not limited to: water damage, mold in the lenses from improper storage, droppage, modification to the camera, opening the camera body, use of non- IDT cables, or third party accessories, etc. Removal or modification of camera lens mount voids any and all warranties except when the lens mount is replaced by the Buyer with an IDT approved lens mount. Breaking the seal on the camera body is prohibited and voids any and all warranties. Any parts replaced by IDT during warranty repair are the property of IDT and will not be returned to Buyer.

IDT products are compatible with IDT software, IDT parts, and IDT products only. Use of any software, parts, or products other than IDT or IDT approved software, parts, and products voids any and all warranties.

EXCEPT AS SPECIFICALLY SET FORTH ABOVE, IDT AND ITS LICENSORS MAKES NO WARRANTIES, CONDITIONS, REPRESENTATION OR TERMS, EXPRESS OR IMPLIED, WHETHER BY STATUE, COMMON LAW, CUSTOM, USAGE OR OTHERWISE AS TO THE IDT PRODUCT OR ANY COMPONENT THEREOF, INCLUDING BUT NOT LIMITED TO NON-INFRINGEMENT OF THIRD PARTY RIGHTS, INTEGRATION, MERCHANTABILITY, SATISFACTORY QUALITY, OR FITNESS FOR ANY PARTICULAR PURPOSE. IDT AND

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- 6b. Third-Party Warranty – IDT does not honor warranty agreements extended by third parties. Only warranty agreements granted by IDT will be honored by IDT.

THE SOLE REMEDY UNDER THIS WARRANTY SHALL BE THE REPAIR, REPLACEMENT, OR CREDIT FOR DEFECTIVE PARTS AS STATED ABOVE. THIS WARRANTY IS THE SOLE WARRANTY GIVEN BY IDT AND IS IN LIEU OF ANY OTHER WARRANTIES EITHER EXPRESS OR IMPLIED. THIS WARRANTY EXTENDS TO THE BUYER AND IS NON-TRANSFERABLE TO OTHER THIRD PARTIES.

- 6c. IDT Re-Certified Product Warranty – All Electronic Products that are not possessed by the original Buyer may be sent to an Authorized IDT Service Center for an evaluation fee of \$500. IDT will provide a quotation for the re-certification of the product to existing IDT product specifications at time of repair. The Customer is responsible for all costs associated with such re-certification, such as troubleshooting, diagnosis, repair, test, calibration, and shipping costs. The evaluation fee will be applied to the cost of the re-certification if the cost of the re-certification is greater than the evaluation fee. Upon completion of re-certification, customer may be offered an IDT Re-Certified Product Warranty for an additional cost determined at that time.

“Customer” is defined as an entity who obtained an IDT product by other means than directly from IDT. Product re-certification is only available to a Customer and is limited to a one re-certification per Customer upon a change of ownership. As part of the process, IDT will register the Product to the new Customer.

An IDT Re-Certified Product Warranty is valid for a period of ninety (90) days for the camera and camera accessories after the warranty is accepted by the Customer. IDT Re-Certified Product Warranty is not available for Digital Media and Batteries.

- 6d. Non-Warranty Repair – Product that no longer qualifies for Warranty Repair may be sent to an Authorized IDT Service Center for an evaluation fee of \$250. IDT will provide a quotation for the repair of the product. The Customer is responsible for all costs associated with such refurbishment, such as troubleshooting, diagnosis, repair, test, calibration, and shipping costs. The evaluation fee will be applied to the cost of the refurbishment if the cost of the refurbishment is greater than the evaluation fee. Any repaired or replaced product shall be warranted for ninety (90) days after it is received by Customer. Only the components that were repaired or replaced will be eligible for the 90-day period. Any parts replaced by IDT during non-warranty repair are the property of IDT and will not be returned to Customer.

7. RETURNS – Buyers must obtain a Return Merchandise Authorization (RMA) prior to the return of any product. Cameras may only be returned for refund within seven (7) days of original delivery by IDT at shipping address specified by Buyer and with less than 10 hours of run time and pass IDT Inbound Quality Control (IQC). Accessories, except Digital Media and Batteries, may be returned for refund within seven (7) days of original delivery by IDT at shipping address specified by Buyer and pass IDT IQC.

- 7a. Factory Seal – If the factory seal on the product has been broken, a return will not be accepted, unless IDT gives specific approval for such a return after evaluation (subject to \$500 evaluation fee) and the returned product is subject to a 25% restocking fee. All equipment must be shipped in as new condition and in the original shipping materials. Refunds are subject to an evaluation of the merchandise upon receipt at IDT as defined above, in addition to other tests to ascertain condition of returned goods. A refund less the restocking fee will be provided within forty-five (45) days of completion of evaluation of goods at IDT.

- 7b. Shipping – Buyer is responsible for shipping costs to return product to IDT. For Buyer's protection, IDT recommends that the Buyer uses a traceable and insurable form of mail for shipment.
- 7c. Buyer has seven (7) days from the date the RMA is issued to deliver the product to IDT. All product received seven (7) days after the RMA was issued will not be considered eligible as a return for credit. IDT will return product to Buyer and Buyer will assume all shipping costs.
- 7d. Dangerous Goods Requirements – Buyer acknowledges that Buyer has been advised of the Dangerous Goods shipping requirements relating to lithium ion batteries. If Buyer's return includes a lithium ion battery, Buyer agrees to have the battery shipped by a certified shipper of Dangerous Goods. Buyer further agrees not to attempt to ship any lithium ion battery that has been physically damaged. Buyer agrees to indemnify and hold IDT and its employees harmless from any and all liability arising from Buyer's failure to comply with this provision.

8. CUSTOMER SOURCE INSPECTION – a fee of \$500 will be charged for any order requiring customer source inspection or receipt of goods, at the IDT facility.

No-Trouble Found Inspection Fee – Any product sent to IDT for inspection or evaluation where IDT finds no defects or problems with IDT product will be subject to a No-Trouble Found Inspection Fee of \$250. The No-Trouble Found Inspection policy is in place to encourage the Customer to exhaust all technical support resources before shipping product to IDT.

9. LIMITATION OF LIABILITY – IN NO EVENT SHALL IDT OR ITS LICENSORS BE LIABLE TO BUYER FOR ANY INDIRECT, CONSEQUENTIAL, PUNITIVE, INCIDENTAL, OR SPECIAL DAMAGES, OR ANY DAMAGES WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR PROFITS (HOWEVER CAUSED AN UNDER ANY THEORY OF LIABILITY), EVEN IF IDT OR ITS LICENSORS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL IDT'S OR ITS LICENSORS' LIABILITY FOR A PRODUCT (WHETHER ASSERTED AS A TORT CLAIM, A CONTRACT CLAIM OR OTHERWISE) EXCEED THE AMOUNTS PAID TO IDT FOR SUCH PRODUCT. IN ADDITION, IN NO EVENT SHALL IDT'S LIABILITY FOR ALL CLAIMS ARISING OUT OF OR RELATING TO THIS ORDER EXCEED \$25,000 (TWENTY-FIVE THOUSAND U.S. DOLLARS). IN NO EVENT WILL IDT OR ITS LICENSORS BE LIABLE FOR COSTS OF PROCUREMENT OF SUBSTITUTE GOODS BY BUYER. IN NO EVENT SHALL IDT OR ITS LICENSORS BE LIABLE FOR DAMAGES ARISING OUT OF ANY LATE DELIVERY. THE LIMITATIONS SET FORTH HEREIN SHALL APPLY TO ALL LIABILITIES THAT MAY ARISE OUT OF THIRD-PARTY CLAIMS AGAINST BUYER. THESE LIMITATIONS SHALL APPLY NOTWITHSTANDING ANY FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY. THE LIMITATION SET FORTH IN THIS SECTION SHALL APPLY WHERE THE DAMAGES ARISE OUT OF OR RELATED TO THIS AGREEMENT.

10. INDEMNIFICATION – Buyer shall indemnify, defend, and hold IDT and IDT's officers, agents, other representatives and licensors harmless from all demands, claims, actions, causes of actions, proceedings, suits, assessments, losses, damages, liabilities, settlements, judgments, fines, penalties, interest, costs and expenses incurred (including fees and disbursements of legal counsel) of every kind (i) based upon personal injury or death or injury to property to the extent any of the foregoing is proximately caused Buyer's misuse of the product or by the negligent or willful acts or omissions by the Buyer, or (ii) based on any breach of this agreement by the Buyer.

11. PROPRIETARY INFORMATION – IDT retains for itself and its licensors all proprietary rights, including without limitation all patent, trademark, trade secret, copyright and other intellectual property rights in and to all IDT designs, manufacturing processes, engineering details, and other data pertaining to any product sold except where the rights have been assigned to pursuant to a written agreement signed by a corporate officer of IDT. The products are offered for sale and sold by IDT on the condition that such sale does not convey any right, express or implied, stated or otherwise, under any intellectual property or manufacturing process. IDT and its licensors

expressly reserves all intellectual property rights in the product. Without limited the foregoing, all software included in the products (including any updates to such software provided to Buyer, if applicable) is licensed to Buyer, not sold, and Buyer shall not transfer any such software apart from the product, or modify, decompile, disassemble or reverse engineer or otherwise attempt to derive the source code of such software.

12. NON-WAIVER – Failure of IDT to insist upon strict performance of any terms and conditions herein shall not be deemed a waiver of any subsequent default of terms and conditions thereof.

13. LAW GOVERNING AND EXCLUSIVE JURISDICTION – This Agreement is to be interpreted in accordance with the laws of the State of Florida, United States of America. The sale of any IDT product to Buyer is considered to have taken place in Leon County, Florida and shall be governed by this Agreement. This Agreement will not be governed by the conflict of law rules or the United Nations Convention on Contracts for the International Sale of Goods, the application of which is expressly excluded. Exclusive jurisdiction for any dispute arising from the terms and conditions of this Agreement shall be Leon County, Florida and both Buyer and IDT waive all rights to have a dispute brought elsewhere.

14. SEVERABILITY – If any of the terms and conditions of this Agreement is held to be invalid under any applicable statute or rule of law, they are, to that extent, deemed omitted.

15. COMPLETE AGREEMENT - The terms and conditions set forth herein comprise the entire agreement between IDT and the Buyer.

1.2. Return address

Please contact your local dealer within 7 days to obtain an RMA. Included in the original shipping container is a return shipping label. Product must be returned in its original packaging and shipping container and must be in good working order.

Return address:

**Integrated Design Tools, Inc.
1 W Mountain Street, Suite 3
PASADENA CA 91103-3070
United States of America
Attn.: Service Department
T: (+1) 626 794-4649
F: (+1) 626 794-4651**

2. Precautions

2.1. Cleaning the sensor

Clean the optical surfaces with filtered, compressed air and glass cleaner or distilled water. Use a cotton swab or lens paper. Do not use alcohol or other solvents as these may damage the optical coating and cements.

2.2. Laser

Do not focus a laser beam on the sensor directly or by reflection, it can cause permanent damage to the sensor. Any laser powerful enough to produce localized heating at the surface of the sensor will cause damage, even if the camera power is off. **Laser-damaged sensors are NOT covered by the warranty.**

3. System Overview

3.1. Introduction to the cameras



MotionPro Y Series consists of cameras with superlative recording speeds and memory capacities.

The Pixel Pipeline design improves dynamic range, and provides the power to adjust images on the fly. For precision triggering and data acquisition, Y cameras include IRIG-B and GPS time code functionality. Gigabit Ethernet, USB 2.0 and HDMI serve as available outputs, enabling fast download and instant playback of the acquired images. With an available app, users can control the camera wirelessly on iPad, iPhone or PDA.

Y Series cameras are the primary option for recording high speed events, such as supersonic ballistics and aerodynamic tests and research. The improved capability afforded by the larger bodies also make Y cameras ideal for those applications demanding the best image quality, such as for extreme slow motion in cinema.

Like all IDT cameras, Y-Series models are rated to withstand 100Gs of shock and 40Gs vibration and temperatures -30 to 50C. They also are fully interactive with Motion Studio software and the MotionPro Timing Hub, creating cross compatibility between cameras and complete customization of multi-camera systems. Sensor exposure of as little as 1 μ s minimizes motion blur in individual frames.



Although small and lightweight the **MotionXtra NR Series** cameras are capable to attain speeds and image quality comparable to larger cameras.

Succeeding N Series, NR presents a radical shift in camera body design. By subtly adjusting the internal components, memory capabilities increased fourfold, to (currently) 5 GB storage while also augmenting user control, enabling the real time image honing Pixel Pipeline for superior image stability, clarity and control.

NR cameras are 3D-ready with the addition of a second camera; a short inter-optical distance enables stereoscopic effects at closer distance. NR cameras feature a simplified rear panel with a single I/O jack enabling the potential for dust and waterproof cameras. These LEMO-16 (standard) or 21-pin (airborne) jacks connect to an external hub which splits the signal providing power, video feedback and computerized control.

NR cameras are indispensable for applications requiring the small size and weight, such as onboard crash testing or mounted aircraft tests. With a sealed interior, the unrivaled NR cameras are the only choice for externally-mounted high speed image capture at high altitudes.





MotionScope M Series is the preferred solution for continuous acquisition of high speed image streams. Each camera offers the smallest, lightest bodies and are optimized to record for long stretches. They are further distinguished by functional split screen recording, allowing each half of the sensor to operate as individual apparatus.

Compatible with two of the most widely used programming environments, LabVIEW and MatLab, M cameras are fully integrated into preexisting computer controlled environments built for gathering and assessing data. The provided SDK enhances user control over every aspect of the recording and automation process. The proprietary Taurus platform, with multiple memory configurations available, is another option for custom- IDT systems.

M Series cameras are integral for such lengthy applications as specialized research and industrial tasks, including parachute deployment/landing and automated item, process or subject scanning.

All IDT cameras, including the M Series, are fully compatible with Motion Studio. Additionally, all cameras resist shock up to 100Gs, and temperatures between -30 and 50C. Exposure times for all cameras can be as fast as 1 μ s, minimizing motion blur for the fastest of movements.



The **X-Series** is the first high-speed camera featuring a CMOS sensor that can support a **double-exposure** mode. This mode advance allows two consecutive exposures within a 100-nanosecond interval, a revolution for capturing the motion of objects at ultra-high speeds, as in Particle Image Velocimetry. High framing rates are achieved using the partial windowing capability. **The X-Series** cameras are designed for use in industrial and scientific applications that include machine vision, microscopy, and flow and spray analysis.

The camera is supplied in one basic memory configuration: 4 GB.

The cameras feature a **USB 2.0** digital interface and **Giga-Ethernet (1000 Mbps)** that provides true and easy plug-and-play installation and capabilities at a high-speed rate of transfer to a desktop or laptop computer with a single cable. Also, the readily accessible sync input and output signals quickly integrate the camera with illumination sources, such as laser or strobe light. A video output signal (PAL/NTSC) and IRIG-B are also available.



HG systems are rugged cameras that can withstand violent forces up to 100 G. They come equipped with an internal battery for memory backup, and feature a synchronization scheme via a hub that has become the standard among many automotive manufacturers.

HG camera designs are ideal for Range, Aerospace, and Ballistics applications due to their rugged build, and their ability to perform in a wide range of environments. Accurate phase synchronization between cameras is easy using GPS signals, even when the cameras are miles apart.

The unique ability to process images via look-up tables (LUTs) on the fly allows the system to acquire and download 10 bit dynamic range images at the same fast rate as downloading 8 bit images. Custom LUTs can also be created for the specific needs of any application.

Current HG models supported by Motion Studio and the SDK are:

- Legacy Redlake cameras (**HG-2000**, **CR-2000**, **HG-TX**).
- **HG-100K**, **HG-LE**, **HG-TH**.
- New **HG-XR**, **HG-XL** and **HG-CH**.

3.2. System components

The systems components are listed below.

- **Camera:** it is the first high-speed camera featuring a CMOS sensor capable of supporting a double-exposure mode. The camera body accepts standard C-mount lenses.
- **MotionPro X/Y and MotionXtra NR (N) Digital Interface:** The USB 2.0 (480 Mbps) cable or Giga-Ethernet (1000 Mbps) provides data and control signals to and from the camera as well as it connects the camera to any USB 2.0 or Ethernet port on your personal computer or laptop. N cameras do not have any USB interface.
- **MotionScope M Digital Interface:** the camera interfaces to a computer system via a Full Camera Link™ frame grabber. Currently supported frame grabbers are the Dalsa-Coreco X64 Xcelera-CL PX4 and the National Instruments PCIe-1429.
- **Power Source:** The power source provides external power to the camera
- **Trigger and Synchronization Connectors:** The camera has three BNC connectors for input and output of synchronization signals and triggering. These signals are CMOS level, and provide a means to synchronize the camera with an external clock or triggered it with relationship to a given event. The synchronization signals are generated for every image frame produced.
- **Software and SDK:** operates in Windows 2000, XP, Vista and MAC OS X (10.2 and later) environment.
- **Optical Interface:** The standard interface is C-mount. C-to F and Canon mount converters are available upon request.

3.3. System accessories

- **MotionPro Timing Hub:** USB 2.0 digital interface, integrated control software with 8 outputs and 2 inputs.
- **MotionPro Data Acquisition (DAS):** USB 2.0 digital interface, integrated control software with 16 analog inputs, 4 analog outputs and 16 digital I/O channels.
- **Galileo Wireless Sync/Trigger system.**
- **USB repeater:** for up to 15 m.

3.4. Package contents

Before beginning the installation process, check that the following items are present in the package. If you are missing any of the items listed below, please contact Integrated Design Tools, Inc. or your sales representative.

- Camera.
- I/O USB 2.0 Cable (MotionPro X and Y camera).
- CD-ROM of Motion Studio software suite and documentation.
- Power supply.
- Cross-platform Quick Start Guide.

3.5. Minimum computer requirements

| MotionPro X/Y – MotionXtra N | | |
|------------------------------|--|---|
| | PC (Win32 and x64) | MAC |
| Operating System | Windows XP, Vista and 7 | MAC OS X 10.3 (Panther) or higher |
| Processor | Pentium III or equivalent with 500 MHz processor. | G4 MAC OS X compatible |
| RAM | 2 GB | 512 MB |
| USB 2.0 Port | USB 2.0 port that is NOT shared with other devices (X and Y) | high speed USB port that is NOT shared with other devices (X and Y) |
| Network adapter | Giga-Ethernet (recommended) or 10/100 Mbps. | Giga-Ethernet (recommended) or 10/100 Mbps (Y and N). |
| Hard Drive | 60GB or greater hard drive (recommended). | 60GB or greater hard drive (recommended). |

NOTE: Use an USB 2.0 port on the computer or a Giga-Ethernet port. USB 1.1 DOES NOT support camera operation.

| MotionScope M™ | | | |
|-------------------------|--|--|---------------|
| | PC Win32 | PC x64 | MAC |
| Operating System | Windows XP, Vista and 7 @ 32-bit | Windows XP, Vista and 7 @ 64-bit | Not supported |
| Processor | Intel CORE 2 at 2 GHz | Intel CORE 2 at 2 GHz. | Not supported |
| RAM | 2 GB | 4 GB | Not supported |
| Frame Grabber | Coreco X64 Xcelera-CL PX4 NI PCIe-1429 EPIX PIXCI E4 Bitflow Karbon | Coreco X64 Xcelera-CL PX4 EPIX PIXCI E4 Bitflow Karbon | Not supported |
| Computer Slots | One available x4 or larger PCI Express slot | One available x4 or larger PCI Express slot | Not supported |
| Hard Drive | 100GB or greater hard drive | 100GB or greater hard drive | Not supported |

3.6. IRIG Support

X cameras support IRIG B-120. The signal should be connected to the Trigger In connector.

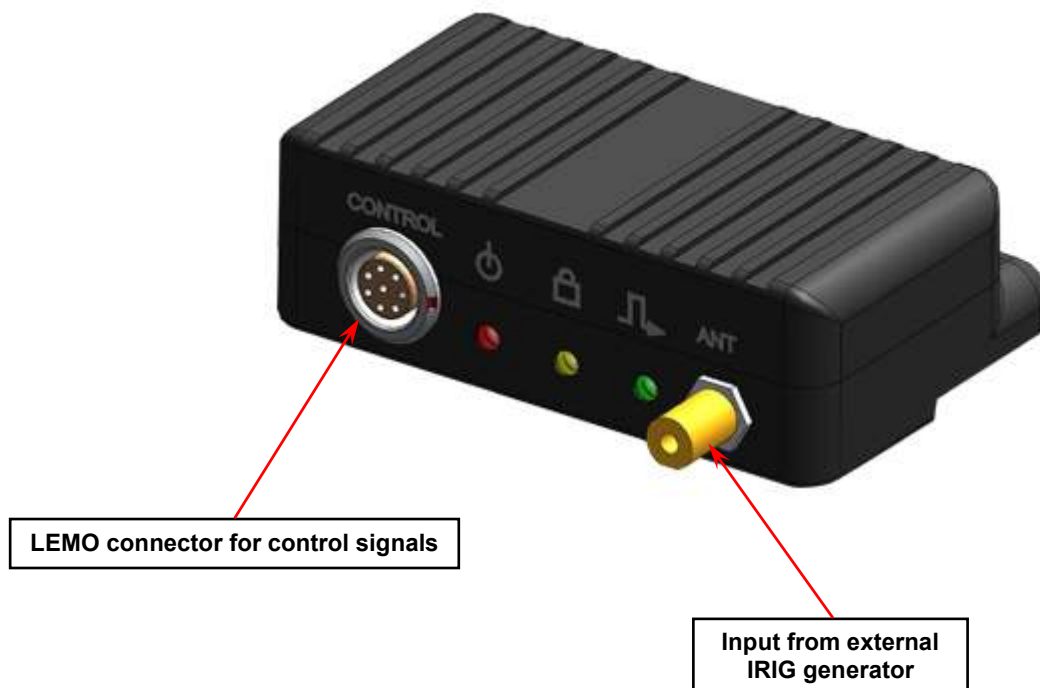
Y cameras support the IRIG modes listed below.

- Modulated IRIG: A, B, D, E, G, H
- Level Shift IRIG: B simple and B differential.

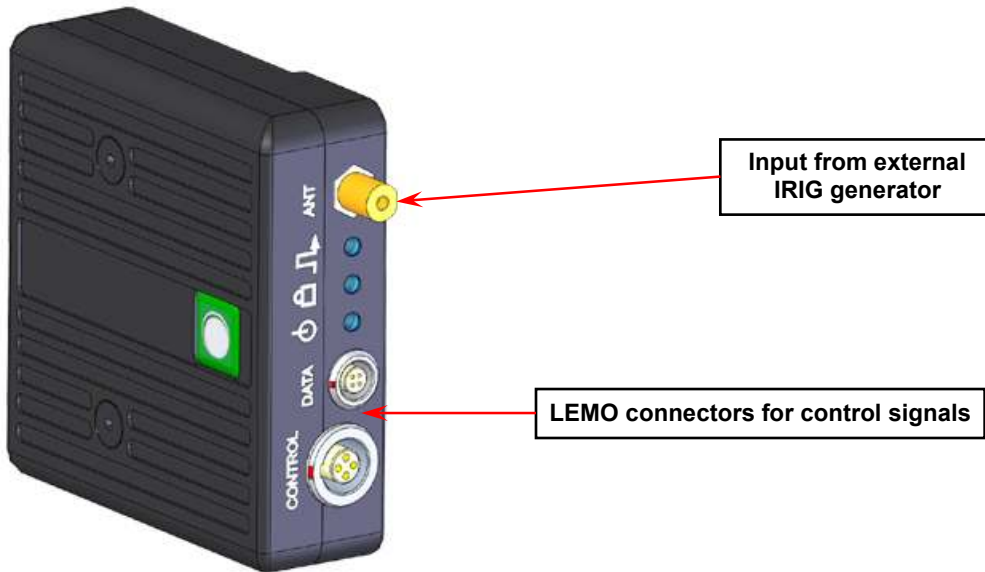
The IRIG signal is detected by an external box docked to the camera and connected to the “Control” 8-pin control LEMO connector. The input IRIG signals come from an external IRIG generator connected to the box.

The module has three LED:

- **Red:** power.
- **Yellow:** IRIG signal is locked
- **Green:** 1 PPS reference signal sent to the camera.

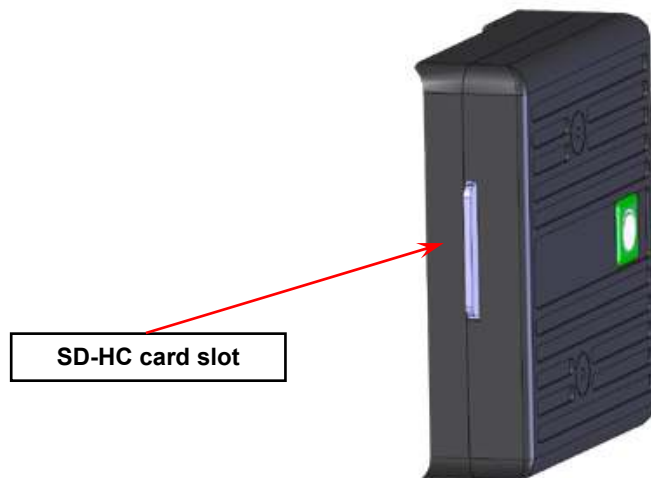


3.7. IRIG-Flash Device



The IRIG flash device is an external box that can be connected to the Y cameras via the external 8-pin and 4-pin control LEMO connectors. The device can be easily hooked to the camera. It is provided with a connector for the IRIG generator and it is fully compatible with the Motion Studio software.

Also, it is provided with a smart card slot that can contain a 16 GB SD card (SD-HC), for a direct download of the acquired images.



WARNING: DO NOT CONNECT the control cables between the module and the camera when the camera is powering up. Connect the cables **BEFORE** powering up the camera or **AFTER** the power up cycle is completed and the back “Status” light is turned into green.

3.8. Camera lens adapter

The cameras are supplied with a standard C-mount. Alternatively, a C to F mount adapter is available to interface with F-mount (Nikon type) lenses. Use Nikon lenses with a tilt/shift capability when imaging at an angle. As an option, mounting hardware for tilt/shift lenses by Canon is also available. Contact your Integrated Design Tools Inc. sales representative for ordering information.

4. Product Specifications

4.1. Camera specifications

The specifications of the IDT high speed camera models are listed below.

4.1.1. MotionPro Y3

| | Y3-classic | Y3-HD |
|--------------------------------|--|--|
| Max fps @ max res | 1030 @ 1280x1024 (1100 @ 1504x1128) | 1470 @ 1920x1080 and 1280x720 |
| Minimum exposure time | 1 μ s | 1 μ s |
| Sensitivity ASA (mono) | 3000 | 6000 |
| Sensitivity ASA (color) | 1000 | 2000 |
| Power requirement | 12V, 6.3 A | 12V, 6.3 A |
| Operating temperature | 0-50° C, 32-122° F | 0-50° C, 32-122° F |
| Memory/DRAM | Internal 8-16 GB | Internal 8-16 GB |
| Sensor Type | CMOS-Sirius | CMOS-Sirius |
| CFA Pattern | BGGR | BGGR |
| Sensor Size | 15.4 x 12.3 mm | 15.4 x 12.3 mm |
| Array Size | 1.3 Megapixels | 1.3 Megapixels |
| Pixel Size | 12x12 μ m | 12x12 μ m |
| Aspect ratio | 5:4 | 5:4 |
| Pixel Fill factor | 40 % | 40 % |
| Dynamic Range | 59 dB | 59 dB |
| Quantum Efficiency QE | 40% | 40% |
| Pixel Depth (mono) | 10-bit | 10-bit |
| Pixel Depth (color) | 30-bit | 30-bit |
| Internal clock | 90.00 MHz | 90.00 MHz |
| Triggers | TTL/switch closure | TTL/switch closure |
| Sync Input | Phase-lock TTL | Phase-lock TTL |
| Sync Output | Frame sync/Strobe | Frame sync/Strobe |
| IRIG | Optional | Optional |
| GPS Time Code | Optional | Optional |
| HDMI | 30 fps | 30 fps |
| Communication | Ethernet (100-1000 BaseT) – USB 2.0 | Ethernet (100-1000 BaseT) – USB 2.0 |
| Size | See mechanical | See mechanical |
| Approx weight | 1.9 kg / 4.18 lbs | 1.9 kg / 4.18 lbs |
| Shock/Vibration Rating | 100G – all axes 40G – all axes | 100G – all axes 40G – all axes |
| Battery | 2 hours operation and backup | 2 hours operation and backup |
| Lens Mount | C-mount standard, F/PL optional | C-mount standard, F/PL optional |
| Tripod mount | Standard ¼-20 photo | Standard ¼-20 photo |

| | Y3-S1 | Y3-S2 |
|--------------------------------|-------------------------------------|-------------------------------------|
| Max fps @ max res | 3000 @ 1280x1024 | 6000 @ 1280x1024 |
| Minimum exposure time | 1 μ s | 1 μ s |
| Sensitivity ASA (mono) | 6000 | 6000 |
| Sensitivity ASA (color) | 2000 | 2000 |
| Power requirement | 12V, 6.3 A | 12V, 6.3 A |
| Operating temperature | 0-50° C, 32-122° F | 0-50° C, 32-122° F |
| Memory/DRAM | Internal 8-16 GB | Internal 8-16 GB |
| Sensor Type | CMOS-Polaris II | CMOS-Polaris II |
| CFA Pattern | GBRG | GBRG |
| Sensor Size | 13.9 x 13.9 mm | 13.9 x 13.9 mm |
| Array Size | 1 Megapixel | 1 megapixel |
| Pixel Size | 10.94x10.94 μ m | 10.94x10.94 μ m |
| Aspect ratio | 1:1 | 1:1 |
| Pixel Fill factor | 40 % | 40 % |
| Dynamic Range | 60 dB | 60 dB |
| Quantum Efficiency QE | 50% | 50% |
| Pixel Depth (mono) | 10-bit | 10-bit |
| Pixel Depth (color) | 30-bit | 30-bit |
| Internal clock | 104.00 MHz | 176.47 MHz |
| Triggers | TTL/switch closure | TTL/switch closure |
| Sync Input | Phase-lock TTL | Phase-lock TTL |
| Sync Output | Frame sync/Strobe | Frame sync/Strobe |
| IRIG | Optional | Optional |
| GPS Time Code | Optional | Optional |
| HDMI | 30 fps | 30 fps |
| Communication | Ethernet (100-1000 BaseT) – USB 2.0 | Ethernet (100-1000 BaseT) – USB 2.0 |
| Size | See mechanical | See mechanical |
| Approx weight | 1.9 kg / 4.18 lbs | 1.9 kg / 4.18 lbs |
| Shock/Vibration Rating | 100G – all axes 40G – all axes | 100G – all axes 40G – all axes |
| Battery | 2 hours operation and backup | 2 hours operation and backup |
| Lens Mount | C-mount standard, F/PL optional | C-mount standard, F/PL optional |
| Tripod mount | Standard ¼-20 photo | Standard ¼-20 photo |

4.1.2. MotionPro Y4

| | Y4-S1 | Y4-S2 | Y4-S3 |
|--------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Max fps @ max res | 3000 @ 1016x1016 | 4500 @ 1016x1016 | 5100 @ 1016x1016 |
| Minimum exposure time | 1 μ s | 1 μ s | 1 μ s |
| Sensitivity ASA (mono) | 6000 | 6000 | 6000 |
| Sensitivity ASA (color) | 2000 | 2000 | 2000 |
| Power requirement | 12V, 6.3 A | 12V, 6.3 A | 12V, 6.3 A |
| Operating temperature | 0-50° C, 32-122° F | 0-50° C, 32-122° F | 0-50° C, 32-122° F |
| Memory/DRAM | Internal 8-16 GB | Internal 8-16 GB | Internal 8-16 GB |
| Sensor Type | CMOS-Polaris II | CMOS-Polaris II | CMOS-Polaris II |
| CFA Pattern | GBRG | GBRG | GBRG |
| Sensor Size | 13.9 x 13.9 mm | 13.9 x 13.9 mm | 13.9 x 13.9 mm |
| Array Size | 1 Megapixels | 1 Megapixel | 1 megapixel |
| Pixel Size | 13.68 x 13.68 μ m | 13.68 x 13.68 μ m | 13.68 x 13.68 μ m |
| Aspect ratio | 1:1 | 1:1 | 1:1 |
| Pixel Fill factor | 40 % | 40 % | 40 % |
| Dynamic Range | 60 dB | 60 dB | 60 dB |
| Quantum Efficiency QE | 50% | 50% | 50% |
| Pixel Depth (mono) | 10-bit | 10-bit | 10-bit |
| Pixel Depth (color) | 30-bit | 30-bit | 30-bit |
| Internal clock | 127.27 MHz | 166.66 MHz | 185.71 MHz |
| Triggers | TTL/switch closure | TTL/switch closure | TTL/switch closure |
| Sync Input | Phase-lock TTL | Phase-lock TTL | Phase-lock TTL |
| Sync Output | Frame sync/Strobe | Frame sync/Strobe | Frame sync/Strobe |
| IRIG | Optional | Optional | Optional |
| GPS Time Code | Optional | Optional | Optional |
| HDMI | 30 fps | 30 fps | 30 fps |
| Communication | Ethernet (100-1000 BaseT) – USB 2.0 | Ethernet (100-1000 BaseT) – USB 2.0 | Ethernet (100-1000 BaseT) – USB 2.0 |
| Size | See mechanical | See mechanical | See mechanical |
| Approx weight | 1.9 kg / 4.18 lbs | 1.9 kg / 4.18 lbs | 1.9 kg / 4.18 lbs |
| Shock/Vibration Rating | 100G – all axes 40G – all axes | 100G – all axes 40G – all axes | 100G – all axes 40G – all axes |
| Battery | 2 hours operation and backup | 2 hours operation and backup | 2 hours operation and backup |
| Lens Mount | C-mount standard, F/PL optional | C-mount standard, F/PL optional | C-mount standard, F/PL optional |
| Tripod mount | Standard ¼-20 photo | Standard ¼-20 photo | Standard ¼-20 photo |

4.1.3. MotionPro Y5

| | Y5-base | Y5-HD |
|---------------------------------|-------------------------------------|---|
| Max fps @ max resolution | 730 fps @ 2336x1728 | 640 fps @ 2560 x 1920 1130 fps @ 2560 x 1080 1020 fps @ 1920 x 1080 |
| Minimum exposure time | 1 μ s | 1 μ s |
| Sensitivity ASA (mono) | 3000 | 3000 |
| Sensitivity ASA (color) | 1000 | 1000 |
| Power requirement | 12V, 6.3 A | 12V, 6.3 A |
| Operating temperature | 0-50° C, 32-122° F | 0-50° C, 32-122° F |
| Memory/DRAM | Internal 8-16 GB | Internal 8-16 GB |
| Sensor Type | CMOS-Orion II | CMOS-Orion II |
| CFA Pattern | GRBG | GRBG |
| Sensor Size | 16.0 x 12.1 mm | 16.0 x 12.1 mm |
| Array Size | 4 Megapixels | 4 Megapixel |
| Pixel Size | 7 x 7 μ m | 7 x 7 μ m |
| Aspect ratio | 4:3 | 4:3 |
| Pixel Fill factor | 55 % | 55 % |
| Dynamic Range | 60 dB | 60 dB |
| Quantum Efficiency QE | 50% | 50% |
| Pixel Depth (mono) | 10-bit | 10-bit |
| Pixel Depth (color) | 30-bit | 30-bit |
| Internal clock | 90, 150, 200 MHz | 90, 132, 176 MHz |
| Triggers | TTL/switch closure | TTL/switch closure |
| Sync Input | Phase-lock TTL | Phase-lock TTL |
| Sync Output | Frame sync/Strobe | Frame sync/Strobe |
| IRIG | Optional | Optional |
| GPS Time Code | Optional | Optional |
| HDMI | 30 fps | 30 fps |
| Communication | Ethernet (100-1000 BaseT) – USB 2.0 | Ethernet (100-1000 BaseT) – USB 2.0 |
| Size | See mechanical | See mechanical |
| Approx weight | 1.9 kg / 4.18 lbs | 1.9 kg / 4.18 lbs |
| Shock/Vibration Rating | 100G – all axes 40G – all axes | 100G – all axes 40G – all axes |
| Battery | 2 hours operation and backup | 2 hours operation and backup |
| Lens Mount | C-mount standard, F/PL optional | C-mount standard, F/PL optional |
| Tripod mount | Standard 1/4-20 photo | Standard 1/4-20 photo |

4.1.4. MotionPro Y6

| | Y6 |
|---------------------------------|-------------------------------------|
| Max fps @ max resolution | 1150 fps @ 1504x1128 |
| Minimum exposure time | 1 μ s |
| Sensitivity ASA (mono) | 9000 |
| Sensitivity ASA (color) | 3000 |
| Power requirement | 12V, 6.3 A |
| Operating temperature | 0-50° C, 32-122° F |
| Memory/DRAM | Internal 8-16 GB |
| Sensor Type | CMOS-Scorpio |
| CFA Pattern | GBRG |
| Sensor Size | 24.0 x 18.0 mm |
| Array Size | 1.7 megapixel |
| Pixel Size | 16 x 16 μ m |
| Aspect ratio | 4:3 |
| Pixel Fill factor | 67 % |
| Dynamic Range | 66 dB |
| Quantum Efficiency QE | 50% |
| Pixel Depth (mono) | 12-bit |
| Pixel Depth (color) | 36-bit |
| Internal clock | 66 MHz |
| Triggers | TTL/switch closure |
| Sync Input | Phase-lock TTL |
| Sync Output | Frame sync/Strobe |
| IRIG | Optional |
| GPS Time Code | Optional |
| HDMI | 30 fps |
| Communication | Ethernet (100-1000 BaseT) – USB 2.0 |
| Size | See mechanical |
| Approx weight | 1.9 kg / 4.18 lbs |
| Shock/Vibration Rating | 100G – all axes 40G – all axes |
| Battery | 2 hours operation and backup |
| Lens Mount | F-mount standard, PL optional |
| Tripod mount | Standard 1/4-20 photo |

4.1.5. MotionPro Y7

| | Y7-S1 | Y7-S2 | Y7-S3 |
|--------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Max fps @ max res | 5000 @ 1920x1080 | 7500 @ 1920x1080 | 9000 @ 1920x1080 |
| Minimum exposure time | 1 μ s | 1 μ s | 1 μ s |
| Sensitivity ASA (mono) | 6000 | 6000 | 6000 |
| Sensitivity ASA (color) | 2000 | 2000 | 2000 |
| Power requirement | 12V, 6.3 A | 12V, 6.3 A | 12V, 6.3 A |
| Operating temperature | 0-50° C, 32-122° F | 0-50° C, 32-122° F | 0-50° C, 32-122° F |
| Memory/DRAM | Internal 8-16-32 GB | Internal 8-16-32 GB | Internal 8-16-32 GB |
| Sensor Type | CMOS-Polaris II | CMOS-Polaris II | CMOS-Polaris II |
| CFA Pattern | GBRG | GBRG | GBRG |
| Sensor Size | 13.9 x 7.8 mm | 13.9 x 7.8 mm | 13.9 x 7.8 mm |
| Array Size | 1 Megapixels | 1 Megapixel | 1 megapixel |
| Pixel Size | 7.24 x 7.24 μ m | 7.24 x 7.24 μ m | 7.24 x 7.24 μ m |
| Aspect ratio | 1:1 | 1:1 | 1:1 |
| Pixel Fill factor | 40 % | 40 % | 40 % |
| Dynamic Range | 60 dB | 60 dB | 60 dB |
| Quantum Efficiency QE | 50% | 50% | 50% |
| Pixel Depth (mono) | 10-bit | 10-bit | 10-bit |
| Pixel Depth (color) | 30-bit | 30-bit | 30-bit |
| Internal clock | 127.27 MHz | 166.66 MHz | 185.71 MHz |
| Triggers | TTL/switch closure | TTL/switch closure | TTL/switch closure |
| Sync Input | Phase-lock TTL | Phase-lock TTL | Phase-lock TTL |
| Sync Output | Frame sync/Strobe | Frame sync/Strobe | Frame sync/Strobe |
| IRIG | Optional | Optional | Optional |
| GPS Time Code | Optional | Optional | Optional |
| HDMI | 30 fps | 30 fps | 30 fps |
| Communication | Ethernet (100-1000 BaseT) – USB 2.0 | Ethernet (100-1000 BaseT) – USB 2.0 | Ethernet (100-1000 BaseT) – USB 2.0 |
| Approx size | See mechanical | See mechanical | See mechanical |
| Approx weight | 1.9 kg / 4.18 lbs | 1.9 kg / 4.18 lbs | 1.9 kg / 4.18 lbs |
| Shock/Vibration Rating | 100G – all axes 40G – all axes | 100G – all axes 40G – all axes | 100G – all axes 40G – all axes |
| Battery | 2 hours operation and backup | 2 hours operation and backup | 2 hours operation and backup |
| Lens Mount | C-mount standard, F/PL optional | C-mount standard, F/PL optional | C-mount standard, F/PL optional |
| Tripod mount | Standard ¼-20 photo | Standard ¼-20 photo | Standard ¼-20 photo |

4.1.6. MotionXtra NR3 (N3)

| | NR3-S1 | NR3-S2 | NR3-S3 |
|---------------------------------|--------------------------------------|--|------------------------------------|
| Max fps @ max resolution | 500 @ 1280x1024 (530 @ 1504x1128) | 1030 @ 1280x1024 (1100 @ 1504x1128) | 2550 fps @ 1280x1024 |
| Minimum exposure time | 1 μ s | 1 μ s | 1 μ s |
| Sensitivity ASA (mono) | 3000 | 3000 | 6000 |
| Sensitivity ASA (color) | 1000 | 1000 | 2000 |
| Power requirement | 12V, 2 A | 12V, 2 A | 12V, 2 A |
| Operating temperature | 0-50° C, 32-122° F | 0-50° C, 32-122° F | 0-50° C, 32-122° F |
| Memory/DRAM | Internal 2.5 / 5 / 10 GB | Internal 2.5 / 5 / 10 GB | Internal 2.5 / 5 / 10 GB |
| Sensor Type | CMOS-Sirius | CMOS-Sirius | CMOS-Polaris II |
| CFA Pattern | BGGR | BGGR | GBRG |
| Sensor Size | 15.4 x 12.3 mm | 15.4 x 12.3 mm | 13.9 x 13.9 mm |
| Array Size | 1.3 Megapixels | 1.3 Megapixels | 1 Megapixel |
| Pixel Size | 12x12 μ m | 12x12 μ m | 10.94 x 10.94 μ m |
| Aspect ratio | 5:4 | 5:4 | 1:1 |
| Pixel Fill factor | 40 % | 40 % | 40 % |
| Dynamic Range | 59 dB | 59 dB | 60 dB |
| Quantum Efficiency QE | 40% | 30% | 50% |
| Pixel Depth (mono) | 10-bit | 10-bit | 10-bit |
| Pixel Depth (color) | 30-bit | 30-bit | 30-bit |
| Internal clock | 50.00 MHz | 90.00 MHz | 90.00 MHz |
| Triggers | TTL/switch closure | TTL/switch closure | TTL/switch closure |
| Sync Input | Phase-lock TTL | Phase-lock TTL | Phase-lock TTL |
| Sync Output | Frame sync/Strobe | Frame sync/Strobe | Frame sync/Strobe |
| IRIG | Optional | Optional | Optional |
| GPS Time Code | Optional | Optional | Optional |
| HDMI | N/A | N/A | N/A |
| Communication | Ethernet (100-1000 BaseT) | Ethernet (100-1000 BaseT) | Ethernet (100-1000 BaseT) |
| Size | See mechanical | See mechanical | See mechanical |
| Approx weight | 0.65 kg / 1.43 lbs | 0.65 kg / 1.43 lbs | 0.65 kg / 1.43 lbs |
| Shock/Vibration Rating | 200G – all axes 40G – all axes | 200G – all axes 40G – all axes | 200G – all axes 40G – all axes |
| Battery | 2 hours operation and backup | 2 hours operation and backup | 2 hours operation and backup |
| Lens Mount | C-mount standard, F/PL optional | C-mount standard, F/PL optional | C-mount standard, F/PL optional |
| Tripod mount | Standard ¼-20 photo | Standard ¼-20 photo | Standard ¼-20 photo |

4.1.7. MotionXtra NR4 (N4)

| | NR4-S1 | NR4-S2 | NR4-S3 |
|---------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| Max fps @ max resolution | 1000 fps @ 1016x1016 | 2000 fps @ 1016x1016 | 3000 fps @ 1016x1016 |
| Minimum exposure time | 1 μ s | 1 μ s | 1 μ s |
| Sensitivity ASA (mono) | 6000 | 6000 | 6000 |
| Sensitivity ASA (color) | 2000 | 2000 | 2000 |
| Power requirement | 12V, 2 A | 12V, 2 A | 12V, 2 A |
| Operating temperature | 0-50° C, 32-122° F | 0-50° C, 32-122° F | 0-50° C, 32-122° F |
| Memory/DRAM | Internal 2.5 / 5 / 10 GB | Internal 2.5 / 5 / 10 GB | Internal 2.5 / 5 / 10 GB |
| Sensor Type | CMOS-Polaris II | CMOS-Polaris II | CMOS-Polaris II |
| CFA Pattern | GBRG | GBRG | GBRG |
| Sensor Size | 13.9 x 13.9 mm | 13.9 x 13.9 mm | 13.9 x 13.9 mm |
| Array Size | 1 Megapixels | 1 Megapixel | 1 megapixel |
| Pixel Size | 13.68 x 13.68 μ m | 13.68 x 13.68 μ m | 13.68 x 13.68 μ m |
| Aspect ratio | 1:1 | 1:1 | 1:1 |
| Pixel Fill factor | 40 % | 40 % | 40 % |
| Dynamic Range | 60 dB | 60 dB | 60 dB |
| Quantum Efficiency QE | 50% | 50% | 50% |
| Pixel Depth (mono) | 10-bit | 10-bit | 10-bit |
| Pixel Depth (color) | 30-bit | 30-bit | 30-bit |
| Internal clock | 45.00 MHz | 90.00 MHz | 128.57 MHz |
| Triggers | TTL/switch closure | TTL/switch closure | TTL/switch closure |
| Sync Input | Phase-lock TTL | Phase-lock TTL | Phase-lock TTL |
| Sync Output | Frame sync/Strobe | Frame sync/Strobe | Frame sync/Strobe |
| IRIG | Optional | Optional | Optional |
| GPS Time Code | Optional | Optional | Optional |
| HDMI | N/A | N/A | N/A |
| Communication | Ethernet (100-1000 BaseT) | Ethernet (100-1000 BaseT) | Ethernet (100-1000 BaseT) |
| Size | See mechanical | See mechanical | See mechanical |
| Approx weight | 0.65 kg / 1.43 lbs | 0.65 kg / 1.43 lbs | 0.65 kg / 1.43 lbs |
| Shock/Vibration Rating | 200G – all axes 40G – all axes | 200G – all axes 40G – all axes | 200G – all axes 40G – all axes |
| Battery | 2 hours operation and backup | 2 hours operation and backup | 2 hours operation and backup |
| Lens Mount | C std, F/PL optional | C std, F/PL optional | C std, F/PL optional |
| Tripod mount | Standard 1/4-20 photo | Standard 1/4-20 photo | Standard 1/4-20 photo |

4.1.8. MotionXtra NR5 (N5)

| | NR5-S1 | NR5-S2 |
|---------------------------------|-----------------------------------|-----------------------------------|
| Max fps @ max resolution | 325 fps @ 2336x1728 | 730 fps @ 2336x1728 |
| Minimum exposure | 1 μ s | 1 μ s |
| Sensitivity ASA (mono) | 3000 | 3000 |
| Sensitivity ASA (color) | 1000 | 1000 |
| Power requirement | 12V, 6.5 A | 12V, 6.5 A |
| Operating temperature | 0-50° C, 32-122° F | 0-50° C, 32-122° F |
| Memory/DRAM | Internal 2.5 / 5 / 10 GB | Internal 2.5 / 5 / 10 GB |
| Sensor Type | CMOS-Orion II | CMOS-Orion II |
| CFA Pattern | GRBG | GRBG |
| Sensor Size | 16.0 x 12.1 mm | 16.0 x 12.1 mm |
| Array Size | 4 Megapixels | 4 Megapixels |
| Pixel Size | 7 x 7 μ m | 7 x 7 μ m |
| Aspect ratio | 4:3 | 4:3 |
| Pixel Fill factor | 55 % | 55 % |
| Dynamic Range | 60 dB | 60 dB |
| Quantum Efficiency QE | 50% | 50% |
| Pixel Depth (mono) | 10-bit | 10-bit |
| Pixel Depth (color) | 30-bit | 30-bit |
| Internal clock | 90 MHz | 200 MHz |
| Triggers | TTL/switch closure | TTL/switch closure |
| Sync Input | Phase-lock TTL | Phase-lock TTL |
| Sync Output | Frame sync/Strobe | Frame sync/Strobe |
| IRIG | Optional | Optional |
| GPS Time Code | Optional | Optional |
| HDMI | 30 fps | 30 fps |
| Communication | Ethernet (100-1000 BaseT) | Ethernet (100-1000 BaseT) |
| Size | See mechanical | See mechanical |
| Approx weight | 0.65 kg / 1.43 lbs | 0.65 kg / 1.43 lbs |
| Shock/Vibration Rating | 200G – all axes 40G – all axes | 200G – all axes 40G – all axes |
| Battery | 2 hours operation and backup | 2 hours operation and backup |
| Lens Mount | C-mount standard, F/PL optional | C-mount standard, F/PL optional |
| Tripod mount | Standard 1/4-20 photo | Standard 1/4-20 photo |

4.1.9. MotionScope M3 and M5

| | M3 | M5 |
|---------------------------------|--|--|
| Max fps @ max resolution | 517 fps @ 1280x1024 | 170 fps @ 2320x1728 |
| Minimum exposure time | 1 μ s | 1 μ s |
| Sensitivity ASA (mono) | 3000 | 3000 |
| Sensitivity ASA (color) | 1000 | 1000 |
| Power requirement | 12 V, 1 A | 12 V, 1 A |
| Operating temperature | 0-50° C, 32-122° F | 0-50° C, 32-122° F |
| Memory/DRAM | PC RAM – 2 GB (Win32), 16 GB (x64), direct write to disk | PC RAM – 2 GB (Win32), 16 GB (x64), direct write to disk |
| Sensor Type | CMOS-Sirius | CMOS-Orion II |
| CFA Pattern | BGGR | GRBG |
| Sensor Size | 15.4 x 12.3 mm | 16.0 x 12.1 mm |
| Array Size | 1.3 Megapixels | 4 Megapixels |
| Pixel Size | 12x12 μ m | 7 x 7 μ m |
| Aspect ratio | 5:4 | 4:3 |
| Pixel Fill factor | 40 % | 55 % |
| Dynamic Range | 59 dB | 60 dB |
| Quantum Efficiency QE | 40% | 50% |
| Pixel Depth (mono) | 10-bit | 10-bit |
| Pixel Depth (color) | 30-bit | 30-bit |
| Internal clock | 72.00 MHz | 40.00 MHz |
| Triggers | TTL/switch closure | TTL/switch closure |
| Sync Input | Phase-lock TTL | Phase-lock TTL |
| Sync Output | Frame sync/Strobe | Frame sync/Strobe |
| IRIG | N/A | N/A |
| GPS Time Code | N/A | N/A |
| HDMI | N/A | N/A |
| Communication | Full CameraLink 10 taps 8 bit each | Full CameraLink 10 taps 8 bit each |
| Size | See mechanical | See mechanical |
| Approx weight | 0.32 kg / 0.71 lbs | 0.32 kg / 0.71 lbs |
| Shock | 100G – all axes | 100G – all axes |
| Battery | N/A | N/A |
| Lens Mount | C-mount standard, F optional | C-mount standard, F optional |
| Tripod mount | Standard 1/4-20 photo | Standard 1/4-20 photo |

4.1.10. X-Series

| | XS-3 | HS3 / X3 | HS4 / X4 | X5 |
|---------------------------------|--|------------------------|----------------------|-----------------------|
| Max fps @ max resolution | 517 fps @ 1280 x 1024 | 1040 fps @ 1280 x 1024 | 5130 fps @ 512 x 512 | 250 fps @ 2352 x 1728 |
| Pixel Size | 12x12 µm | 12x12 µm | 16x16 µm | 7x7 µm |
| Sensor Dynamic Range | 59 dB | 59 dB | 57 dB | 60 dB |
| Sensor aspect ratio | 5:4 | 5:4 | 1:1 | 4:3 |
| Pixel Fill factor | 40 % | 40 % | 62 % | 55 % |
| Pixel Depth (mono) | 10-bit | 8-bit | 8-bit | 8-bit |
| Pixel Depth (color) | 24-bit | 24-bit | 24-bit | 24-bit |
| Minimum exposure | 1 µs | 1 µs | 1 µs | 1 µs |
| Pixel Depth (color) | 24-bit | 24-bit | 24-bit | 24-bit |
| Internal clock | 90 MHz | 90 MHz | 90 MHz | 66 MHz |
| | | | | |
| Triggers | TTL/switch closure | | | |
| Sync Input | Phase-lock TTL | | | |
| Sync Output | Frame sync/Strobe | | | |
| IRIG | Optional | | | |
| GPS Time Code | N/A | | | |
| HDMI | N/A | | | |
| Communication | Ethernet (100-1000 BaseT) – USB 2.0 | | | |
| | | | | |
| Approx Size | 95 x 95 x 162 mm 3.7 x 3.7 x 6.3 in | | | |
| Approx weight | 1.9 kg – 4.18 lbs | | | |
| Battery | N/A | | | |
| Lens Mount | C-mount, F-mount (Nikon and Canon) | | | |
| Tripod Mount | Standard ¼-20 photo mounts | | | |

4.2. Camera back panel

4.2.1. MotionPro Y

The MotionPro Y-series camera back panel is shown below.



4-pins Control connector

The Sync/Trigger signals are available through the pins of the Control LEMO Connector. The connector is located in the central part of the back panel. The signals mapping is listed in the table below:

| PIN # | Position | Type | Signal |
|-------|-------------|--------|------------|
| 1 | Upper-Left | INPUT | Trigger In |
| 2 | Lower-Left | INPUT | Sync In |
| 3 | Lower-Right | OUTPUT | Sync Out |
| 4 | Upper-Right | - | Ground |

8-pins Control connector

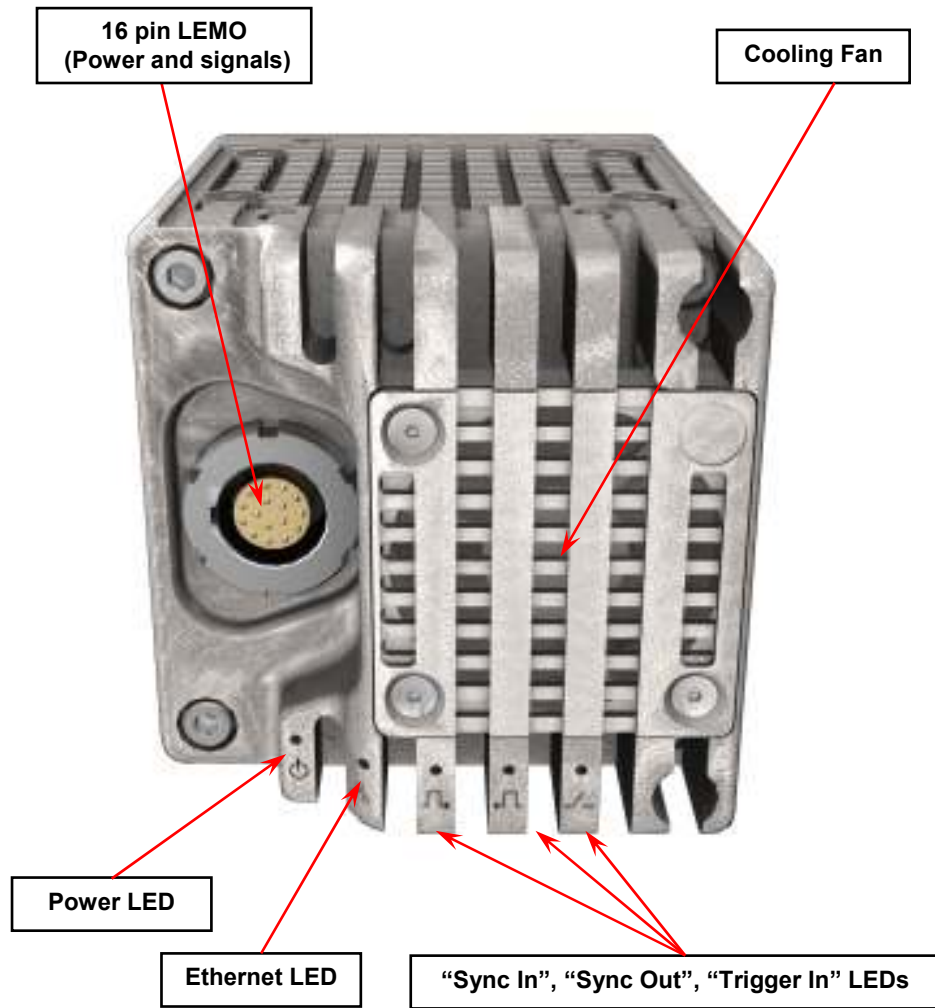
The 8 PIN size 1 LEMO connector pin-out is listed below:

- **PIN 1:** upper position close to the red dot.
- **PIN 2 to 7:** counter clockwise from PIN1.
- **PIN 8:** central position.

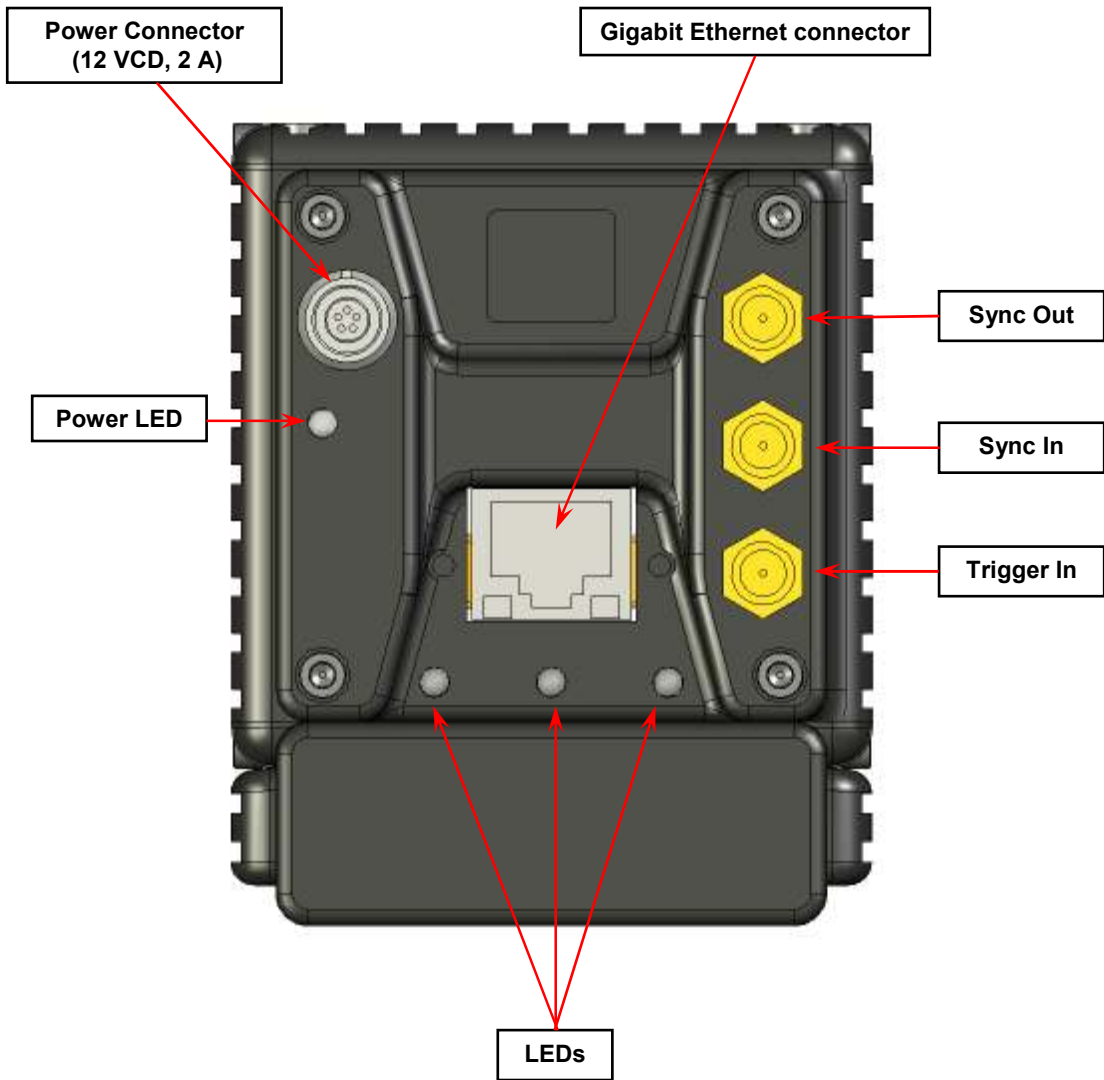
| PIN # | Type | Signal |
|-------|------|------------|
| 1 | - | +12 V |
| 2 | - | Ground |
| 3 | IN | Trigger In |
| 4 | IN | Sync In |
| 5 | OUT | Sync Out |
| 6 | IN | RX |
| 7 | OUT | TX |
| 8 | IN | GPS |

RX and TX are “receive” and “transmit” signals of the new internal serial interface.

4.2.2. MotionXtra NR

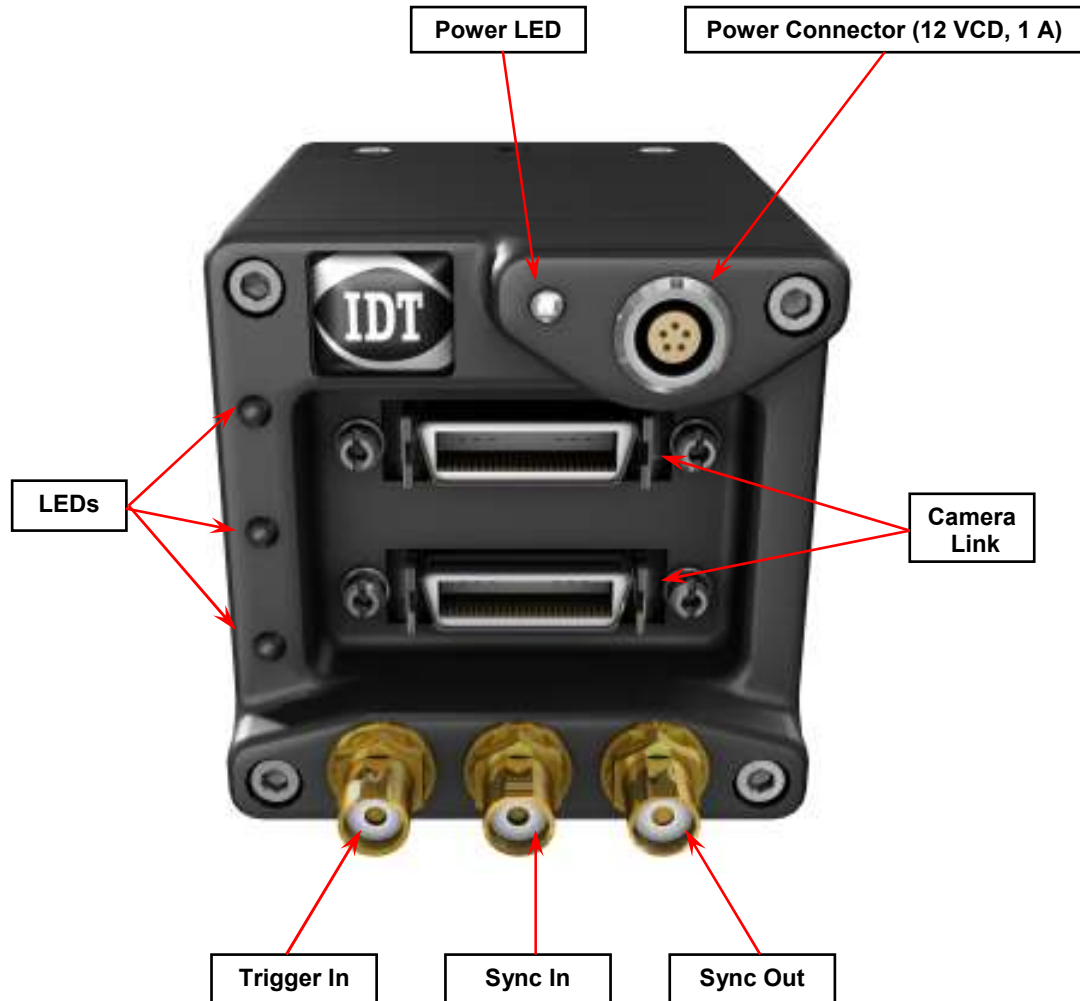


4.2.3. MotionXtra N



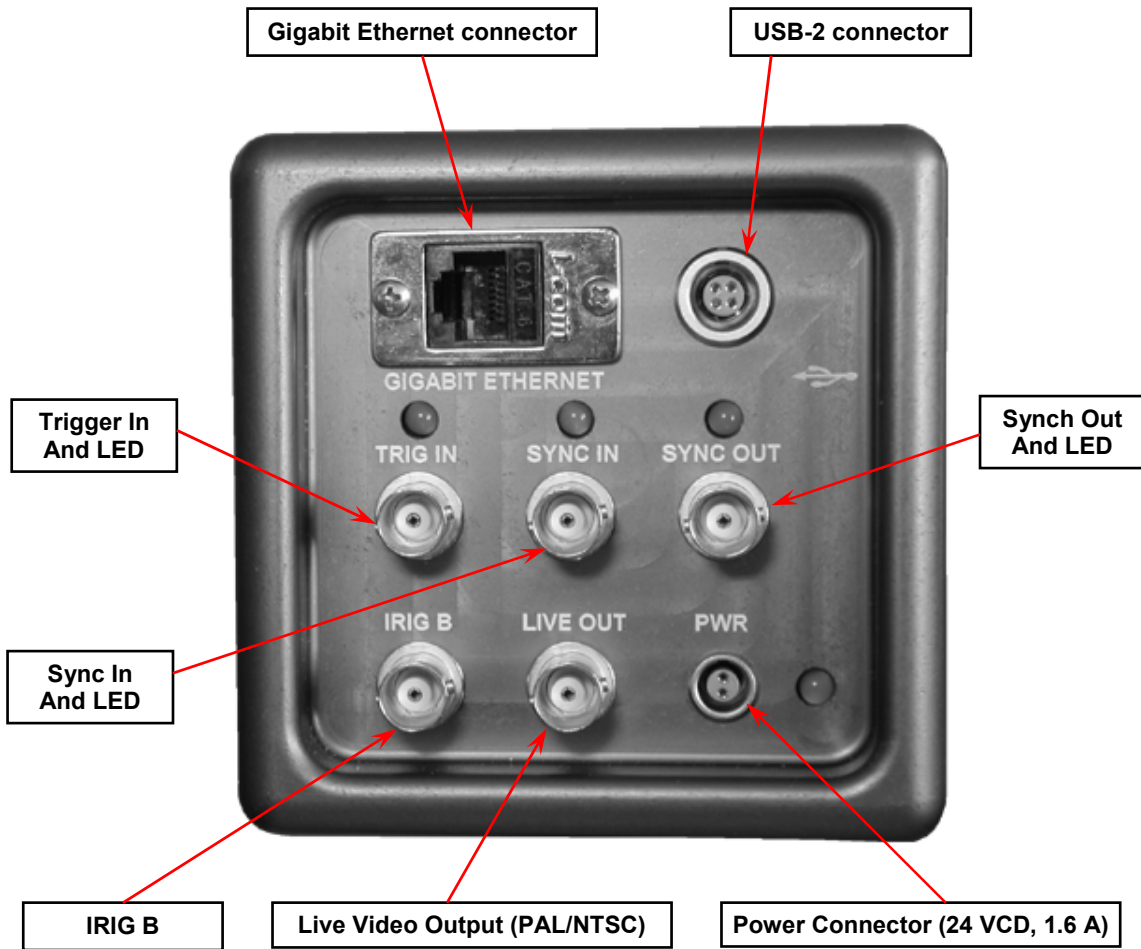
4.2.4. MotionScope M

The MotionScope M-series camera back panel is shown below.



4.2.5. MotionPro X

The MotionPro X USB 2.0/Gigabit-Ethernet camera back panel is shown below.



4.3. Frame Rates

In the tables below, the max frame rates for some camera resolutions.

4.3.1. Y-Series

| MotionPro Y3-Classic | | |
|----------------------|------------|------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 1280 x1024 | 1,030 | 2,065 |
| 1280 x 512 | 2,065 | 4,125 |
| 1280 x 256 | 4,125 | 8,210 |
| 1280 x 128 | 8,210 | 16,000 |
| 1280 x 64 | 16,000 | 32,000 |
| 1280 x 32 | 32,000 | 62,000 |
| 1280 x 16 | 62,000 | 115,000 |

| MotionPro Y3-S1 | | |
|-----------------|------------|------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 1280 x1024 | 3,030 | N/A |
| 1280 x 512 | 6,000 | N/A |
| 1280 x 256 | 11,240 | N/A |
| 1280 x 128 | 21,000 | N/A |
| 1280 x 64 | 34,000 | N/A |
| 1280 x 32 | 50,000 | N/A |
| 1280 x 16 | 70,000 | N/A |

| MotionPro Y3-S2 | | |
|-----------------|------------|------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 1280 x1024 | 6,030 | N/A |
| 1280 x 512 | 11,700 | N/A |
| 1280 x 256 | 22,100 | N/A |
| 1280 x 128 | 40,000 | N/A |
| 1280 x 64 | 65,000 | N/A |
| 1280 x 32 | 96,000 | N/A |
| 1280 x 16 | 140,000 | N/A |

| MotionPro Y4-S1 | | |
|-----------------|------------|------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 1016 x 1016 | 3,000 | 5,800 |
| 1016 x 512 | 5,800 | 11,100 |
| 1016 x 256 | 11,100 | 20,200 |
| 1016 x 128 | 20,200 | 34,300 |
| 1016 x 64 | 34,300 | 52,000 |
| 1016 x 32 | 52,000 | 72,000 |
| 1016 x 16 | 72,000 | 88,000 |

| MotionPro Y4-S2 | | |
|-----------------|------------|------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 1016 x 1016 | 4,500 | 8,800 |
| 1016 x 512 | 8,800 | 16,700 |
| 1016 x 256 | 16,700 | 30,600 |
| 1016 x 128 | 30,600 | 52,000 |
| 1016 x 64 | 52,000 | 79,000 |
| 1016 x 32 | 79,000 | 108,000 |
| 1016 x 16 | 108,000 | 132,000 |

| MotionPro Y4-S3 | | |
|-----------------|------------|------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 1016 x 1016 | 5,100 | 9,820 |
| 1016 x 512 | 9,820 | 18,700 |
| 1016 x 256 | 18,700 | 34,000 |
| 1016 x 128 | 34,000 | 58,000 |
| 1016 x 64 | 58,000 | 89,000 |
| 1016 x 32 | 89,000 | 122,000 |
| 1016 x 16 | 122,000 | 150,000 |

| MotionPro Y5 | | |
|--------------|------------|------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 2352 x 1728 | 730 | 1,455 |
| 2352 x 1024 | 1,230 | 2,455 |
| 2352 x 512 | 2,455 | 4,890 |
| 2352 x 256 | 4,890 | 9,720 |
| 2352 x 128 | 9,720 | 19,100 |
| 2352 x 64 | 19,100 | 37,000 |
| 2352 x 32 | 37,100 | 69,000 |

| MotionPro Y6 | | |
|--------------|------------|------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 1504 x 1128 | 1,000 | N/A |
| 1280 x 1024 | 1,200 | N/A |
| 1024 x 768 | 2,000 | N/A |
| 800 x 600 | 3,200 | N/A |
| 640 x 480 | 4,500 | N/A |
| 512 x 512 | 5,000 | N/A |
| 480 x 320 | 8,900 | N/A |
| 256 x 256 | 17,300 | N/A |

| MotionPro Y7 | | | |
|---------------------|-----------------|-----------------|-----------------|
| Dyn Mag | S1 [fps] | S2 [fps] | S3 [fps] |
| 1X | 5,000 | 7,500 | 9,000 |
| 1.25X | 6,100 | 9,100 | 10,900 |
| 1.5X | 7,200 | 10,600 | 12,800 |
| 2X | 9,150 | 13,600 | 16,300 |
| 3X | 13,900 | 20,800 | 25,000 |
| 4X | 16,500 | 24,500 | 29,400 |
| 5X | 19,000 | 28,300 | 33,900 |
| 6X | 23,900 | 35,600 | 42,800 |
| 7X | 27,500 | 40,800 | 48,800 |
| 8X | 35,400 | 51,800 | 62,800 |

4.3.2. NR-Series (N)

| MotionXtra NR3-S1 | | |
|-------------------|------------|------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 1280 x 1024 | 500 | 1000 |
| 1280 x 512 | 1000 | 2000 |
| 1280 x 256 | 2000 | 4000 |
| 1280 x 128 | 4000 | 8000 |
| 1280 x 64 | 8000 | 16000 |
| 1280 x 32 | 16000 | 32000 |
| 1280 x 16 | 32000 | 64000 |

| MotionXtra NR3-S2 | | |
|-------------------|------------|------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 1280 x 1024 | 1,030 | 2,065 |
| 1280 x 512 | 2,065 | 4,125 |
| 1280 x 256 | 4,125 | 8,210 |
| 1280 x 128 | 8,210 | 16,000 |
| 1280 x 64 | 16,000 | 32,000 |
| 1280 x 32 | 32,000 | 62,000 |
| 1280 x 16 | 62,000 | 115,000 |

| MotionXtra NR3-S3 | | |
|-------------------|------------|------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 1280 x 1024 | 2,500 | N/A |
| 1280 x 512 | 4,960 | N/A |
| 1280 x 256 | 9,420 | N/A |
| 1280 x 128 | 17,700 | N/A |
| 1280 x 64 | 29,000 | N/A |
| 1280 x 32 | 42,000 | N/A |
| 1280 x 16 | 62,000 | N/A |

| MotionXtra NR4-S1 | | |
|-------------------|------------|------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 1016 x 1016 | 1,000 | 1,980 |
| 1016 x 512 | 1,980 | 3,900 |
| 1016 x 256 | 3,900 | 7,580 |
| 1016 x 128 | 7,580 | 14,500 |
| 1016 x 64 | 14,500 | 24,000 |
| 1016 x 32 | 24,000 | 35,000 |
| 1016 x 16 | 35,000 | 45,000 |

| MotionXtra NR4-S2 | | |
|--------------------------|-------------------|-------------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 1016 x 1016 | 2,000 | 3,980 |
| 1016 x 512 | 3,980 | 7,750 |
| 1016 x 256 | 7,750 | 14,700 |
| 1016 x 128 | 14,700 | 26,000 |
| 1016 x 64 | 26,000 | 42,000 |
| 1016 x 32 | 42,000 | 62,000 |
| 1016 x 16 | 62,000 | 80,000 |

| MotionXtra NR4-S3 | | |
|--------------------------|-------------------|-------------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 1016 x 1016 | 3,000 | 5,930 |
| 1016 x 512 | 5,930 | 11,400 |
| 1016 x 256 | 11,400 | 21,200 |
| 1016 x 128 | 21,200 | 37,000 |
| 1016 x 64 | 37,000 | 60,000 |
| 1016 x 32 | 60,000 | 90,000 |
| 1016 x 16 | 90,000 | 100,000 |

| MotionPro NR5-S1 | | |
|-------------------------|-------------------|-------------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 2336 x 1728 | 325 | 650 |
| 2336 x 1024 | 545 | 1,095 |
| 2336 x 512 | 1,095 | 2,180 |
| 2336 x 256 | 2,180 | 4,300 |
| 2336 x 128 | 4,300 | 8,400 |
| 2336 x 64 | 8,400 | 16,000 |

| MotionPro NR5-S2 | | |
|-------------------------|-------------------|-------------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 2352 x 1728 | 640 | 1,230 |
| 2352 x 1024 | 1,230 | 2,450 |
| 2352 x 512 | 2,450 | 4,850 |
| 2352 x 256 | 4,850 | 9,650 |
| 2352 x 128 | 9,650 | 19,000 |
| 2352 x 64 | 19,000 | 35,000 |

4.3.3. M-series

| MotionScope M3 | | |
|----------------|------------|------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 1280 x1024 | 520 | 1,040 |
| 1280 x 512 | 1,040 | 2,080 |
| 1280 x 256 | 2,080 | 4,140 |
| 1280 x 128 | 4,100 | 8,200 |
| 1280 x 64 | 8,200 | 16,000 |
| 1280 x 32 | 16,000 | 31,000 |
| 1280 x 16 | 31,000 | 58,000 |

| MotionScope M5 | | |
|----------------|------------|------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 2320 x1728 | 170 | 340 |
| 2320 x 1080 | 270 | 540 |
| 2320 x 1024 | 285 | 570 |
| 2320 x 768 | 380 | 760 |
| 2320 x 512 | 570 | 1,140 |
| 2320 x 256 | 1,135 | 2,270 |
| 2320 x 128 | 2,270 | 4,450 |
| 2320 x 64 | 4,450 | 8,700 |
| 2320 x 32 | 8,700 | 16,000 |
| 2320 x 16 | 16,000 | 28,000 |

4.3.4. X-Series

| X-Stream XS3 / MotionPro HS1 | |
|------------------------------|----------------|
| Resolution | Max Rate [fps] |
| 1280 x 1024 | 660 |
| 1280 x 512 | 1,320 |
| 1280 x 256 | 2,640 |
| 1280 x 128 | 5,270 |
| 1280 x 64 | 10,400 |
| 1280 x 32 | 20,500 |
| 1280 x 16 | 39,800 |

| MotionPro X3 / HS3 | | |
|--------------------|------------|------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 1280 x 1024 | 1,040 | 2,080 |
| 1280 x 512 | 2,080 | 4,160 |
| 1280 x 256 | 4,160 | 8,290 |
| 1280 x 128 | 8,290 | 16,400 |
| 1280 x 64 | 16,400 | 32,200 |
| 1280 x 32 | 32,200 | 62,300 |
| 1280 x 16 | 62,300 | 116,500 |

| MotionPro X4 / HS4 | | |
|--------------------|------------|------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| | | |
| 512 x 512 | 5,130 | 10,100 |
| 512 x 256 | 10,100 | 20,100 |
| 512 x 128 | 20,100 | 38,500 |
| 512 x 64 | 38,500 | 73,500 |
| 512 x 32 | 73,500 | 132,000 |
| 512 x 16 | 132,000 | 200,000 |

| MotionPro X5 | | |
|--------------|------------|------------------|
| Resolution | Rate [fps] | Plus™ Rate [fps] |
| 2352 x 1728 | 250 | 500 |
| 2352 x 1376 | 314 | 628 |
| 2352 x 1024 | 422 | 842 |
| 2352 x 768 | 563 | 1120 |
| 2352 x 512 | 842 | 1,675 |
| 2352 x 256 | 1,675 | 3,310 |
| 2352 x 128 | 3,310 | 6,470 |
| 2352 x 64 | 6,470 | 12,360 |
| 2352 x 32 | 12,360 | 22,720 |
| 2352 x 16 | 22,720 | 39,100 |

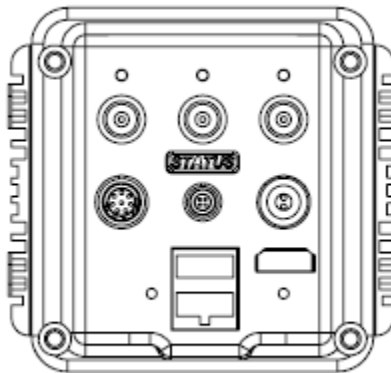
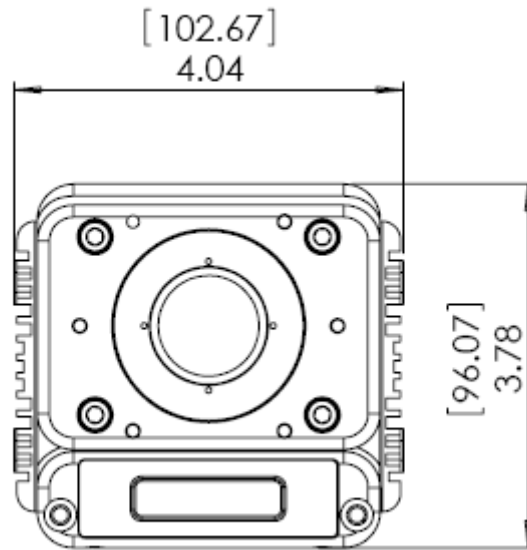
4.4. Intensified X cameras

In the table below, you may find the optical specifications at 20 C and nominal operating conditions.

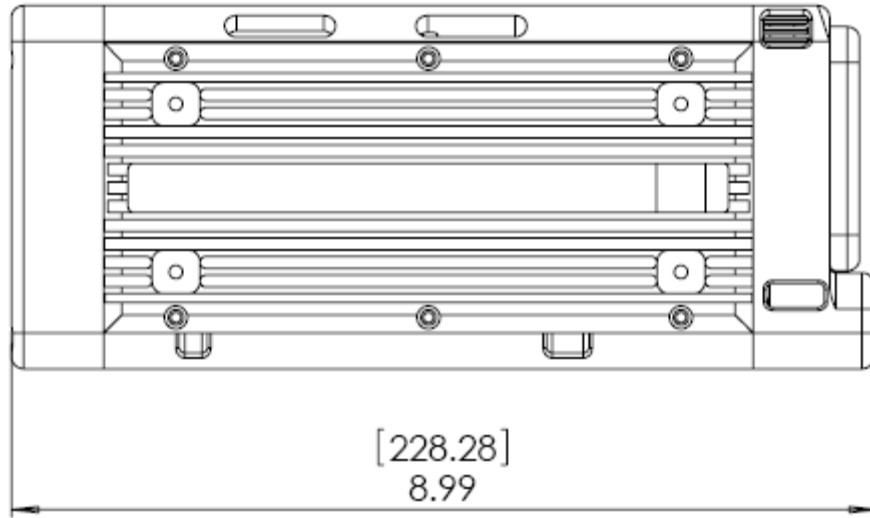
| Parameter | Value |
|-------------------------------------|---|
| Input diameter | 17.5 mm min |
| Input window | Glass (AVG) |
| Cathode sensitivity for white light | 500 $\mu\text{A}/\text{lm}$ min |
| at 800 nm | 43 mA/lm min |
| at 850 nm | 33 mA/lm min |
| Phosphor | P46 |
| Output window | Fiber-optic |
| Luminance gain | 1590 $\text{cd}/\text{m}^2/\text{lx}$ min |
| E.B.I. | 0.25 μx max |
| Shading | 45 % max |
| Resolution | 36 lp/mm min |
| Gate-able | Yes (down to 50 ns) |
| Iris delay | 16.6 ns max |

4.5. Mechanical and hole mounts (MotionPro Y)

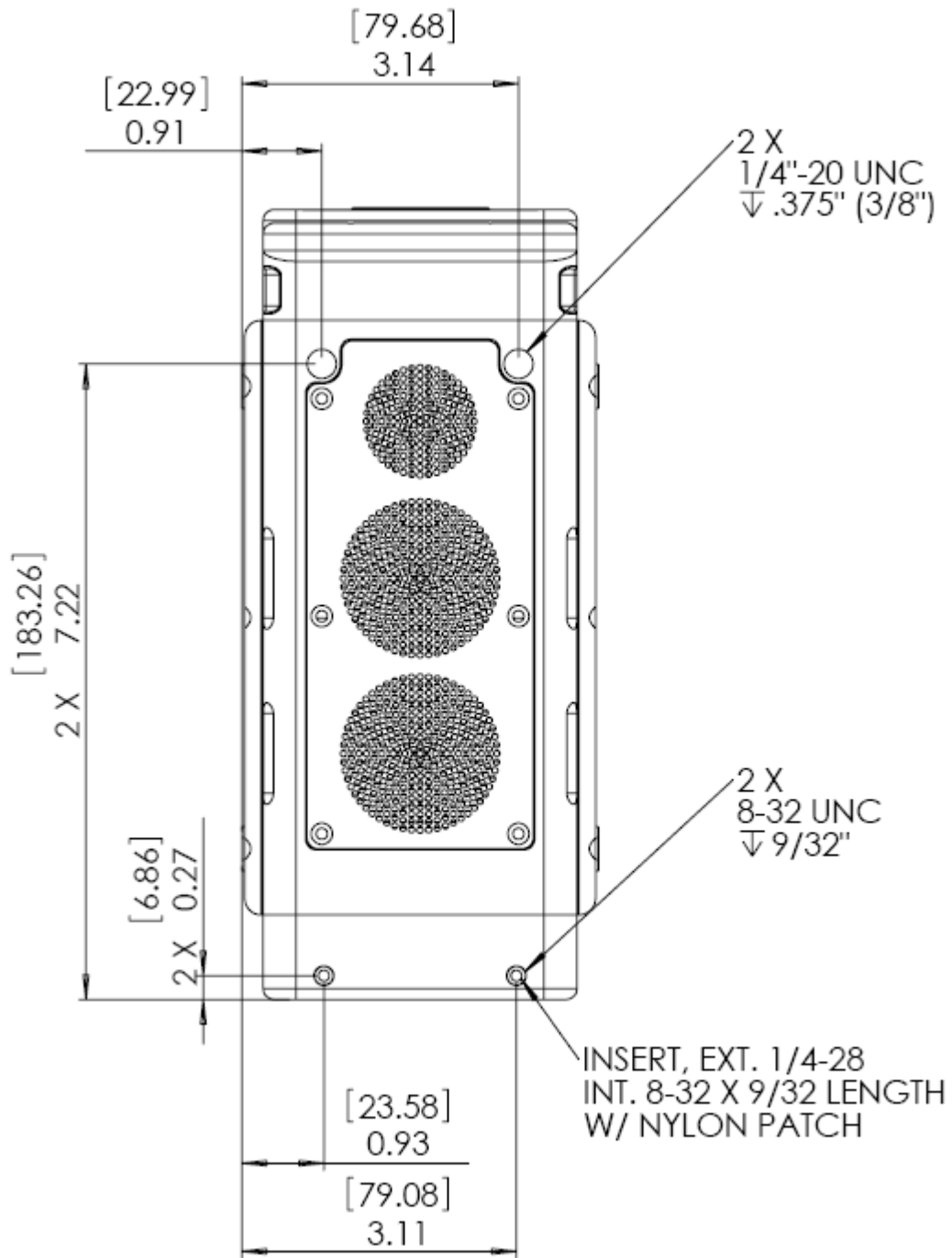
4.5.1. Front and back views



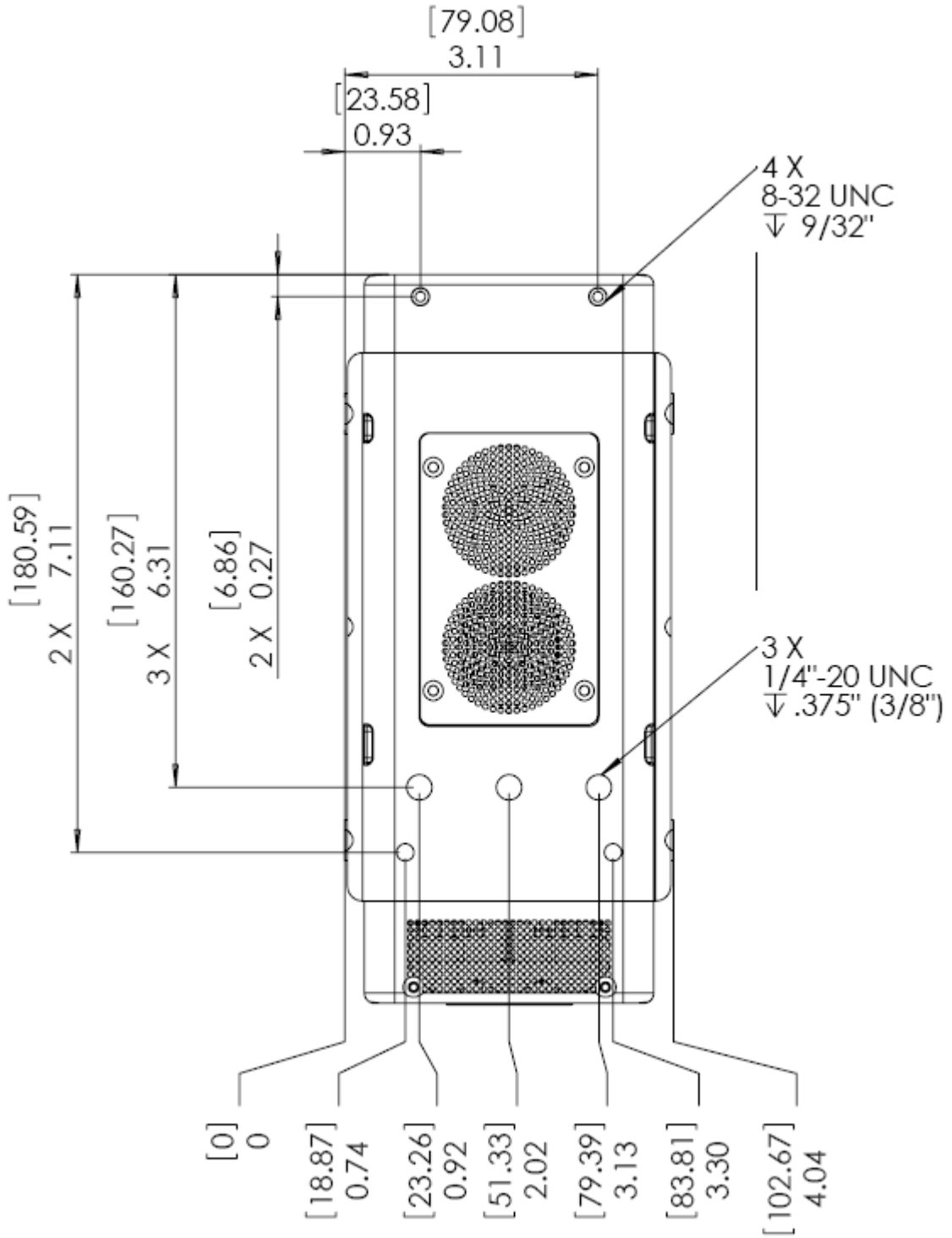
4.5.2. Side view



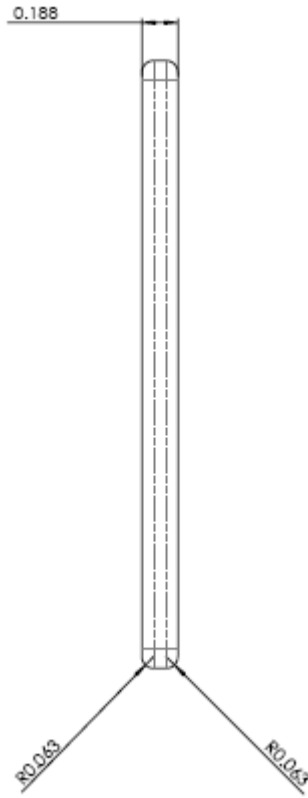
4.5.3. Top View



4.5.4. Bottom view

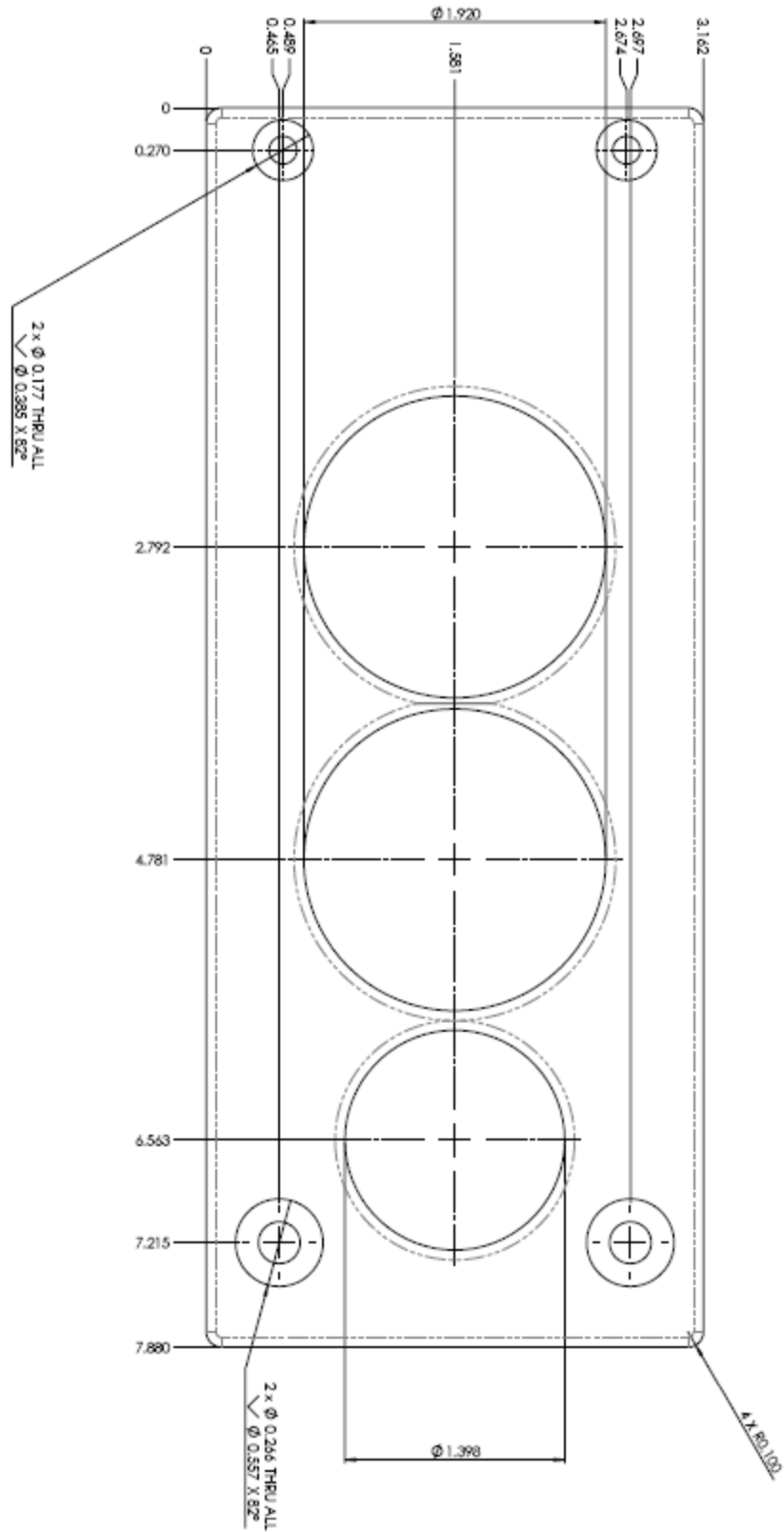


Side view

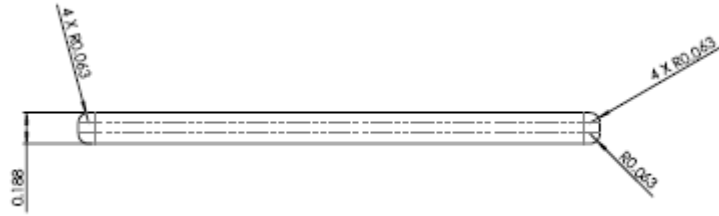


4.5.6. Top mounting plate

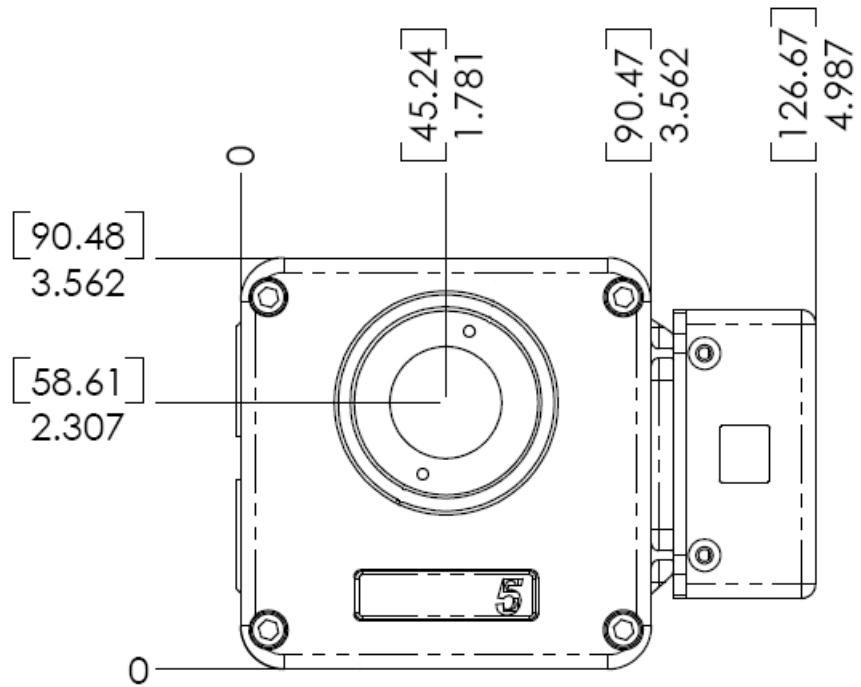
Front view



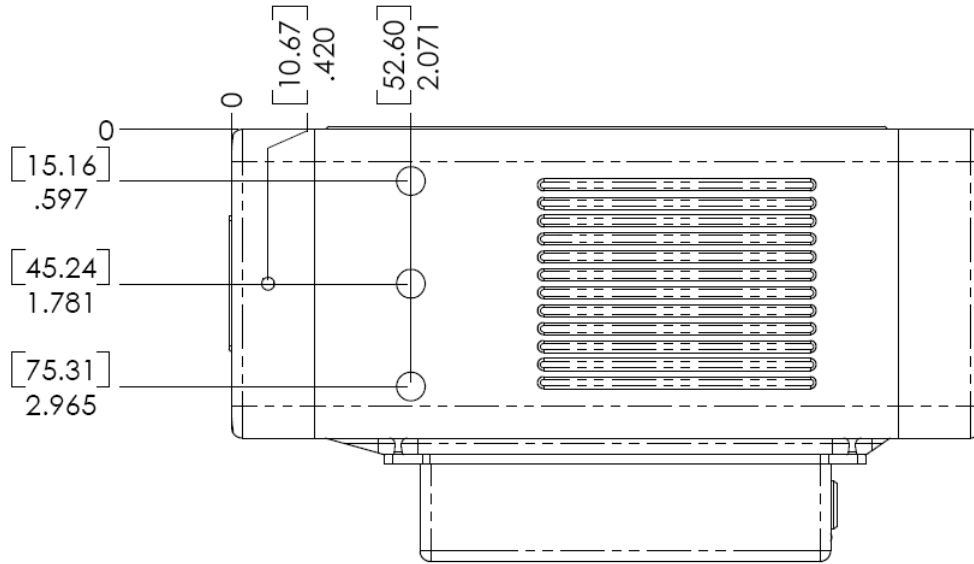
Side view



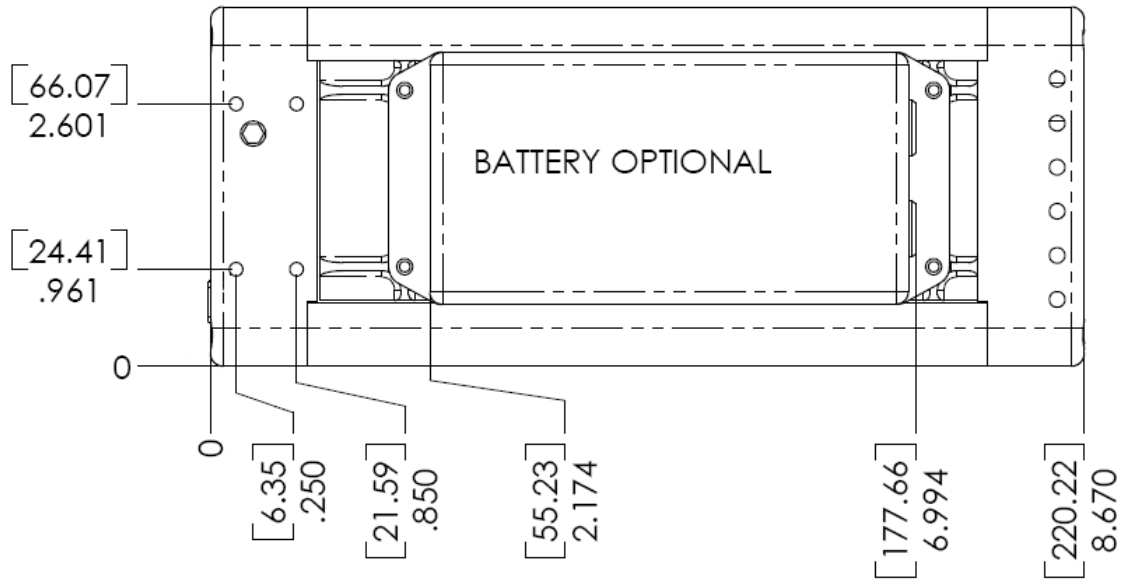
4.5.7. First revision camera front view



4.5.8. First Revision camera top view

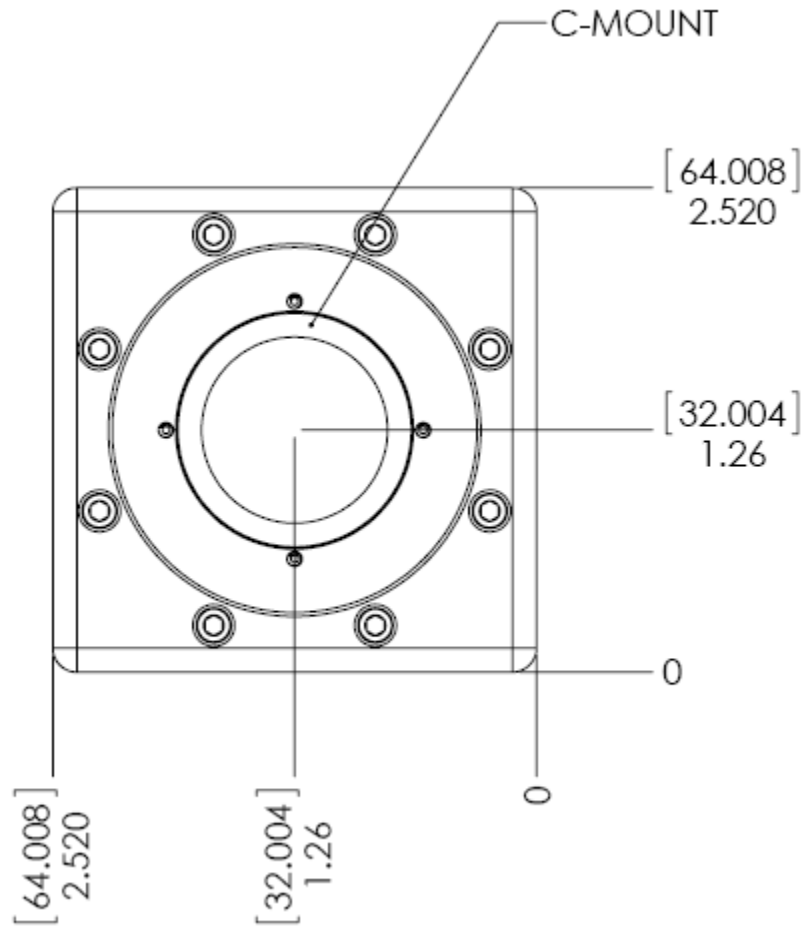


4.5.9. First revision camera side view

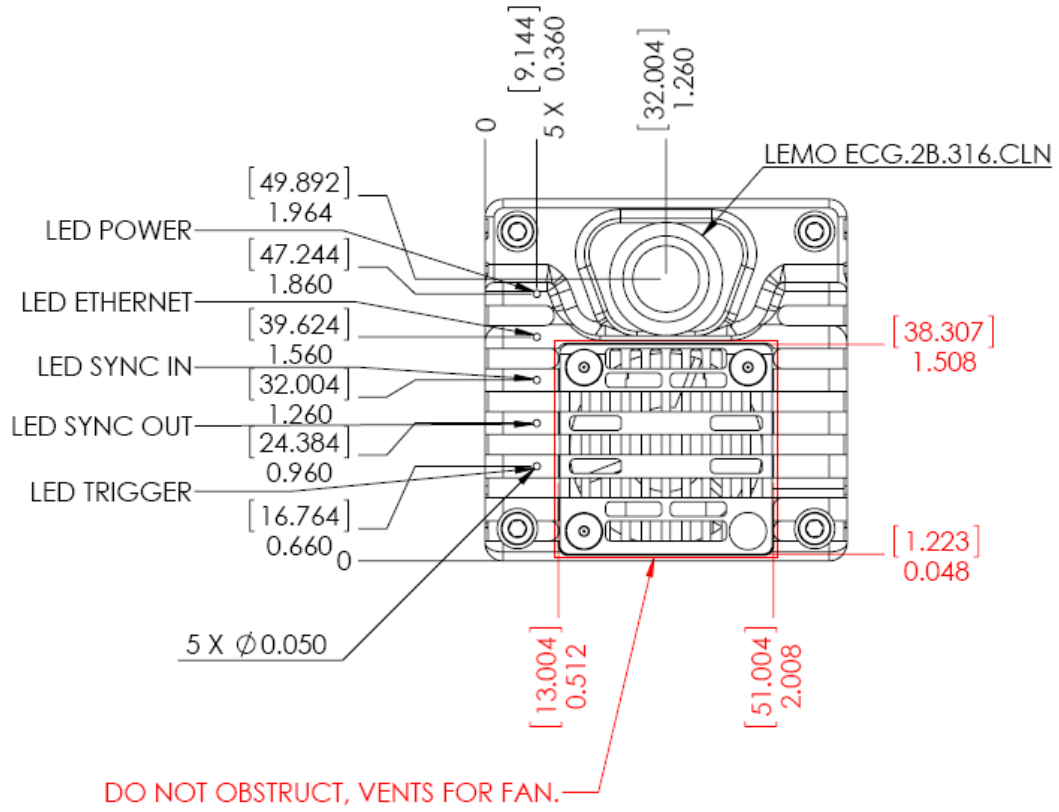


4.6. Mechanical and hole mounts (MotionXtra NR)

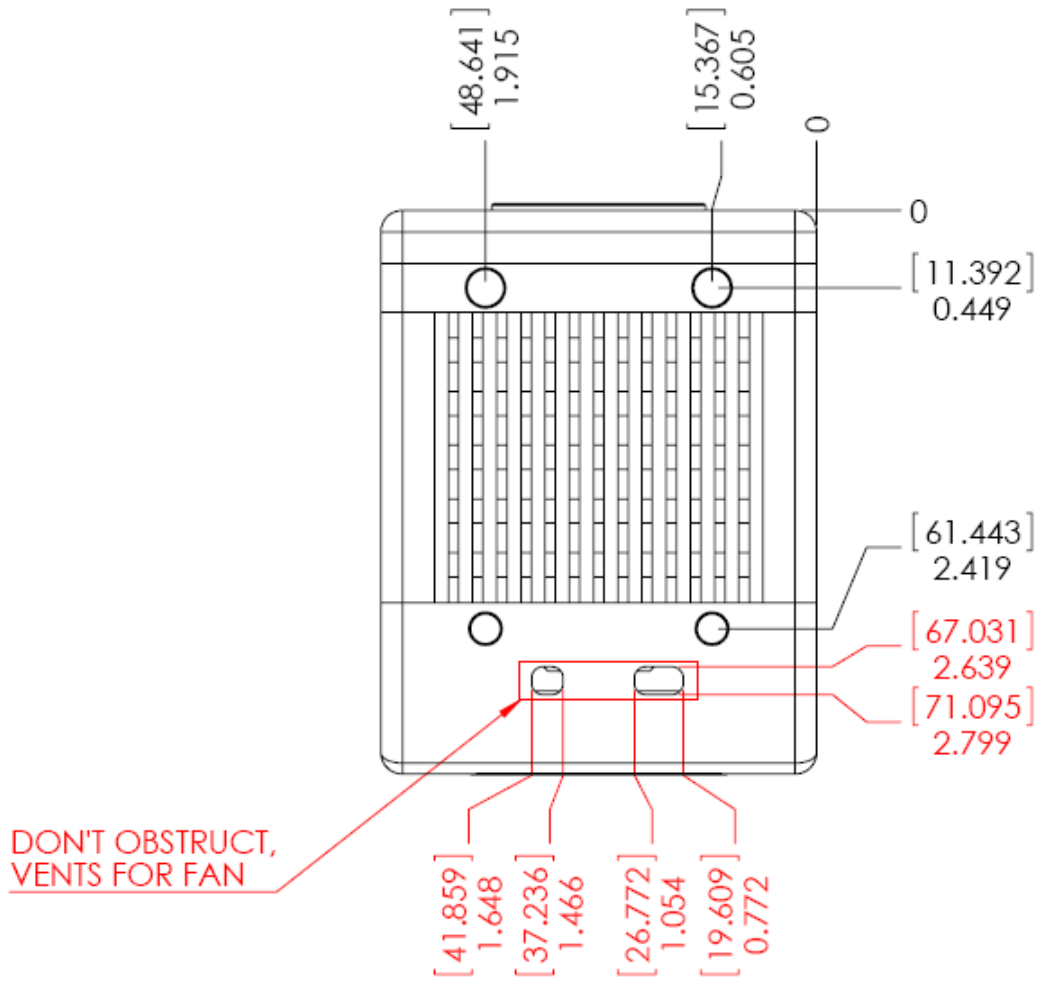
4.6.1. Front View (all memory configurations)



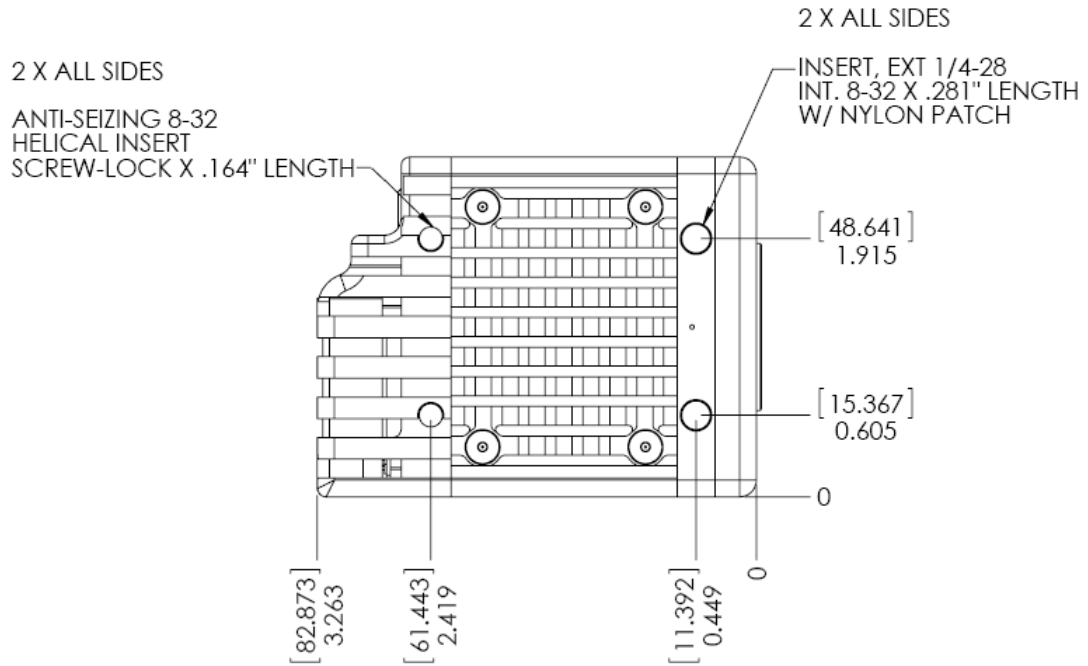
4.6.2. Back View (all memory configurations)



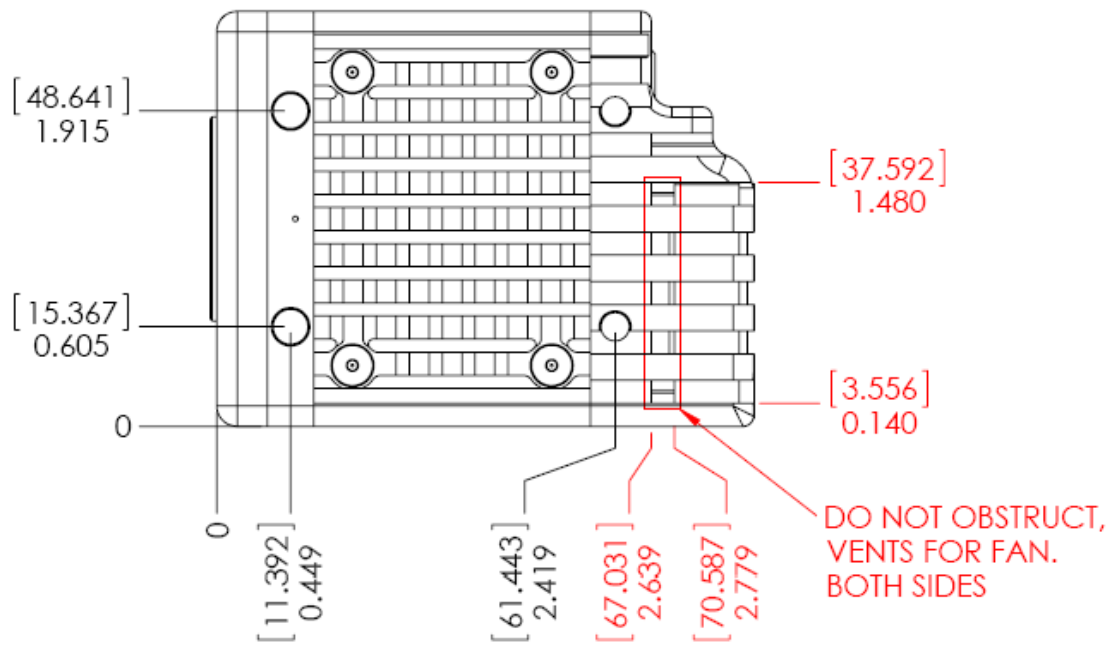
4.6.3. Side View (1.25 GB)



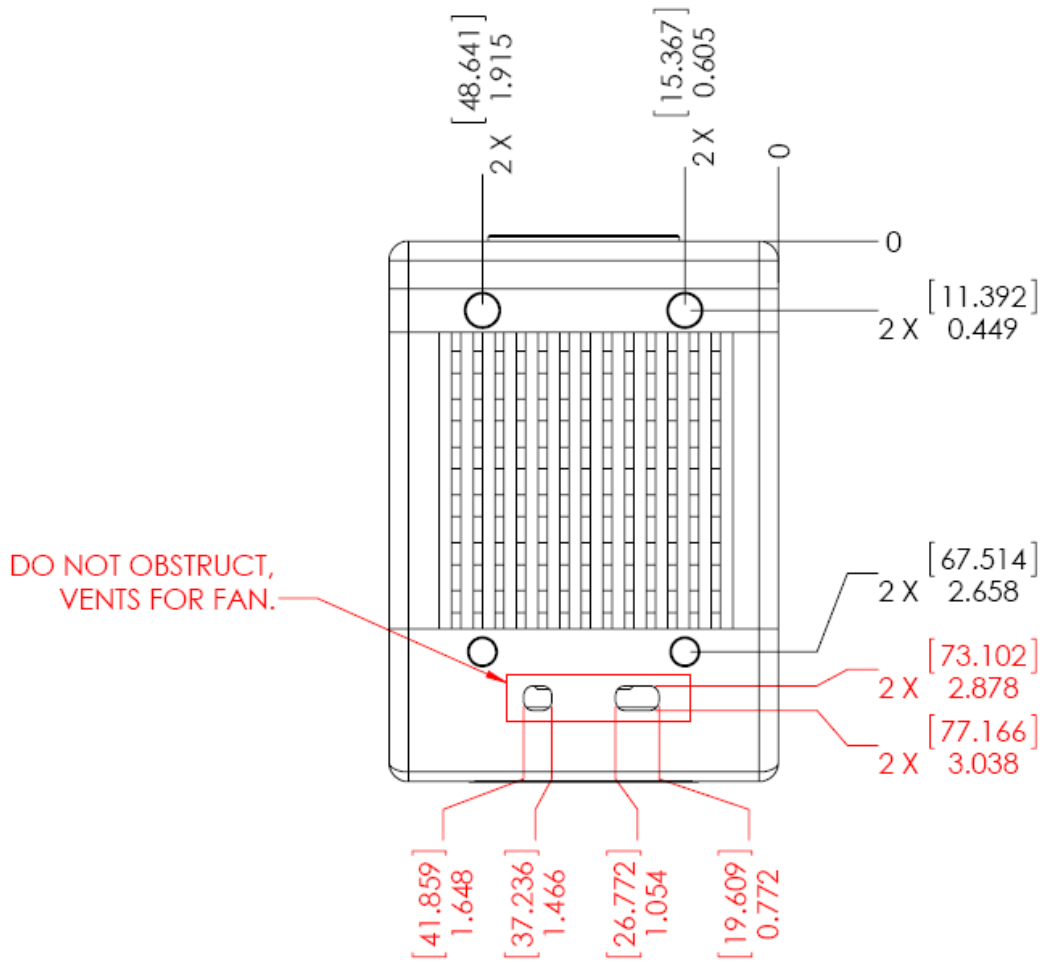
4.6.4. Top View (1.25 GB)



4.6.5. Bottom View (1.25 GB)



4.6.6. Side View (2.5 GB)



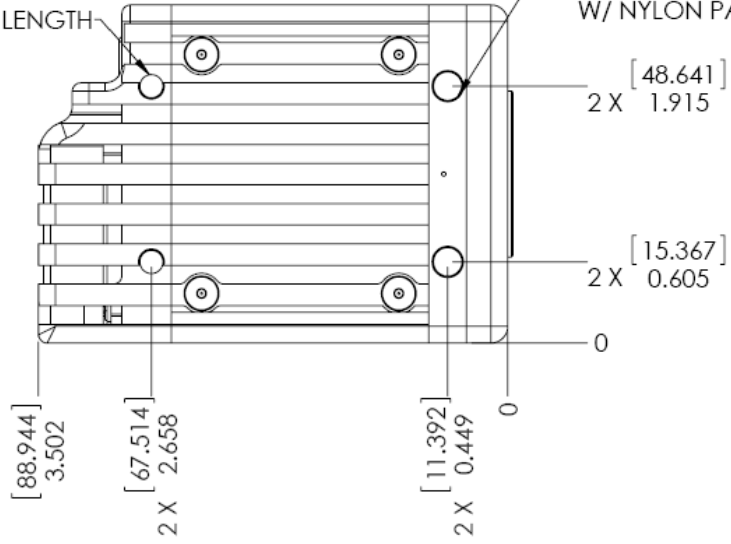
4.6.7. Top View (2.5 GB)

2 X ALL SIDES

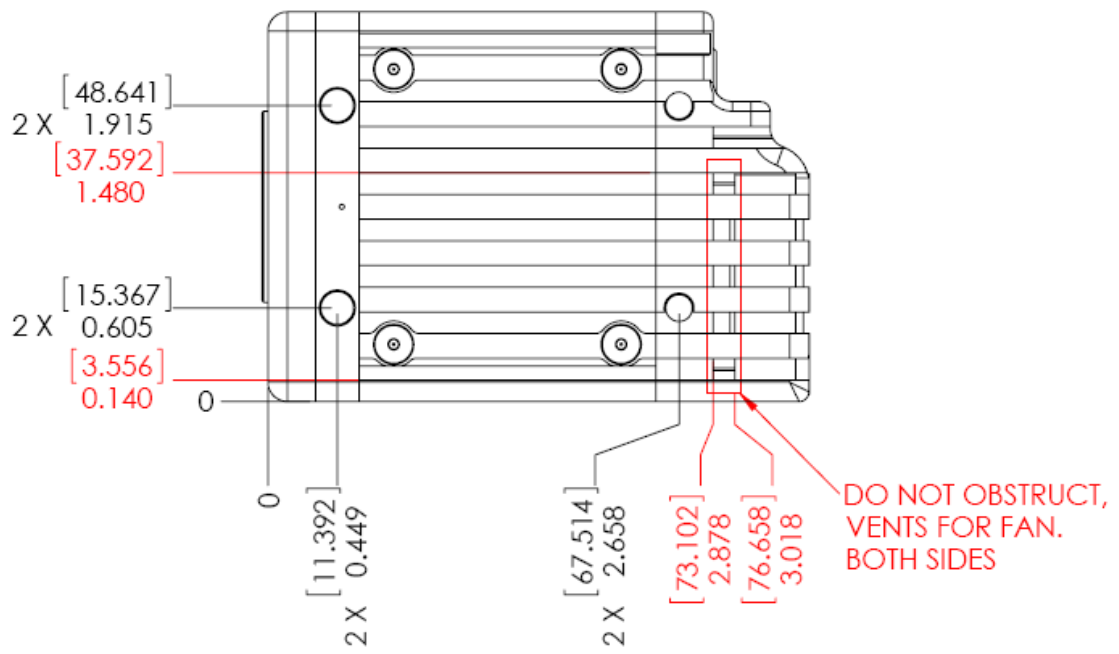
ANTI-SEIZING 8-32
HELICAL INSERT
SCREW-LOCK X .164" LENGTH

2 X ALL SIDES

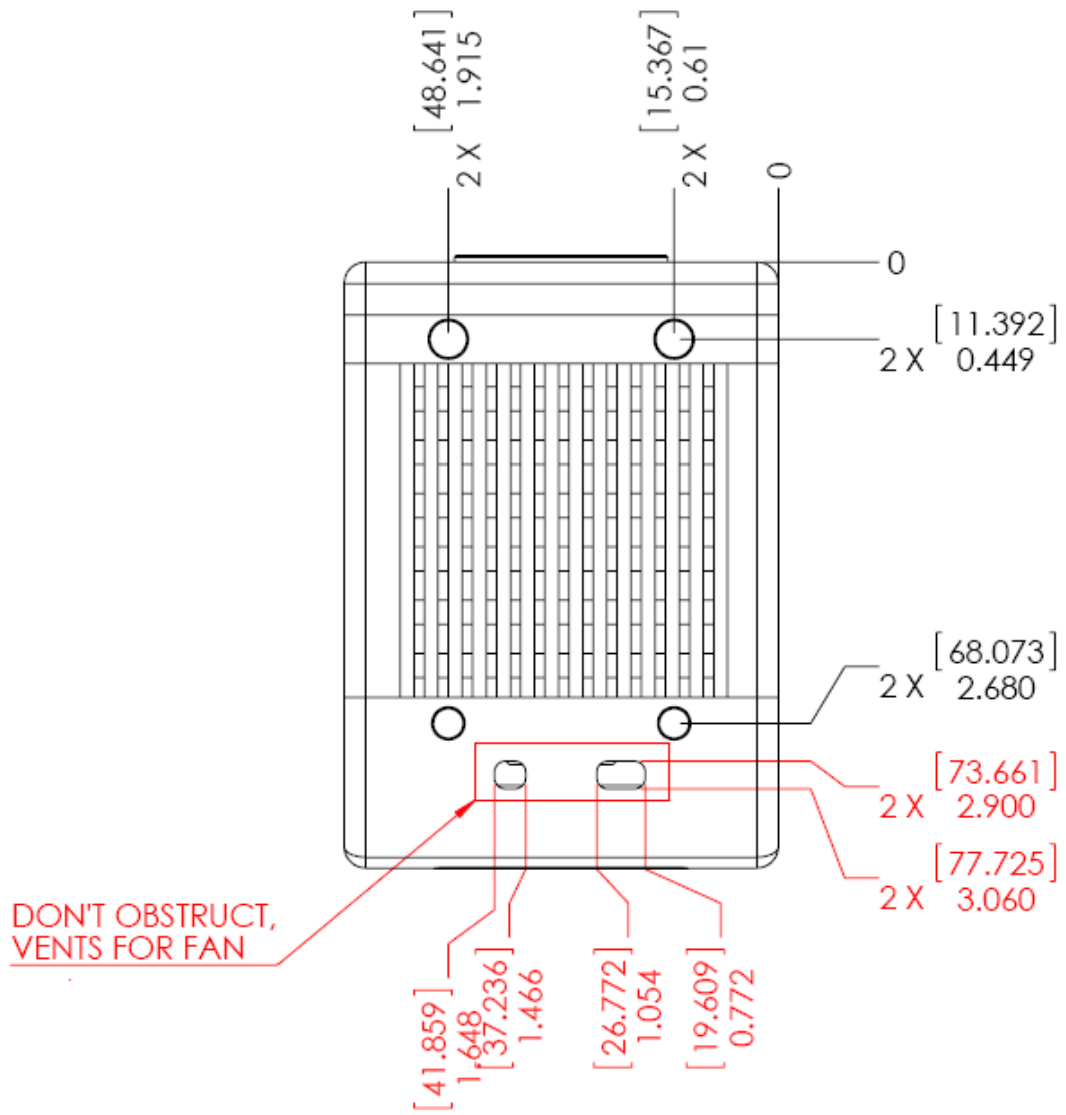
INSERT, EXT 1/4-28
INT. 8-32 X .281" LENGTH
W/ NYLON PATCH



4.6.8. Bottom View (2.5 GB)



4.6.9. Side View (5.0 GB)



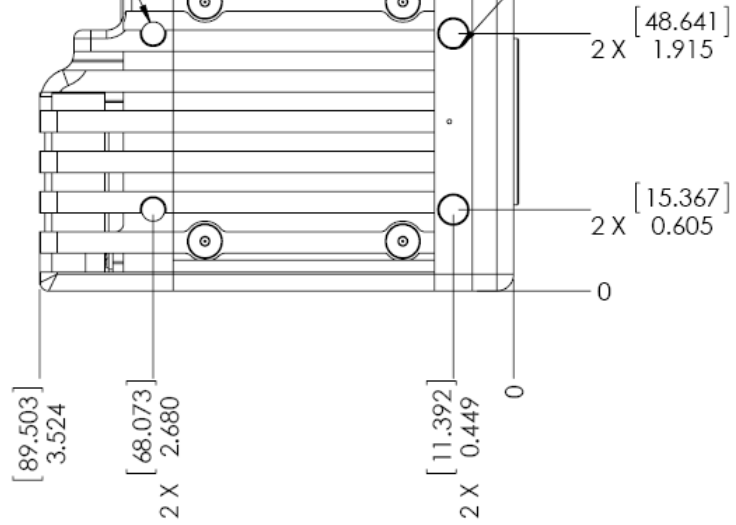
4.6.10. Top View (5.0 GB)

2 X ALL SIDES

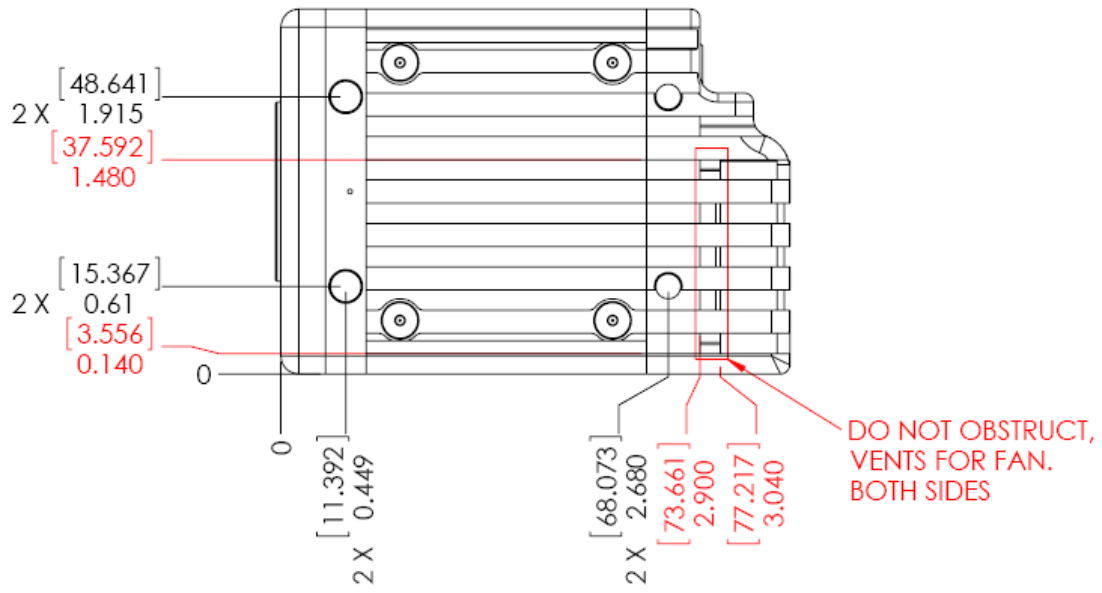
ANTI-SEIZING 8-32
HELICAL INSERT
SCREW-LOCK X .164" LENGTH

2 X ALL SIDES

INSERT, EXT 1/4-28
INT 8-32 X .281" LENGTH
W/NYLON PATCH

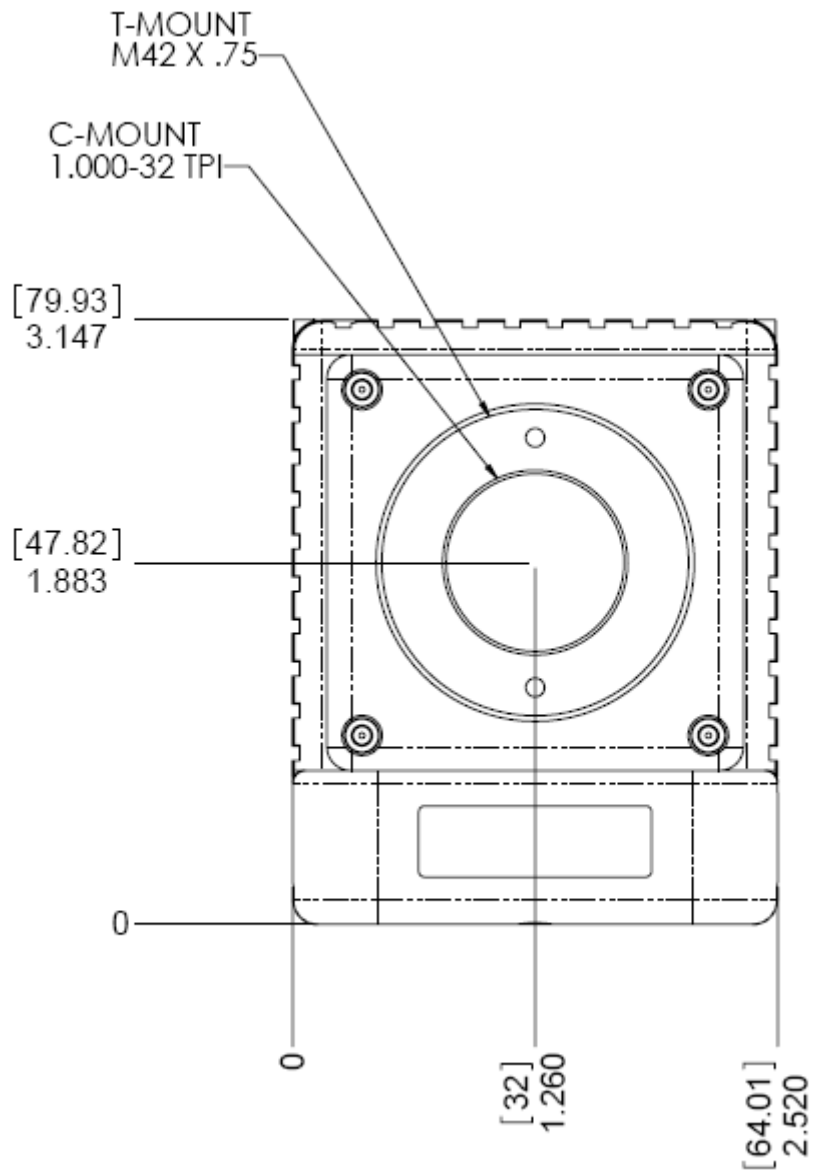


4.6.11. Bottom View (5.0 GB)

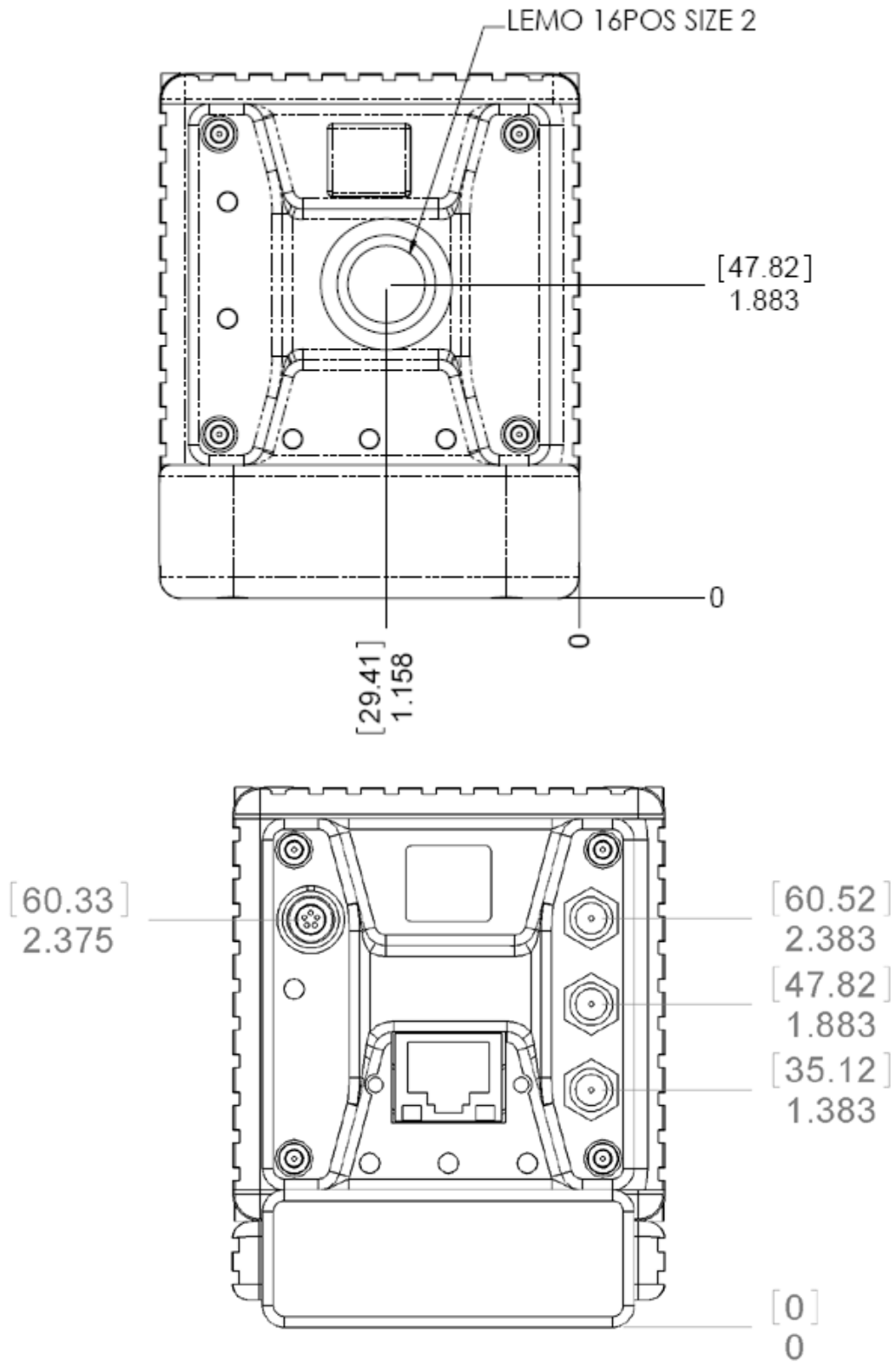


4.7. Mechanical and hole mounts (MotionXtra N)

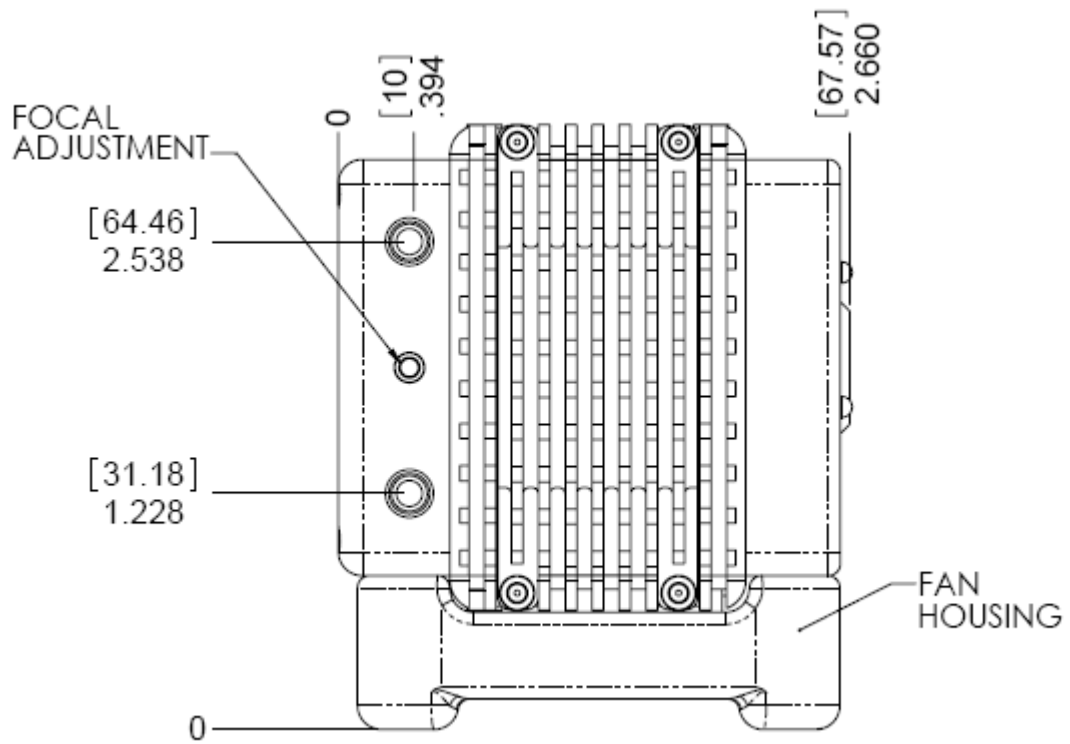
4.7.1. Front View



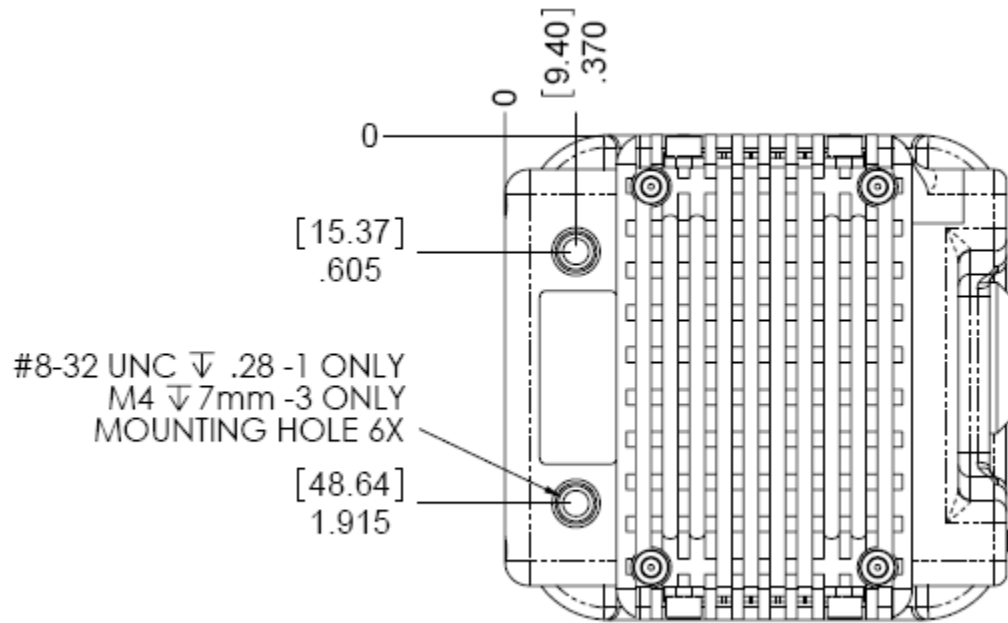
4.7.2. Back Views



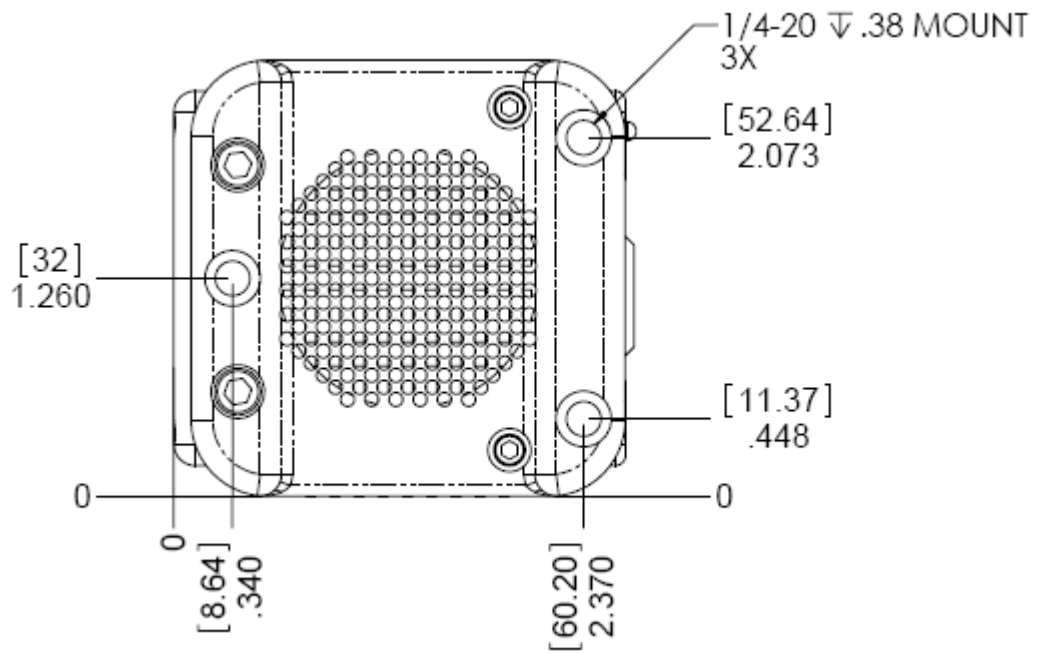
4.7.3. Side View



4.7.4. Top View

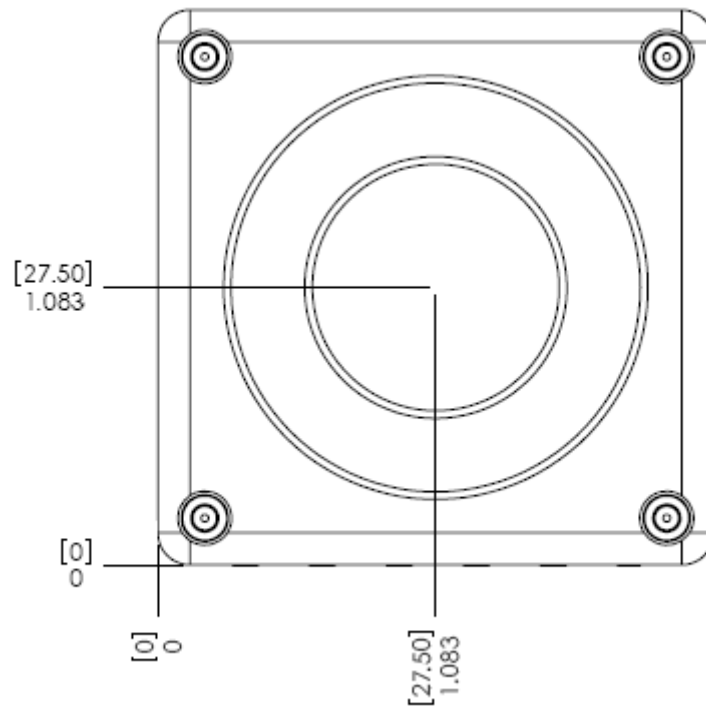


4.7.5. Bottom View

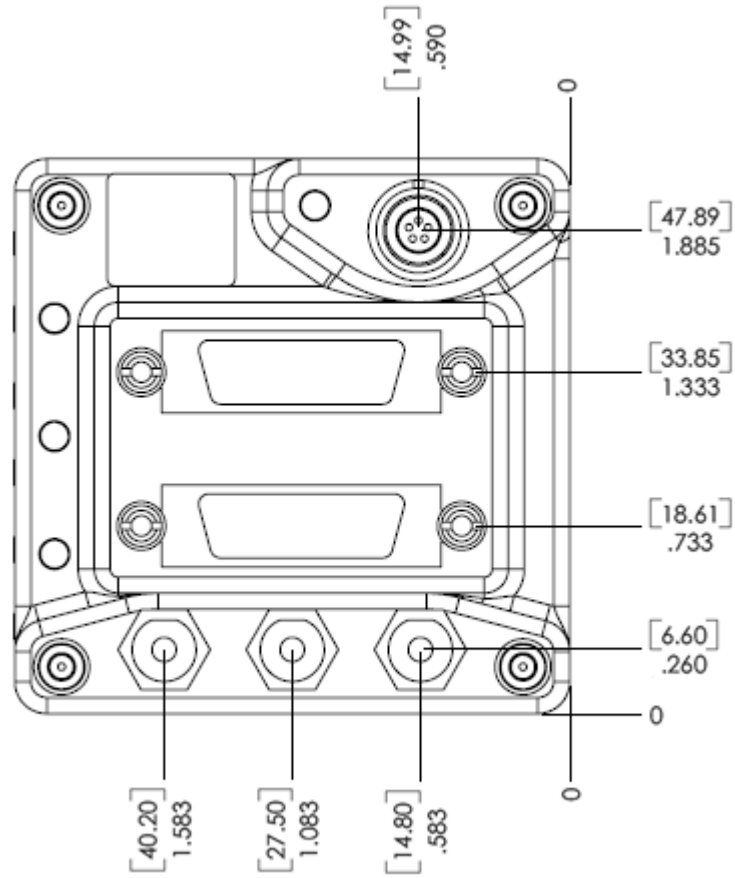


4.8. Mechanical and hole mounts (MotionScope M)

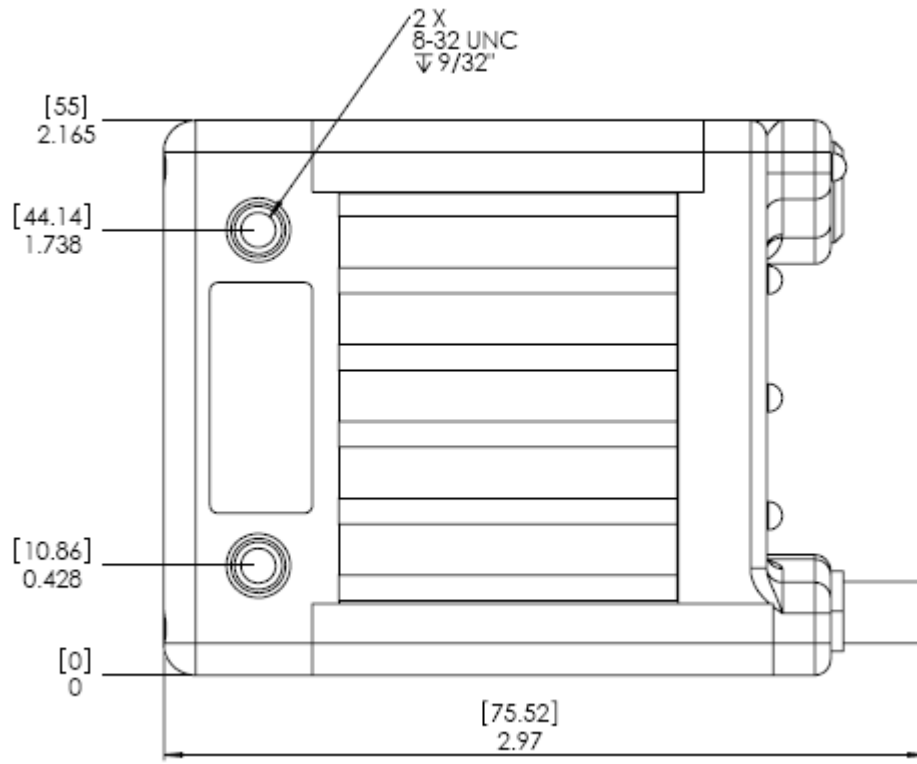
4.8.1. Front View



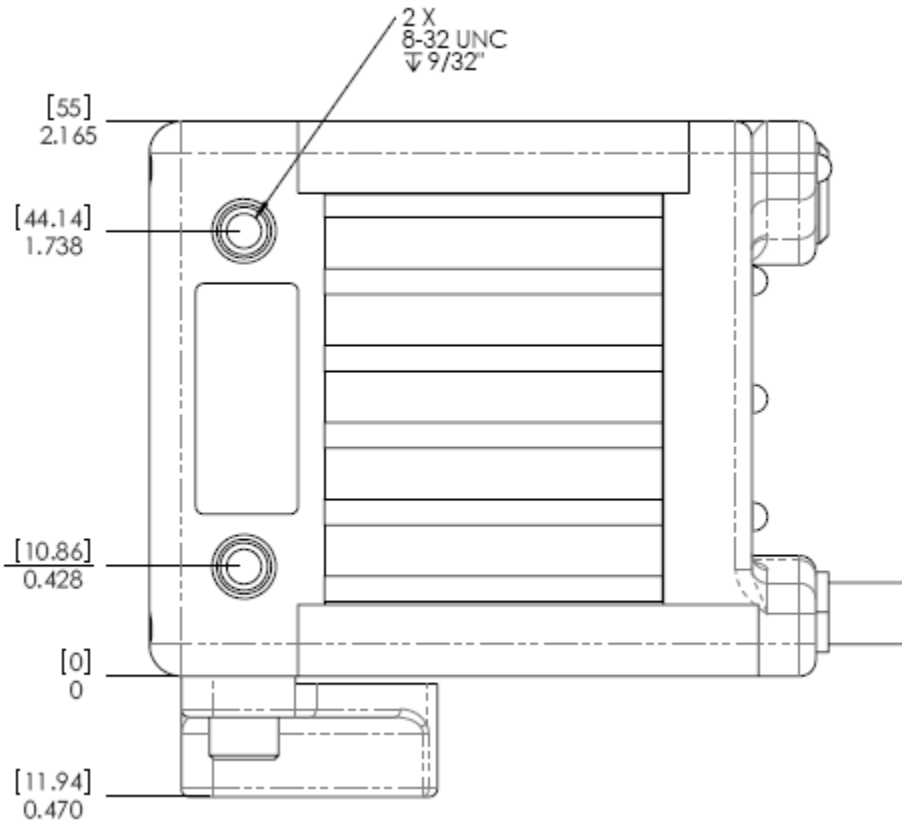
4.8.2. Back View



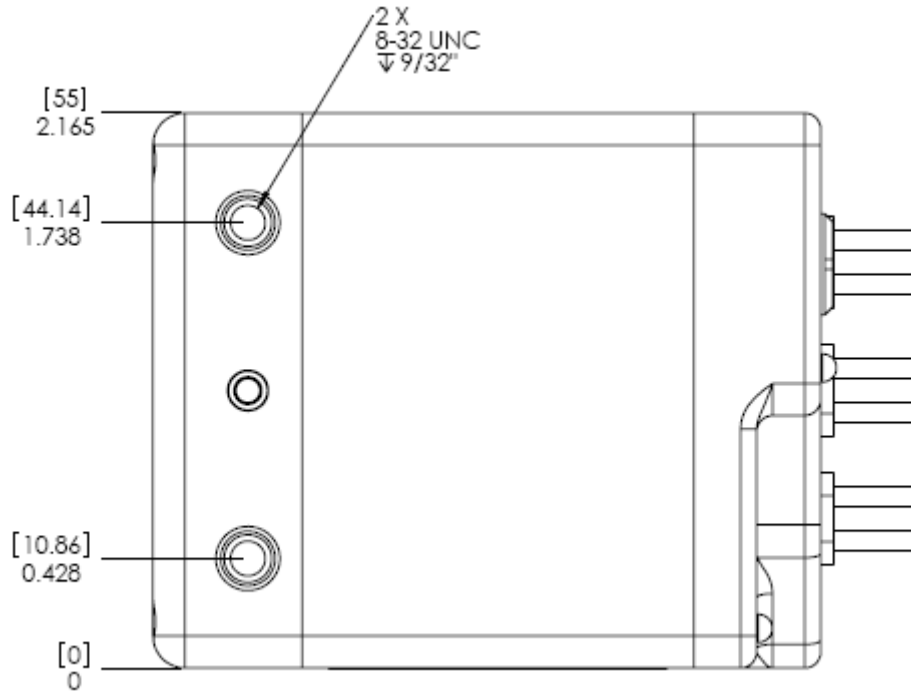
4.8.3. Side View



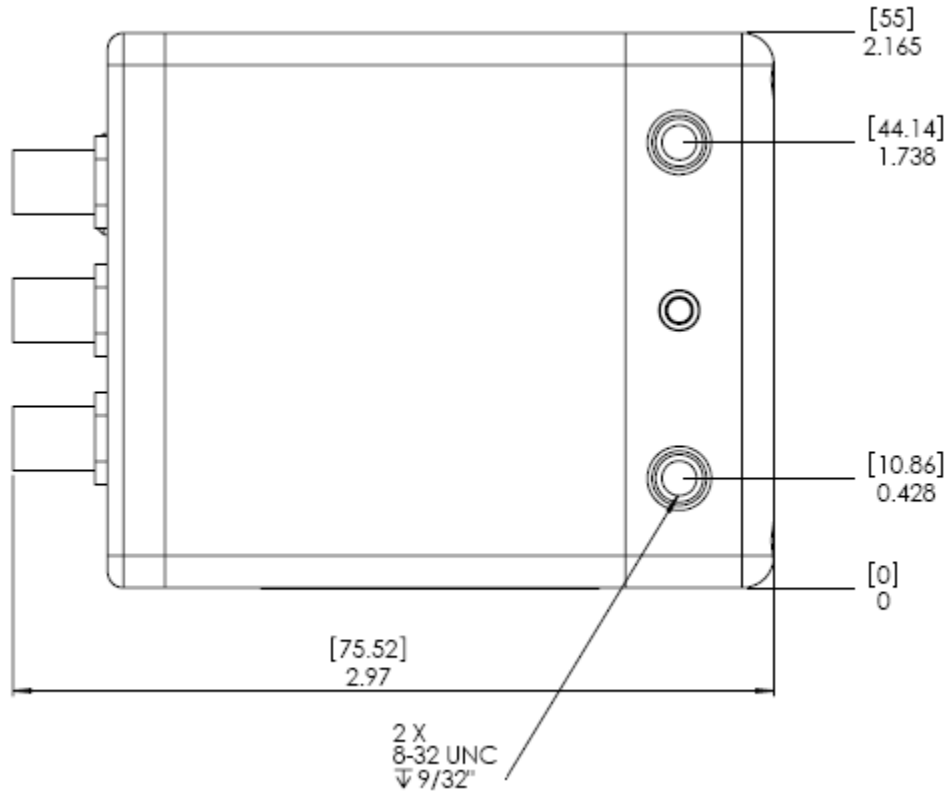
4.8.4. Side View with mount



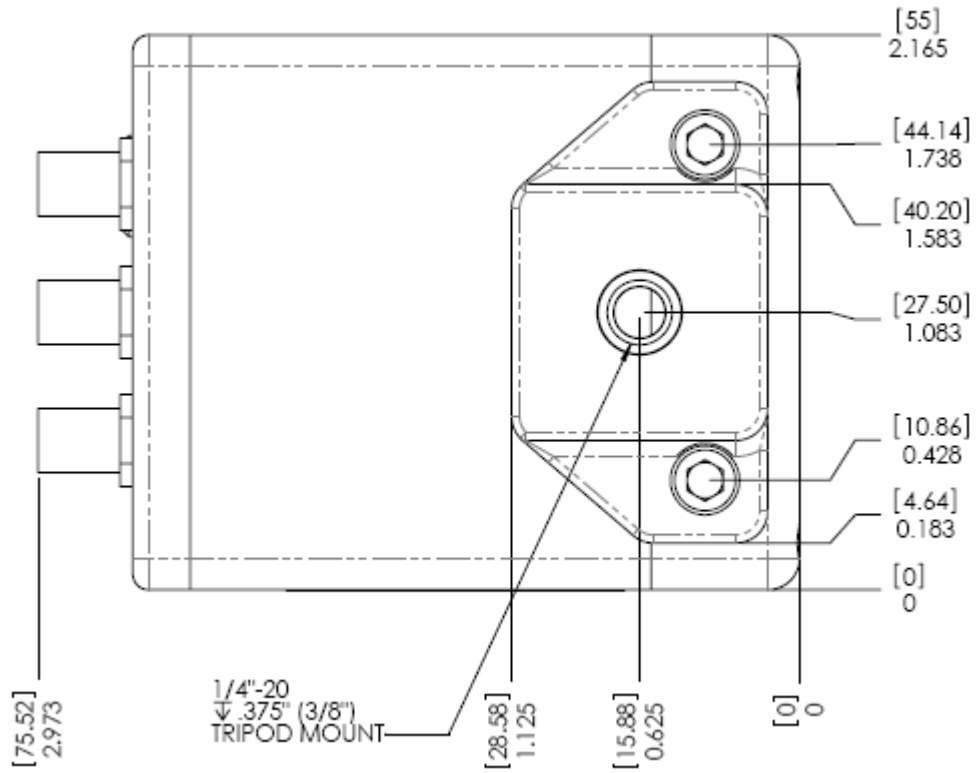
4.8.5. Top View



4.8.6. Bottom View

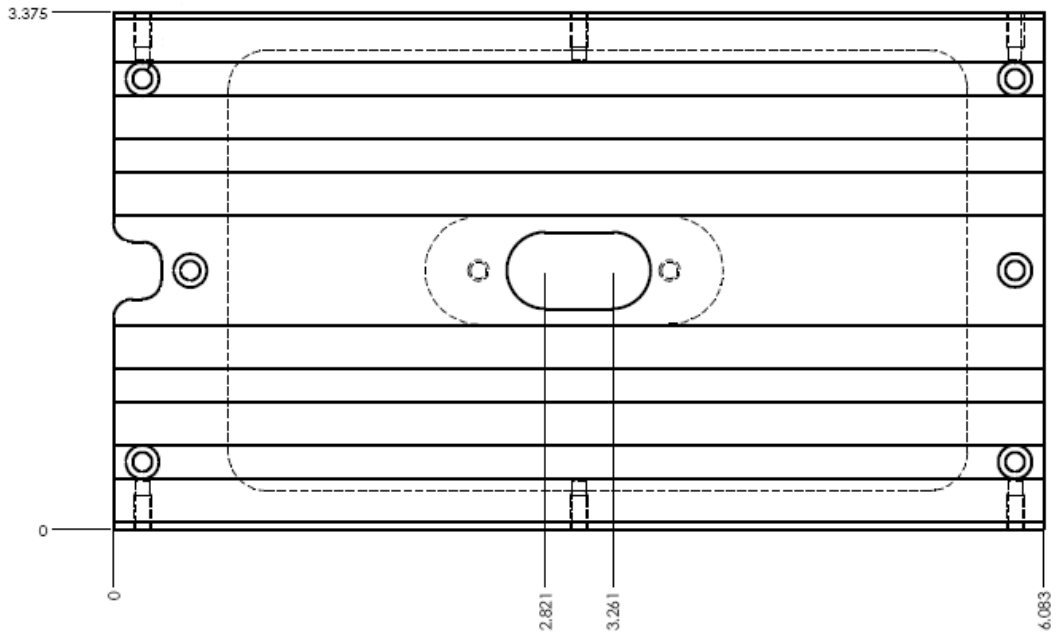


4.8.7. Bottom View with Mount

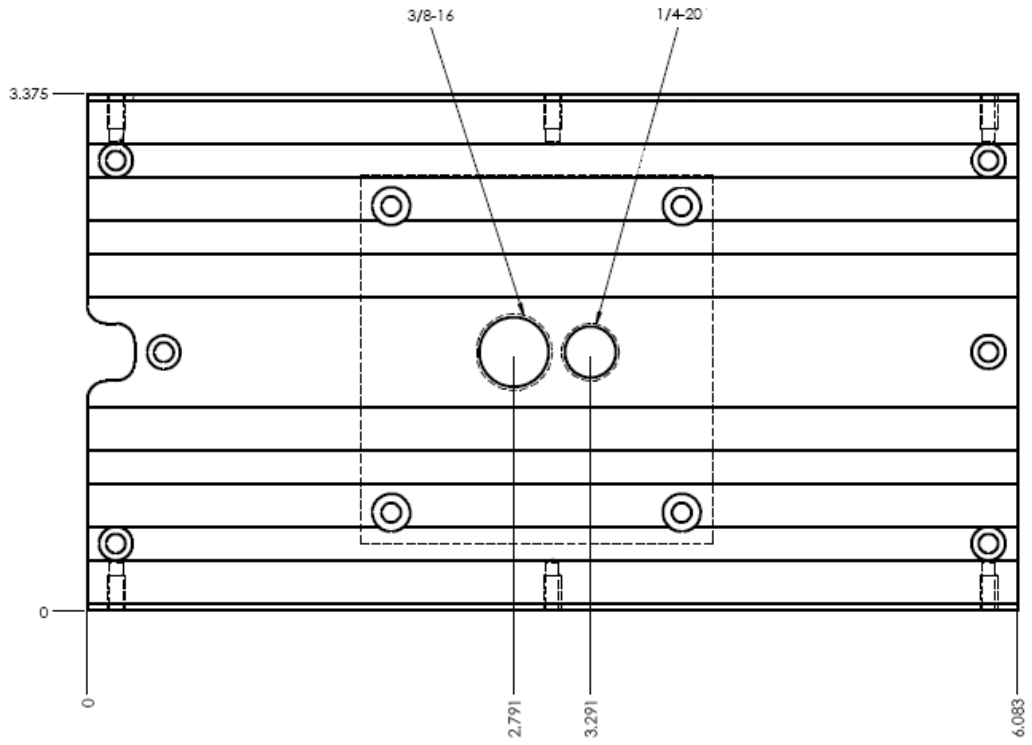


4.9. Mechanical and hole mounts (MotionPro X)

4.9.1. Top view



4.9.2. Bottom view



4.9.3. Side view

