IDT Cameras
Specification Manual

Document Revision
January 2017

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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 Written quotations shall expire thirty (30) calendar days from the date of quotation unless withdrawn in writing sooner.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.

3e. Immediate Order Payments – Immediate 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.

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 two (2) years, 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 detective 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 two (2) years, 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 ITS LICENSORS DOES NOT WARRANT THE PERFORMANCE OR RESULT OF THE IDT PRODUCT.

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 $500. 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**.

2.3. Disconnect power prior to plugging or unplugging any cables

We use high-performance connectors on all our products to assure operational integrity and durability: these connectors provide many benefits but are not “hot-swappable” (cannot be unplugged while powered). Unplugging any connectors while powered has a high likelihood of damaging cameras, lights and related accessories.

3. Introduction to the cameras

3.1. M-series

M3 records continuously at an impressive 520 fps with a full resolution of 1280 x 1024 directly to hard drive. Examples of useful applications of the M3 system include automated industrial uses, such as assembly line malfunction prevention and detection, and scientific uses including sustained observation of microscopic or quick-moving subjects.

With the available accessories, a full M5 system definitely offers the ideal solution for any situation where image sharpness and contrast are imperative, and is specially suited for industrial and scientific scanning.

3.2. iN-series

The iNdustrial is a small size, shock and vibration proof, lightweight camera system. The iN8 configuration produces stunning 1600 x 1200 pixel images. It is offered in two speed

grades: S1 and S2 to deliver up to 500 fps and 1,000 fps in full resolution respectively. The camera also features advanced thermal management that does not require the use of fans, and benefits from a sealed (IP68) mechanical package allowing under water operation down to a depth of 1 meter.

3.3. Os-series

The Os-series is a new digital high-speed camera designed to operate in the most demanding environments. The salient design feature of the Os are its compact size combined with a wide data bus, making it capable of achieving very high frame rates including transfer speeds to high-capacity solid-state (non-volatile) memory.

3.4. Nx-series

With 6000 ISO Mono 2000 ISO Color sensitivity, 30-bit pixel depth (color), and High G resistance to shock, the NX-Series is well suited for on-board crash testing, where space is at a premium.

NX4: three speed grades allow customized camera performance. Crash-testing, especially in vehicle, is the quintessential NX4 application. The cameras' compact design allows for use in tight environments or when attached to a bore-scope.

NX5: optimally designed for resolution, the 7 micron array of 2336 x 1728 pixels, powers the 730 fps. This sensor array benefits from improved quantum efficiency from its predecessor to reduce noise without sacrificing light sensitivity or bit depth. This makes the camera well-suited for situations requiring light weight and superb resolving power, such as component testing and microscope imaging. Special opportunities for the NX5 exist in broadcast and cinema, when the small size combined with the 4.0 megapixel resolution provides high definition imaging formats. Two cameras can be used as a compact stereoscopic assembly for 3D applications.

NX8: with a maximum resolution of 1600 x 1200, the NX8 can record up to 4,000 fps. Combine this with its extremely compact size and High G resistance to shock, it is well-suited for on-board crash testing, where space is at a premium.

3.5. NX-Air series

With 6000 ISO Mono 2000 ISO Color sensitivity, 30-bit pixel depth (color), High G resistance to shock, and internal battery, the NX-Air series are well suited for on-board crash testing, where space is at a premium.

3.6. Y Series

With extremely low noise levels and high light sensitivity, Y3 models perform well for those whose needs encompass both detail and speed, such as product testing automobiles and engines.

The Y4 is the most versatile camera system, useful in production and research and development environments. This camera system can be operated in an extended dynamic range (EDR) mode to produce either 11-bit or 12-bit images.

The Y5 surpasses high definition with a 4.0 megapixel sensor capable of 730 fps at full resolution. Variable lens mounts support cinema lenses, as well as those built for Nikon and Canon SLRs. The HDMI output ensures that the image can be monitored at the full resolution before, during and after recording.

New to the Y Series, the Y7 PIV model introduces a universal integrated timing interface. This allows for synchronization of any illumination sources such as lasers or LEDs. Together with our standard 200-nanosecond inter-frame time, the camera is perfectly suited for PIV researchers as it decreases PIV system size and cost.

Y8 is our latest breakthrough in Y Series development. Utilizing the next generation of sensor technology, the Y8 provides a maximum resolution of 1600 x 1200 and comes in three speed grades with the capability of recording up to 9,300 fps offering uncompromised speed and performance.

3.7. CC Series

IDT's CrashCam™ with integrated storage: 8GB DDR and optional solid-state non-volatile memory of up to 0.5TB. The CrashCam™ is a rugged, sealed, high G and vibration rated camera product designed for use (not exclusively) in harsh, Automotive testing environments. Latest CMOS sensor technology produces extremely low-noise images with up to 12-bit mono or 36-bit color. Support for several sensor platforms to deliver various resolutions and frame rates. Power supply and break-out cable for easy out-of-the-box operation are included.

3.8. Airborne

IDT Os-Series Version 3 Airborne Camera with integrated storage: 8GB of DDR and optional solid-state non-volatile memory of up to 0.5TB. Latest CMOS sensor technology produces extremely low-noise images with up to 12-bit mono or 36-bit color. Support for several sensor platforms to deliver various resolutions and frame rates. Power supply and break-out cable for easy out-of-the-box operation are included.

3.9. XStream PCIe series

The XStream™ is a compact camera designed for use with a computer system. It is an image-streaming camera supported by Linux, MAC OS and Windows operating systems. It is supplied with an end-user software package as well as the SDK.

The main features are:

- streaming.
- high-resolution and frame rate.
- high sensitivity.
- low noise.

3.10. Legacy series

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 (LUT) 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 look-up tables 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**.

3.11. System components

The systems components are listed below.

- **Camera**: IDT cameras are the first high-speed cameras featuring a CMOS sensor capable of supporting double-exposure operation mode. The camera body accepts standard C-mount lenses.
- **MotionPro X/Y**: The USB 2.0 (480 Mbps) cable or Giga-Ethernet (1000 Mbps) provide data and control signals to and from the camera as well as connecting the camera to any USB 2.0 or Ethernet port on a desktop or laptop. The **CC, OS, NX, NR and N series** cameras provide only Giga-Ethernet data and control signals and do not have a USB interface.
- **MotionScope M Digital Interface**: This camera interfaces to a computer system via a Full Camera Link™ frame grabber. Currently supported frame grabbers are the Bitflow Karbon, Dalsa-Coreco X64 Xcelera-CL PX4 and the National Instruments PCIe-1429.
- **Xstream**: this camera is interfaced with a PCI express version 2.0 (X4) board. An adapter allow the communication through Thunderbolt.
- **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 trigger it in relation to a given event. The synchronization signals are generated for every image frame produced.
- **Software and SDK**: operates in Windows 2000, XP, Vista, 7, 8, 10 and MAC OS X environment.
- **Optical Interface**: The standard interface is C-mount. C-to-F and Canon mount converters are available upon request.

3.12. 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.

3.13. 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 or Ethernet cable.
- USB key of Motion Studio software suite and documentation.
- Power supply.
- Cross-platform Quick Start Guide.

3.14. Minimum computer requirements

Operating system: Windows XP, Vista, 7, 8, 8.1 or 10. MAC OS X with Intel processor.

Processor: Intel

RAM: 4 GB.

Hard Disk: 200 GB or greater.

Network: 1000 Mbps Ethernet adapter.

USB: USB 2.0 or 3.0

Frame grabbers for M series: Teledyne-Dalsa Coreco Xcelera-CL PX4, National Instruments PCIe-1429, EPIX PIXCI E4, Bitflow Karbon.

PCIe card for Xstream camera.

3.15. IRIG Support

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

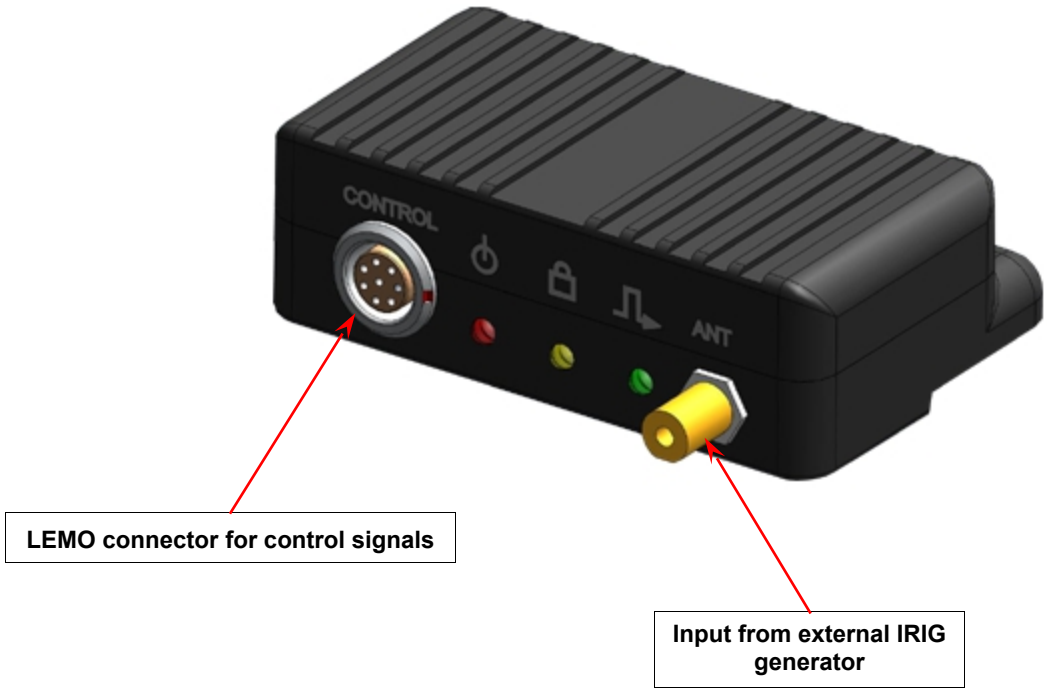
Y cameras support the IRIG modes listed below.

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

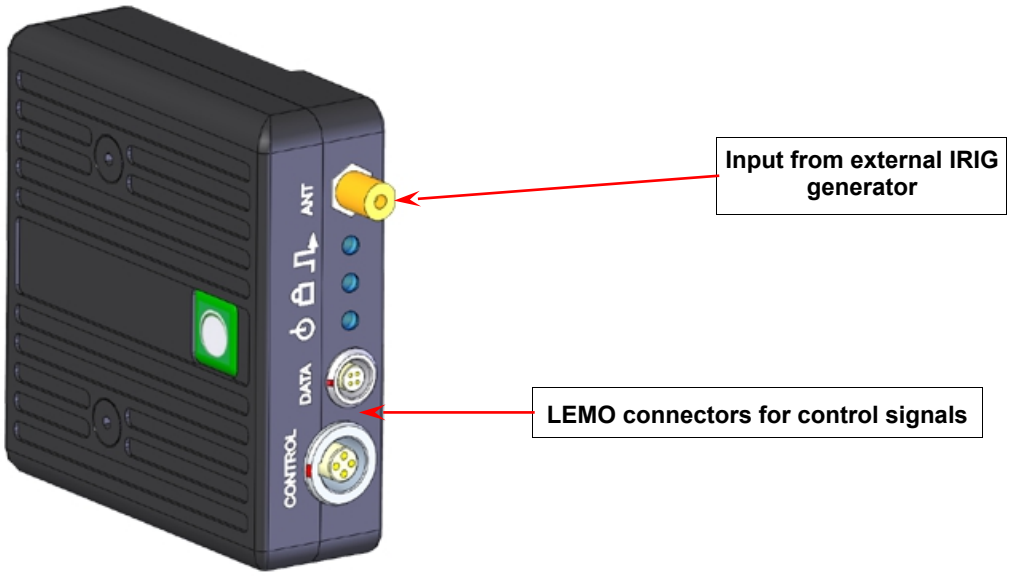
The IRIG signal is detected by an external box docked to the camera and connected to the “Control” 8-pin control LEMO connector. The input IRIG signals come from an external IRIG generator connected to the box.

The module has three LED:

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

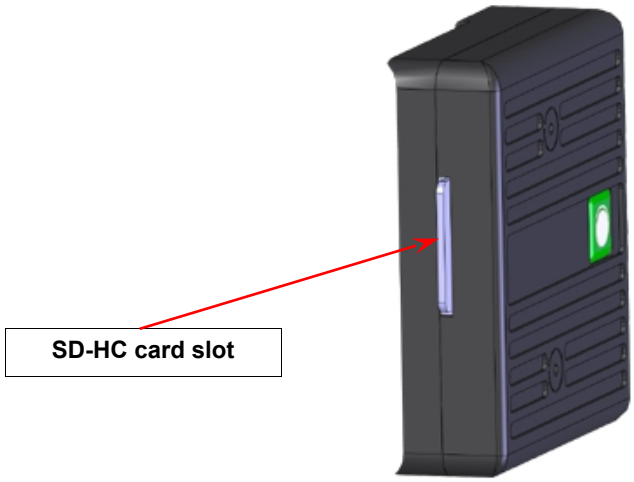


3.16. IRIG-Flash Device



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.

3.17. 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.

3.18. NX-Air with Wi-Fi Adapter

The NX-Air camera may be shipped with a Wi-Fi adapter and a NETGEAR™ router.

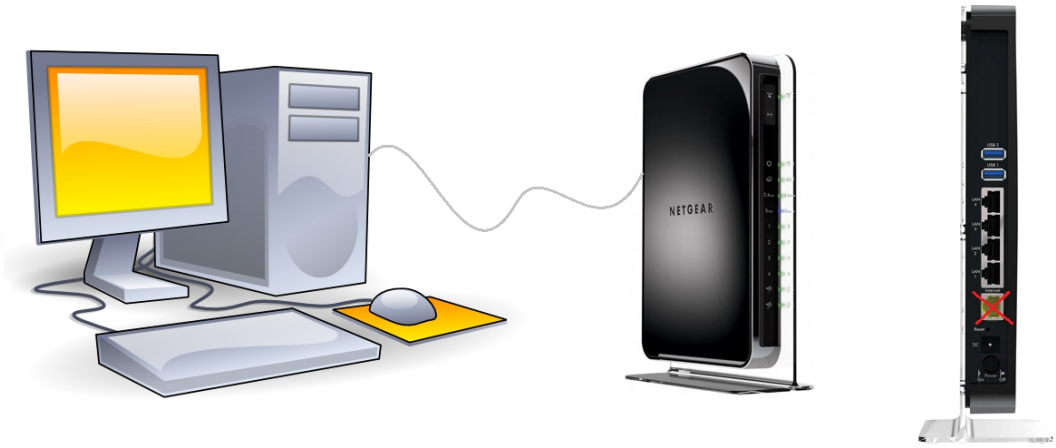
The adapter mounted on the camera has two settings.

1. **Client**: the camera is connected to the Wi-Fi network through the NETGEAR router.
2. **AP**: the adapter acts as an access point.

To switch between the two settings, follow the instruction below.

- Turn off the NX-Air and disconnect the wireless module.
- Remove the Wi-Fi adapter from NX-Air by removing the top four screws.
- On the bottom of the Wi-Fi adapter there is a switch. Move it to “AP” for Access Point setting or to “Client” to for the Client settings.

3.18.1. Instructions for Client configuration



- Make sure the switch underneath the Wi-Fi Adapter is in the middle position labeled client.
- Connect the router to your computer via Gigabit Ethernet (Make sure not to plug Ethernet cable into yellow Internet port on router).
- Turn on both the router and camera.
- Make sure that jumbo packets on both the camera and computer are disabled.
- Once these steps are complete, you should be able to locate your camera in the cameras enumerator list.

3.18.2. Instructions for Access Point configuration

- Make sure the switch underneath the Wi-Fi Adapter is in the position for AP.
- Turn on camera and wireless device.
- The Camera will create its own wireless network with a SSID of NXA followed by four digits (example: NXA0001).
- Connect to this new network (no password)
- Once these steps are complete, you should be able to locate your camera in the cameras enumerator list.

4. Product Specifications

4.1. Camera specifications

4.1.1. M Series

	M3	M5
Max fps @ max resolution	520 fps @ 1280x1024	170 fps @ 2320x1728
Minimum exposure time	1 µs	1 µs
Sensitivity ISO (mono)	3000	3000
Sensitivity ISO (color)	1000	1000
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-proprietary	CMOS- proprietary
CFA Pattern	BGGR	GRBG
Sensor Size	15.4 x 12.3 mm	16.4 x 12.1 mm
Array Size	1.3 Megapixels	4 Megapixels
Pixel Size	12x12 µm	7 x 7 µm
Aspect ratio	5:4	4:3
Pixel Depth	10-bit	10-bit
Internal clock	72.00 MHz	40.00 MHz
Triggers	TTL / switch closure	
Sync Input	Phase-lock TTL	
Sync Output	Frame Sync / Strobe	
IRIG	N/A	
GPS Time Code	N/A	
HDMI/SDI	N/A	
Communication	Full Camera-Link (10 taps 8 bit each)	
Power requirement	12 V, 2 A	
Operating temperature	0-50º C, 32-122º F	
Size	See mechanical	
Approx weight	0.32 kg / 0.71 lbs	
Shock	100G	
Vibration	40 G, all axes	
Battery	N/A	
Lens Mount	C-mount standard, F optional	

4.1.2. Y series

4.1.2.1. Common specifications

	All models
Power requirement	12V, 6.3 A
Operating temperature	-40 º to +50º C (-40 to +122º F)
Memory/DRAM	Internal 8-16-32-64 GB
Sensor type	CMOS-proprietary
Pixel Depth	10-bit
Triggers	TTL / switch closure
Sync Input	Phase-lock TTL
Sync Output	Frame Sync / Strobe
IRIG	Optional
GPS Time Code	Optional
HDMI/SDI	HDMI 30/60 fps
WiFi module	Optional
Communication	Ethernet (100-1000 BaseT) – USB 2.0
Approx size	See mechanical
Approx weight	3.4 kg / 7.5 lbs
Shock Rating	100G – all axes
Vibration Rating	40G – all axes
Battery powered operation time	Operation and backup up to 1 hour
Lens Mount	C-mount standard, F/PL optional

4.1.2.2. Y3

	Y3-S1	Y3-S2
Max fps @ max res	3750 @ 1280x1024	6030 @ 1280x1024
Minimum exposure time	1 µs	1 µs
CFA Pattern	GBRG	GBRG
Sensor Size	13.9 x 11.2 mm	13.9 x 11.2 mm
Array Size	1.3 Megapixel	1.3 megapixel
Pixel Size	10.85 x 10.85 µm	10.85 x 10.85 µm
Aspect ratio	5:4	5:4
Pixel Depth	10-bit	10-bit

4.1.2.3. Y4

	Y4-S1	Y4-S2	Y4-S3
Max fps @ max res	3000 @ 1024x1024	5100 @ 1024x1024	7000 @ 1024x1024
Minimum exposure time	1 µs	1 µs	1 µs
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 µm	13.68 x 13.68 µm	13.68 x 13.68 µm
Aspect ratio	1:1	1:1	1:1
Pixel Depth	10-bit	10-bit	10-bit

4.1.2.4. Y5

	Y5
Max fps @ max resolution	730 fps @ 2560x1920
Minimum exposure time	1 µs
CFA Pattern	GRBG
Sensor Size	16.4 x 12.1 mm
Array Size	5 Megapixels
Pixel Size	7 x 7 µm
Aspect ratio	4:3
Pixel Depth	10-bit

4.1.2.5. Y6

	Y6
Maximum fps @ max resolution	1150 fps @ 1504x1128
Minimum exposure time	1 µs
CFA Pattern	GBRG
Sensor Size	24.0 x 18.0 mm
Array Size	1.7 megapixel
Pixel Size	16 x 16 µm
Aspect ratio	4:3

4.1.2.6. Y7

	Y7-S1	Y7-S2	Y7-S3
Max fps @ max res	5300 @ 1920x1080	9000 @ 1920x1080	12300 @ 1920x1080
Minimum exposure time	1 µs	1 µs	1 µs
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	2 Megapixels	2 Megapixel	2 megapixel
Pixel Size	7.24 x 7.24 µm	7.24 x 7.24 µm	7.24 x 7.24 µm
Aspect ratio	16:9	16:9	16:9

4.1.2.7. Y8

	Y8-S1	Y8-S2	Y8-S3
Max fps @ max res	4000 @ 1600x1200	6800 @ 1600x1200	9300 @ 1600x1200
Minimum exposure time	1 µs	1 µs	1 µs
CFA Pattern	GBRG	GBRG	GBRG
Sensor Size	13.9 x 10.4 mm	13.9 x 10.4 mm	13.9 x 10.4 mm
Array Size	2 Megapixels	2 Megapixel	2 megapixel
Pixel Size	8.68 x 8.68 µm	8.68 x 8.68 µm	8.68 x 8.68 µm
Aspect ratio	4:3	4:3	4:3

4.1.3. Os-series

4.1.3.1. Common specifications

	All models
Power requirement	18-36 VDC
Operating temperature	-40 º to +50º C (-40 to +122º F)
Memory/DRAM	Internal (8 GB)
Internal SSD	256 GB / 512 GB
Sensor type	CMOS-proprietary
Pixel Depth	12-bit
Minimum exposure time	1 µs (100 ns optional)
Triggers	TTL/switch closure
Sync Input	Phase-lock TTL
Sync Output	Frame sync/Strobe
IRIG	Optional
GPS Time Code	Optional
HDMI/SDI	N/A
WiFi module	N/A
Communication	Ethernet (1000 BaseT)
Approximate size	See mechanical
Approximate weight	0.69 kg or 1.52 lbs
Shock Rating	200G
Vibration Rating	40G - All axes
Battery powered operation time	Optional
Lens Mount	C-mount standard

4.1.3.2. Os3

	Os3-S1	Os3-S2	Os3-S3
Max fps @ max res	3000 @ 1280x1024	5000 @ 1280x1024	7000 @ 1280x1024
CFA Pattern	GBRG	GBRG	GBRG
Sensor Size	13.9 x 11.1 mm	13.9 x 11.1 mm	13.9 x 11.1 mm
Array Size	1.3 Megapixels	1.3 Megapixels	1.3 Megapixels
Pixel Size	10.85 x 10.85 µm	10.85 x 10.85 µm	10.85 x 10.85 µm
Aspect ratio	5:4	5:4	5:4

4.1.3.3. Os4

	Os4-S1	Os4-S2	Os4-S3
Max fps @ max res	3000 @ 1024x1024	4500 @ 1024x1024	6000 @ 1024x1024
CFA Pattern	GBRG	GBRG	GBRG
Sensor Size	14 x 14 mm	14 x 14 mm	14 x 14 mm
Array Size	1 Megapixels	1 Megapixels	1 Megapixels
Pixel Size	13.68 x 13.68 µm	13.68 x 13.68 µm	13.68 x 13.68 µm
Aspect ratio	1:1	1:1	1:1

4.1.3.4. Os7

	Os7-S1	Os7-S2	Os7-S3
Max fps @ max res	1350 @ 1920x1280	2700 @ 1920x1280	4200 @ 1920x1280
CFA Pattern	GBRG	GBRG	GBRG
Sensor Size	17.5 x 11.7 mm	17.5 x 11.7 mm	17.5 x 11.7 mm
Array Size	2 Megapixels	2 Megapixels	2 Megapixels
Pixel Size	9.13 x 9.13 µm	9.13 x 9.13 µm	9.13 x 9.13 µm
Aspect ratio	3:2	3:2	3:2

4.1.3.5. Os8

	Os8-S1	Os8-S2	Os8-S3
Max fps @ max res	2000 @ 1600x1200	4000 @ 1600x1200	8000 @ 1600x1200
CFA Pattern	GBRG	GBRG	GBRG
Sensor Size	13.9 x 10.4 mm	13.9 x 10.4 mm	13.9 x 10.4 mm
Array Size	2 Megapixels	2 Megapixels	2 Megapixels
Pixel Size	8.68 x 8.68 µm	8.68 x 8.68 µm	8.68 x 8.68 µm
Aspect ratio	4:3	4:3	4:3

4.1.3.6. Os9

	Os9
Max fps @ max res	2500 @ 2560x1440
CFA Pattern	GRBG
Sensor Size	19.2 x 10.8 mm
Array Size	8 Megapixels
Pixel Size	7.5 x 7.5 µm
Aspect ratio	15:9

4.1.3.7. Os10-4K

	Os10-4K
Max fps @ max res	1000 @ 3840x2400
CFA Pattern	GRBG
Sensor Size	17.9 x 11.2 mm
Array Size	8 Megapixels
Pixel Size	4.67 x 4.67 µm
Aspect ratio	8:5

4.1.3.8. Os Airborne

	Os4A	Os7A	Os8A-S1
Max fps @ max res	1200 @ 1024x1024	1350 @ 1920x1280	1500 @ 1600x1200
CFA Pattern	GBRG	GBRG	GBRG
Sensor Size	14 x 14 mm	17.5 x 11.7 mm	13.9 x 10.4 mm
Array Size	1 Megapixels	2 Megapixels	2 Megapixels
Pixel Size	13.68 x 13.68 µm	9.13 x 9.13 µm	8.68 x 8.68 µm
Aspect ratio	1:1	3:2	4:3

4.1.4. CC series

4.1.4.1. Common specifications

	All models
Power requirement	18-36 VDC
Operating temperature	-40 º to +50º C (-40 to +122º F)
Memory/DRAM	Internal (8 GB)
Internal SSD	256 GB / 512 GB
Sensor type	CMOS-proprietary
Pixel Depth	12-bit
Minimum exposure time	1 µs (100 ns optional)
Triggers	TTL/switch closure
Sync Input	Phase-lock TTL
Sync Output	Frame sync/Strobe
IRIG	Optional
GPS Time Code	Optional
HDMI/SDI	SDI 30/60 fps
WiFi module	Optional
Communication	Ethernet (1000 BaseT)
Approximate size	See mechanical
Approximate weight	0.69 kg or 1.52 lbs
Shock Rating	200G
Vibration Rating	40G - All axes
Battery powered operation time	optional
Lens Mount	C-mount standard

4.1.4.2. CC 1060

	CC 1060
Max fps @ max res	6000 @ 1024x1024
CFA Pattern	GBRG
Sensor Size	14 x 14 mm
Array Size	1 Megapixels
Pixel Size	13.68 x 13.68 µm
Aspect ratio	1:1

4.1.4.3. CC 1520 / 1540

	CC 1520	CC 1540
Max fps @ max res	2000 @ 1440x1024	4000 @ 1440x1024
CFA Pattern	GBRG	GBRG
Sensor Size	16.7 x 11.9 mm	16.7 x 11.9 mm
Array Size	2 Megapixels	2 Megapixels
Pixel Size	11.60 x 11.60 µm	11.60 x 11.60 µm
Aspect ratio	3:2	3:2

4.1.4.4. CC 2020

	CC2020
Max fps @ max res	2000 @ 1920x1080
CFA Pattern	GRBG
Sensor Size	19.2 x 10.8 mm
Array Size	2 Megapixels
Pixel Size	10 x 10 µm
Aspect ratio	15:9

4.1.4.5. CC 4010

	CC4010
Max fps @ max res	1000 @ 2560x1600
CFA Pattern	GRBG
Sensor Size	17.9 x 11.2 mm
Array Size	8 Megapixels
Pixel Size	7 x 7 µm
Aspect ratio	8:5

4.1.5. NX / NX-Air series

4.1.5.1. Common specifications

	All models
Power requirement	12 VDC (N, NR, NX) 18-48 VDC (NXA)
Operating temperature	-40 º to +50º C (-40 to +122º F)
Memory/DRAM	Internal (1.25, 3, 4, 5 GB)
Sensor type	CMOS-proprietary
Pixel depth	10 bit
Triggers	TTL/switch closure
Sync Input	Phase-lock TTL
Sync Output	Frame sync/Strobe
IRIG	Optional
GPS Time Code	Optional
HDMI/SDI	N/A
WiFi module	Optional
Communication	Ethernet (100-1000 BaseT)
Approximate size	See mechanical
Approximate weight	0.2 kg / 0.5 lbs (NX-NXT) 0.6 kg / 1.5 lbs (NXA)
Shock Rating	200G – all axes
Vibration Rating	40G – all axes
Battery powered operation time	Operation and backup up to 2 hours
Lens Mount	C-mount standard, F/PL optional

4.1.5.2. NX3 (NR3, N3 except weight, size and memory)

	NX3-S1	NX3-S2	NX3-S3	NX3-S4
Max fps @ max res	500 @ 1280x1024	1030 @ 1280x1024	2550 fps @ 1280x1024	3800 fps @ 1280x1024
Minimum exposure time	1 µs	1 µs	1 µs	1 µs
CFA Pattern	BGGR	BGGR	GBRG	GBRG
Sensor Size	15.4 x 12.3 mm	15.4 x 12.3 mm	13.9 x 11.2 mm	13.9 x 11.2 mm
Array Size	1.3 Megapixels	1.3 Megapixels	1.3 Megapixel	1.3 Megapixel
Pixel Size	12x12 µm	12x12 µm	10.85 x 10.85 µm	10.85 x 10.85 µm
Aspect ratio	5:4	5:4	5:4	5:4

4.1.5.3. NX4 (NR4, N4 except weight, size and memory)

	NX4-S1	NX4-S2	NX4-S3
Max fps @ max res	1000 @ 1024x1024	2000 @ 1024x1024	3000 @ 1024x1024
Minimum exposure time	1 µs	1 µs	1 µs
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 µm	13.68 x 13.68 µm	13.68 x 13.68 µm
Aspect ratio	1:1	1:1	1:1

4.1.5.4. NX5 (NR5, N5 except weight, size and memory)

	NX5-S1	NX5-S2
Max fps @ max res	325 fps @ 2336x1728	730 fps @ 2336x1728
Minimum exposure time	1 µs	1 µs
CFA Pattern	GRBG	GRBG
Sensor Size	16.4 x 12.1 mm	16.4 x 12.1 mm
Array Size	4 Megapixels	4 Megapixels
Pixel Size	7 x 7 µm	7 x 7 µm
Aspect ratio	4:3	4:3

4.1.5.5. NX7

	NX7-S1	NX7-S2
Max fps @ max res	2500 @ 1920x1080	5000 @ 1920x1080
Minimum exposure time	1 µs	1 µs
CFA Pattern	GBRG	GBRG
Sensor Size	13.9 x 7.8 mm	13.9 x 7.8 mm
Array Size	1 Megapixels	1 Megapixel
Pixel Size	7.24 x 7.24 µm	7.24 x 7.24 µm
Aspect ratio	16:9	16:9

4.1.5.6. NX8

	NX8-S1	NX8-S2
Max fps @ max res	2000 @ 1600x1200	4000 @ 1600x1200
Minimum exposure time	1 µs	1 µs
CFA Pattern	GBRG	GBRG
Sensor Size	13.9 x 10.4 mm	13.9 x 10.4 mm
Array Size	1 Megapixels	1 Megapixel
Pixel Size	8.68 x 8.68 µm	8.68 x 8.68 µm
Aspect ratio	4:3	4:3

4.1.6. iN series

4.1.6.1. Common specifications

	All models
Power requirement	12 VDC
Operating temperature	-40 º to +50º C (-40 to +122º F)
Memory/DRAM	Internal (1.25, 3, 4, 5 GB)
Sensor type	CMOS-proprietary
Pixel depth	10 bit
Triggers	TTL/switch closure
Sync Input	Phase-lock TTL
Sync Output	Frame sync/Strobe
IRIG	Optional
GPS Time Code	Optional
HDMI	N/A
WiFi module	Optional
Communication	Ethernet (100-1000 BaseT)
Approximate size	See mechanical
Approximate weight	0.2 kg / 0.5 lbs (NX-NXT) 0.6 kg / 1.5 lbs (NXA)
Shock Rating	200G – all axes
Vibration Rating	40G – all axes
Battery powered operation time	Operation and backup up to 2 hours
Lens Mount	C-mount standard, F/PL optional

4.1.6.2. iN8

	iN8-S1	iN8-S2
Max fps @ max res	500 @ 1600x1200	1000 @ 1600x1200
Minimum exposure time	1 µs	1 µs
CFA Pattern	GBRG	GBRG
Sensor Size	13.9 x 10.4 mm	13.9 x 10.4 mm
Array Size	1 Megapixels	1 Megapixels
Pixel Size	8.68 x 8.68 µm	8.68 x 8.68 µm
Aspect ratio	4:3	4:3

4.1.7. XStream series

	720p	1440p
Max fps @ max resolution	1700 fps @ 1280x720	450 fps @ 2560x1440
Minimum exposure time	1 µs	1 µs
Memory/DRAM	PC RAM, direct write to disk	PC RAM, direct write to disk
Sensor Type	CMOS-proprietary	CMOS- proprietary
CFA Pattern	GRBG	GRBG
Sensor Size	15.4 x 12.3 mm	16.1 x 12.1 mm
Array Size	1.3 Megapixels	5 Megapixels
Pixel Size	12x12 µm	7 x 7 µm
Aspect ratio	16:9	16:9
Pixel Depth	10-bit	10-bit
Triggers	TTL / switch closure	
Sync Input	Phase-lock TTL	
Sync Output	Frame Sync / Strobe	
IRIG	N/A	
GPS Time Code	N/A	
HDMI	N/A	
Communication	PCIe Gen 2.0 x4, Thunderbolt 1 and 2	
Power requirement	7-12 V, 1 A	
Operating temperature	Active cooling -40º to +60º C, -40 to +122º F	
Size	See mechanical	
Approx weight	0.24 kg or 0.53 lbs	
Battery	N/A	
Lens Mount	C-mount standard, F optional	

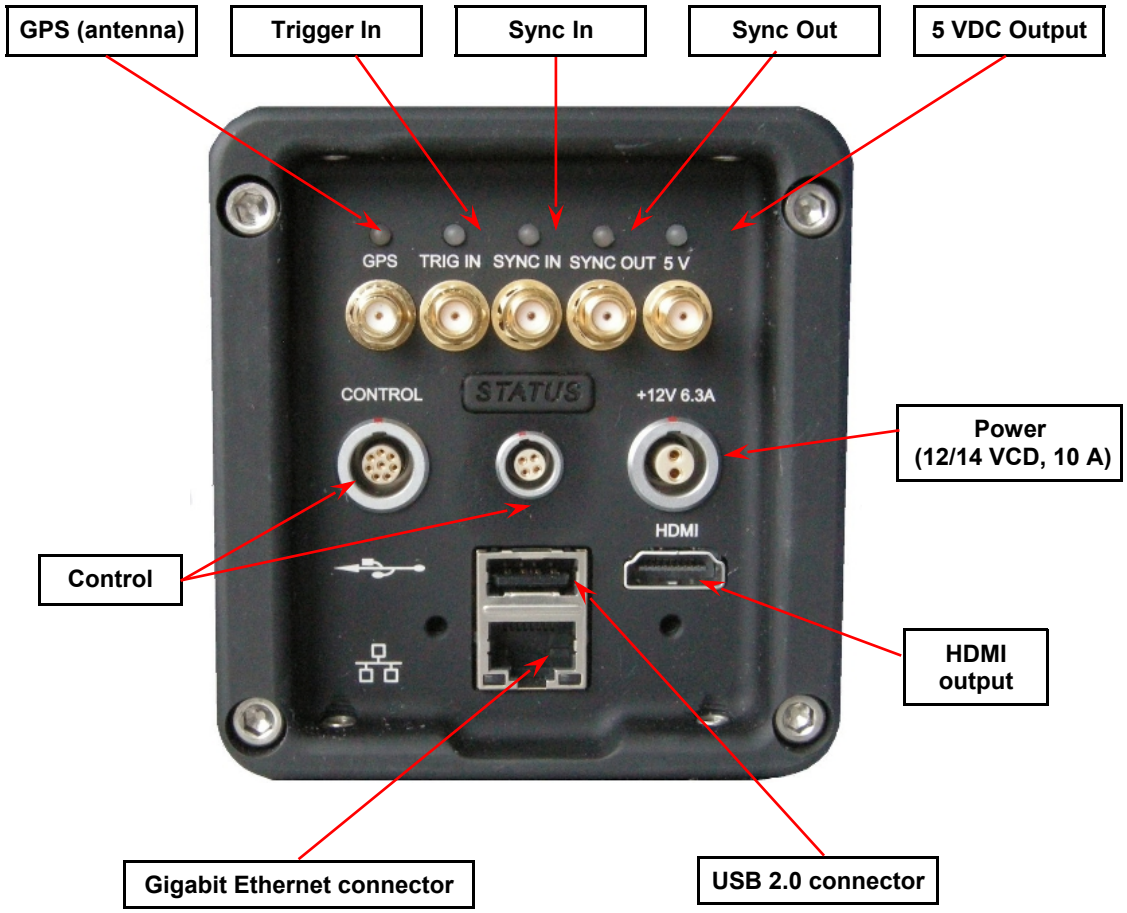
4.2. Camera back panel

4.2.1. Y series

Two versions of the back panel are available (with SMA or BNC)

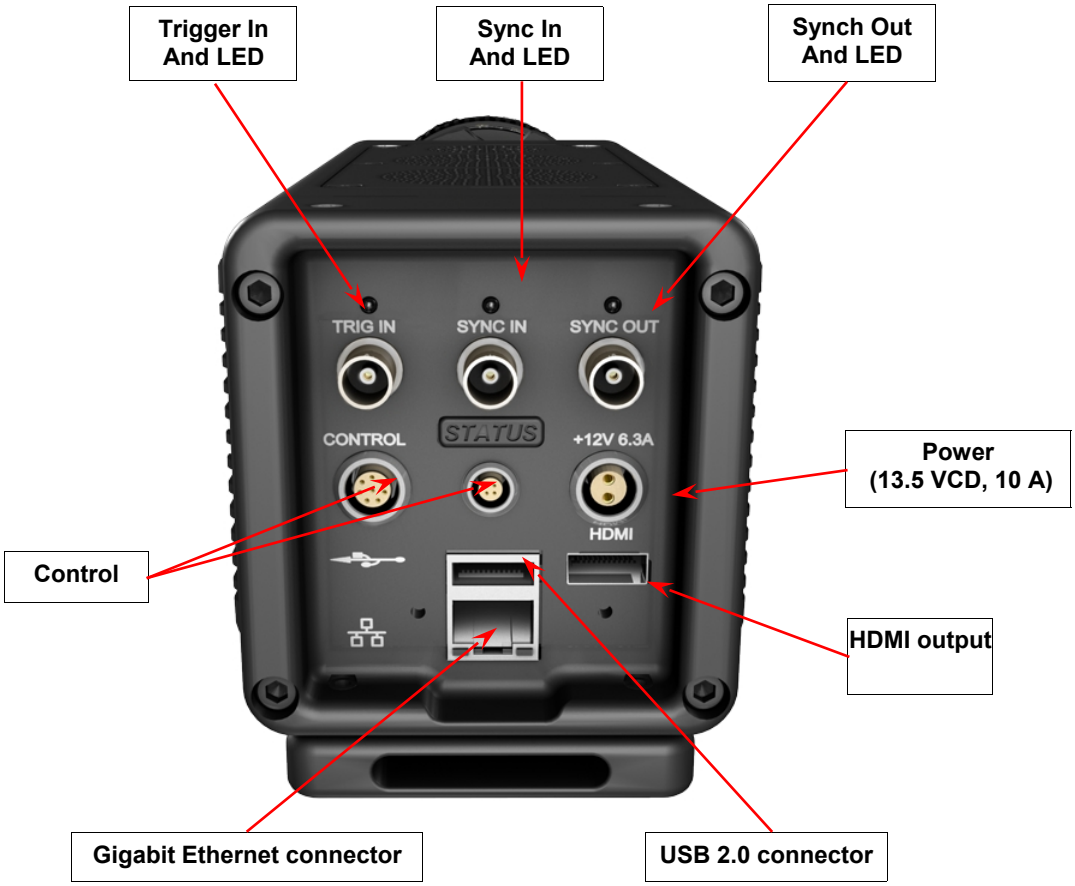
SMA Version

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



BNC version (older)

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 (cameras with BNC connectors)

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 #	Signal
1	+12 VDC
2	GND
3	Trigger
4	Sync In
5	Sync Out
6	RX
7	TX
8	GPS

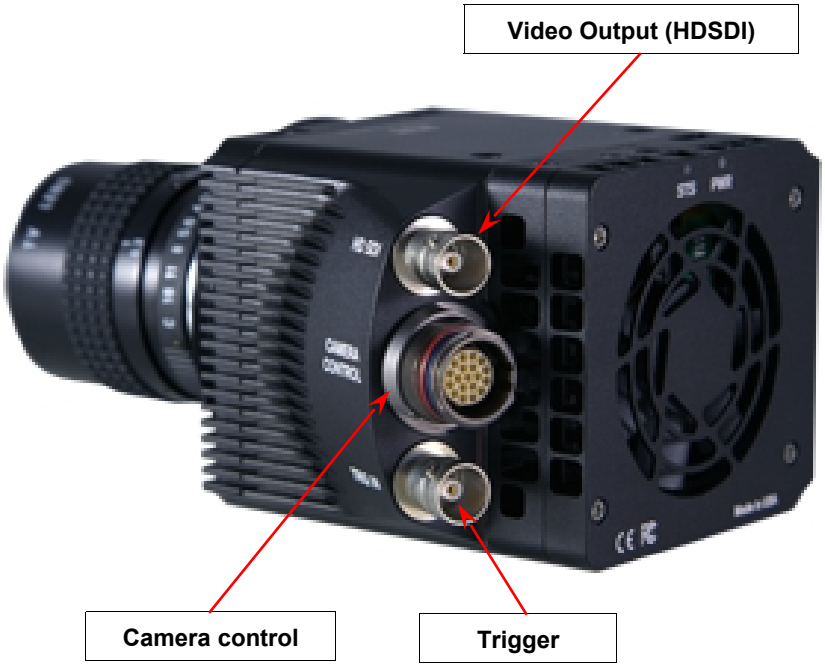
RX and TX are “receive” and “transmit” signals of the internal serial interface.

8-pins Control connector (cameras with SMA connectors)

PIN #	Single-ended (5V TTL)	Differential (RS422/485)
1	+ 12 VDC	+Trig In
2	GND	- Trig In
3	Trigger	+ Sync In
4	Sync In	- Sync In
5	Sync Out	+ Sync Out
6	IRIG	- Sync Out
7	TX	+ IRIG
8	GPS	- IRIG

4.2.2. Os series / Airborne / CC series

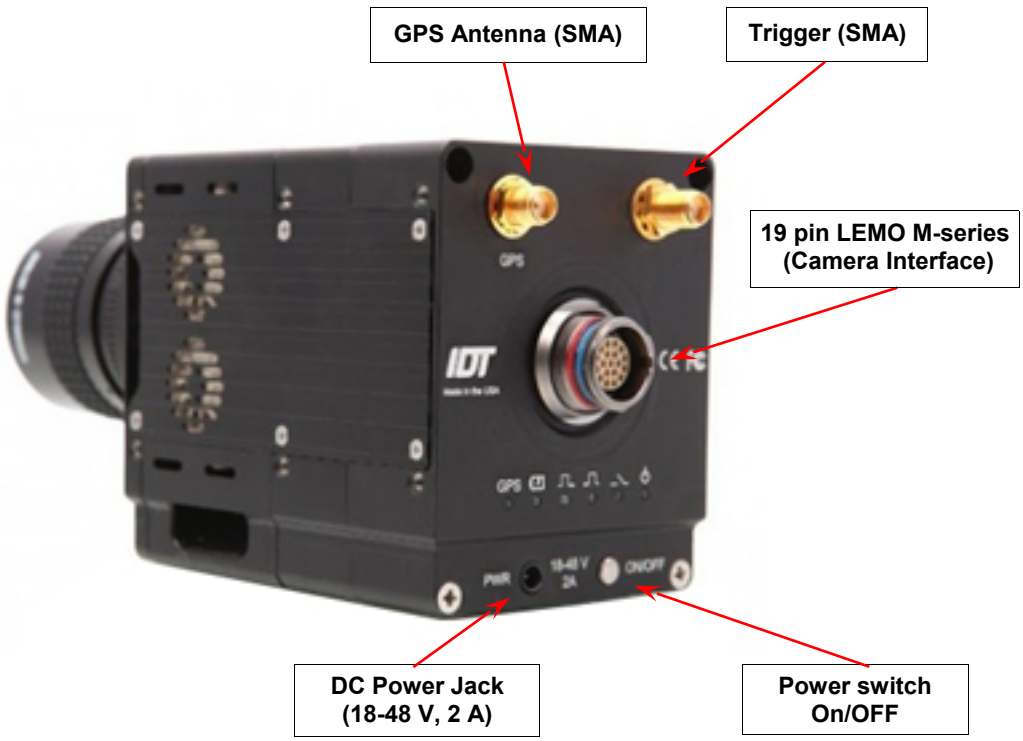
The back panel of the CC series is shown below.



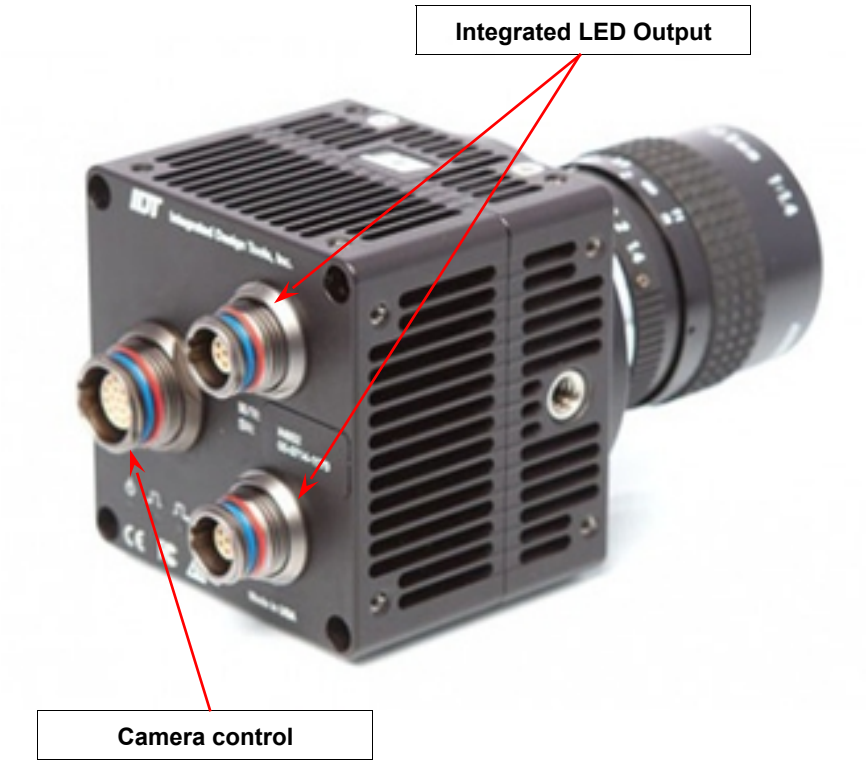
The back panel of Os series is the same with the only difference being the HDSDI connector.

4.2.3. NX series

4.2.4. NX-Air series

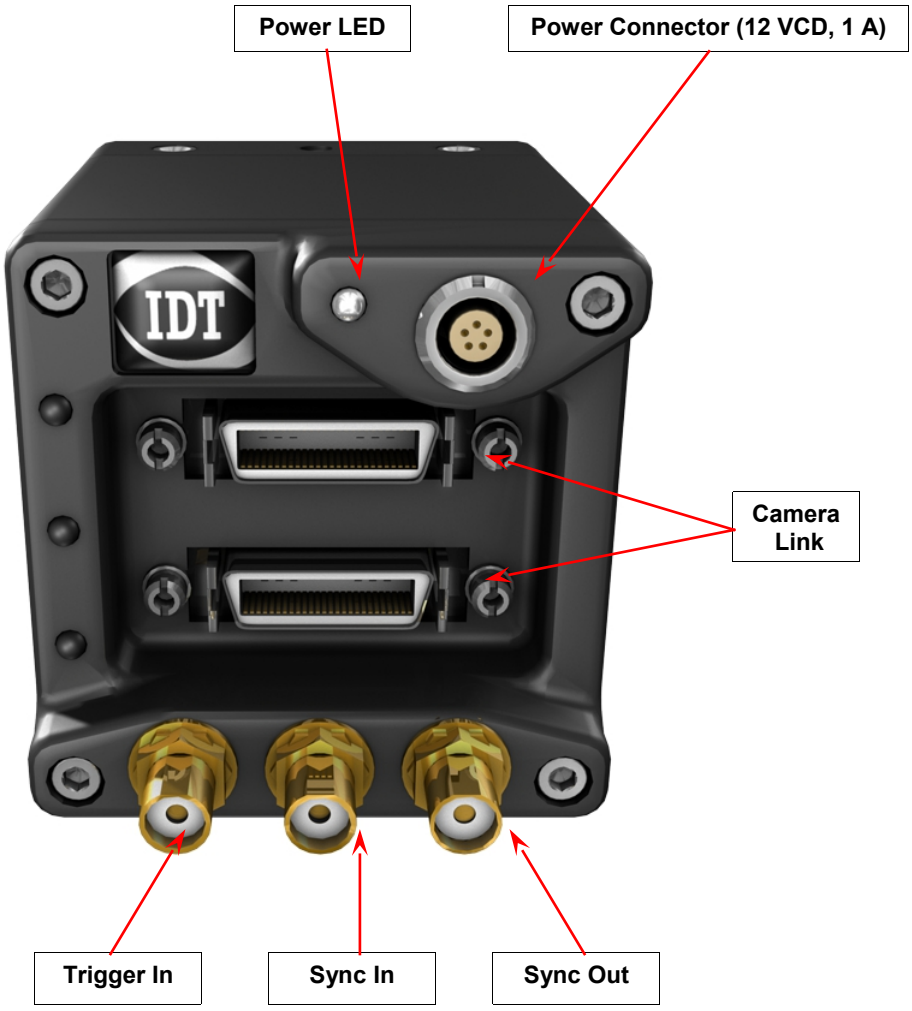


4.2.5. iN series



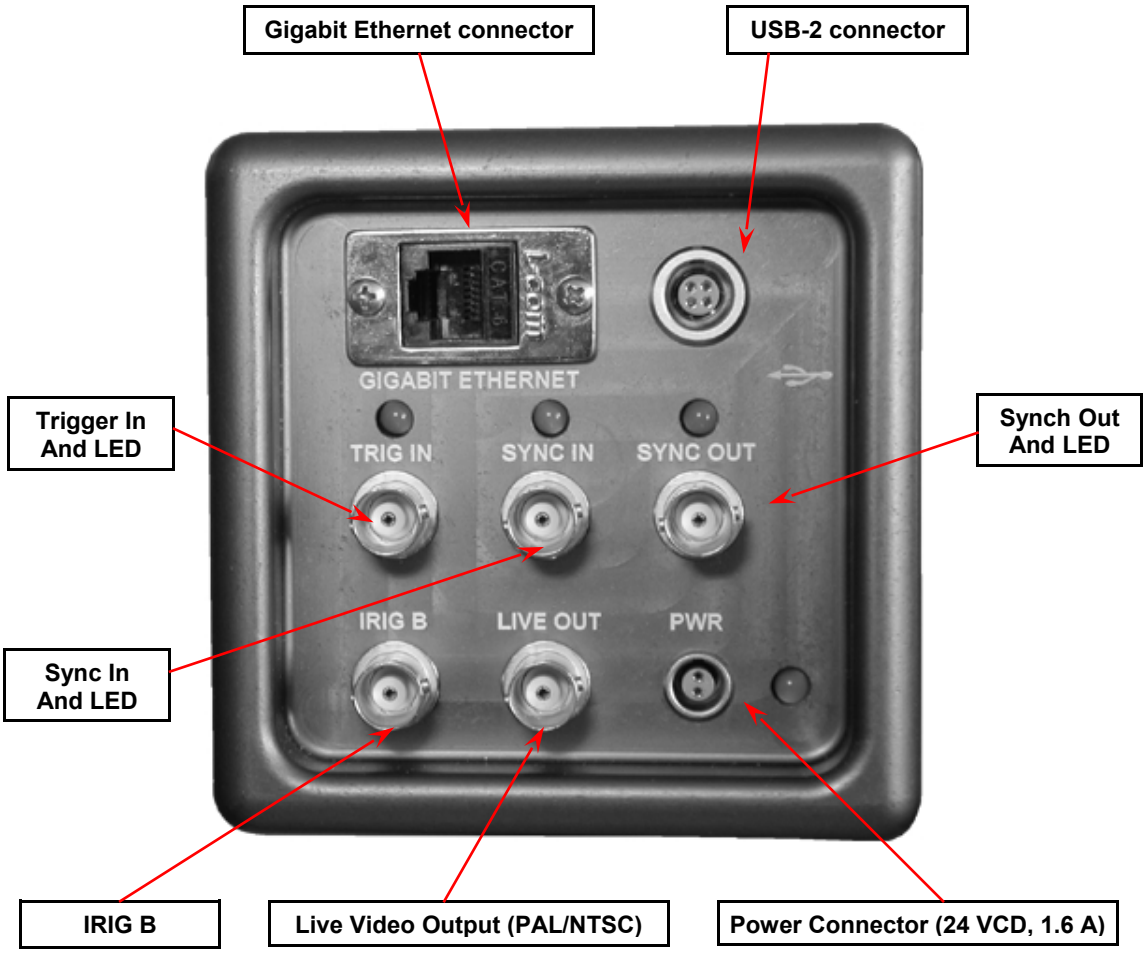
4.2.6. M series

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

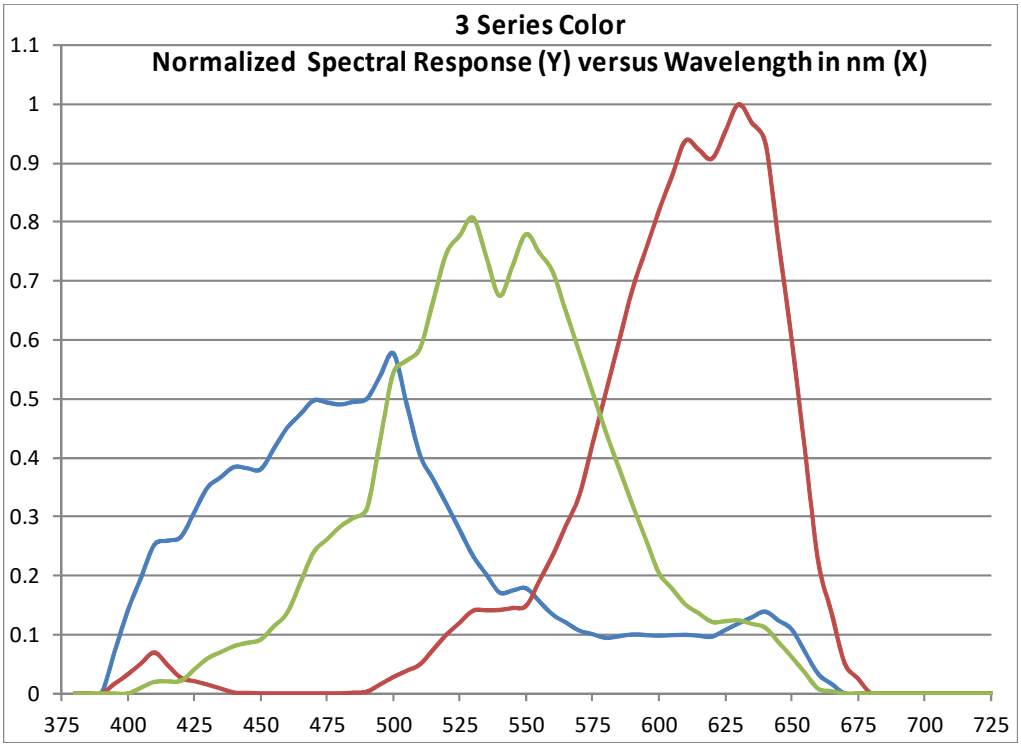


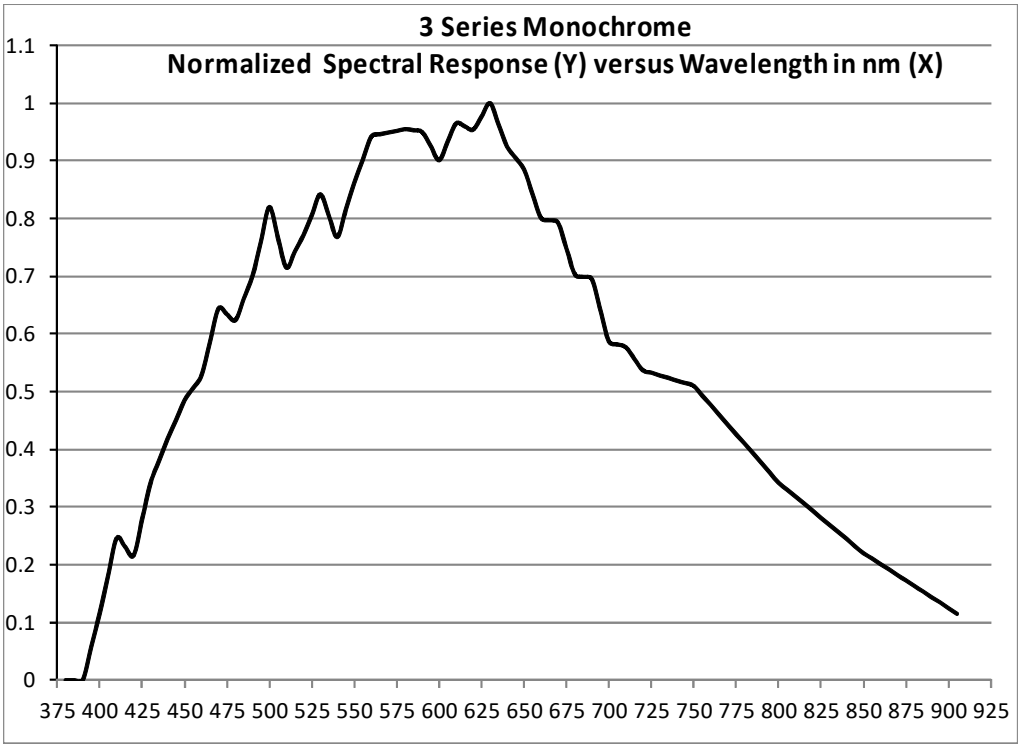
4.2.7. X series

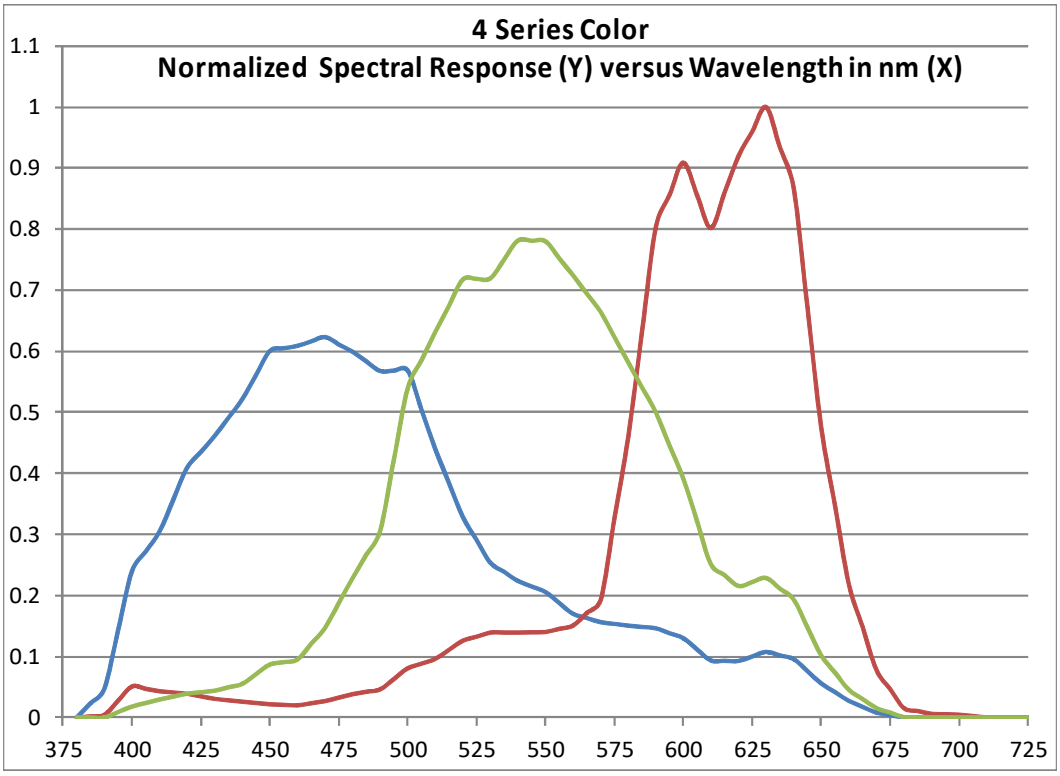
The MotionPro X USB 2.0/Gigabit-Ethernet camera back panel is shown below.

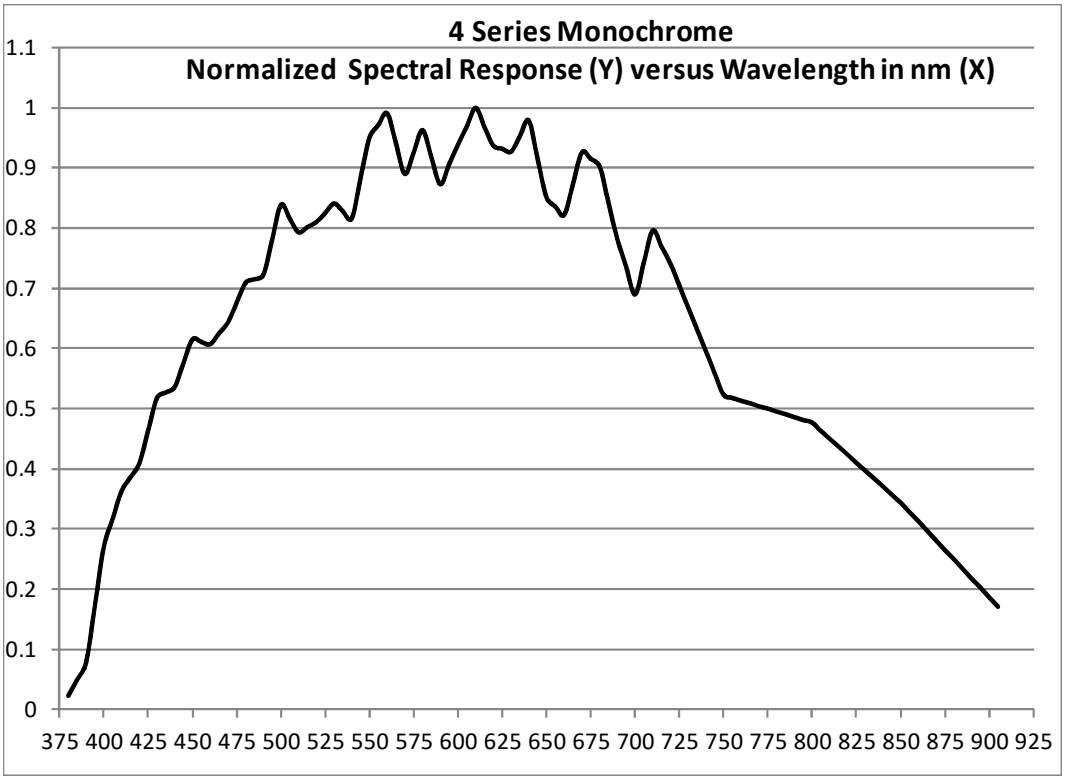


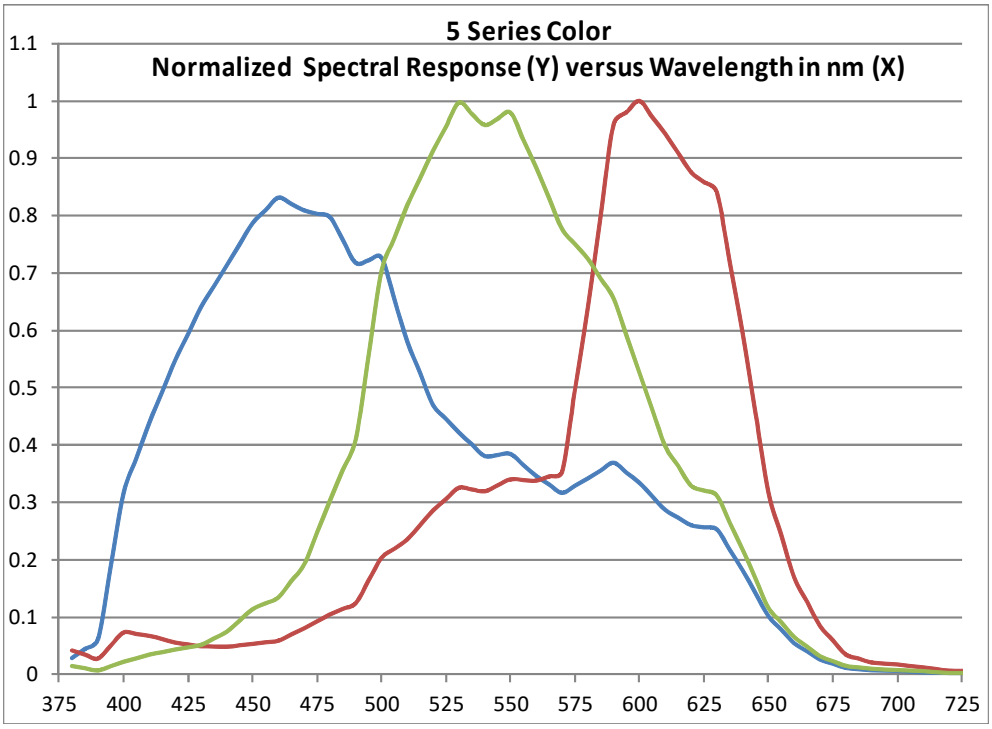
4.3. Camera Spectral Response Curves

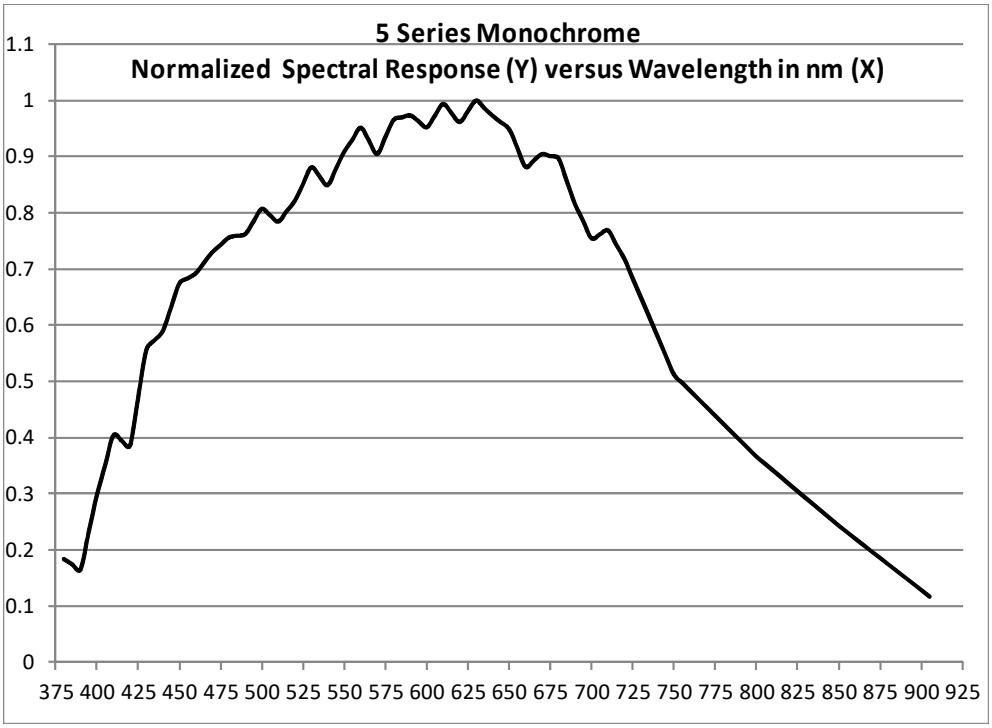





4 Series Color
Normalized Spectral Response (Y) versus Wavelength in nm (X)
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
375 400 425 450 475 500 525 550 575 600 625 650 675 700 725


4 Series Monochrome
Normalized Spectral Response (Y) versus Wavelength in nm (X)
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
375 400 425 450 475 500 525 550 575 600 625 650 675 700 725 750 775 800 825 850 875 900 925


5 Series Color
Normalized Spectral Response (Y) versus Wavelength in nm (X)
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
375 400 425 450 475 500 525 550 575 600 625 650 675 700 725


5 Series Monochrome
Normalized Spectral Response (Y) versus Wavelength in nm (X)
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
375 400 425 450 475 500 525 550 575 600 625 650 675 700 725 750 775 800 825 850 875 900 925

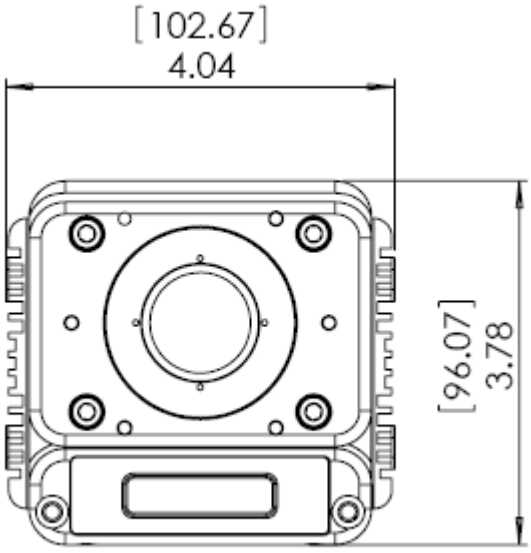
4.4. Intensified X cameras

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

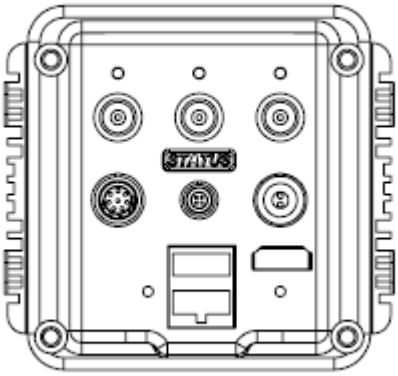
Parameter	Value
Input diameter	17.5 mm min
Input window	Glass (AVG)
Cathode sensitivity for white light	500 µA/lm min
at 800 nm	43 mA/lm min
at 850 nm	33 mA/lm min
Phosphor	P46
Output window	Fiber-optic
Luminance gain	1590 cd/m²/lx min
E.B.I.	0.25 µlx max
Shading	45 % max
Resolution	36 lp/mm min
Gate-able	Yes (down to 50 ns)
Iris delay	16.6 ns max

4.5. Mechanical and hole mounts (Y series)

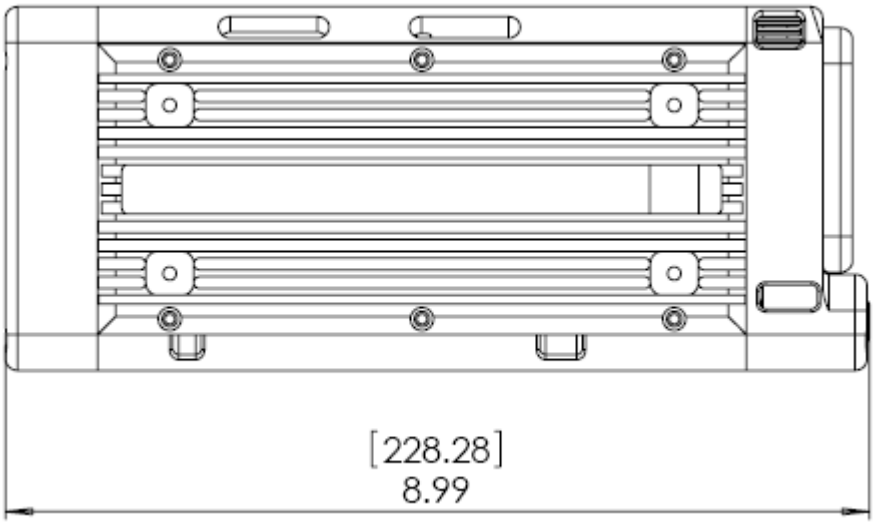
4.5.1. Front view



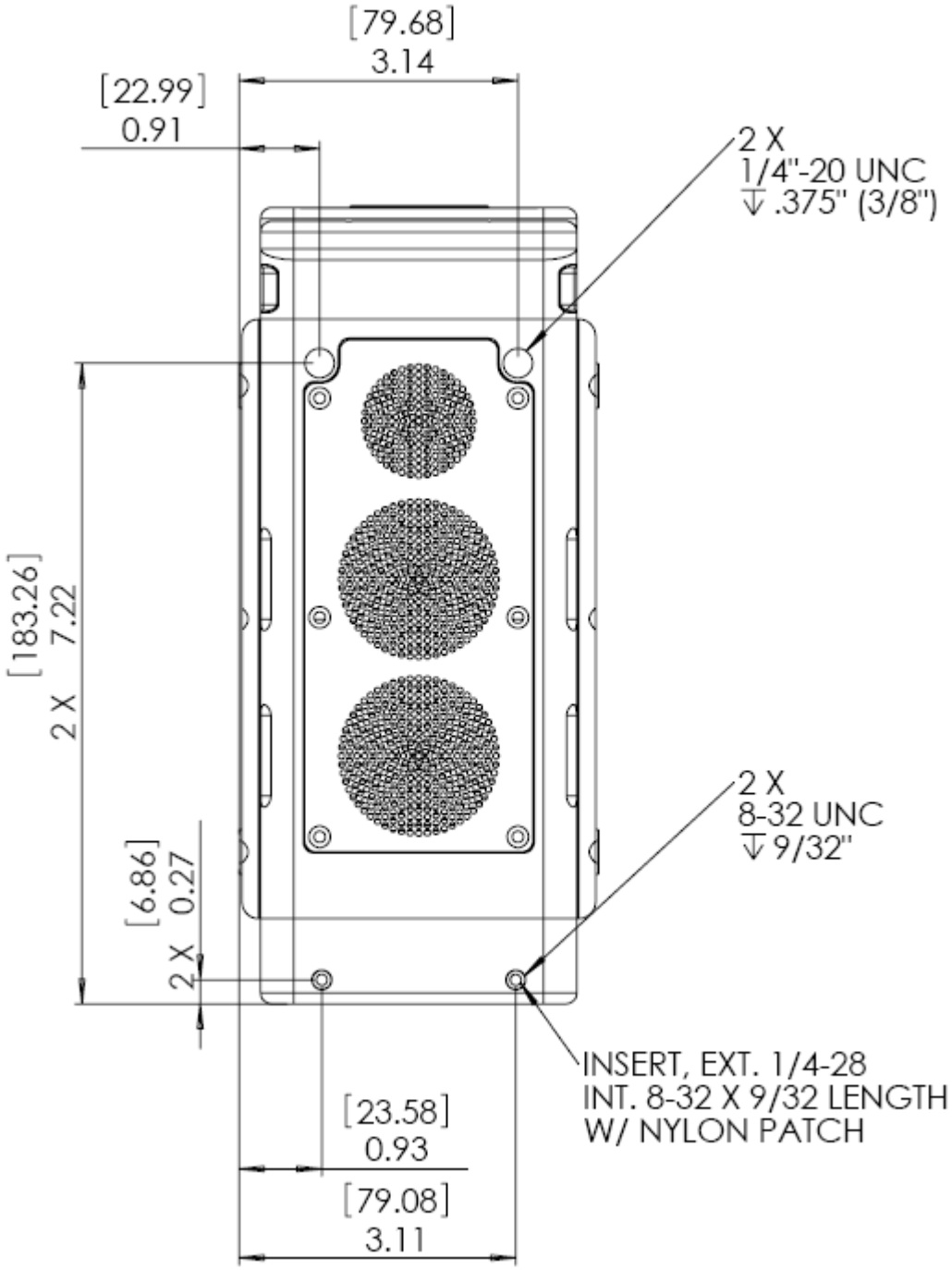
4.5.2. Back view



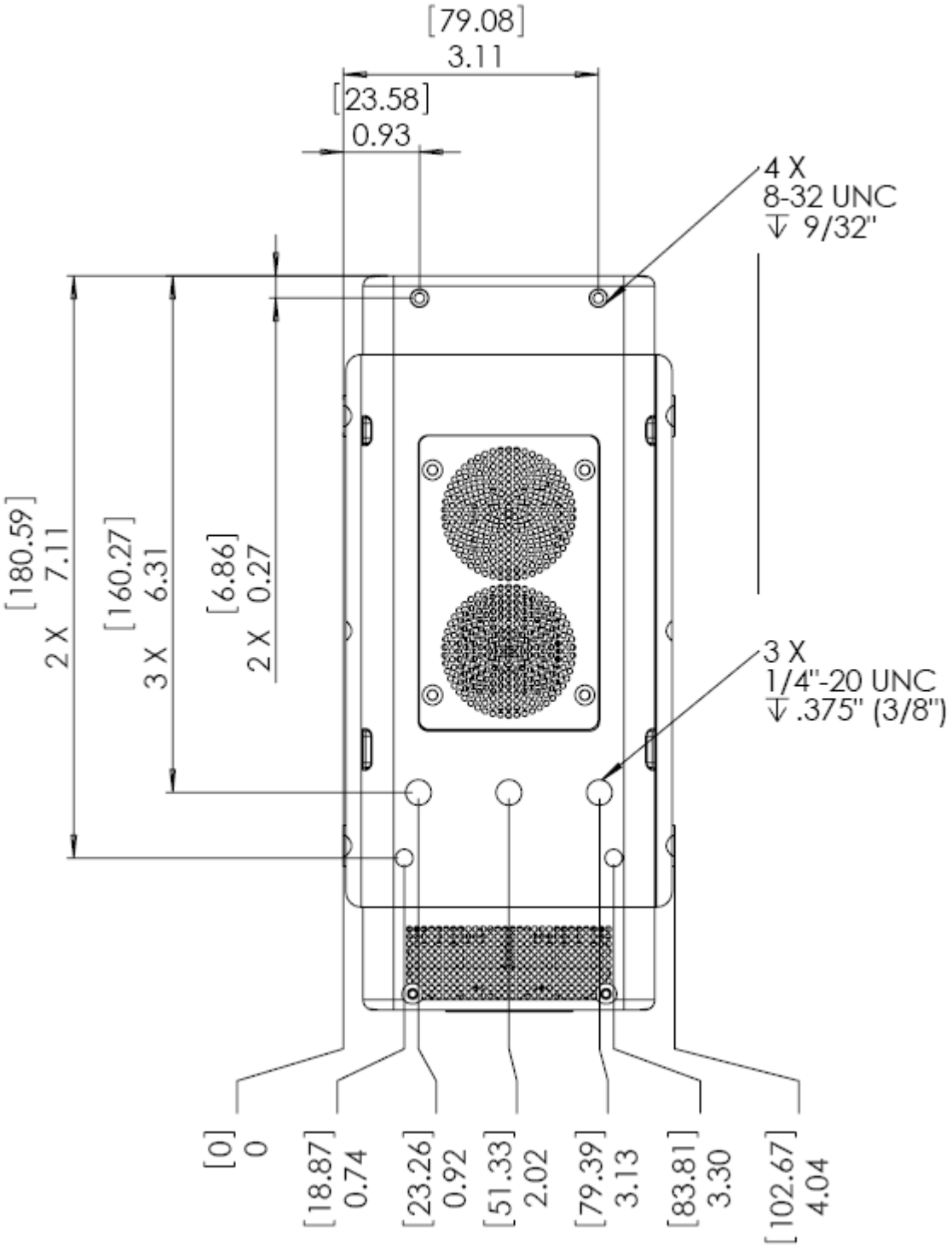
4.5.3. Side view



4.5.4. Top View

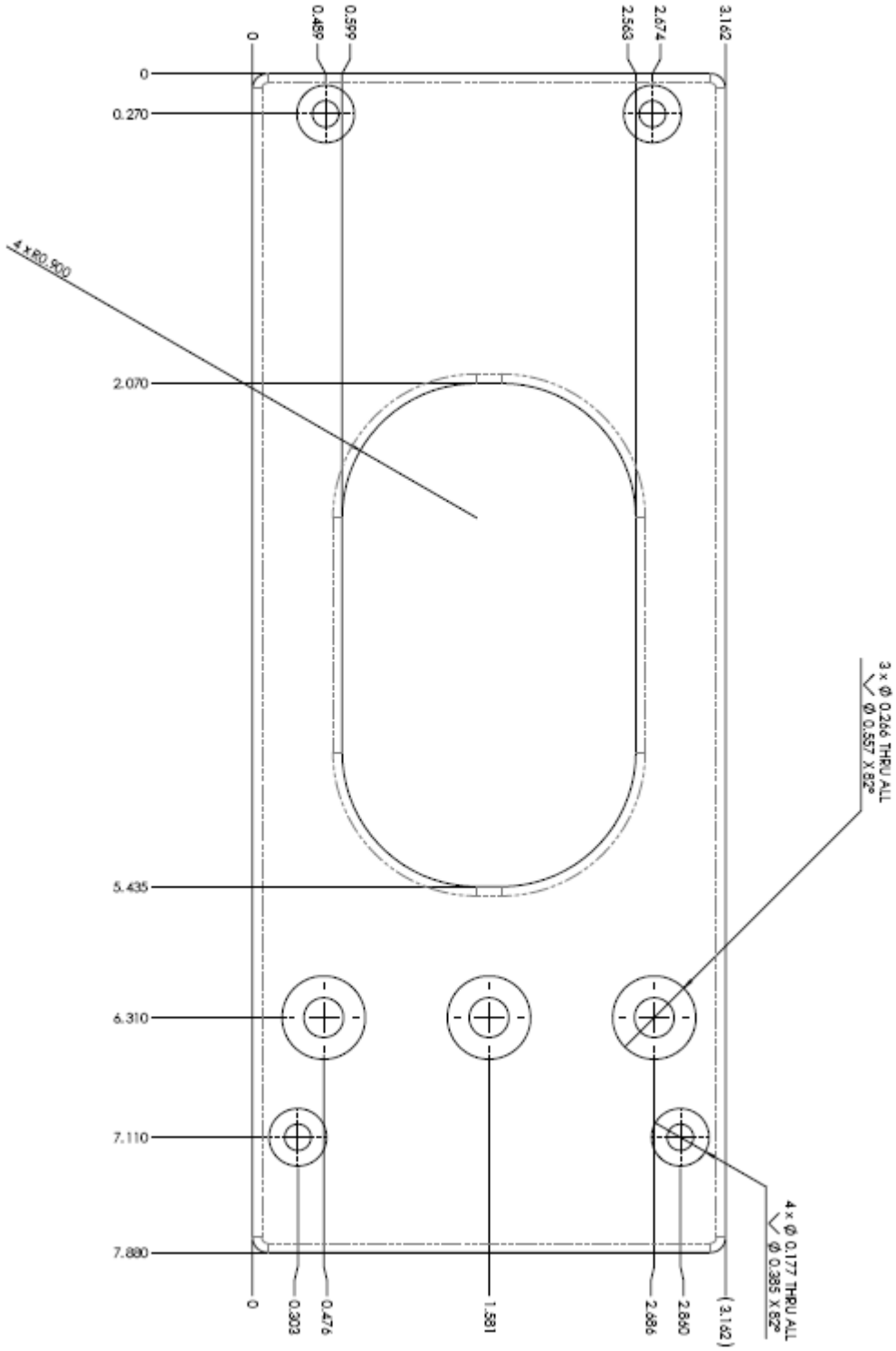

[79.68]
3.14
[22.99]
0.91
2 X
1/4"-20 UNC
↧ .375" (3/8")
[183.26]
7.22
2 X
[6.86]
0.27
2 X
2 X
8-32 UNC
↧ 9/32"
INSERT, EXT. 1/4-28
INT. 8-32 X 9/32 LENGTH
W/ NYLON PATCH
[23.58]
0.93
[79.08]
3.11

4.5.5. Bottom view

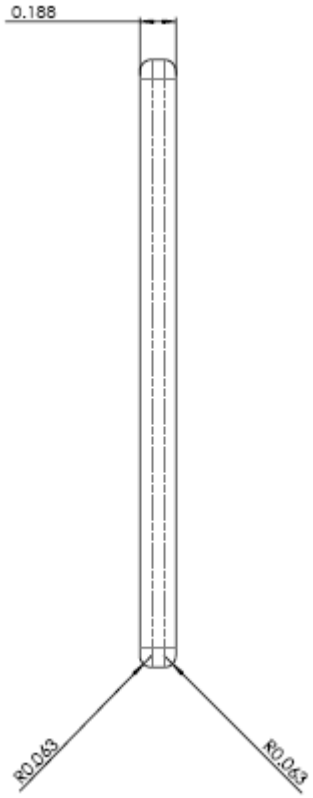


4.5.6. Mounting plate

Front View

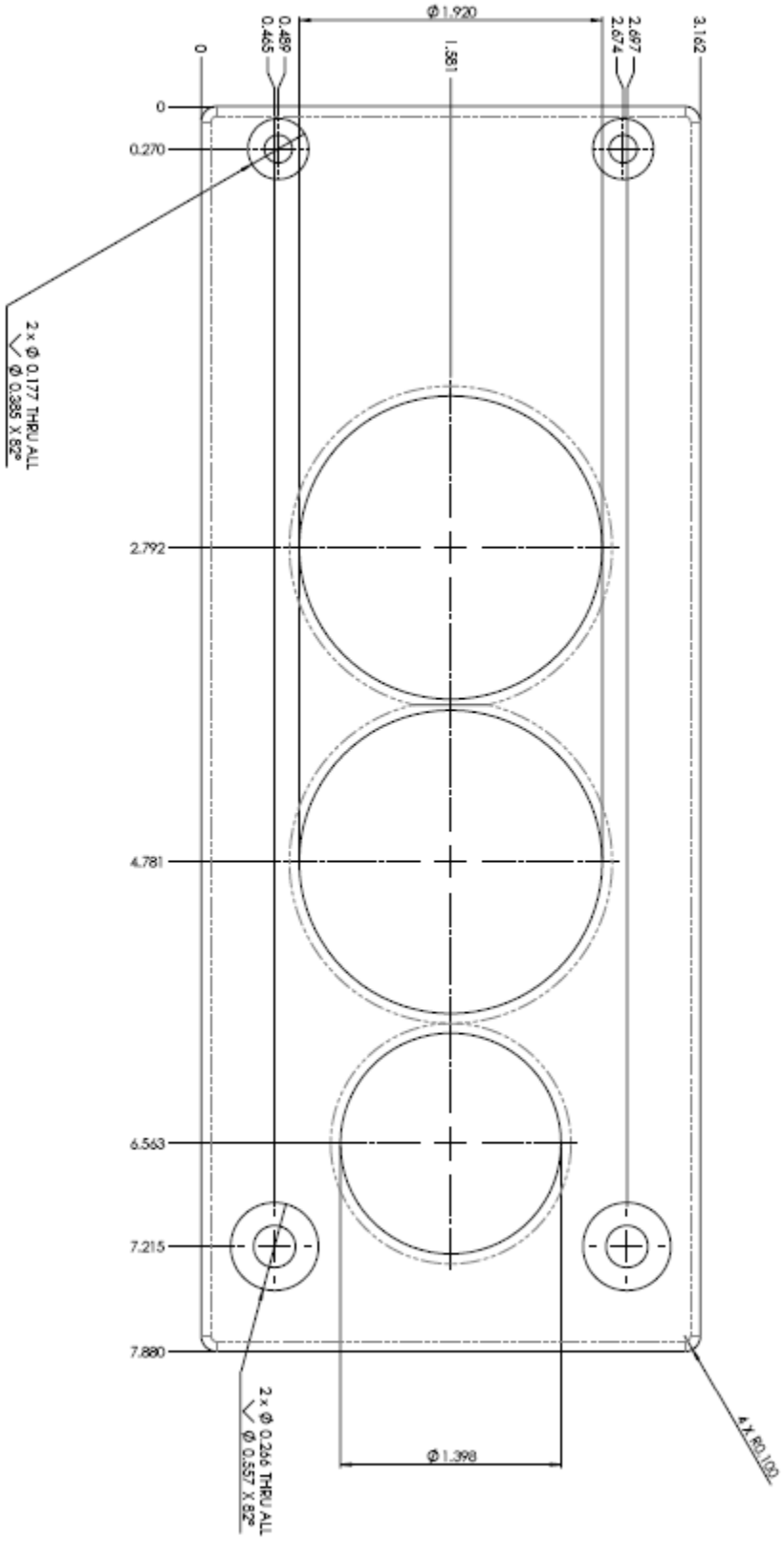


Side view


0.188
R0.063
R0.063

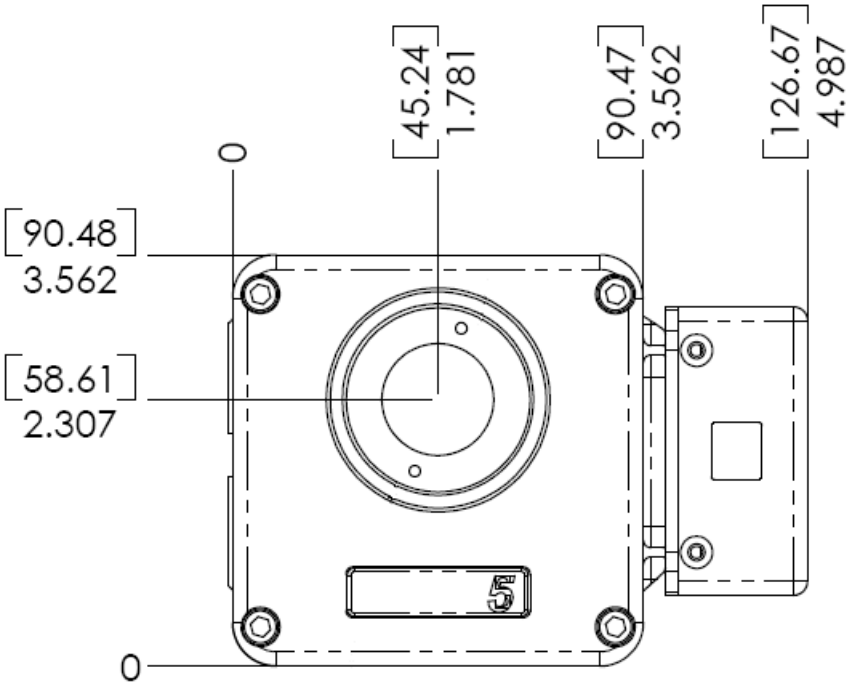
4.5.7. Top mounting plate

Front view

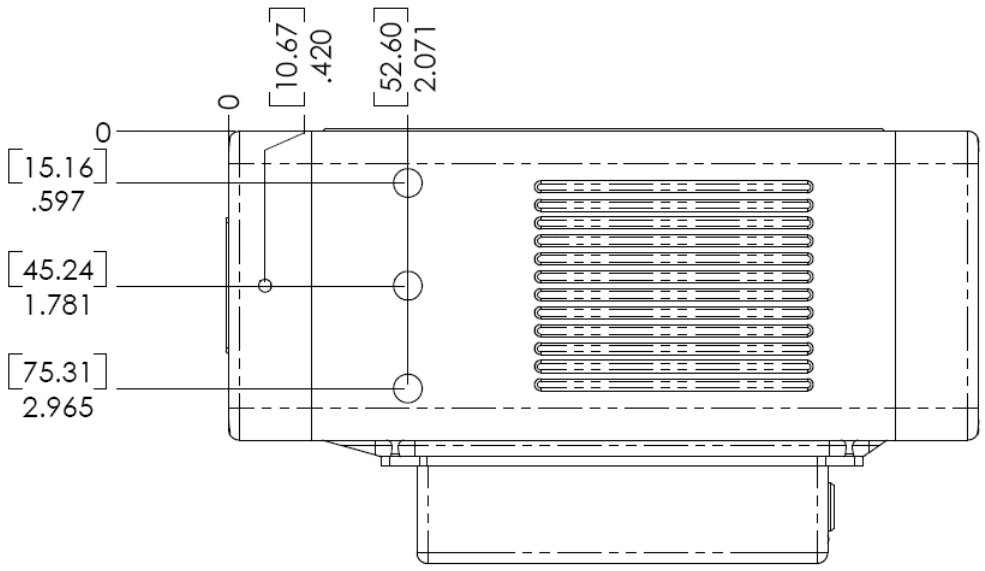


Side view

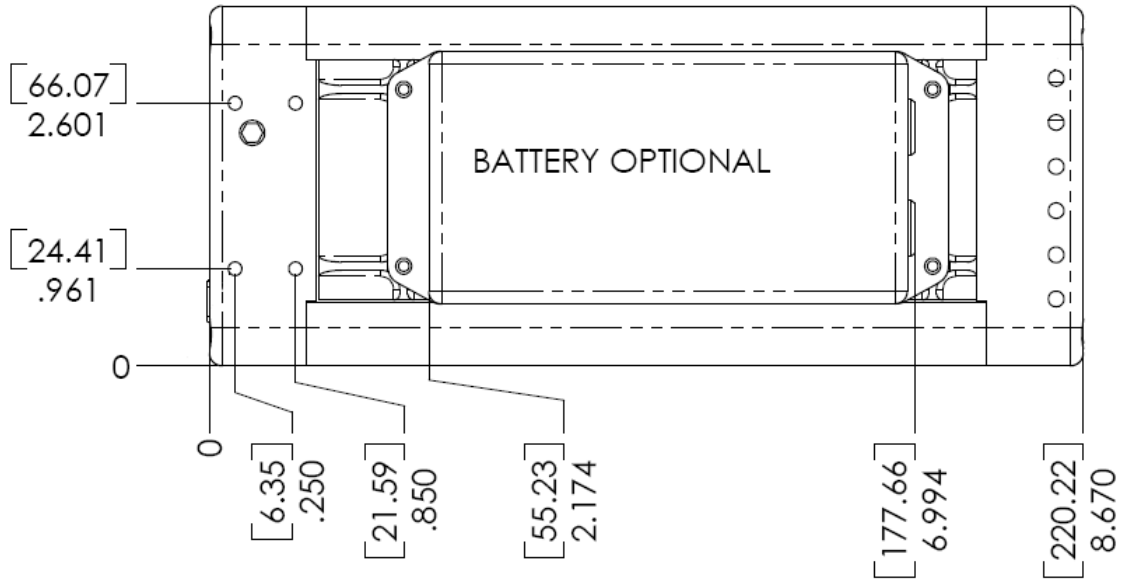
4.5.8. First revision camera front view



4.5.9. First Revision camera top view

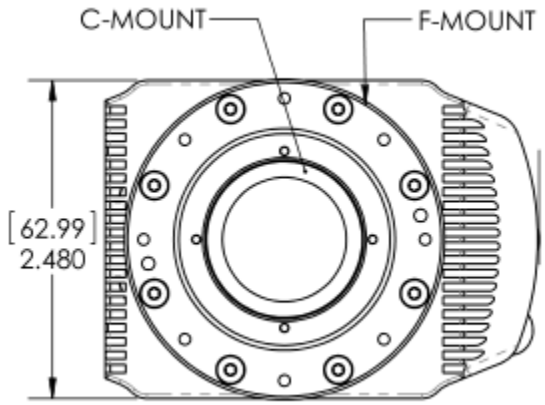


4.5.10. First revision camera side view

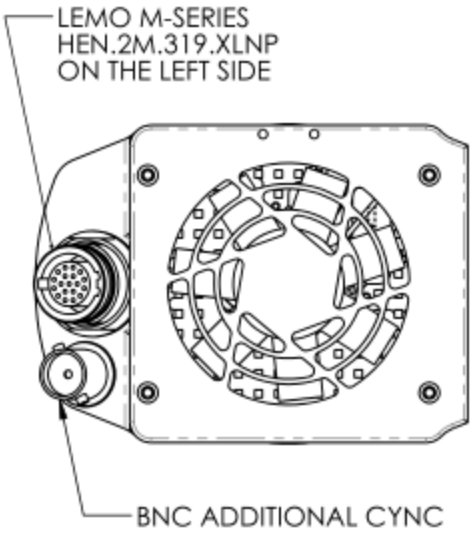


4.6. Mechanical and hole mounts (OS V3 and CC series)

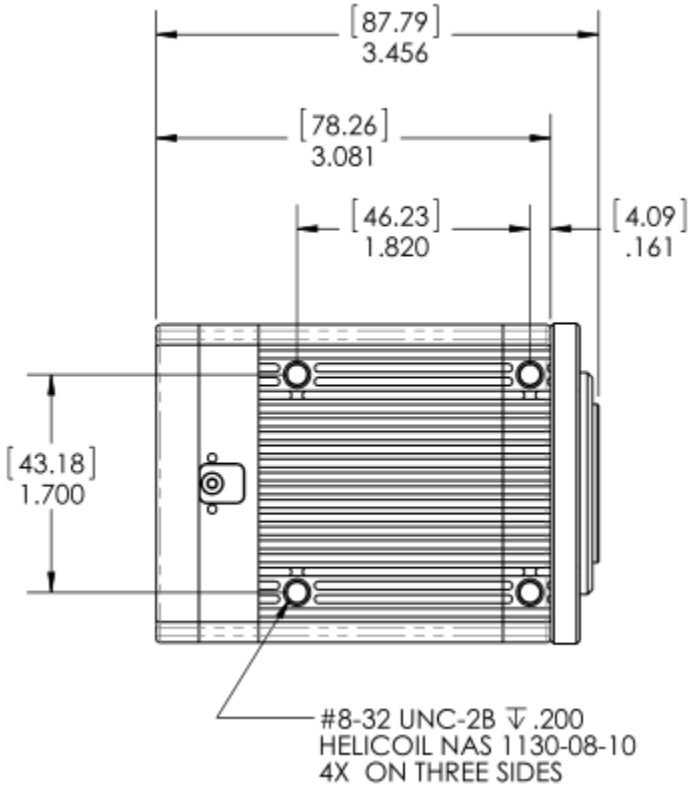
4.6.1. Front View

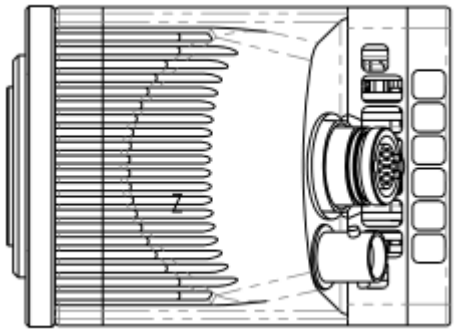


4.6.2. Back view

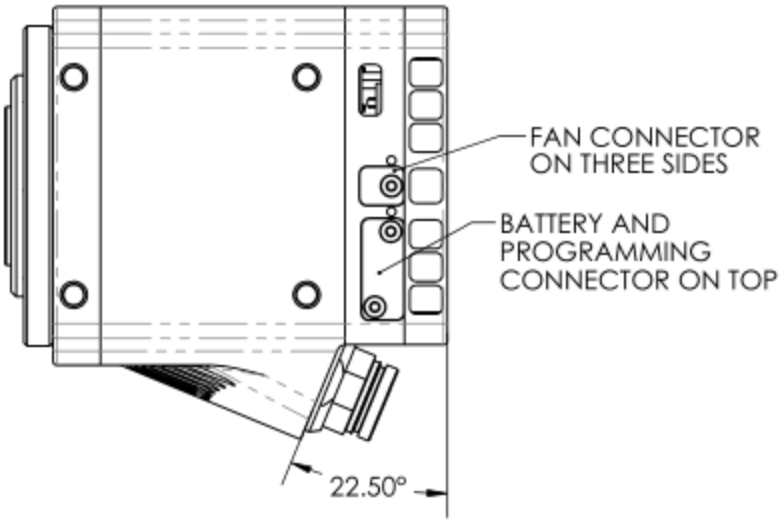


4.6.3. Side views

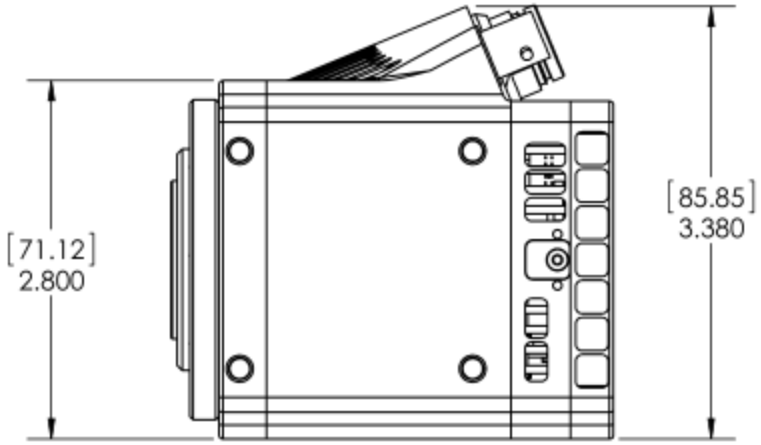




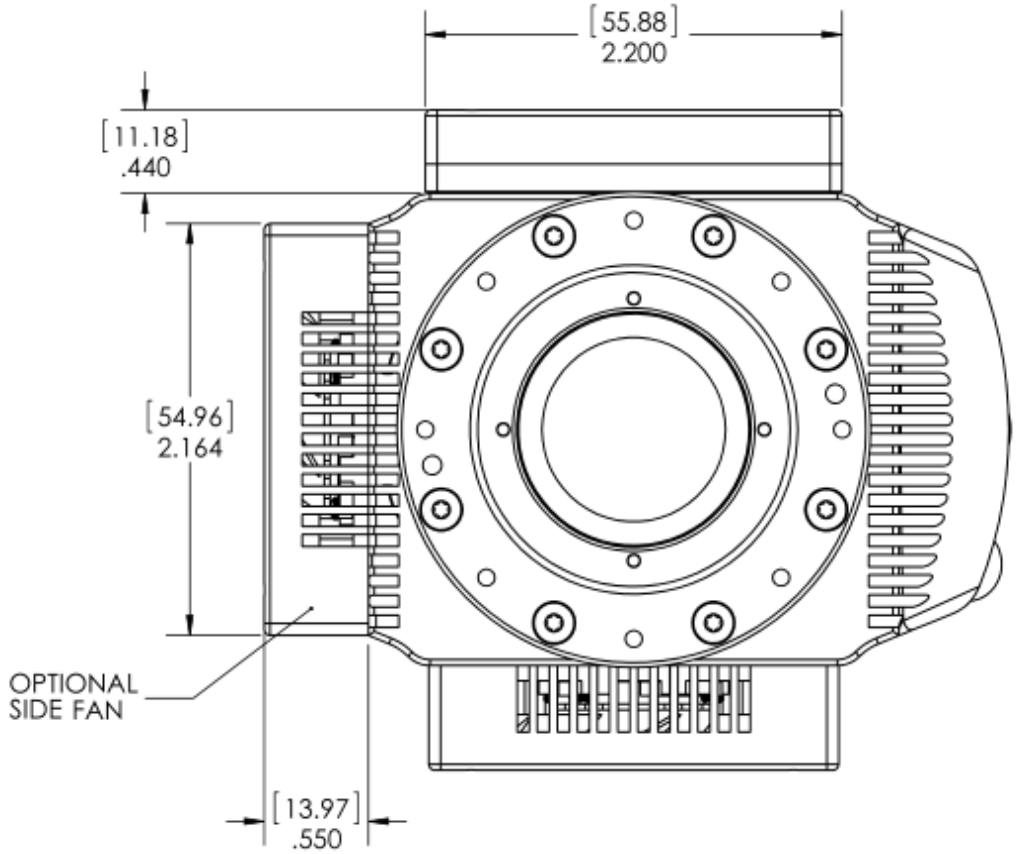
4.6.4. Top View


FAN CONNECTOR
ON THREE SIDES
BATTERY AND
PROGRAMMING
CONNECTOR ON TOP
22.50°

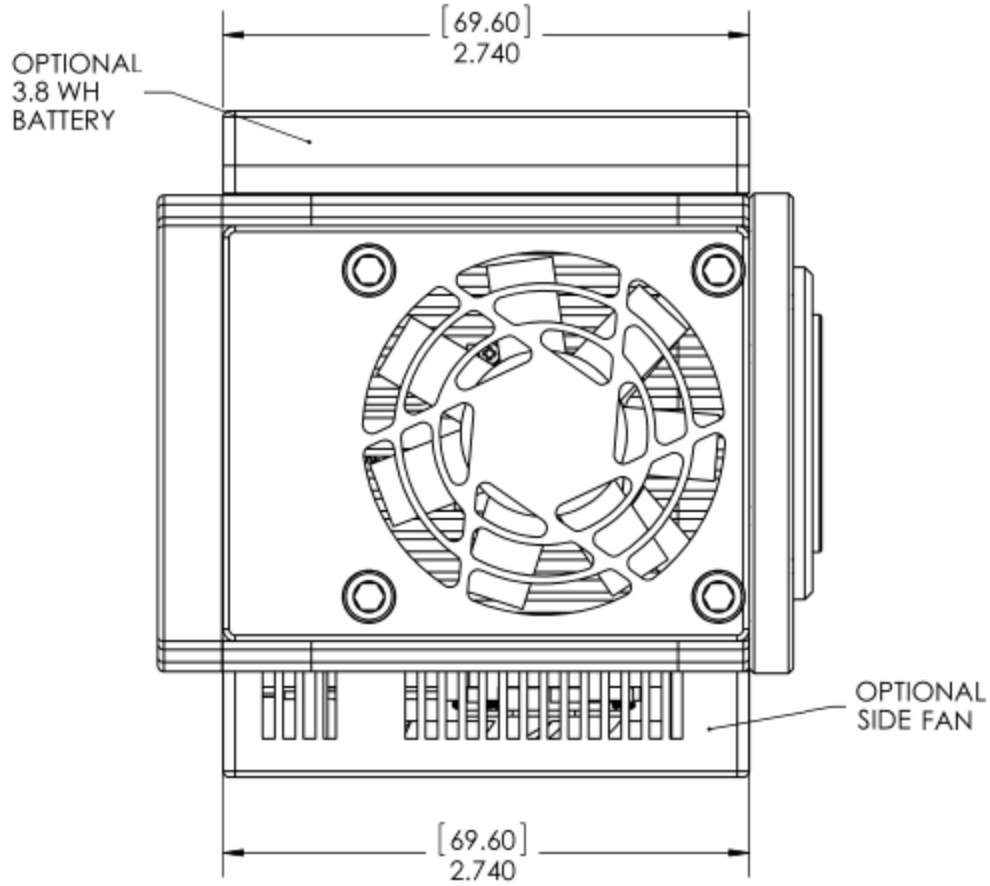
4.6.5. Bottom View



4.6.6. Front view with fans and battery

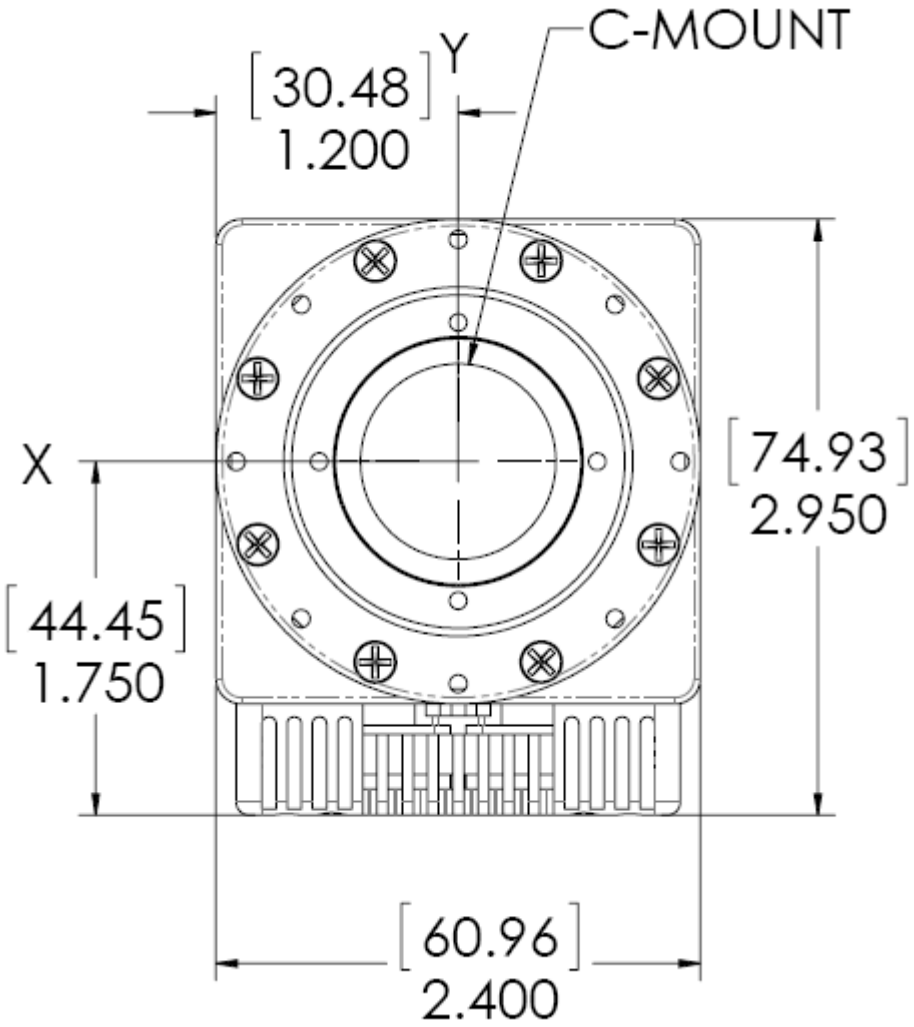


4.6.7. Side view with fans and battery

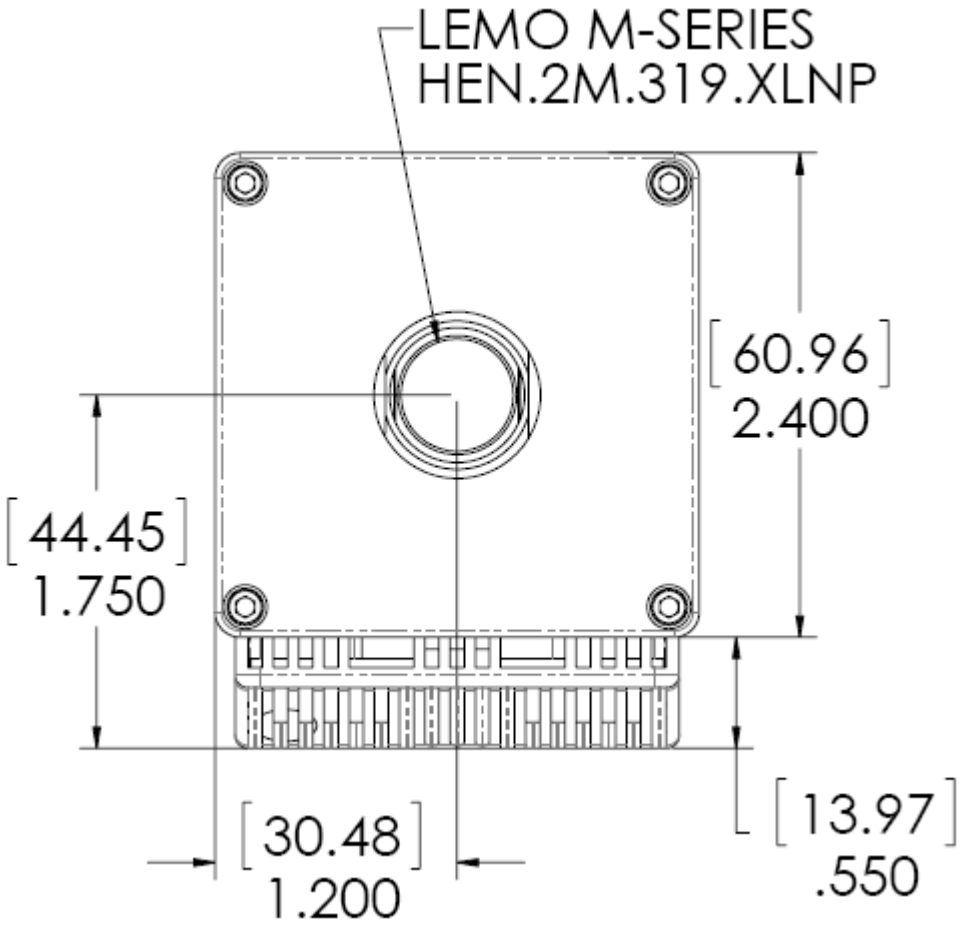


4.7. Mechanical and hole mounts (Os V1 series)

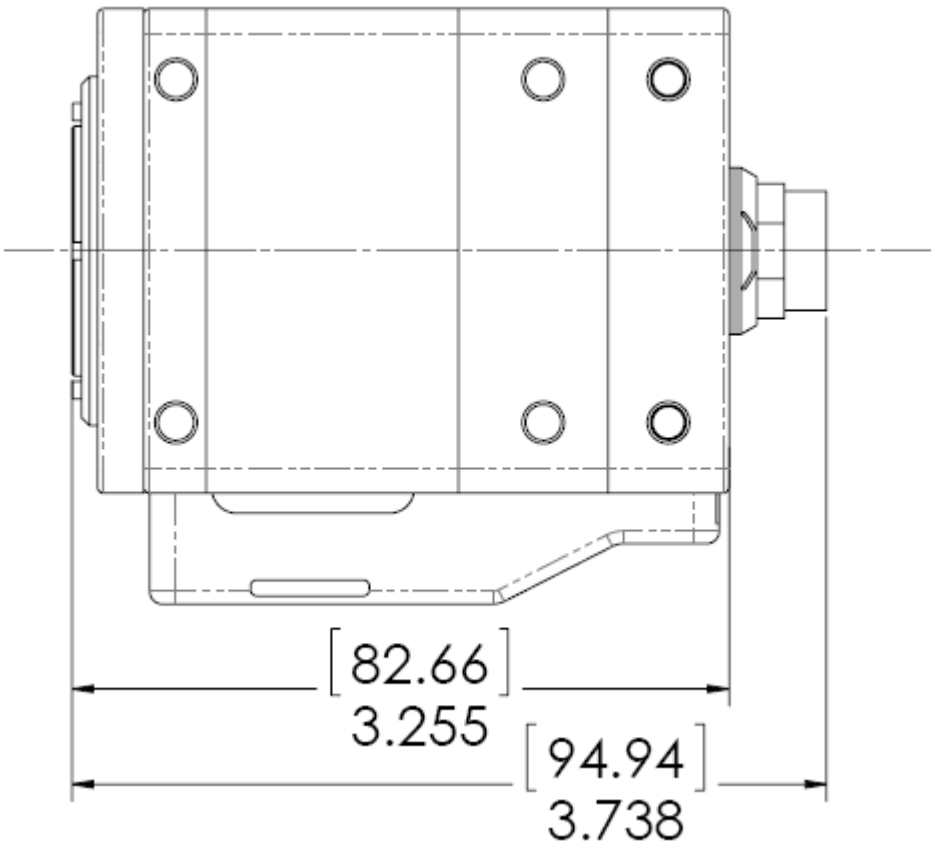
4.7.1. Front View



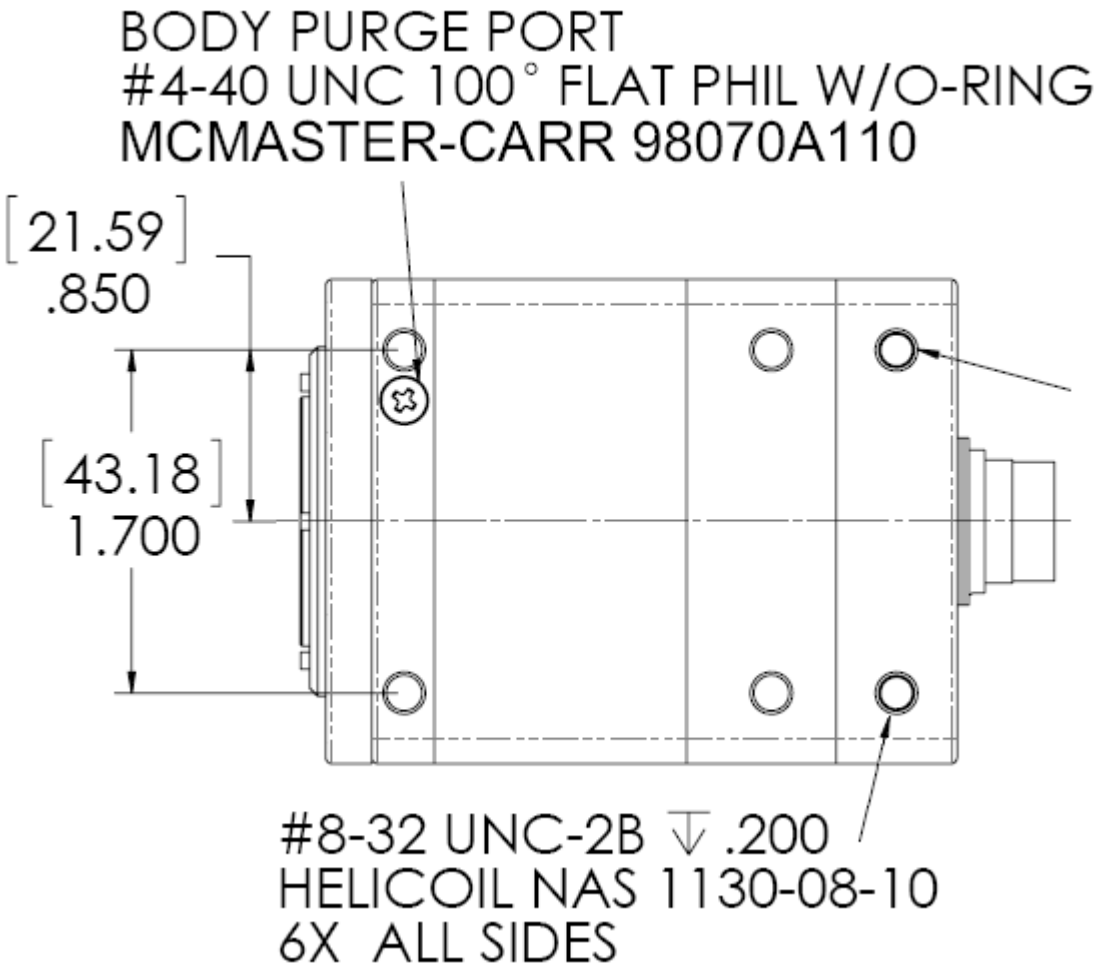
4.7.2. Back View



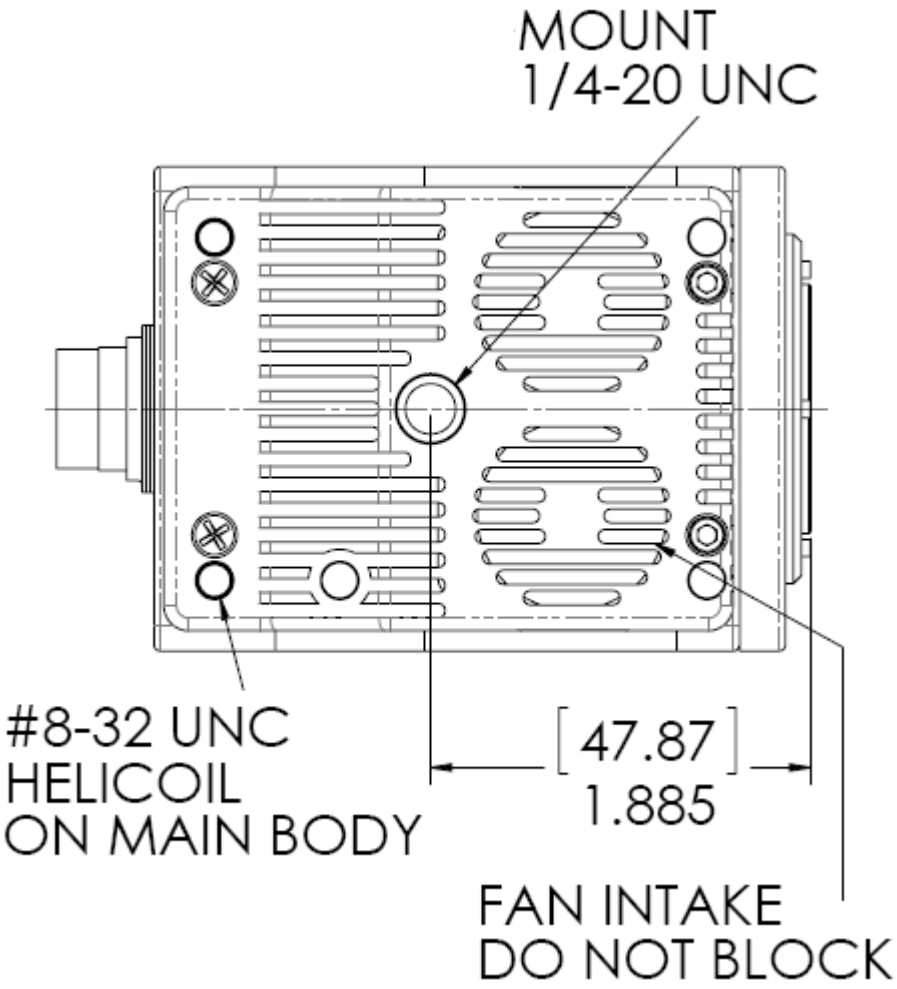
4.7.3. Side View



4.7.4. Top View

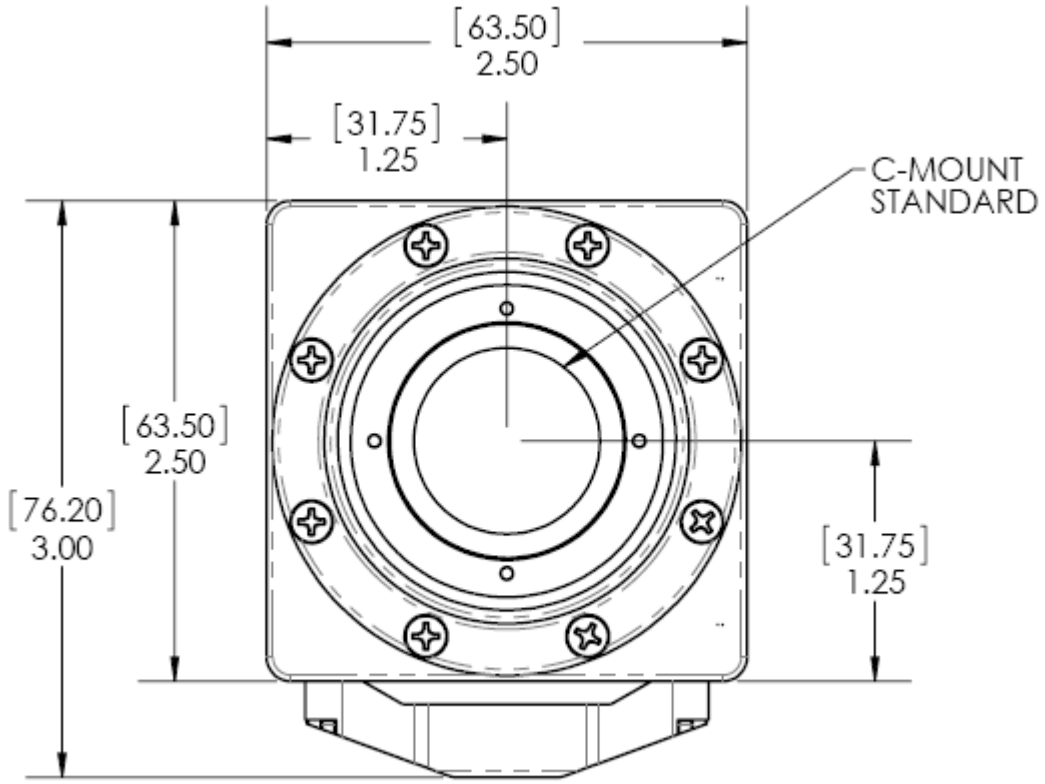

BODY PURGE PORT
#4-40 UNC 100° FLAT PHIL W/O-RING
MCMASTER-CARR 98070A110
[21.59]
.850
[43.18]
1.700
#8-32 UNC-2B ↧ .200
HELICOIL NAS 1130-08-10
6X ALL SIDES

4.7.5. Bottom View

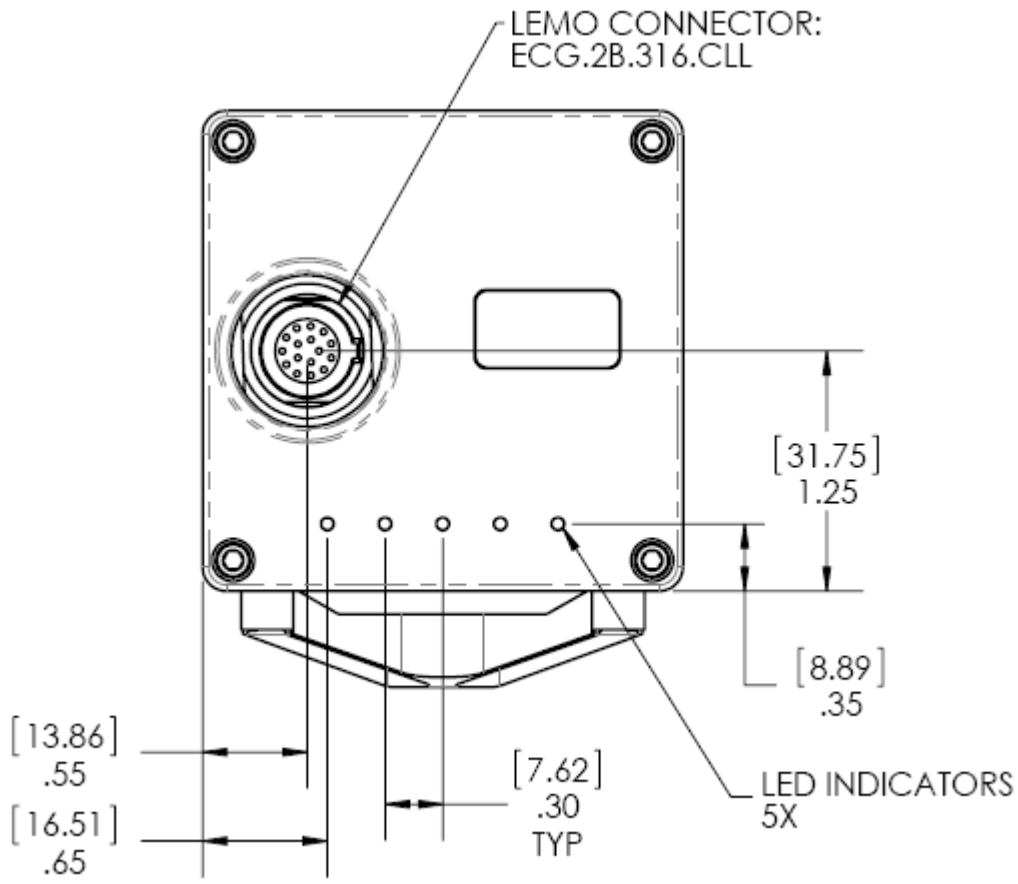


4.8. Mechanical and hole mounts (NX series)

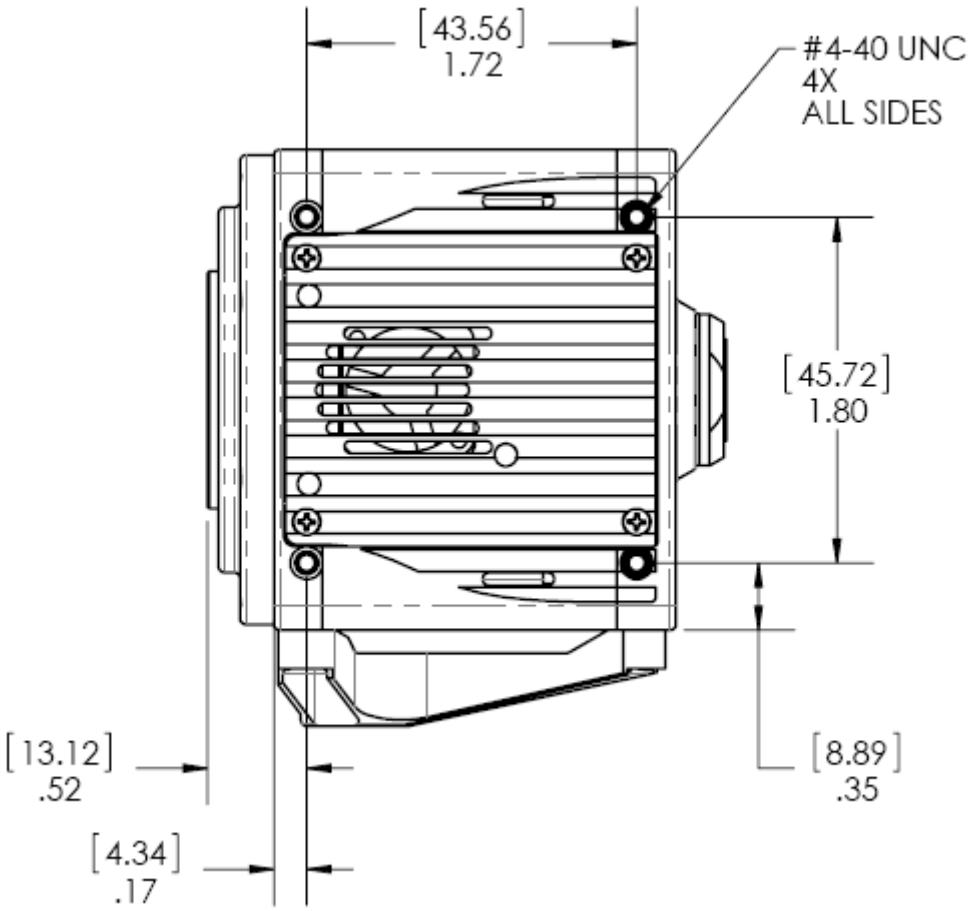
4.8.1. Front View



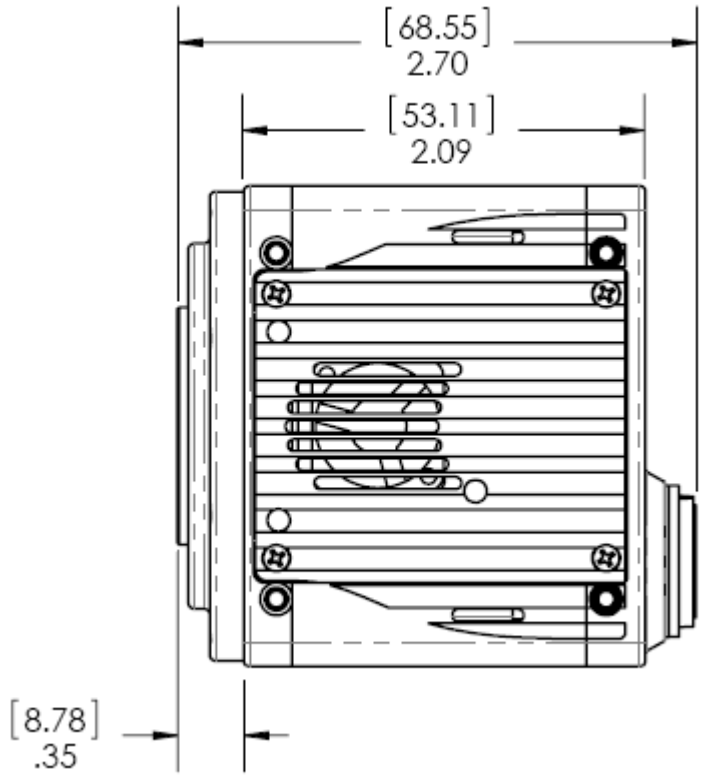
4.8.2. Back View



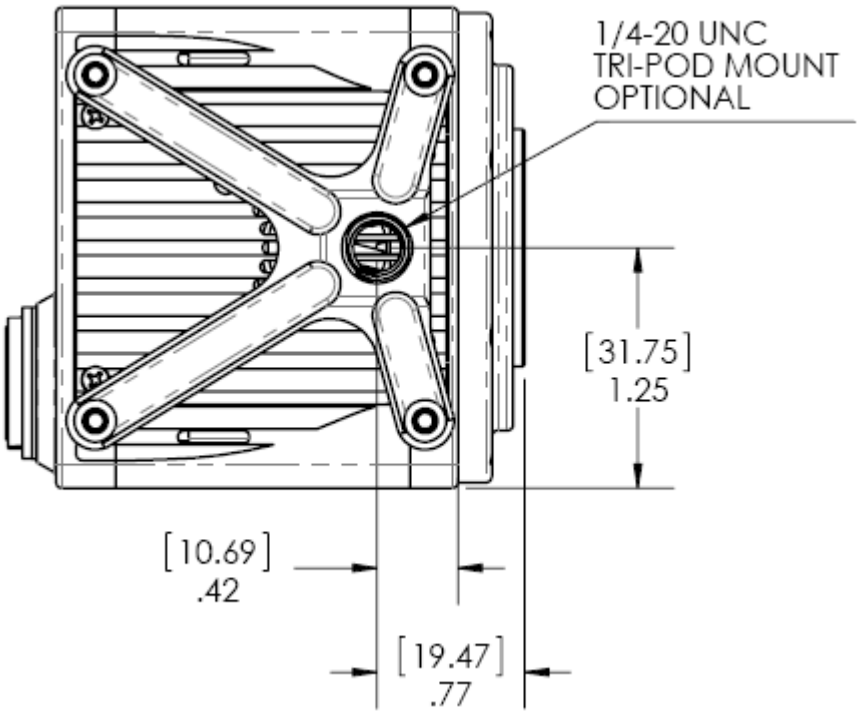
4.8.3. Side View



4.8.4. Top View

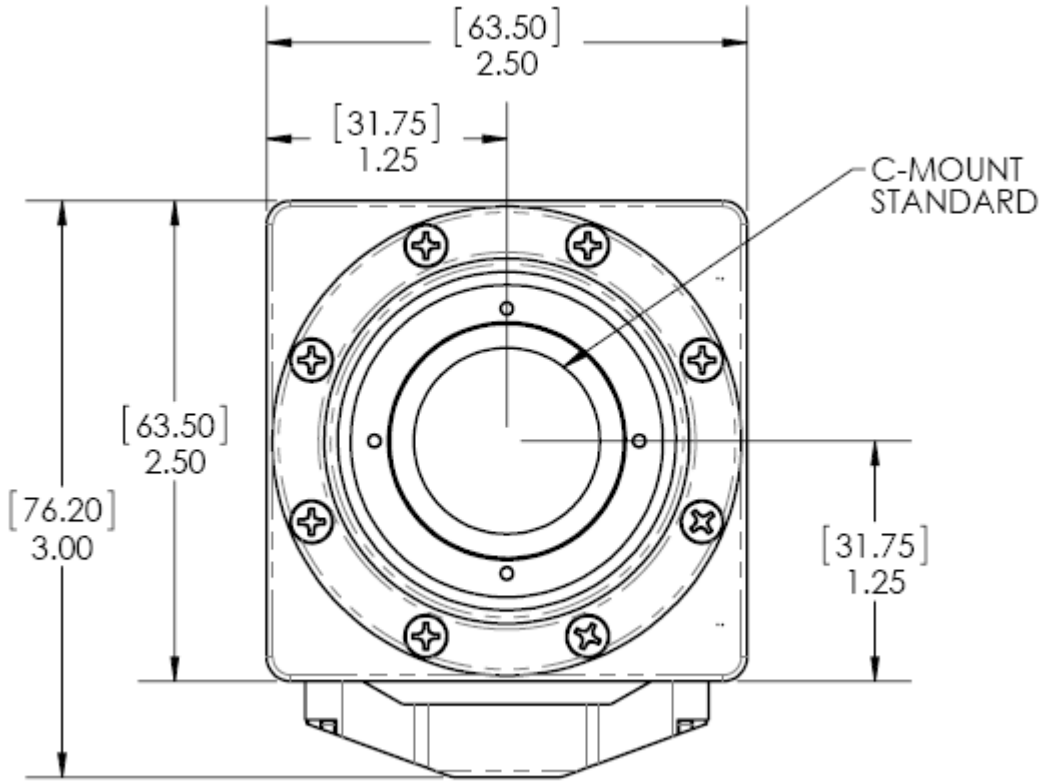


4.8.5. Bottom View

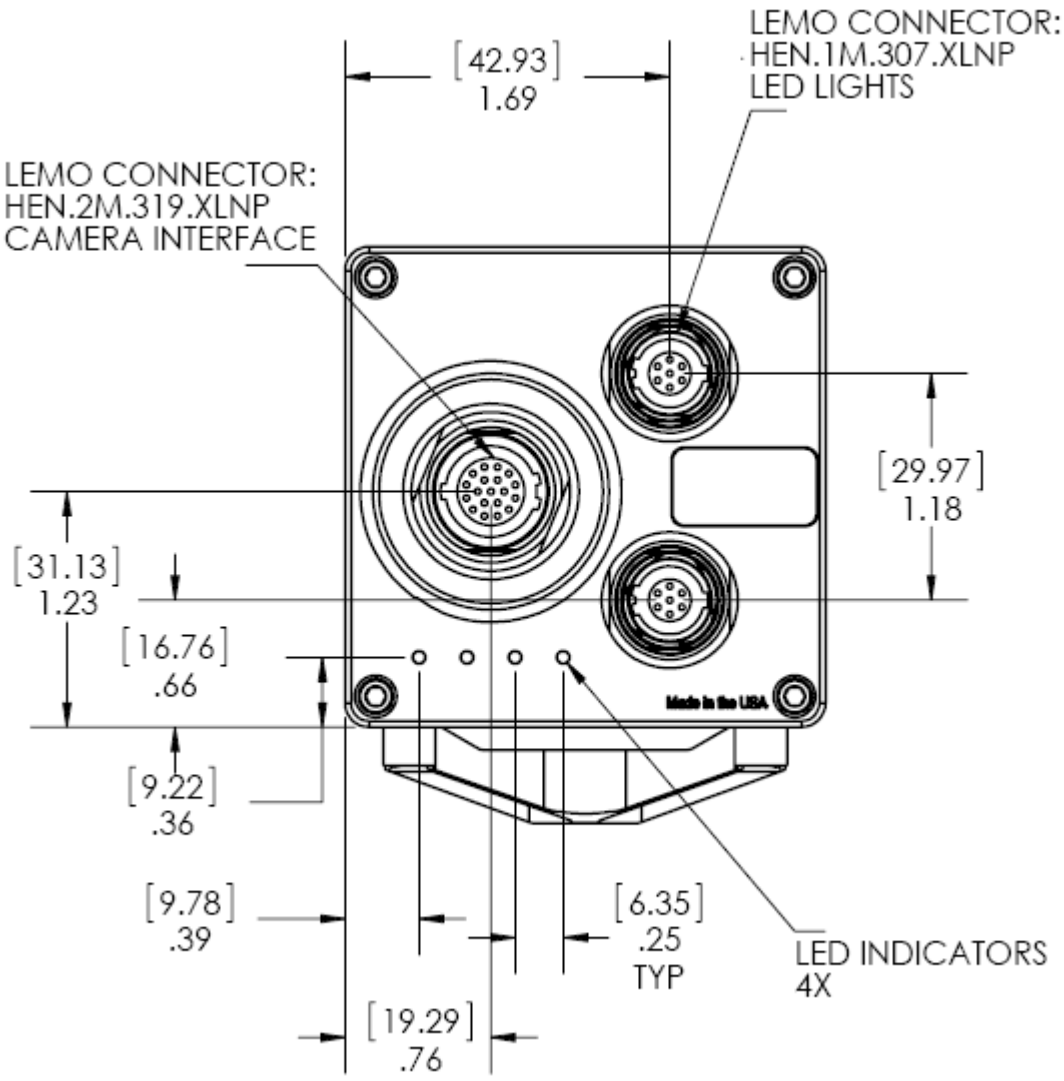


4.9. Mechanical and hole mounts (iN series)

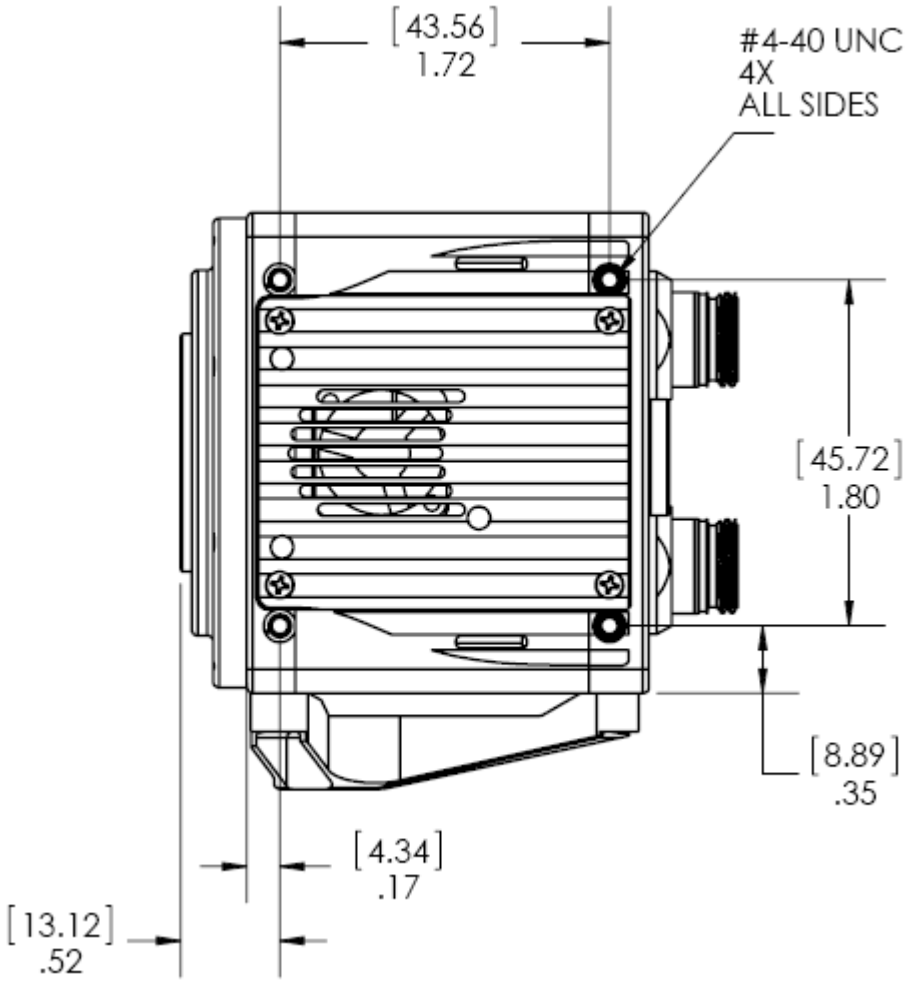
4.9.1. Front View



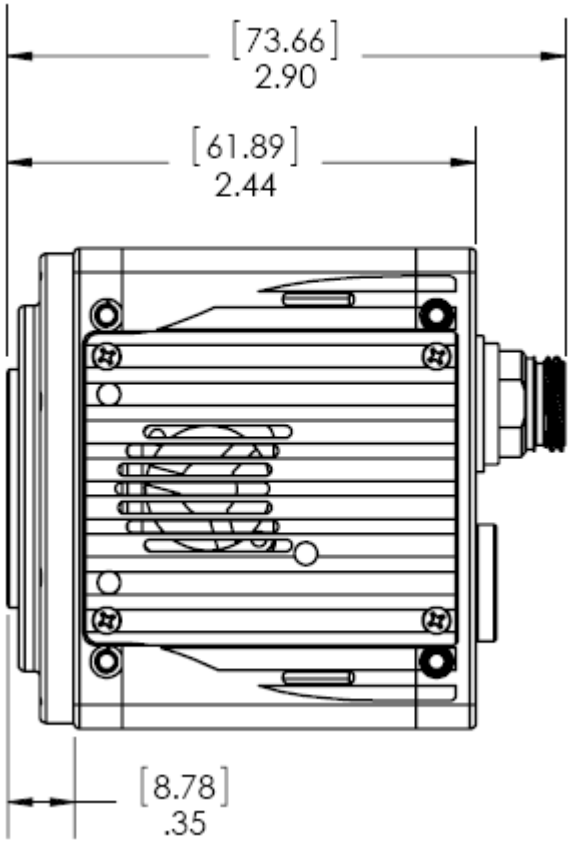
4.9.2. Back View



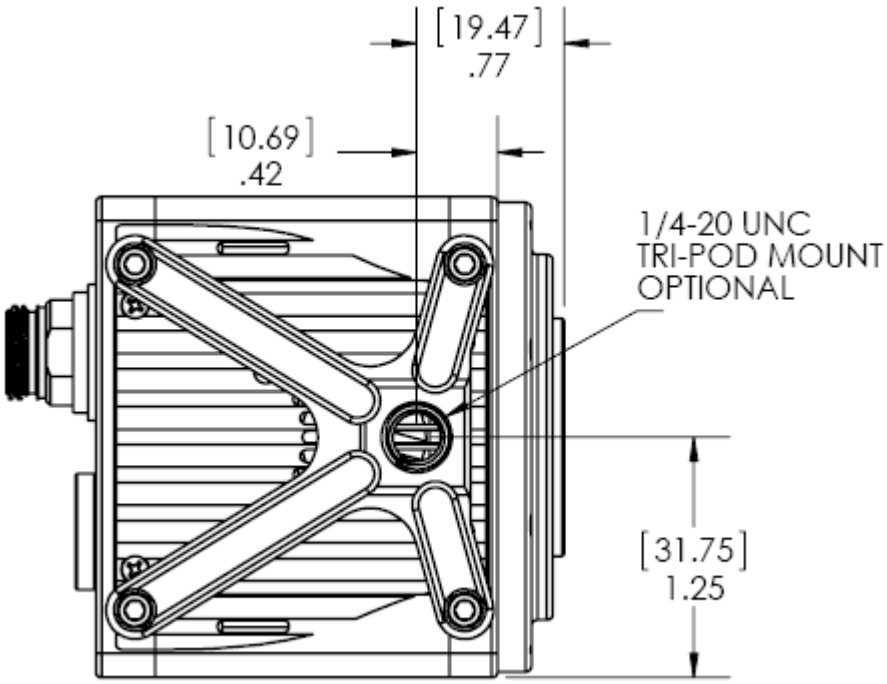
4.9.3. Side View



4.9.4. Top View

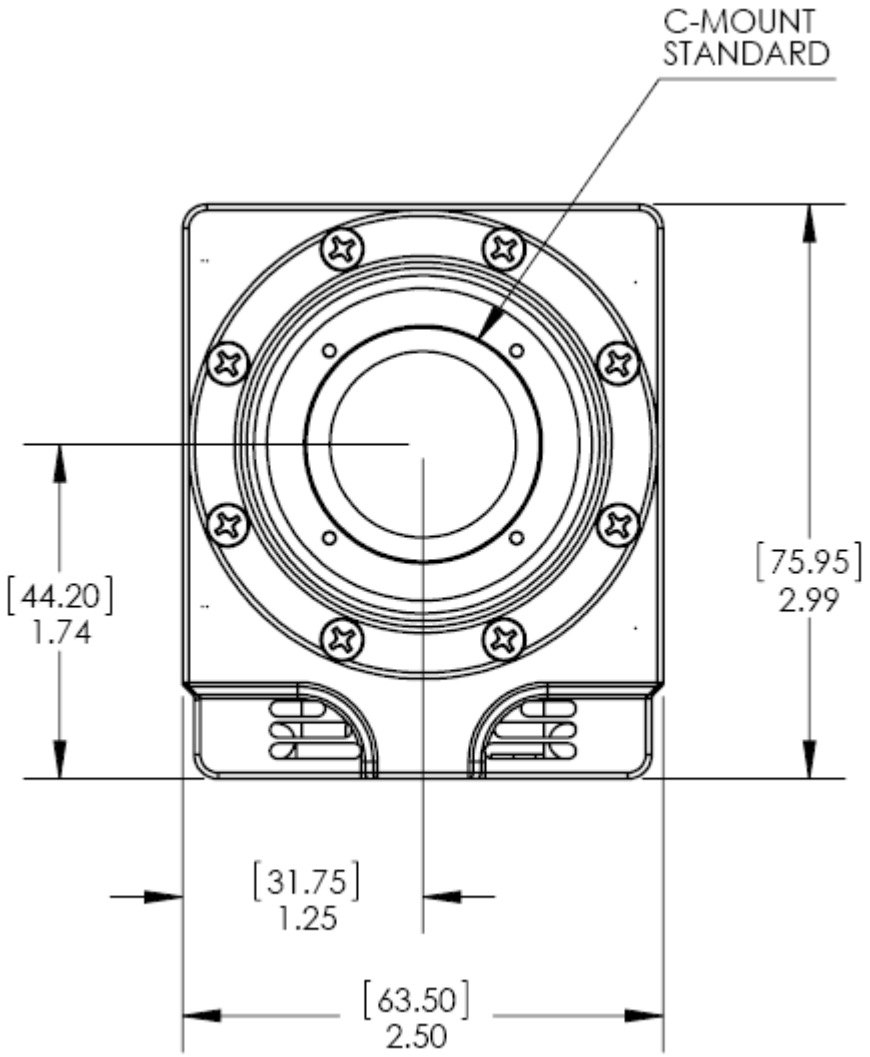


4.9.5. Bottom View

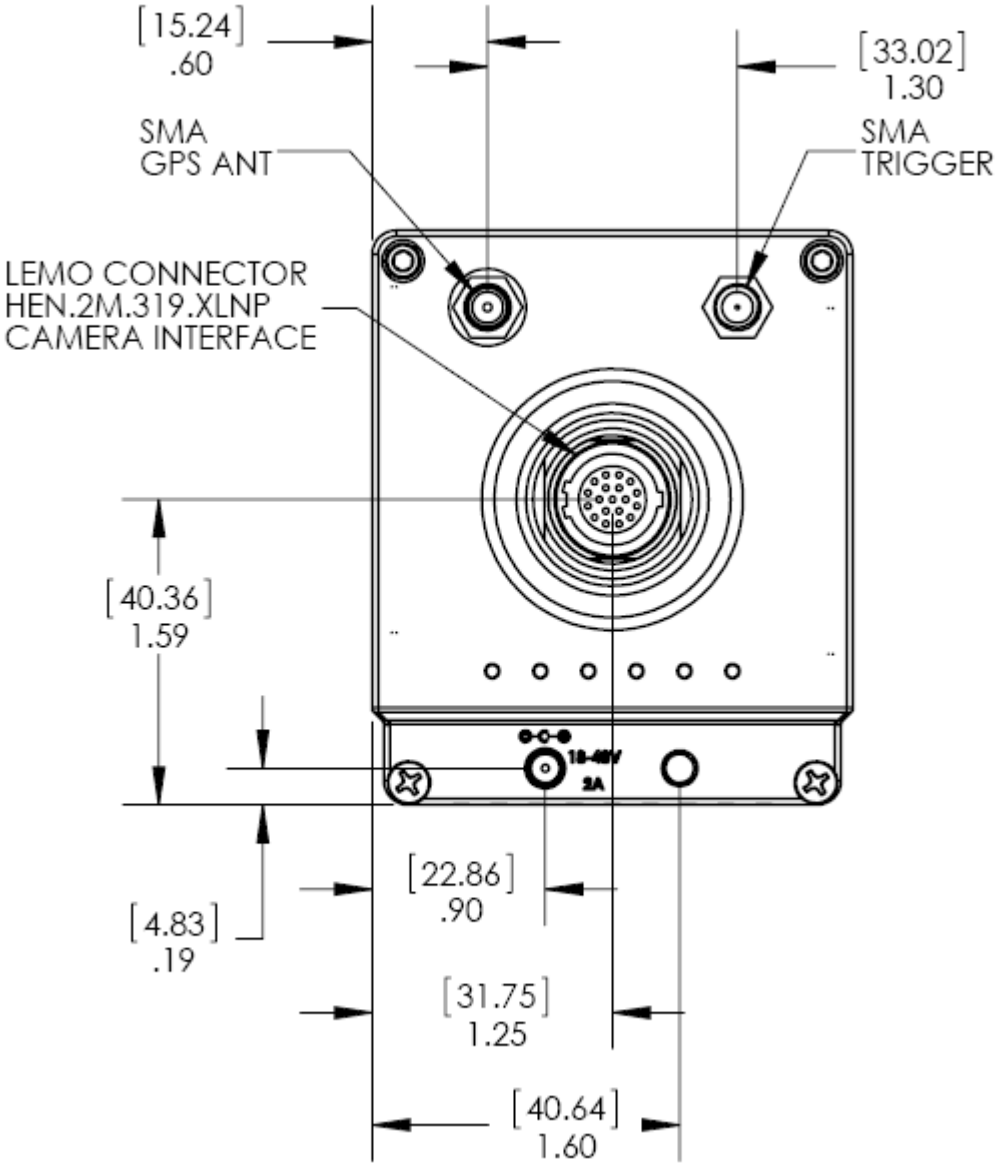


4.10. Mechanical and hole mounts (NX-Air series)

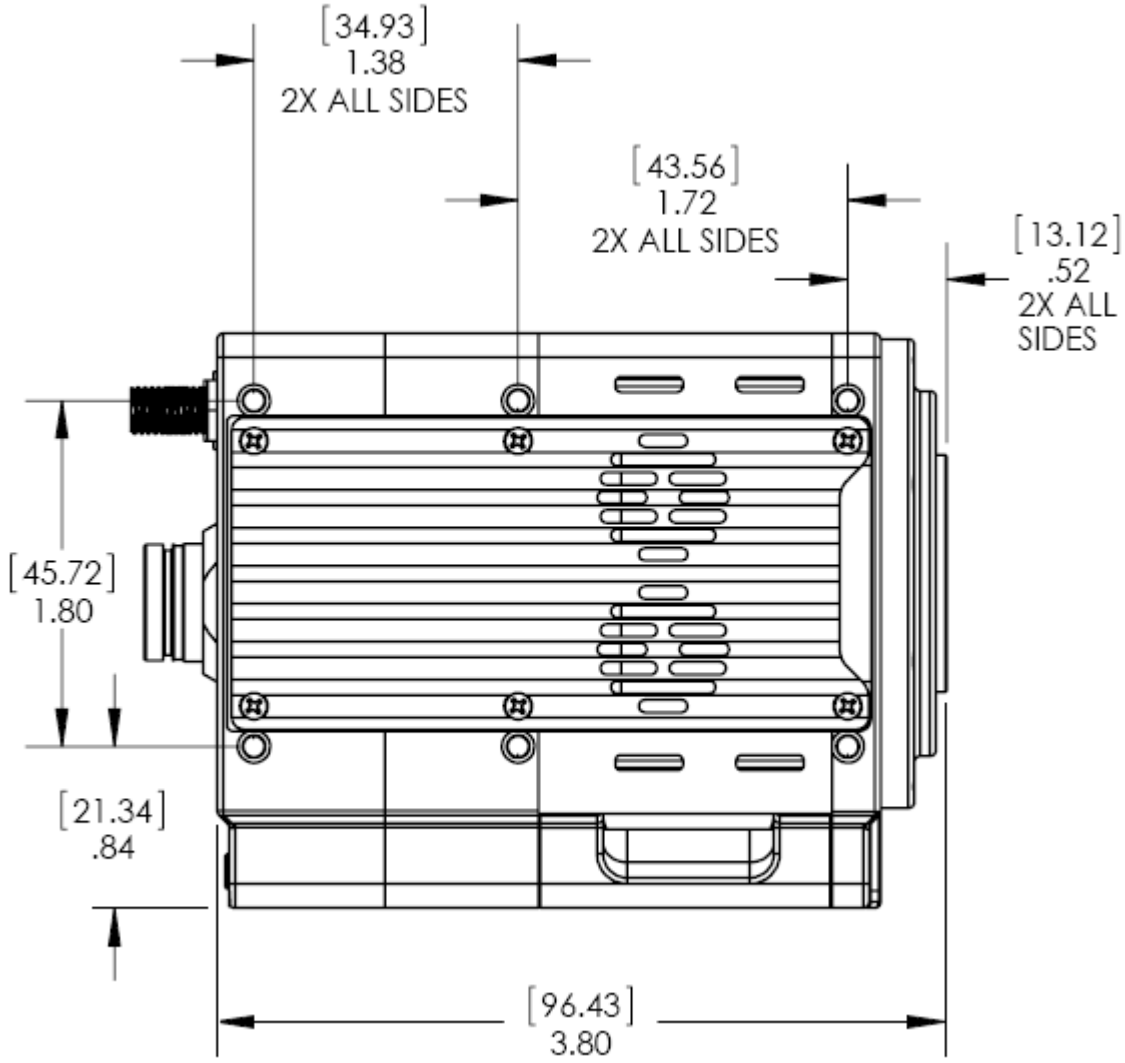
4.10.1. Front View



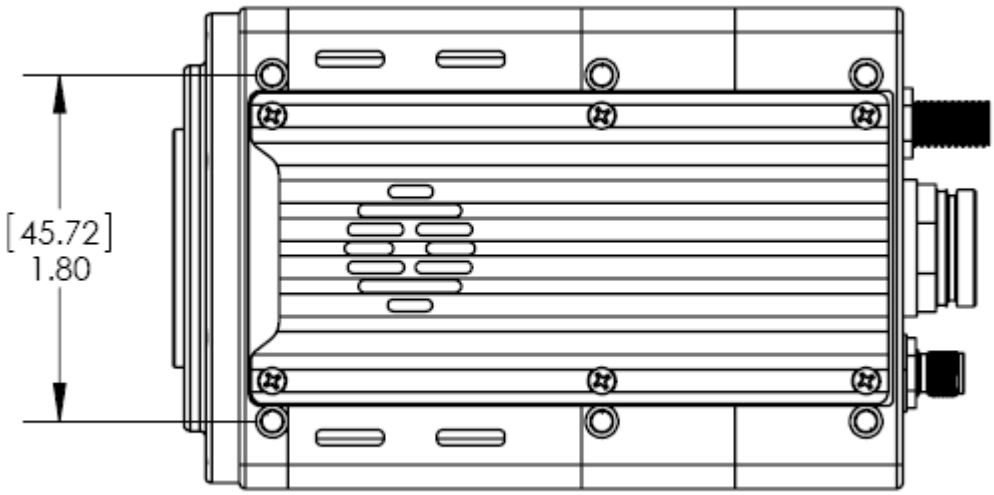
4.10.2. Back View



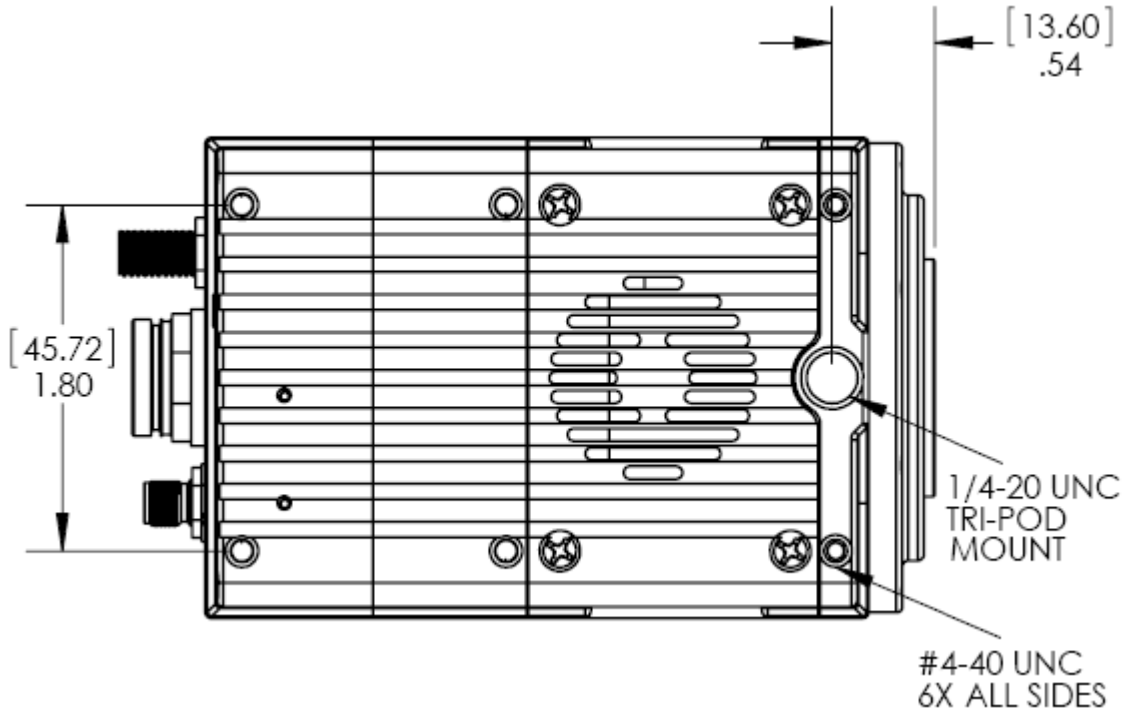
4.10.3. Side View



4.10.4. Top View

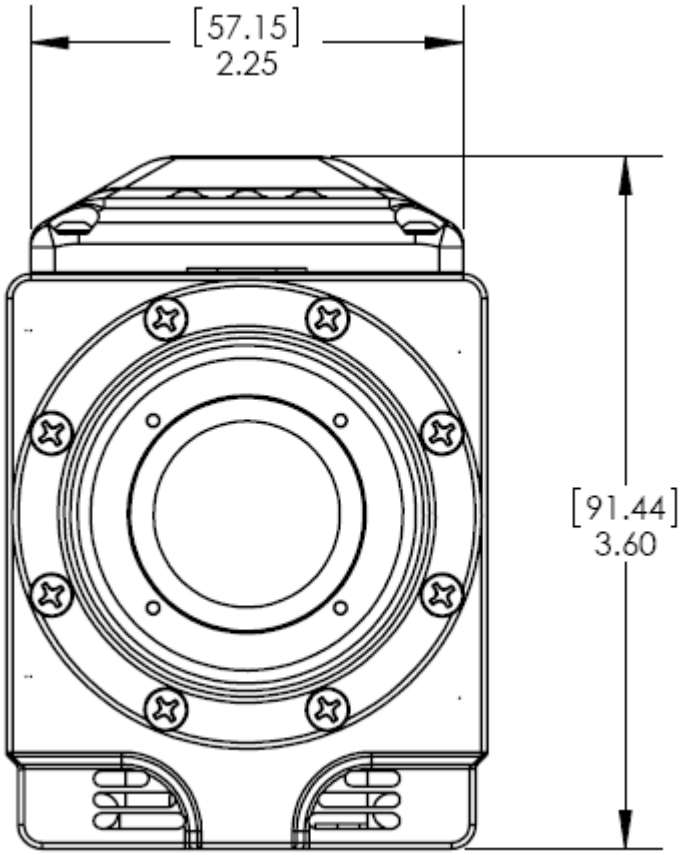


4.10.5. Bottom View

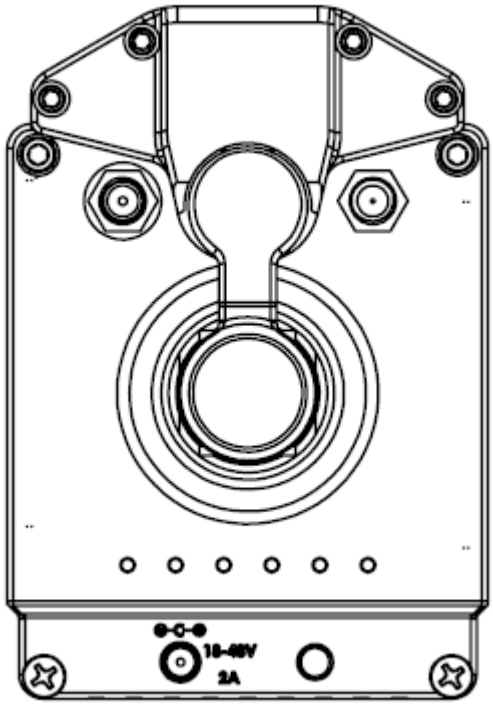


4.11. Mechanical and hole mounts (NX-Air with Wi-Fi module)

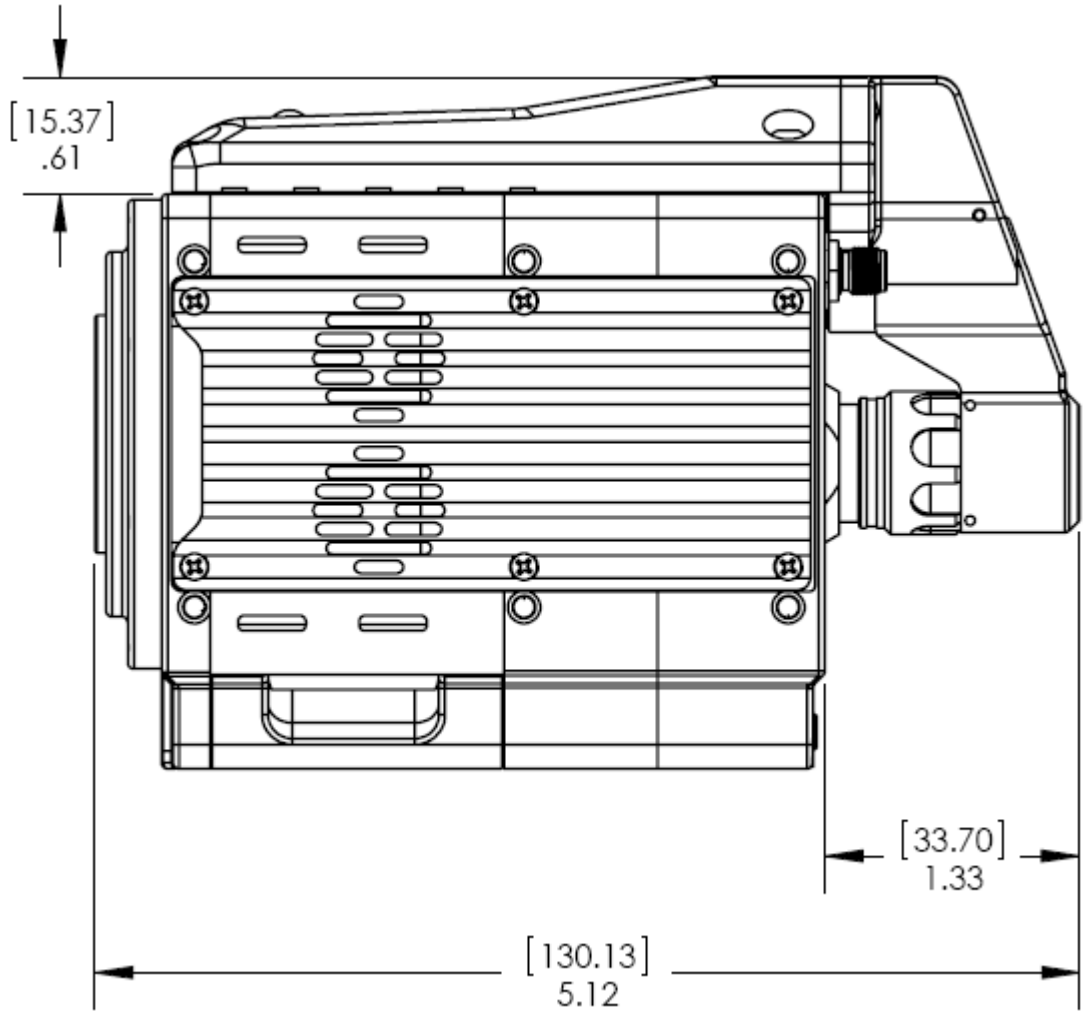
4.11.1. Front View



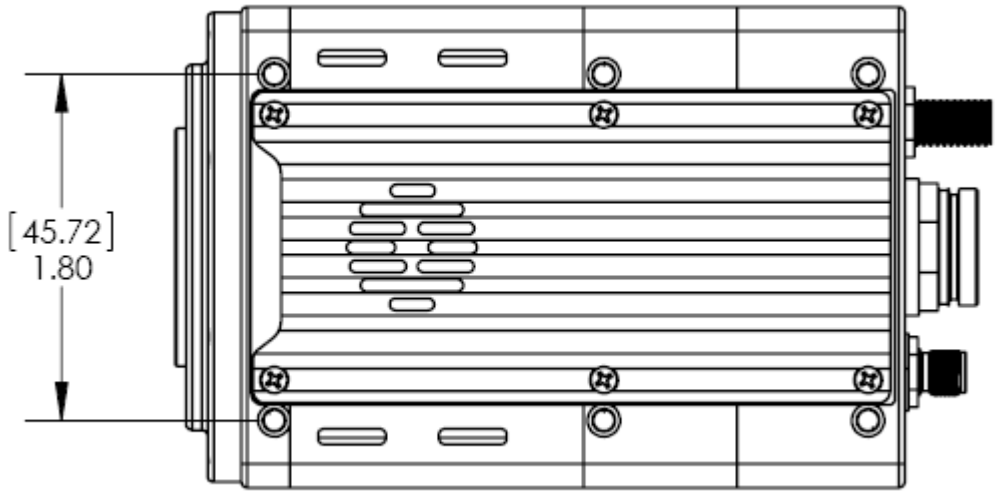
4.11.2. Back View



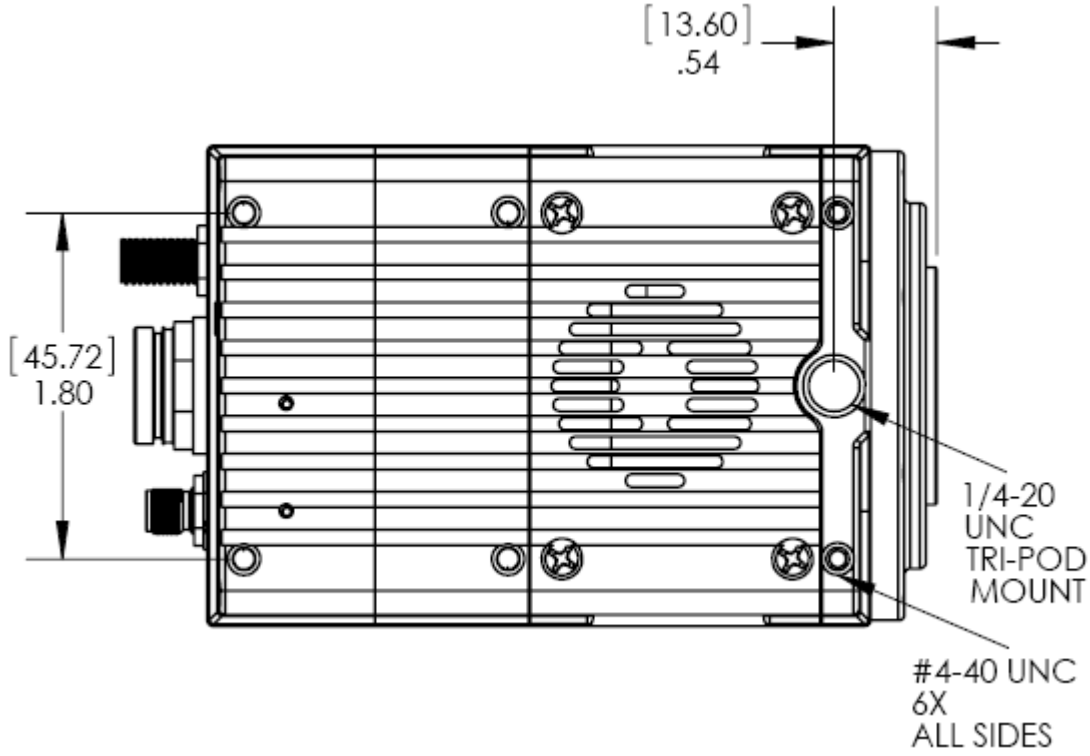
4.11.3. Side View



4.11.4. Top View

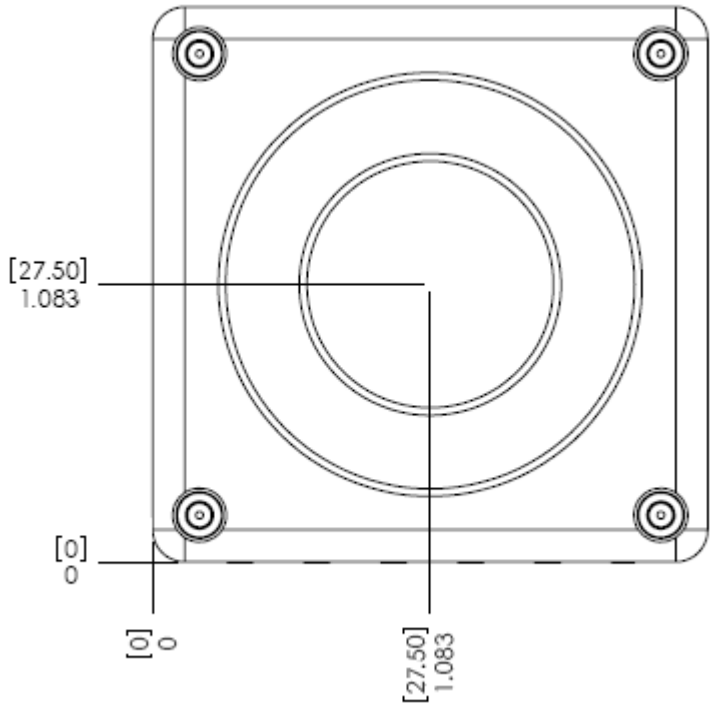


4.11.5. Bottom View

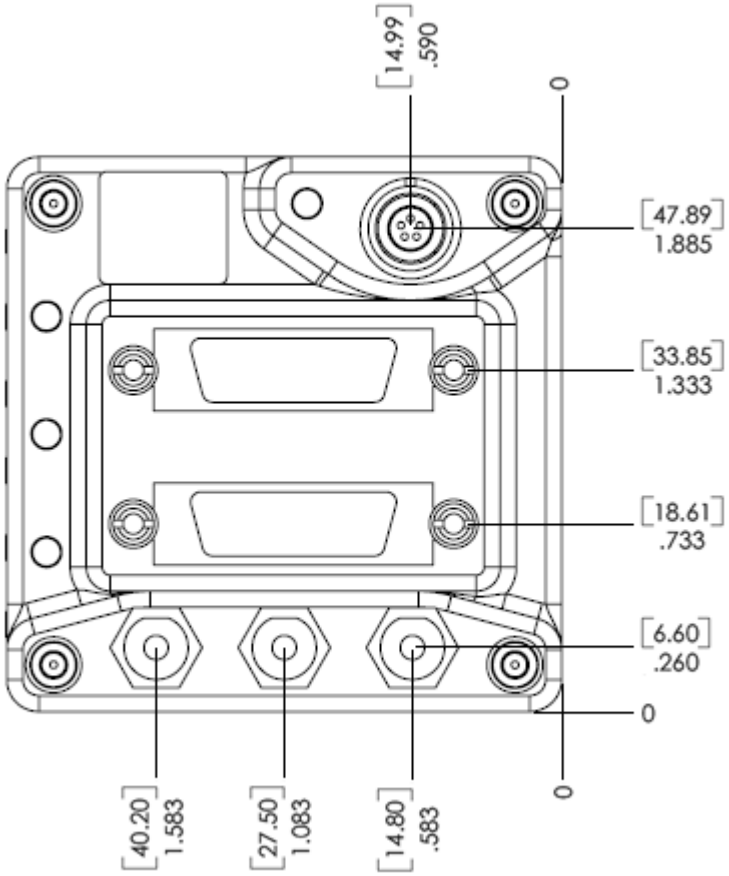


4.12. Mechanical and hole mounts (M series)

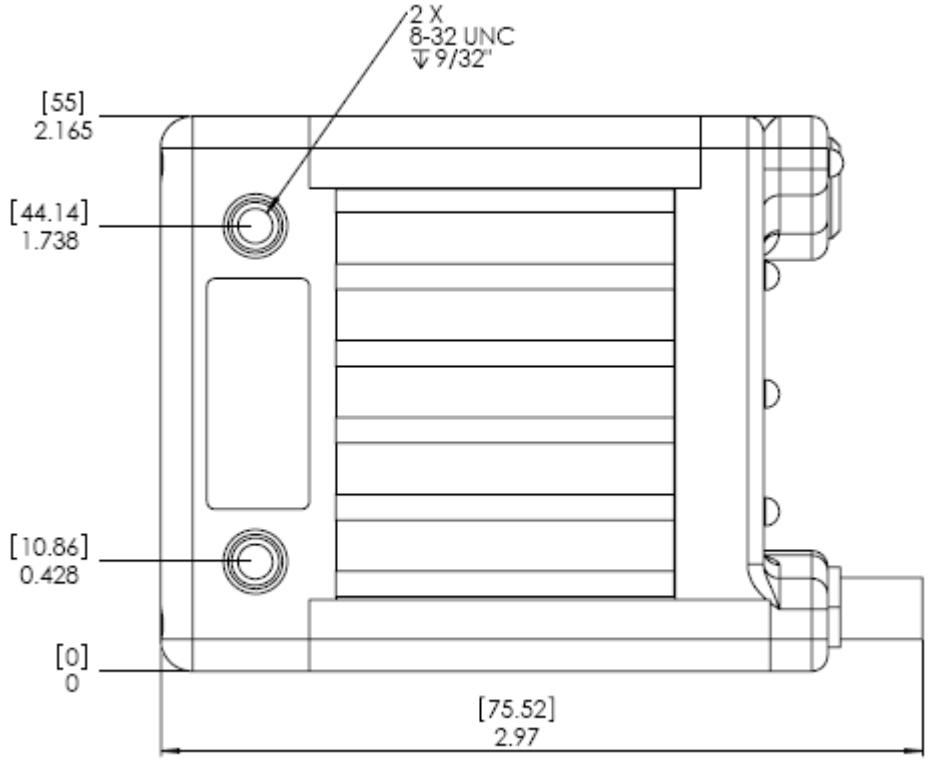
4.12.1. Front View



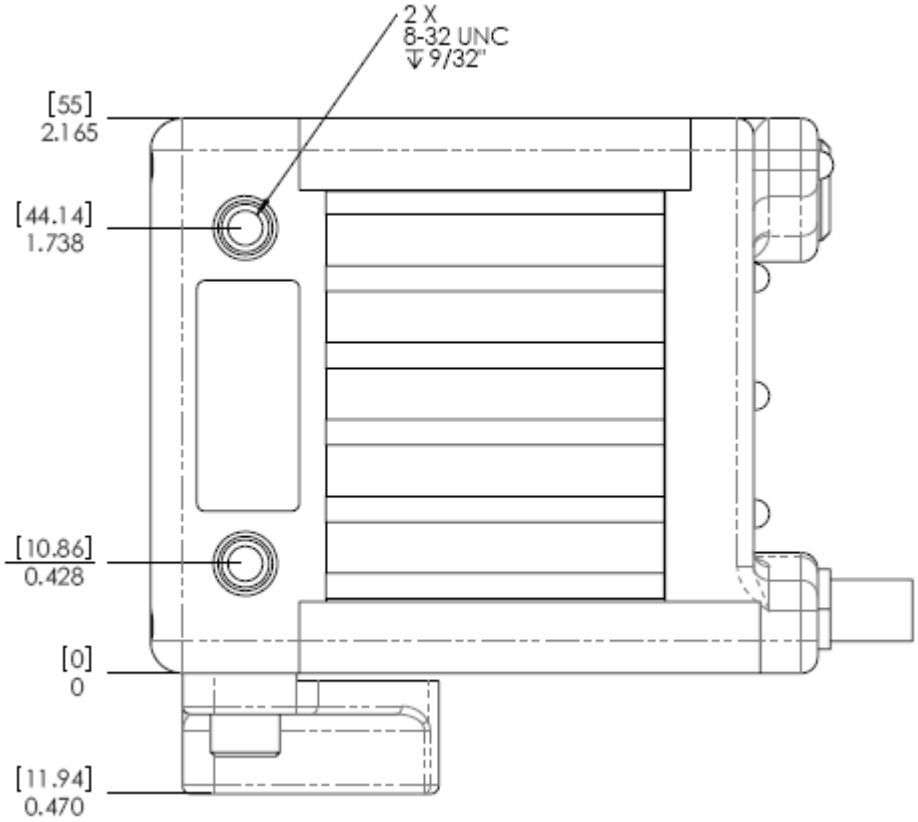
4.12.2. Back View



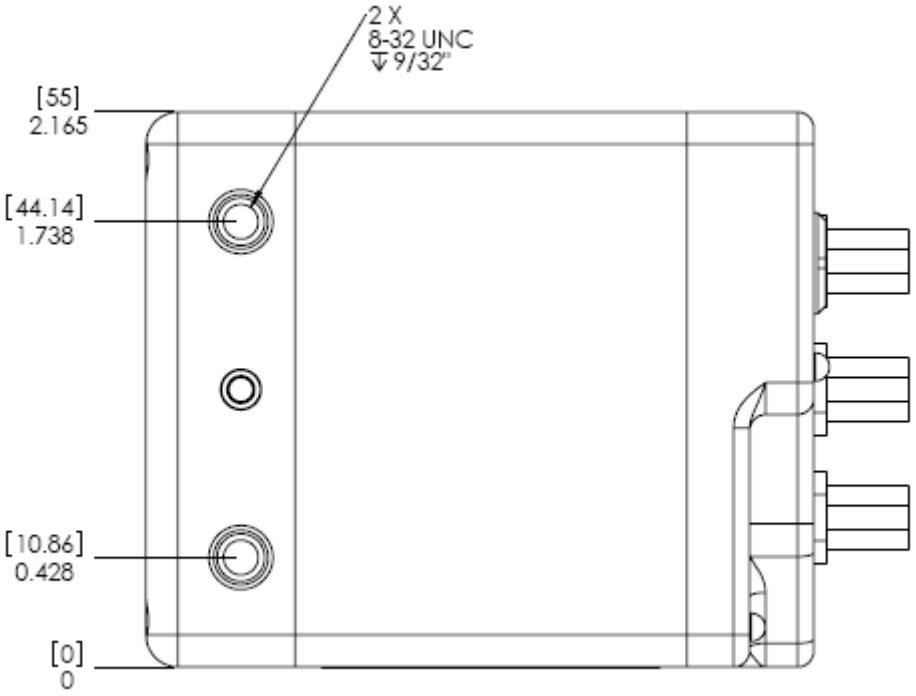
4.12.3. Side View



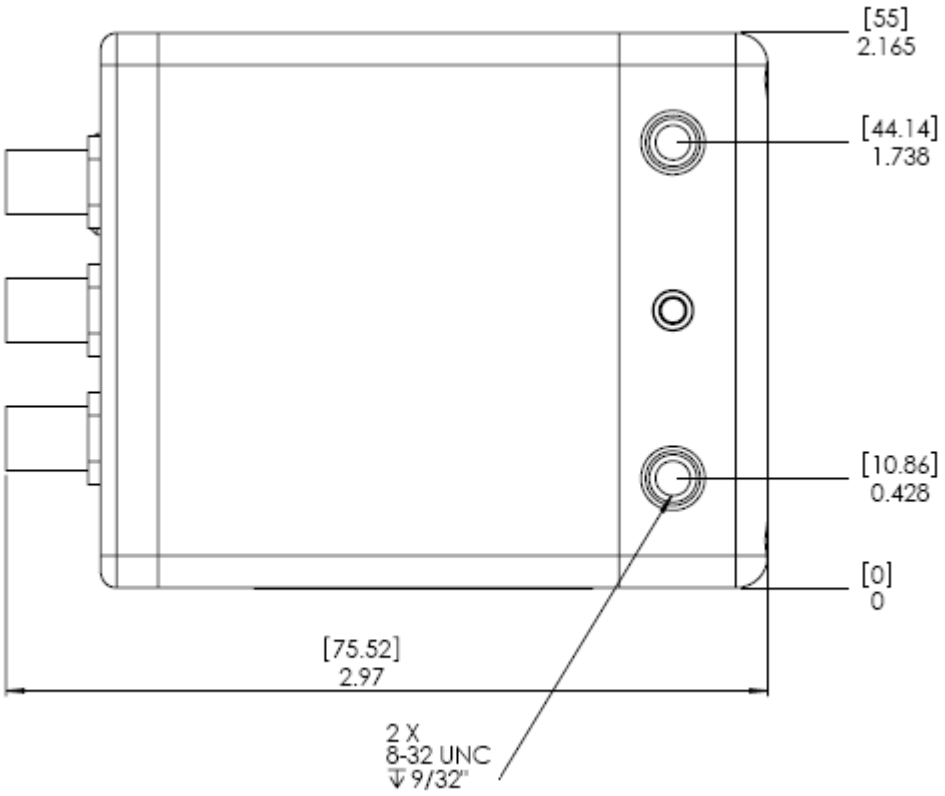
4.12.4. Side View with mount



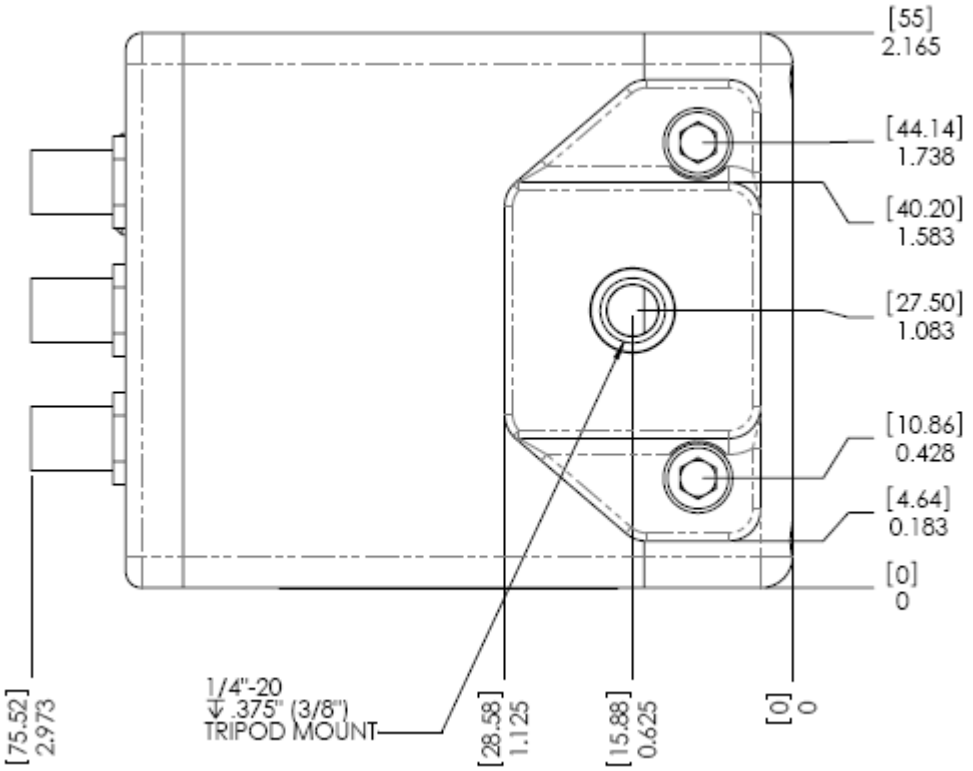
4.12.5. Top View



4.12.6. Bottom View

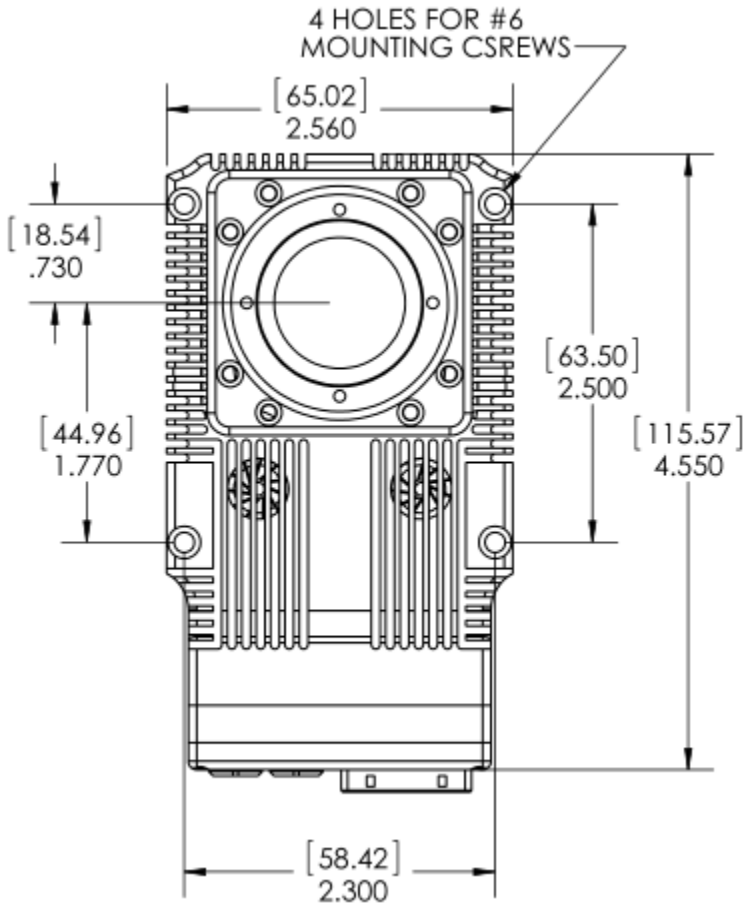


4.12.7. Bottom View with Mount

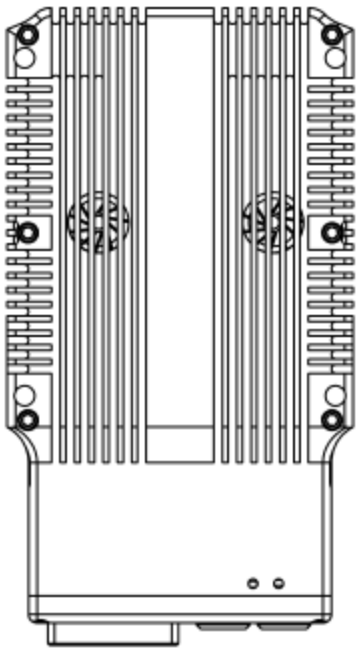


4.13. Mechanical and hole mounts (XStream)

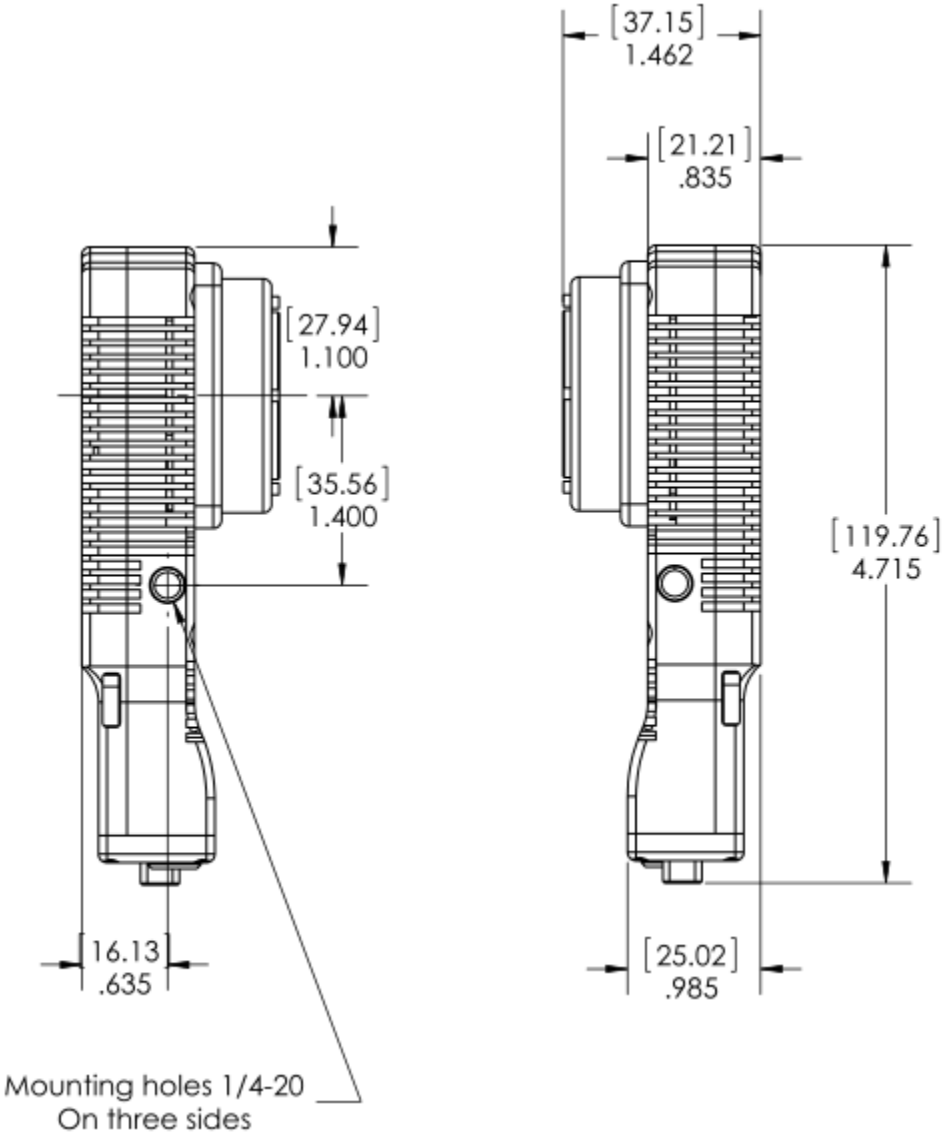
4.13.1. Front view



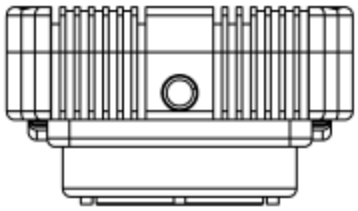
4.13.2. Back view



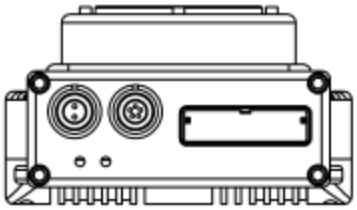
4.13.3. Side views



4.13.4. Top view

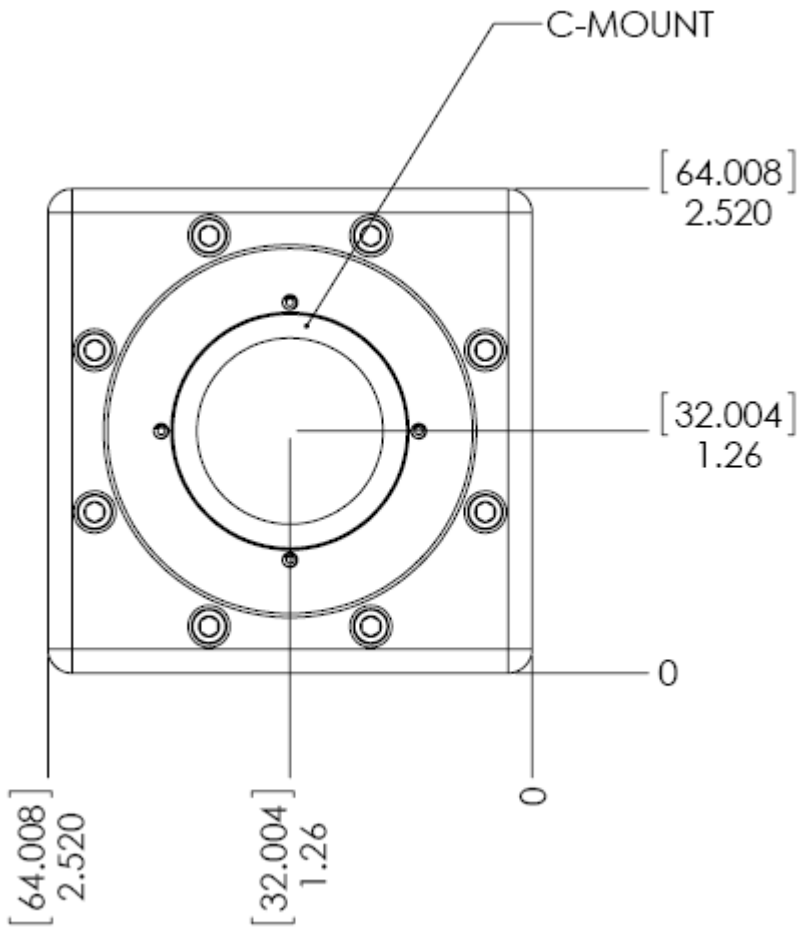


4.13.5. Bottom view

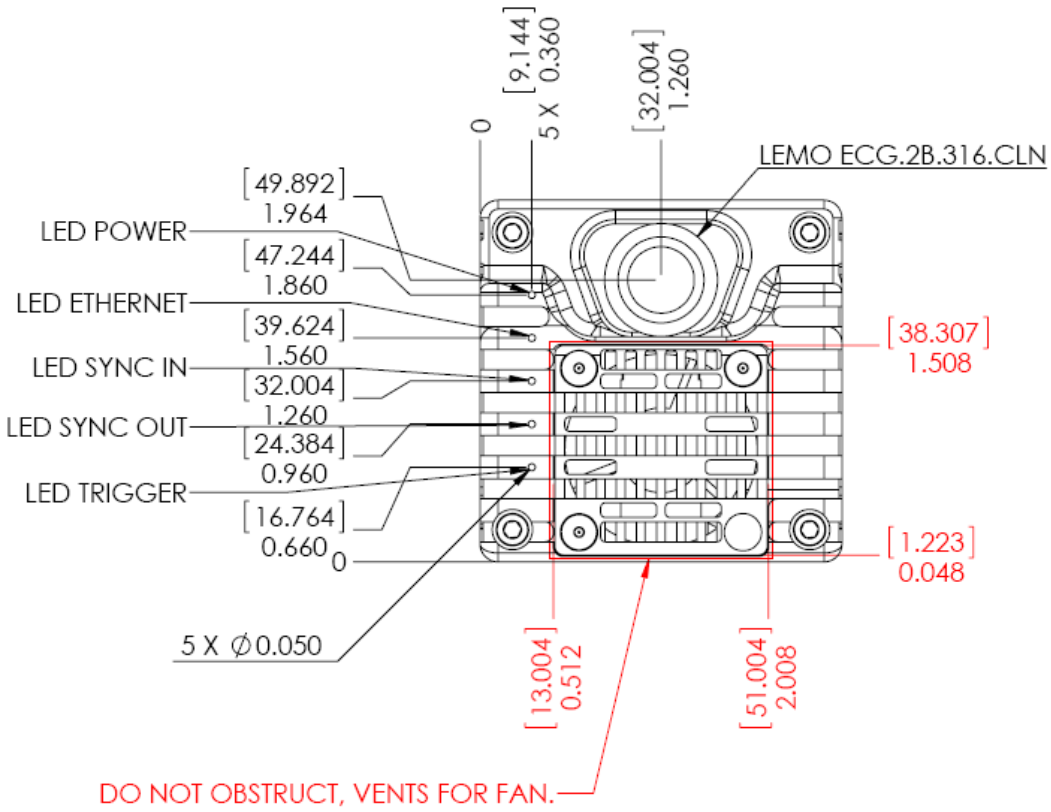


4.14. Mechanical and hole mounts (NR series)

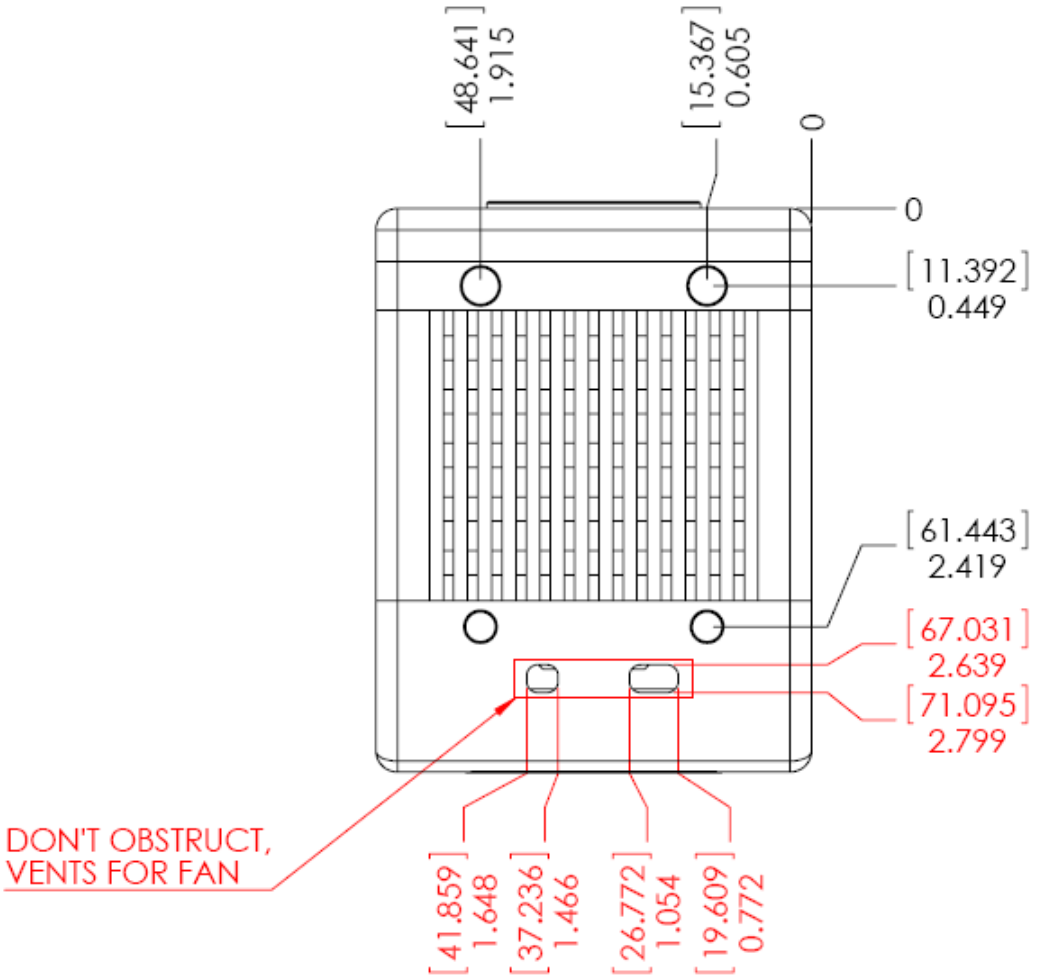
4.14.1. Front View (all memory configurations)



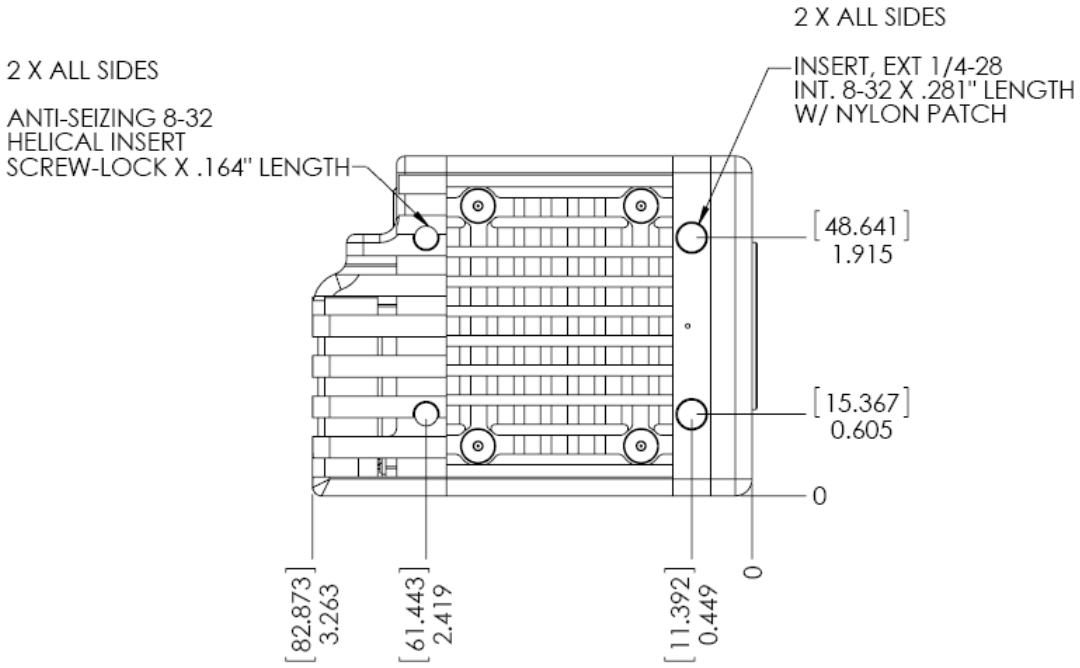
4.14.2. Back View (all memory configurations)



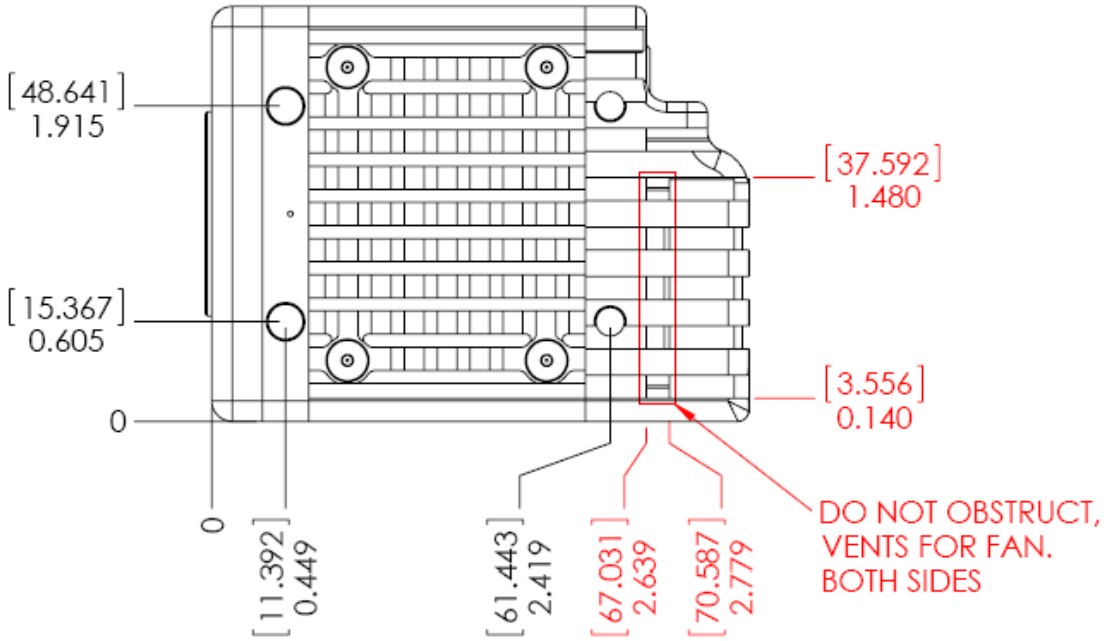
4.14.3. Side View (1.25 GB)



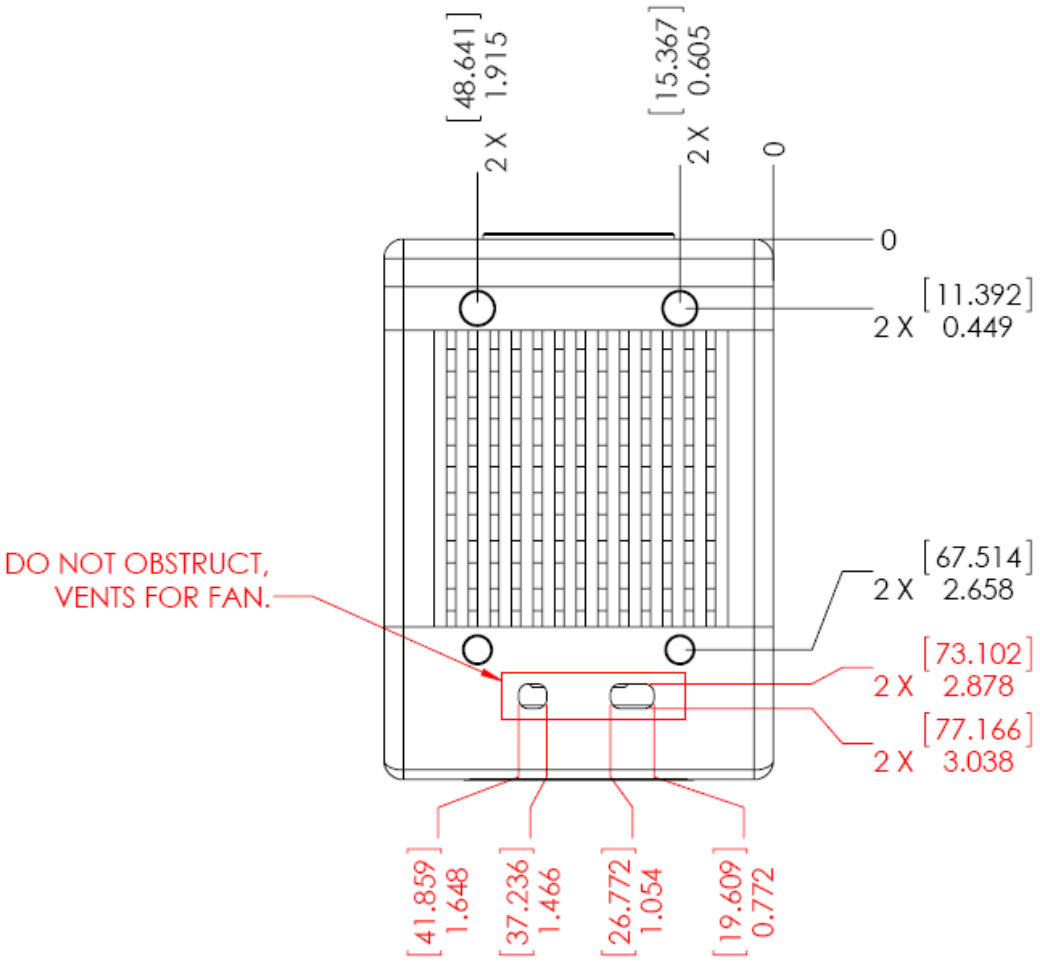
4.14.4. Top View (1.25 GB)



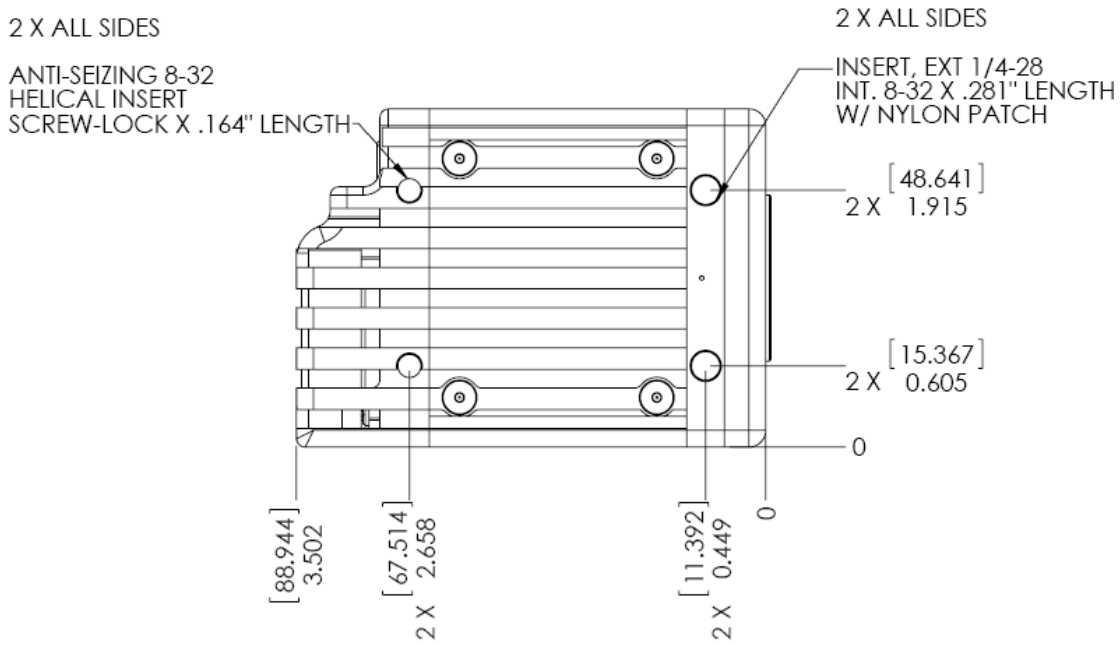
4.14.5. Bottom View (1.25 GB)



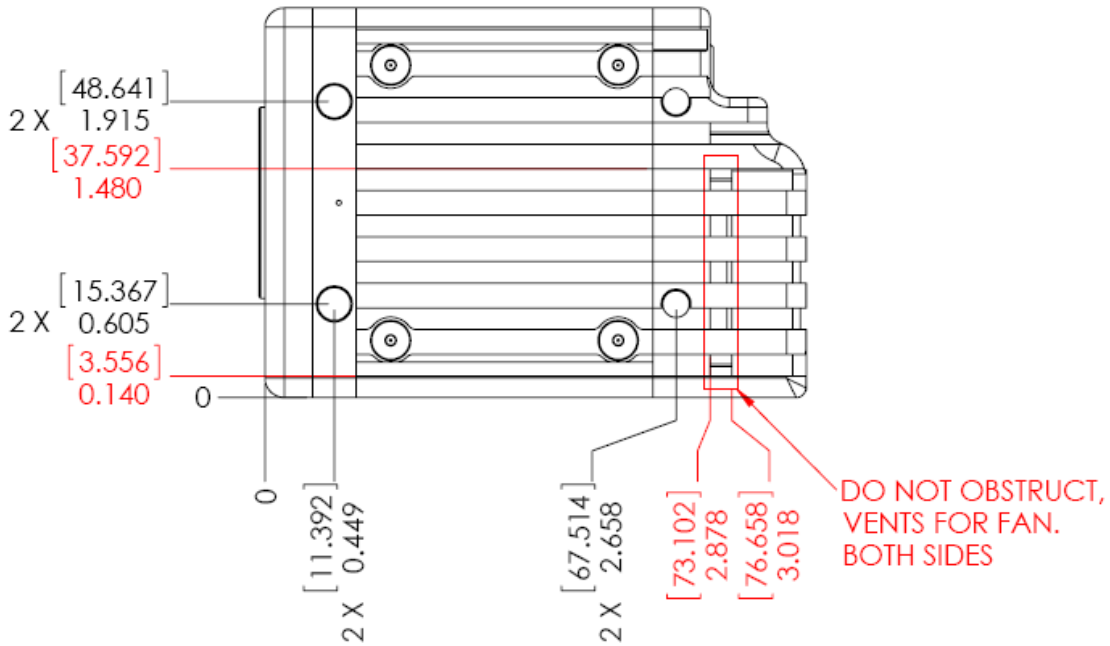
4.14.6. Side View (2.5 GB)



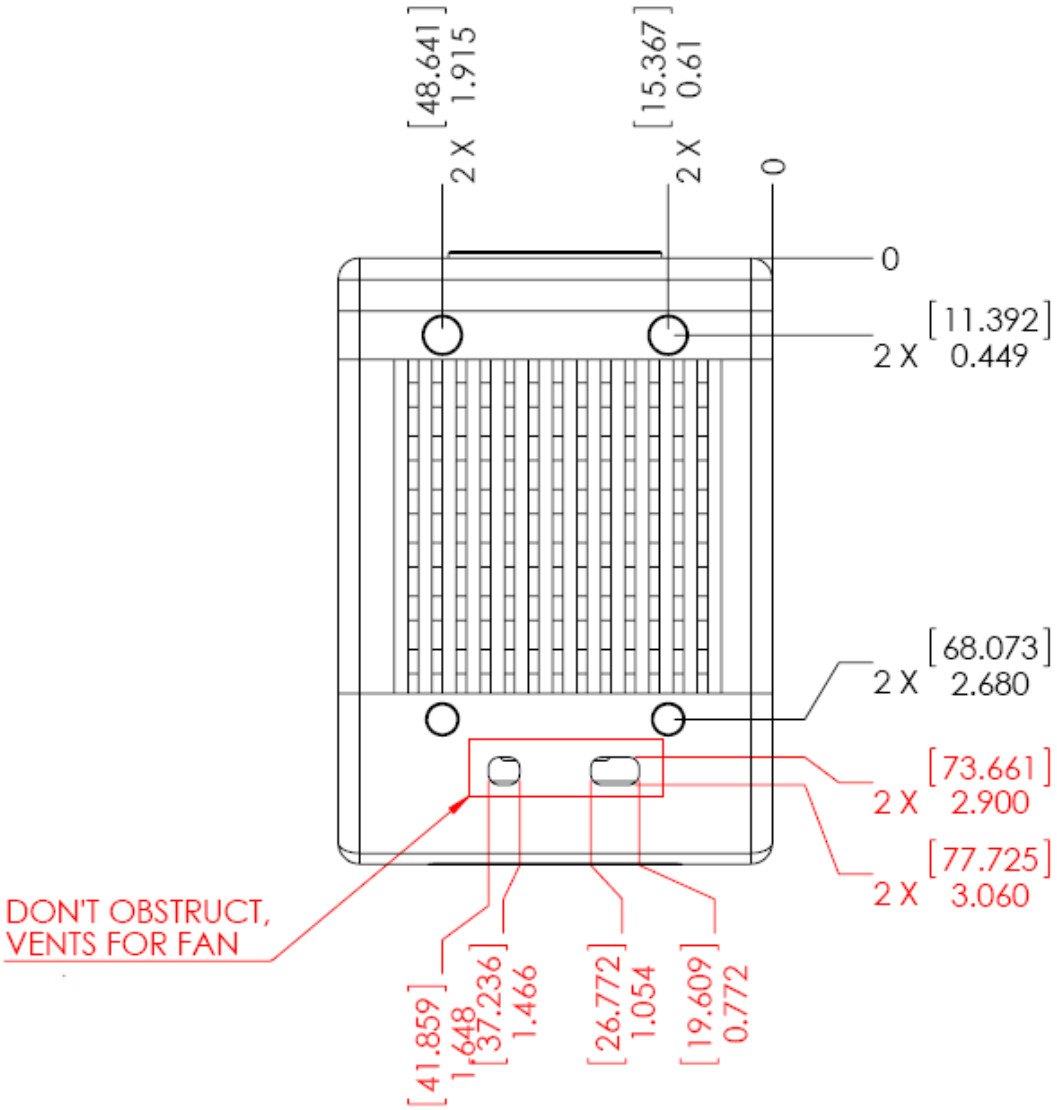
4.14.7. Top View (2.5 GB)



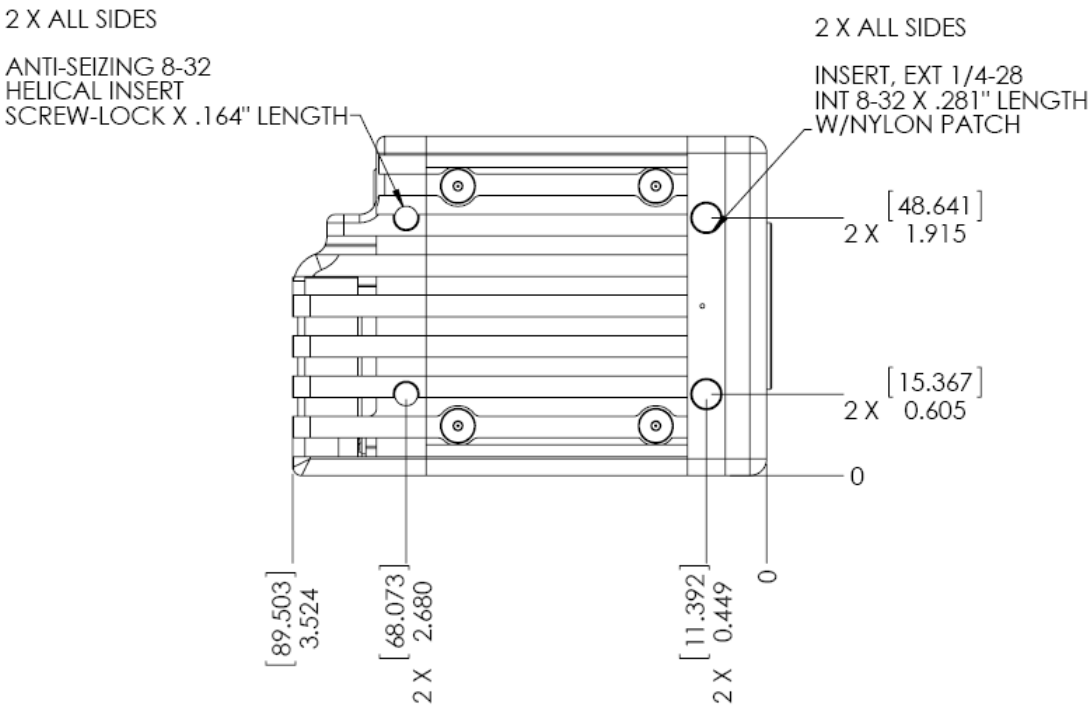
4.14.8. Bottom View (2.5 GB)



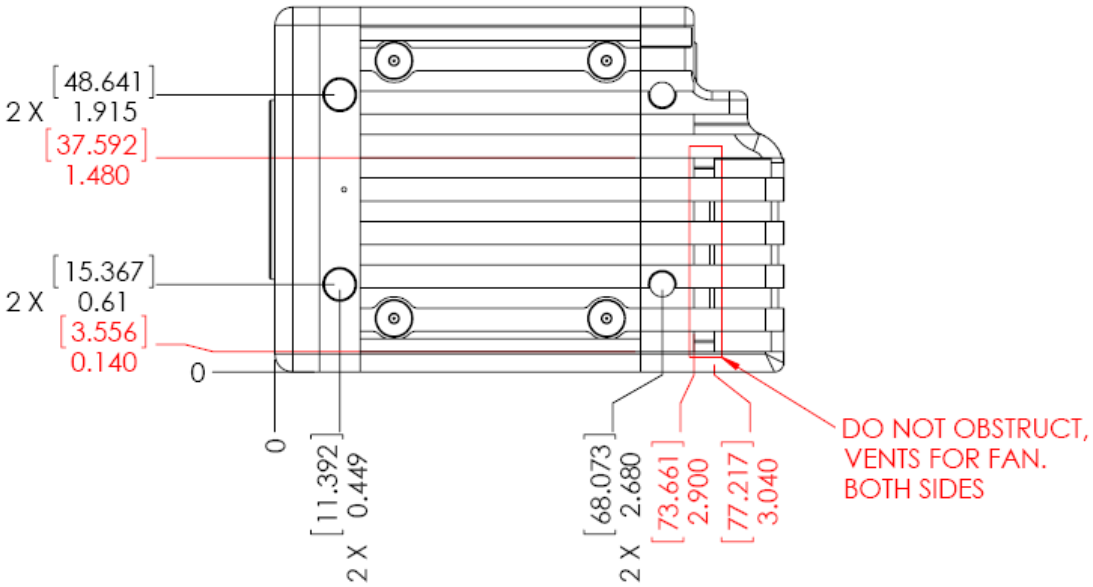
4.14.9. Side View (5.0 GB)



4.14.10. Top View (5.0 GB)

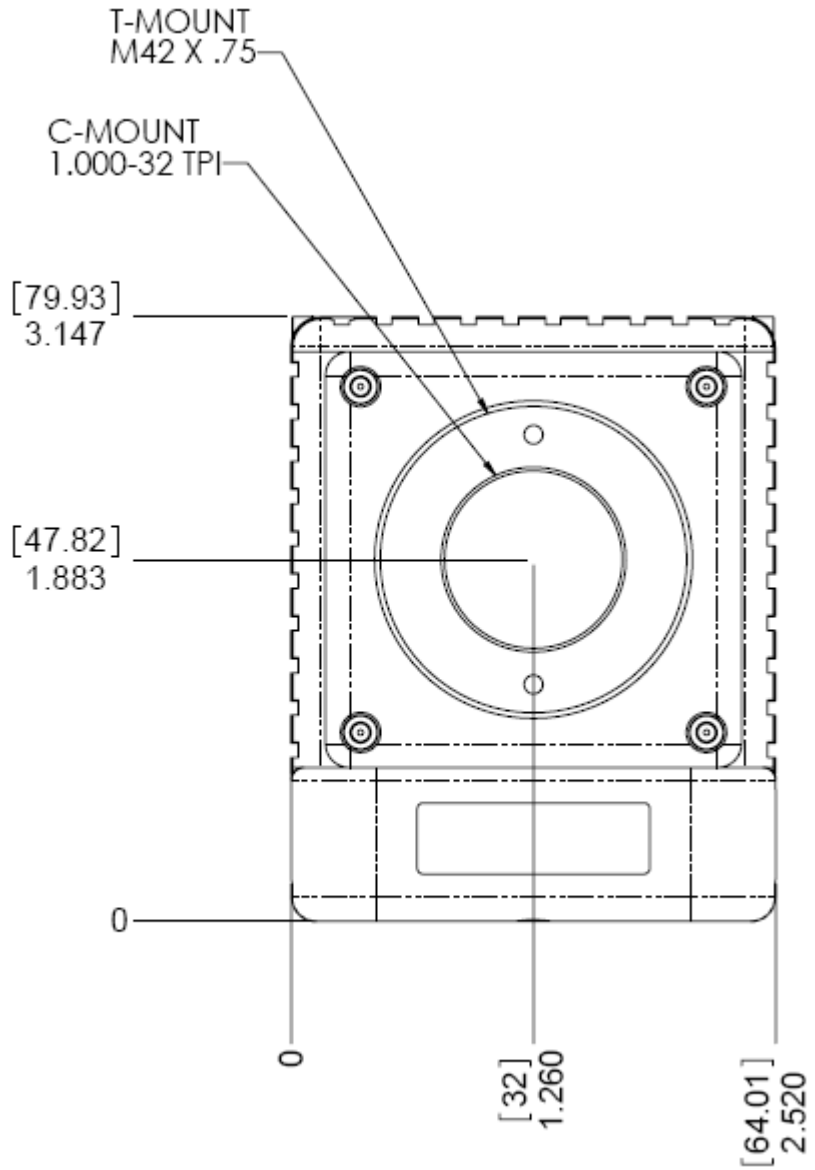


4.14.11. Bottom View (5.0 GB)

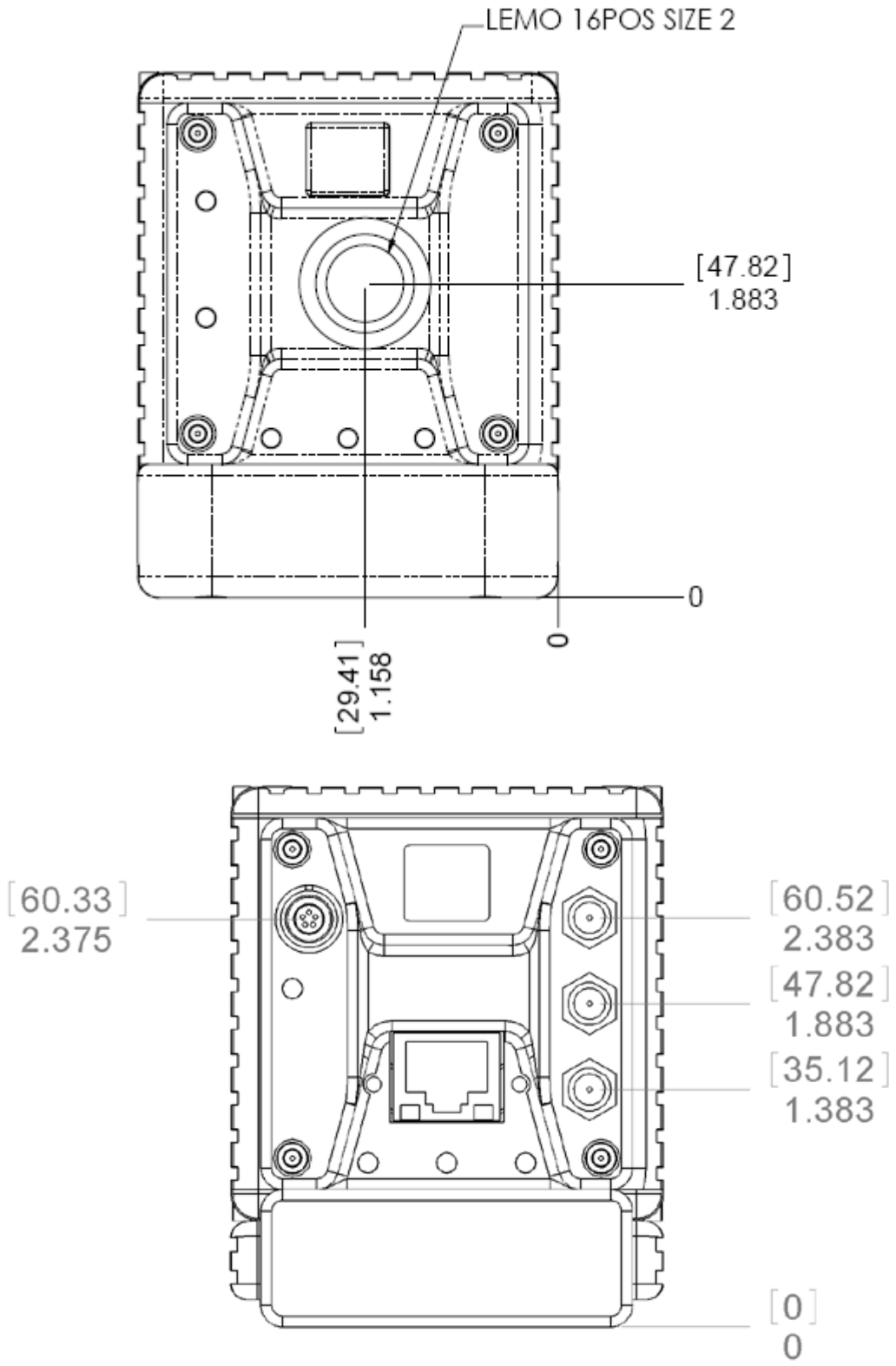


4.15. Mechanical and hole mounts (N series)

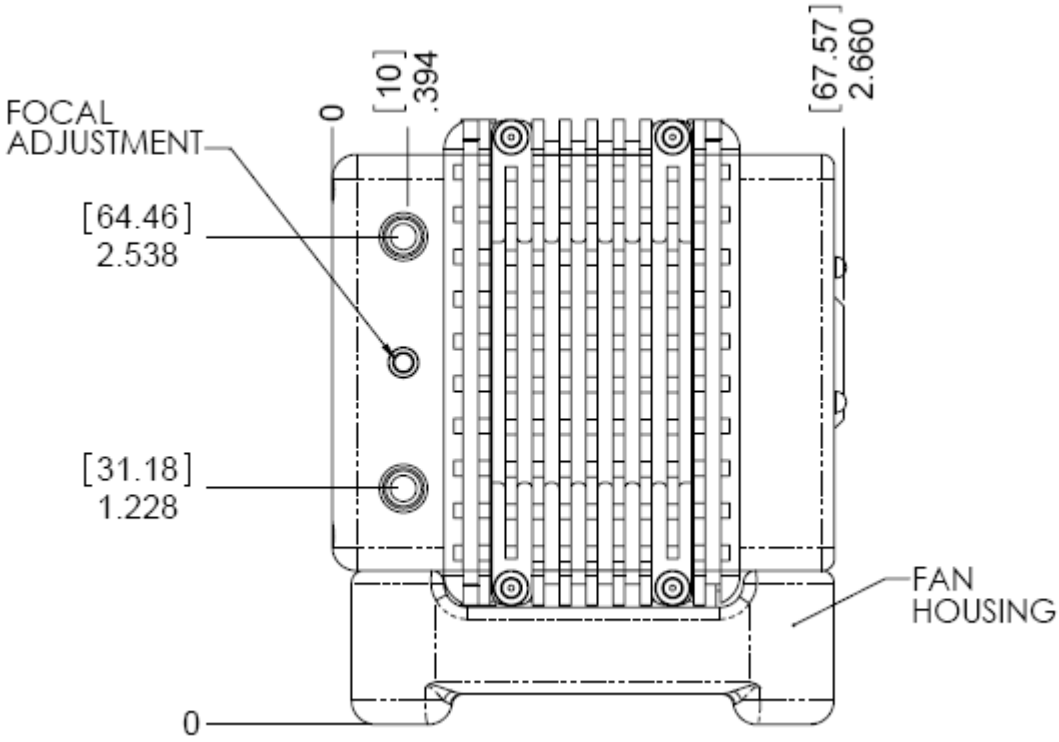
4.15.1. Front View



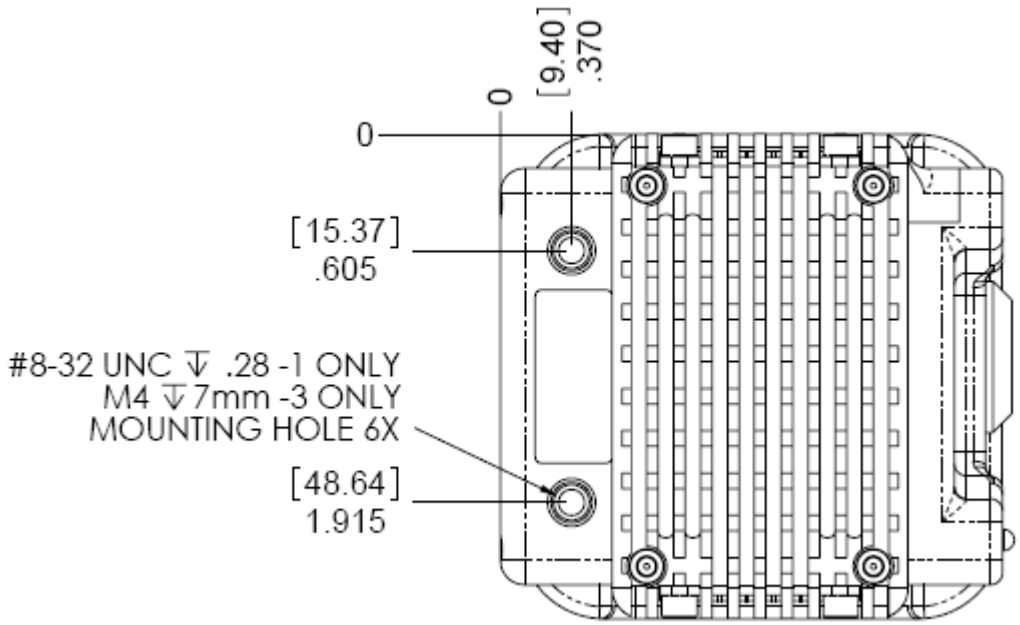
4.15.2. Back Views



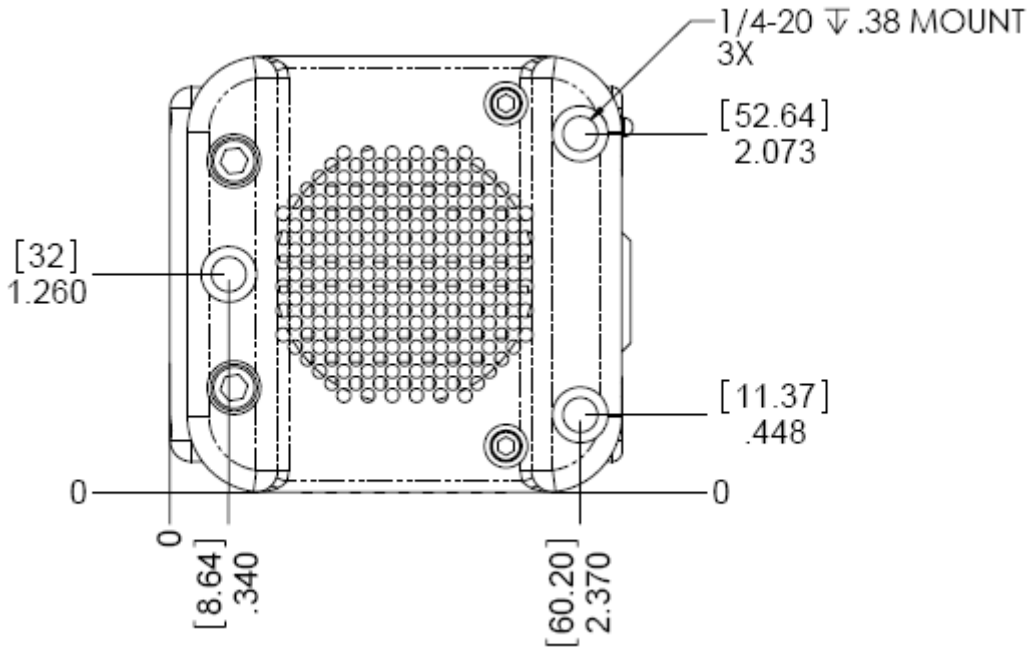
4.15.3. Side View



4.15.4. Top View

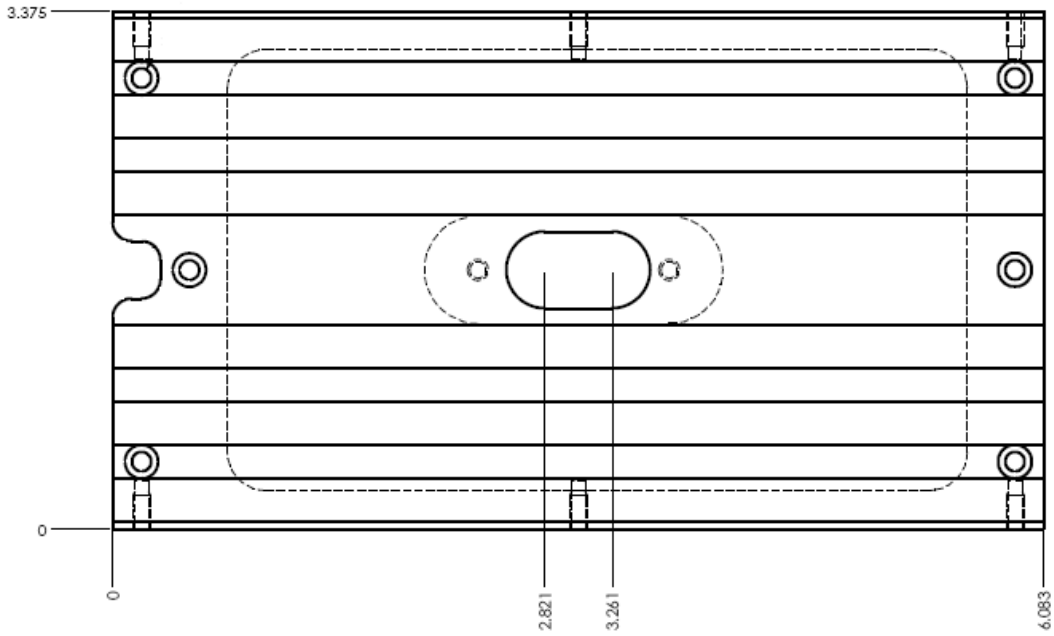


4.15.5. Bottom View

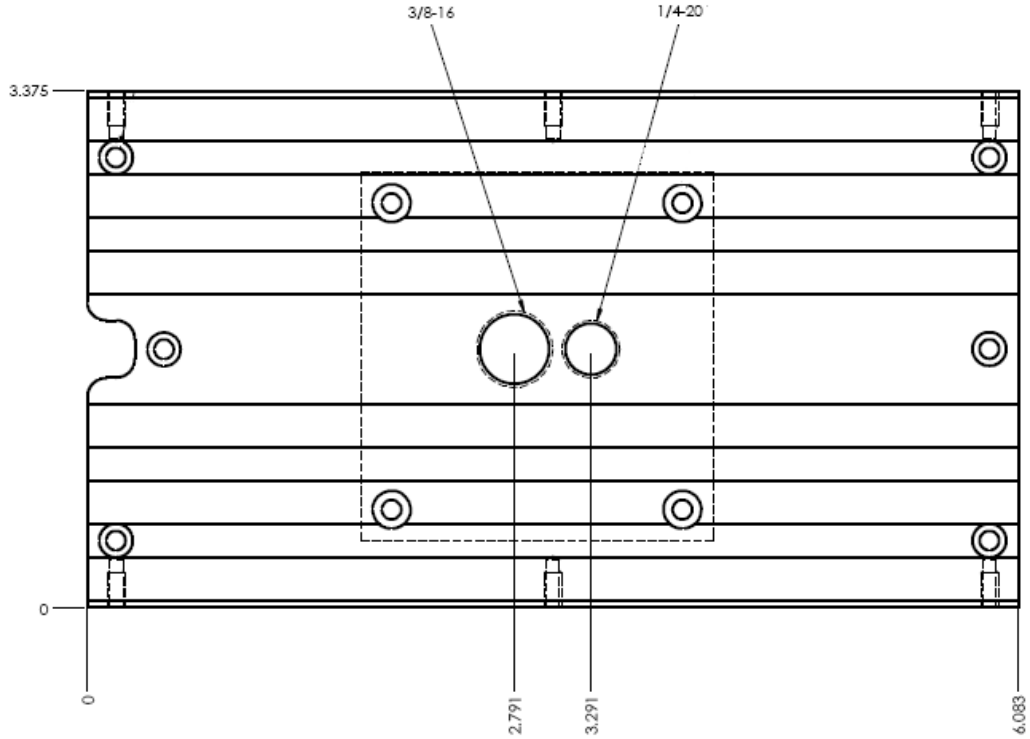


4.16. Mechanical and hole mounts (X series)

4.16.1. Top view



4.16.2. Bottom view



4.16.3. Side view