LASER MARKING WORKSTATION

WL-100A MARKER WORKSTATION

OPERATION MANUAL

990-381 Rev C

Revision Record

REV	ECO	DATE	BASIS OF REVISION
A	43139	12/14	Original edition.
B	44289	08/16	New illustrations with Amada colors + Corrections.
C	45842	04/20	Update Model Names and Company Name

Your WL-100A Fiber Laser Marker Workstation shipment contains the following items:

1. WL-100A Fiber Marker Workstation Enclosure
2. LM-F Fiber Marker based WL-100A Power Supply
   - Optical Fiber Length Dependent on Configuration
3. Ship Kit P/N 4-81226-01
   - Power Cord with Ferrite, #14-3, M/F, Black 4-36136-01 (1 Each)
   - CAT 5e Crossover Cable, 205-318 (1 Each)
   - USB, Flash Drive, 4-77190-01 (1 Each)
     - **i.** 990-381 - This Operator Manual for the WL-100A Fiber Laser Marker Workstation
     - **ii.** 990-559 - Operator Manual For The LM-F Fiber Laser Marker
     - **iii.** 990-502 - Laser Safety Manual
   - System I/O Jumper Assembly, 4-69639-01 (1 each)
   - Emergency Stop Test Jumper Assembly, 4-69641-01 (1 each)
   - Kit, Connectors and Backshells, I/O, 4-69642-01 (1 each)
   - Harness, Remote Interlock, 4-71023-01 (1 each)
   - Cable, 15P, 205-419 (1 each)
   - Cable, 25P, 205-363 (1 each)
   - Fume Extraction Hose Kit, Flexform, 2.5 in Diameter, 366-037 (1 each)
   - Fume Extraction Port, 4-71873-01 (1 each)
4. Customer specified *f*-theta lens and collimator installed in the marker (where applicable)

CONTENTS

Page

CONTACT US

Thank you for purchasing an Amada Weld Tech Laser Marker Work Station.

Upon receipt of your equipment, please thoroughly inspect it for shipping damage prior to its installation. Should there be any damage, please immediately contact the shipping company to file a claim, and notify us at:

Amada Weld Tech Inc.
1820 South Myrtle Avenue
Monrovia, CA 91016

Telephone: (626) 303-5676

FAX: (626) 358-8048

E-Mail: info@amadaweldtech.com

The purpose of this manual is to provide the information required for proper and safe operation and maintenance of the Amada Weld Tech Laser Marker Work Station.

We have made every effort to ensure that information in this manual is both accurate and adequate. If you have any questions or suggestions to improve this manual, please contact us at the phone number or address above.

Amada Weld Tech is not responsible for any loss or injury due to improper use of this product.

CAUTION

Amada Weld Tech may be released from all warranty obligations if repairs or modifications are made by persons other than its own service personnel, or its authorized representatives, unless such repairs or modifications are specifically authorized in writing by Amada Weld Tech.

SAFETY PRECAUTIONS

General

This Operator's Manual describes the Operation and Maintenance of the WL-100A Laser Marker Workstation based on the LM-F Fiber Laser Marker, and provides instructions relating to its SAFE use. Procedures described in this manual ***must*** be performed as detailed by ***qualified*** and ***trained*** personnel.

For SAFETY, and to effectively take advantage of the full capabilities of the Marker, please read this instruction manual, the Laser Marker Operator Manual (Amada Weld Tech Part Number 990-559) and the Laser Safety Manual (Amada Weld Tech Part Number 990-502) thoroughly ***before*** attempting to use the Marker.

After reading this manual, retain it for future reference when any questions arise regarding the proper and SAFE operation of the Marker.

Operation

Always operate the Marker with the workstation enclosure closed and the safety interlock satisfied. The design of the enclosure and protective glass make the marker a Class 1 product when used as intended. When operating the system as intended it is not required to wear laser safety eyewear. Do not bypass the door interlock, remove panels, or modify the enclosure or it will revert to a Class 4 configuration.

If operating or servicing the Marker with panels removed, the interlock bypassed, or similar ***always*** wear Protective Goggles having an optical density of at least 7^{+} at a wavelength of 1060-1150 nanometers for the operation of the Marker.

Follow all OSHA requirements for workplace safety. Appoint a Laser Safety Officer. The Laser Safety Officer (LSO) must provide personnel with sufficient training so that personnel can operate, maintain and service the Laser Marker safely. The LSO must take charge of the key to the Key Switch to ensure that ***only*** qualified and authorized personnel operate the Laser Marker.

Establish and control a dedicated Laser Operation Area. The Laser Safety Officer must isolate the Laser Operation Area from other work areas and display signs warning that the Laser Operation Area is off-limits to unauthorized personnel.

Maintenance/Service

Before performing any maintenance on the Marker and/or Workstation, read *Chapter 4, Maintenance* in the 990-559 manual and/or *Section V, Maintenance* in this manual thoroughly prior to starting work. Use the appropriate tools for terminating the connecting cables, being careful not to nick the wire conductors.

Procedures other than those described in this manual or not performed as prescribed in this manual, may expose personnel to electrical and/or laser radiation hazards.

Do ***not*** modify the Marker without prior written approval from Amada Weld Tech.

Before using this equipment, read the **Safety Precautions** carefully to understand the correct usage of the equipment.

- These precautions are given for the safe use of the Marker and for prevention of injury to operators or others.
- Be sure to read ***each*** of the instructions, as they are all important for safe operation.
- The meaning of the words and symbols are as follows:

⚠ CAUTION

Denotes operations and practices that may result in personal injury or damage to the equipment if not correctly followed.

⚠ WARNING

Denotes operations and practices that may result in serious injury or loss of life if not correctly followed.

⚠ DANGER

Denotes operations and practices that may imminently result in serious injury or loss of life if not correctly followed.

These symbols denote **PROHIBITION**. They are warnings about actions that should ***not*** be performed because they can damage the equipment and will void the warranty.

These symbols denote actions which operators ***must*** take.

Each symbol with a triangle denotes that the contents gives notice of **DANGER**, **WARNING**, or **CAUTION** to the operator.

⚠ DANGER

Do *not* touch inside the Marker when it is turned ON.

Doing so may result in electric shock.

***Never* attempt to disassemble, repair, or modify the Marker.**

Doing so may result in electric shock or fire.
Refrain from any mechanical adjustment other than the maintenance procedures specifically described in the operation manual.

***Never* expose eyes or skin to laser irradiation.**

Exposure to direct or scattered laser light is extremely hazardous.
Direct exposure of the eye to laser beams may result in blindness.

WARNING

	**Wear protective eyewear suitable for the laser being used.** Always wear protective eyewear when using the Marker. Keep in mind that exposure of the eyes to direct laser irradiation may result in blindness, even when wearing protective eyewear.
	**Never aim the laser at any part of your own body or other people.** Exposure to laser beams will cause severe burns. Never aim the laser at yourself or at anyone else.
	**Do *not* touch workpieces during or just after marking.** Workpieces may be very hot.
	**Use only the specified cables. Make sure they are firmly connected.** Using cables of inadequate current capacity or connecting cables loosely may result in fire or electric shock.
	**Avoid damaging power or connecting cables.** Do not step on, twist, or pull cables. Damaged cables may result in electric shock, short circuits, or fires. To repair or replace cables, contact your Amada Weld Tech dealer or Amada Weld Tech.
	**Avoid damaging the delivery fiber.** Do not twist, kink or attempt to remove the fiber. Do not attempt to coil or bend the fiber tighter than a 4.7 inch (120mm) radius. Doing any of these actions will required factory refurbishment of the laser and will void the warranty.
	**Stop using the Marker if any problems arise.** Continuing to use the Marker in the presence of abnormalities (fumes, unusual sounds, excessive heat, smoke, and so forth) may result in electric shock or fire. In this case, immediately turn the Marker OFF and contact your Amada Weld Tech dealer or Amada Weld Tech.
	**Ground the Marker and Workstation.** Failure to ground the Marker may result in electric shock if the Marker or Workstation is damaged or if electrical leaks occur.
	**Avoid spilling or splashing water on the Marker or Workstation.** The presence of water on electrical parts may result in electric shock or short circuits. Liquid spills may degrade the unit's insulation, resulting in electric leaks or fire.

CAUTION

	**Use the appropriate tools to terminate the power cable (wire strippers, crimp tools, etc.).** Failure to use the appropriate tools may result in damage to the wire core, resulting in fire or electric shock.
	**Install the Marker Workstation on a solid, level surface.** Should the Marker tip over or fall, injury or damage to the unit may result.
	**Keep combustible materials away from the Marker Workstation.** Sparks or spattering material may ignite combustible matter. To avoid the risk of fire, never apply the laser beam to flammable or combustible materials.
	**During use, do *not* cover the Marker with a blanket, cloth, or similar articles.** When using the Marker, do ***not*** cover with a blanket, cloth, or similar articles. The Laser Marker may become extremely hot, resulting in fire.
	**Do *not* use the Marker for any purpose other than laser processing.** Using the unit for non-specified applications may result in electric shock or fire.
	**Wear protective gear.** Use protective gloves, long-sleeve garments, leather aprons, or other appropriate protective gear. Sparks or spattering material may burn the skin on contact.
	**Keep a fire extinguisher nearby.** Keep a fire extinguisher in the marking area in case of fire.
	**Maintain and inspect the unit at periodic intervals.** Maintain and inspect the unit at periodic intervals. Repair any damage before resuming use.

Guidelines for Normal Use

1. Appoint a Laser Safety supervisor (LSO). Ensure that the LSO has as much expertise and experience with lasers and laser equipment as possible.

   The LSO, who will be in charge of the laser key switch, is responsible for familiarizing users with safety issues and for coordinating laser marking.

2. Partition off all areas that may be exposed to laser light.

   The supervisor is responsible for posting signs to keep unauthorized personnel out of the marking area.

3. Install the Marker and Workstation on a solid, level surface that meets all applicable safety rules, regulations, and requirements.
   - To prevent errant marking, place workpieces on the same stand as the Marker Head so that the workpieces do ***not*** vibrate during marking.

4. To ensure optimal marking quality, use the Marker in a location where ambient temperatures are 41ºF to 95ºF (5°C to 35°C), free of sudden temperature fluctuations and a relative humidity less than 90% (non-condensing). Do ***not*** use the marker workstation in any of the following locations:
   - Locations with excessive dirt, dust, oil mist, fumes, or moisture.
   - Locations in which the unit may be subject to vibration or impact
   - Locations in which the unit may be exposed to chemicals
   - Locations near sources of high-frequency noise, or
   - Locations in which condensation may form on the unit's surface.

5. If the room temperature changes quickly (as when a heater is turned ON in cold weather), moisture may condense on the optical components, resulting in fogging or collection of dust.

   Avoid sudden changes in temperature. Under the conditions in which condensation may occur, wait for a period of time after turning the unit ON before beginning operations.

6. If the exterior of the unit becomes soiled, wipe it with a soft lightly moistened or dry cloth.

   Clean heavily soiled areas with a cloth moistened with diluted neutral detergent or alcohol. Do ***not*** use paint thinner, acetone, benzene, or similar chemicals, which may discolor or damage the unit.

7. Never place screws or other foreign objects inside the marker. Such objects can damage the unit.

8. Operate the switches and buttons gently by hand.

9. For more consistent marking, allow the unit to thermally stabilize for approximately 10 to 30 minutes before use.

   Note: The appropriate warm-up time will depend on the ambient temperature and work piece material.

WARNING

Always wear protective goggles with an optical density of at least 7+, at a wavelength of 1060-1150 nanometers when performing Marker maintenance or operating without the Class 1 Workstation.

Refer to the following standards for more information on managing laser equipment:

- **IEC60825-1 Edition 1.2** "Safety of laser products Part1: Equipment Classifications, requirements and user's guide."
- **Amada Weld Tech Laser Safety Manual** (Amada Weld Tech Part Number 990-502)
- **ANSI Z136.1-2007** American National Standard for Safe Use of Lasers

Warning Labels

The Laser Marker carries the following labels. Read and follow the label instructions to ensure correct use. Some label contents may differ based on configuration.

WARNING

DO NOT PLUG OR UNPLUG CABLES WHEN AC POWER IS TURNED ON

4-66-534-01 Rev A

DANGER

LASER BEAM MAY CAUSE BLINDNESS AND BURN WHEN LASER IS EMITTED WITHOUT THIS COVER.

4-38093-01 REV B

DANGER

AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION.

4-66500-01 REV A

DANGER

VISIBLE AND/OR INVISIBLE LASER RADIATION WHEN OPEN AND INTERLOCK DEFEATED.

4-38089-01 REV B

AVOID EXPOSURE

VISIBLE AND/OR INVISIBLE LASER RADIATION IS EMITTED FROM THIS APERTURE.

4-38089-01 REV B

CAUTION

DO *NOT* ATTEMPT TO REMOVE THE FIBER UNDER ANY CIRCUMSTANCES. DOING SO WILL *DESTROY* THE FIBER AND VOID THE WARRANTY.

WARNING!

For Viewing of diffused laser lights only

Yb Fiber 1065 +/- 5nm

OD 4+ @ 860-1070nm

OD 6+ @ 1064nm

Never look directly into a laser beam. Using this special glass for any other wavelength than specified could result in serious injury and/or blindness.

AMADA

AMADA WELD TECH

MANUFACTURED BY:
AMADA WELD TECH
1820 SOUTH MYRTLE AVENUE
MONROVIA, CA 91017 U.S.A.

CAT. NO.	SEE I.D. LABEL ON REAR
MOD NO.	PANEL FOR MODEL AND
SER. NO.	SERIAL INFORMATION

INPUT POWER: SINGLE PHASE AC
VOLTS: 90-130 180-260 Hz: 50/60
MAXIMUM RMS AMPS: 10

LASER OUTPUT:	*Yb FIBER*	*AIMING:*
MAXIMUM:	*52 W*	*<1 mW*
OSCILLATION:	PULSED	CW
WAVE LENGTH:	1055-1070nm	660nm

CENTRAL EMISSION WAVELENGTH: 1064nm

PULSE OUTPUT FREQUENCY: 50-200kHz

COMPLIES WITH 21 CFR 1040.10
CLASS IV LASER PRODUCT

LIMITED WARRANTY

GENERAL TERMS AND CONDITIONS FOR THE SALE OF GOODS

1. Applicability.

(a) These terms and conditions of sale (these "**Terms**") are the only terms which govern the sale of the goods ("**Goods**") by Amada Weld Tech Inc. ("**Seller**") to the buyer identified in the Sales Quotation and/or Acknowledgment (as each defined below) to which these Terms are attached or incorporated by reference ("**Buyer**"). Notwithstanding anything herein to the contrary, if a written contract signed by authorized representatives of both parties is in existence covering the sale of the Goods covered hereby, the terms and conditions of said contract shall prevail to the extent they are inconsistent with these Terms.

(b) The accompanying quotation of sale (the "**Sales Quotation**") provided to Buyer, and/or sales order acknowledgement ("**Acknowledgement**") and these Terms (collectively, this "**Agreement**") comprise the entire agreement between the parties, and supersede all prior or contemporaneous understandings, agreements, negotiations, representations and warranties, and communications, both written and oral. For clarification, after the Acknowledgement is received by Buyer, the order for Goods is binding and cannot be cancelled by Buyer for any reason and the full purchase price amount set forth in the Acknowledgement shall be due and payable by Buyer to Seller pursuant to the payment schedule set forth in the Acknowledgement unless otherwise agreed to in writing by Seller. All terms and conditions contained in any prior or contemporaneous oral or written communication which are different from, or in addition to, the terms and conditions in this Agreement are hereby rejected and shall not be binding on Seller, whether or not they would materially alter this Agreement. These Terms prevail over any of Buyer's terms and conditions of purchase regardless whether or when Buyer has submitted its purchase order or such terms. Fulfillment of Buyer's order does not constitute acceptance of any of Buyer's terms and conditions and does not serve to modify or amend these Terms. Notwithstanding anything herein to the contrary, all orders for Goods must be for a minimum purchase price of $100 or such orders will be rejected by Seller.

2. Delivery.

(a) The Goods will be delivered within a reasonable time after Seller provides Buyer the Acknowledgment, subject to availability of finished Goods. Seller will endeavor to meet delivery schedules requested by Buyer, but in no event shall Seller incur any liability, consequential or otherwise, for any delays or failure to deliver as a result of ceasing to manufacture any product or any Force Majeure Event. Delivery schedules set forth in the Acknowledgment are Seller's good faith estimate on the basis of current schedules. In no event shall Seller be liable for special or consequential damages resulting from failure to meet requested delivery schedules.

(b) Unless otherwise agreed in writing by the parties in the Acknowledgement, Seller shall deliver the Goods to Seller's plant in Monrovia, CA, USA (the "**Shipping Point**") using Seller's standard methods for packaging and shipping such Goods. Buyer shall take delivery of the Goods within three (3) days of Seller's written notice that the Goods have been delivered to the Shipping Point. Buyer shall be responsible for all loading costs (including freight and insurance costs) and provide equipment and labor reasonably suited for receipt of the Goods at the Shipping Point. Seller shall not be liable for any delays, loss or damage in transit.

(c) Seller may, in its sole discretion, without liability or penalty, make partial shipments of Goods to Buyer, if applicable. Each shipment will constitute a separate sale, and Buyer shall pay for the units shipped whether such shipment is in whole or partial fulfillment of Buyer's purchase order.

(d) If for any reason Buyer fails to accept delivery of any of the Goods on the date fixed pursuant to Seller's notice that the Goods have been delivered at the Shipping Point, or if Seller is unable to deliver the Goods at the Shipping Point on such date because Buyer has not provided appropriate instructions, documents, licenses or authorizations: (i) risk of loss to the Goods shall pass to Buyer; (ii) the Goods shall be deemed to have been delivered; and (iii) Seller, at its option, may store the Goods until Buyer picks them up, whereupon Buyer shall be liable for all related costs and expenses (including, without limitation, storage and insurance).

3. Non-delivery.

(a) The quantity of any installment of Goods as recorded by Seller on dispatch from Seller's place of business is conclusive evidence of the quantity received by Buyer on delivery unless Buyer can provide conclusive evidence proving the contrary.

(b) Seller shall not be liable for any non-delivery of Goods (even if caused by Seller's negligence) unless Buyer gives written notice to Seller of the non-delivery within three (3) days of the date when the Goods would in the ordinary course of events have been received.

(c) Any liability of Seller for non-delivery of the Goods shall be limited to (in Seller's sole discretion) replacing the Goods within a reasonable time or adjusting the invoice respecting such Goods to reflect the actual quantity delivered.

4. Shipping Terms. Unless indicated otherwise in the Acknowledgment, Delivery shall be made EXW (Incoterms 2010), Shipping Point, including without limitation, freight and insurance costs. If no delivery terms are specified on the Acknowledgement, the method of shipping will be in the sole discretion of Seller. Unless directed in writing otherwise by Buyer, full invoice value will be declared for all shipments.

5. Title and Risk of Loss. Title and risk of loss passes to Buyer upon delivery of the Goods at the Shipping Point. As collateral security for the payment of the purchase price of the Goods, Buyer hereby grants to Seller a lien on and security interest in and to all of the right, title and interest of Buyer in, to and under the Goods, wherever located, and whether now existing or hereafter arising or acquired from time to time, and in all accessions thereto and replacements or modifications thereof, as well as all proceeds (including insurance proceeds) of the foregoing. The security interest granted under this provision constitutes a purchase money security interest under the California Commercial Code.

6. Amendment and Modification. These Terms may only be amended or modified in a writing which specifically states that it amends these Terms and is signed by an authorized representative of each party.

7. Inspection and Rejection of Nonconforming Goods.

(a) Buyer shall inspect the Goods within two (2) days of receipt ("**Inspection Period**"). Buyer will be deemed to have accepted the Goods unless it notifies Seller in writing of any Nonconforming Goods during the Inspection Period and furnishes such written evidence or other documentation as required by Seller. "**Nonconforming Goods**" means only the following: (i) product shipped is different than identified in Buyer's Acknowledgement; or (ii) product's label or packaging incorrectly identifies its contents. Notwithstanding the foregoing, for shipped Goods that require field installation, the "re-verification" terms in the Acknowledgement shall apply and for custom installations, the inspection and verification shall take place at Buyer's site immediately after the installation is completed.

(b) Seller will only accept Nonconforming Goods that are returned under Seller's Return Material Authorization procedures then in effect ("**RMA**"). Buyer shall obtain a RMA number from Seller prior to returning any Nonconforming Goods and return the Nonconforming Goods prepaid and insured to Seller at 1820 South Myrtle Avenue, Monrovia, CA 91016 or to such other location as designated in writing by Seller for the examination to take place there. If Seller reasonably verifies Buyer's claim that the Goods are Nonconforming Goods and that the nonconformance did not developed by use from Buyer, Seller shall, in its sole discretion, (i) replace such Nonconforming Goods with conforming Goods, or (ii) credit or refund the Price for such Nonconforming Goods pursuant to the terms set forth herein. Notwithstanding the foregoing, the only remedy for Nonconforming Goods that are custom systems is repair (not refund or replacement). No returns for Nonconforming Goods are allowed after thirty (30) days from the original shipping date.

(c) Buyer acknowledges and agrees that the remedies set forth in Section 7(a) are Buyer's exclusive remedies for the delivery of Nonconforming Goods. Except as provided under Section 7(a) and Section 14, all sales of Goods to Buyer are made on a one-way basis and Buyer has no right to return Goods purchased under this Agreement to Seller.

8. Price.

(a) Buyer shall purchase the Goods from Seller at the prices (the "**Prices**") set forth in Seller's published catalogue literature in force as of the date of the Sales Quotation. However, the Prices shown in such catalogue literature or any other publication are subject to change without notice. Unless specifically stated to the contrary in the Sales Quotation, quoted Prices and discounts are firm for thirty (30) days from the date of the Sales Quotation. Unless otherwise stated, prices are quoted EXW (Incoterms 2010), Shipping Point. Unless otherwise stated in the Acknowledgement, if the Prices should be increased by Seller before delivery of the Goods to a carrier for shipment to Buyer, then these Terms shall be construed as if the increased prices were originally inserted herein, and Buyer shall be billed by Seller on the basis of such increased prices.

(b) All Prices are exclusive of all sales, use and excise taxes, and any other similar taxes, duties and charges of any kind imposed by any governmental authority on any amounts payable by Buyer. Buyer shall be responsible for all such charges, costs and taxes (present or future); provided, that, Buyer shall not be responsible for any taxes imposed on, or with respect to, Seller's income, revenues, gross receipts, personnel or real or personal property or other assets.

9. Payment Terms.

(a) Unless otherwise provided in the Acknowledgement, if Buyer has approved credit with Seller, Buyer shall pay all invoiced amounts due to Seller within thirty (30) days from the date of Seller's invoice. If Seller does not have Buyer's financial information and has not provided pre-approved credit terms for Buyer, the payment must be made in cash with order or C.O.D. in US dollars. If Buyer has approved credit terms, the payment may be made by cash with order, wire transfer of immediately available funds, or check in US dollars. Certain products require a down payment. Any payment terms other than set forth above will be identified in the Acknowledgement. Notwithstanding anything herein to the contrary, all prepaid deposits and down payments are non-refundable. If a deposit is not received when due, Seller reserves the right to postpone manufacturing of Goods until payment is received. Seller will not be responsible for shipment delays due to deposit payment delays.

(b) In Seller's sole discretion, Seller may access Buyer interest on all late payments at the lesser of the rate of 1.5% per month or the highest rate permissible under applicable law, calculated daily and compounded monthly. Buyer shall reimburse Seller for all costs incurred in collecting any late payments, including, without limitation, attorneys' fees. In addition to all other remedies available under these Terms or at law (which Seller does not waive by the exercise of any rights hereunder), Seller shall be entitled to suspend the delivery of any Goods if Buyer fails to pay any amounts when due hereunder and such failure continues for ten (10) days following written notice thereof.

(c) Buyer shall not withhold payment of any amounts due and payable by reason of any set-off of any claim or dispute with Seller, whether relating to Seller's breach, bankruptcy or otherwise.

10. Intellectual Property; Software License.

(a) To the extent that any Goods provided under this Agreement contains software, whether pre-installed, embedded, in read only memory, or found on any other media or other form ("**Software**"), such Software and accompanying documentation are licensed to Buyer, not sold and shall remain the sole and exclusive property of Seller or third party licensors of Seller. Seller grants Buyer a non-exclusive license to use the Software solely as provided in and in connection with the use of the Goods in which such Software is contained and in accordance with any applicable user documentation provided with such Goods and subject to the provisions of this Agreement. Certain of Seller's Goods may include third party software such as computer operating systems. Licenses to such third party software are subject to the terms and conditions of any applicable third party software license agreements. Unless identified in the Acknowledgement, no license is granted by Seller with respect to such third party software products that may be provided with the Goods (if any). Seller makes no warranties regarding any third party software that may accompany the Goods or otherwise and such software is explicitly included in the definition of Third Party Products below.

(b) Buyer shall not copy, modify, or disassemble, or permit others to copy, modify, or disassemble, the Software, nor may Buyer modify, adapt, translate, reverse assemble, decompile, or otherwise attempt to derive source code from the Software. Buyer shall not transfer possession of the Software except as part of, or with, the Goods, and each such transfer shall be subject to the restrictions contained herein. Buyer may not sublicense, rent, loan, assign or otherwise transfer the Software or documentation, and Buyer shall retain on all copies of the Software and documentation all copyright and other proprietary notices or legends appearing therein or thereon. Seller may terminate this license upon written notice for any violation of any of the terms of this license or any material breach of any provision of this Agreement. Buyer shall immediately discontinue use of the Software upon any termination of this license or Agreement. This license shall terminate upon any termination of the Agreement.

(c) All patents, trademarks, copyrights or other intellectual property rights embodied in the Goods, including without limitation the Software, are owned by Seller and its licensors. Seller and its licensors retain all right, title and interest in such intellectual property rights. Except as expressly set forth herein, no license rights or ownership in or to any of the foregoing is granted or transferred hereunder, either directly or by implication. ALL RIGHTS RESERVED.

(d) If Buyer is the United States Government or any agency thereof, each of the components of the Software and user documentation are a "commercial item," and "computer software" as those terms are defined at 48 C.F.R. 2.101, consisting of "commercial computer software" and "commercial computer software documentation," as such terms are used in 48 C.F.R. 12.212. Consistent with 48 C.F.R. 12.212 and 48 C.F.R. 227.7202-1 through 227.7202-4, all United States government Buyers acquire only those rights in the Software and user documentation that are specified in this Agreement.

11. Installation and Other Services. Seller shall provide installation services ("**Installation Services**") to Buyer if set forth in the Acknowledgment. If Installation Services are provided for in the Acknowledgement, Buyer will prepare the location for the installation consistent with Buyer's written specifications and Buyer will install necessary system cable and assemble any necessary equipment or hardware not provided by Seller, unless agreed otherwise in writing by the parties. For Goods that will be operated on or in connection with Buyer supplied hardware or software, Buyer is responsible for ensuring that its hardware and software conform with Seller minimum hardware and software requirements as made available to Buyer. Seller shall provide other field services, such as maintenance visits and field repairs (the "**Other Services**" and together with the Installation Services, the "**Services**") if set forth in the Acknowledgement.

12. Limited Warranty.

(a) Subject to the exceptions and upon the conditions set forth herein, Seller warrants to Buyer that for a period of one (1) year from the date of shipment ("**Warranty Period**"), that such Goods will be free from material defects in material and workmanship.

(b) Notwithstanding the foregoing and anything herein to the contrary, the warranty set forth in this Section 12 shall be superseded and replaced in its entirety with the warranty set forth on **Exhibit A** hereto if the Goods being purchased are specialty products, which include, without limitation, laser products, fiber markers, custom systems, workstations, Seller-installed products, non-catalogue products and other custom-made items (each a "**Specialty Product**").

(c) **EXCEPT FOR THE WARRANTY SET FORTH IN SECTION 12(A), SELLER MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO THE GOODS (INCLUDING ANY SOFTWARE) OR SERVICES, INCLUDING ANY (a) WARRANTY OF MERCHANTABILITY; (b) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; (c) WARRANTY OF TITLE; OR (d) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.**

(d) Products manufactured by a third party and third party software ("**Third Party Product**") may constitute, contain, be contained in, incorporated into, attached to or packaged together with, the Goods. Third Party Products are not covered by the warranty in Section 12(a). For the avoidance of doubt, **SELLER MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO ANY THIRD PARTY PRODUCT, INCLUDING ANY (a) WARRANTY OF MERCHANTABILITY; (b) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; (c) WARRANTY OF TITLE; OR (d) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.** Notwithstanding the foregoing, in the event of the failure of any Third Party Product, Seller will assist (within reason) Buyer (at Buyer's sole expense) in obtaining, from the respective third party, any (if any) adjustment that is available under such third party's warranty.

(e) Seller shall not be liable for a breach of the warranty set forth in Section 12(a) unless: (i) Buyer gives written notice of the defect, reasonably described, to Seller within five (5) days of the time when Buyer discovers or ought to have discovered the defect and such notice is received by Seller during the Warranty Period; (ii) Seller is given a reasonable opportunity after receiving the notice to examine such Goods; (iii) Buyer (if requested to do so by Seller) returns such Goods (prepaid and insured to Seller at 1820 South Myrtle Avenue, Monrovia, CA 91016or to such other location as designated in writing by Seller) to Seller pursuant to Seller's RMA procedures and Buyer obtains a RMA number from Seller prior to returning such Goods for the examination to take place; and (iii) Seller reasonably verifies Buyer's claim that the Goods are defective and that the defect developed under normal and proper use.

(f) Seller shall not be liable for a breach of the warranty set forth in Section 12(a) if: (i) Buyer makes any further use of such Goods after giving such notice; (ii) the defect arises because Buyer failed to follow Seller's oral or written instructions as to the storage, installation, commissioning, use or maintenance of the Goods; (iii) Buyer alters or repairs such Goods without the prior written consent of Seller; or (iv) repairs or modifications are made by persons other than Seller's own service personnel, or an authorized representative's personnel, unless such repairs are made with the written consent of Seller in accordance with procedures outlined by Seller.

(g) All expendables such as electrodes are warranted only for defect in material and workmanship which are apparent upon receipt by Buyer. The foregoing warranty is negated after the initial use.

(h) Subject to Section 12(e) and Section 12(f) above, with respect to any such Goods during the Warranty Period, Seller shall, in its sole discretion, either: (i) repair or replace such Goods (or the defective part) or (ii) credit or refund the price of such Goods at the pro rata contract rate, provided that, if Seller so requests, Buyer shall, at Buyer's expense, return such Goods to Seller.

(i) **THE REMEDIES SET FORTH IN SECTION 12(H) SHALL BE BUYER'S SOLE AND EXCLUSIVE REMEDY AND SELLER'S ENTIRE LIABILITY FOR ANY BREACH OF THE LIMITED WARRANTY SET FORTH IN SECTION 12(A).** Representations and warranties made by any person, including representatives of Seller, which are inconsistent or in conflict with the terms of this warranty, as set forth above, shall not be binding upon Seller.

13. Limitation of Liability.

(a) **IN NO EVENT SHALL SELLER BE LIABLE FOR ANY CONSEQUENTIAL, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR PUNITIVE DAMAGES, LOST PROFITS OR REVENUES OR DIMINUTION IN VALUE, LOSS OF INFORMATION OR DATA, OR PERSONAL INJURY OR DEATH ARISING IN ANY WAY OUT OF THE MANUFACTURE, SALE, USE, OR INABILITY TO USE ANY GOODS, SOFTWARE OR SERVICE, ORARISING OUT OF OR RELATING TO ANY BREACH OF THESE TERMS, WHETHER OR NOT THE POSSIBILITY OF SUCH DAMAGES HAS BEEN DISCLOSED IN ADVANCE BY BUYER OR COULD HAVE BEEN REASONABLY FORESEEN BY BUYER, REGARDLESS OF THE LEGAL OR EQUITABLE THEORY (CONTRACT, TORT OR OTHERWISE) UPON WHICH THE CLAIM IS BASED, AND NOTWITHSTANDING THE FAILURE OF ANY AGREED OR OTHER REMEDY OF ITS ESSENTIAL PURPOSE.**

(b) **IN NO EVENT SHALL SELLER'S AGGREGATE LIABILITY ARISING OUT OF OR RELATED TO THIS AGREEMENT, WHETHER ARISING OUT OF OR RELATED TO BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE) OR OTHERWISE, EXCEED THE TOTAL OF THE AMOUNTS PAID TO SELLER FOR THE GOODS SOLD HEREUNDER.**

(c) **ALL WARRANTIES SET FORTH HEREIN, DIRECT OR IMPLIED, ARE VOIDED IF THE INITIAL INSTALLATION AND START-UP OF THE SUBJECT GOOD IS NOT SUPERVISED BY AN AUTHORIZED REPRESENTATIVE OF SELLER. AFTER INSTALLATION, ANY RE-ALIGNMENT, RE-CLEANING, OR RE-CALIBRATION, PROVIDED THEY ARE NOT RELATED TO A PROVEN DEFECT IN MATERIALS OR WORKMANSHIP, SHALL BE PERFORMED BY AN AUTHORIZED REPRESENTATIVE OF SELLERAT THE CURRENT SERVICE RATES.**

(d) **WHERE GOODS ARE SUBJECT TO A MOVE TO ANOTHER LOCATION AFTER THE ORIGINAL INSTALLATION HAS BEEN MADE, THE WARRANTY MAY BE MAINTAINED ONLY IF SUPERVISED BY AN AUTHORIZED REPRESENTATIVE OF SELLER. SELLER, FOR A SERVICE CHARGE, WILL ARRANGE FOR AND SUPERVISE THE DISCONNECTION, TRANSPORTATION, REINSTALLATION AND START-UP OF THE EQUIPMENT. CLAIMS FOR DAMAGE IN SHIPMENT ARE THE RESPONSIBILITY OF BUYER AND SHALL BE FILED PROMPTLY WITH THE TRANSPORTATION COMPANY.**

14. Return Goods Policy. Seller's products may be returned to Seller for credit within sixty (60) days of shipment subject to the following conditions.

(a) In order to return products for credit, Buyer must obtain a RMA number from Seller. Upon receipt, it must be executed by an authorized person and then returned with the Goods. Goods returned to Seller without a RMA will be returned at Buyer's expense.

(b) Goods are to be returned to Seller at 1820 South Myrtle Avenue, Monrovia, CA 91016 with Freight Prepaid. Seller will not accept collect shipments.

(c) Restocking fees will be assessed in accordance with the following schedules: (i) Goods returned within the first thirty (30) days from shipment date will be restocked less twenty percent (20%) of the amount billed on the original invoice. (ii) Goods returned over thirty (30) days of shipment but less than sixty (60) days will be restocked less thirty percent (30%) of the amount billed on the original invoice. (iii) No returns are allowed after sixty (60) days from the original shipping date.

(d) The restocking fees set forth above are the minimum fees. If a returned Good requires rework to restore it to a saleable condition, further charges will be assessed. Seller's quality assurance department will document the condition of the Goods when received by Seller and report their findings to Buyer.

(e) **Notwithstanding the foregoing provisions of this Section 14, the following Goods cannot be returned, are not eligible for any credit and cannot be restocked: (i) custom or modified products and (ii) any expendable product(s) that have been used.**

15. Compliance with Law and Indemnification. Buyer shall comply with all applicable laws, regulations and ordinances. Buyer shall maintain in effect all the licenses, permissions, authorizations, consents and permits that it needs to carry out its obligations under this Agreement. Buyer shall comply with all export and import laws of all countries involved in the sale of the Goods under this Agreement or any resale of the Goods by Buyer. Goods, Services and technical data delivered by Seller shall be subject to U.S. export controls. Buyer shall, and shall cause its customers to, obtain all licenses, permits and approvals required by any government and shall comply with all applicable laws, rules, policies and procedures of the applicable government and other competent authorities. Buyer will indemnify and hold Seller harmless for any violation or alleged violation by Buyer of such laws, rules, policies or procedures. Buyer shall not transmit, export or re-export, directly or indirectly, separately or as part of any system, the Goods or any technical data (including processes and Services) received from Seller, without first obtaining any license required by the applicable government, including without limitation, the U.S. government. Buyer also certifies that none of the Goods or technical data supplied by Seller under this Agreement will be sold or otherwise transferred to, or made available for use by or for, any entity that is engaged in the design, development, production or use of nuclear, biological or chemical weapons or missile technology. No Buyer information will be deemed "technical data" unless Buyer specifically identifies it to Seller as such. Buyer assumes all responsibility for shipments of Goods requiring any government import clearance. Seller may terminate this Agreement if any governmental authority imposes antidumping or countervailing duties or any other penalties on Goods. For all international shipments, Seller requires that all required Export Control documentations, including Form BIS-711 Statement by Ultimate Consignee and Purchases, are submitted by Buyer along with the purchase order. Seller reserves the right to postpone shipment until all documentations are completed and submitted to Seller. Seller will not be responsible for shipment delays due to non-compliance by Buyer of the foregoing two sentences.

16. Termination. In addition to any remedies that may be provided under these Terms, Seller may terminate this Agreement with immediate effect upon written notice to Buyer, if Buyer: (i) fails to pay any amount when due under this Agreement and such failure continues for ten (10) days after Buyer's receipt of written notice of nonpayment; (ii) has not otherwise performed or complied with any of these Terms, in whole or in part; or (iii) becomes insolvent, files a petition for bankruptcy or commences or has commenced against it proceedings relating to bankruptcy, receivership, reorganization or assignment for the benefit of creditors.

17. Waiver. No waiver by Seller of any of the provisions of this Agreement is effective unless explicitly set forth in writing and signed by Seller. No failure to exercise, or delay in exercising, any rights, remedy, power or privilege arising from this Agreement operates or may be construed as a waiver thereof. No single or partial exercise of any right, remedy, power or privilege hereunder precludes any other or further exercise thereof or the exercise of any other right, remedy, power or privilege.

18. Confidential Information. All non-public, confidential or proprietary information of Seller, including, but not limited to, specifications, samples, patterns, designs, plans, drawings, documents, data, business operations, customer lists, pricing, discounts or rebates, disclosed by Seller to Buyer, whether disclosed orally or disclosed or accessed in written, electronic or other form or media, and whether or not marked, designated or otherwise identified as "confidential," in connection with this Agreement is confidential, solely for the use of performing this Agreement and may not be disclosed or copied unless authorized in advance by Seller in writing. Upon Seller's request, Buyer shall promptly return all documents and other materials received from Seller. Seller shall be entitled to injunctive relief for any violation of this Section 18. This Section 18 does not apply to information that is: (a) in the public domain through no fault of Buyer; (b) known to Buyer at the time of disclosure without restriction as evidenced by its records; or (c) rightfully obtained by Buyer on a non-confidential basis from a third party.

19. Force Majeure. Seller shall not be liable or responsible to Buyer, nor be deemed to have defaulted or breached this Agreement, for any failure or delay in fulfilling or performing any term of this Agreement when and to the extent such failure or delay is caused by or results from acts or circumstances beyond

the reasonable control of Seller including, without limitation, acts of God, flood, fire, earthquake, explosion, governmental actions, war, invasion or hostilities (whether war is declared or not), terrorist threats or acts, riot, or other civil unrest, national emergency, revolution, insurrection, epidemic, lock-outs, strikes or other labor disputes (whether or not relating to either party's workforce), or restraints or delays affecting carriers or inability or delay in obtaining supplies of adequate or suitable materials, materials or telecommunication breakdown or power outage (each a "**Force Majeure Event**"), provided that, if the event in question continues for a continuous period in excess of thirty (30) days, Buyer shall be entitled to give notice in writing to Seller to terminate this Agreement.

20. Assignment. Buyer shall not assign any of its rights or delegate any of its obligations under this Agreement without the prior written consent of Seller. Any purported assignment or delegation in violation of this Section 20 is null and void. No assignment or delegation relieves Buyer of any of its obligations under this Agreement.

21. Relationship of the Parties. The relationship between the parties is that of independent contractors. Nothing contained in this Agreement shall be construed as creating any agency, partnership, joint venture or other form of joint enterprise, employment or fiduciary relationship between the parties, and neither party shall have authority to contract for or bind the other party in any manner whatsoever.

22. No Third-Party Beneficiaries. This Agreement is for the sole benefit of the parties hereto and their respective successors and permitted assigns and nothing herein, express or implied, is intended to or shall confer upon any other person or entity any legal or equitable right, benefit or remedy of any nature whatsoever under or by reason of these Terms.

23. Governing Law. All matters arising out of or relating to this Agreement is governed by and construed in accordance with the internal laws of the State of California without giving effect to any choice or conflict of law provision or rule (whether of the State of California or any other jurisdiction) that would cause the application of the laws of any jurisdiction other than those of the State of California.

24. Dispute Resolution.

(a) If Buyer is an entity formed under the laws of the United States of America, or any of its states, districts or territories ("**U.S. Law**"), then any dispute, legal suit, action or proceeding arising out of or relating to this Agreement shall be adjudicated and decided in the federal courts of the United States of America or the courts of the State of California in each case located in the City of Los Angeles and County of Los Angeles, California and each party irrevocably submits to the exclusive and personal jurisdiction of such courts in any such dispute, suit, action or proceeding.

(b) If Buyer is an entity formed under the laws of any country, state, district or territory other than U.S. Law, then the parties irrevocably agree that any dispute, legal suit, action or proceeding arising out of or relating to this Agreement shall be submitted to the International Court of Arbitration of the International Chamber of Commerce ("**ICC**") and shall be finally settled under the Rules of Arbitration of the ICC. The place and location of the arbitration shall be in Los Angeles, California, pursuant to the ICC's Rules of Arbitration and shall be finally settled in accordance with said rules. The arbitration shall be conducted before a panel of three arbitrators. Each party shall select one arbitrator and the two arbitrators so selected shall select the third arbitrator, who shall act as presiding arbitrator. Notwithstanding the foregoing, if the matter under dispute is $500,000 or less, there shall only be one arbitrator who shall be mutually selected by both parties. If the party-selected arbitrators are unable to agree upon the third arbitrator, if either party fails to select an arbitrator, or in the case that only one arbitrator is required and the parties are unable to agree, then the International Court of Arbitration shall choose the arbitrator. The language to be used in the arbitral proceeding shall be English. The arbitrator(s) shall have no authority to issue an award that is contrary to the express terms of this Agreement or the laws of the State of California or applicable US Federal Law, and the award may be vacated or corrected on appeal to a court of competent jurisdiction for any such error. The arbitrator(s) shall be specifically empowered to allocate between the parties the costs of arbitration, as well as reasonable attorneys' fees and costs, in such equitable manner as the arbitrator(s) may determine. The arbitrator(s) shall have the authority to determine issues of arbitrability and to award compensatory damages, but they shall not have authority to award punitive or exemplary damages. Judgment upon the award so rendered may be entered in any court having jurisdiction or application may be made to such court for judicial acceptance of any award and an order of enforcement, as the case may be. In no event shall a demand for arbitration be made after the date when institution of a legal or equitable proceeding based upon such claim, dispute or other matter in question would be barred by the applicable statute of limitations. Notwithstanding the foregoing, either party shall have the right, without waiving any right or remedy available to such party under this Agreement or otherwise, to seek and obtain from any court of competent jurisdiction any interim or provisional relief that is necessary or desirable to protect the rights or property of such party, pending the selection of the arbitrator(s) hereunder or pending the arbitrator(s)' determination of any dispute, controversy or claim hereunder.

25. Notices. All notices, request, consents, claims, demands, waivers and other communications hereunder (each, a "**Notice**") shall be in writing and addressed to the parties at the addresses set forth on the face of the Acknowledgement or to such other address that may be designated by the receiving party in writing. All Notices shall be delivered by personal delivery, nationally recognized overnight courier (with all fees pre-paid), facsimile (with confirmation of transmission) or certified or registered mail (in each case, return receipt requested, postage prepaid). Except as otherwise provided in this Agreement, a Notice is effective only (a) upon receipt of the receiving party, upon confirmation of delivery by nationally recognized overnight courier or upon forty-eight (48) hours after being sent by certified or registered mail (as applicable), and (b) if the party giving the Notice has complied with the requirements of this Section 25.

26. Severability. If any term or provision of this Agreement is invalid, illegal or unenforceable in any jurisdiction, such invalidity, illegality or unenforceability shall not affect any other term or provision of this Agreement or invalidate or render unenforceable such term or provision in any other jurisdiction.

27. Survival. Provisions of these Terms which by their nature should apply beyond their terms will remain in force after any termination or expiration of this Order including, but not limited to, the following provisions: Compliance with Laws, Confidentiality, Governing Law, Dispute Resolution, Survival, and the restrictions on Software in Sections 10(b), (c) and (d).

Exhibit A
Warranty For "Specialty Products"
LIMITED WARRANTY

EXCEPT FOR THE WARRANTY SET FORTH BELOW IN THIS EXHIBIT A, SELLER MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO THE GOODS (INCLUDING ANY SOFTWARE) OR SERVICES, INCLUDING ANY (a) WARRANTY OF MERCHANTABILITY; (b) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; (c) WARRANTY OF TITLE; OR (d) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.

Warranty Period: The Warranty Period for Specialty Products is for one (1) year, and the Warranty Period for laser welders and laser markers is two (2) years (unlimited hours), and the Warranty Period for the laser pump diodes or modules is two (2) years or 10,000 clock hours, whichever occurs first (as applicable, the "**Warranty Period**"). The Warranty Period begins as follows: (i) on orders for Goods purchased directly by Buyer, upon installation at Buyer's site or thirty (30) days after the date of shipment, whichever occurs first; or (ii) on equipment purchased by a Buyer that is an OEM or systems integrators, upon installation at the end user's site or six (6) months after the date of shipment, whichever occurs first.

Acceptance Tests: Acceptance Tests (when required) shall be conducted at Sellers, Monrovia, CA, USA (the "**Testing Site**") unless otherwise mutually agreed in writing prior to issuance or acceptance of the Acknowledgement. Acceptance Tests shall consist of a final visual inspection and a functional test of all laser, workstation, enclosure, motion and accessory hardware. Acceptance Tests shall include electrical, mechanical, optical, beam delivery, and software items deliverable under the terms of the Acknowledgement. Terms and conditions for Additional Acceptance Tests either at Seller's or Buyer's facility shall be mutually agreed in writing prior to issuance or acceptance of the Acknowledgement.

Performance Warranty: The system is warranted to pass the identical performance criteria at Buyer's site as demonstrated during final Acceptance Testing at the Testing Site during the Warranty Period, as provided in the Acknowledgement. Seller explicitly disclaims any responsibility for the process results of the laser processing (welding, marking, drilling, cutting, etc.) operations.

Exclusions: Seller makes no warranty, express or implied, with respect to the design or operation of any system in which any Seller's product sold hereunder is a component.

Limitations: The limited warranty set forth on this Exhibit A does not cover loss, damage, or defects resulting from transportation to Buyer's facility, improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the equipment, or improper site preparation and maintenance. This warranty also does not cover damage from misuse, accident, fire or other casualties of failures caused by modifications to any part of the equipment or unauthorized entry to those portions of the laser which are stated. Furthermore, Seller shall not be liable for a breach of the warranty set forth in this Exhibit A if: (i) Buyer makes any further use of such Goods after giving such notice; (ii) the defect arises because Buyer failed to follow Seller's oral or written instructions as to the storage, installation, commissioning, use or maintenance of the Goods; (iii) Buyer alters or repairs such Goods without the prior written consent of Seller; or (iv) repairs or modifications are made by persons other than Seller's own service personnel, or an authorized representative's personnel, unless such repairs are made with the written consent of Seller in accordance with procedures outlined by Seller.

Seller further warrants that all Services performed by Seller's employees will be performed in a good and workmanlike manner. Seller's sole liability under the foregoing warranty is limited to the obligation to re-perform, at Seller's cost, any such Services not so performed, within a reasonable amount of time following receipt of written notice from Buyer of such breach, provided that Buyer must inform Seller of any such breach within ten (10) days of the date of performance of such Services.

Seller shall not be liable for a breach of the warranty set forth in this Exhibit A unless: (i) Buyer gives written notice of the defect or non-compliance covered by the warranty, reasonably described, to Seller within five (5) days of the time when Buyer discovers or ought to have discovered the defect or non-compliance and such notice is received by Seller during the Warranty Period; (ii) Seller is given a reasonable opportunity after receiving the notice to examine such Goods and (a) Buyer returns such Goods to Seller's place of business at Buyer's cost (prepaid and insured); or (b) in the case of custom systems, Seller dispatches a field service provider to Buyer's location at Buyer's expense, for the examination to take place there; and (iii) Seller reasonably verifies Buyer's claim that the Goods are defective or non-compliant and the defect or non-compliance developed under normal and proper use.

All consumable, optical fibers, and expendables such as electrodes are warranted only for defect in material and workmanship which are apparent upon receipt by Buyer. The foregoing warranty is negated after the initial use.

No warranty made hereunder shall extend to any product whose serial number is altered, defaced, or removed.

Remedies. With respect to any such Goods during the Warranty Period, Seller shall, in its sole discretion, either: repair such Goods (or the defective part). **THE REMEDIES SET FORTH IN THE FOREGOING SENTENCE SHALL BE BUYER'S SOLE AND EXCLUSIVE REMEDY AND SELLER'S ENTIRE LIABILITY FOR ANY BREACH OF THE LIMITED WARRANTY SET FORTH IN THIS EXHIBIT A.** Representations and warranties made by any person, including representatives of Seller, which are inconsistent or in conflict with the terms of this warranty, as set forth above, shall not be binding upon Seller. Products manufactured by a third party and third party software ("**Third Party Product**") may constitute, contain, be contained in, incorporated into, attached to or packaged together with, the Goods. Third Party Products are not covered by the warranty in this Exhibit A. For the avoidance of doubt, **SELLER MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO ANY THIRD PARTY PRODUCT, INCLUDING ANY (a) WARRANTY OF MERCHANTABILITY; (b) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; (c) WARRANTY OF TITLE; OR (d) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.** Notwithstanding the foregoing, in the event of the failure of any Third Party Product, Seller will assist (within reason) Buyer (at Buyer's sole expense) in obtaining, from the respective third party, any (if any) adjustment that is available under such third party's warranty.

Section I: Description

The WL-100A Fiber Laser Marker Workstation is an advanced system designed for low volume production and uses a high-precision scanning fiber laser marker. The system consists of an Amada Weld Tech LM-F Fiber Laser Marker power supply upon which a laser safety enclosure is mounted. Together the laser safety enclosure and LM-F Fiber Laser form one WL-100A workstation. All Amada Weld Tech LM-F fiber laser markers are available for use in the WL-100A. The WL-100A family of workstations includes; WL-P102A, WL-P103A, WL-P104A and WL-P105A. The exact model number is based on the internal configuration options.

Since the WL-100A is based on a LM-F family laser marker, the 990-559 Operator Manual for the 8-79 LM-F is valid and can be used for any specification or instruction that is not otherwise provided in this document. Although this document refers to the general term “WL-100A” it will also at times refer to specific configurations of the laser marker or workstation (ex, LM-F050A or WL-P102A).

The laser safety enclosure component of the WL-100A has an easy to use manual door, 270 degree part access, tooling plate, fume extraction port, internal lighting, adjustable Z-height for easy focus, programmatic rotary axis and Z-axis options, and a large viewport for easy process monitoring. Autofocus options, CCTV, and many other options are available.

Laser Marking

- **Permanent marking**

  In contrast to ink-based printing, laser marking is permanent, since the laser beam changes the material itself.

- **Environmentally friendly**

  No ink is needed, so no solvent is used.

  Use of recycling marked materials is easier because they contain no ink.

- **Non-contact marking**

  Permits marking of curved and concave surfaces.

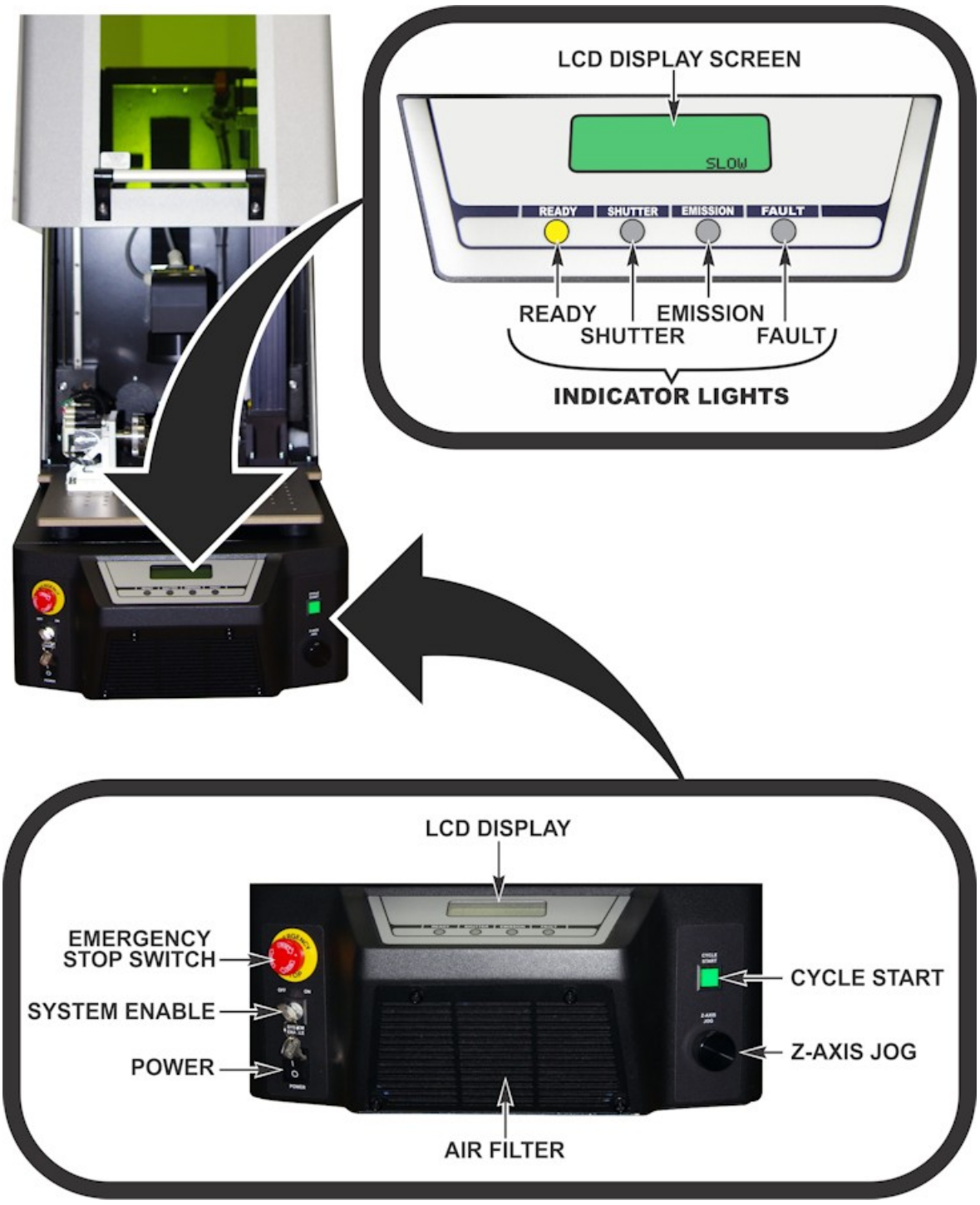
WL-100A Features

- **Compact and lightweight.**
  Desktop form factor ideal for production lines where space is limited.
- **Energy efficient.**
  Low power consumption, thanks to a highly efficient laser engine.
- **Compact IP-54 laser head with high performance galvanometer scanner standard.**
- **Manual Door Laser Safety Enclosure with panel controlled Z-Axis adjust standard**
- **Marker Motion programmatically controlled Rotary Axis and Z-Axis Options**
- **Easy Part Tooling with drilled tooling plate and wide 270 degree access to work area**
- **Built-in Fume Extraction port and LED Lighting**
- **Fully air-cooled.**
  Easy maintenance. No coolant or coolant filters needed.

Miniscan Ultra Compact High Performance Scanner (All Models)

- **Compatible with PCs running with the *Windows*™ operating system.**
  The WinLase application runs in *Windows 7/10 Professional*™ with all Microsoft Updates applied. The software is user-friendly and fully-featured which allows you to easily program the most complicated marking operations. When using *WinLase*, one PC can simultaneously administer multiple markers.
- **High-speed marking.**
  Capable of marking at extremely high speeds (≥ 5000mm/s) for the fastest possible marking time. The maximum speed for each process is dependent on the selected optical configuration and the material being marked.
- **Built-in guide beam.**
  A visible red guide beam for positioning makes it easy to align marking positions.
- **Full-featured drawing functions allow for more efficient production of marking data.**
  Functions include: move, rotate, copy, enlarge, reduce, compress, mirror text, reverse marking, undo, redo, grid, ruler, vector node editing of vector files, and many more.

Location and Function of Controls



Emergency Stop Switch

The Emergency Stop switch immediately renders the system safe.

System Enable Key Switch

The System Enable Key Switch is the primary access control device. Laser Marker will not operate if the key is missing or not present.

Power

The power switch turns the system on and off.

Cycle Start

The Cycle Start button sends a cycle start input to the laser marker software.

Z-Axis Jog Rotary Knob

The Z-Axis Jog control is used in some configurations to control the height of the laser marker head.

Air Filter

The air filter is a replaceable dual element filter. Replace when dirty.

LCD Display

The LCD Display shows important information about the WL-100A system. For details of laser messages please consult the *LM-F Fiber Laser Operator's Manual, 990-559*. When equipped with the Manual Z-Jog stage the stage motion setting (FAST/SLOW/LOCK) will be visible as well as any error messages.

Indicator Lights

Please refer to the *LM-F Fiber Laser Operator's Manual 990-559*, for details on indicator light behavior. The following is a summary.

Ready

Ready indicates that the system is enabled, no faults are present, and the key switch is turned on.

Emission

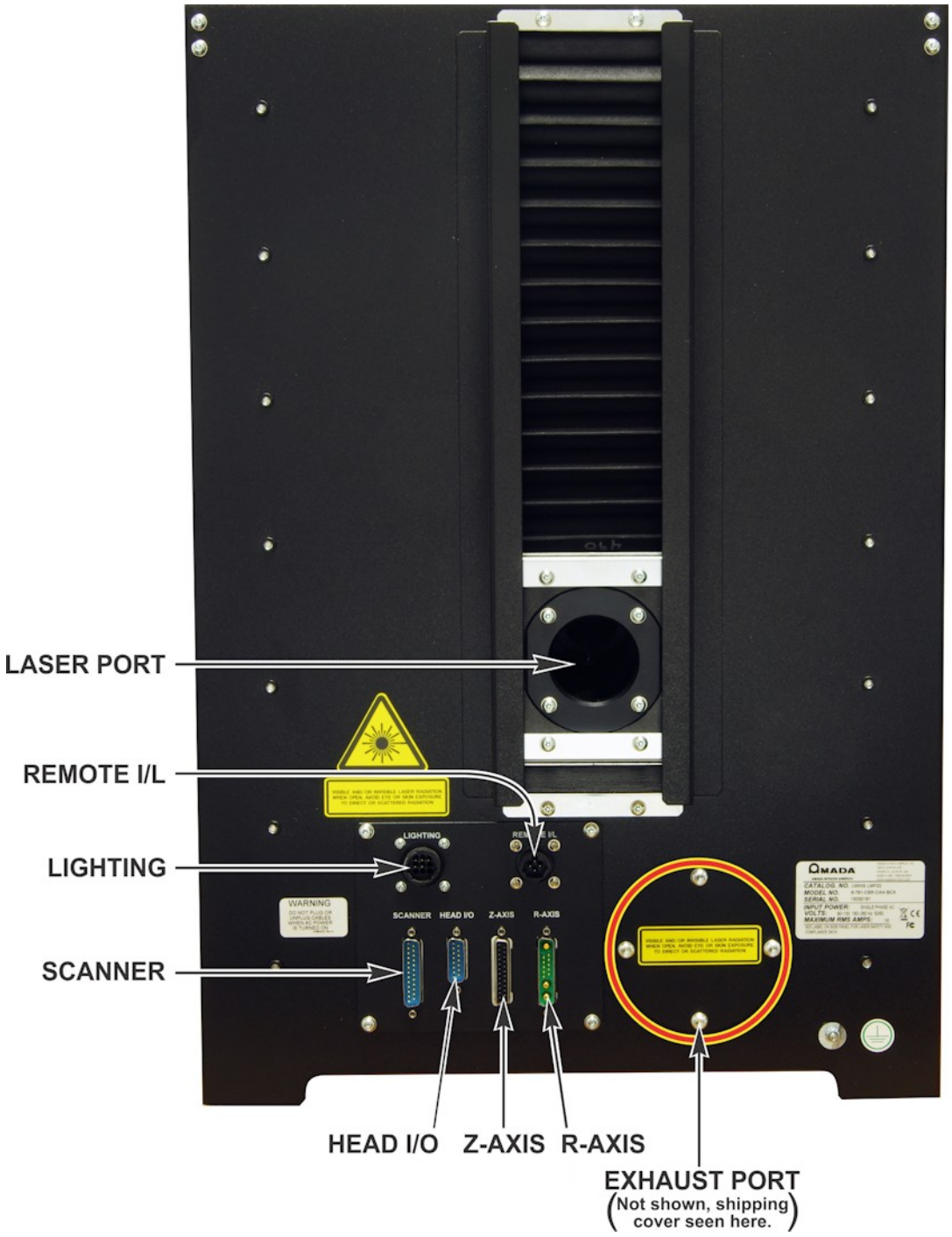
Emission indicates that the laser system is currently executing a job and warns of laser emission.

Shutter

The Shutter LED indicates that the laser safety shutter is open. This will be extinguished when the shutter closes because of a fault, shutter close command, or interlock event.

Fault

The Fault LED indicates that a system fault has occurred. Consult the LCD screen and *LM-F Fiber Laser Operator's Manual 990-559* for details


LASER PORT
REMOTE I/L
LIGHTING
SCANNER
HEAD I/O
Z-AXIS
R-AXIS
EXHAUST PORT
(Not shown, shipping cover seen here.
LIGHTING
SCANNER
HEAD I/O
Z-AXIS
R-AXIS
WARNING
OMADA

Fiber Laser Optic Cable

The fiber laser cable carries the laser energy from the power supply to the delivery optics in the head. Do not disconnect from isolator, cut, kink, or damage. Observe a minimum 4.7" (120mm) bend radius at all times. Do not push or pull on the fiber optic cable at any time.

Laser

The Laser Isolator is a tube that is installed in the laser head. The laser head is a part of the WL-100A enclosure. Refer to the Installation section of this document for information on connecting. If the laser isolator tube is not installed in the laser head it will not be possible to clear the Emergency Stop condition.

Remote I/L

The Remote Interlock connector on the back of the WL-100A connects to the Remote Interlock connector on the back of the fiber laser marker power supply. If this cable is disconnected it will not be possible to clear an interlock fault. Do not attempt to bypass or defeat the remote interlock.

Lighting

The Lighting connector carries power to the 24VDC LED lighting inside the unit and is always on when the system is turned on. If customer lighting is installed this can be disconnected. It is also possible to unplug the LED lights inside the unit and use alternate internal lighting selected and installed by the customer.

Z-Axis

The Z-Axis connector is used by the Marker Motion or Rotary Jog Controlled Manual Z-Stage. Each has a different number of conductors so it is not possible to cross-connect.

When using the Rotary Jog Controlled Manual Z-Stage this will be connected to a cable harness coming from the back of the power supply near the fiber optic output.

When using the Marker Motion Z-Axis configuration this will connect to one of the MTR connectors on the back of the fiber laser power supply using a short jumper cable harness assembly. Do not attempt to connect or disconnect with the system power on or damage to the motor will occur.

R-Axis

If equipped this connector is used by the Marker Motion controlled rotary axis. When using the Marker Motion Z-Axis configuration this will connect to one of the MTR connectors on the back of the fiber laser power supply using a short jumper cable harness assembly. Do not attempt to connect or disconnect with the system power on or damage to the motor will occur.

Scanner

This cable connects the laser galvanometer scanner head control signals between the laser power supply and WL-100A connector. Do not disconnect with the system power on or damage to the scanner will occur.

Head I/O

This connector controls other I/O in the scanhead including LEDs, safety features, shutter, etc.

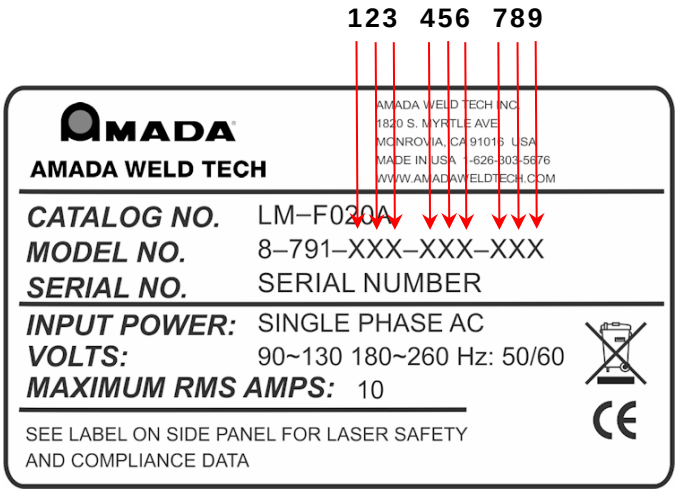
Fume Exhaust Port

> **WARNING**
>
> Failure to properly install the Fume Exhaust assembly (in addition to the issues noted below) can create light-leakage and cause the system to no longer comply with Class 1 laser safety regulations. The Fume Exhaust assembly is shipped with the unit but not installed. ***Before using*** the fume exhaust assembly ***must*** be removed and installed according to the instructions in the **Installation** section of this document.

The Fume Exhaust Port is a 2.5" diameter fitting designed to be connected to a customer or an Amada Weld Tech supplied fume extractor. **If particulate matter is generated by the laser mark process a fume extractor MUST be used.** Selection of the appropriate fume extractor is the responsibility of the customer as it is application dependent. Failure to use an appropriate fume extractor will cause contamination on the door slides, motion stage, laser head, and potential inhalation hazard to the operator. Damage to the WL-100A system due to particulate contamination in absence of appropriate fume extraction may not be covered by the system warranty.

Part Number Configuration

The WL-100A system carries a part number 8-791-xxx-xxx-xxx where each of the x characters is a configurable option. The exact laser configuration can be extracted from the first six configuration characters. The first six configuration characters are exactly the same as the equivalent standalone LM-F Fiber Laser Marker 8-79-xxx-xxx and can be cross referenced. The last three characters are workstation specific and indicate various options.



1	**Laser**	**B** = 50W HC (Q-switched 50-200kHz, $M^2 \leq 2.0$) Identifies LM-F050A (LMF50 / ML-7350D *legacy*) **C** = 20W HC (Q-switched 20-200kHz, $M^2 \leq 2.0$) Identifies LM-F020A (LMF20 / ML-7321D *legacy*) **D** = 10W HC (Q-switched 20-200kHz $M^2 \leq 2.0$) Identifies LM-F010A (LMF10 / ML-7311D *legacy*) **E** = 70W (Full Waveform Control, $M^2 < 1.6$) Identifies LM-F070A-HP (LMF70-HP / ML-7370D *legacy*) **P** = 20W SM (Single-Mode, Full Waveform Control, $M^2 \leq 1.3$) Identifies LM-F020A-SM (LMF20-SM / ML-7322D *legacy*) **Q** = 35W HM (Full Waveform Control, $M^2 \leq 3.5$) Identifies LM-F035A-HP (LMF35-HP / ML-7340D *legacy*) **R** = 20W HS, ST (Full Waveform Control, $M^2 \leq 2.0$) Identifies LM-F020A-HP (LMF20-HP / ML-7320D *legacy*)

2	**Control**	**C** = WinLase with LEC-2 Advanced License **D** = WinLase with LEC-2 Standard License **E** = WinLase with LEC-2 Basic License **L** = WinLase with LEC-1 Advanced License (*legacy*) **B** = WinLase with LEC-1 Advance License, Platform 6 (*legacy*)

3	**Scan Head**	**R** = Miniscan High Performance Scanner

4	***f*-theta Lens** As shipped. Includes mounting collar.	**A** = NONE **B** = 100mm **C** = 160mm **E** = 254mm

5	**Beam Expanding Collimator** As shipped. B, C, D Laser options not use this option**.**	**A** = NONE (for models LM-F010A, LM-F020A & LM-F050A) **B** = ***f*30** Smallest beam size results in largest spot size at workpiece. Replaces old "1.5x" expander **C** = ***f*50** Medium beam size results in medium spot size at workpiece. Replaces old "4x" expander **D** = ***f*75** Largest beam size results in smallest spot size at workpiece. Replaces old "6x" expander

6	**OEM Labeling**	**C** = Amada Weld Tech, LM-F **A** = Amada Weld Tech, LMF (*legacy naming convention*) **B** = Amada Weld Tech, ML-73xxD (*legacy naming convention*)

7	**Class**	**A** = None (Laser Power Supply Only) **B** = Class 1 Enclosure **C** = Class 4 Workstation (*future model*)

8	**Motion Option**	**A** = WL-P102A: Manual Knob 10” Z-Jog Only **B** = WL-P103A: Marker Motion Controlled 10” Z-Jog Only **C** = WL-P104A: Manual Knob 10” Z-Jog plus Marker Motion Controlled Direct Drive Rotary Stage and 2.5” 3-Jaw Chuck **D** = WL-P105A: Marker Motion Controlled 10” Z-Jog plus Marker Motion Controlled Direct Drive Rotary Stage and 2.5” 3-jaw chuck
9	**Spare (Future Option)**	**A** = None

Options

The following items are available as accessories or spares:

Component	Description
Protective Glass	The Marker is shipped with a protective glass affixed to the *f*-theta lens. If this glass becomes soiled or cracked a replacement may be purchased.
High Precision Serial Stepper Motors with cables	Up to 2 motors can be connected for stepper motor control with optional encoders.
Air Filter (Control Unit)	An air filter is installed in the Control Unit at the time of purchase. Additional filters are available. Air filters should be replaced as a pair with the black filter to the outside of the unit. Amada Weld Tech Part Numbers 4-70831-01 & 4-70832-01
Lithium System Battery	CR2032 (Backup battery for internal memory) Amada Weld Tech Part Number 145-017
Cat 5e Crossover Cable	For communications with a computer. Amada Weld Tech Part Number 205-318

Example Configuration and Equivalent Standard LM-F Model:

WL-P102A: 8-791-BCR-CAC-BAA

Amada Weld Tech LM-F050A equipped with a 160mm F-theta lens in a Class 1 WL-P102A Workstation with manual jog controlled electronic 10” Z-stage, high speed ultra-compact scan head, fully integrated in WL-100A semi-automatic workstation.

LM-F050A: 8-79-BCR-CAC

Amada Weld Tech LM-F050A equipped with a 160mm F-theta lens, high speed ultra-compact scan head, Class 4, ready for integration by end user.

Section II: Compliance

Please refer to the CE Declaration of Conformity in this manual (next page) for WL-100A compliance details. This product is sold ready for its intended purpose and, as supplied, complies with the regulations and standards listed in the Declaration.

The end user and integrator are responsible for any further integration of the laser according to the information in this manual. With correct installation of the fiber laser marker and WL-100A enclosure the fiber laser marker system will comply with IEC13849-1 category 4. The **PL_r** of this system is **"e"**. Incorrect installation can defeat safety features, cause hazards to personnel, and invalidate compliance or cause compliance to be to a lesser category. This includes bypassing safety functions, removing panels, otherwise modifying the enclosure, or any other change that may modify compliance compared to the as-shipped configuration.

Compliance with IEC13849-1 is achieved using the installation instructions in this manual and affects only the fiber laser marker workstation. Any additional equipment including tooling, automation controller, motion hardware, or other must be separately developed and tested to be compliant with this specification or fiber laser marker compliance will be invalidated.

If there is any doubt about implementation, installation, or construction of the safety features of a machine at large including the fiber laser marker and enclosure do not proceed without appropriate guidance.

Declaration of Conformity

We, Amada Weld Tech Inc.
of 1820 S Myrtle Avenue
Monrovia, CA 91016

In accordance with the following Directive(s):

2014/30/EU	**The Electromagnetic Compatibility Directive**
2014/35/EU	**Low Voltage Directive**
2011/65/EU	**RoHS2 Restriction of the Use of Certain Hazardous Substances**

hereby declare that:

Equipment Function:	WL-100A Series Fiber Laser Marking Workstation
Model Number:	8-791-xxx-xxx-xxx where x is configurable per unit specification
Serial Number:	See Individual Unit Label

is in conformity with the applicable requirements of the following documents

Ref No:
EN61326-1, EN61010-1, EN55011 Class A Group 1, EN61000-4-2, EN61000-4-3, EN61000-4-4, EN6100-4-5, EN61000-4-6, EN61000-4-8, EN61000-4-11, EN50581:2012 (EU RoHS)

We hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications and is in accordance with the requirements of the Directive(s)

In accordance with the following Directive for the same equipment:

2006/42/EC **The Machinery Directive**

we hereby declare that the basic requirements (appendix 1) of the above directive are conformed:

1.5.1, 1.5.11, 1.5.12, 1.6.1-1.6.3, 1.7.2, 1.7.3

we hereby declare that the following EHSRs have been complied with:

EN11553-1: Safety of Machinery – Laser Processing Machines
EN60204-1: Safety of Machinery – Electrical Equipment of Machines
EN60825-1:2014 Safety of laser products – 1 Equipment Classification and Requirements
EN60825-4: Safety of Laser Products – Laser Guards
IEC13849-1: Safety of machinery – Safety Related Parts of Control Systems

and the technical documentation is compiled in accordance with Annex VII (B of the Directive).

We undertake to transmit, in response to a reasoned request by the appropriate national authorities, relevant information on the equipment identified above. The method of transmission shall be at the discretion of Amada Weld Tech.

I, the undersigned, hereby declare the equipment specified above conforms to the above Directive(s) and Standard(s)

Signed by: _____

Name: Matthew Green
Position: Manager, Standard Product R&D
Done at: 1820 S. Myrtle Ave
Monrovia, CA 91016
On: 04/2016

CE

The technical documentation for the machinery is available from:

Name: Dieter Kemmerer-Fleckenstein
AMADA WELD TECH GmbH
Lindberghstrasse 1; D-82178 Puchheim; Deutschland / Germany

Section III. Installation

Planning

When planning for the installation of the WL-100A, make sure that the following conditions are met:

- The WL-100A should be placed on a firm, level surface that is free from vibration.
- Do ***not*** operate the unit where there is considerable dirt, dust, oil mist, chemicals, fumes, moisture, or near a high-frequency noise source.
- The ambient temperature should be between 41°F and 95°F (5°C to 35°C). The installation area should be free of sudden temperature fluctuations and have a relative humidity less than 90% (non-condensing). The area should have no rapid temperature fluctuations, which may cause dew condensation on the optical surfaces.
- If the inside or outside of the WL-100A is stained, wipe it with a dry or slightly moistened cloth. If it is badly stained, use a neutral detergent or alcohol to clean it. Do ***not*** use paint thinner, acetone, benzene, etc. which can discolor or deform the parts. Do not use solvents on the laser window.
- To accommodate the standard cable lengths, the Control Unit, and Laser Head must be located within 2m (6.5ft) of each other for LM-F020A-HP and LM-F020A-SM models. Other models must be located within 3m (10ft). The computer can be located anywhere as long as both the marker and PC have network accessibility and can be located on the same subnet.
- Fume extraction must be used with any process that generates particulate matter to prevent damage to internal components or safety hazards to operators. The user is responsible for ensuring that fume extraction meets the specific requirements of the material being processed.
- Make sure that the bend radius of the optical fiber on the back of the Laser Head is greater than 4.7” (120mm).
- When locating, ensure that the front air filter and side exhausts are clear for proper ventilation with at least 6” of clearance.
- The control unit must be placed on a hard surface to allow the bottom laser exhaust to function as designed. Do not block the bottom exhaust vent by placing the Control Unit on a soft surface like foam that can prevent adequate airflow.

Installation

The WL-100A requires minor assembly prior to use. Follow the procedure below to assemble correctly and safely. Some operations may require multiple people for safely moving machine components. Failure to follow these instructions completely voids safety compliance declarations and may damage your machine and/or void your warranty.

Note: Colors may vary

1) **Unpack Components and Prepare to Install**

   The unit is shipped in two major pieces. Use Caution when moving the enclosure, the lid is not locked down. It is held closed by magnetic force.

   The top portion is heavy and bulky. Two people are needed to move the enclosure. Suggested grip points are from the sides and back as shown in the next step. Be careful when setting down on the power supply.

   Two people are also needed to lift the LM-F power supply chassis. The best grip points are from the sides. **Do not lift from the front panel!!**

ENCLOSURE

INSTALLATION KIT

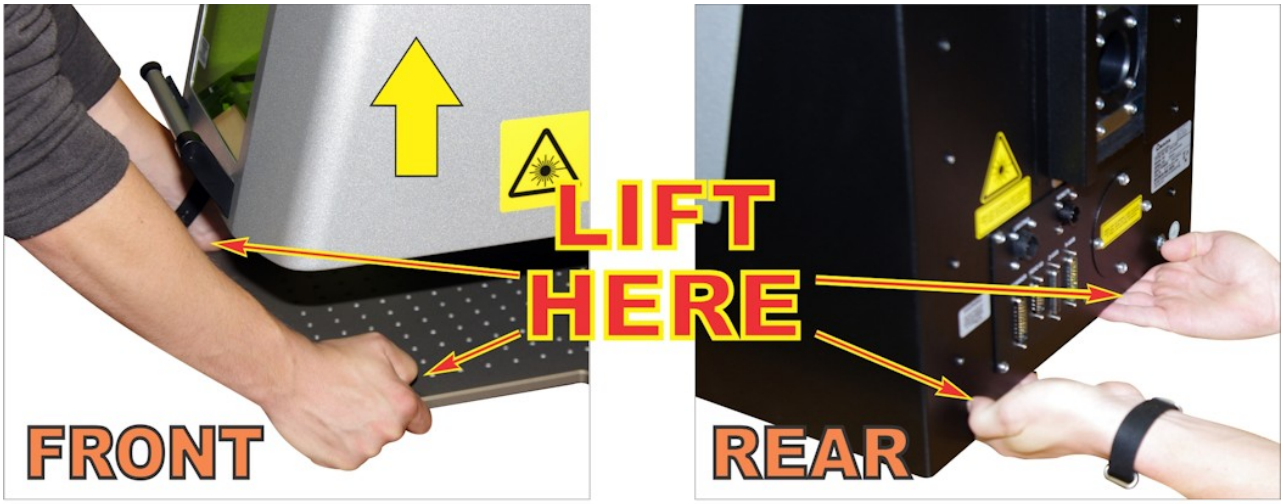
CERTIFICATE & *WINLASE* USB KEY

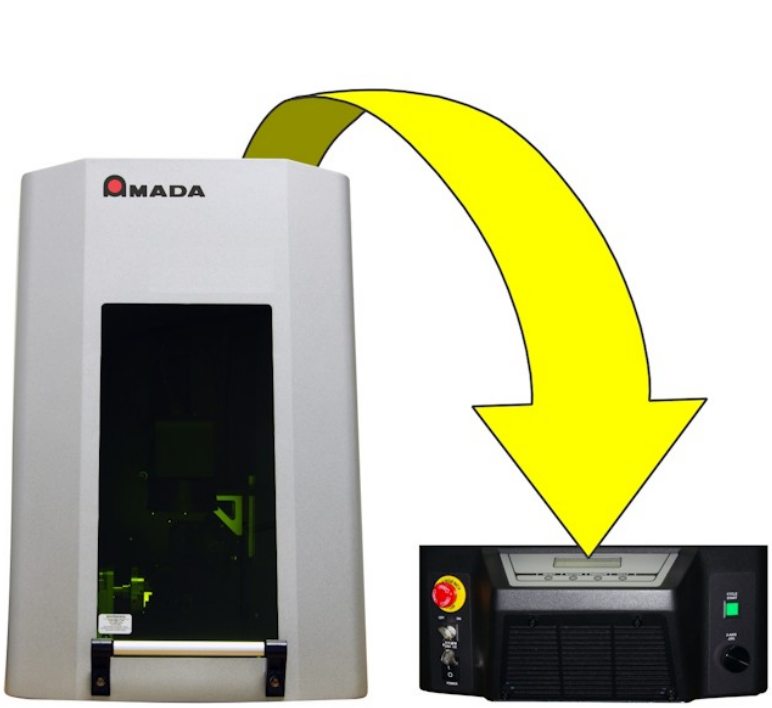
LASER POWER SUPPLY

2) Stack the enclosure on the power supply. Make sure the fiber optic cable and isolator are clear

The top portion is heavy and bulky. Two people are needed to move the enclosure. Suggested grip points are from the sides and back as shown. Be careful when setting down on the power supply.

Two people are also needed to lift the LM-F power supply chassis. The best grip points are from the sides. **Do not lift from the front panel!!**





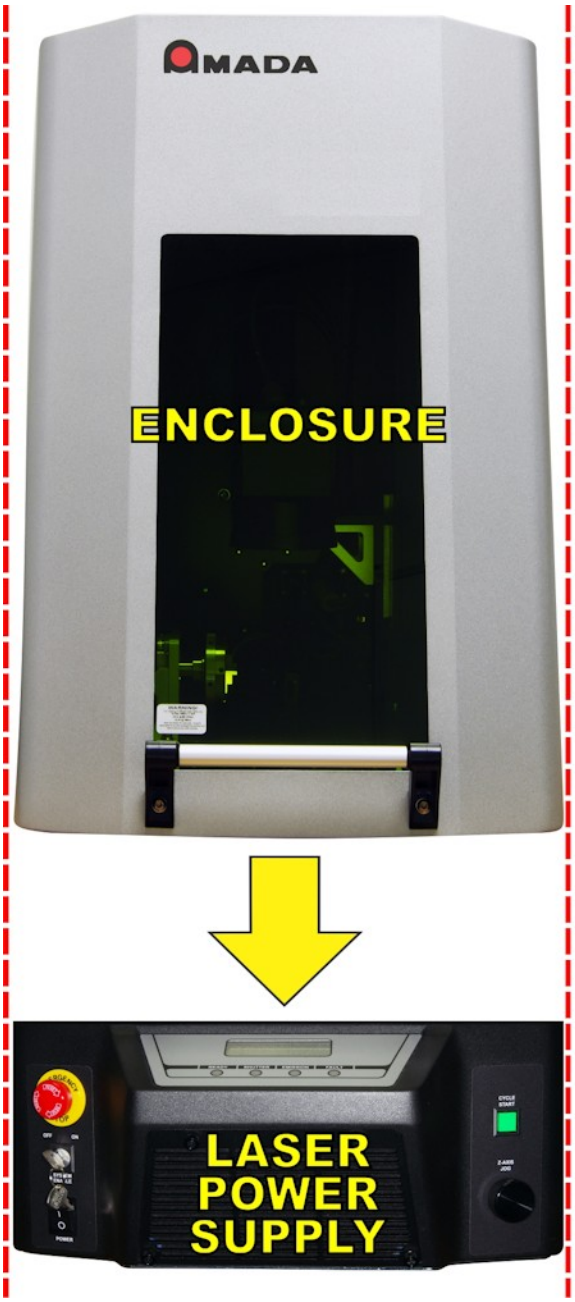
ENCLOSURE

LASER POWER SUPPLY

STACKED COMPONENTS

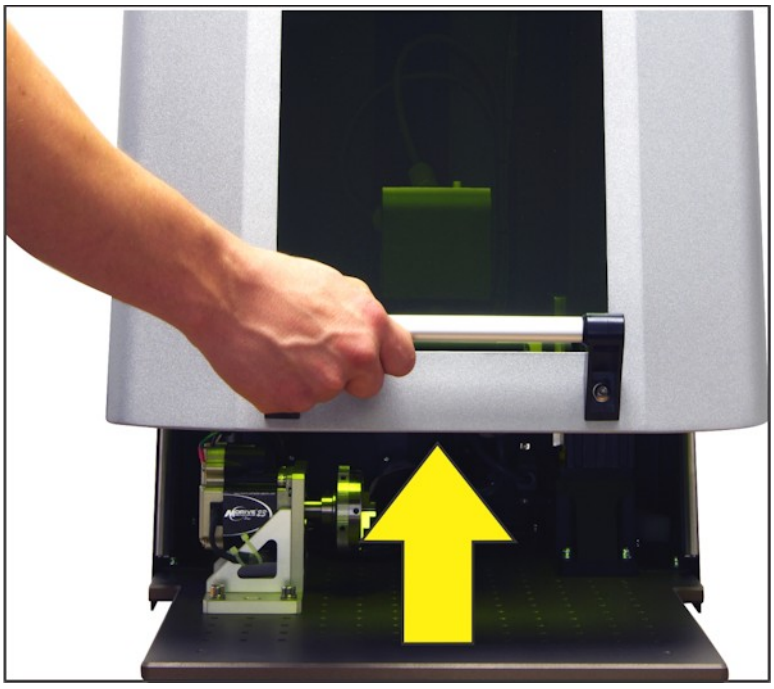
3) Align the WL-100A work enclosure to the laser power supply

LINE UP SIDES AND BACK



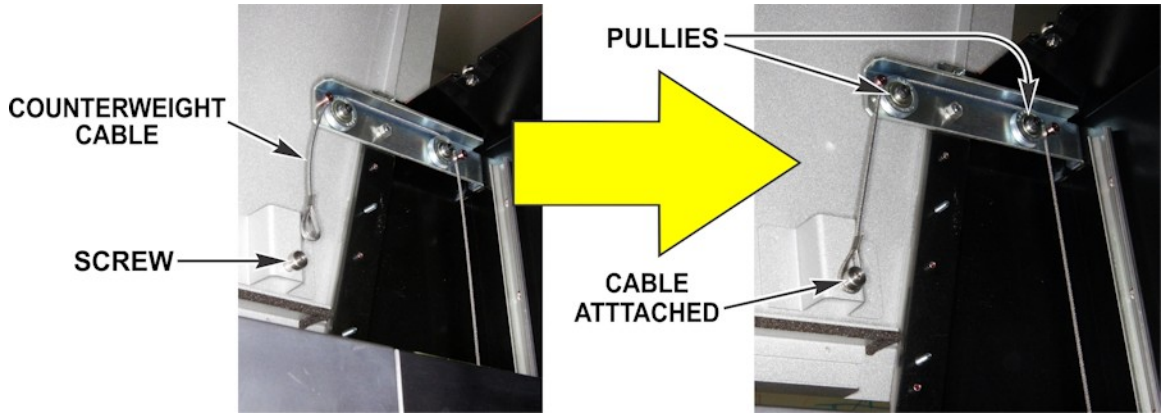
4) Open the Door and Prop Open

The door will not stay open since the counterweights are removed for shipping. Use a suitable object to prop the door open so the counterweights can be reattached.



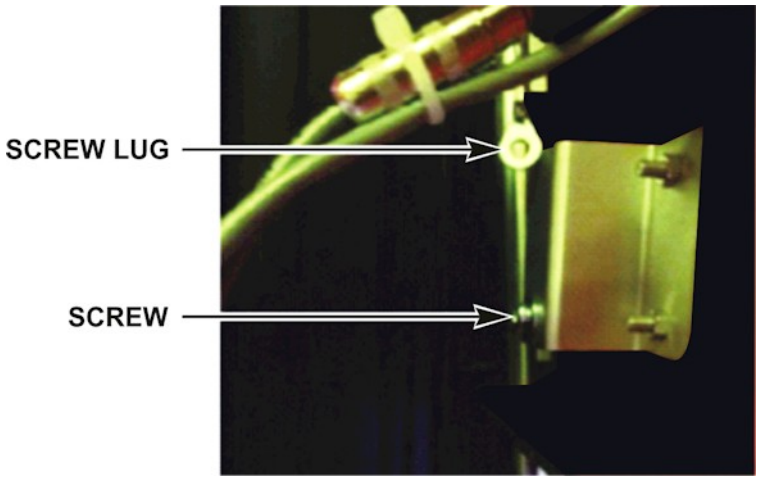
5) Reattach Weights on Pulley System (Left Side)

For shipping, weights were released. These must be reattached. Used a #2 Phillips screwdriver to remove and replace screw. Be careful not to drop counterweight or door.



6) Reattach Weights on Pulley System (Right Side)

On Right Side accessibility is limited when door is fully opened. It is recommended that the pulley cable is attached with the door halfway open and the pulley cable pulled down to attach. Be careful not to drop counterweight or door.

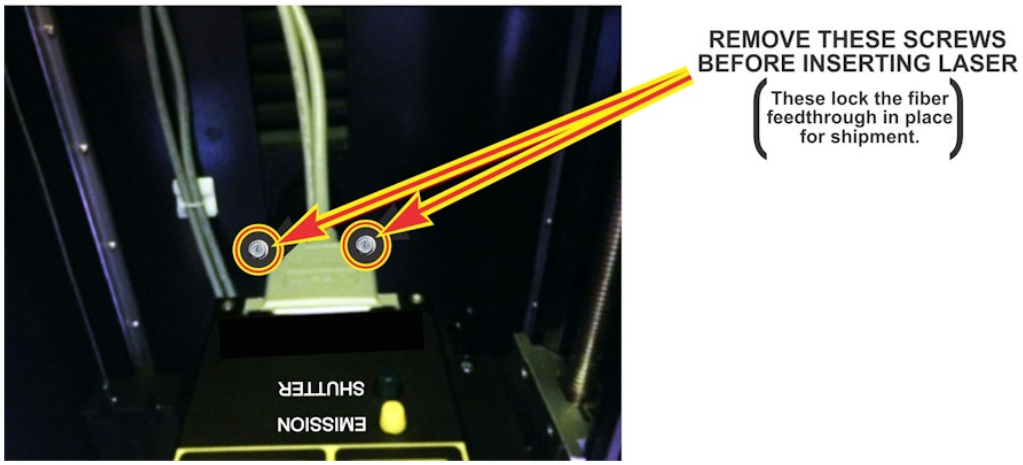


7) Once both weights are connected remove the door prop and test the door by opening and closing several times

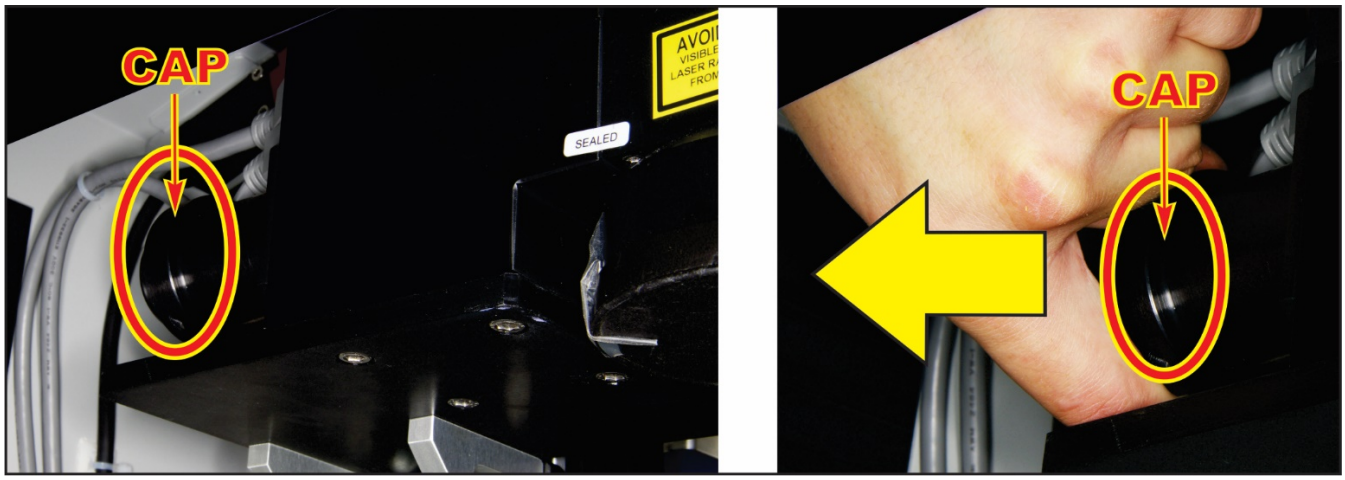
The door is held closed by adjustable magnets at the back of the enclosure. If the door does not stay closed or is too difficult to open from the fully closed position adjust the magnets.

8) Remove shipping screws holding fiber feed through in place.

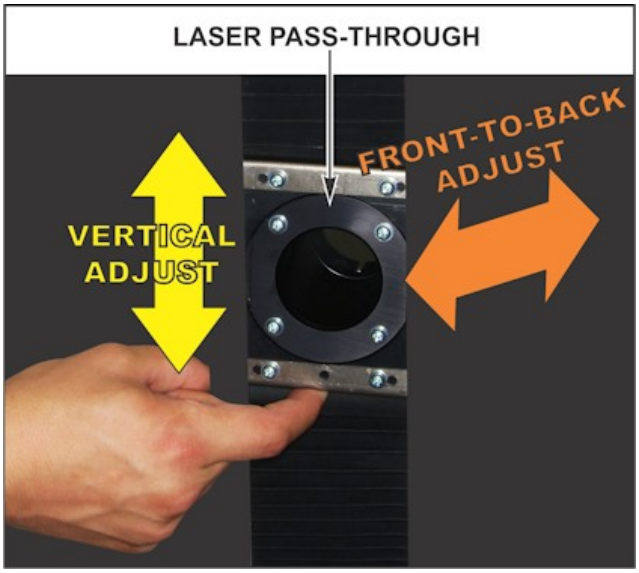
VIEW: INSIDE ENCLOSURE ON REAR PANEL

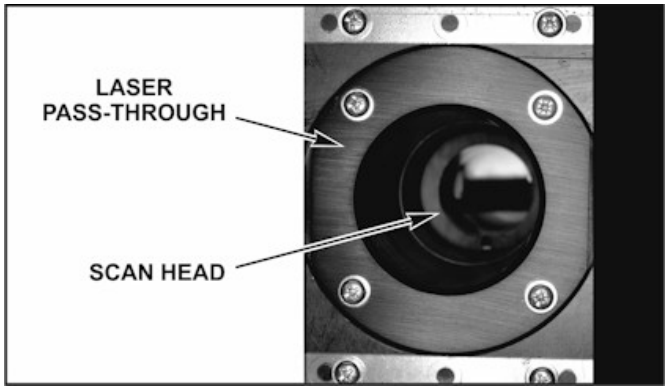


9) **Remove caps on the laser isolator and on the back of the laser head inside the workstation.**

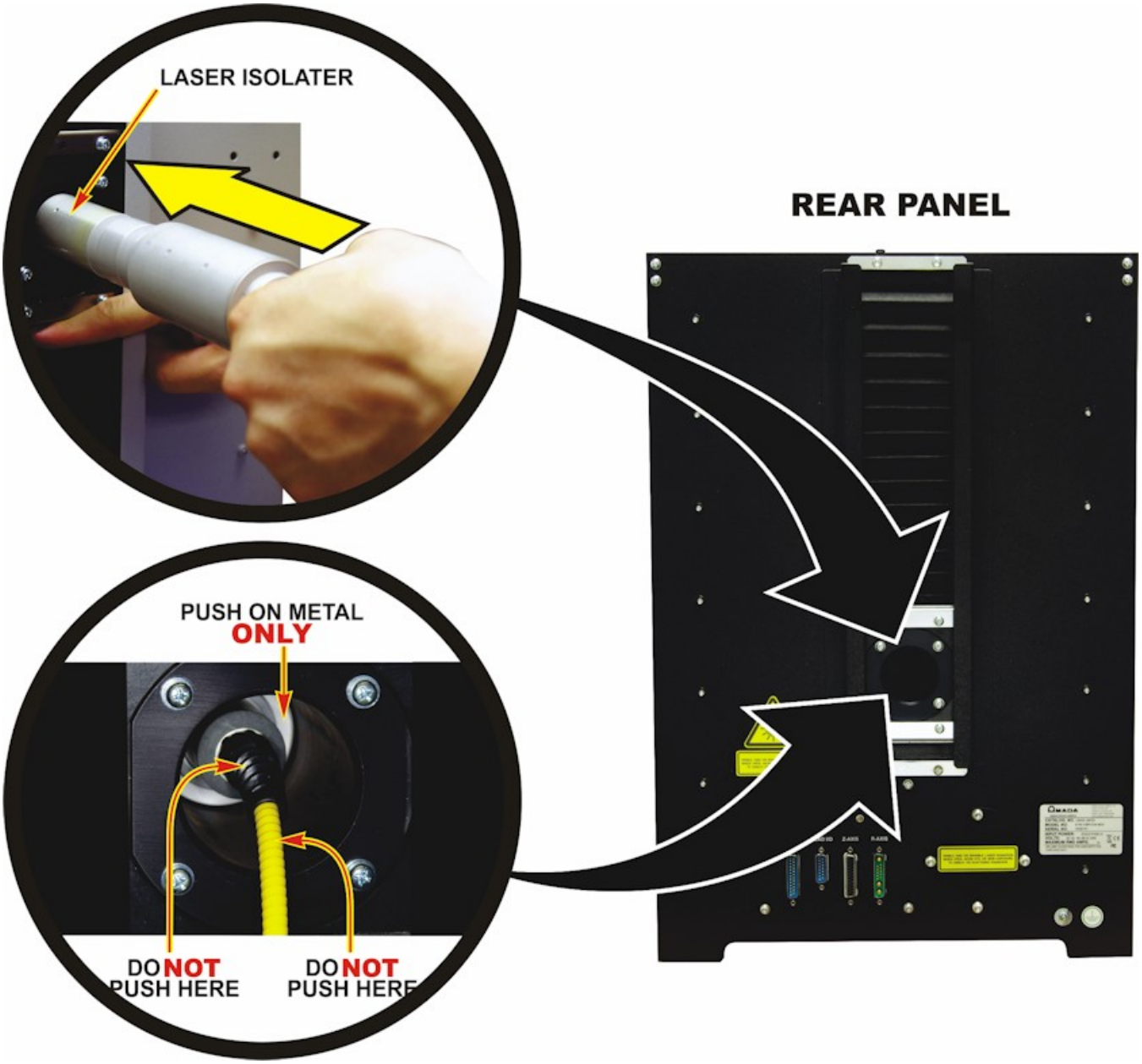


10) **Prepare to install the fiber.** Lift the fiber pass through to align with the laser head. Sight down the fiber pass through to ensure that it is lined up with the head.

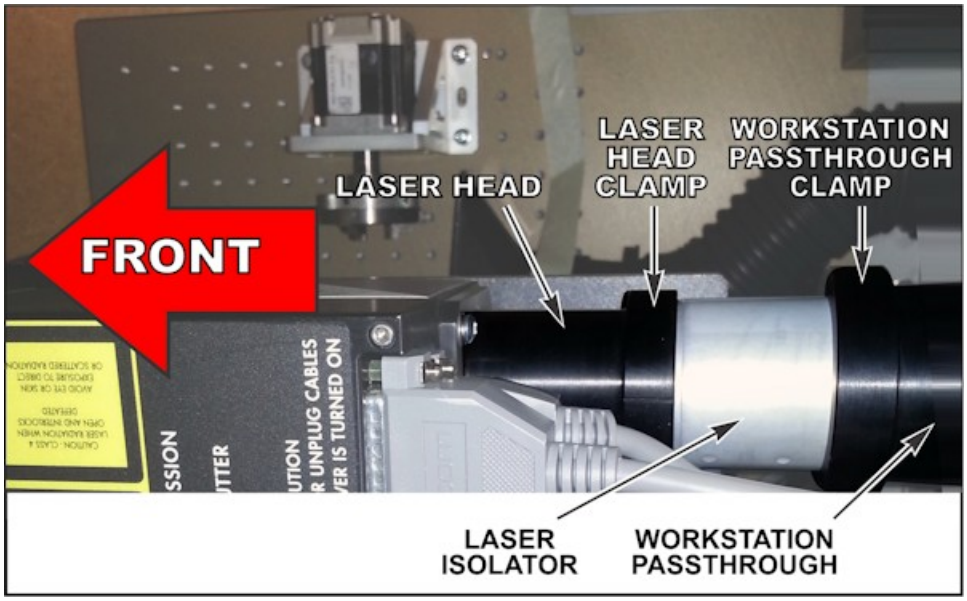




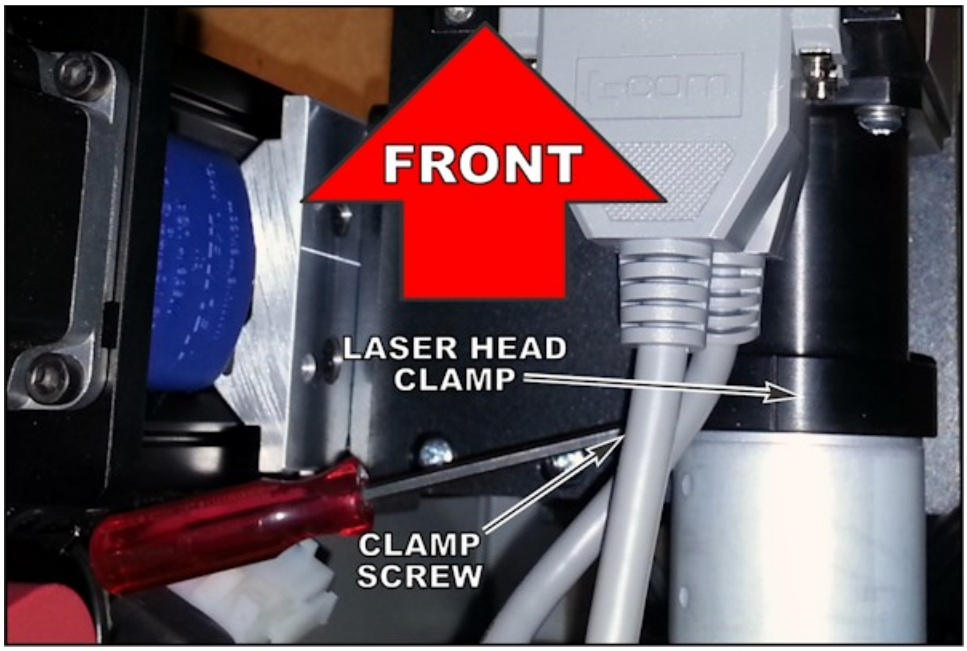
11) **Carefully insert the laser isolator into the pass-through and into the head.** Be careful not to damage the fiber by pushing on the strain relief or fiber. Push only on the metal. You may need to rotate the isolator slightly to overcome friction from the sealing O-rings. If there is an excessive amount of resistance STOP and verify all parts are aligned, no obstructions exist, etc.



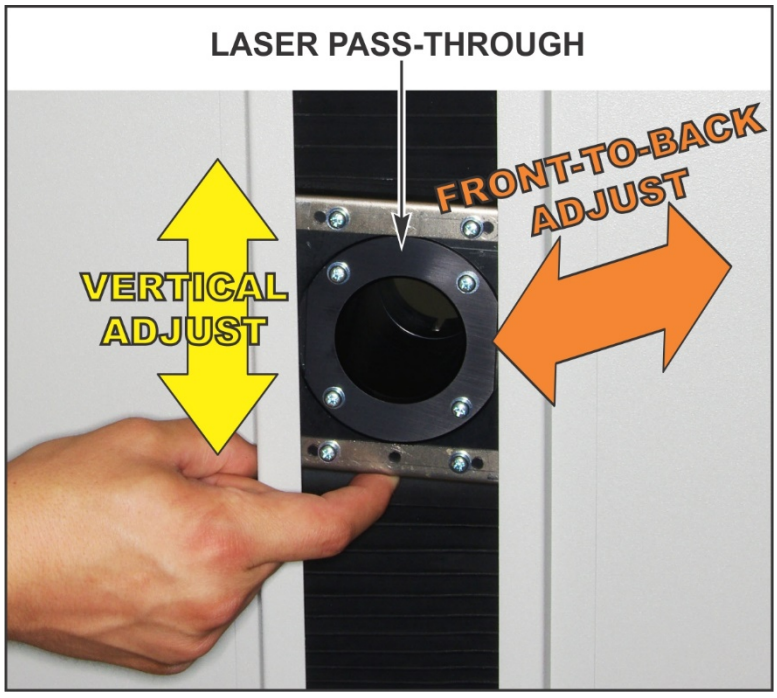
12) **Verify that the laser isolator is fully inserted into the head clamp.** The isolator must be fully inserted or it will not be possible to clear the Emergency Stop condition. When fully installed it will look similar to the picture below. If an alignment sticker exists (not shown below) rotate the isolator so that it lines up with the scribe mark at the top of the laser head clamp.



13) **Tighten the clamp screw holding the isolator to the laser.** Do not yet tighten the clamp screw on the pass through. Use a 3mm hex wrench with a ball-end or L shaped.



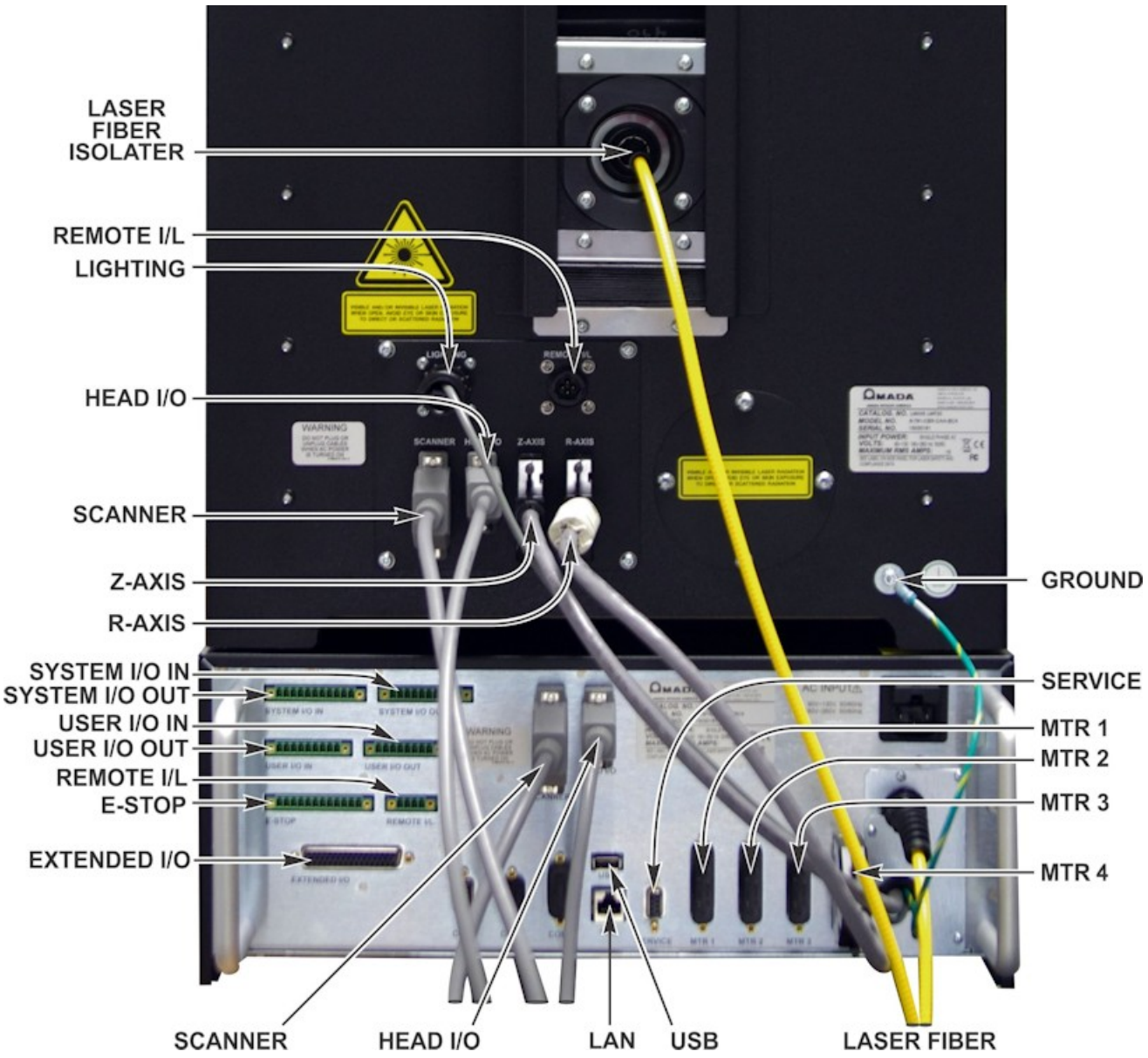
14) **Adjust the laser passthrough so that it won't rub on up/down motion.** It will need to be adjusted front to back and rotationally to ensure that no rubbing occurs.



15) **Tighten the clamp screw on the laser passthrough inside the unit.** When tight the clamp should be firmly mounted on the laser isolator. If it isn't firmly attached vibration can occur while the stage is being moved up and down.

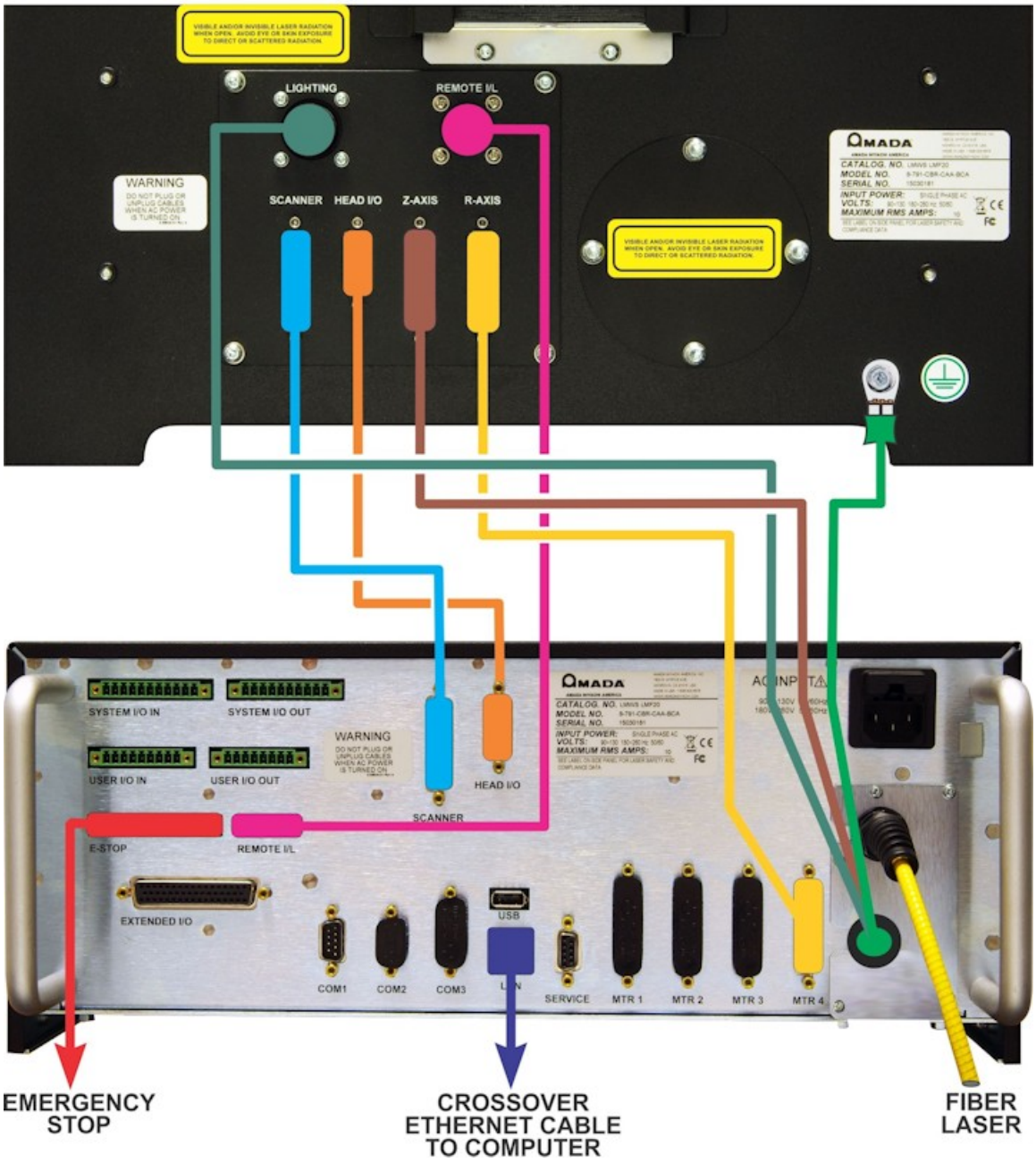
Correct Installation

16) **Connect cables between power supply and enclosure.** Each plug has a unique size. Marker Motion connections can be connected to any of the MTR ports on the back of the laser power supply. Ensure that cables with screws are tightened down.



Connection Diagram with Rotary and Manual Z-Jog

ENCLOSURE REAR

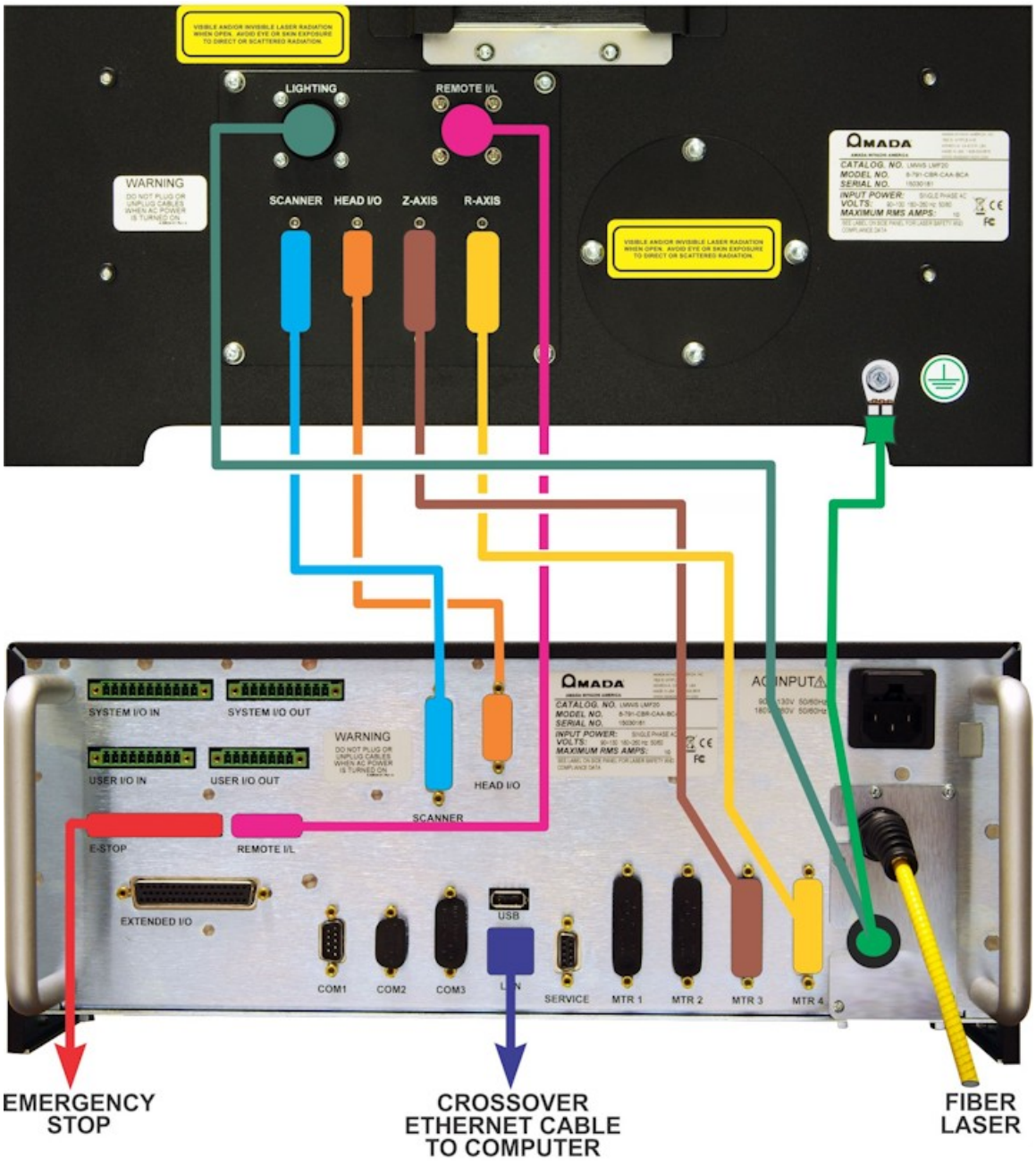


LASER POWER SUPPLY REAR

NOTE: **The plugs are self-explanatory.**
Each has its own size, depending on ordering options, not all plugs are used.

Connection Diagram with Rotary and Programmable Z-Jog

ENCLOSURE REAR

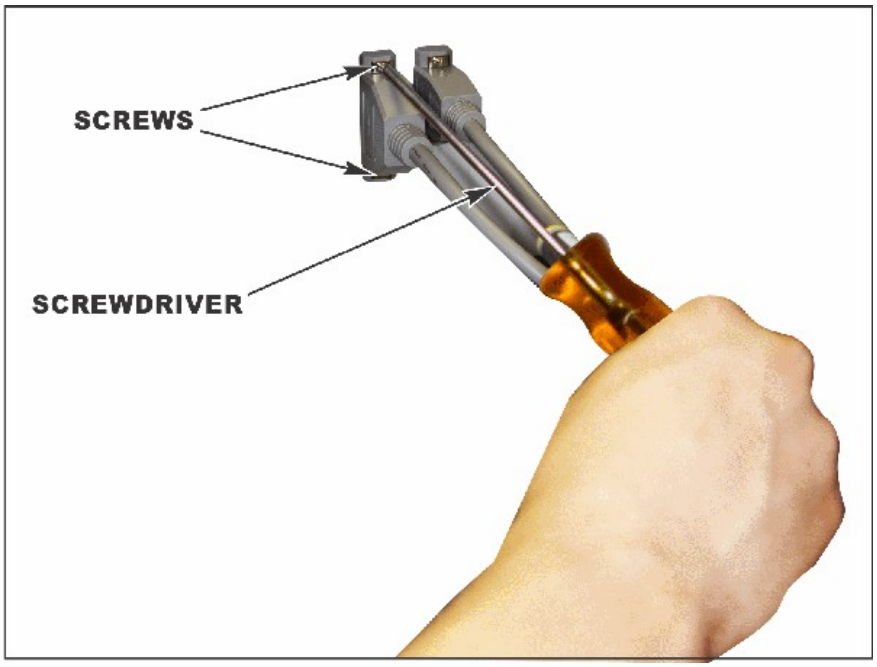


LASER POWER SUPPLY REAR

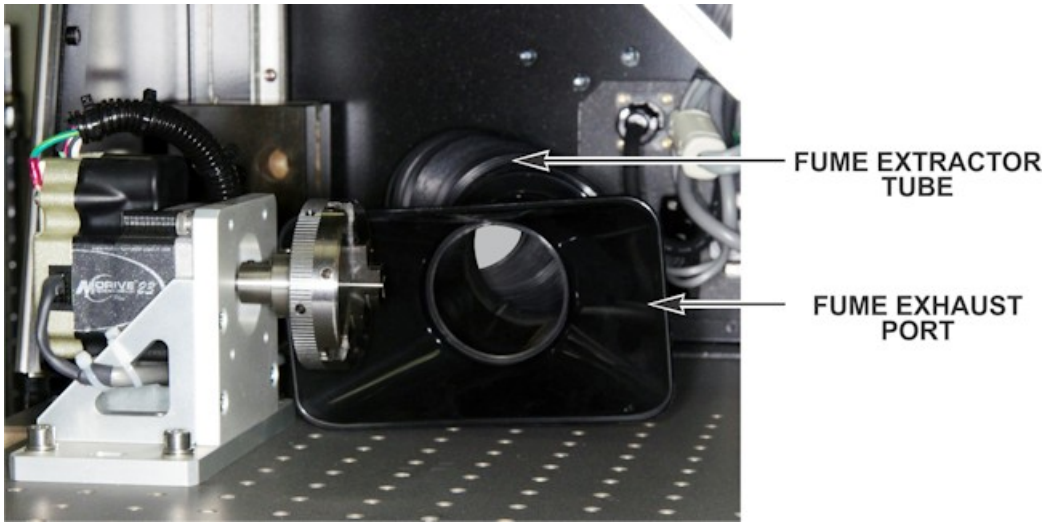
NOTE: **The plugs are self-explanatory.**
Each has its own size, depending on ordering options, not all plugs are used.

CAUTION

Be sure to securely fasten all D-Sub connectors before powering up the unit. Failure to do so can damage the unit.

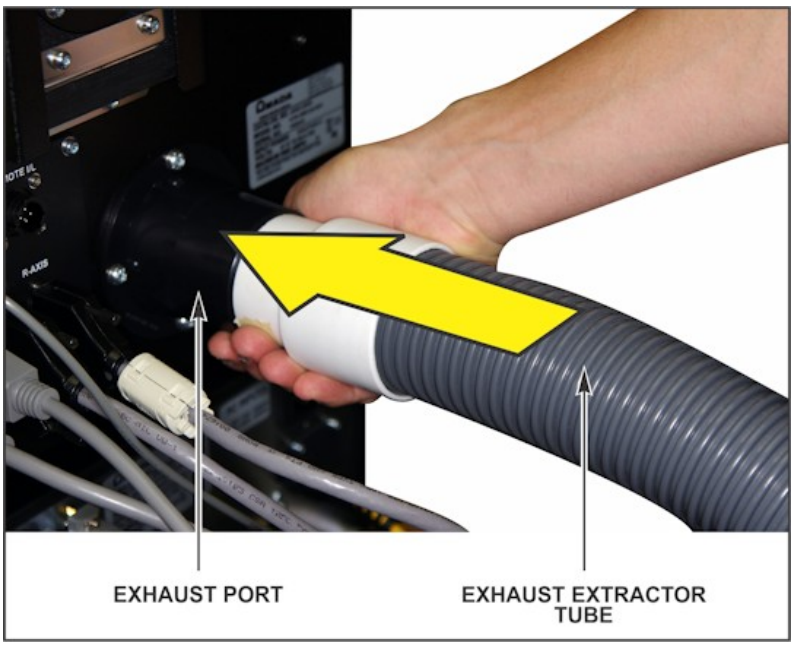


17) **Install Fume Extraction if required**. From the outside remove block off plate and install the Fume Exhaust port using the same hardware. From the inside, install the extractor tube and fittings. It may be necessary to shorten the tube to meet application requirements. During installation of fume extraction components the Class 1 laser safety certification will be void.



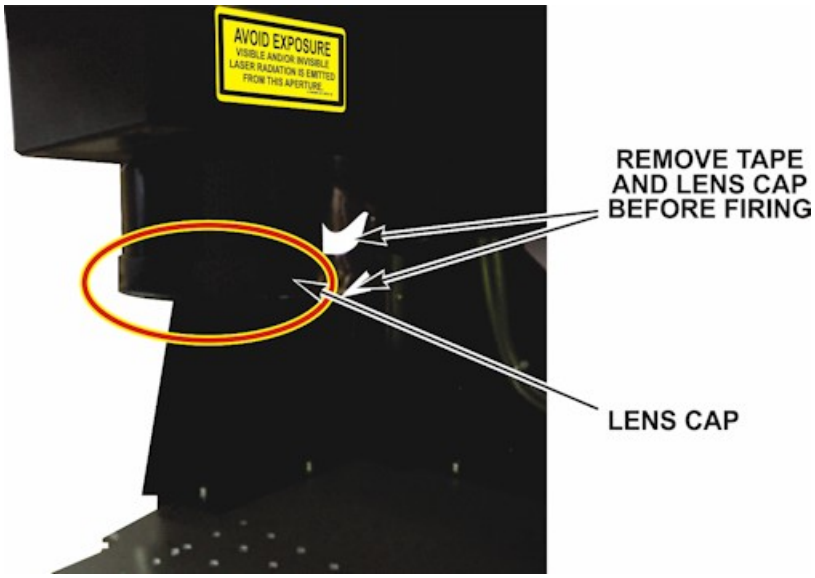
18) **Fume extraction is strongly recommended**. To install, remove the exhaust cover port and install 2.5" exhaust port using Torx type driver. Note that opening this port removes the enclosures Class 1 laser safety certification until an appropriate hose is attached and secured. Refer to your organization's Laser Safety Officer if there are any questions.

19) **Once the fume exhaust port is installed connect the port to the user supplied Fume Exhaust hose.** It is imperative that no light leakage is possible at this connection or through the user supplied hose. Secure fume exhaust hose in the fume exhaust port using tape, self-tapping screws, or some other method so it will not fall out of the port.



20) **Power up the system, install WinLase by following instructions in the fiber laser operator's manual, and connect to the fiber laser in WinLase.**

21) **Remove the cap on the F-Theta lens**



Section IV. Operating Instructions

Operating instructions for the Fiber Laser Marker can be found in the *LM-F Fiber Laser Marker Operator's Manual 990-559.* Specific instructions and explanation of WinLase LAN features can be found in the *WinLase LAN User's Guide* included on the CD that was shipped with your unit. Manuals can be found in the marker\documentation folder on the CD.

Specific operating instructions for the Marker Motion system of the fiber laser marker can be found in the *LM-F Fiber Laser Marker Operator Manual 990-559, Chapter 6.*

Using the Door

Made of lightweight aluminum the door is counterweighted to allow for easy opening and closing during production. The door shape allows for 270 degree access to the part and a large viewing window

Large ball bearing roller slides guide the door and counterweights for easy and reliable operation. Adjustable magnets at the top rear of the enclosure allow for a settable opening force. To open the door grab the handle and lift up. Release at any point and the door will stay in place. To close the door pull down.

The system is equipped with adjustable upstops to limit the range of travel. There are three settable positions – Full Open, 3/4 Open, or Half Open. At the top of each door slide there is a U-shaped piece of metal installed on a threaded stud. To change the upstop position remove the nut from the stud, slide the U-Shaped upstop off the stud, and install on one of the other stud positions. Upstops must be moved in pairs.

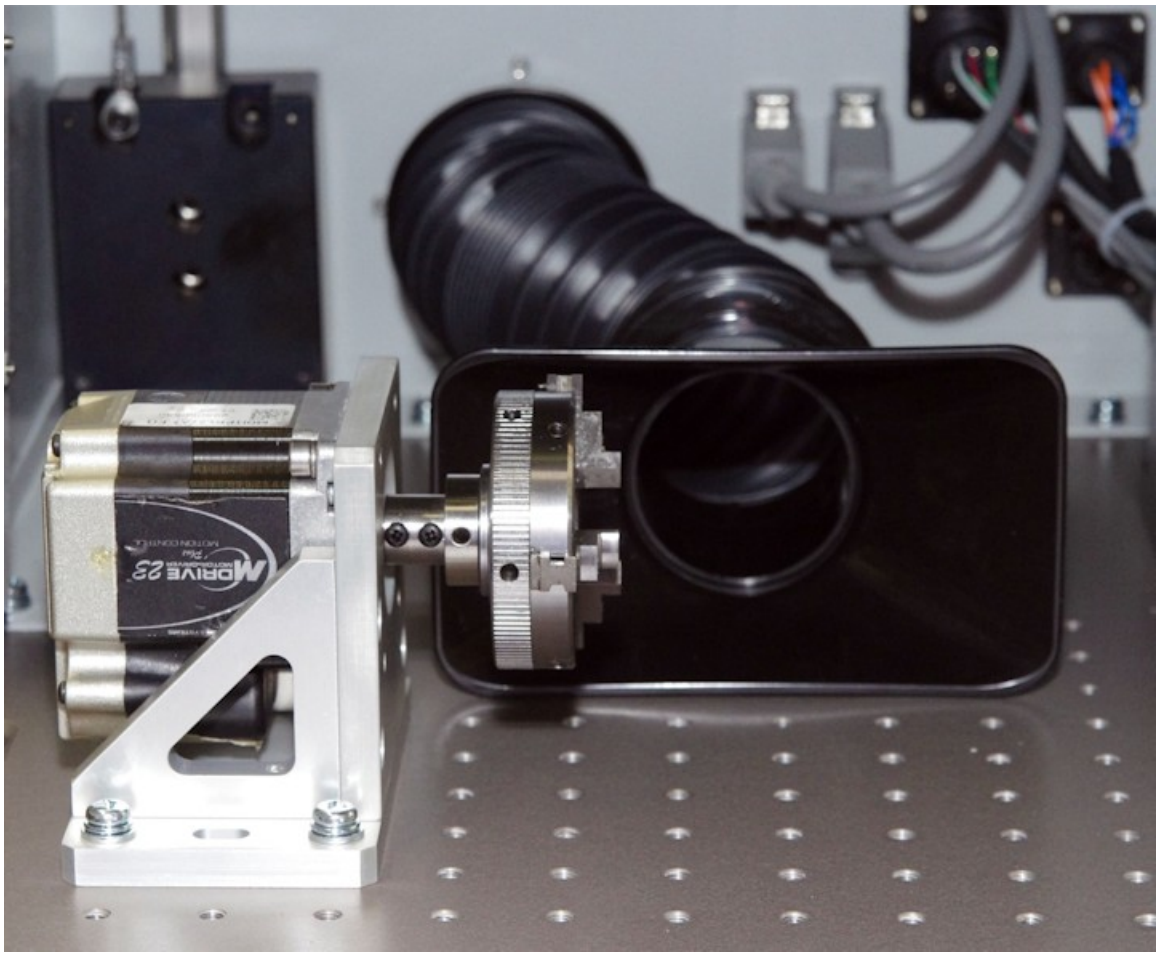
Fixturing

The tooling baseplate is drilled for M6 (1.0mm pitch) screws on a 25mm square pattern. Accessories and tooling can be mounted to the plate as necessary. Accessories must not interfere with door operation.

Fume Extraction

The fume extraction kit provides a flexible length of tubing, two tubing end pieces, and fume extractor nozzle. These items can be configured to safely remove airborne particulate matter generated by the laser process. Specific fume extraction configuration is determined by the end application. Depending on how the parts are tooled, arranged, and under what circumstances the marking occurs the fume extraction at the point of use will need to be customized. Customization can include shortening the flexible tube, choosing a different end piece, or supplying a complete custom tube and nozzle for the inside of the workstation tailored to a specific application.

A good starting point is to set up your fume extraction nozzle as shown in the image below. The hose should be shortened to keep the fume exhaust nozzle out of the field area if required.



Finding Focus

Laser processing requires that the part is located at the laser focal point. The head must be moved up and down to locate the part at the laser focus.

There are two popular methods of setting the focus. Method 1 is recommended.

1) Use the specified working distance for the chosen lens to move the head to the focal point. This can be determined by measuring from the part to the lowest point on the lens housing. Use the Z-Axis to move the head up and down until the correct measurement is reached. Specified working distances for each lens can be found in Appendix A of this manual and the *Fiber Laser Marker Operator's Manual 990-559.* Making a "focus stick" out of a piece of metal cut to the working distance length is a common aid when frequently changing parts.

2) Find the focus experimentally using the Z-axis and the laser. Place a piece of metal on the tooling plate. Set the laser to a setting that will mark. 25kHz, 100mm/s, 95% power is a good starting point but specific settings will vary based on the laser. Add a filled rectangle to provide a consistent mark and have the system mark on repeat. Using the Z-axis vary the focal distance until the correct focus is found. The correct focus is found when the mark is brightest, sounds the loudest, and makes the smallest spot. Lowering the frequency range for –HP models to the audible range helps make the sound of the mark more distinct and easier to lock in on the focus. This method is useful when questions about mark process arise and the process engineer wants to prove that the specified focus is correct.

Note: ***The Z-stage will not travel far enough down to focus near the tooling plate with an f100 lens. Use a spacer under the object to raise it. The f160 and f254 lenses can be focused down to the tooling plate if required.***

Task Lighting

The system is equipped with fixed LED lights wired to the laser 24V supply. These can be disconnected at the back of the workstation if desired. Additional task lighting can be installed if necessary.

System Controls

Emergency Stop Switch

The Emergency Stop switch immediately renders the system safe. Upon pressing the Emergency Stop switch the laser output is terminated, the laser safety shutter closes, the internal power supplies are de-energized, motion stops if equipped, and the system enters a fault state. To reset, clear the Emergency Stop condition and send a system reset by cycling the key switch OFF → ON or sending a "System Reset" I/O signal to the appropriate input on the back of the machine. The Emergency Stop switch is a latching type and must be rotated to release.

If an Emergency Stop condition can't be cleared there are diagnostic instructions located in the *LM-F Fiber Laser Marker Operator Manual 990-559.* Common causes include missing or loose head I/O cables inside or external to the workstation, the laser isolator not being completely installed in the scan head, or the Emergency Stop button being latched in the pushed condition.

System Enable Key Switch

The System Enable Key Switch is the primary access control device. If the key switch is off then the laser can't be activated. The System Enable key switch must be turned ON for the system to reach the Ready state. Cycling the System Enable switch will reset the system. Use the key switch to control access to the unit by only providing the key to qualified operators.

Power

The power switch turns the system on and off. Line voltage is present inside the unit with the power switch off so it is necessary to unplug before servicing the power supply.

Cycle Start

The Cycle Start button sends a cycle start input to the laser marker software. If the system is currently waiting for a start input, it will begin the selected marking cycle. If the system is not currently waiting for a start input, nothing will happen. The Cycle Start button is equipped with a LED that illuminates when the system is enabled and waiting for a cycle start input to begin the marking cycle.

Z-Axis Jog Rotary Knob

The Z-Axis Jog control is used in some configurations to control the height of the laser marker head. The rotary knob is the encoder type and has a push button feature that is used to select mode of operation. See the next section, *Controlling the Z-Axis, for details on operation*

Controlling the Z-Axis

For Manual Z-Jog Configurations

(8-791-xxx-xxx-xAx, 8-791-xxx-xxx-xCx)

The LCD display will read “SLOW”, “FAST”, or “LOCK”. When the LCD display reads “SLOW” or “FAST”, the System Enable key switch is on, and no faults are present the Z-Axis Jog knob will cause the stage to move. Each “click” of the rotary knob will move the stage a fixed distance. Continuously moving the rotary knob will cause the stage to move at the preprogrammed maximum velocity for a given speed. This maximum speed is not adjustable. If the rotary knob movement stops axis movement will stop as well. System faults will prevent stage movement.

FAST / SLOW

Holding the Z-Axis Jog knob down for 2 seconds or more will toggle the Z-Axis between active (FAST or SLOW) and Locked (LOCK). While active pressing the Z-Axis Jog button for less than 2 seconds will toggle between FAST and SLOW.

The Z-Axis stage is equipped with end of travel limit switches which will stop movement at the end of stage travel. Movement commands in the direction of an active limit will be ignored.

For Marker Motion Controlled Z-Jog Configurations

(8-791-xxx-xxx-xBx, 8-791-xxx-xxx-xDx)

The Z-Axis Jog control is inactive for configurations in which Marker Motion controls the Z-Axis. In this configuration use the WinLase software to jog the Z-Axis. See Chapter 6 of the *LM-F Fiber Laser Marker Operator Manual 990-559* for details.

The Z-Axis stage is equipped with end of travel limit switches which will stop movement at the end of stage travel. The end of travel limit switches are also used to home the axis to provide a stable zero position for reference within WinLase motion objects.

Use the following motion software configurations from the list installed with WinLase for these system configurations. Some changes may be necessary to fine-tune behavior to process requirements.

8-791-xxx-xxx-xBx equipped with Programmable Z
“Z Axis Only”

8-791-xxx-xxx-xDx equipped with Programmable Z + Programmable Rotary
“R Only – Direct Drive”

Controlling the Rotary Axis

The direct drive rotary axis can be equipped with a manual or marker motion controlled Z-stage. The motor is equipped with an encoder and encoder index that can be used for accurate homing and movement. In these configurations use the WinLase software to jog the rotary axis. The rotary movements can be controlled programmatically within the WinLase job. See Chapter 6 of the *LM-F Laser Marker Operator's Manual 990-559* for details.

Use the following motion software configurations from the list installed with WinLase for these system configurations. Some changes may be necessary to fine-tune behavior to process requirements.

8-791-xxx-xxx-xCx equipped with Manual Z + Programmable Rotary
"Z + Direct Drive R"

8-791-xxx-xxx-xDx equipped with Programmable Z + Programmable Rotary
"R Only – Direct Drive"

Section V. Maintenance

Refer to LM-F Fiber Laser Marker Operator Manual 990-559 for detailed laser marker maintenance instructions including firmware update.

Cleaning Lens Cover Glass

Each *f*-theta lens is equipped with an optically-coated protective glass. When marking materials over a period of time, many of the airborne particles produced during the marking process can dirty or fog the protective glass. ***It is important to keep the protective glass clean.*** If the protective glass is dirty and continually used, the contaminants may permanently damage the glass surface. When cleaning the surface, use only lens cleaning paper. A scratched glass surface will cause undesirable marking results.

CAUTION

To prevent dust contamination, ***always*** wear powder free latex gloves before performing any steps involving optics. Perform the following steps in a location free of dust or other airborne contaminants.

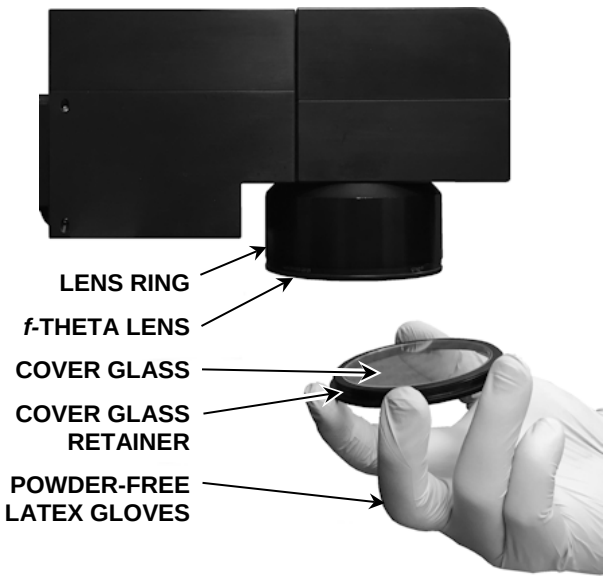
Required Items:

- Lens Cleaning Paper
- Acetone or Lens Cleaning Solution
- Air Blower
- Powder-free Vinyl Gloves or Finger Cots

1. Turn the System power OFF.
2. Turn the cover glass retainer CCW (counter-clockwise) to separate it from the *f*-theta lens. Take care ***not*** to drop it.

   Caution: The cover glass itself may not be physically connected to the cover glass retainer. Keep the cover glass assembly level after separating it from the *f*-theta lens.

   NOTE: ***Before*** handling the cover glass assembly, put on a pair of powder-free vinyl gloves or finger cots.



3. Blow clean air over the surface to remove any free contaminants.
4. If air does not clean the cover glass, then use some lens paper and a solvent to clean the cover glass (acetone, etc.)

   When cleaning, ***draw a spiral pattern from the center of the glass outward***.

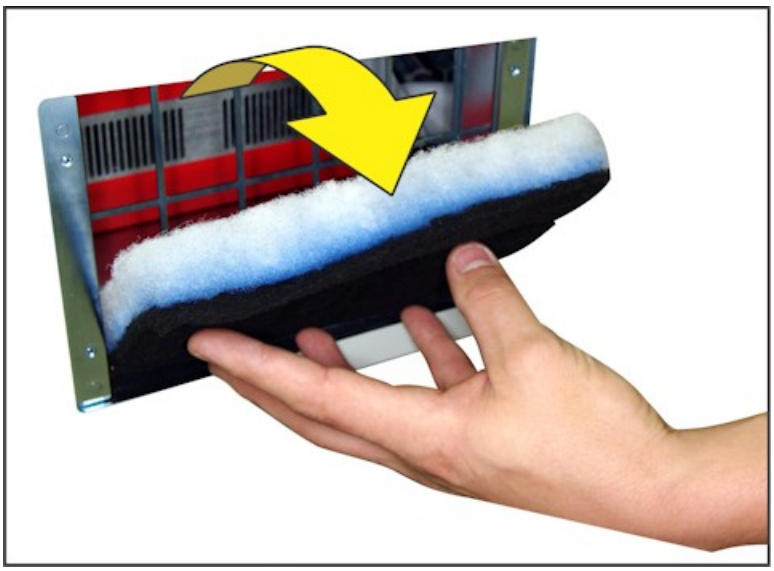
   NOTE: If you can ***not*** get the protective glass clean after several attempts, replace the protective glass with a new unit.
5. Install the protective glass back onto the Marker head.

Changing the Air Filters

The air filters on the Marker need to be cleaned regularly to reduce the risk of overheating caused by restricted airflow into the device. Please change the filters every 1-6 months depending on the operating environment.

To change, locate the two thumb screws at the top of the air filter grill and remove. Remove the old filters and install the new ones as shown in the picture below. The blue/white filter is installed first with the blue side facing out, then the black filter goes in second on the outside.

Blue Filter: **4-70831-01**
Black Filter: **4-70832-01**



Replacing Real Time Clock Battery

If the laser controller has trouble retaining the current time and date the button cell battery inside may need to be replaced. Move the WL-100A system enclosure to allow access to the top cover of the power supply. Remove the top cover and locate the battery near the back right corner on the control board stack. Replace.

Lubricating Door Slides

The door slides must be lubricated for proper operation. The ball bearing carriages in the slides are sealed units and do not require individual lubrication beyond lubricating the slides. It is important that the correct amount of grease of the correct type is used. Using too much grease in the slides will trap contaminants and lead to excessive wear as well as create a mess. Using too little grease will also lead to excessive wear. The correct amount of grease is a light film applied to each of the four tracks in the unit – two for the door and two for the counterweights at the back of the work area. If "globs" or other large amounts of grease are present remove them with a paper towel. Grease dripping down the track is a sign of excessive lubrication and should be cleaned and reapplied.
Lubrication should occur every 3-6 months or sooner when symptoms of friction occur. Typical symptoms of friction include abnormal behavior like noise from the slides or difficulty opening the door. Always wipe off old grease from the tracks before reapplying
Amada Weld Tech recommends *Magnalube G* PTFE grease for this purpose.

The slides and ball bearing carriages are wear items and will eventually need to be replaced. When lubrication fails to restore proper door movement it may be time to replace. Before replacing these components the system should be evaluated to see if there is some other cause like a trapped wire, misalignment, obstruction, cable pulley system issue, etc.

Lubricating the Z-Axis Stage

The Z-axis stage must also be lubricated. The same rules apply to lubricating the Z-axis stage – apply a small amount spread evenly over the lead screw and carriage friction surfaces. Do not over lubricate.

Lubrication should occur every 6-9 months or when symptoms of excessive friction occur. Possible symptoms include excessive noise during stage movement, stalls during motion commands, etc.

Amada Weld Tech recommends *Magnalube G* PTFE grease (P/N 900-207) for this purpose.

Maintaining Pulley System

The counterweight pulleys are sealed units and do not require maintenance. If a pulley wears and has excessive friction replace it with an identical part.

Monitor the pulley cables for damage and replace if signs of wear occur.

Inspecting Bellows for Damage

Inspect the rear bellows on the laser workstation regularly for damage. Do not use if damage has occurred.

Adjusting Magnets

The door closure magnets can be adjusted to increase “hold closed” force. These magnets are found at the top of the rear frame of the WL-100A enclosure. To make the hold closed force stronger move the magnets up towards the cover. Move them away from the cover to weaken the hold closed force.

Appendix A. Technical Specifications

Item	Description
Dimensions	(H x W x L)
Door Open	33.89” x 17.37” x 32.07” (860.8mm x 441.1mm x 814.5mm)
Door Closed	50.59” x 17.37” x 32.07” (1285mm x 441.1mm x 814.5mm)
Workstation Mass (typical)	93 lbs. (42kg) – mass can vary depending on ordered options
Laser Specifications	See *LM-F Fiber Laser Marker Operator Manual, 990-559* for specific specifications
Laser Safety Class	Class 1 Units conform to CDRH Class I and Class 1 under IEC60825-1. Laser marker itself is a Class 4 (IV) laser when not integrated into the WL-100A enclosure. See *LM-F Fiber Laser Marker Operator Manual, 990-559* for details on safe operation without the enclosure or with enclosure safety features bypassed.
Z-Stage Specifications	Stepper Motor Controlled 10” Travel
	Lead Screw Anti-Backdrive Design
	0.100” travel per motor revolution
	Equipped with upper and lower end of travel limit switches
	Equipped with Marker Motion controlled stepper or Rotary Knob Controlled Z-Drive

Item	Description
Direct Drive Rotary Axis	3-Jaw 2.5” Chuck mounted on rotary axis motor
	Marker Motion version equipped with encoder – 2048 counts/revolution
Optical Tooling Plate	Metric threaded M6 (1.0mm pitch) on 25mm centers
Ambient Temperature	41-95°F (5-35ºC)
Relative Humidity	Less than 90% Non-condensing
Installation Site	Do not use where there is considerable dirt, dust, oil mist, chemicals, fumes, moisture, vibration or near a high frequency noise source
Electrical Specifications	Power Supply 90-130VAC/180-260VAC ± 10%, 50/60 Hz, Single-Phase
	Maximum Running Current: 10A @ 110VAC

Marking Envelope Specification

Marking Area Specifications by Lens

WL-100A Lens Marking Area			
***f* θ Lens Unit**	***f* = 100mm**	***f* = 160mm**	***f* = 254mm**
Scanning Method	Galvanometer Scanner		
λ (wavelength)	1060-1150, central emission 1064 ± 5 nm		
Marking Area	2.42 in. x 2.42in. (61.5mm x 61.5mm)	3.89 in. × 3.89 in. (98.9mm × 98.9mm)	6.18 in. × 6.18 in. (157 mm × 157mm)
Working Distance (approximate)	3.86 ± 0.04 in. (98 ± 1mm)	6.93 ± 0.08 in. (176 ± 2mm)	11.65 ± 0.12 in. (296 ± 3 mm)
Position Resolution	0.00016 in. (4μm)	0.00028 in. (7μm)	0.00044 in. (11μm)

Working Envelope for 10” Travel Stage

***f*-theta Lens**	**Bottom of Marking Envelope**	**Top of Marking Envelope**
***f* = 100mm**		
***f* = 160mm**	**Tooling Plate**	
***f* = 254mm**	**Tooling Plate**	**1” Above Rotary Axis Center**

Mark Field Dimensional Tolerance

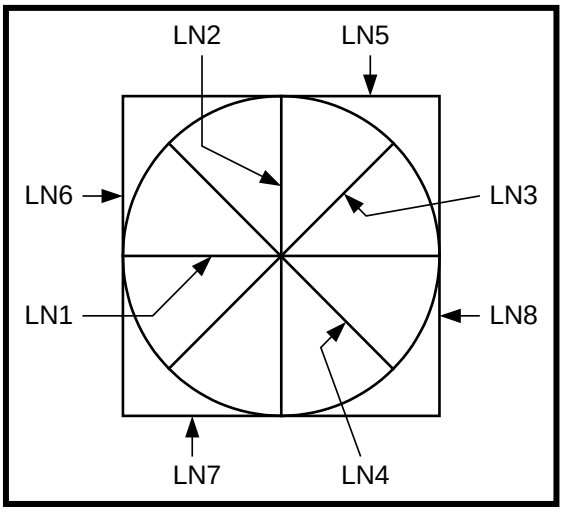
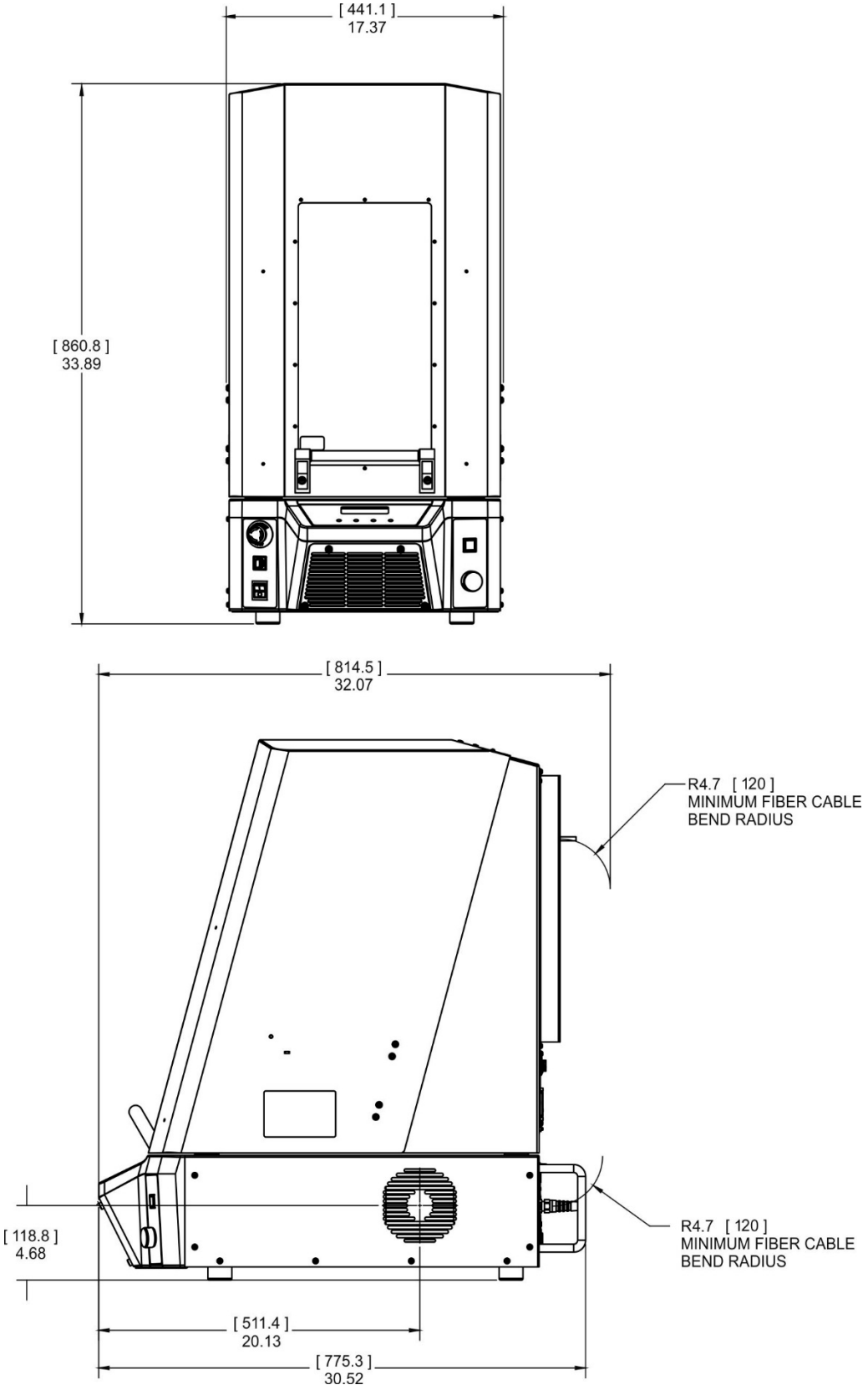


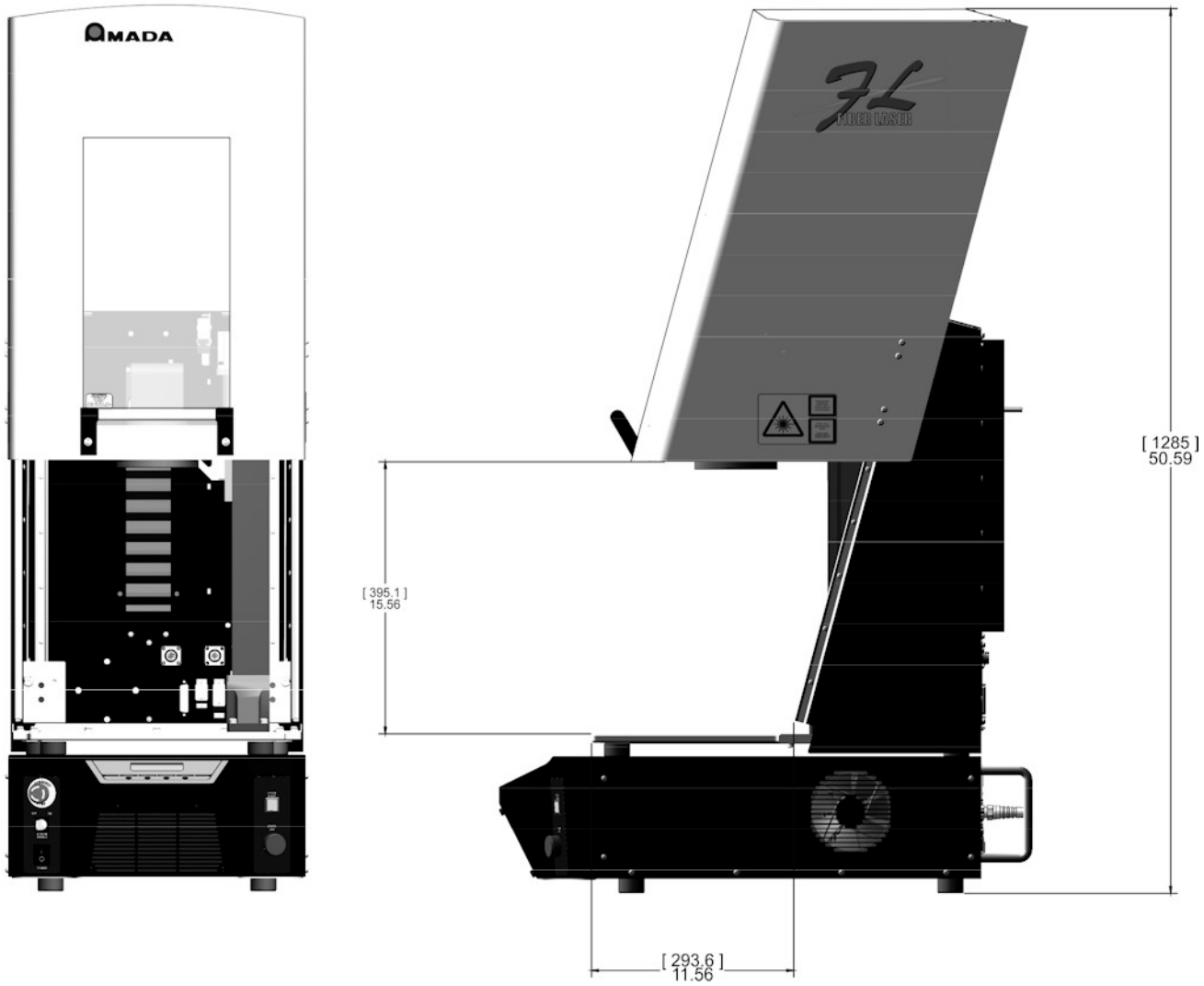
Figure 1: Marking Area: (*f*100, *f*160, *f*254)

	***f*100**	***f*160**	***f*254**
LN1 Length	61.5 ± 0.4mm	98.8 ± 0.5mm	157 ± 0.6mm
LN2 Length	61.5 ± 0.4mm	98.8 ± 0.5mm	157 ± 0.6mm
LN3 Length	61.5 ± 0.8mm	98.8 ± 1.0mm	157 ± 1.2mm
LN4 Length	61.5 ± 0.8mm	98.8 ± 1.0mm	157 ± 1.2mm
LN5 Length	61.5 ± 0.4mm	98.8 ± 0.5mm	157 ± 0.6mm
LN6 Length	61.5 ± 0.4mm	98.8 ± 0.5mm	157 ± 0.6mm
LN7 Length	61.5 ± 0.4mm	98.8 ± 0.5mm	157 ± 0.6mm
LN8 Length	61.5 ± 0.4mm	98.8 ± 0.5mm	157 ± 0.6mm

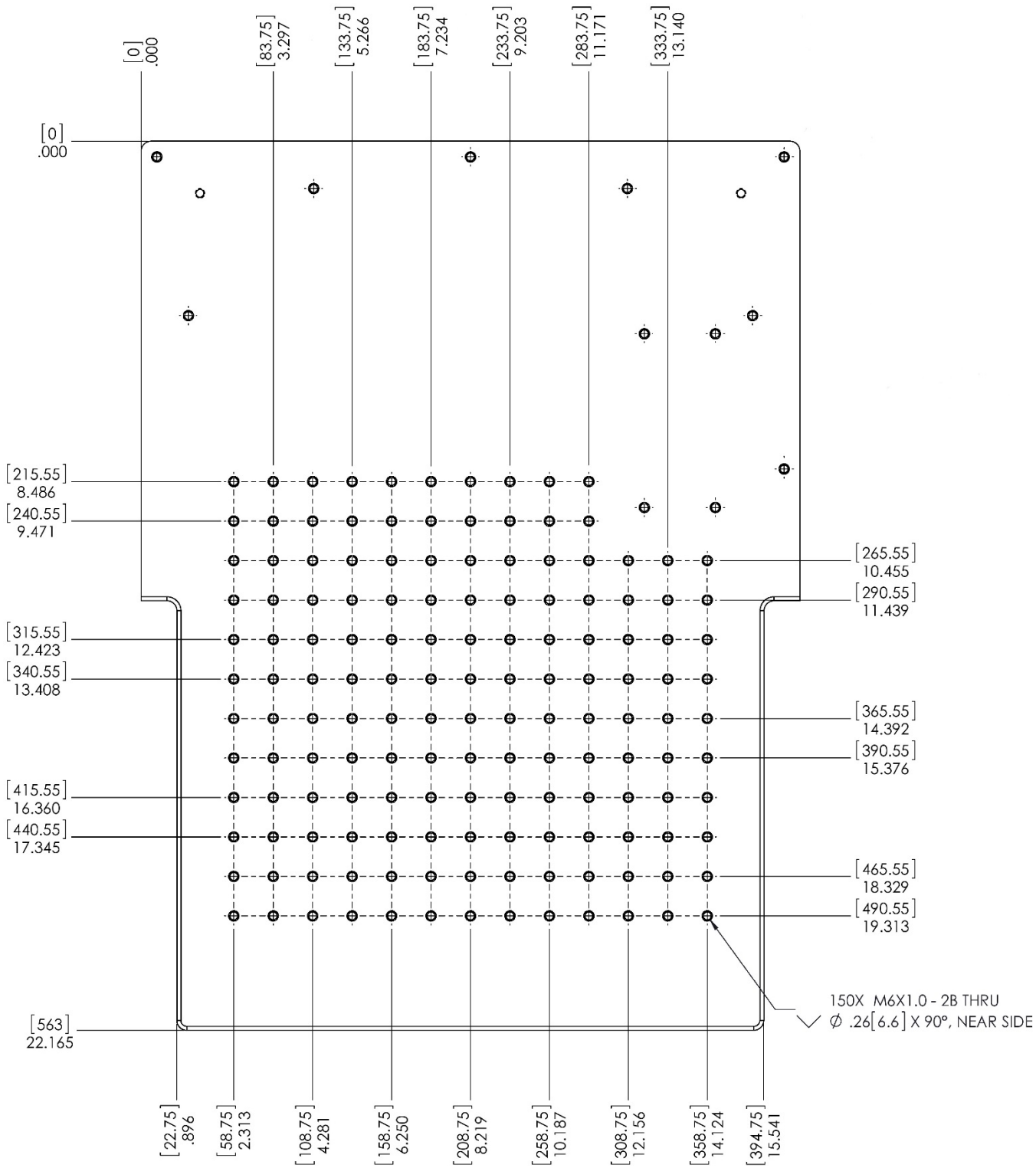
Engineering Drawings – Overall Dimensions



Engineering Drawings – Door Open Dimensions



Engineering Drawings – Optical Tooling Plate



AMADA WELD TECH INC.

http://www.amadaweldtech.com

AMADA WELD TECH INC.

1820 South Myrtle Ave., Monrovia, CA 91016, U.S.A.

TEL. +1-626-303-5676 FAX, +1-626-358-8048

http://www.amadaweldtech.com

AMADA WELD TECH CO., LTD.

200, Ishida, Isehara-shi, Kanagawa 259-1196, Japan

AMADA WELD TECH KOREA CO., LTD.

28, Dongtanhana 1-gil, Hwaseong-si, Gyeonggi-do, 18423, Korea

TEL. +82-31-8015-6810 FAX. +82-31-8003-5995

AMADA WELD TECH SHANGHAI CO., LTD.

Unit 401, A206(C8), No. 77, Hongcao Road, Xuhui District, Shanghai, China

TEL. +86-21-6448-6000 FAX. +86-21-6448-6550

AMADA WELD TECH GmbH

Lindberghstrasse 1, DE-82178 Puchheim, Germany

TEL. +49-89-839403-0 FAX. +49-89-839403-68

AMADA WELD TECH TAIWAN CO., LTD.

Rm. 5, 2F., No. 9, Dehui St., Zhongshan Dist., Taipei 10461, Taiwan (R.O.C.)

TEL. +886-2-2585-0161 FAX. +886-2-2585-0162

AMADA VIETNAM CO., LTD.

469 Ha Huy Tap Road, Yen Vien, Gia Lam, Ha Noi, Vietnam

TEL. +84-4-6261-4583 FAX. +84-4-6261-4584

AMADA (THAILAND) CO., LTD.

Asia Industrial Estate Suvarnabhumi (AIES) 88/41 Moo 4, Khlongsuan, Bangbo, Samutprakarn 10560, Thailand

TEL. +66 2170-5900 FAX. +66 2170-5909

AMADA WELD TECH INDIA PVT. LTD.

G-A Ground Floor, 5C-409, 5th Cross, Kammanahalli Main Road, HRBR Layout, Kalyan Nagar, Bengaluru, - 560043, India

TEL. +91-80-4092-1749 FAX. +91-80-4091-0592

AMADA WELD TECH LTDA.

Av. Tamboré, 965/973, Salas P22e F11, bairro Tamboré, 06460-000-Barueri-SP, Brazil

TEL. +55-11-4193-1187

AMADA WELD TECH INC.
1820 South Myrtle Ave., Monrovia, CA 91016, U.S.A.
TEL. +1-626-303-5676 FAX. +1-626-358-8048