

GAGEMAKER

***MIC TRAC
MT-4000***

OPERATION MANUAL



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OMMT400012-99

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Congratulations! Your decision to purchase a Gagemaker product above all others on the market demonstrates your confidence in our quality and workmanship.

This precision measurement center will quickly become one of the most important pieces of equipment in your facility. The MIC TRAC™ System has developed into what it is today due to response to the needs of industries just like yours. The MIC TRAC System addresses gage setting and calibration issues that were never possible before. All it takes is a little imagination.

But, for those who don't have time to imagine, Gagemaker provides gages and fixtures to accompany the MIC TRAC to make your job easier and more precise.

To ensure the high performance and operation of our product, we urge you to use the included reference materials. They contain important information for proper set up and use of the equipment. Also, we recommend that you follow the care and maintenance tips in this manual to keep the equipment working in top condition.

If your questions have not been addressed in our reference materials, contact your local representative or a customer service representative at 713-472-7360.

Introduction

What is the MIC TRAC?

The MIC TRAC™ System is an electronic, adjustable calibration and measurement center that will improve your ability to inspect parts, preset indicator style gages, and calibrate a variety of hand held inspection gages, as well as non-split, cylindrical ring and plug gages.

The MT-4000 measurement system includes the base unit, which houses an optical scale. This glass scale provides the MIC TRAC with its precision measuring capability with accuracies to .00005". The base unit includes receiver pads and anvils that are manufactured and precision ground to within .00005" to provide parallel surfaces for measuring. The MT-4000 also contains a weight system that supplies the necessary measuring forces to meet national standards.

For gage calibration, this system comes complete with a computer containing the CERTIFI Software. The software is an integrated package. The software is comprised of a computerized digital readout (INSPEX), calibration report writer, and a database (Recall Database) for tracking gage information. Refer to the CERTIFI Software manual for information about using this software.

As an option, the MT-4000 measurement system includes the CAL-PAK, for calibrating gages. The CAL-PAK is an assortment of fixtures that attach to the base unit for holding gages securely during the calibration process. Proper positioning of the gage improves the accuracy of the calibration and provides more consistent results. Refer to the MIC TRAC MT-4000 Calibration Reference Cards and the Gage Calibration Setup Poster for information about using the CAL-PAK fixtures.

Gagemaker's Philosophy of Accuracy

Over a decade of research and development of calibration and measuring equipment has provided us with many eye opening experiences into the realities of what accuracy means. Accuracy is subjective. Accuracy is controlled by many physical elements, all of which have their own variables. Temperature and humidity are just two factors that can affect accuracy.

It is critical to stabilize, monitor and adjust both temperature and humidity in order to maintain an accurate environment. 68°F (20°C) and 50% humidity have been established by NIST as the temperature at which measurements should be taken. Measurement or calibration in any other environment should be evaluated prior to certification.

All equipment manufactured by Gagemaker LP is accurate when operated according to our instructions and under suitable environmental conditions. In many cases, to improve accuracy, you may need to improve environmental conditions.

Technical Support

Phone: 713-472-7360

Hours: Monday – Friday 8AM – 5PM (CST)

Product Information and Updates

Visit our web site at: www.gagemaker.com

Unpacking and Handling



Before removing the unit, be sure you have a flat, secure surface to place it on. A granite or marble surface is ideal to reduce vibration, but a good solid wood top bench with sturdy legs is acceptable. Also, since the MIC TRAC requires an electrical power source, locate the unit within four feet of an electrical outlet.

1. After opening the cover of the shipping carton, check for signs of damage.

Note: If the unit appears damaged, contact Gagemaker immediately at 713-472-7360.

2. To release the unit from the shipping carton, loosen and remove the wing nuts and washers.
3. Remove the wood strips. The unit is ready to be lifted from the shipping carton.

4. For removing the unit, there are four lifting lugs attached to the sides of the MIC TRAC.

5. Secure two 36" X $\frac{3}{4}$ " durable lifting straps around the lifting lugs on each side.

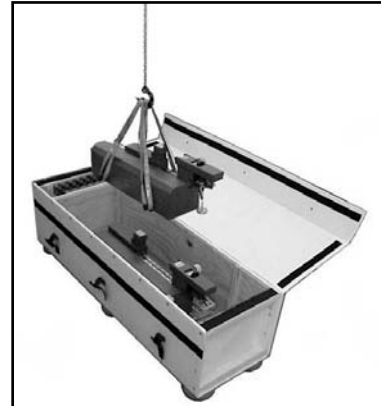


Unpacking and Handling (continued)

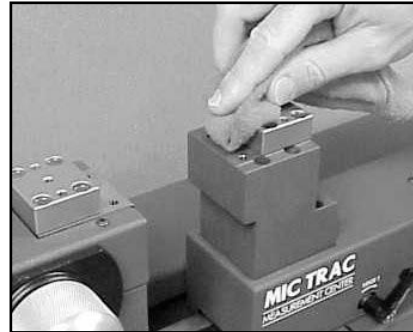
6. Since the MT-4000 weighs in excess of 100 pounds, use a crane or hoist to remove it from the shipping carton and place it on a secure surface. If this is not available, we recommend using two people to lift the unit out of the shipping carton.



Lift the unit from the shipping carton by picking up on the bottom only. **Do not** use the upper carriage.



7. Once in place, clean all bare metal surfaces to remove any debris from packaging and shipping and apply a thin coat of lightweight gage oil to these surfaces.



8. After unpacking the MIC TRAC **do not** destroy or discard the shipping carton or shipping materials. If for any reason you need to return the MIC TRAC to our factory, you'll need to use the original shipping carton.



If the unit is returned in any container other than the original shipping carton, there will be a charge of \$150.00 for carton replacement when the gage is returned to you.

Gagemaker is not responsible for any damages incurred during return shipment due to poor packing.



Returning the MIC TRAC

1. Contact Gagemaker for a Return Authorization Number at 713-472-7360.



No shipments will be accepted without a Return Authorization Number.

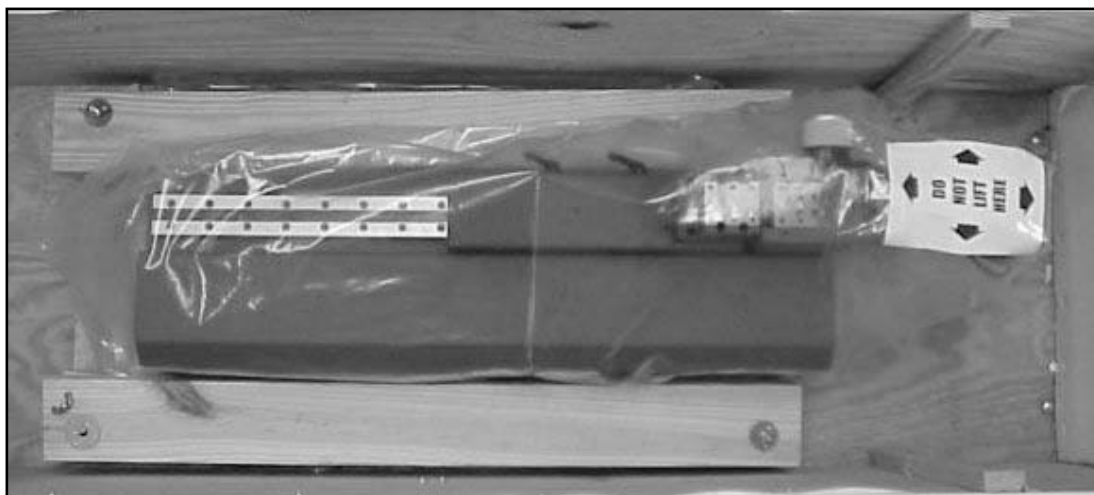
2. If you have removed the lifting lugs, reattach them before shipping the unit back to the factory.
3. Attach the bracket, originally shipped with the MIC TRAC, to the weight holder to secure the weight system during shipping.
4. Tighten the coarse adjust and fine adjust locks before packing the unit.
5. Place two 36" X ¾" durable lifting straps around the lifting lugs and place the unit in the **original** shipping carton. The lifting lugs will fit into the grooves in the bottom of the carton.



If the unit is returned in any container other than the original shipping carton, there will be a charge of \$525.00 for carton replacement when the gage is returned to you. Gagemaker is not responsible for any damages incurred during return shipment due to poor packing.

6. Place the wood strips over the bolts in the shipping carton.
7. Place the washers and wing nuts over the boards and tighten.
8. Close the lid and secure the flap to the velcro on the side of the carton.
9. Secure the three strap latches on the outside of the shipping carton.
10. Secure the shipping carton to a pallet.
11. Display the Return Authorization Number clearly on the shipping carton.
12. Ship to the following address by motor freight **only**. UPS shipments **will not** be accepted.

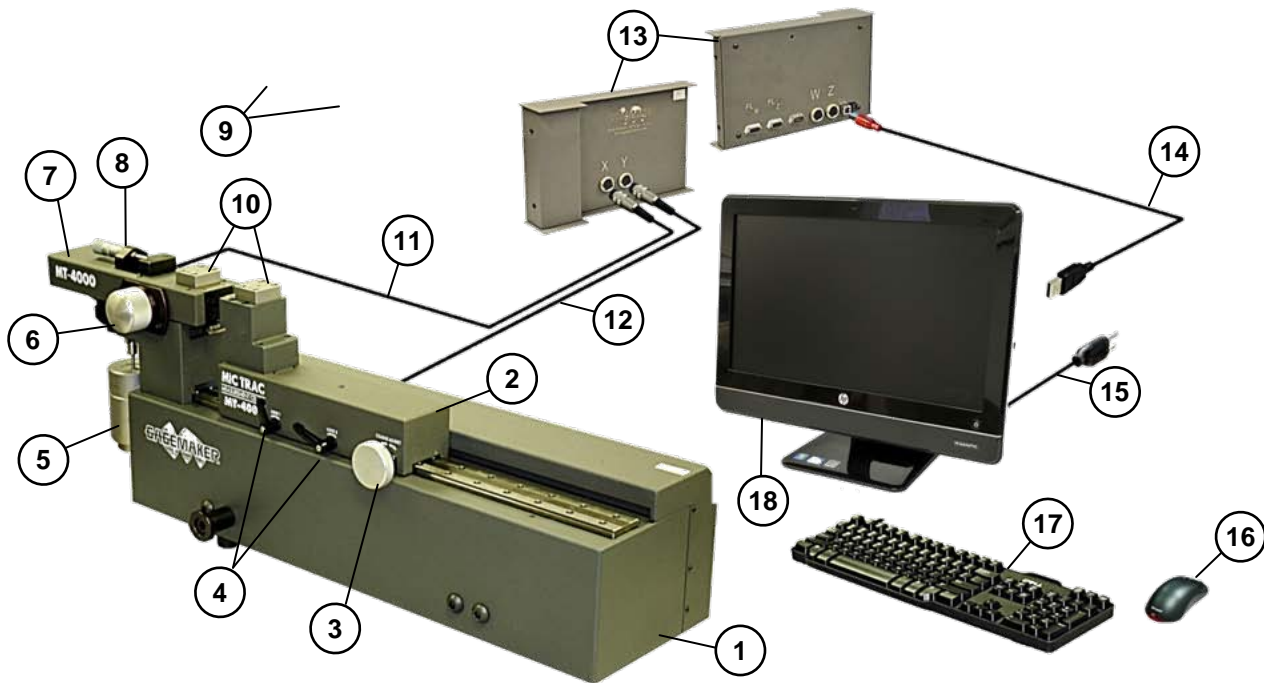
Gagemaker
712 East Southmore Ave.
Pasadena, Texas 77502



MIC TRAC Secured in Original Shipping Carton

System Components

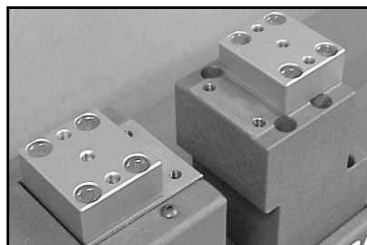
Take some time to become familiar with all the parts that make up the MIC TRAC system by reviewing the labeled diagram and descriptions that follow. The part names are important to understand the assembly and operating instructions.



Component List

Item	Description	Quantity
1	MIC TRAC Base Unit	1
2	Right Carriage (Y Axis)	1
3	Y Axis Adjust Knob	1
4	Y Axis Locks	2
5	Weight System (includes weight holder, compensator and 2 weights)	1
6	X Axis Adjust Knob	1
7	Left Carriage (X Axis)	1
8	Fine Adjust Spindle	1
9	Carbide Anvils (TF-2R Blocks)	2
10	Receiver Pads	2
11	X Axis MT Cable	1
12	Y Axis MT Cable	1
13	MT-4-USB	1
14	USB Data Link Cable	1
15	CPU Power Cable (may not include transformer box)	1
16	Mouse (may be wireless)	1
17	Keyboard (may be wireless)	1
18	CPU (Central Processing Unit, all-in-one computer)	1

MIC TRAC Base Unit Component Descriptions



Receiver Pads

Located on the right and left carriages and are used to hold fixtures, such as the carbide anvils (TF-2R blocks). The receiver pads are ground in matched sets so the mounting surfaces are flat and parallel.



Y Axis Adjust Knob

Used for positioning the right receiver pad. This knob moves the carriage left and right in large increments (4.000" with each revolution) and is used for quick positioning.



X Axis Adjust Knob

Used for moving the left receiver pad left and right. Pulling out on this knob releases the left carriage, which allows it to float during a measurement and eliminates any mechanical interference.



Only release the X axis adjust knob once you reach the point of measurement.



**Y Axis Locks
(Lock 1 and Lock 2)**

Secure the left carriage during measurement.



Do not attempt to turn the Y axis adjust knob when the locks are secured.



Fine Adjust Spindle

Located on top of the left carriage. This knob moves the left receiver pad in small increments and allows for close positioning. The spindle provides for approximately 1.00" of fine adjustment.

MIC TRAC Base Unit Component Descriptions (continued)



Weight System

Includes a weight holder and three weights. Weights consist of: internal measurement compensator (4 oz), a 1.0 lb, and 2.0 lbs. weights. During the measurement process, the weights are used to achieve the recommended measuring force. The internal compensator is used to overcome the spring pressure of the probe when set for internal measurements. The direction of the measuring force is determined by the position of the force lugs (refer to the procedure for Changing the Measuring Force Direction in this manual).



**Support Table
(Optional)**

Used to support parts or gages during measurement. The adjustable height support base includes clamps that hold the work piece for measuring.

MIC TRAC Setup Procedures



The accuracy and repeatability of your MIC TRAC depends on the correct attachment of the components. If the components are attached improperly, the gage will perform incorrectly. Each of the procedures on the following pages will help you to setup your MT-4000 properly.

Removing Lifting Lugs (Optional)

Materials Needed:

- MIC TRAC MT-4000 base unit
- 3/8" and 5/16" hex wrenches
- Button head cap screws (included with unit)

When the unit is in place, you may want to remove the (4) lifting lugs. However, if you do remove the lugs, keep the lugs and bolts handy. You will need to reattach them if the unit needs to be relocated or shipped back to the factory.

1. Remove the four lugs with a 3/8" hex wrench.



2. Replace each lug bolt with one of four button head cap screws, using a 5/16" hex wrench.



Releasing the Weight Holder

Materials Needed:

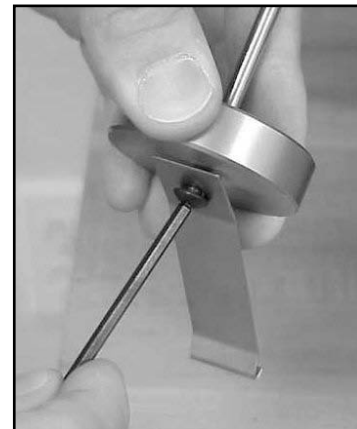
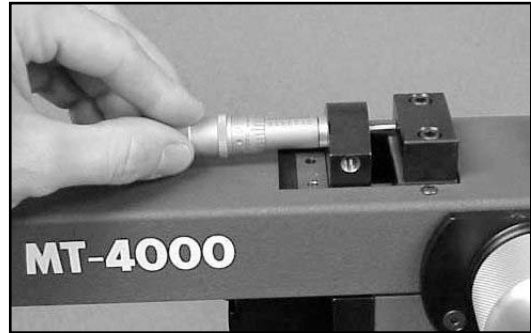
- MIC TRAC MT-4000 base unit
- 1/8" hex wrench
- Lightweight gage oil



The weight holder on the MT-4000 is secured in place for shipping. It is important to remove the shipping bracket before using the equipment.

1. Remove the foam wrapping from the weight holder.
2. Turn the fine adjust spindle on top of the left carriage counterclockwise to loosen.
3. Turn the X axis adjust knob counterclockwise until the weight holder releases.
4. Using a 1/8" hex wrench, remove the bracket from the weight holder.

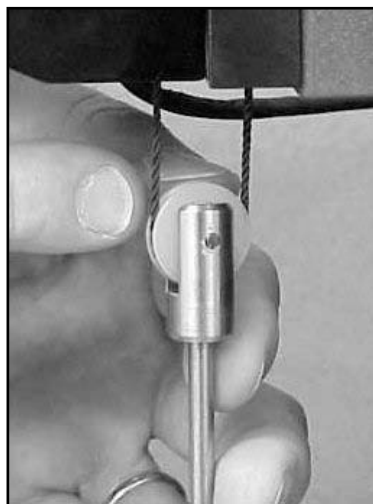
Note: Be sure to keep the bracket in case the unit needs to be shipped back to the factory.



Releasing the Weight Holder (continued)

5. Be sure that the cords that hold the weights are properly seated on their pulleys (refer to the Weight System diagram at the back of this manual).

Note: During the measurement process, you will place the proper combination of the three weights on the weight holder to achieve the necessary measuring force.



Connecting the Computer

Materials Needed:

- All-In-One Computer
- Power cord
- Wireless Keyboard
- Wireless Mouse
- Wireless plug-in module

The computer, which is included with the MT-4000, should be used exclusively with the MIC TRAC. We recommend that you do not install other software programs on this computer. The CERTIFI Software is a 32-bit Windows based calibration program that comes installed on the computer.

1. Plug the female end of the power cord into the power port on the back of the Computer. Plug the other end of the power cord into an electrical outlet.
2. Plug the keyboard/mouse wireless module into one of the USB ports on the back of the Computer.
3. Plug the USB Data Cable into one of the USB ports on the back of the computer.
4. Install AA batteries into the mouse and keyboard.



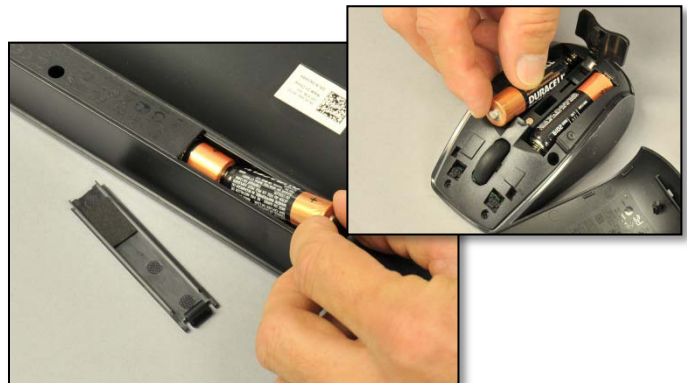
Inserting power cord



Inserting wireless module



Inserting USB Data cable



Installing batteries in keyboard and mouse

Connecting the Computer (continued)

5. If you have a printer, plug the USB printer cable into one of the USB ports on the back of the computer. Refer to the instructions that came with your printer, if you need additional help connecting the printer.



Inserting USB cable to printer

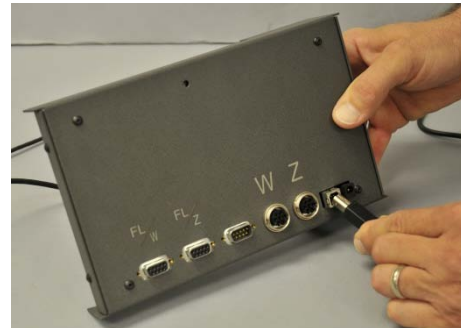
Connecting the MIC TRAC to the Computer

Materials Needed:

- MIC TRAC MT-4000 base unit
- USB Data Cable
- MT-4-USB Interface Box

The data link cable feeds information from the MIC TRAC to the computer. It has a large connector on one end and three small connectors on the other end. The small connectors represent the X axis, Y axis, and an optional remote switch, which can be used for saving measurements during calibration without using your mouse.

1. Plug the B end of the USB Data Cable into the data port on the backside of the MT-4-USB box.



2. Plug the X axis data cable into the X axis port, and the Y axis cable into the X axis port of the MT-4-USB box.



Setting Up the Optional Support Table

Materials Needed:

- MIC TRAC MT-4000 base unit
- Support Table (optional)

The MT-4000 is available with an optional support table. The table's height can be adjusted to support parts during the measurement process. The support table is also equipped with clamps that can hold a part in place while measurements are taken.


1. Turn the Y axis adjust knob to position the right carriage to the far right.
2. Place the support table over the MT-4000 so the support legs straddle the base of the MIC TRAC.
3. Screw the clamps into the holes in the support base, as necessary, to hold down parts or gages.



Finding Home Position on the MIC TRAC

Materials Needed:

- MIC TRAC MT-4000 base unit
- Computer, Keyboard, and Mouse
- CERTIFI software

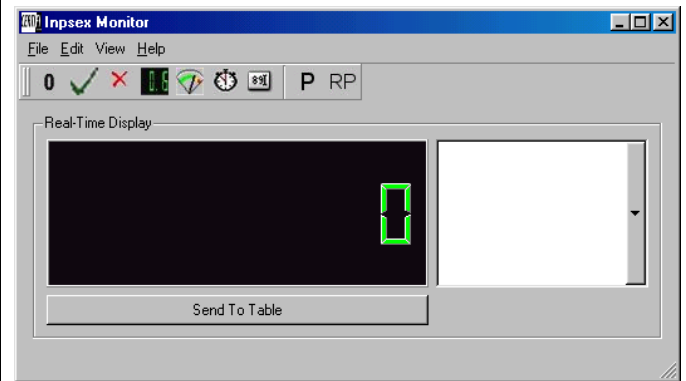
1. Start CERTIFI. From the main screen click the **Inspex Monitor** icon . The DRO or digital readout for the X and Y axis and their sum—S display. The X axis button is red, which means X is active.

2. Turn

3. Click on

4. Turn.

5.

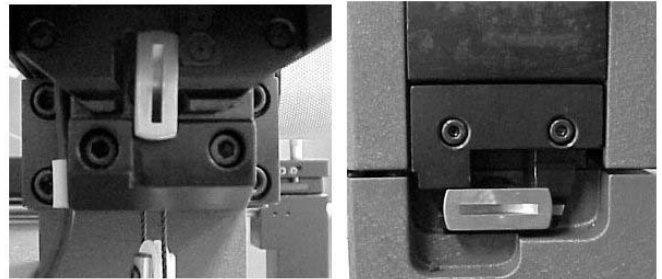


Changing the Measuring Force Direction

Materials Needed:

- MIC TRAC MT-4000 base unit
- Slotted screwdriver or coin

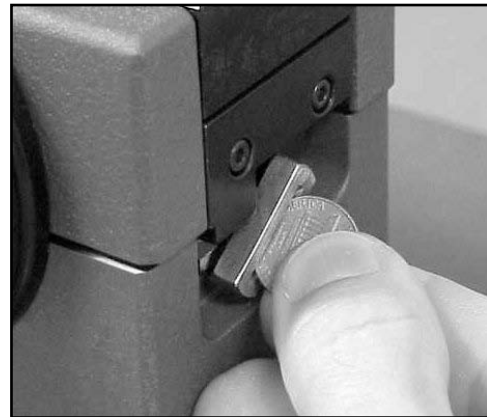
1. Initially, the weight system's measuring force is set up for internal measurements, where the left force lug is vertical and the right force lug is horizontal.



2. To change the measuring force direction, turn the Y axis adjust knob counterclockwise to position the right carriage to the far left.

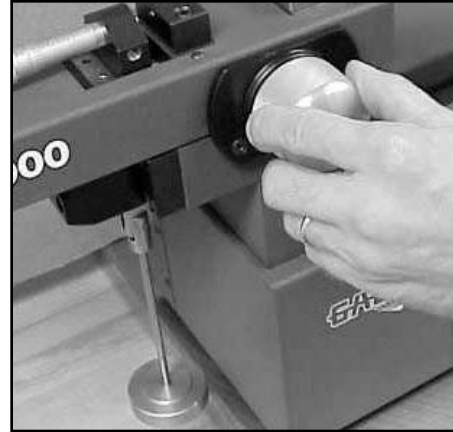


3. Insert the blade of a screwdriver or a coin into the slot of the right force lug and rotate 90 degrees.

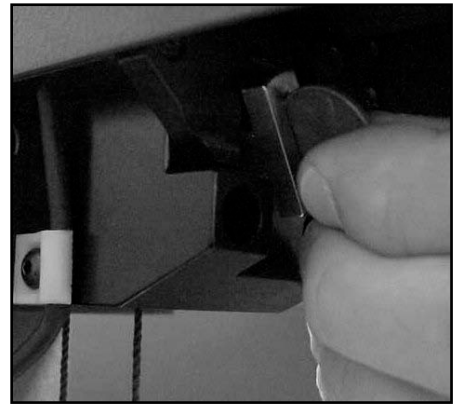


Changing the Measuring Force Direction (continued)

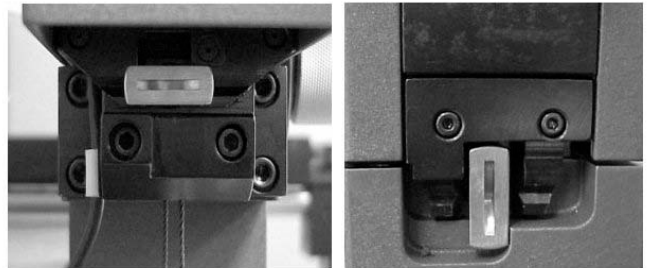
4. Turn the X axis adjust knob clockwise to position the left carriage to the far right.



5. Insert the blade of a screwdriver or a coin into the slot of the left force lug and rotate 90 degrees.



Note: The direction of the measuring force is now set for external measurements.



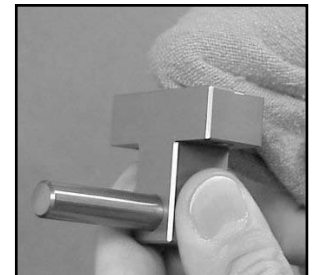
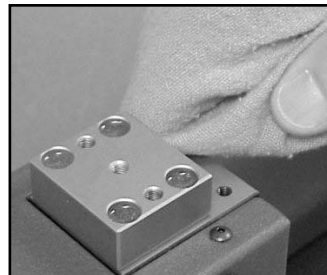
Mounting the Carbide Anvils (TF-2R Blocks)

Materials Needed:

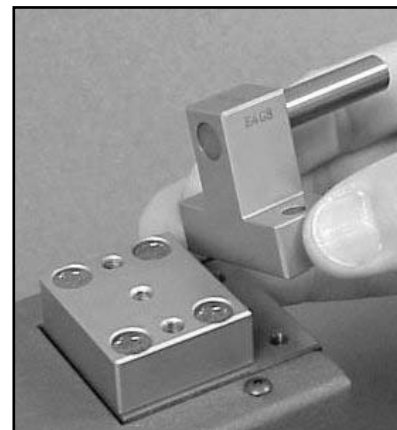
- MIC TRAC MT-4000 base unit
- Carbide anvils (TF-2R Blocks), cap screws and washers
- 5/32" hex wrench
- 30 in/lb torque wrench
- Gage ball
- ZEP I.D. Red Cleaner
- Cloth

The carbide anvils are mounted on the receiver pads of the MT-4000 to provide a measuring surface. To ensure a precise surface for measuring, the anvil ends are lapped parallel.

1. Clean both of the receiver pads and the mounting surfaces of the carbide anvils using the cloth and ZEP I.D. Red cleaner.



2. Locate the left carbide anvil. Place the anvil against the left receiver pad shoulder.



3. While holding the anvil against the receiver pad shoulder, insert the two cap screws with washers into the holes on either side of the fixture.



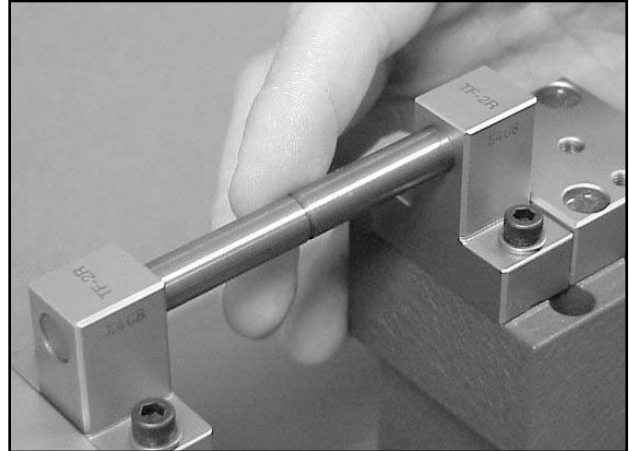
4. While applying pressure toward the receiver pad shoulder, use a 5/32" hex wrench to slightly tighten the screws.



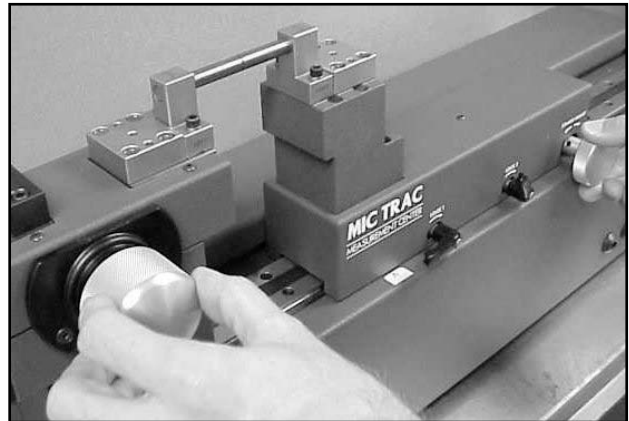
5. Use a 30 in/lbs torque wrench to secure the cap screws.

Mounting the Carbide Anvils (TF-2R Blocks) (continued)

6. Repeat the same process with the right carbide anvil, but before completely tightening the screws, be sure the anvils are aligned:
 - Bring the carbide anvils together using the Y axis adjust knob.
 - While holding the anvils together with the Y axis adjust knob, move your finger back and forth along the backside of the anvils to verify alignment.
 - If not aligned, loosen the right anvil and align.
 - Once aligned, use the torque wrench to secure the right anvil.



7. Pull out the X axis adjust knob.
8. Turn the Y axis adjust knob counterclockwise until the carbide anvils touch.



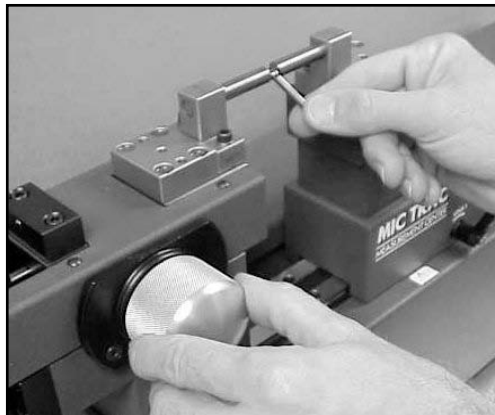
9. Secure Locks 1 and 2.



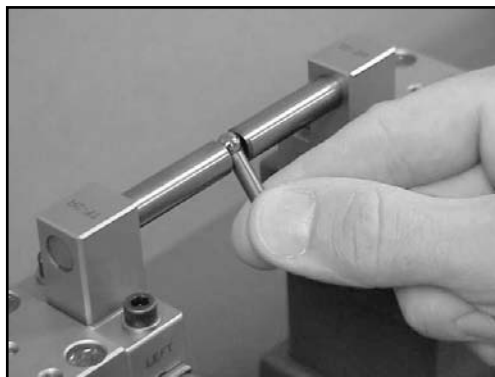
Mounting the Carbide Anvils (TF-2R Blocks) (continued)

10. Clean a gage ball with the cloth and ZEP I.D. Red cleaner to remove any dirt or oil.

11. Push in the X axis adjust knob. Turn the knob counterclockwise and place a gage ball between the carbide anvils.



12. Position the ball near the center of the contact area and pull out the X axis adjust knob. The measuring force will hold the ball in place.

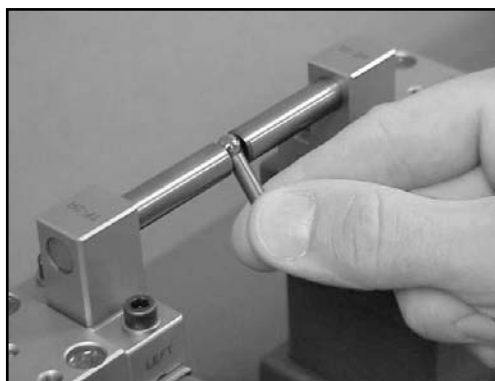


13.



14. Drag the ball from side to side and top to bottom. The maximum deviation across the anvil face should not exceed .00001". If the maximum misalignment exceeds .00001", the anvils need to be loosened, adjusted, and realigned.

15. Continue to adjust the position of the anvils until the desired deviation is achieved. You can increase the overall accuracy of subsequent measurements, by adjusting the anvils as close to zero as possible.



Measurement Procedures

Measuring Parts

Materials Needed:

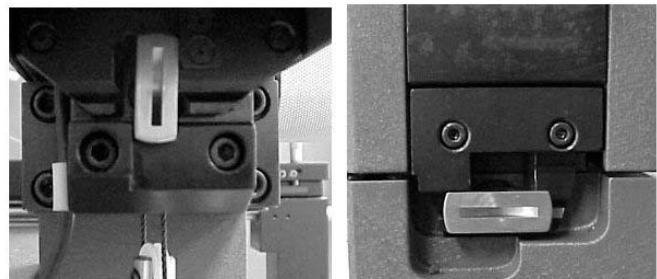
- MIC TRAC MT-4000 base unit
- Carbide anvils (TF-2R Blocks)
- Computer
- CERTIFI software
- Part
- ZEP I.D. Red Cleaner
- Cloth

1. If measuring a part immediately after turning on the computer, locate the home position on the MT-4000 (refer to Finding Home Position on the MIC TRAC in this manual).
2. Check the positions of the weight system's force lugs.

Note: For most parts, the right lug should be horizontal and the left lug should be vertical. Change the positions; if necessary refer to the procedure for Changing the Measuring Force Direction in this manual.

3. Set the measuring force for the weight system by placing the 1 pound weight on the weight holder. The recommended measuring force for most parts is 1 pound.

4. Start CERTIFI by double clicking the CERTIFI icon.
5. Click on the readout (digital display) for S to activate S. The S button turns red.



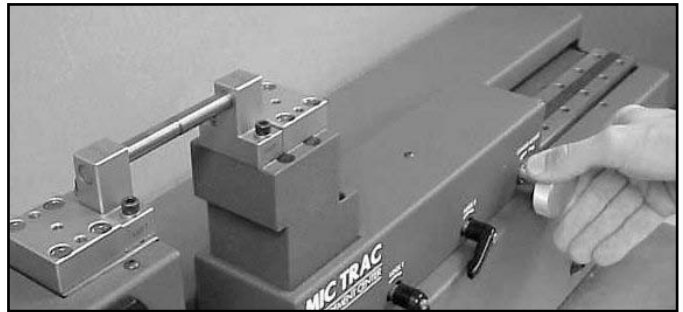
Left Lug

Right Lug

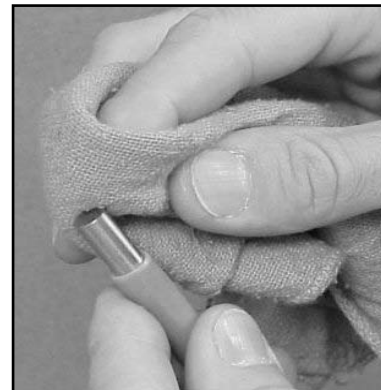


Measuring Parts (continued)

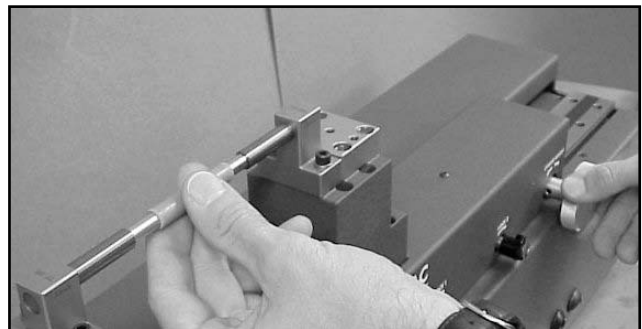
6. Turn the Y axis adjust knob counterclockwise to bring the carbide anvils together.
7. In INSPEX, click the S button on the digital readout to zero the MT-4000.



8. Clean the part with the cloth and ZEP I.D. Red cleaner.



9. Pull out the X axis adjust knob.
10. Turn the Y axis adjust knob counterclockwise to move the right carbide anvil closer to the left anvil. As the anvils move closer together, place the ends of the part between the anvils.
11. Continue turning the Y axis adjust knob until the X axis moves approximately $\frac{1}{2}$ inch, then secure Locks 1 and 2.
12. The measurement displays on the S readout. Refer to the Calibration Reference Cards and Gage Calibration Setup Poster for instructions on calibrating specific gages and parts.



Care and Maintenance

Maintenance Tips

- Keep all unprotected metal surfaces coated with light oil.
- Always use the gage on a sturdy, level surface.
- Avoid dropping the gage or subjecting it to any vibration or impact.
- Use only in a static free environment.
- Keep the unit dry and away from any machine coolant spray.
- Do not place the unit in direct line of flying chips.
- Keep the unit covered when not in use.
- Do not use the unit while standing on a wet surface
- Do not force the movement of any of the mechanical parts. The mechanics are designed to move freely.

Maintenance Note

There are no user serviceable parts inside the MIC TRAC base unit. Any disassembly of this equipment will void the warranty. When used properly, by trained personnel, the MIC TRAC requires no internal maintenance. We suggest you return your unit to Gagemaker on a regular basis for re-calibration and certification. When shipping your MIC TRAC, for whatever reason, use the shipping carton and packing material that came with the unit to minimize the risk of damage. Gagemaker will assume no responsibility for goods damaged during return shipment due to improper packaging.

Safety Tips

The MIC TRAC can be used in virtually any safe working environment. However, certain precautions should be taken for safety as follows:

- All cables from the CPU and printer should be kept out of the way of any rotating equipment.
- To avoid electrical shock, DO NOT use the unit while standing on any wet surface.
- Use the correct lifting procedures when transporting the unit.

MIC TRAC Calibration

The MIC TRAC MT-4000 is calibrated at the factory to $\pm .000020$ " traceable to NIST. To ensure that the MIC TRAC is providing accurate measurements, the unit should be calibrated annually, based on frequency of use and operating conditions.

To return the MIC TRAC MT-4000 measurement center to Gagemaker for calibration:

1. Contact Gagemaker for a Return Authorization Number at 713-472-7360.
2. Place the MT-4000 measurement center in the original shipping carton (refer to the procedure for Returning the MIC TRAC in this manual) and return to:

**Gagemaker
712 East Southmore Ave.
Pasadena, Texas 77502**

Warranty Information

GAGEMAKER warrants its products to be free from defects in material and workmanship for one year from the date of shipment. At our option, we will repair or replace any defective product upon return, prepaid, properly packed to our factory in Pasadena, Texas. This warranty applies to all products when used in a normal industrial environment. Any unauthorized tampering, misuse or neglect will make this warranty null and void. Under no circumstances will GAGEMAKER or any affiliate have any liabilities for loss or for any indirect or consequential damages. The foregoing warranties are in lieu of all other warranties expressed or implied, including but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

Technical Information

Specifications

Overall Dimensions

MT-4012-10 Base Unit	36.00" x 13.00" x 12.00"	(914mm x 330mm x 304mm)
MT-4024-10 Base Unit	47.00" x 13.00" x 12.00"	(1194mm x 330mm x 304mm)
MT-4036-10 Base Unit	58.00" x 13.00" x 12.00"	(1473mm x 330mm x 304mm)
MT-4048-10 Base Unit	69.00" x 13.00" x 12.00"	(1752mm x 330mm x 304mm)
CPU with monitor	24.00" x 18.00" x 16.00"	(130mm x 457mm x 406mm)

Weights

MT-4012E Base Unit	121.0 lbs. (55.0 kg)
MT-4024E Base Unit	152.0 lbs. (69.0 kg)
MT-4036E Base Unit	184.0 lbs. (83.6 kg)
MT-4048E Base Unit	215.0 lbs. (97.7 kg)
CPU with monitor	22.0 lbs. (10.0 kg)

Voltage Requirements (all models)

CPU	110 volts, 110/220 volts or 220 volts AC, 50-60 Hz
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Gage Accuracy (at 68 F / 20 C) *

	X Axis	Y Axis	With Summing**
MT-4012-10	±.00002"	±.00005"	±.00007"
MT-4024-10	±.00002"	±.00010"	±.00012"
MT-4036-10	±.00002"	±.00015"	±.00017"
MT-4048-10	±.00002"	±.00020"	±.00022"
Resolution of internal scale	±.00001"	±.00004"	N/A
Repeatability of assembled MIC TRAC	±.00004"	±.00004"	N/A
Resolution of MIC TRAC CPU	±.00001"	±.00001"	N/A

* Base units are segmentally linear error corrected.

** Summing is a software feature that allows the movement of both X and Y to be read together

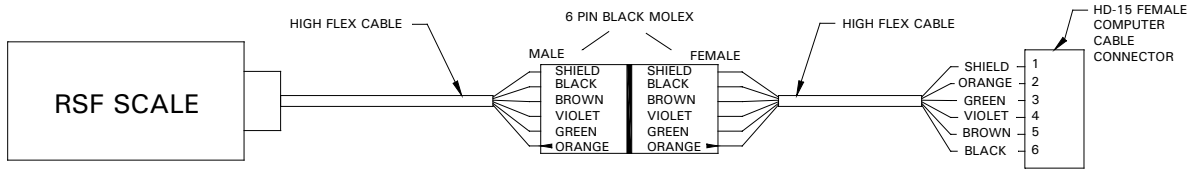
Service Temperature Range 32° to 100° F (0° to 40° C)



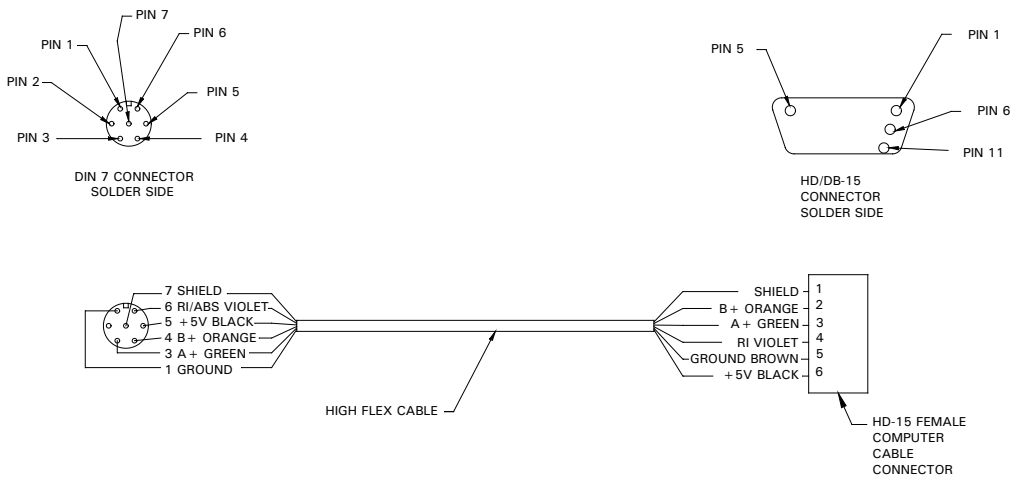
The recommended temperature for any precision metrology, if a high degree of accuracy is required, is 68 F. All certifications should be made at 68 F.

Cable Wiring Diagrams

Scale to HD15



HD/DB-15 X DIN 7 Readout Cable

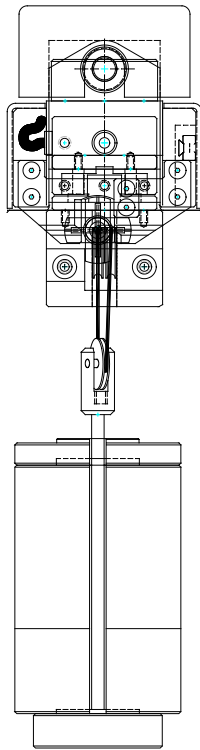


**L120 Connector Color Code
HI-FLEX Cable (Thin Cable)**

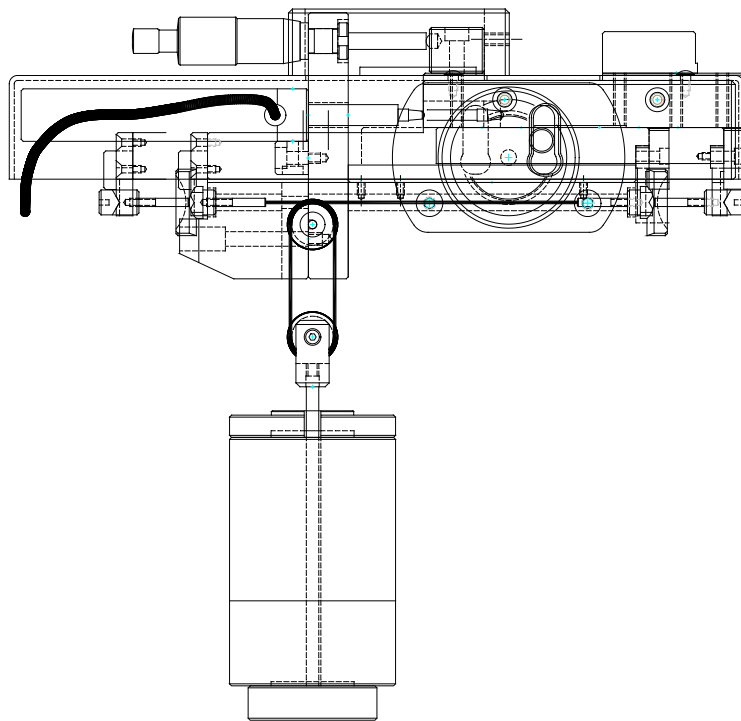
<u>PIN #</u>	<u>Color</u>	<u>LD SQ Wave</u>
A	Shield	Earth Grnd
B	Brown	Ground
C	Green	CH A+
D	Yellow	CH A-
E	Orange	CH B+
G	Violet	RI+
H	Blue	RI-
K	Black	+5V
L	Red	CH B-

Weight System

The diagram that follows depicts the pulley system that operates the MT-4000 weight system. In the event that the cord holding the weights becomes tangled or disconnected, this diagram will help with reconnecting it properly.

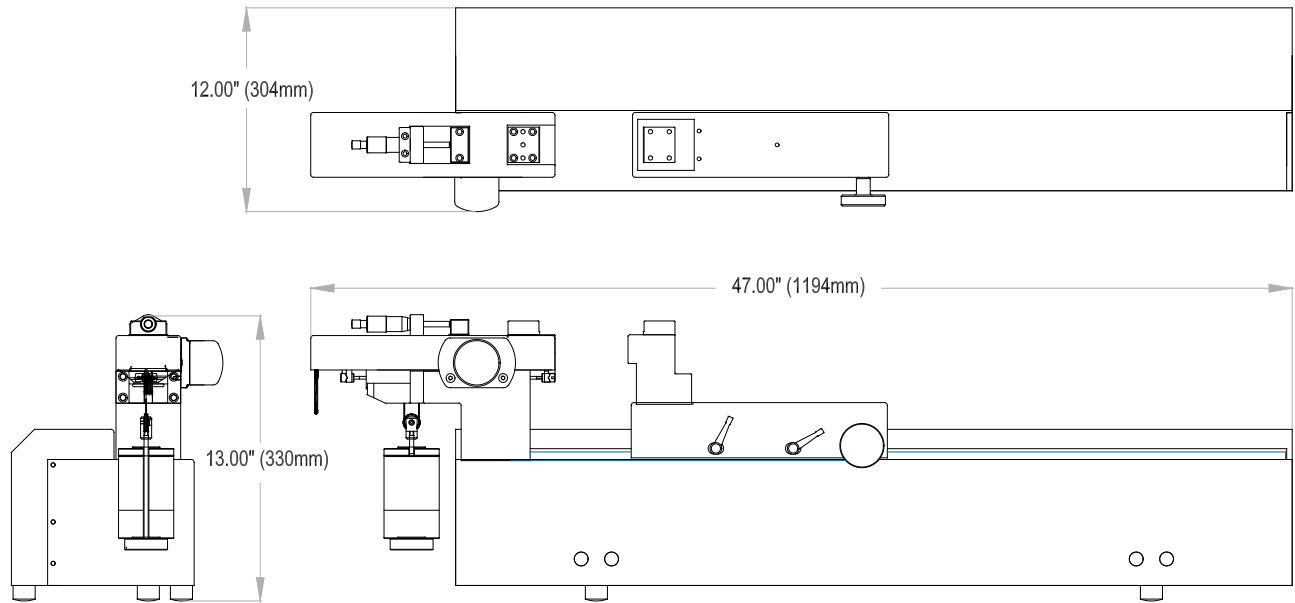


Left End View



Front View

MT-4024-10 General Dimensions



GAGEMAKER

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