SUPERIOR

Linear Mill
Operating Manual

CONFIDENTIALITY STATEMENT

DOCUMENT NUMBER SPR-MAN-LM

REV 01

SUPERIOR

One Company, *Superior* Results.

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ABOUT US

Superior Plant Rentals, LLC. (SPR) specializes in portable machining, bore welding, line isolation, and testing solutions, providing equipment and tools manufactured under the highest standards of quality control and engineering expertise along with 24/7 service and support. Designed with the operator in mind, our tools and equipment deliver dependable and precise performance, providing cost-effective solutions and reduced downtime, making them beneficial resources in the Oil and Gas, Mining, Heavy Construction, Shipbuilding, Aerospace, Defense, and Power Generation industries.

SPR rents and sells equipment and tools; we offer our own line of portable ID/OD flange facers, linear/gantry and rotary mills, end prep bevelers, isolation and test plugs, line boring, and bore welders, as well as custom-designed equipment and tools.

Our team includes machining, test and isolation, and engineering experts, all with a thorough working knowledge of applications to support you with our equipment on any job. We understand the urgency of your projects and are committed to delivering the highest quality equipment and tools to satisfy the requirements of your clients.

SPR delivers outstanding customer service, specialized training by seasoned professionals, and tools as tough as the jobs you need them to do.

YORK
PORTABLE MACHINE TOOLS

SUPERIOR
PLANT RENTALS

CLIFF'S BITS
PRECISION GRINDING & TOOLING

WARNING:

SPR is committed to continued product improvement; therefore, the machine you received may be slightly different than the one described herein. This manual and the information provided is a basic guideline for our customers. SPR will do its best to ensure that the information and procedures contained in this manual are correct and up-to-date. Superior cannot guarantee that the information and procedures contained herein are correct for all applications or situations.

The contents of this manual are subject to change without notice. It is the obligation of the user to read all information in this manual, become familiar with the equipment to be used, and exercise the utmost care in equipment operation. **Do not make any modifications to this equipment. Any modifications will void all warranty claims, as well as increase the risk of injury or harm.** Do not operate this equipment if all parts are not functioning at 100% efficiency. Notify us immediately for any needed repairs.

Note: SPR will supply all repair and replacement parts necessary for maintenance and operation of this machine. For repair, service, or additional information, please locate repair and replacement part description/part numbers within the O&M manual in the exploded view section and contact us for ordering.

USA

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350 Dowdy Road, Gonzales, LA 70737 | Phone: 225.647.7771

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1530 Live Oak Street, Webster, TX 77598 | Phone: 281.554.9400

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8233 Leopard Street, Corpus Christi, TX 78409 | Phone: 361.541.5900

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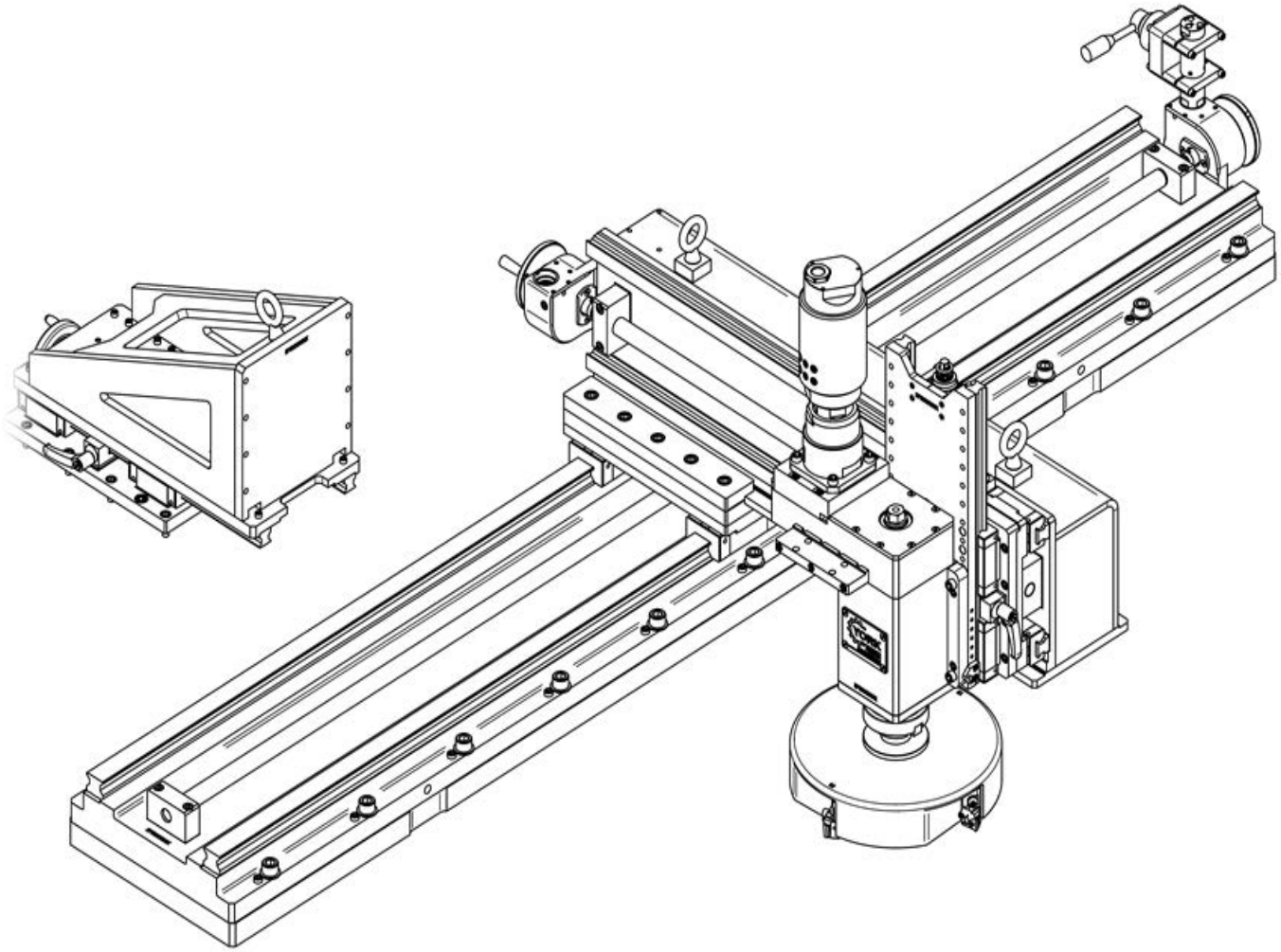
INTRODUCTION

APPLICATIONS

SPR's precision linear mills are versatile, efficient, and designed with the end user in mind. The mills are designed with ball screws and rails in all three axis, X-Y-Z, to replace older dove tail models. Multiple spindle positions allow for a greater range of milling adjustments whether it is horizontal, vertical and/or angular. This allows the machine to produce CNC quality work in field/shop conditions depending on the job scope.

When you receive the Linear Mill:

The Linear Mill is generally shipped in one crate. Inspect the machine for shipping damage. Verify that all of the parts listed below, or on the Bill of Materials, are present. If any parts are missing, or if you have questions regarding the Linear Mill, please contact a Superior Plant Rentals or SPR York location nearest you immediately.

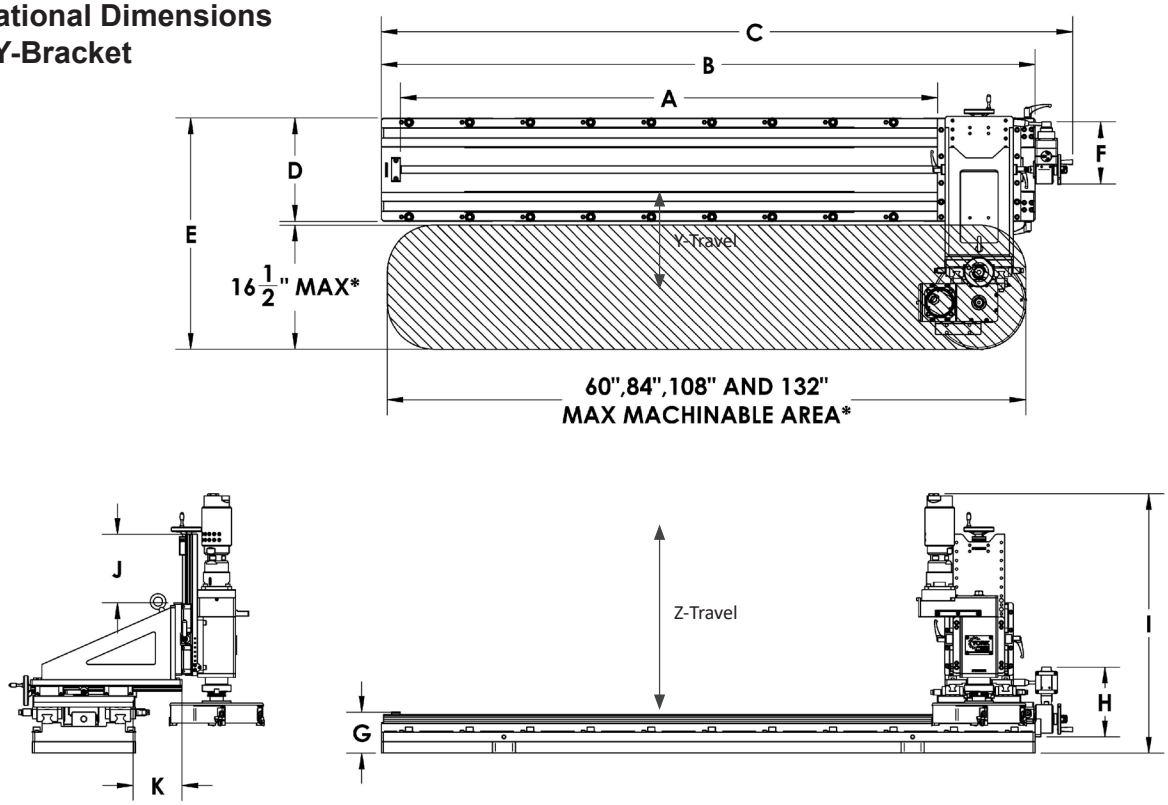


SPECIFICATIONS CHART

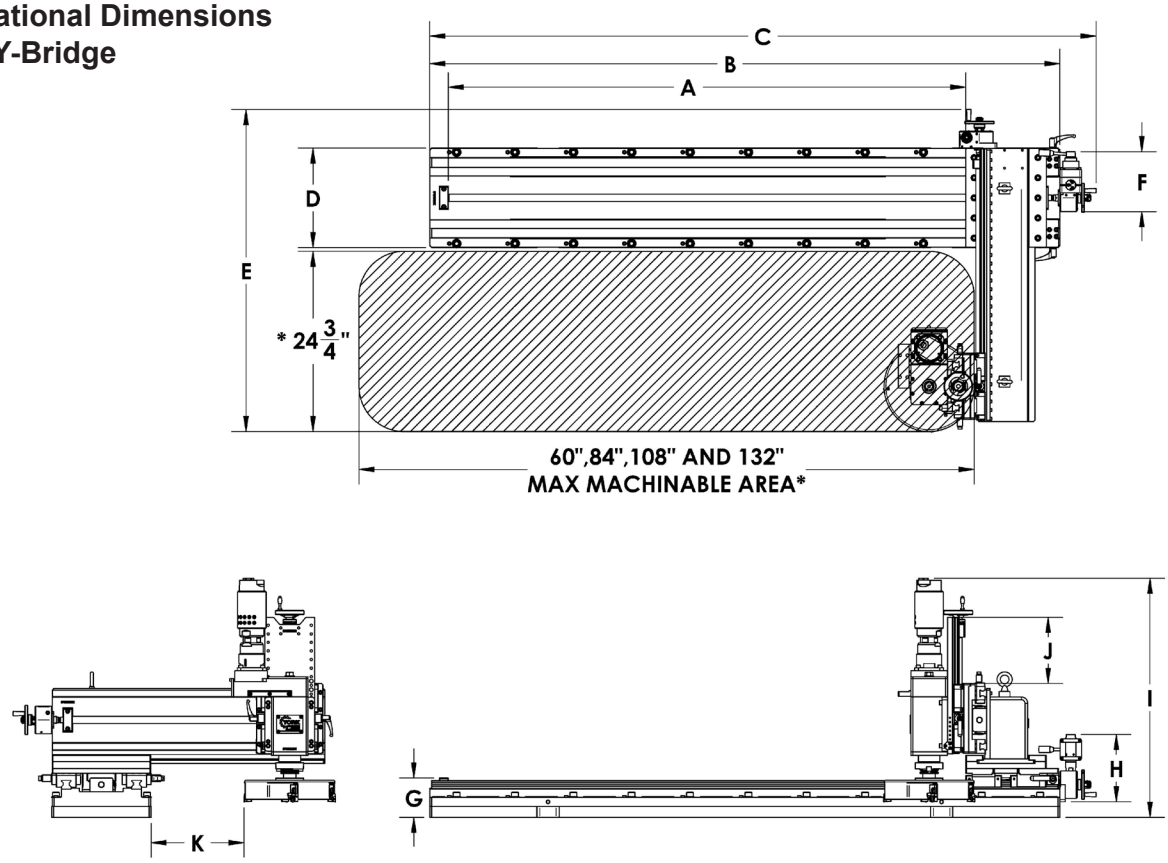
Linear Mill	Travel Length (in)	Length of Base (in)	Overall Length (in)	Width of Base (in)	Overall Width (in) E		Gearbox Width (in)	Base Height (in)
	A	B	C	D	Bracket Assy.	Bridge Assy.	F	G
LM-800-4	48	59.75	65	8	27.000	N/A	9	4.375
LM-1000-6	72	84.50	89	10	27.875	33.625	9	4.375
LM-1400-6	72	86.375	91.375	14	31.625	37.375	9	4.625
LM-1000-8	96	108.5	113.375	10	27.875	33.625	9	4.375
LM-1400-8	96	110.375	115.375	14	31.625	37.375	9	4.625
LM-1400-10	120	134.375	139.375	14	31.625	37.375	9	4.625

Linear Mill	Gearbox Height (in)	Overall Height (in)	Vertical Tool Travel (in)	Horizontal Tool Travel (in) K		Machine Weight	Shipping Weight	Shipping Dimensions
	H	I	J	Angle Bracket Assy.	Y-Bridge Assy.	(lbs)	(lbs)	(in)
LM-800-4	10.375	31.625	9	6	N/A	765	1165	26 x 41 x 76
LM-1000-6	10.375	31.625	9	6	16	1150	1520	27 x 42 x 101
LM-1400-6	10.625	32.250	9	6	16	1620	2050	22 x 39 x 99
LM-1000-8	10.375	31.625	9	6	16	1445	1690	22 x 39 x 123
LM-1400-8	10.625	32.250	9	6	16	1755	2500	22 x 39 x 123
LM-1400-10	10.625	32.250	9	6	16	1890	2750	32 x 43 x 156

Operational Dimensions with Y-Bracket



Operational Dimensions with Y-Bridge



** DIMENSIONS SHOWN USING 12" FLYCUTTER*

SAFETY PRECAUTIONS

The customer shall ensure that only people thoroughly trained in safe work procedures operate this machine. Safe working procedures are required when operating rotating machine tools. The misuse of this machine could result in severe injury or death.

Proper training and safety precautions can help avoid accidents.

Please observe all company and Government work safety practices.

- Keep others clear from the machine when it is running.
- Keep clear of the cutting head and other moving parts. Never try to remove chips while the machine is running.
- Disconnect the power when inserting or adjusting the cutting tool.
- Wear protective goggles, footwear and ear plugs. Please observe all Company and Government work-safe practices
- Do not wear loose fitting clothing that could get caught up or wrapped in the machine.
- Flying chips can cut or burn you. Do not remove cuttings with bare hands.
- Do not operate in water. Watch for electrical hazards.

MACHINE SAFETY

- Do Not leave machine unattended while in operation.
- Do not replace brass shear pin (1/8” brazing rod) with steel.
- Beware of pinch points. Keep all body parts clear of the machine while it is running.

Rotating machine parts can cause serious injuries, even death!

Running the X-Axis feed into End-Stops may damage machine.

For maximum safety and performance, read the entire instruction manual before operating this machine.

WARNING!
MOVING PARTS.
Keep hands, loose clothing, and hair away from rotating or moving parts. Disconnect the air supply from the machine and unplug all equipment prior to adjusting or servicing. If electric, remove power from the machine prior to adjusting or servicing.

WARNING!
ELECTRICAL SHOCK.
Possible shock if not handled properly.

WARNING!
KEEP DRY.
Keep all equipment and components away from any water source.

WARNING!
EYE PROTECTION.
Eye protection must be worn while operating or working near powered equipment.

WARNING!
EAR PROTECTION.
Ear protection should be worn while operating or working near loud equipment.

TOOL REQUIREMENTS AND SETUP

TOOL REQUIREMENTS

- Dial gauge and magnetic dial gauge stand
- Imperial Hex Keys
- 15/16 Box Wrench
- Welder
- CAT40 Taper Insert
- CAT40 Cutting Head

LINEAR MILL SETUP

1. Carefully remove all components from crate, lifting heavy items with a crane using the eye-bolts provided.

Lift X-BASE using all four EYE-BOLTS keeping X-BASE in a horizontal position (Figure 1).

DO NOT allow lifting straps to push down on BALL-SCREW (Figure 1).

2. Lift X-BASE by the four provided LIFTING HOIST RINGS with WELD PLATE attached with 5/8X1.75in CAP-SCREWS (Figure 1) and set X-BASE into final milling position.

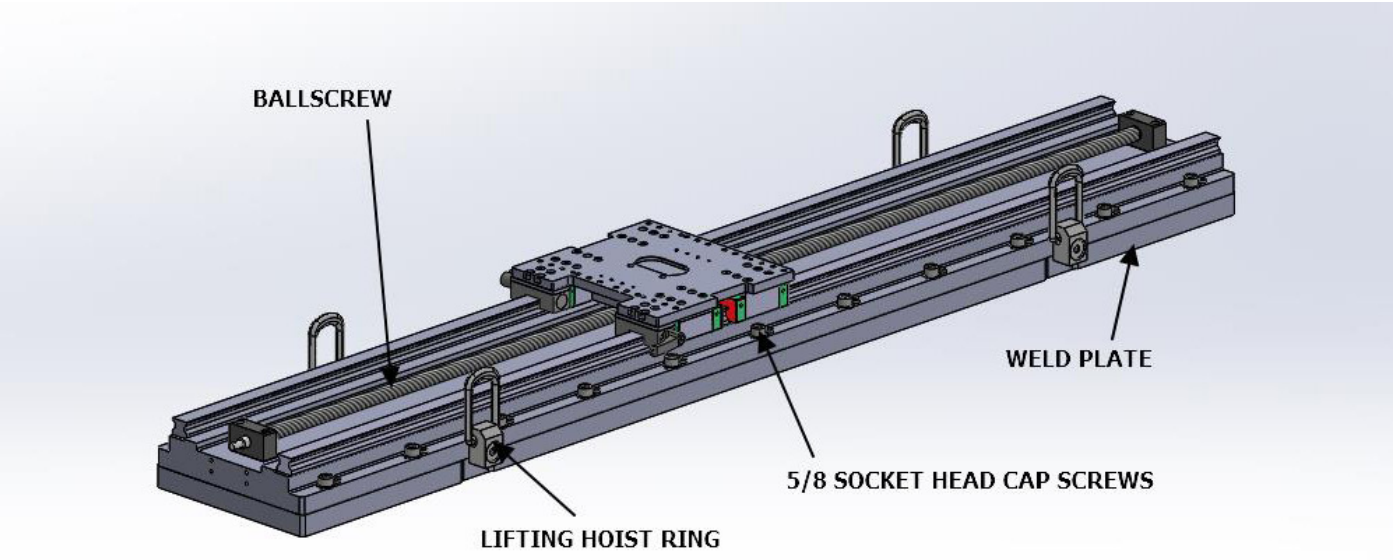


FIGURE 1

3. Remove ARM-CLAMPS from X-CARRIAGE. Using the provided EYE-BOLTS, place Y-ARM on X-CARRIAGE and reattach the ARM-CLAMPS, ensuring that the end of Y-ARM is flush or overhanging with the edge of X-CARRIAGE. Tighten the ½-13X1 SOCKET HEAD CAP SCREWS on both ARM-CLAMPS (Figure 2).

Do not extend Y-ARM inwards past the edge of the X-CARRIAGE to obtain more travel.

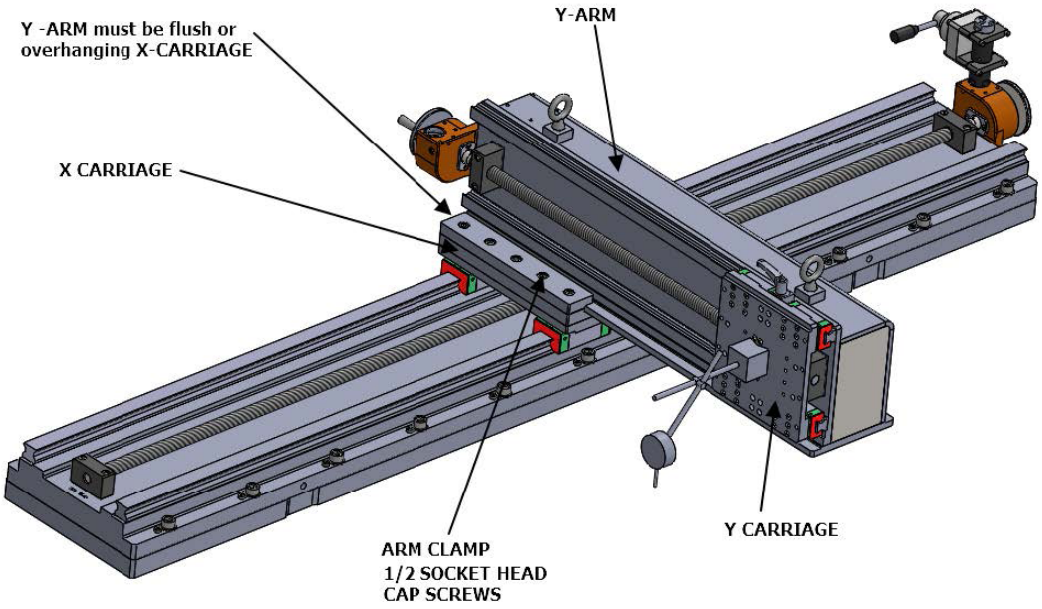


FIGURE 2

4. Take measurements with a scale or tape measure to ensure the base mill is straight or parallel to the pad or surface to be machined.

5. Place a series of stich welds about 1” long around the outside of the bottom of the weld plate to securely attach the mill and weld plate into position.

6. Loosen all 5/8-11 SOCKET HEAD CAP SCREWS in WELD-PLATE to allow adequate room for levelling.

Do not weld directly on any parts of the machine other than the WELD-PLATES.

While welding, cover/protect machine to prevent weld splatter from damaging rails, runner-blocks, ball-screw and other critical components.

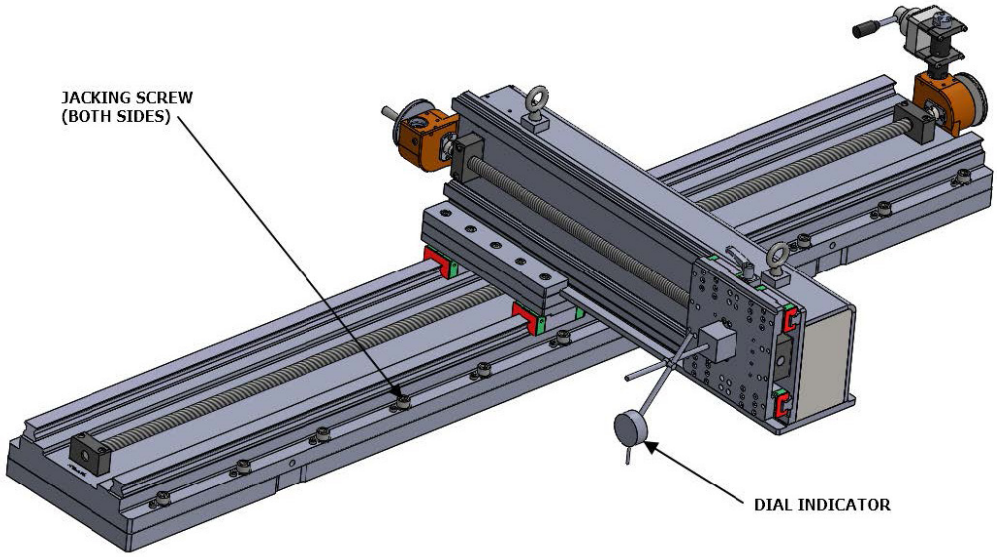


FIGURE 3

7. There are two different methods that can be used to level to mill for machining. One is to use an indicator as described below, and the other is to use either a machinist level or transit level to level the rails to the world.

8. Place a DIAL-INDICATOR on the Y-CARRIAGE (Figure 3) and level the machine by adjusting the JACKING SCREWS while running the DIAL-INDICATOR along both X and Y-axis.

9. Once level, attach the dial indicator next to one set of JACKING SCREWS with the dial indicator referencing the ground (Figure 4).

10. Carefully tighten the 5/8-11 CAP-SCREWS and the JACKING-SCREWS ensuring that the DIAL-INDICATOR doesn't change the position. Repeat for the other sets of JACKING SCREWS.

11. Lightly "Finger Tighten" JACKING-SCREWS into the remaining 8 positions and repeat the tightening procedure of both JACKING-SCREWS and 5/8-11 CAP-SCREWS using the DIAL-INDICATOR at each new position (Figure 4) to maintain level position.

Tightening the screws without the DIAL-INDICATOR can cause the X-BASE to bend, reducing flatness and potentially damaging the machine.

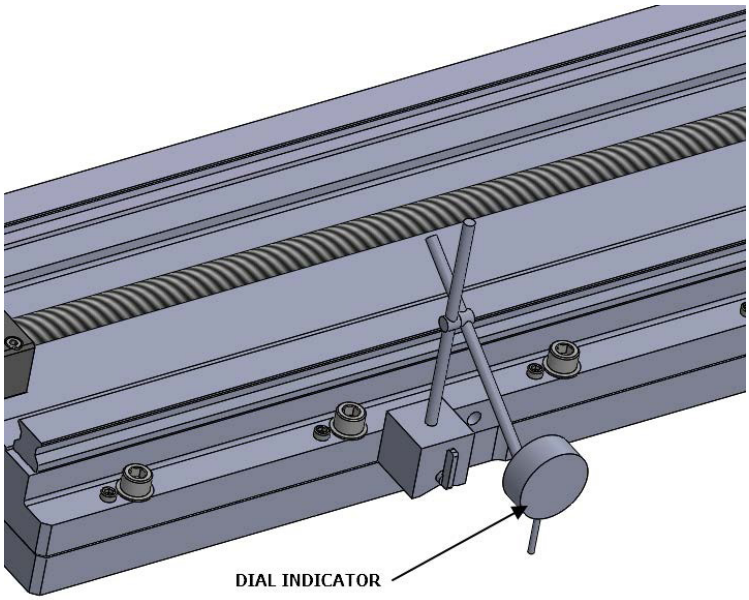


FIGURE 4

12. Align the top reference surface of the Z-ASSEMBLY onto the Y-CARRIAGE and align edges prior to inserting and tightening the 1/4-20 SOCKET HEAD CAP SCREWS on either side of the Z-ASSEMBLY (Figure 5).

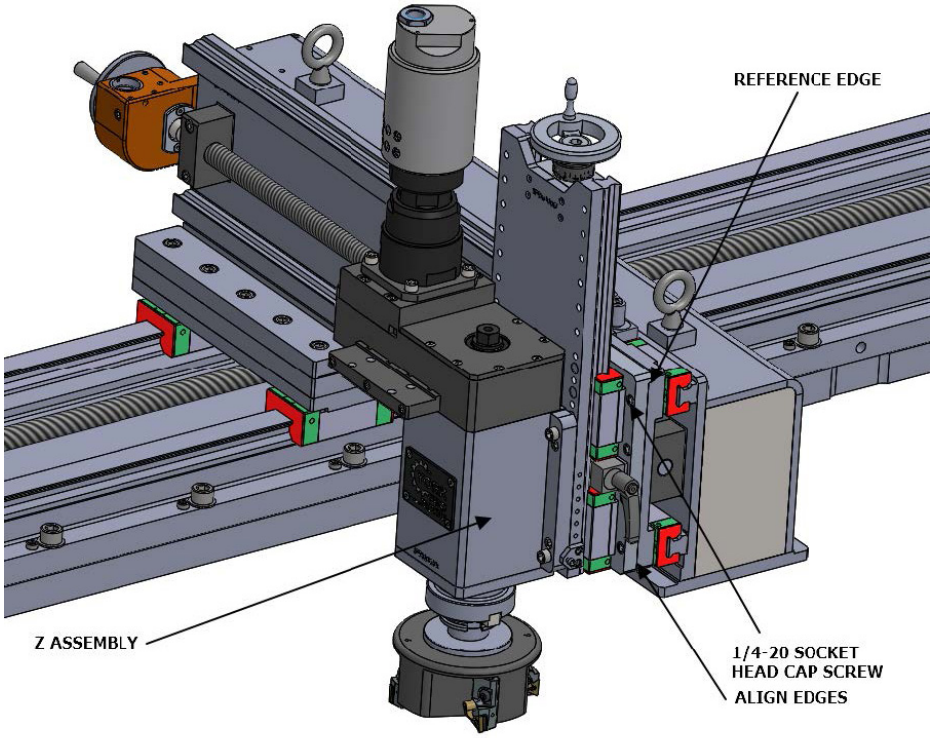


FIGURE 5

13. Note: There are different options for the SPINDLE position depending on desired height and if milling downwards, upwards or sideways. Additionally, the BELT-HOUSING can be dissembled and rotated to the left, right or center if clearance is required. This will require loosening and removal of timing pulleys.

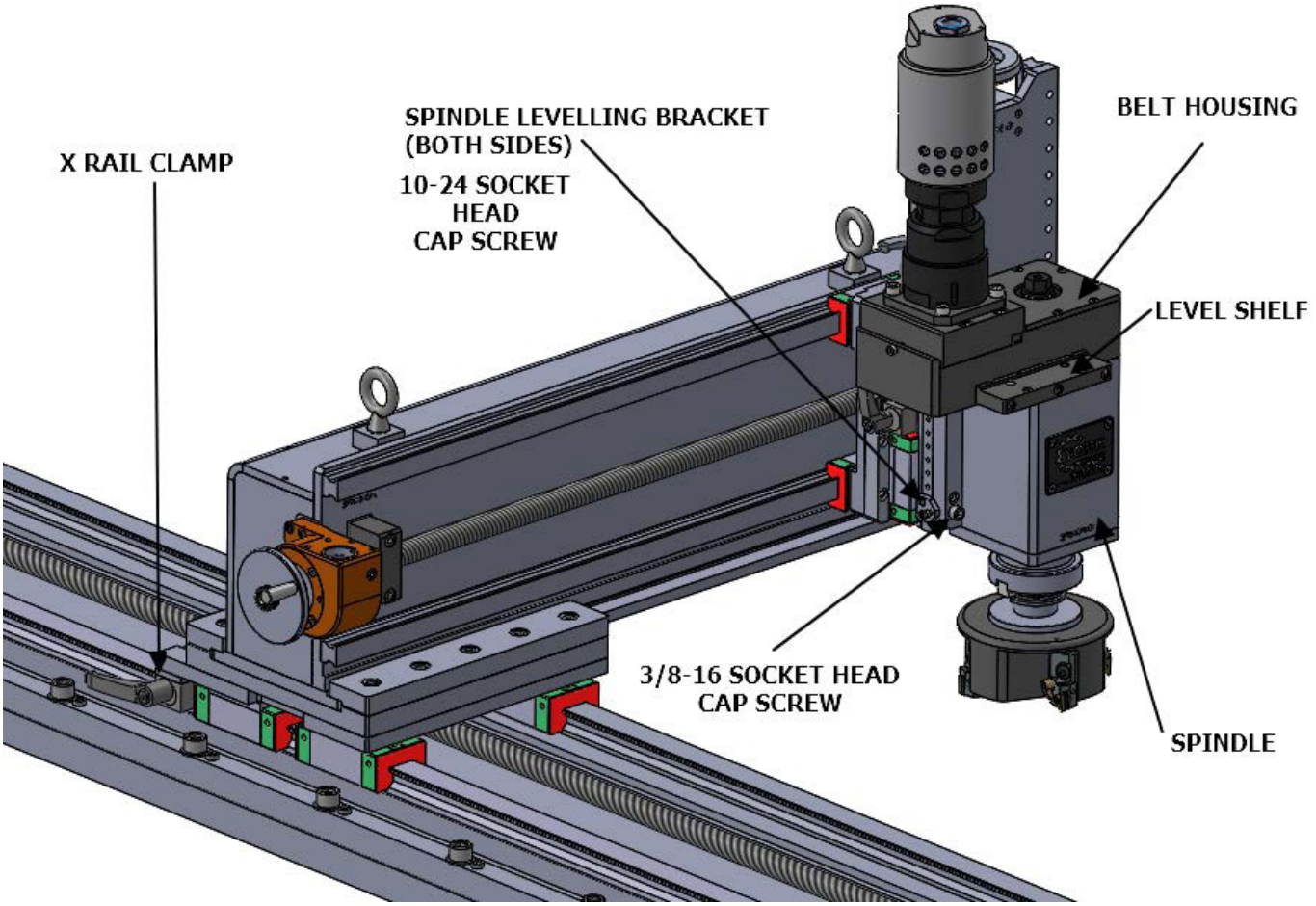


FIGURE 6

14. Place the user-provided CAT40 TAPER inside SPINDLE and draw up by tightening the DRAWBOLT. Attach the user-provided TOOL-HEAD to CAT40 TAPER.

OPERATION

1. The Linear Mill is similar in operation to any 3-Axis Milling Machine.
2. Before operating ensure all mounting fasteners are secure.
3. Ensure all pneumatic lines are connected correctly.
4. Start-up milling spindle away from job to check for correct rotation.
5. Adjust speed and feed to suit tooling and material.
6. To feed the X-Axis manually, loosen both X-RAIL-CLAMPS (Figure 6) and pull the CLUTCH outwards to disengage from the GEAR-BOX (Figure 7).

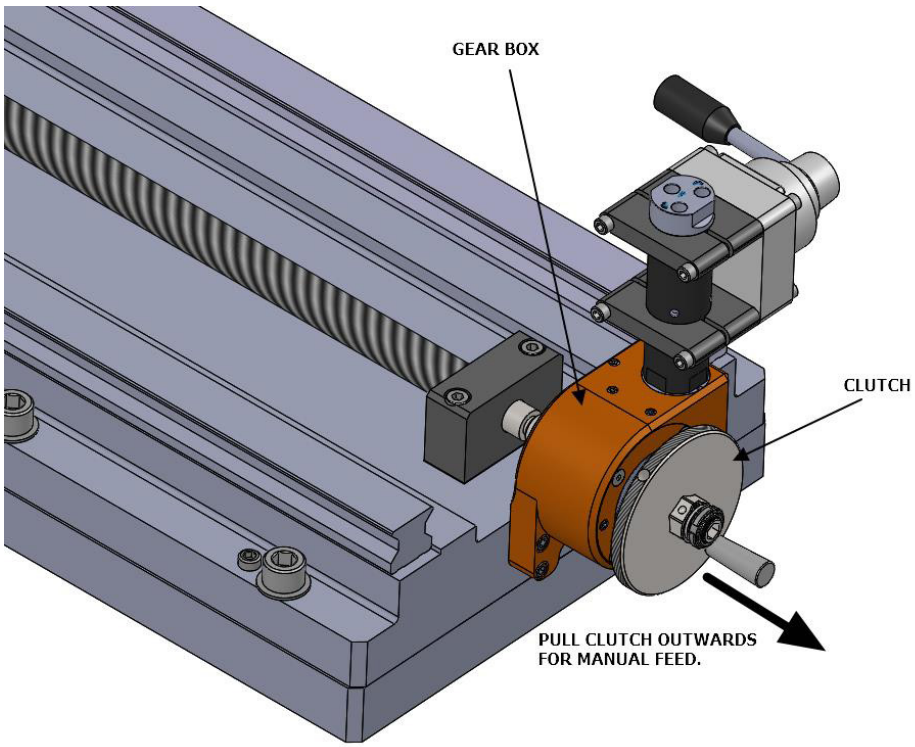


FIGURE 7

7. To feed the Y-Axis or Z-Axis, loosen RAIL-CLAMPS and turn HAND-WHEEL.

NOTE: Z-AXIS will drop when loosening RAIL-CLAMPS

8. To power feed the X-Axis, ensure CLUTCH is engaged by snapping it inwards towards the GEAR-BOX.
9. Lock out all the RAIL-CLAMPS in non-feeding axes when cutting material.

Vibrations from cuts which are too deep or too fast can cause the RAIL-CLAMPS to slip.

TIPS FOR BEST RESULTS

1. Slower feed on cuts will produce less vibrations and a better surface finish.

2. Conventional milling will produce less vibrations and a better surface finish.

3. Narrower cuts will produce better flatness by minimizing misalignment of cutter tool

4. It is recommended that with the pneumatic mill, a max depth of cut of 0.020” or less will achieve the best results.

5. Positioning the Linear Mill as close as possible to the material to be cut will produce better surface finish.

6. Hand-wheels can be placed on either end of the Y and Z-axis feeds.

7. Clear chips while machining (Do Not use your hands to clear chips)

MAINTENANCE & TROUBLESHOOTING

MAINTENANCE

Ensure during setup and operation that the X-BASE (Figure 1) is in an unstressed state. Failure to do so may result in damage to the machine components and undesired results to the work.

Timing belts will stretch over time and should be checked occasionally to ensure proper tension is maintained.

Ensure all machined surfaces are cleaned and lightly lubricated as assembled. Wipe off excess oil as oil will attract dirt and debris.

DO NOT weld directly to any part of the machine other than the WELD-PLATE (Figure 1).

While welding, cover exposed parts of the machine to prevent damage from weld splatter.

DO NOT use air to clear debris as debris may be forced into running components resulting in damage.

When not in use, machine should be stored in its crate and kept in a clean and dry environment.

TROUBLESHOOTING

SPINDLE NOT ROTATING

- Check pneumatic hose connections.
- Check air source

X-AXIS NOT FEEDING

- Check clutch is engaged
- Check shear pin hasn't sheared
- Check pneumatic hose connection
- Check air source

MACHINE DOESN'T HOLD POSITION

- Tighten RAIL-CLAMPS
- Reduce cut depth, cut width or feed speed to reduce vibrations

MACHINE AXIS HARD TO MOVE

- Disengage RAIL-CLAMPS

WARRANTY

Superior Plant Rentals, LLC (SPR) warrants that the equipment manufactured by it will: (i) conform to SPR's written specifications and descriptions, and (ii) be free from substantial defects in design, materials, and workmanship for a period of one year from date of shipment to the original buyer, or six months from date of placing in service by buyer, whichever date is earlier.

During this period, if any equipment is proved to SPR's satisfaction to be defective, SPR will, at our sole and absolute discretion, and as SPR's sole warranty liability and buyer's sole remedy, repair, replace, or credit buyer's account for any equipment that fails to conform to the warranties, provided that: (i) SPR is notified in writing within 10 days following discovery of such failure with a detailed explanation of any alleged deficiencies; (ii) SPR is given a reasonable opportunity to investigate all claims; and (iii) SPR's examination of such equipment confirms the alleged deficiencies and that the deficiencies were not caused by accident, misuse, neglect, improper use, unauthorized alteration, repair, or improper testing.

Shipping cost of the alleged defective equipment to SPR is to buyer's account. However, if SPR agrees that the equipment is defective, then pursuant to this warranty, SPR will reimburse buyer its shipping cost to return the equipment to SPR.

The warranty against defects does not apply to: (1) consumable components or ordinary wear items, and (2) use of the equipment with equipment, components, or parts not specified or supplied by SPR or contemplated under the equipment documentation.

The following actions will void the one-year warranty:

1. Repairs or attempted repairs have been made by persons other than SPR personnel, or authorized service repair personnel;

2. Repairs are required because of normal wear;

3. The tool has been abused or involved in an accident;

4. There is evidence of misuse such as overloading of the tool beyond its rated capacity, use after partial failure, or use with improper accessories.

5. Damage to the motor due to lack of oiler/mister while tool was in use (pending motor type).

NO OTHER WARRANTY IS VALID

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YORK PORTABLE MACHINE TOOLS

SUPERIOR PLANT RENTALS

CLIFF'S BITS PRECISION GRINDING & TOOLING

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