

TRAK® TRL LATHES

ProtoTRAK® RLX CNC

Safety, Installation, Maintenance, Service & Parts List

Document:	P/N 29542
Version:	102224

Covers Models:

- **1630RX**
- **1630HSRX**
- **1845RX**
- **2470RX**
- **3060RX**
- **30120RX**

TRAK MACHINE
TOOLS



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TRAK Machine Tools

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TRAK Machine Tools Reference Page

Use this page to log your machine's Model and Serial Number, as well as your Login credentials for buytrakparts.com. For additional manuals visit www.trakmt.com. For additional machine drawings not found in this manual, visit www.buytrakparts.com.

Machine Model & Serial Number

The plate below is for you to write down your model and serial number. Keep this info handy for when you contact Customer Service.

TRAK MACHINE TOOLS

 **SOUTHWESTERN INDUSTRIES, INC.**

2615 HOMESTEAD PLACE,
RANCHO DOMINGUEZ, CA 90220

MODEL

S/N

THIS UNIT HAS _____ POWER SOURCE(S)
ELECTRICAL RATINGS:

<input type="text"/>	VOLTS	<input type="text"/>	AMPS	<input type="text" value="3"/>	PHASE
<input type="text" value="60"/>	Hz				
<input type="text"/>	VOLTS	<input type="text"/>	AMPS	<input type="text" value="1"/>	PHASE
<input type="text" value="60"/>	Hz				

FLA OF LARGEST MOTOR AMPS

SHORT CIRCUIT CURRENT RATING AMPS

ELECTRICAL DRAWING #:

MACHINE (ONLY) MADE IN TAIWAN

Buytrakparts.com Login Credentials

Login: _____

Password: _____

1.0 Safety Specifications

The safe operation of the TRAK TRL Lathe & ProtoTRAK RLX CNC depends on its proper use and the precautions taken by each operator.

- Read and study the TRAK TRL Lathe & ProtoTRAK RLX CNC Safety, Programming, Operating, and Care Manual. Be certain that every operator understands the operation and safety requirements of this machine **before** its use.
- Read and study the TRAK TRL Lathe Safety, Installation, Maintenance, Service & Parts List Manual. Be certain that every operator understands the operation and safety requirements of this machine **before** servicing.
- Always wear safety glasses and safety shoes.
- Always stop the spindle and check to ensure the CNC control is in the stop mode before changing or adjusting the tool or workpiece.
- Never wear gloves, rings, watches, long sleeves, neckties, jewelry, or other loose items when operating, or around the machine.
- Use adequate point of operation safeguarding. It is the responsibility of the employer to provide and ensure point of operation safeguarding per ANSI B11.6-2001.

1.1 Safety Publications

Refer to and study the following publications for assistance in enhancing the safe use of this machine:

Safety Requirements for Manual Turning Machines with or without Automatic Control (ANSI B11.6-2001). Available from the American National Standards Institute, 1819 L Street N. W., Washington, D.C. 20036.

Concepts And Techniques Of Machine Safeguarding (OSHA Publication Number 3067). Available from The Publication Office - O.S.H.A., U.S. Department of Labor, 200 Constitution Avenue, NW, Washington, DC 20210.

All other regulations are specific to the State in which the machine is installed.

1.2 Danger, Warning, Caution, and Note Labels and Notices as Used In This Manual

DANGER – Immediate hazards that **will** result in severe personal injury or death. Danger labels on the machine are red in color.

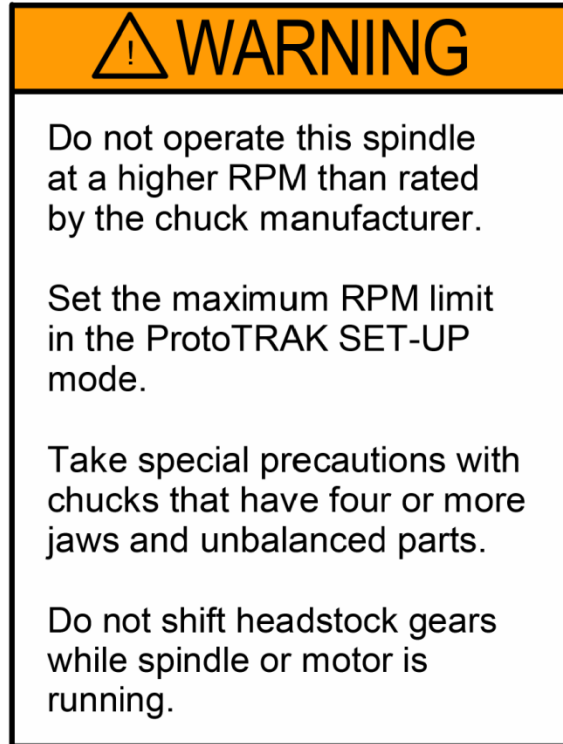
WARNING – Hazards or unsafe practices that *could* result in severe personal injury and/or damage to the equipment. Warning labels on the machine are gold in color.

CAUTION – Hazards or unsafe practices that *could* result in minor personal injury or equipment/product damage. Caution labels on the machine are gold in color.

NOTE – *Call attention to specific issues requiring special attention or understanding.*

Safety & Information Labels Used on the TRAK TRL Lathe

It is forbidden by OSHA regulations and by law to deface, destroy or remove any of these labels




i01162



i01161

**Danger, Warning, Caution, and Note Labels and Notices Listed Below
TRAK TRL 3060 and 30120RX Only**

SAFETY WARNING

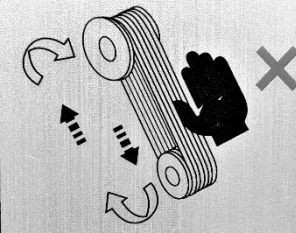


1. Read the instruction manual before installing or operating the machine.
2. Do Not turn on the power before the protective grounding has been securely connected.
3. Isolate power before install, test, adjust or maintain the electrical equipment of this machine.
4. Hazardous voltage present in the electrical equipment of this machine. Only qualified engineers are allowed to install, test, adjust or maintain it.
5. Residual, hazardous voltages remain after the power is disconnected. Wait 5 minutes after removal of power before undertaking any work on the electrical equipment of this machine.
6. Observe all instructions written on the caution plates.
7. Never operate the machine without the protective covers, interlock, or other safety devices in place.
8. Do Not make any modifications to this machine or its controls without authorisation from the manufacturer.
9. The machine starts and moves automatically. Never touch or stand near revolving or moving parts.
10. Never remove or obstruct the view of any warning plates on the machine.
11. Do Not change any device of this machine without permission.

FAILURE TO OBSERVE THE ABOVE INSTRUCTIONS MAY CAUSE SERIOUS PERSONAL INJURY OR MACHINE DAMAGE.

S-S3051

WARNING



1. Isolate power before removing covers.
2. High speed belt and pulley inside! Do not touch moving parts.
3. Failure to comply with the above may result in serious injury.

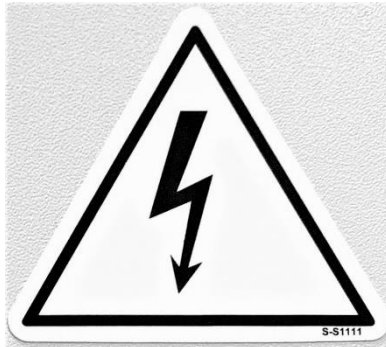
S-S2040

480 VOLTS

CAUTION

Crush hazard.
Keep hands clear.

S-S2230



WARNING

Bars may only protrude beyond this point if adequate additional guarding and support is provided.

S-S2140

CAUTION

Please remove the transit bolts before powering up the machine.

S-S3110

WARNING

S-S2030

Do not put your hands close to the center to avoid injury.

CAUTION


1. Air pressure must be between 6 - 7kgf/cm² (85psi-100psi).
2. Filter and Lubricator must be maintained once a week.
3. Recommended Air line - 12mm (1/2 inch).

S-S2050

<p>Eye protection must be worn</p>	<p>Do not touch moving chuck or parts.</p>	<p>WARNING</p> <p>Never open door during operation. Do not operate with door open / removed. Flying objects can cause injury or death.</p> <ol style="list-style-type: none"> 1. Do not tamper with any safety devices. 2. This equipment should only be operated by qualified personnel that have been trained in the operation and use of this equipment. 3. Do not operate with any guard removed. Lockout / tagout before servicing. <p>FAILURE TO OBSERVE THESE INSTRUCTIONS MAY CAUSE SERIOUS PERSONAL INJURY OR MACHINE DAMAGE.</p> <p>S-S2340</p>
<p>Read and understand operator's manual and all other safety instructions before using this machine.</p>	<p>Crush hazard. Keep hands clear when opening / closing door.</p>	
<p>Do not operate with any guard removed. Lockout / tagout before servicing.</p>		

The following label is found near the window(s) on all lathes. On the 1630, 1845 and 2470 lathes, the window(s) should be replaced every 12 months. For the 3060 and 30120, the window must be replaced every 3 years if the polycarbonate window is surrounded by glass.

TRAK[®] MACHINE TOOLS


 SOUTHWESTERN INDUSTRIES, INC.

Installed Date _____

To be Replaced By Date _____

Customer Service - 1 • 800 • 367 • 3165

TRAK MACHINE TOOLS

 SOUTHWESTERN INDUSTRIES, INC.

2615 HOMESTEAD PLACE,
RANCHO DOMINGUEZ, CA 90220

MODEL

S/N

THIS UNIT HAS _____ POWER SOURCE(S)
ELECTRICAL RATINGS:

VOLTS AMPS PHASE
 Hz

VOLTS AMPS PHASE
 Hz

FLA OF LARGEST MOTOR AMPS

SHORT CIRCUIT CURRENT RATING AMPS

ELECTRICAL DRAWING #:

MACHINE (ONLY) MADE IN TAIWAN

Power Requirements at 208 Volts, 3-phase 60 Hz		
Model	Full-load Amp of Machine	Full-load Amp of Largest Motor
1630RX	44	20
1630HSRX	44	20
1845RX	54	30
2470RX	73	40.5

Power Requirements at 480 Volts, 3-phase 60 Hz		
Model	Full-load Amp of Machine	Full-load Amp of Largest Motor
3060RX	62	42
30120RX	62	42

1.3 Safety Precautions

WARNING!

Use only chucks which are rated to the maximum RPM of the lathe.

1. Do not operate this machine before the TRAK TRL Lathe and ProtoTRAK RLX CNC Programming, Operating and Care Manual has been studied and understood.
2. Read and study this TRAK TRL Lathe Safety, Installation, Maintenance, Service & Parts List Manual. Be certain that every operator understands the operation and safety requirements of this machine **before** servicing.
3. Do not run this machine without knowing the function of every control key, button, knob, or handle. Ask your supervisor or a qualified instructor for help when needed.
4. Protect your eyes. Wear approved safety glasses (with side shields) at all times.
5. Don't get caught in moving parts. Before operating this machine, remove all jewelry, including watches and rings, neckties, and any loose-fitting clothing.
6. Keep your hair away from moving parts. Wear adequate safety headgear.
7. Protect your feet. Wear safety shoes with oil-resistant, anti-skid soles, and steel toes.
8. Take off gloves before you start the machine. Gloves are easily caught in moving parts.
9. Remove all tools (wrenches, chuck keys, etc.) from the machine before you start. Loose items can become dangerous flying projectiles.
10. Never operate any machine tool after consuming alcoholic beverages, or taking strong medications, or while using non-prescription drugs.
11. Protect your hands. Stop the machine spindle and ensure that the CNC control is in the STOP mode:
 - Before changing tools
 - Before changing parts
 - Before you clear away the chips, oil or coolant. Always use a chip scraper or brush
 - Before you make an adjustment to the part, chuck, coolant nozzle or take measurements
 - Before you open safeguards (protective shields, etc.). Never reach for the part, tool, or fixture around a safeguard.
12. Protect your eyes and the machine as well. Don't use a compressed air hose to remove the chips or clean the machine (oil, coolant, etc.).
13. Stop and disconnect the power to the machine before you change belts, pulley, gears, etc.
14. Keep work area well lighted. Ask for additional light if needed.
15. Do not lean on the machine while it is running.
16. Prevent slippage. Keep the work area dry and clean. Remove the chips, oil, coolant and obstacles of any kind around the machine.
17. Avoid getting pinched in places where the spindle, carriage, cross slide or sliding door create "pinch points" while in motion.
18. Securely clamp and properly locate the workpiece in the chuck or in the fixture. Use proper tool holding equipment.
19. Use correct cutting parameters (speed, feed, and depth of cut) in order to prevent tool breakage.
20. Use proper cutting tools for the job.
21. Prevent damage to the workpiece or the cutting tool. Never start the machine (including the rotation of the spindle) if the tool is in contact with the part.

22. Don't use dull or damaged cutting tools. They break easily and may become airborne. Inspect the sharpness of the edges, and the integrity of cutting tools and their holders.
23. Large overhangs on cutting tools when not required result in accidents and damaged parts.
24. Prevent fires. When machining certain materials (magnesium, etc.) the chips and dust are highly flammable. Obtain special instruction from your supervisor before machining these materials.
25. Prevent fires. Keep flammable materials and fluids away from the machine and hot, flying chips.
26. Never change gears when the spindle is rotating.
27. Do not rotate the spindle by hand unless the Red Emergency Stop button is pressed.
28. On the 3060 and 30120 lathe, the door and pendant moves along the Z axis. Be careful to stay out of the way as it moves. There are safety switches on each side of the door so if the door hits an operator the machine will go into an E stop condition.

2.0 Installation

Read and understand this entire installation section before beginning the installation procedure.

2.1 Floor Plan, Layout & Space Requirements

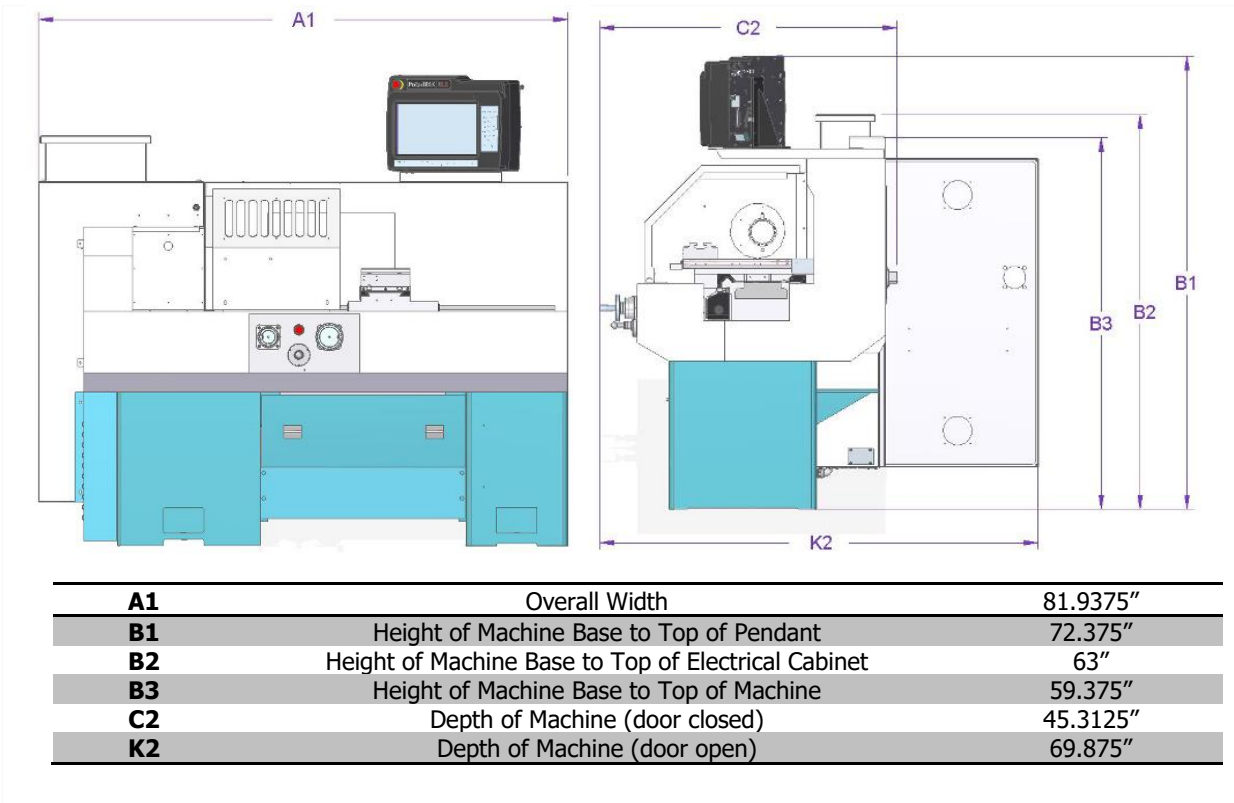
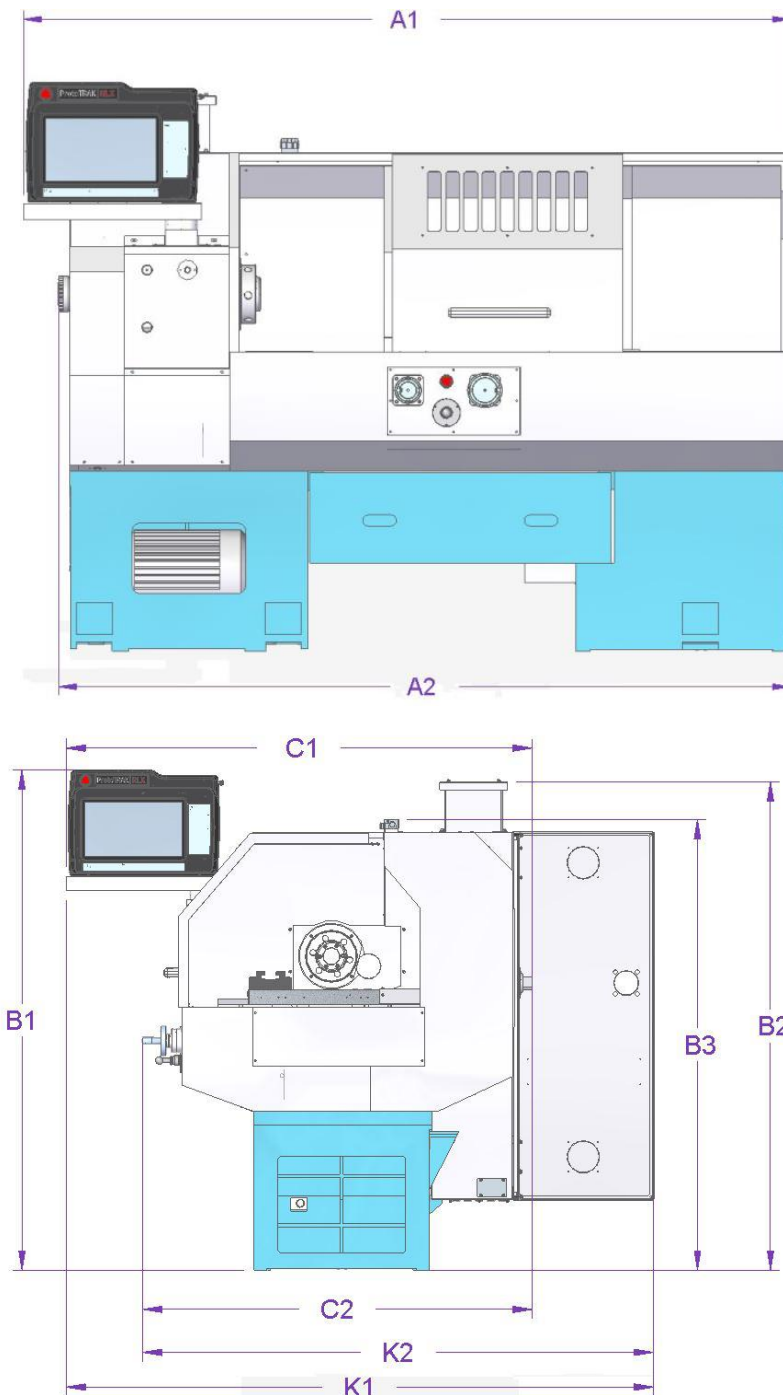
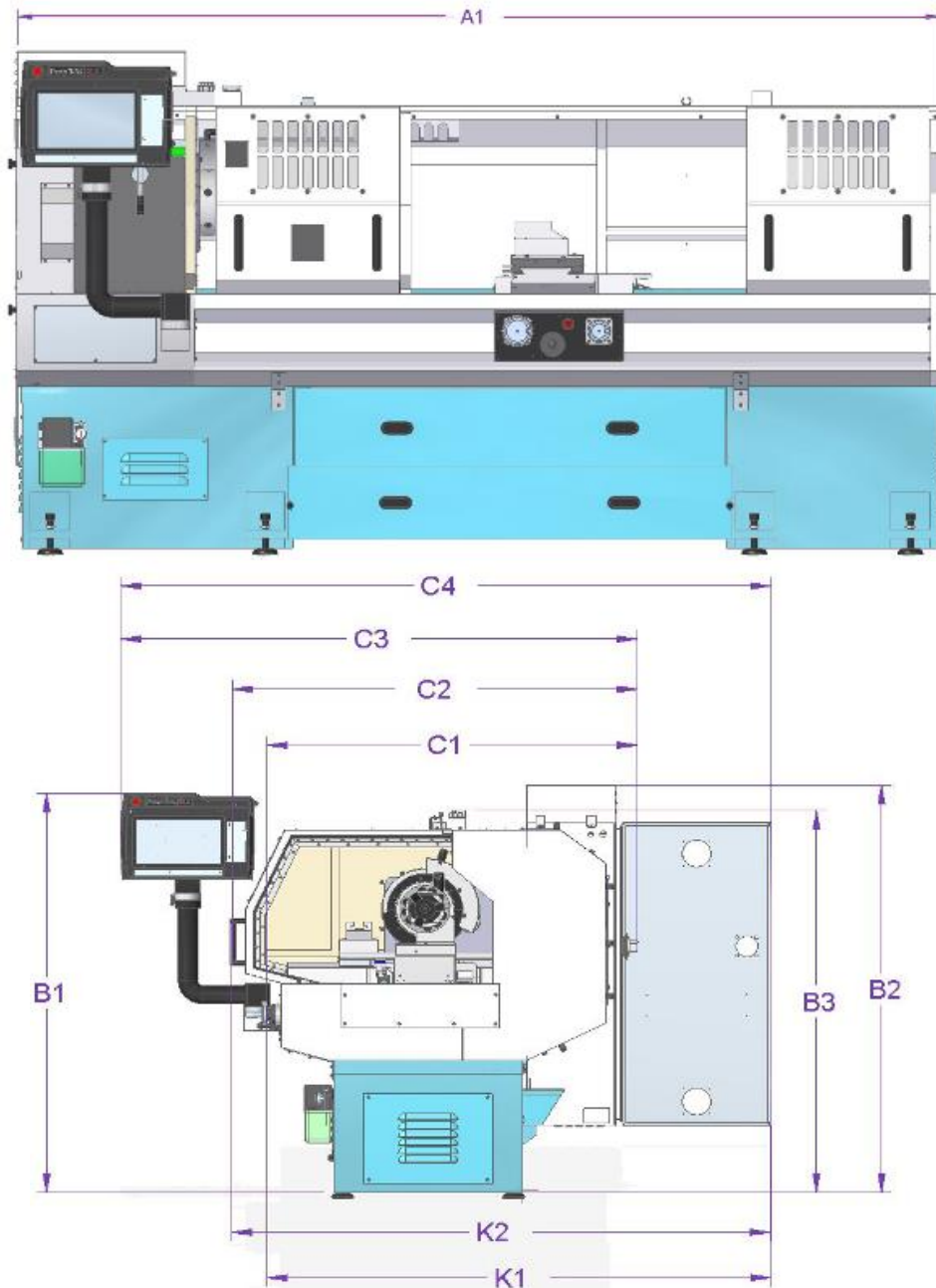


Figure 2.1a – 1630RX and 1630HSRX Lathe



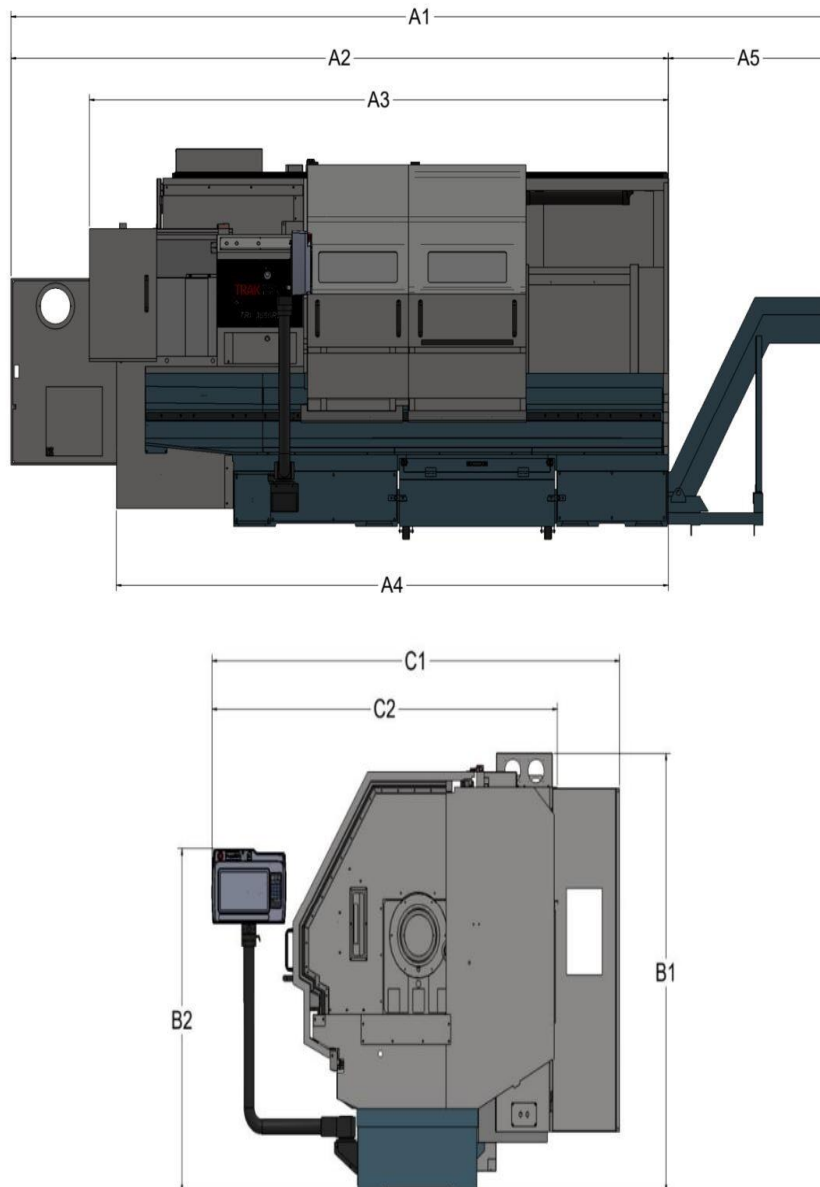
A1	Overall Width	94.25"
A2	Maximum Width of Machine (Pendant arm retracted)	89.9375"
B1	Height of Machine Base to Top of Pendant	69.9375"
B2	Height of Machine Base to Top of Electrical Cabinet	68.25"
B3	Height of Machine Base to Top of Machine	63.25"
C1	Depth of Machine with Pendant swung out (door closed)	65.375"
C2	Depth of Machine Pendant retracted (door closed)	55.125"
K1	Depth of Machine with Pendant swung out (door open)	88.3125"
K2	Depth of Machine with Pendant retracted (door open)	71.75"

Figure 2.1b – 1845RX Lathe



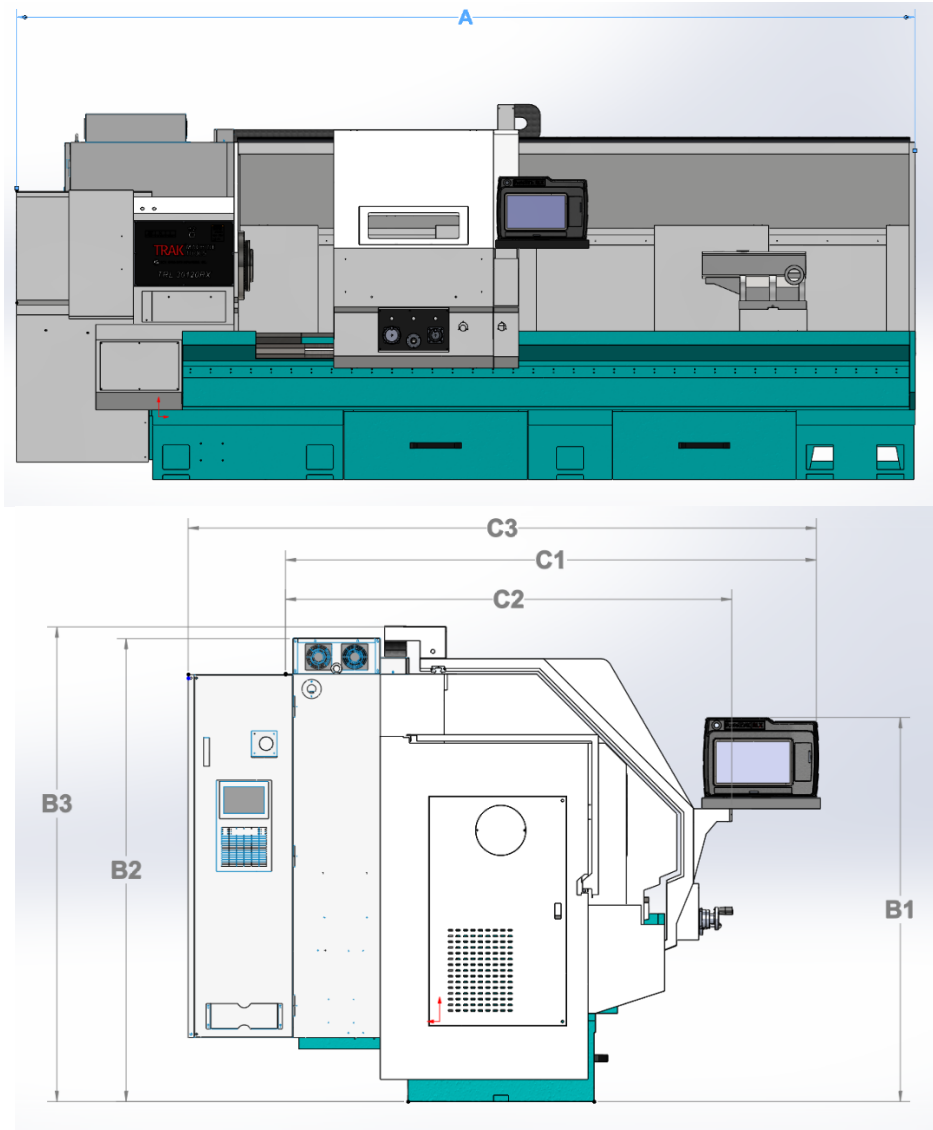
A1	Overall Width	129.125"
A2	Maximum Width of Machine (Pendant arm retracted)	89.9375"
B1	Height of Machine Base to Top of Pendant	69.9375"
B2	Height of Machine Base to Top of Machine	68.25"
B3	Depth of Machine with Pendant swung out (door closed)	82"
C1	Depth of Machine with Pendant retracted (door closed)	64.75"
C2	Depth of Machine with Pendant retracted (door closed)	55.125"
K1	Depth of Machine with Pendant swung out (door open)	88.3125"
K2	Depth of Machine with Pendant retracted (door open)	85.0625"

Figure 2.1c – 2470RX Lathe



A1	OVERALL WIDTH WITH CONVEYOR	219.95" [5586.8mm]
A2	OVERALL WIDTH WITH SPINDLE MOTOR LEFT SIDE DOOR OPEN	179.03" [4547.4mm]
A3	OVERALL WIDTH WITH REAR CHUCK DOOR OPEN	157.68" [4005.0mm]
A4	OVERALL WIDTH	150.35" [3819.0mm]
A5	CONVEYOR PROJECTION	40.92" [1039.4mm]
B1	OVERALL HEIGHT	85.87" [2181.0mm]
B2	PENDANT HEIGHT	67.28" [1709.0mm]
C1	OVERALL DEPTH WITH ELECTRICAL CABINET DOORS OPEN	117.09" [2974.0mm]
C2	OVERALL DEPTH	99.17" [2518.9mm]

Figure 2.1d – 3060RX Lathe



A	Overall Width	210.75"
B1	Height of Machine Base to Top of Pendant	71.5"
B2	Height of Machine Base to Top of Electrical Cabinet	86"
B3	Height of Machine Base to Top of Machine	88.25"
C1	Depth of Machine with Pendant rotated 90° (door closed)	99"
C2	Depth of Machine Pendant (door closed)	82.75"
C3	Depth of Machine with Pendant rotated 90° (door open)	117.5"

Figure 2.1d – 30120RX Lathe

2.2 TRAK TRL Lathe Specifications

Capacity	1630RX	1630HSRX	1845RX	2470RX	3060RX	30120RX
Height of Centers	8"	8"	9"	12"	16.5"	16.5"
Distance Between Centers	30"	30"	45"	70"	60"	118"
Swing Over Bed	16"	16"	18.1"	24"	33"	33"
Swing Over Saddle Wings	16"	16"	17"	24"	33"	33"
Swing Over Cross Slide	8.6"	8.6"	9.13"	14.5"	21.2"	21.2"
Cross Slide Travel	8.5"	8.5"	10.6"	12.5"	20.5"	20.5"
Tool Section Max.	¾"	¾"	1"	1"	1.5"	1.5"
Coolant	8 gal.	8 gal.	13 gal.	15 gal.	35.6 gal.	48 gal.
Oil Pump – Way Lubrication	2 liter	2 liter	2 liter	2 liter	2 liter	2 liter
Oil Reservoir – Headstock	1.5 gal.	None	1.85 gal.	5.3 gal ~6.3 gallon with oil cooler option	> 10 Gallons	> 10 Gallons
Bed						
Width	12.6"	12.6"	13.4"	14.57"	18"	19.69"
Height	12.6"	12.6"	12.4"	15"	15.75"	18.7"
Headstock						
Spindle Nose	D1-6	A2-4	D1-6	D1-8	A2-11	A2-11
Spindle Through Hole	2.12"	1.57"	2.36"	4.09"	6.3"	6.3"
Spindle Taper	MT#6	MT#5	MT #6	MT #8	Non standard taper in spindle	Non standard taper in spindle
Taper in Reduction Sleeve	n/a	n/a	MT #4	MT #5	MT #6	MT #6
Spindle Taper Runout	Max 0.0004"	Max 0.0003"	Max 0.0004"	Max 0.0004"	Max 0.0004"	Max 0.0004"
Spindle Face Runout	Max 0.0006"	Max 0.0006"	Max 0.0006"	Max 0.0006"	Max 0.0006"	Max 0.0006"
Spindle Diameter Front Bearing	3.15"	2.56"	3.35"	5.51"	7.87	7.87"
Number of Bearings	2	5	2	2	2	2
Number of Spindle Speed Ranges	1	1	2	2	2	2
Spindle Speed Range (RPM)	150-2500	150-4000	80 – 850 250 - 2500	40-670, 100-1800	20-415 40-1300	20 – 415, 40 - 1300
Spindle ID Thread on end of Spindle	M56 X 2 MM Pitch	M56 X 2 MM Pitch	N/A	N/A	M185 X 3.0	M185 X 3.0
Headstock and Tailstock Alignment (Top of Arbor)	Up and Down tolerance 0.000" + 0.004" only at tailstock end					
Tailstock						
Quill Travel	5.75"	5.75"	6"	8.5"	8	8"
Quill Diameter	2.36"	2.36"	2.56"	3.5"	4.13	4.13"
Quill Taper Hole	MT#4	MT#4	MT#4	MT #5	MT #6	MT6
Spindle Motor						
H.P.	7.5	7.5	10	15	30	30
Machine Power Requirements						
Voltage	200 to 240	200 to 240	200 to 240	200 to 240	432 to 528	432 to 528
Amps, Full Load	44	44	54	73	62	62
Phase, Hz	3/60	3/60	3/60	3/60	3/60	3/60
Dimensions						
Net Inches L x W x H lbs.	82 x 40 x 71", 2750	82 x 40 x 71", 2750	88.5 x 49 x 61", 3285	129 x 60 x 77" 6500 lbs	150.31" x 86.61 x 88.25" 13970	212.6" x 86.61" x 79.53" 18920

Capacity	1630RX	1630HSRX	1845RX	2470RX	3060RX	30120RX
Ship Inches L x W x H lbs.	87 x 45 x 67", 3420	87 x 45 x 67", 3420	91 x 52 x 84 3800 lbs	134 x 64 x 77" 6900 lbs	162" x 90.55 x 96.25" 14270	222.44" x 90.55" x 110.23", 19270
Other						
Coolant Pump Motor, H.P.	1/8	1/8	1/8	1/8	1/4	1/4
Spindle Motor Brake			Dynamic Braking			
Way Surface Hardness	400 – 450 HB			480-560 HB		
Headstock Lubrication	Oil Bath	Grease	Oil Bath	Oil Bath	Oil Bath	Oil Bath
Options						
Tooling Kit	¾"	¾"	¾" or 1"	1"	1 ¼	1 ¼ "
Chuck	8", D1-6	6", A2-4	8", D1-6	12", D1-8	20" Front 16" Rear	20" Front 16" Rear
5C Collet Closer	D1-6	A2-4	D1-6	n/a	n/a	n/a
Pneumatic Turret Option	¾", 8-Position ¾", 4-position	¾", 8-Position ¾", 4-position	¾ or 1" 8-position ¾ or 1" 4-position	1", 4-position 1", 8-position	n/a	n/a
Hydraulic Turret Option – Includes hydraulic system	n/a	n/a	n/a	n/a	1", 8 position	1", 8 position

* No maintenance grease cartridge

2.3 Uncrating

Carefully remove the wood crate and protective packaging, paying attention not to scratch, damage, or mar any parts of the machine.

Remove the cardboard boxes with the PENDANT DISPLAY (handle carefully). The leveling pads and screws for the machine can be found in the toolbox.

Loosen and remove the screws and nuts holding the machine to the wood pallet.

ATTENTION!
Immediately report, in writing, any damages observed at this time that can be attributed to the transportation or improper handling/moving of the machine.

Figure 2.3 shows the bracket used to ship the 2470 doors during shipment. This bracket remains on the machine, but the bolt circled is to be removed.

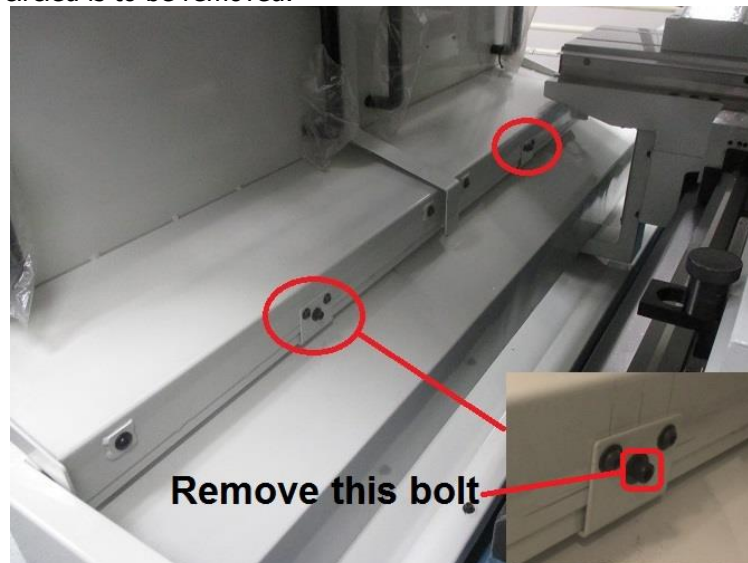


Figure 2.3 – 2470 Door Shipping Bracket

2.3.1 Uncrating 3060 and 30120

The following boxes or loose parts are placed on the pallet or on the machine when shipping.

1. Pendant box
2. Jogstick and X and Z electronic handwheels that mount on apron
3. Tool box which contains the level feet
4. Chuck wrench key
5. Coolant pump
6. Air regulator at tailstock end of lathe. Must be installed back on the machine. End user to provide a 3/8" NPT fitting to match the air line fittings in that shop.
7. Reduction sleeve and dead centers for headstock and tailstock
8. Coolant hose that runs between the 2 coolant tanks (see picture)
9. 3 sheet metal covers that are used to cover the leveling feet.
10. Extra set of fingers if end user orders a steady rest option

The machine ships with the main door attached to the saddle and the saddle locked to the tailstock and the tailstock then locked to the bedway. The control, EHW's and jogstick must be installed to disconnect the door from the saddle. Use the door open button on the apron to do so.

Remove the coolant tanks from the pallet and connect the tanks with the coolant hose provided in one of the boxes that shipped with the lathe. Make sure to install the coolant pump as shown in picture so the coolant line faces the tailstock end of the machine. Attach the coolant pump cable to the connector on the electrical cabinet. One connector is for the coolant pump and one is for the chip conveyor.





If the machine comes with a steady rest, it will be fastened to the bed way for shipping. Remove the steady rest so you can move the Z axis fully along its travel length.

2.4 Shortages: Inventory Checklist

- _____ Machine (check model and serial number)
- _____ Leveling pads and screws (4 each for 1630RX, and 1630HSRX, 6 each for 1845 RX, 8 each for 2470RX and 3060RX and 10 for 30120RX)
- _____ Pendant Display – 29006-3
- _____ Toolbox with various tools
- _____ TRAK Lathe Safety, Operation & Programming Manual (P/N 29540)
- _____ TRAK Lathe Safety, Installation, Maintenance, Service & Parts List Manual (P/N 29542)

In case of shortages, contact the representative from whom you purchased the machine.

2.5 Installation Instructions & Checklist (not applicable to 3060RX and 30120)

Installer: Use this checklist to assure a complete set-up of the RX Lathes.

<input type="checkbox"/>	1.	Shut off power to the machine.
<input type="checkbox"/>	2.	Visually inspect the 208-wiring going into the electrical panel. Visually verify the wiring is correct per our wiring diagram. Make sure a strain relief is being used where the wiring enters the cabinet. Have the customer repair any wiring discrepancies.
<input type="checkbox"/>	3.	Clean the machine if needed and remove any remaining grease.
<input type="checkbox"/>	4.	Mount the pendant on top of the sliding door or on the pendant arm. Make sure the pendant swivels and slides easily.
<input type="checkbox"/>	5.	Make and check all the proper electrical connections from the pendant to the electrical cabinet. See the pendant and electrical cabinet wiring diagrams. Be sure to mount the cable cover to the left side of the pendant.
<input type="checkbox"/>	6.	Slide the door or doors back and forth to make sure it slides smoothly. For the 2470, remove the bolt that holds the door in place during shipment. There is one for each door. See picture in section 2.3. For the 1845, remove the bracket that holds the door in place.
<input type="checkbox"/>	7.	Remove the protective plastic cover from the headstock nameplate.
<input type="checkbox"/>	8.	Turn on the power to the machine and to the pendant. Ensure that the 208V line is plugged in.
<input type="checkbox"/>	9.	Check that oil is flowing to the headstock when the spindle is on. For the 2470 oil cooler option, make sure the pump is rotating the correct direction (CCW as indicated by arrow on pump). Failure to do so will not allow the oil cooler to work.
<input type="checkbox"/>	10.	Lubricate all the way surfaces and the ball screws. Under service codes press code 300 to operate the lube pump.
<input type="checkbox"/>	11.	Jog the saddle and cross slide back and forth until the way surfaces are well lubricated. Oil should be visible on all the way surfaces.
<input type="checkbox"/>	12.	Position the saddle and tailstock to the center of the bed for leveling.
<input type="checkbox"/>	13.	Check the level of the machine. The machine should be level to within 0.0008" longitudinally and 0.0005" transversely. Make any necessary adjustments.
<input type="checkbox"/>	14.	Check the tailstock and the tailstock barrel locks by locking and unlocking. Run the tailstock barrel in and out to ensure proper function.
<input type="checkbox"/>	15.	For the 1845RX and 2470RX, shift the headstock in low and high gear. Verify that the control recognizes each gear. To run the spindle, a maximum RPM must be set in SETUP mode.
<input type="checkbox"/>	16.	Open and close the door and verify the door switch is functional. The control should display a message of "DOOR OPEN" in DRO mode when the door is open and it should disappear when the door is closed.
<input type="checkbox"/>	17.	Make sure the X and Z electronic handwheels and jogstick are functional.
<input type="checkbox"/>	18.	Check to make sure that both E-Stop buttons are functioning correctly.
<input type="checkbox"/>	19.	Perform Service Code 123 to calibrate the X and Z-axis using a 150mm standard.
<input type="checkbox"/>	20.	Perform Service Code 127 and 128 to manually calculate the backlash for the X and Z-axis.
<input type="checkbox"/>	21.	Check for positional accuracy and repeatability on the X and Z-axis using programs X LATHE REPEAT.PT10 and Z LATHE REPEAT.PT10 respectively. Positioning and repeatability values should be less than or = to 0.0005". Programs can be found on hard drive under the PT4 folder followed by the SWI TEST PROGRAMS folder. Note: <i>The door must be closed to run these programs.</i>
<input type="checkbox"/>	22.	Run the spindle throughout each gear range at various speeds.
<input type="checkbox"/>	23.	Use the accessory key on the pendant. Make sure the coolant pump turns on. The accessory key should be in the ON position in DRO to test.
<input type="checkbox"/>	24.	Check to make sure the limit switches are functioning properly where applicable.
<input type="checkbox"/>	25.	Cut the test part to check for taper. Measure the test bar and make any machine adjustments. If unacceptable taper is found, re-check the level before attempting to adjust the headstock.
<input type="checkbox"/>	26.	Attach Lathe Maintenance Schedule Sticker on machine.
<input type="checkbox"/>	27.	Wipe down the machine to finish.

CAUTION!


If the TRAK Lathe has a chuck mounted to the spindle, make sure the chuck is mounted properly to the spindle and also make sure the chuck jaws are engaged onto themselves or a piece of material before running the machine.



If the chuck was not purchased from SWI, check to make sure the chuck is rated for the maximum rpm of the machine. If it is not, do not run the machine above the chuck's maximum rated rpm.



The chucks purchased from SWI are rated for the machine's maximum rpm.



2.6 Installation Instructions & Checklist – 3060RX and 30120RX

Installer: Use this checklist to assure a complete set-up of the 30120RX Lathes.

<input type="checkbox"/>	1.	Shut off power to the machine if it has already been powered up.
<input type="checkbox"/>	2.	Visually inspect the 480-wiring going into the electrical panel. Visually verify the wiring is correct per our wiring diagram. Make sure a strain relief is being used where the wiring enters the cabinet. Have the customer repair any wiring discrepancies. Note: <i>There are 4 motors that run on 3 phase power, they may all run backwards depending on how the 3 phase power is hooked up. If they are running backwards, reverse 2 of the 3 wires on the incoming power to solve problem. The 4 motors are: headstock oil pump, coolant pump, optional conveyor motor and spindle motor fan.</i>
<input type="checkbox"/>	3.	Clean the machine if needed and remove any remaining grease.
<input type="checkbox"/>	4.	Mount the pendant on top of the sliding door or on the pendant arm. Make sure the pendant swivels and slides easily.
<input type="checkbox"/>	5.	Make and check all the proper electrical connections from the pendant to the electrical cabinet. See the pendant and electrical cabinet wiring diagrams. Be sure to mount the rear cable cover to the rear of the pendant. This cover prevents coolant from possibly getting on the connectors on the rear of the pendant.
<input type="checkbox"/>	6.	Install the jogstick and X and Z electronic handwheels.
<input type="checkbox"/>	7.	Install the coolant pump and attach the power cable per the picture in section 2.3.1 above. Confirm motor runs the correct direction.
<input type="checkbox"/>	8.	For the optional chip conveyor sold with the machine, make sure to plug the cable into the side of the electrical cabinet in the same location as the coolant pumps. See section 2.3.1. Once the machine is power up, confirm the conveyor runs in the FWD and REV directions. The switch for this is found on the apron.
<input type="checkbox"/>	9.	For chip conveyor option make sure to install the coolant/chip tray wheels. 
<input type="checkbox"/>	10.	Install the air regulator that fastens at the tailstock end of the machine. It was shipped in a box. The end user to provide a 3/8" NPT air fitting.

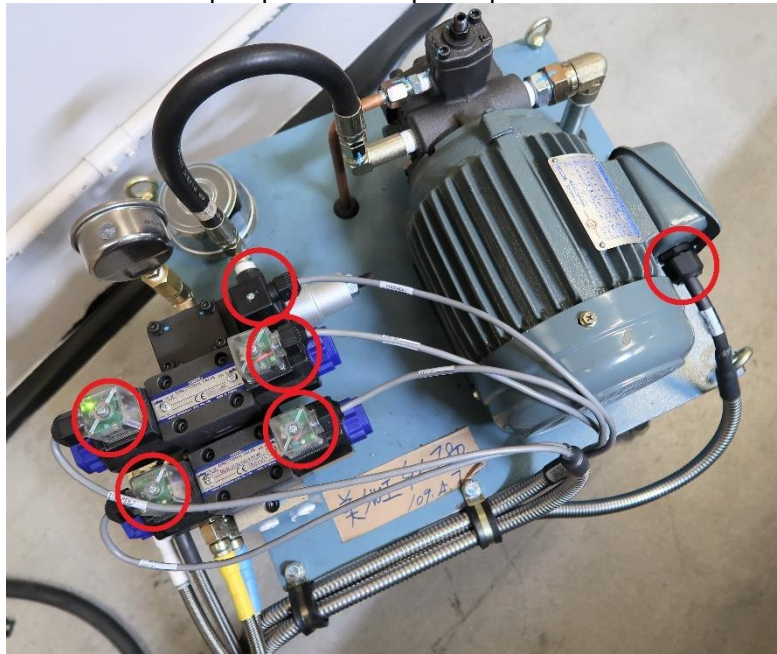
<input type="checkbox"/>	11.	Turn on the power to the machine and to the pendant. Ensure that the 480V line is plugged in.
<input type="checkbox"/>	12.	Disconnect the door or doors (early machines came with 1 door). The main door is fastened to the saddle during shipment. When the control is powered on, go to DRO and press the door open button on the apron to disconnect the door from the saddle. 
<input type="checkbox"/>	13.	Slide the door or doors back and forth to make sure it slides smoothly.
<input type="checkbox"/>	14.	Remove the protective plastic cover from the headstock nameplate.
<input type="checkbox"/>	15.	Check that oil is flowing to the headstock. The pump runs all the time when the POWER RESET button is active. An E stop condition will turn the pump off. The site glass is on the headstock next to the spindle. This is a 3 phase oil pump so depending on how you wire the machine the pump may run backwards and not provide oil to the headstock. The control will warn the user with a LOW HEADSTOCK OIL PRESSURE flashing message and not allow the spindle to run. Reverse 2 of the 3 phase incoming wires to solve this problem.
<input type="checkbox"/>	16.	Lubricate all the way surfaces and the ball screws. Under service codes press code 300 to operate the lube pump.
<input type="checkbox"/>	17.	Jog the saddle and cross slide back and forth until the way surfaces are well lubricated. Oil should be visible on all the way surfaces.
<input type="checkbox"/>	18.	Position the saddle and tailstock to the center of the bed for leveling.
<input type="checkbox"/>	19.	Check the level of the machine. The machine should be level to within 0.0008" longitudinally and 0.0005" transversely. Make any necessary adjustments.
<input type="checkbox"/>	20.	Make sure to lower the support foot for the headstock cabinet.  support foot for head stock cabinet
<input type="checkbox"/>	21.	Check the tailstock and the tailstock barrel locks by locking and unlocking. Run the tailstock barrel in and out to ensure proper function. Connect the tailstock to the saddle and confirm the machine only allows a jog speed of ~80 ipm. There is a switch that tells the control when the tailstock is connected.

□	22.	<p>Run headstock in low and high gear. Verify that the control recognizes each gear. To run the spindle, a maximum RPM must be set in SETUP mode. Confirm the spindle jog feature works when shifting gears. Turn switch below to JOG and then press the hold to run button to rotate the spindle slowly. You can now shift gears from low to high or high to low.</p> 
□	23.	<p>Open and close the door and verify the door switch is functional. The control should display a message of "DOOR OPEN" in DRO mode when the door is open and it should disappear when the door is closed. For machines with 2 doors, please check each door individually meaning only one of the doors must be closed for the DOOR OPEN message to disappear.</p>
□	24.	<p>Confirm the 4 chuck guard switches are working properly. When a chuck guard is open, the spindle will not run. The 4 chuck guard inputs are the front chuck guard, the rear chuck guard door, the left side door that allows access to the spindle motor and the part loading door that opens by pressing the door open button on the apron. A flashing CHUCK GUARD OPEN message should show up in DRO when one or more of these guards are open.</p>
□	25.	<p>Make sure the X and Z electronic handwheels and jogstick are functional and move in the correct directions.</p>
□	26.	<p>Check to make sure all 3 E-Stop buttons are functioning correctly. Pressing each button will require the POWER RESET button to be pressed to turn the servos back on. Also confirm the 2 safety strips on each side of the main door when pressed act like an E-stop and shut down the axis motors and spindle.</p>
□	27.	<p>Go to DRO mode and test the spindle HOLD feature Turn the switch on the headstock to HOLD and confirm you cannot rotate the spindle when in high gear.</p> 
□	28.	<p>Make sure electrical cabinet chillers are working. Verify both fans on each door are blowing in towards the door with a small paper, it should stick to the fan intake.</p>
□	29.	<p>The X and Z axis were calibrated at the factory using 450- and 400-mm standards. The machine should not need to be calibrated in the field. Backlash was also set at the factory. Adjustments to the backlash can be made with service code 128.</p>
□	30.	<p>Check for positional accuracy and repeatability on the X and Z-axis using programs X LATHE REPEAT.PT10 and Z LATHE REPEAT.PT10 respectively. Positioning and repeatability values should be less than or = to 0.0005". Programs can be found on C drive under the ProtoTRAK folder followed by the SWI TEST PROGRAMS folder. Note: <i>The door must be closed to run these programs.</i></p>
□	31.	<p>Run the spindle throughout each gear range at various speeds. Note: <i>The acceleration and deceleration times for the spindle are ~ 20 seconds when going from 0 to top RPM and back to 0 RPM.</i></p>

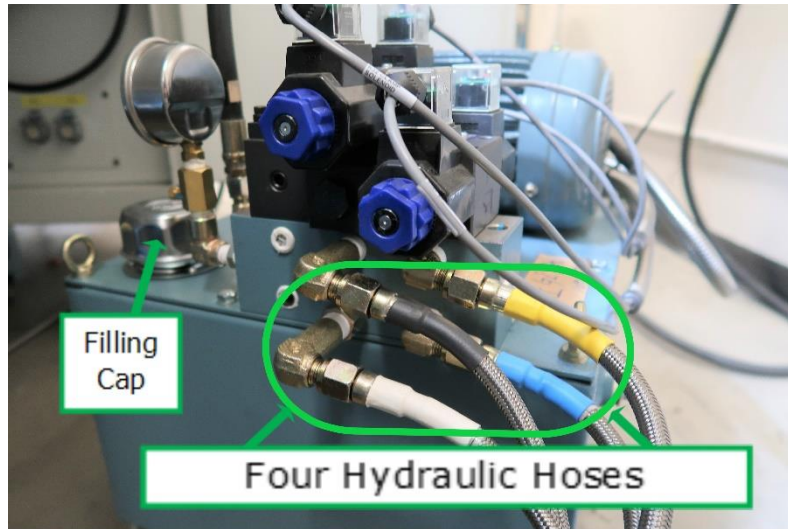
<input type="checkbox"/>	32.	Use the accessory key on the pendant. Make sure the coolant pump turns on. The accessory key should be in the ON position in DRO to test.
<input type="checkbox"/>	33.	Check to make sure the limit switches are functioning properly. Limit switches are standard on this machine.
<input type="checkbox"/>	34.	If a chuck or chucks were installed by the end user, confirm the spindle is free of vibration when running at high RPM's. Be careful and slowly build up speed. The spindle and chucks installed at the factory are balanced for the maximum RPM of the machine. Chucks installed in the field may require balancing and specialize equipment to do so. This is the responsibility of the end user.
<input type="checkbox"/>	35.	Cut the test part to check for taper. Measure the test bar and make any machine adjustments. If unacceptable taper is found, re-check the level before attempting to adjust the headstock.
<input type="checkbox"/>	36.	Attach Lathe Maintenance Schedule Sticker on machine.
<input type="checkbox"/>	37.	For the optional chip conveyor, make sure to install the side covers that keep chips within the conveyer. See red arrow.
		
<input type="checkbox"/>	38.	Confirm optional chip conveyor came with a chip pusher broom.
		
<input type="checkbox"/>	39.	Install 3 covers that come loose with the machine and cover the leveling screws in front of the machine.
<input type="checkbox"/>	40.	Wipe down the machine to finish.

3060 and 30120 Hydraulic Turret Option Only

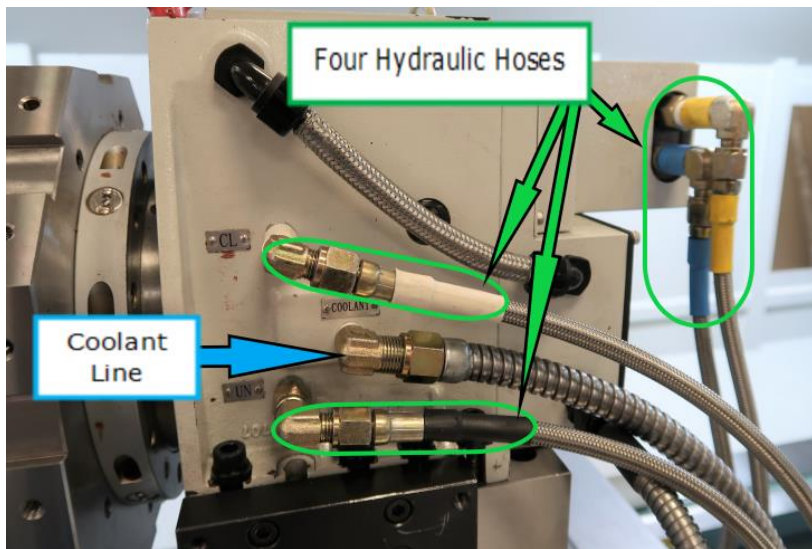
41. Attach solenoid connectors to hydraulic valves and power supply connections to pump from electric cabinet to pump. Attach loop clamps as shown.



- 42. Verify hose connections are correct with matching color heat shrink on each end of the hydraulic hose. Verify pump end has hoses connected as in the photo below:

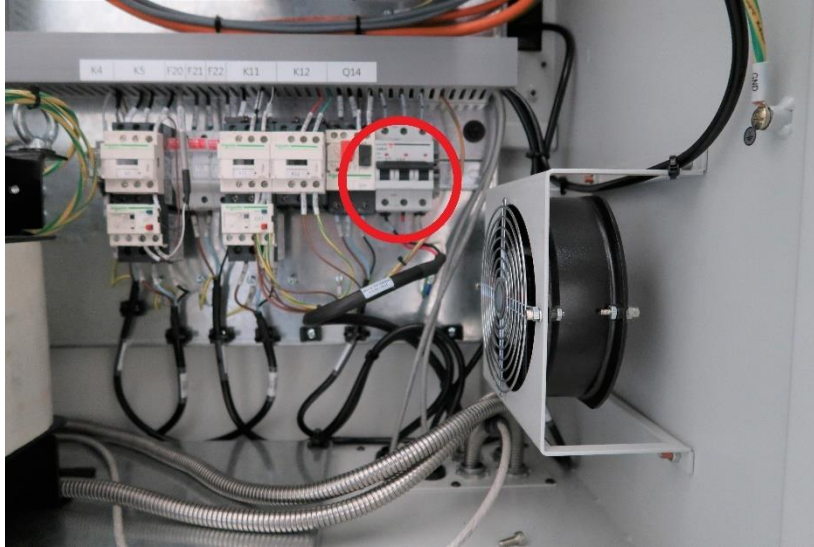


Verify turret has hoses connected as shown below:

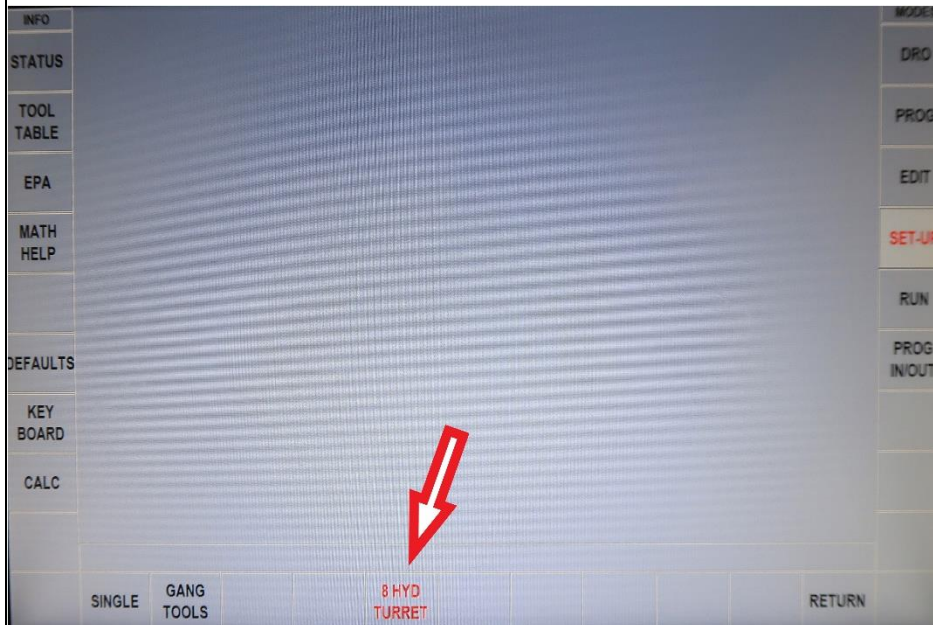


Turret end of the hydraulic hoses are shown here. Turret has an additional hose for coolant from the chip tray connected as shown in the photo above.

- 43. Wire up the breaker, then turn it on.



- 44. Test the system, turn power on, make sure E-Stop is not activated, and enable the 8 tool hydraulic turret by pressing SETUP > TOOL GROUPS > 8 HYD TURRET. Red means operational. Cycle between 8HYD TURRET and SINGLE will disable the turret and return the lathe to single tool operation.



CAUTION!

If the TRAK Lathe has a chuck mounted to the spindle or rear of the spindle, make sure the chuck is mounted properly to the spindle and also make sure the chuck jaws are engaged onto themselves or a piece of material before running the machine.

If the chuck was not purchased from SWI, check to make sure the chuck is rated for the maximum rpm of the machine which in this case is 1300 RPM. If it is not, do not run the machine above the chuck's maximum rated rpm.

The chucks purchased from SWI are the machine's maximum rpm.

2.7 ProtoTRAK RLX Control Hardware

- 2-axis CNC, 2-axis DRO
- Intel® 2 GHz or faster PC-based processor or faster
- 4 GB of RAM or higher
- 32 GB or larger mSATA SSD (solid state) memory drive
- 15.6" color LCD for clear presentation of prompts, status information and part graphics
- Touch screen activated graphical menus with context configured touch keys
- LED status lights built into run panel
- 4 USB ports (plus 1 for the options key as a USB drive)
- 2 Ethernet Ports (1 for the control system and 1 for the user)
- Polycarbonate sealed membrane and gasket sealed control enclosure to lock out contamination
- Feedrate override of programmed feedrate and rapid
- Spindle Control (FWD, REV, OFF) keys
- Accessory button to control coolant and AUTO mode in RUN mode
- Programmable Spindle Speed
- Feed STOP and GO keys
- Speed override of programmed spindle speed
- Power Reset Button
- Modular design simplifies service and maximizes uptime
- Limit switches for the X and Z-axes that are installed to prevent crashes. Optional on some lathes.
- Electronic handwheels on the X and Z-axes
- Fine vs Course EHW resolution control
- Jogstick for convenient jog
- D.C. Servo Motors rated at 21.2 in-lbs continuous torque for X axis and 56 or 84.5 in-lbs for the Z-axis. The 84.5 in-lb rated Z motor applies to the 2470 lathe.
- For the 3060 and 30120 lathe, the X axis motor is rated at 28.1 in-lbs and Z axis motor is rated at 169 in-lbs continuous torque
- Precision ground ballscrews in the carriage and cross slide to ensure smooth accurate contours without backlash

2.8 Lifting and/or Moving the Machine

CAUTION!

Proper equipment of sufficient capacity must be used when lifting and/or moving the machine.

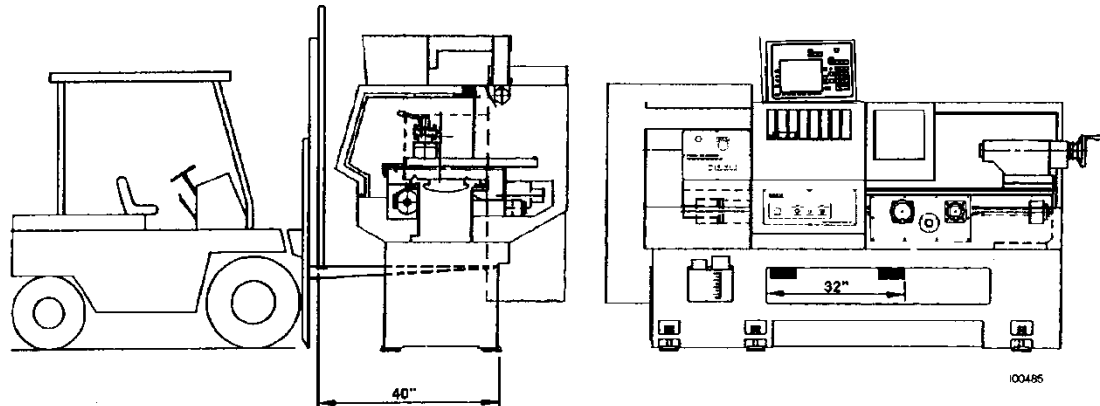
To lift the machine, remove the chip pan. Place the forks of the forklift at least 32" apart as shown in the figure below. Be certain to lift the lathe toward the headstock.

Lathe Model	Machine Weight	Approximate Machine Shipping Weight	Minimum Forklift Capacity
1630RX	2,875 Lbs	3,420 Lbs	6,000 Lbs
1630HSRX	2,875 Lbs	3,420 Lbs	6,000 Lbs
1845RX	3,285 Lbs	3,800 Lbs	8,000 Lbs
2470RX	6,500 Lbs	6,900 Lbs	10,000 Lbs
3060RX	13,970	14,270 LBS	15,000 LBS
30120RX	18,920 Lbs	19,270 Lbs	20,000 Lbs

Do not attempt to lift this machine with a forklift having less than 6000 lb capacity for the 1630, 8000 lb capacity for the 1845, 10000 lb capacity for the 2470, 15000 lb capacity for the 3060 and 20000 lb capacity for the 30120.

Do not remove the skid from the machine until it is brought to its final position, especially if the machine is to be moved on rollers.

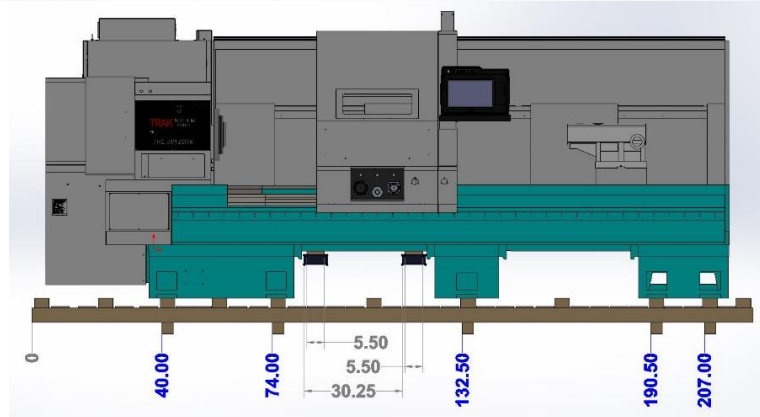
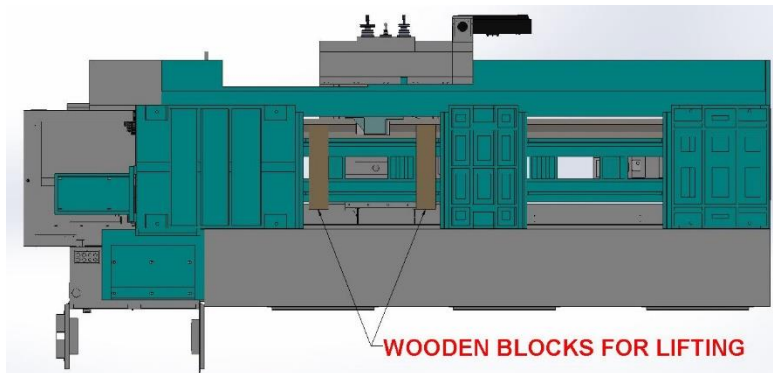
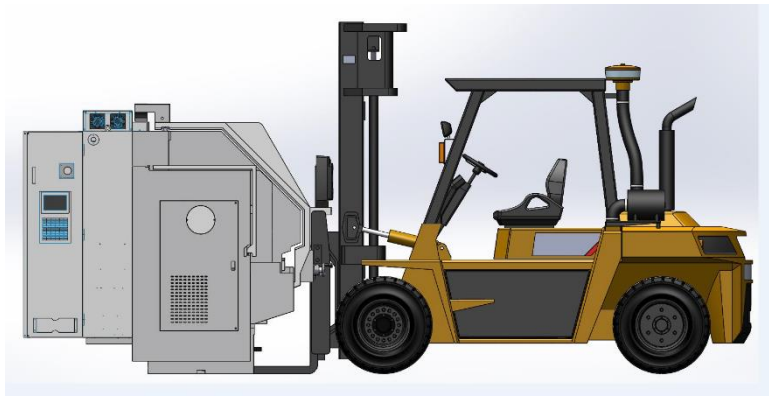
Figure 2.7 – Lifting and/or Moving the Machine



Once the skid has been removed, place the machine in position on top of the four (4) for the 1630RX, six (6) for the 1845RX and eight (8) rest pads for the 2470RX.

For proper operation, the machine should be set on a substantial floor capable of supporting the weight safely. For the location of the bolt holes, size and recommended mounting, see Figures 2.1a through 2.1c.

For the 3060RX and 30120RX: To lift machine, use 2 blocks of wood on top of the forklift forks as shown below. Make sure blocks of wood are touching the bed casting of the lathe and not the sheet metal. Place forks as shown in picture below to balance machine when lifting.



2.9 Cleaning

1. Remove rust protective coating from the machine before moving any slideways.
2. The coating is best removed with clean, dry rags. Do not use a cleaning solution that may damage the rubber way scrapers, plastic parts, or paint.

WARNING!

Do not use gasoline or other flammable cleaning agents for cleaning the machine.

3. It may be necessary to move the carriage and cross slide back and forward as well as left and right.

CAUTION!

Never move any of the above parts over ways that were not previously cleaned. Serious damage to the TURCITE surface of slideways can occur.

4. Be certain the carriage, cross slide and spindle move freely and smoothly over their entire length.

2.10 Leveling

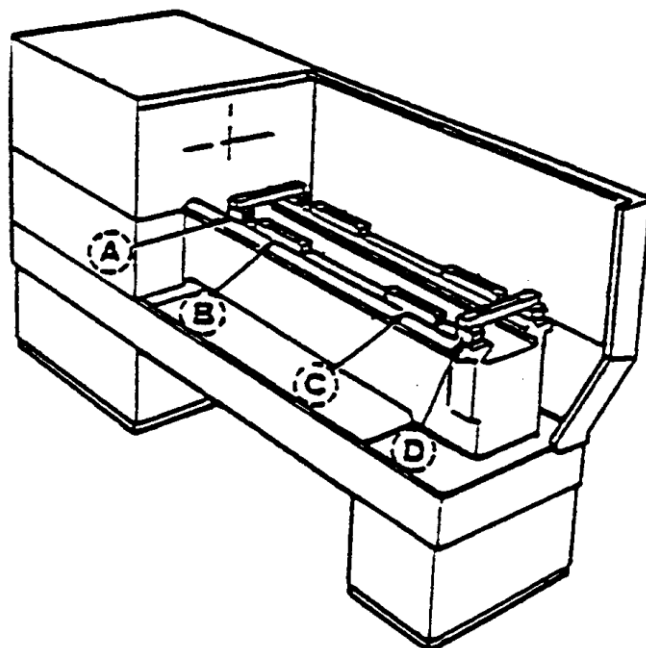
The precision and durability of the lathe depends on it being leveled properly. Final inspection can be done only when the machine has been correctly leveled.

After the machine is in position on top of the 4/6/8/10 rest pads, it must be leveled by the use of the 4/6/8/10 leveling bolts. It is important that the lathe be level in order to produce accurate work. It may be necessary to lag bolt the machine in order to eliminate a small amount of twist.

Note: *The use of a precision level having a minimum accuracy of .0005" over 10.0" will be required.*

(See section 2.10.1 for 3060 and 30120 lathe)

Move the saddle and tailstock to the center of the bed. To take a reading off the level longitudinally, place the level at each of the four (4) corners of the bedways (Figure 2.9, Positions B & C). To take a reading off the level transversely, place it on top of .7500" parallels at each end of the bedways (Figure 2.9 Positions A & D).



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Figure 2.9 - TRAK TRL Lathes – Leveling

Using the four (4) interior leveling screws (see Figure 2.9) on the lathe base, level the bedways longitudinally within .0008" over the total length and transversely within .0005" inches. After leveling with the four (4) interior leveling screws, bring the exterior leveling screws on the lathe (see Figures 2.1a through 2.1c) into contact with the leveling pads using care not to disturb the level. The 1630RX, and 1630HSRX lathes only have 4 leveling screws.

For a newly installed machine, check the level once every week. Once the foundation is rigid enough, then check it once per month.

2.10.1 Leveling the 3060 and 30120 Lathe

1. Scope:

The scope of this document is to define the correct way to level the 3060 and 30120 lathe at the time of installation.

2. Tools required:

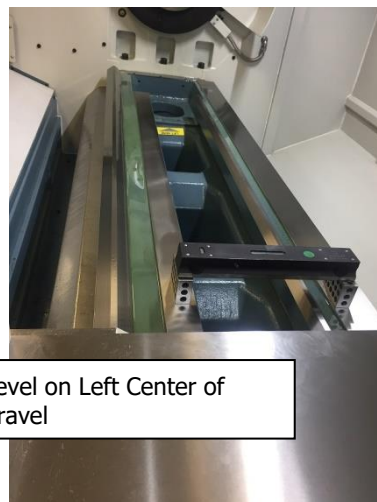
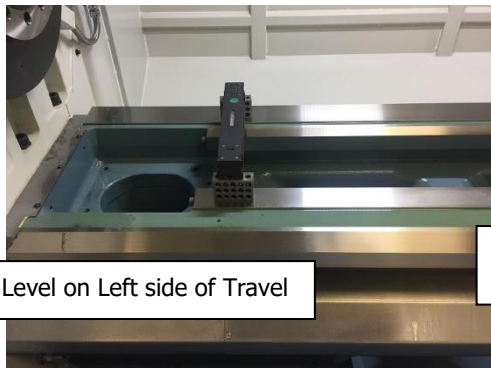
- 12" Precision Level
- A pair of 1 2 3 blocks
- Large Wrench
- Small Bottle of Way Oil

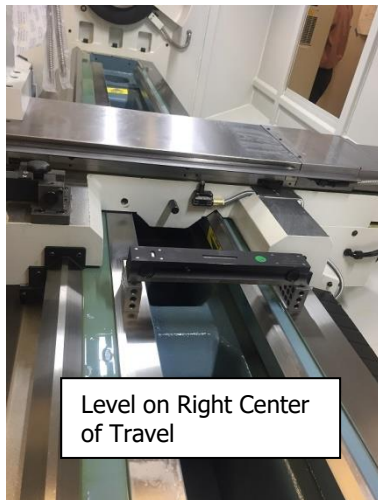
3. Machine leveling procedure:

1. Before installing the leveling screws into the machine base casting put a small amount of oil on the threads to assist in turning the screws when leveling the machine.
2. Install the oiled leveling screws into the casting and thread them in almost as far as they can go. It is much easier to lower the machine than it is to raise it.
3. Put the feet under the leveling screws and lower machine onto them.
4. Level the machine front to back using the 4 leveling screws shown in the photo below. Make sure none of the other leveling screws are in contact with the leveling feet

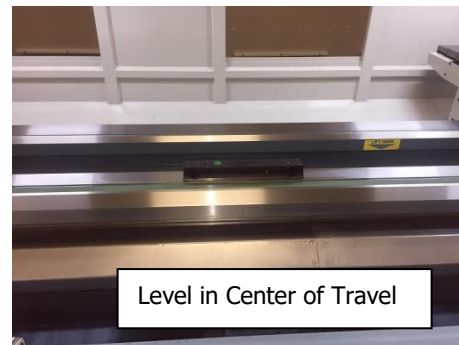
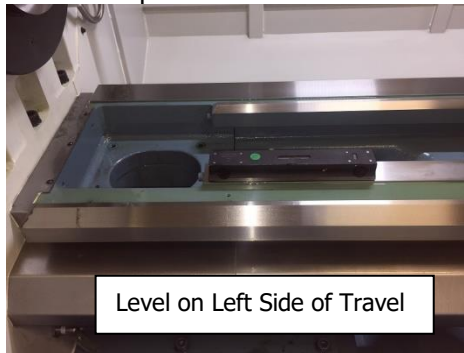


5. Check the level front to back placing the level at each end of the Z travel and at least one place in the center. See Photos below.





6. Once machine is level from front to back use the same 4 leveling points and level machine from side to side. Measure the level at each end of the Z travel and at least 1 point in the center of travel. See photos below.



7. Once machine is level from side to side verify machine is still level from front to back and adjust as needed. Once machine is level on these 4 points lower the levelers in the center of the machine until there is weight on them without changing the machine level.
8. Once the center leveling feet have been set and the machine is level bring the remaining 4 levelers down until there is weight on them without changing the level of the machine. Once all of the levelers have been adjusted and the machine is level tighten the lock nuts on the leveling screws.

2.11 Electrical Connection

The 1630, 1845 and 2470 TRAK Lathes can only be configured for 208-240 volt 3 phase electricity. To run at 440V, you will need a step down transformer from 440V to 208V.

The 3060RX and 30120RX runs on 480 volt 3 phase power only.

DANGER!

Be certain that 208-volt electricity (typical range 208 – 240V) is used only with a machine labeled 208 volts at the motor and at the electrical cabinet on the back of the column.

Be certain that 480-volt electricity (typical range 432 – 528V) is used only with a machine labeled 480 volts at the motor and at the electrical cabinet on the back of the column.

WARNING!

440 Volts will damage expensive electrical components if the 1630, 1845, 2470 machines are wired by mistake as 440 volts. These components are not covered under warranty.

DANGER!

The 208-240 volt or 432 to 528 volt line must originate from a dedicated and independent fused box with a manual shut-off lever. It is the responsibility of the purchaser to supply a wired box that meets all local codes and regulations.

The 208-240 volts wires to the 1630, 1845, and 2470 machines through the electrical cabinet located on the back of the column. The wire enters the main on/off switch through a hole on the top of the box. The ground wire should be connected at the top or bottom of the breaker bracket.

The power into the 3060 and 30120 machine comes in from the side of the electrical cabinet.

DANGER!

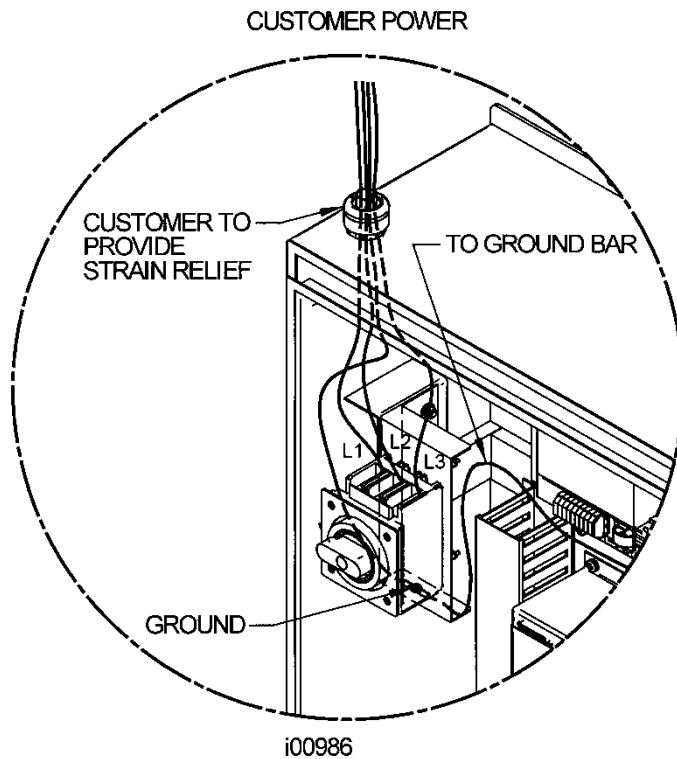
Only a qualified electrician should wire the 208-240 or 432-528 volt 3-phase electricity.

Southwestern Industries recommends the machine be earth grounded by driving a copper rod into the ground. It is the responsibility of the customer to install this rod.

2.11.1 Phase Converters

For those machines that will be run with a phase converter, it must be a CNC rated rotary type rather than a static phase converters. CNC rated rotary phase converters allow for varying loads in the system. A CNC rated phase converter also regulates the new leg created so it does not end up being too high or low of a voltage. The electrical load on the machine will vary based on the type of cut taken and the speed of the motor. Static phase converters can only be used on machines with a non-varying load. Please contact your local phase converter distributor for precise sizing. The 3060 and 30120 lathe cannot be run with a phase converter.

Model	Recommended Size of Phase Converter	Full-load Amp of Machine
1630RX	17 KVA	44
1630HSRX	17 KVA	44
1845RX	21 KVA	54
2470RX	39 KVA	73
3060RX	Not applicable	Not applicable
30120RX	Not applicable	Not applicable



Note: Please connect the incoming ground wire to copper ground bar on left side of cabinet.

Figure 2.11 - Wiring the TRAK TRL Lathe

2.12 Air Connection

The 1630, 1845 and 2470 TRAK machines have an air hookup in the rear of the machine only if they come with a CNC Turret option.

The air regulator pressure is set to 90 psi at the factory for the turret unit.

The 3060 and 30120 lathe requires air to help move the tailstock. There is a connection at the tailstock end of the lathe to hook up air.

2.13 Mounting the Display Pendant

The ProtoTRAK RLX display pendant mount differs depending on which lathe is being installed. The pendant is held with 4 socket head cap screws. There is a locating screw on the pendant arm to help align the pendant with the mounting holes.

Make sure the pendant rotates freely from side to side only on the 1845RX, 2470RX, 3060RX and 30120RX. On the 1630RX, the pendant is stationary.

For the 3060 and 30120 lathe, a rear cover is installed to protect the back of the pendant from potential coolant or chips.

2.14 Cable Interconnections

All cable interconnections are made at the factory except for those connecting to the pendant display. There are 2 cables that need to be connected to the pendant.

With the main power to the machine turned off, plug in the Pendant I/O cable (SWI 22556-15: DB25 connectors on both ends) and the Ethernet patch cable (SWI 22432-5-xx). Figure 2.13b shows the connectors on the rear of the pendant.

Make sure there is sufficient slack in the cables for when the pendant is rotated about the pendant arm. The following drawing describes all of the cable and other connections to the pendant.

Make sure there is a hardware (option) key plugged into one of the USB ports of the pendant. This key activates any converters or options ordered. The part number for this key is 23770-8. The key must be programmed according to the type of machine it is on and the options ordered.

CAUTION!
Make sure the main power switch is turned off at the electrical cabinet before plugging in the cables.

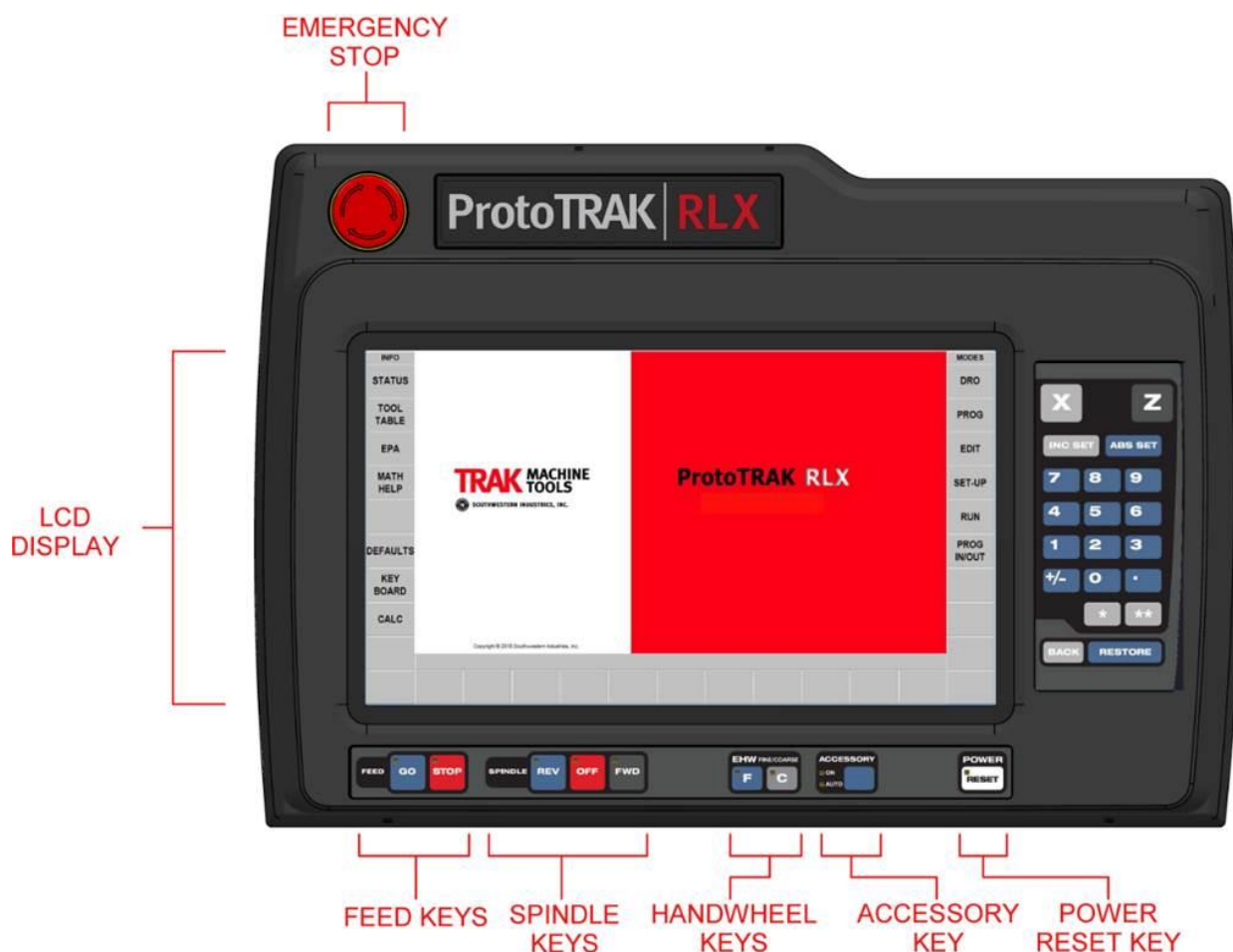


Figure 2.13a - RLX - Pendant Front Side - P/N 29008-2

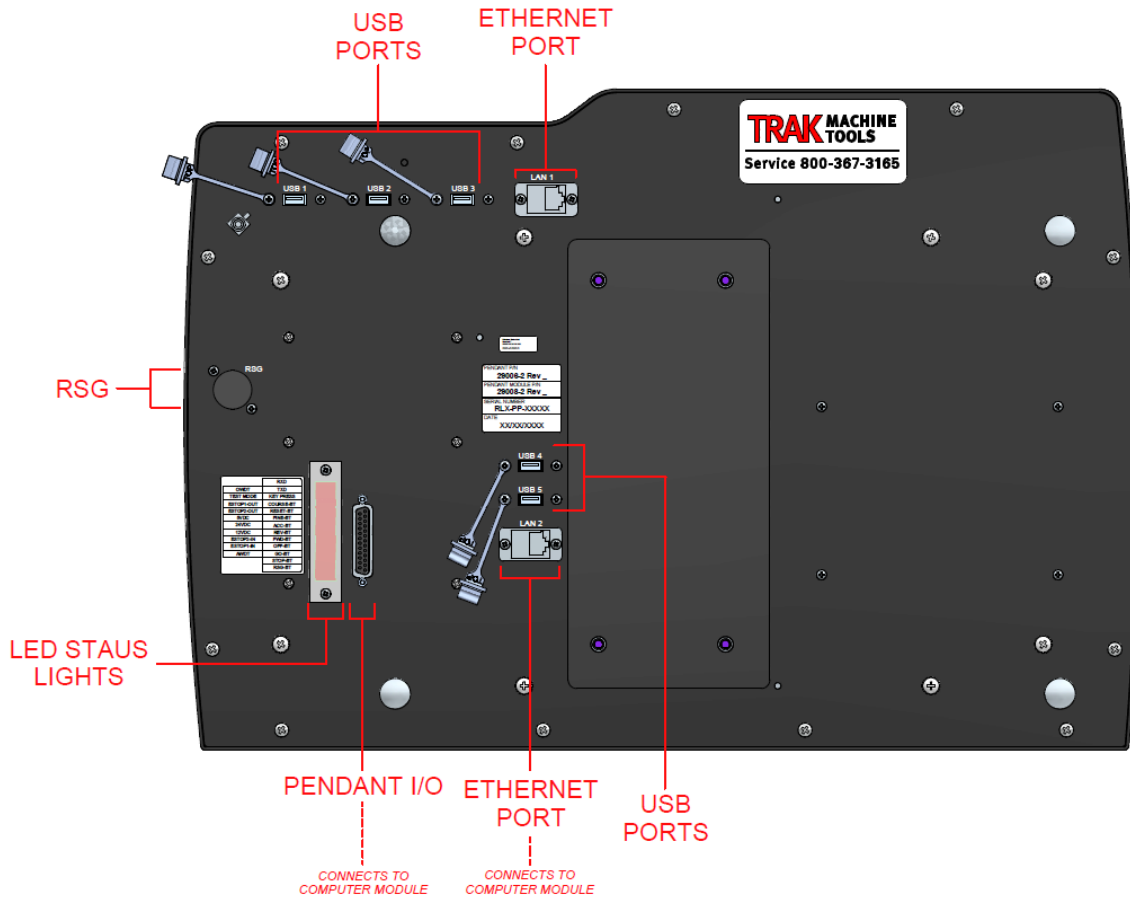


Figure 2.13b - RLX - Pendant Back Side - P/N 29008-2

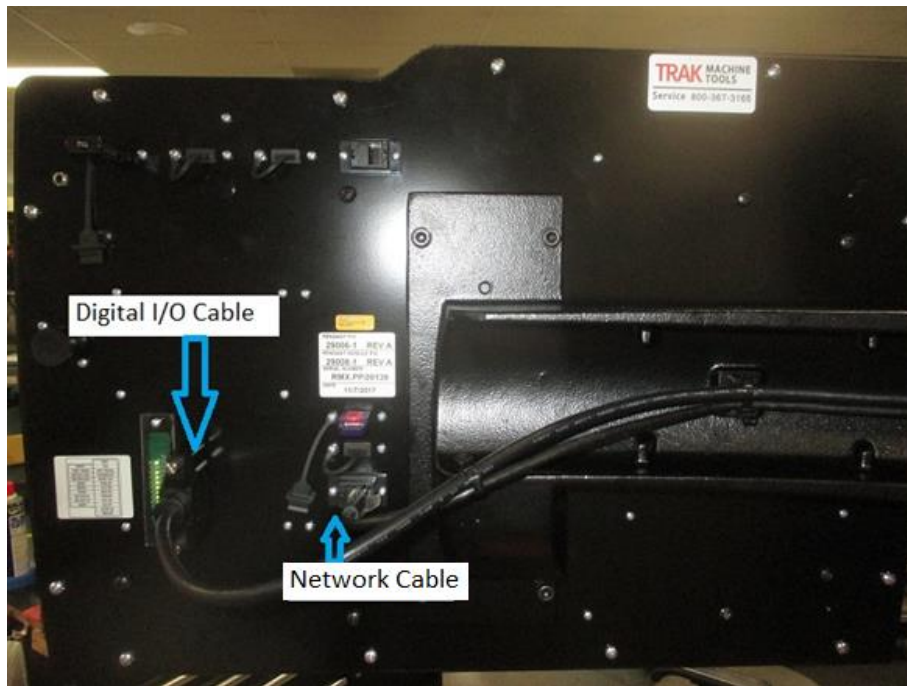


Figure 2.13c - RLX - Pendant Cable Connections

2.15 Machine ID Key

Ensure that the Machine ID key is plugged into the port on the computer module inside the electrical cabinet, or the machine will not run.

CAUTION!
Make sure the main power is turned off on the back of the electrical cabinet before plugging in the cables.

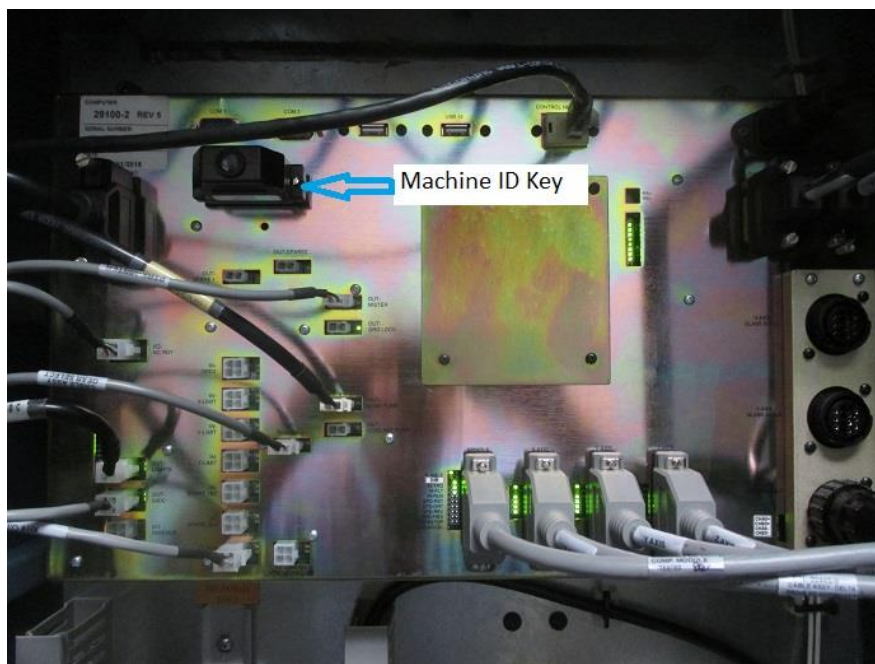


Figure 2.14 - RLX – Machine ID Key

2.16 Pendant Maintenance

2.16.1 How to Clean the Touchscreen

When cleaning the touchscreen, make sure to turn off the machine. You can use any window cleaning solution to get any debris off of the screen. It is preferable to use a non-lint cloth when cleaning.

Note: *If you clean the screen with the power on, you may get false triggering or no touchscreen detection at all.*

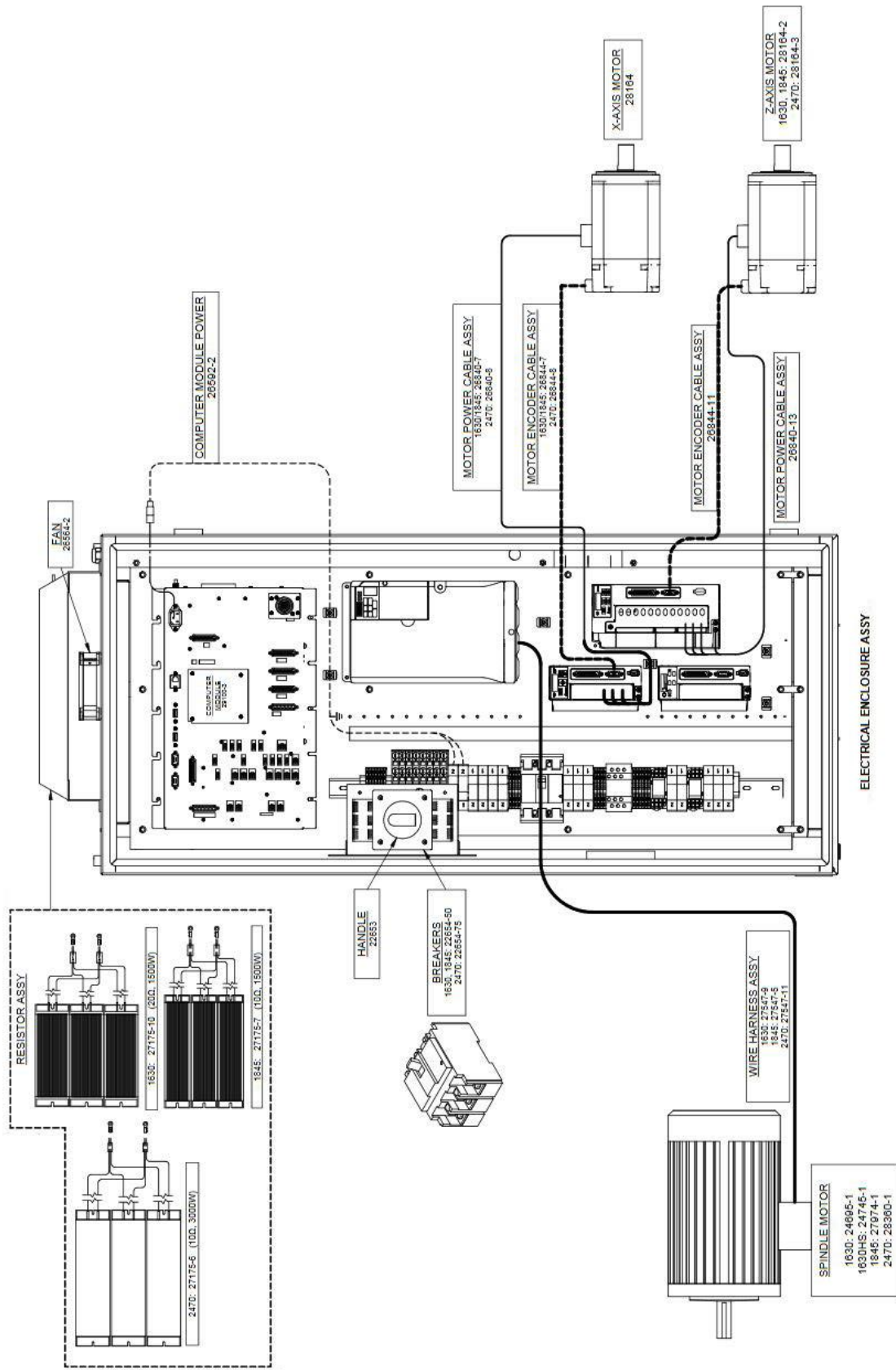


Figure 2.15.1 - RLX – Electrical Cabinet Connectivity

Parts List - TRAK TRL Lathes (Figure 2.15.1)

Item	1630RX	1630HSRX	1845SX	2470SX	Description
1	29980-1630US-X	29980-1630US-X	29980-1845-X	29980-2470-X	X Servo Drive
2	28164	28164	28164	28164	X-Axis Motor
3	29980-1630US-Z	29980-1630US-Z	29980-1845-Z	29980-2470-Z	Z Servo Drive
4	28164-2	28164-2	28164-2	28164-3	Z-Axis Motor
5	29166-1630	29166-1630HS	29166-1845	29166-2470	AC Drive
6	29100-3	29100-3	29100-3	29100-3	Computer Module
7	29008-2	29008-2	29008-2	29008-2	Pendant

Item	3060RX	30120RX	Description
1	29980-3060-X	29980-30120-X	X Servo Drive
2	28164-1	28164-1	X-Axis Motor
3	29980-3060-Z	29980-30120-Z	Z Servo Drive
4	28164-4	28164-4	Z-Axis Motor
5	29166-3060	29166-30120	AC Drive
6	29100-6	29100-6	Computer Module
7	29008-2	29008-2	Pendant

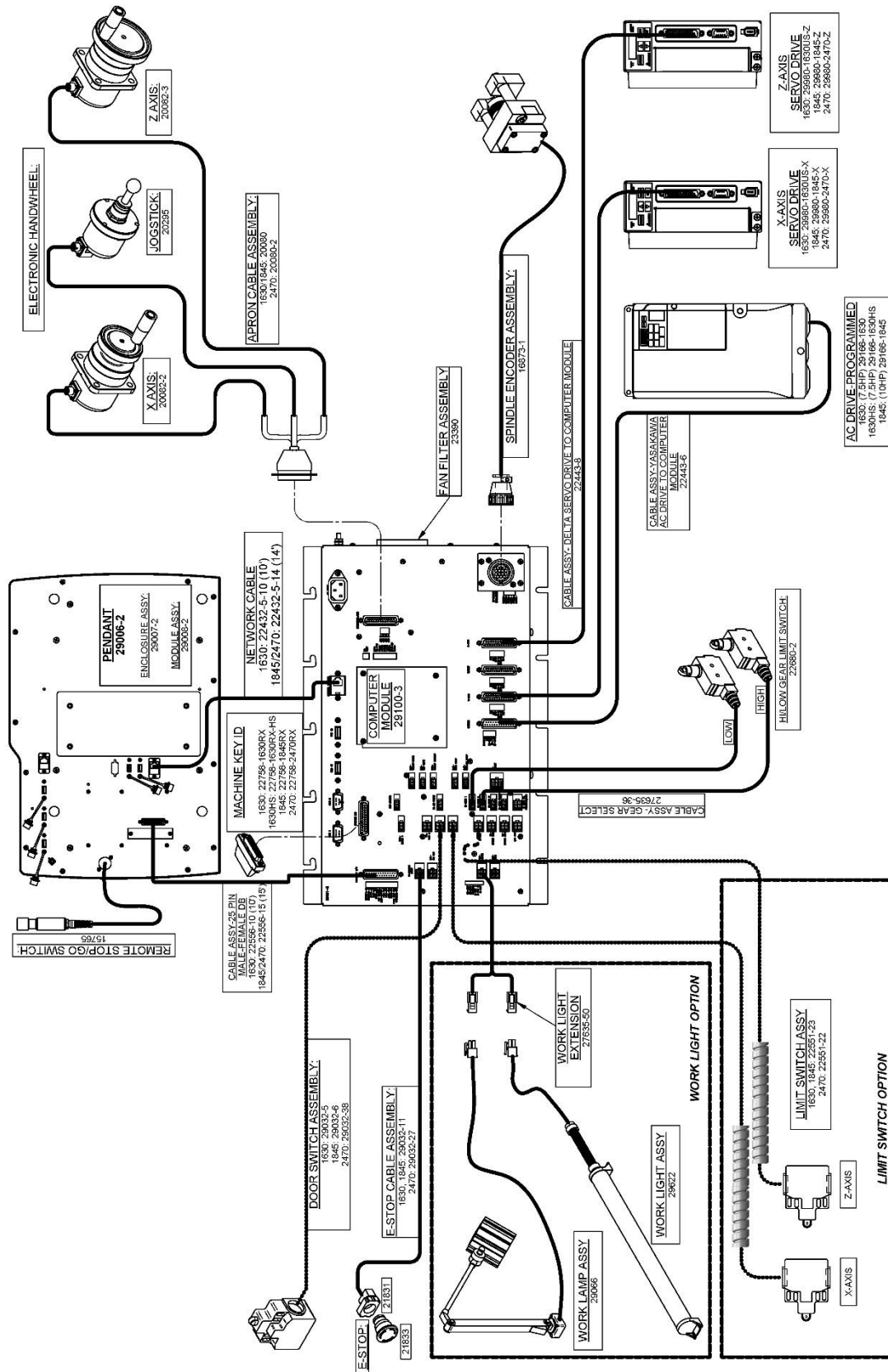


Figure 2.15.2 - RLX – Computer Module Connectivity

2.17 Lubrication

The TRAK Lathe auto lube system provides centralized automatic lubrication for the carriage, cross slide and ballscrews. The lube pump has a 2-liter reservoir filled with ISO VG 68/SAE 20W slideway oil.

CAUTION!
Oil that is too heavy and viscous such as 50W or 90W oil can clog oil line tubing. Do not mix detergent type automotive or multi-purpose oils with the ISO VG 68/SAE 20W slideway oil used in this application.

The lube pump has electronic memory which acts as an internal clock to keep track of the running time of the axis motor. Even when the spindle is turned off, the lube pumps internal clock will not reset. The interval between pump cycles is based on axis motor movement time.

The 3060 and 30120 lathe lube pump is different than our other lathes in that we monitor for oil level and oil pressure. If one or both of these issues are present we will notify the operator with screen messages.

2.17.1 Lube Pump Operation

The pumping output can be regulated electronically to control the Interval Time between pumping cycles, and the Discharge Time of each pumping cycle. The pump can also be run manually through a key found under service codes. The following describes the steps used to program the lube pumps Interval and Discharge times.

Start with using Service Code "E".

- **Setting Interval Time:** Service Code 301
Press "Mode", "Set up", "Service Codes", "C" (Machine Setup), Code 301, and then enter the desired Interval time in minutes.
- **Setting Discharge Time:** Service Code 302
Press "Mode", "Set up", "Service Codes", "C" (Machine Setup), Code 302, and then enter the desired Discharge time in seconds.
- **To manually Pump Oil:** Service Code 300
Press "Mode", "Set up", "Service Codes", press "E", and then press Code 300 (Lubrication Pump Switch). The pump will pump oil for the amount of time programmed in Code 302. The spindle does not need to be turned on.

2.17.2 Factory Default Values

Interval Time - 60 min

Discharge Time - 15 sec

Discharge Pressure - Approximately 100 - 150psi

To adjust the amount of Discharge Pressure displayed on the lube pump gauge, loosen the jam nut and turn the adjustment screw located on the top right side of the lube pump while the lube pump is activated. To activate the lube pump use Service Code 300.

CAUTION!
Failure to properly lubricate the lathe will result in the premature failure of ball screws and sliding surfaces.

CAUTION!
Failure to manually activate the pump at the beginning of each day, or allowing the Auto Lube to run dry may cause severe damage to the lathe way surfaces and ballscrews.

2.17.3 1630RX, 1630 HSRX, 1845RX & 2470RX Headstock Oil Reservoir

Oil will only be visible on the headstock site glass when the spindle is running. If oil is not flowing to the site glass when the spindle is ON for either machine, stop running the spindle immediately and call for service. Failure to do so may ruin the spindle bearings.

2.18 Auxiliary Output

An Auxiliary Option Kit is offered for the support +24VDC optional devices. Power and device control are provided via the following terminal block found on a DIN rail in the upper left section of the electrical cabinet.

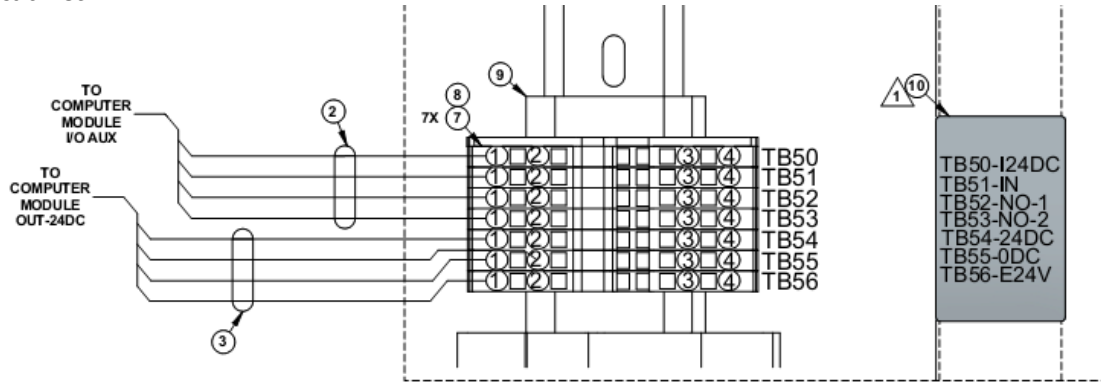


Figure 2.17a – Auxiliary Output Connectivity

The Auxiliary Output control is a Normally Open (NO) contact. It is rated for 30 volts DC or AC for current of up to 1 amp. This is provided via terminals TB52-NO-1 and TB53-NO-2 as shown in the above figure. Terminal blocks TB54-24DC and TB55-0DC provide access to 24 volt power. This Auxiliary power can be used to power a 24V Relay/Solenoid or other device through this Auxiliary Output. It is rated for 1 amp.

An Air Blast Solenoid is an example device which could be used with this Auxiliary Output Option. Auxiliary 24V will be turned OFF and ON via the Auxiliary Output when programmed with the AUX event.

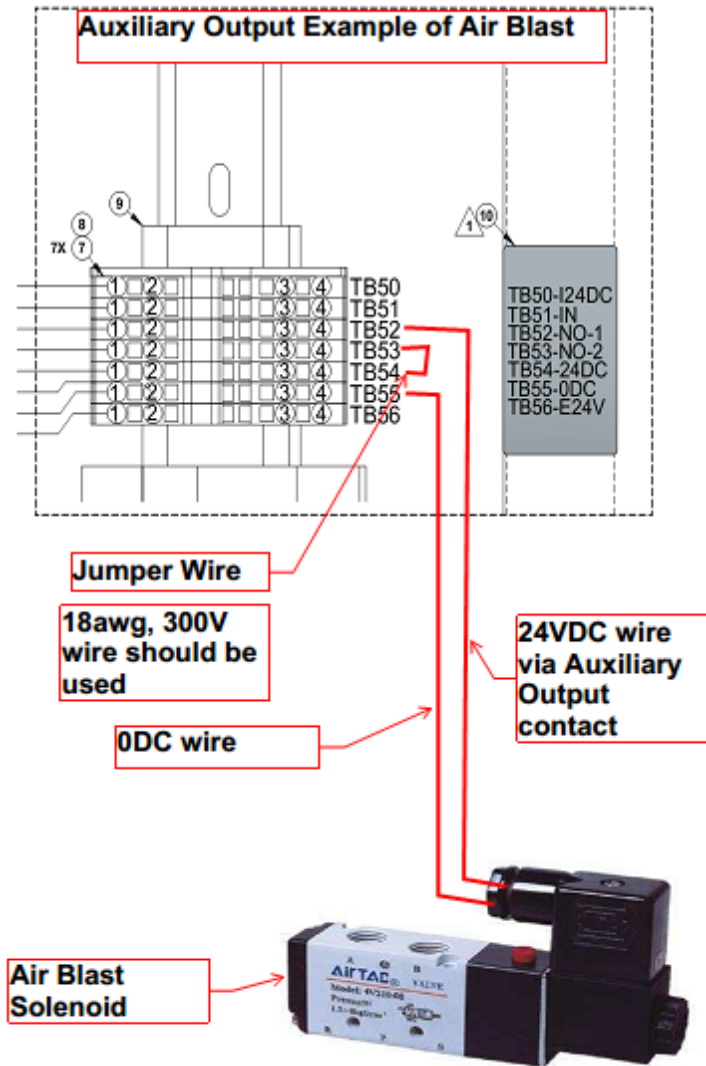


Figure 2.17b – Auxiliary Output Example of Air Blast

Note: The Auxiliary Output relay is overwritten by the E-stop and/or Fault circuit. It will deactivate the relay whenever there is an E-stop condition or when the software shuts OFF all the outputs due to a fault condition.

This Auxiliary Output Option is enabled on the control system via the hardware Options Key. When enabled, the Status screen will show a status of "Yes" for the Auxiliary Output. The use of code 318 will also show the "Auxiliary Output" highlighted when enabled.

This software option turns on the AUX event and gives the user 4 outputs as shown below.

EVENT 3	AUX	
COOLANT	<input type="checkbox"/>	NO
AIR	<input type="checkbox"/>	NO
PULSE INDEXER	<input type="checkbox"/>	NO
AUX OUTPUT	<input type="checkbox"/>	NO

2.18 Cutting the Test Part

(See Figure 2.19)

Tools Required:

- Chuck
- Tool Post
- Tool Block
- Tool Holder, right-hand face and turn type

In order to accurately machine the test part, the gears and bearings in the headstock must be properly warmed and preloaded. This is accomplished by running the spindle for 15 to 25 minutes prior to cutting the test bar at 500 RPM.

Load an approximately 2" dia. aluminum bar into the spindle chuck. Load a standard right hand face and turning tool into a tool block. Align and lock the tool block onto the tool post. Set the depth of cut to a maximum of .002.

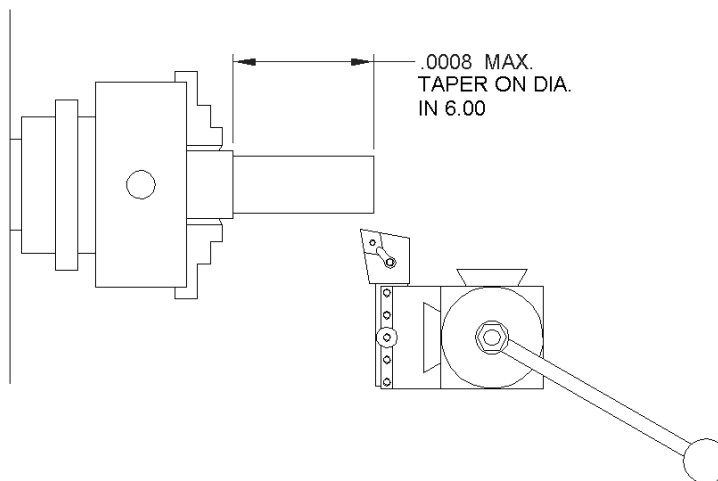
Set the spindle to an acceptable speed for turning the test piece. A speed range from 650 to 950 RPM is recommended.

2.19 Measurement of the Test Part

Tools Required:

- O.D. Micrometers with .0001" graduations

Using a calibrated O.D. micrometer with .0001" graduations, measure and record the generated dimension at a 6.00 spacing. The acceptable measurement of parallelism of spindle axis to carriage movement (taper of test piece) is .0008" over 6". If the taper measured is not acceptable, re-machine the test part and/or check and adjust the level of the machine, or adjust the headstock.



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Figure 2.19 - All TRAK TRL Lathes - Test Part

2.20 Mounting of a Buck Zero Set Chuck- RX Lathe

WARNING!

The Buck chuck requires a certain amount of torque to be properly mounted to the faceplate. Please use the following chart to ensure safe operation and check the torque occasionally. Improper installation of the chuck could result in injury or death. The 12" chuck sold from SWI will come with a special wrench if installed in the field to adjust the chuck to the required specifications. A 20" front chuck is sold on the 3060 and 30120 lathe and a 16" size chuck on the rear of the spindle.

Chuck Model	Mounting Bolt	Torque (foot pound)
8"	M10x1.5P	31.8 ft/lb
12"	M16x2P	137.4 ft/lb
20"	M20x2P	400ft/lbs
	M16x2P	170 ft/lbs
16"	M20x2P	400 ft/lbs
	M14x2P	110 ft/lbs

The 1630HSRX lathe has a Buck Zero Set spindle and requires a chuck of this type. Use the following procedure to mount this style chuck. This chuck is also used on the 1630RX, 1845RX and 2470RX lathes.

Bolt the chuck adaptor plate to the spindle with (4) M10 X 50 SHCS. The key on the spindle orientates the adaptor.

Then bolt the chuck to the adaptor plate with (3) M8 x 70 SHCS. Some of the chucks SWI provides are self-aligning and need no adjustment.

The 3060 and 30120 front chuck has 4 set screws on the OD so you can true up the chuck. The rear chuck does not have these set screws, so you align the chuck to the adapter plate by tapping on the chuck around the perimeter of the chuck with a plastic tipped hammer to true it up. The adaptor plate also should be aligned relative to the rear chuck adaptor that threads on to the rear of the spindle.

Note: *Front and rear chucks that are installed in the field may require balancing of the entire spindle assembly. Chucks ordered and installed at the factory will come balanced as an assembly. It will be the responsibility of the end user to balance chucks purchased and installed in the field.*

Procedure below not applicable to 3060 and 30120 chucks.

Tools required:

- Magnetic indicator base with a 0.0001" reading indicator
- Cam lock wrench
- Chuck wrench
- Allen wrench 3/8"
- Allen wrench 5/16"
- Alignment bar
- Lift for chuck
- Tool post, tool holder and turning tool with insert

Procedure:

Note: *This procedure needs to be performed after the spindle taper test.*

1. On lathes with gears, put in neutral for ease of spinning chuck.
2. Clean the face and outside taper of the spindle
3. Clean the face and inside taper of the adapter plate
4. Verify the cam lock studs are set evenly and at the correct location. The groove on cam the lock stud should line up with adapter plate.
5. Install the adapter plate onto the spindle
 - a. Snug the cam locks one at a time.
 - b. Once all 6 cam locks are adjusted, continue around tightening all cam locks
 - c. Continue around tightening the cam locks until no further movement of the cam locks is detected
 - d. Check to verify the mark on the cam lock is between the marks on the spindle. See photo 1.
 - e. Verify there is no gap between the rear of the adapter plate and the face of the spindle.



Photo 1

6. True the adapter plate to the spindle.

Note 1: *Make sure the carriage does not hit the chuck guard. If the chuck guard is removed, use Loctite #242 when reattaching fasteners*

- a. Install tool post, tool holder and tool with insert. **Note:** *If the machine has a turret, you do not need to install the tool post and holder. Simply install the tool directly into the turret.*
- b. Enter DRO mode
- c. Set spindle speed to 500 RPM
- d. Press spindle "FWD"
- e. Manually move the tool until it contacts the adapter in the Z-axis where the chuck mounts at the location of the mounting holes

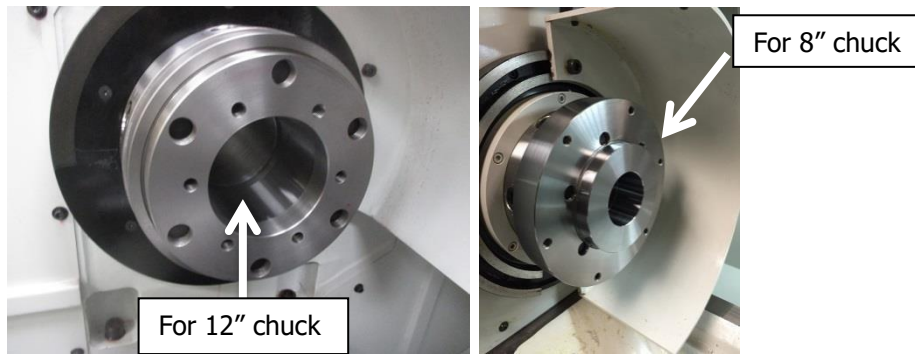


Photo 2

Photo 3

- f. Move the X-axis inward until it clears the material by entering the relief where the taper intersects the mounting flange or clears the surface
 - g. Manually move the Z-axis towards the spindle by 0.004"
 - h. Zero the X and Z readouts.
 - i. Press "Power Feed" soft key.
 - j. Using the override keys, reduce the feed rate to 2.0
 - k. Press "X", "5", "INC SET"
 - l. Press "GO"
 - m. When the cutter clears the part, press STOP and verify the surface has cleaned up.
 - n. Clear the tool and carriage and remove tool.
7. Install the chuck.
 - a. Clean the chuck thoroughly and visually inspect for imperfections. Elevate any issues to your supervisor.
 - b. Adjust the four set screws around the outside of the chuck so they do not protrude into the inside cavity on the rear of the chuck
 - c. Using lift, raise the chuck and locate against the backing plate.
 - d. Rotate spindle until the holes in the chuck align with the holes in the backing plate
 - e. Install the 6 screws and remove the lift.
 8. Trueing the chuck.
 - a. Snug the 6 bolts in the face of the chuck to prevent the chuck from slipping
 - b. Adjust the 4 fine adjustment set screws around the periphery until they contact the adapter plate and then back out one turn.
 - c. Open chuck and clean jaws thoroughly
 - d. Install alignment bar so there is approximately 6" protruding from chuck.
 - e. Using your indicator and the 4 fine adjustment set screws, adjust the chuck until the alignment bar is running within 0.0005" 1" from chuck.
 - i. While adjusting the set screws, rotate the spindle so the set screws align with the indicator.
When the indicator reads low, tighten the set screw and when the indicator reads high, loosen the set screw.
 - f. Move the indicator 6" from chuck and check runout. Max. runout is 0.0015"
 - g. Tighten 6 screws in face and 4 set screws as required to obtain these readings.
 - h. Torque the 6 screws in the face of the chuck to 38 ft-lbs for 8" chuck and 75 ft-lbs for the 12" chuck.
 - i. You will need to go from the 1" from the chuck and 6" from the chuck multiple times to obtain 0.0005" at 1" from chuck and 0.0015" 6" from chuck.

- j. Place your indicator on the outside diameter of the chuck and measure the total runout. Maximum runout of the chuck body cannot exceed 0.004".
- k. Remove alignment bar.
- l. Using a die grinder and a ¼" round nose double cut carbide burr, make a small mark on the spindle for orientation. See photo 4 and 5
- m. Using a stamp, make a mark on the adapter plate for clocking of chuck when it is removed and then re-installed onto spindle. See photo 4 and 5.

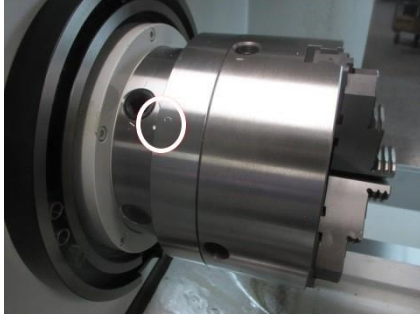


Photo 4



Photo 5

WARNING!

Use only chucks which are rated to the maximum RPM of the lathe.

2.21 Tailstock Air Assist

The purpose of the tailstock air assist is to circulate air underneath the tailstock to act as an "air cushion" to help ease the movement of the tailstock and possibly keep debris from being introduced in between the tailstock and bedway. Recommend between 80-100PSI to regulator located at rear of machine, near tailstock. When the handle pointed down, air assist is off, and when the handle pointed up, air assist is on.

WARNING!

Remember to loosen locking bolts before attempting to move tailstock!

1. If moving the tailstock using the carriage, loosen and remove large thumbscrew.
2. Rotate locking mechanism to engage the tailstock and re-install the large thumbscrew.

Note: *When tailstock is engaged, Z-axis feedrate is de-rated to 78 IPM due to pulling the extra weight of the tailstock. When the feature is on, the operator may only jog using the handwheel and jog stick. You will not be able to run a program with the switch engaged.*

2.22 Cabinet Chiller

The purpose of the cabinet chiller (radiator) is to cool the electrical cabinet and internal components. There are two units, one on each electrical cabinet door. The units are powered by single phase 220VAC and are protected by fuses F14 & F15, which also protect the enclosure fan, resistor fans and oil cooler fans. There is a small tab at bottom of filter to remove. The filter media should be cleaned on a weekly basis with either an air gun or soapy water. A quick check to ensure fans are operating is to place a piece of paper against fan from outside, the fan should pull the paper toward the fan.

3.0 Troubleshooting by Symptom

Use this section to begin the process of resolving a service problem. Each problem type is described in a few words and then more fully described in an explanatory paragraph. Following this is a chart that directs in the most logical steps.

3.1 Problems Related to the Pendant and Computer Module

3.1.1 Pendant will not Connect to Motion Control in Computer Module at Boot Up

This symptom can happen during boot up or when the machine was connected it may disconnect and you may see a flashing message on the screen.

Possible Cause	Check This
Ethernet Cable Not Properly Connected	Windows error "There is a problem with the network adapter: Media Disconnected" will show on the screen for a cable issue. Check the Ethernet cable is properly connected to both the Pendant and Computer Module (disconnect and reconnect) Ensure the Pendant side is the proper Ethernet port (closer to the bottom of Pendant)
Need to Power Cycle the Pendant	Try rebooting the control to solve the problem
Recent changes to the network or network settings	Review settings and return to original status to see if this solves the issue
Windows OS does not see the network connection	In the Windows Control Panel, view the Network and Sharing Center. The Connection diagram should show the network connection. Replace the network cable to see if the network connection is found.
	Replace the Pendant if none of the above resolve the issue

3.1.2 Pendant will not Connect to Motion Control in Computer Module

This symptom can happen during boot up or when the machine is connected. The unit may disconnect and a flashing message on the screen and a Fault Message such as "Unable to communicate with Motion Control..."

Possible Cause	Check This
Start with troubleshooting in the previous section.	Power cycle the Pendant/Computer Module. Replace the Computer Module if the same Error and Fault persists.

3.1.3 Pendant Does Not Power On

This issue may be caused by a lack of power to the Pendant

Possible Cause	Check This
No Power to the Pendant	Check the I/O Cable (DB25 Connector) cable is connected to both the Pendant and the Computer Module. Disconnect the cable and verify there are no bent pins or sockets pushed out of position in the connectors.
No Power on the Computer Module	On the Computer Module, check the status LED labeled +24VDC next to the I/O Cable from the Pendant. If the LED is off, check the power input to the Computer Module.
Power Problem in the Pendant	On the rear of the Pendant, review the Status LED group. All three of the power LEDs should be on: 24VDC, 12VDC and 5VDC. If one or two of the LEDs are not ON, replace the pendant.

3.1.4 Screen Problems

3.1.4.1 Screen is Blank but LCD Backlight is Visible

To check for this symptom, use a flashlight to see if you can see our software running in the background. This means that the pendant module needs to be replaced.

Possible Cause	Check This
LCD Backlight Issue	Use a flashlight to shine light on the LCD screen. If character/graphics can be seen, the Pendant should be replaced.
Power Problem in the Pendant	On the rear of the Pendant, review the Status LED group. All three of the power LEDs should be on: 24VDC, 12VDC and 5VDC. If one or two of the LEDs are not ON, replace the pendant.

3.1.4.2 Bad Picture on the Display

The display has strange characters, horizontal bars or other unfamiliar images, or the display continually rolls.

Possible Cause	Check This
Poor cable connection in Pendant	Check Power LEDs as in 3.1.4.1 Replace Pendant if issue is not resolved.

3.1.5 RSG Button Does Not Work

Possible Cause	Check This
RSG Connection	Disconnect the RSG and confirm the pins/sockets on the connectors of the RSG and Pendant are not bent or pushed in. Reconnect the RSG.
Internal Pendant Issue	Jumper across the two metal sockets on the RSG connection on the Pendant. Review the LED status "RSG-BT" on the rear of the Pendant. The LED should be ON. If this is not the case, replace the Pendant.

3.1.6 System Does Not Respond to Numeric Keys Button Presses

The Numeric Keys are the keys to the right of the LCD screen. (This does not include the keys below the screen.)

Possible Cause	Check This
Software not seeing the Key Press	Press any of the numeric keys. Confirm the "Key Press" LED in the status LEDs group on the rear of the Pendant is ON while the key is pressed. If this does not happen, power cycle the power and repeat. Perform the next test below.
Keypad not functioning	Use Service Code 81 to determine if any the keys are not functioning. Replace the Pendant if any keys are non-function or intermittent functionally.

3.1.7 System Does Not Respond to Critical Keys Button Presses

The Critical Keys overlay is found below the touchscreen.

Possible Cause	Check This
Software not seeing the Key Press	Press any of the numeric keys. Confirm the associated LED in the status LEDs group on the rear of the Pendant is ON while the key is pressed. If this does not happen, power cycle the power and repeat. Replace the Pendant if the problem still exists.

3.1.8 Door Guards Not Working Properly

On USA machines, door guards are turned off by default. Make sure they are turned on, if you have this option installed, by using service code 331. Door guard switches are wired Normally Open.

Possible Cause	Check This
Switch Connection Issue	Check the door guards are connected at the Computer Module. Disconnect and reconnect. Power cycle the Computer Module. Use Service Code 521 to see all the inputs.
Internal Issue	With the door guard closed, verify LED Status GRD3 is ON. If this is not working, jumper across the input on the Computer Module. If this LED does not come On or the "DOOR OPEN" message persists, replace the Computer Module.

3.1.9 Power Reset Button is Not Working

The power reset button must be pressed to energize the servos and spindle. This must be done upon power up, or following the use of the E-Stop button or whenever an M abort (critical fault) message happens.

Possible Cause	Check This
E-Stop Engaged/Remote E-Stop Engaged	Disengage the E-Stop button and repeat using the Power Reset Button. Check the Remote-E-Stop is properly connected and the unit is not damaged.
Fault Messages	Attend to and clear any displayed Fault Message
Keypad Issue	Refer to Critical Keys Issues Above in Section 3.1.7
	Power cycle the unit. If all above do not resolve the issue, replace the Pendant.

3.1.10 Spindle Does Not Turn ON

The user presses the FWD or REV buttons on the pendant and the spindle does not come on.

Possible Cause	Check This
Invalid User Mode for Spindle Control	Check the User Mode
Axis Fault	Confirm can job each axis.
Keypad Issue	Refer to Critical Keys Issues Above
	Power cycle the unit. If all above do not resolve the issue, replace the Pendant.
	Check the AC Drive to Computer Module Connections. Verify the E-Stop is not actuated as well as the NC Ready key is engaged.
3060 and 30120 lathe only – no or low head stock oil pressure or the spindle motor fan is not running	Check fan overload in electrical cabinet and pressure gage on headstock oil pump.

3.1.11 Pendant Does not Respond and Appears to be Locked Up

During normal operation, one of the follow symptoms occurs so that the Pendant is non-responsive;

- No Beep when any button is pressed or touch screen is pressed
- Screen does not change when touched
- USB Keyboard does NOT respond.
- Pressing E-stop Stops the axis but Pendant does not change screen.
- Numeric Key press does not cause the Key Press LED to turn ON.
- Removing Computer module Network does not change Lock-up condition.

Possible Cause	Check This
Remote Stop-Go (RSG) switch has a short (if connected)	Remove the RSG. Turn the system off and then on again. If the problem goes away and then re-appears when the RSG is plugged-in, replace the RSG.
Pendant Non-Responsive	Reboot control and see if problem goes away. If it does, continue to operate the Pendant. Use Service Code 521 to verify the correct LEDs are ON. If the problem returns, replace the Pendant Module

3.1.12 E-Stop Error (Machine Is Disabled)

The E-Stop turns the power off to the axis and spindle motors. On the RX control system, the message that is displayed when a user presses the E-Stop button is as follows: "Servos not enabled – Please press power reset button on the front panel to enable the servos".

Possible Cause	Check This
E-Stop Switch Failure	Confirm E-Stop is not engaged. Verify all cable connections to Pendant and Computer Module are correct. Confirm "E-Stop" LED is ON in the LED Status group on the rear of the unit only when E-Stop is engaged. Replace Pendant if the above does not resolve the issue
Wiring Faulting	For a constant E-Stop message and the LED's on the computer module are all off, check the remote E-stop cable and connections. Take a cable like the door switch cable and plug it into the remote E-Stop connector. If the LED for this comes on and the 2 pendant E-Stop LEDs come on, then the remote E-Stop cable or wiring is at fault.

3.1.13 Touchscreen Does Not Respond

This means when the user presses the screen, there is no feedback from the touchscreen. When the touchscreen is working properly, every touch of the screen produces a noticeable "touch dot" on the screen. When you see this touch dot, it means the operating system sees the touch. If this touch dot is not present then the OS has not seen it nor has our software.

Possible Cause	Check This
Internal connection Issue	A "touch dot" should appear on the screen where contact with the screen is made. For touching the softkeys, a beep is generated by the Pendant on touching the key. (The info area of the screen does not generate a beep sound.) Power cycle the Pendant. If the problem persists, replace the Pendant

3.1.14 USB Not working on Pendant

When plugging in a USB device the control does not recognize it.

Possible Cause	Troubleshooting Procedure and Possible Causes
Device Driver Not Installed	Device driver not installed for USB device. Run service code 540 and load USB driver.
One single USB or all USB connections are not working with any device	For a previously working USB port, and no device functions using the port, power cycle the control system. If the problem persists, replace the Pendant Module
USB Manufacturer	SWI recommends only the brand and model it offers to the customer.
USB Drive Full	Check for free space remaining on the drive.

3.1.15 LAN Port Not working on Pendant

Symptom	Troubleshooting Procedure and Possible Causes
No network connectivity	For either of the network ports not functioning, disconnect and reconnect both ends of the cable. Reboot control and see if problem persists. Repeat with a new, known good cable. If the problem persists, replace the Pendant.

3.1.16 Axis Fault

Perform the following Service Codes and procedures:

- **Code 33** Software Identification. This is needed if you call SWI Customer Service.

The following symptom has to do with the servo drive showing a fault number on the digital LED. See section 4.5 for a list of fault codes for the servos

Symptom	Troubleshooting Procedure and Possible Causes
Servo cables at Computer Module switched around.	Check cable connections, especially the encoder cable to the motor, both ends of cable. If the cable was loose or had a poor connection, fix problem and power cycle the machine.
X and Z-axis Gibs are adjusted extremely tight	Check the adjustment of the X and Z-axis Gibs using the X and Z-axis Gib adjustment procedures.
X and Z-axis Gibs are adjusted extremely tight	Check the adjustment of the X and Z-axis Gibs using the X and Z-axis Gib adjustment procedures. See X and Z-axis Gib Adjustments Section 5.2.1
Excessive friction in the slideways	See Machine Tool & Setup Section 4.1
Binding or looseness in the Drive Train	See Mechanical Drive Train (X, Z) Section 4.2
Incoming electrical power	Incoming voltage. See Electrical Section 4.6
Servo Drive failure	See Servo Driver - Section 4.5
Motor failure	See Motor diagnostics, Section 4.4
Computer/Pendant failure	See Computer/Pendant diagnostics, Section 4.3
	Error code 96(X-axis), 97(Y-axis) or 98(Z-axis)
	(NFLT) LED on the computer module is for that particular axis is OFF
	Error occurs when going into DRO mode or Run mode
	Error is displayed on the Drive all the time even after power reset.
Solution	Failed Servo Drive

3.1.17 Will Not Hold Calibration

The control will not hold calibration. Go to the "Configuration Values" screen and write down the calibration values for the motor encoders. The calibration values are written in Hexadecimal. Recalibrate the system and see if the values change. Turn the system off and on and see if the values are held.

Perform the following service codes and procedures:

- **Code 33** Software Identification. This is needed if you call SWI Customer Service.
- **Code 313** Configuration Values.
- **Code 123** Calibration Mode.

Possible Cause	Check This
Not saving Calibration values	Replace the Computer Module. See Computer/Pendant

If calibration factors are being saved, but the measurements are not repeating or are not accurate:

- See Measurements Are Not Repeating (Section 3.4.1)
- See Measurements Are Not Accurate (Section 3.4.2)

3.1.18 Limit Switch Error

Limit switches are installed on the carriage and cross slide to prevent serious damage to the machine in the event of a crash. The limit switch will trigger when carriage or cross slide moves past the available travel. In the event a limit switch is triggered, the following error message will be displayed.

Critical Error 5252: Limit Switch Active
 The X-axis Limit Switch is activated.
 Use the Handwheels to Move off the Switch.

When this happens, the control will not allow the operator to continue to manually move the carriage or cross slide in the same direction.

To return the machine to its normal state of operation, perform the following procedure:

1. Use the electronic hand wheel to move the carriage or cross slide off the limit switch.
2. Press the "Mode" or "Return" key to reset the control.
3. Press the "DRO" key to enable the machine to once again jog.

Perform the following service code and procedure:

- **Code 312** Toggles limit switches on/off – this will turn the limit switches on or off. This is a temporary fix for the problem and allows the user to run the machine until a replacement part can be installed. If the limit switches are turned off and a problem occurs because of a crash, this will not be covered under warranty.

Possible Cause	Check This
Limit Switches are triggered	Reset the Limit Switches using the procedures described above.
Poor Limit Switch Cable connection	Check for any pins that are loose, pushed in, or bent. Verify that there is a good connection between the cable and the Auxiliary Module.
Limit Switch failure Try this Switch 2 limit switch cables on the auxiliary module in the electrics box.	Turn off all power to the machine. For the positive direction, check for continuity between pins 1 and 6 on the Limit Switch cable connector. You should hear a continuous beep from your Multi-meter. By hand, manually depress the plunger on the limit switch responsible for when the table, saddle, or ram is moving in the positive direction. The beep from your Multi-meter should stop beeping. This means the Limit Switch is triggering properly for the positive direction. For the negative direction, repeat the same procedure as described above using pins 5 and 9 on the Limit Switch cable connector. Does the limit switch problem move to the other axis? If it does then the switch is most likely the problem. If it stays with the original axis then it could be the auxiliary module or computer module. See below.
Limit switch jumpers in cable breakout box are making poor contact	Remove and reseal jumpers

3.2

Problems Relating to Machining Results

3.2.1 Poor Finish

Poor finish can be caused by a number of variables including: speeds, feeds, tooling, machine setup and chatter.

Perform the following Service Codes:

- **Code 33** Software Identification. This is needed if you call SWI Customer Service.
- **Code 131** Manual DRO. Used to move the axes to verify the encoders are counting.
- **Code 127** Measures backlash in the system.
- **Code 128** Enter backlash compensation.

Possible Cause	Check This
Inadequate or no Lubrication to Ballscrews and Way surfaces	Make sure all the Way surfaces are getting proper lubrication. If not, check to make sure that the lube pump is functioning properly. Also check for any pinched or blocked oil lines.
X & Z-axis Drive Trains are loose	Check Repeatability using the Repeatability and Positional Accuracy procedure. Step by step, carefully inspect the Drive Train for any looseness. It may be necessary to disassemble and then reassemble the Drive Train. See Mechanical Drive Train (X, Z) Section 4.2
Way surfaces are pocked, scarred, or excessively worn	Visually check the condition of all the Way surfaces. For machines that may have excessively worn Way surfaces you may need to adjust the Gibs in this area. This will affect performance when using the machine outside of this area. Check lubrication to affected areas.
Machine set-up problem	Machine's feet are not equally supporting weight. See Leveling, Section 2.10. Verify the tool holder is correctly centered to the dead center of the spindle as well as the tail stock.
Tooling problem	Improper tooling, Work piece not properly supported speeds too fast, Feeds too slow. See Machine Tool & Setup, Section 4.1
X gib too tight or loose	See Gib Adjustment, Section 5.2.1
Loose bearing problem	Looseness in the spindle bearings. Adjust spindle preload. Ball screw misalignment, See Mechanical Drive Train (X, Z), Section 4.2.
Poor Thread Finish	Use Service Code 510 to verify the encounter count matches the RPM selected on the Pendant

3.2.2 Turning Diameters Out of Round

Parts are not round within .0004" TIR for 2470, .0006" TIR for the 1630RX and 1845RX, and 0.0002" for the 1630HSRX. Runout for the spindle is best measured by using a .0001" dial indicator and mounting to the inside taper of the spindle. Rotate the spindle and measure the indicator movement.

Note: *The typical geared head engine lathe is not capable of more precise diameters. Careful adjustments to this turning machine will insure to maintain this accuracy. Better accuracy should not be expected from a lathe of this class.*

Perform the following service code and procedures:

Possible Cause	Check This
Tooling problem	Improper tooling, workpiece not properly supported. See Machine Tool & Setup, Section 4.1
Loose bearing problem	Looseness in the spindle bearings. See Mechanical Drive Train (X, Z), Section 4.2. Spindle bearing not preloaded correctly. Reseat bearing and preload.

3.2.3 Cutting Taper

Parts are considered to be cutting on a taper if there is a difference in diameter of more than .0008" over 6 inches. This is best measured by using a .0001" micrometer.

Possible Cause	Check This
Machine set-up problem	Machine not leveled properly See Leveling - Section 2.10
Tooling problem	Improper tooling; Work piece not properly supported. Use steady rest or follow rest, reduce overhang from chuck headstock or tailstock.
Looseness in the gib or Misalignment of ball screw	Gib adjustment. See Gib Adjustment - Section 5.2.1
Loose bearing problem	Looseness in the spindle bearings. See Mechanical Drive Train (X, Z) - 4.2
Headstock and/or tailstock not aligned	Adjust Headstock for Taper To adjust tailstock from side to side, adjust grub screw. See Section 5.1.10

3.2.4 Parts Have Incorrect Dimensions

Parts are being machined with dimensions that are different than those programmed. Typical accuracy expectations should be:

- Parts should be round within .0004" TIR on 2470RX, .0006" TIR on 1630RX and 1845RX, 0.0002" on 1630HSRX.
- The acceptable measurement of parallelism of spindle axis to carriage movement is .0008" over 6 inches.

3.2.4.1 Every Part Has the Same Error

Possible Cause	Check This
Programming Error	Programmed dimensions not correct. Check absolute and incremental values.
Machine & Setup Related	See Machine Tool & Setup - 4.1

3.2.4.2 Errors are Random or Accumulate in Size over the Part Run

Possible Cause	Check This
Machining Setup	See Machine Tool & Setup - 4.1
Looseness in the Drive Train, ball nut loose in yoke, split nut loose, yoke loose	See Mechanical Drive Train (X, Z) - 4.2

3.2.5 Threading Problems

Threads can be cut with an unlimited number of pitches and up to 10 leads. To reduce the relief area when threading up to a shoulder the spindle speed should be reduced as much as possible. The slower the speed of the spindle, the closer the cutting tool can come to the end of the programmed thread before it pulls out and retracts. If a nut must be turned all the way up to a shoulder, machine a relief area behind the last thread.

Note: *No machine can thread up to a shoulder and instantaneously pull out.*

Perform the following service code and procedure:

- **Code 510** Spindle encoder test

3.2.5.1 Cross Threading

Threaded parts are cross-threaded after completion of the threading event.

Possible Cause	Check This
Looseness in the Gib	Gib adjustment See Gib Adjustment - Section 5.2.1
Looseness in the drive train	The drive train Diagnostics See Mechanical Drive Train (X, Z) - Section 4.2
Failure of the spindle encoder Run service code 150 to check if the encoder counts.	Replace spindle encoder See Spindle Encoder replacement - Section 5.1.8

3.2.5.2 Not Threading

The machine will not cut a thread at all.

Possible Cause	Check This
Spindle speed too fast	Slow down spindle speed.
Failure of the spindle encoder Run service code 150 to check if the encoder counts.	Replace spindle encoder See Spindle Encoder replacement - Section 5.1.8
Broken or slipping encoder coupling	Check and replace as necessary
Broken or loose belt on 1630HSRX lathe only	Check belt tension

3.3 Problems Regarding the Motion of the Machine

3.3.1 Run Away Axis

The axis makes an unwanted move at rapid speed in one direction and faults out. This is usually caused by an encoder signal being interrupted.

Perform the following Service Codes:

- **Code 33** Software Identification. This is needed if you call SWI Customer Service.
- **Code 131 Manual DRO.** Used to move the axes to verify the encoders are counting.

Possible Cause	Check This
The home position or tools are not set correctly	See the Controls Programming, Operations and Care manual.
Bad Motor Encoder	See Motor diagnostics Section 4.4

3.3.2 Slow Down Axis

The axis slows down and moves at a feedrate that is lower than rapid or than the programmed feedrate.

Perform the following Service Codes:

- **Code 33** Software Identification. This is needed if you call SWI Customer Service.
- **Code 131** Used to check the maximum feedrate of an axis and if the encoders are counting.
- **Code 129** Set's the maximum allowable arc accuracy error. This applies to arcs only.

Possible Cause	Check This
The maximum allowable Arc Accuracy is set too low.	This value will only slow down the machine during arc moves. The factory default is set at 0.005". Perform Code 129 to check or change this value. See Service Codes section. Values lower than 0.005" may reduce the feedrate.
Incoming AC voltage is inadequate	Perform Code 100. See Service Codes - Section 4.8 and Electrical Section 4.6
Inadequate or no Lubrication to Ballscrews and Way surfaces	Make sure all the Way surfaces are getting proper lubrication. If not, check to make sure that the lube pump is functioning properly. Also check for any pinched or blocked oil lines. See Lubrication Section 4.1.3
X and Z-axis Gibs are not adjusted properly	Check the adjustment of the X and Z-axis Gibs using the X and Z-axis Gib adjustment procedures.
Binding in the Drive Train	Check Repeatability using the Repeatability and Positional Accuracy procedure. Check the torque reading of the Drive Train. Step by step, carefully inspect the Drive Train for any binding. It may be necessary to disassemble and then reassemble the Drive Train. See Mechanical Drive Train (X, Z) Section 4.2
Servo Drive failure	See Servo Drive Section 4.5
Motor failure	See Motor Section 4.4

3.3.3 Axis Motor Motion Is Not Smooth

While under motor power, the motion is not smooth. The motion appears to be "rough" or jerky".

Perform the following Service Codes and procedures:

- **Code 33** Software Identification. This is needed if you call SWI Customer Service.
- **Code 127** Measure's the backlash in the system.
- **Code 128** Enter backlash compensation.

Possible Cause	Check This
X and Z-axis Gibs are not adjusted properly	Check the adjustment of the X and Z-axis Gibs using the X and Z-axis Gib adjustment procedures. Ensure the belts are not overtightened. Any abnormal sound from the belts is an indication of misalignment or mis-adjustment.
Calibration or Backlash problem	Recalibrate the machine. Reset the Backlash. Check Repeatability and Positional Accuracy. See Calibration & Backlash Constants section.

Binding in the Drive Train	Check Repeatability using the Repeatability and Positional Accuracy procedure. Check the torque reading of the Drive Train. Step by step, carefully inspect the Drive Train for any binding. It may be necessary to disassemble and then reassemble the Drive Train. See Mechanical Drive Train (X, Z) Section 4.2
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3.3.4 Vibration in Motion

While axis is moving there is vibration or noise coming from the X or Z-axis.

Perform the following Service Codes and procedures:

- **Code 127** Measure's the backlash in the system.
- **Code 128** Enter backlash compensation.

Possible Cause	Check This
Too much backlash entered in Code 128.	Recheck the machines backlash.
Inadequate or no Lubrication to Ballscrews and Way surfaces	Make sure all the Way surfaces are getting proper lubrication. If not, check to make sure that the lube pump is functioning properly. Also check for any pinched or blocked oil lines. See Lubrication section
X Gib is not making good contact.	Pull gibs out and mark with a blue die to check where the gibs are making contact. It is recommended that the gibs uniformly contact at least 80% of the surface.
Binding or looseness in the Drive Train	Check Repeatability using the Repeatability and Positional Accuracy procedure. Check the torque reading of the Drive Train. Step by step, carefully inspect the Drive Train for any binding or looseness. It may be necessary to disassemble and then reassemble the Drive Train. See Mechanical Drive Train (X, Z) Section 4.2
Axis Motor belt too tight.	Loosen belt.
Misalignment of ball screw	See Mechanical Drive Train (X, Z) Section 4.2

3.4 Problem with the Measurements

3.4.1 X & Z-Axis Measurements Do Not Repeat

With a dial indicator mounted to the spindle, touch off a fixed surface either in the X or Z-axis direction and then set the DRO equal to 0. Crank away several inches and then touch off again at the same place. If the reading has not returned to 0 on the DRO, zero the display and repeat the procedure. If the measurement does not repeat, you have a repeatability problem that must be resolved.

Expected repeatability numbers should be 0.0005" or less.

Possible Cause	Check This
Machine Tool & Setup problem	Check for any looseness in the setup. See Machine Tool & Setup Section 4.1
X and Z-axis Gibs are loose	Check the adjustment of the X and Z-axis Gibs using the X and Z-axis Gib adjustment procedures.
X and Z-axis Drive Trains are loose	Check Repeatability using the Repeatability and Positional Accuracy procedure. Step by step, carefully inspect the Drive Train for any looseness. It may be necessary to disassemble and then reassemble the Drive Train. See Mechanical Drive Train (X, Z) Section 4.2

Encoder Disk or Reader Head on motor are loose	Swap the motor in question with a known good motor. If the symptom stays with the motor in question, then replace the motor. If not, then the motor is not at fault and something else is causing the problem.
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3.4.2 X & Z-Axis Measurements Are Not Accurate

Measurements repeat, but with a dial indicator mounted to the spindle, traversing the length of a gage block or some other measurement standard, the measurement is not accurate.

Note: *If your part has incorrect dimensions, see Parts Have Incorrect Dimensions, Section 3.1.4.*

Note: *First check for repeatability of the DRO: With a dial indicator touch off a fixed surface either in the X or Z-axis direction and set the DRO equal to 0. Crank away several inches and touch off again at the same place. If the reading has not returned to 0 on the DRO, zero the display and repeat the procedure. If the measurement does not repeat, you have a repeatability problem that must be resolved before the accuracy problem can be resolved. See Measurements That Do Not Repeat, Section 3.4.1.*

Possible Cause	Do This
The Calibration is incorrect	Recalibrate the machine. See Calibration & Backlash Constants
Incorrect backlash values	If the machine does not repeat bi-directionally check the backlash on the axis in question. See Section 5.2.2.

3.4.3 The DRO Is Not Counting

The DRO for one axis is not counting when an axis is moved. Often times if this is the case the axis will fault.

Perform the following Service Codes:

- **Code 33** Software Identification. This is needed if you call SWI Customer Service.
- **Code 132** Electronic handwheel test.
- **Code 131** Manual DRO test.

Possible Cause	Check This
Electronic handwheel failure	Each handwheel should count 0.100" & 0.020" respectively for Z and X in fine mode, and count 0.400" & 0.100" in course mode.
Servo driver failure	Check the LED status on the axis in question. See Servo driver Section 4.5
Motor Encoder not counting	See Motor diagnostics
Computer/Pendant failure	See Computer/Pendant diagnostics

3.4.4 X & Z-Axis DRO Counting in Wrong Direction

The DRO is counting in the wrong direction.

The positive directions for each axis are:

- **X-axis** – cross slide moves toward the operator.
- **Z-axis** – carriage moves toward tailstock.

Perform the following service codes and procedures:

- **Code 33** Software Identification. This is needed if you call SWI Customer Service.

If the product does not match the machine then the machine ID key will need to be replaced.

3.4.5 X & Z-Axis Electric Handwheels Count in Wrong Direction

The Electric Handwheels count in the wrong direction.

The positive directions for each Electric Handwheel are:

- **X-axis** - Electric Handwheel turns counterclockwise
- **Z-axis** - Electric Handwheel turns clockwise

Perform the following service codes and procedures:

- **Code 308** Reverse X-axis Handwheel Direction

3.5 Problems with the Machine Tool

3.5.1 Spindle Stalls or Turns-Off During Machining

During machining, the spindle turns off and loses power. First check incoming voltage and connections.

Possible Cause	Check This
Machine Tool and Setup problem	Check the type of material being cut, type and size of cutting tool, RPM, and Feed rate. Also check the condition of the cutter to verify that the cutter is not dull. See Machine Tool & Setup Section 4.1
Motor drive Belt is slipping	Check the alignment, condition, and tension of the Drive Belt.
Cut more than the machine is capable	Check speeds, feeds and depth of cut
Spindle Drive Thermal Overload Relay has tripped	IOUT - Current Out (located on the Spindle Drive). When the Overload Relay is enabled, an "oL1" error occurs shutting off the Spindle Drive. The harder the Spindle Motor works trying to make heavy cuts, the more current the Spindle Motor utilizes. This can be caused by a cut so large that it exceeds the machine capability, or a problem with the spindle motor or AC drive.
Spindle Drive parameters are not correct	May need to re-download the Spindle Drive parameters. Contact Customer Service for assistance.

3.5.2 Spindle Motor Hums or Will Not Run

The spindle motor makes a constant humming noise during operation or will not turn on.

Possible Cause	Check This
Wrong voltage	Check the 208V voltage to the machine
Poor wiring connections	Check all the wiring connections to the electric's box.
Defective cable connections	Check all cable connections
Spindle Motor is bad	Check the resistance of the Spindle Motor windings on the Spindle Motor between L1 & L2, L2 & L3, and L1 & L3, using an Ohmmeter. The resistance should range from ".7 to 1.8 Ohm". If the Ohmmeter reads "0 Ohms" or "OL", then replace Spindle Motor. Next, check the resistance between L1 & Ground, L2 & Ground, and L3 & Ground, using an Ohmmeter. The resistance should read "OL". If not then replace Spindle Motor.

3.5.3 Spindle Runs Backwards

The spindle motor runs in the opposite direction. The spindle should always spin in the counter clockwise direction as viewed from the tailstock end of the lathe when the forward key on the pendant is pressed.

Possible Cause	Check This
3-Phase wires backwards	Need to switch any 2 of the 3 wires either coming out of the Spindle Drive (T1, T2, and T3) or going into the Spindle Motor (U, V, and W). Caution: <i>Be sure to shut off all power to the machine before attempting to switch any wires.</i>

3.5.4 Excess Gearbox Noise

Gearbox noise is louder than normal. Take note of the gear where the noise is most noticeable. Remove the gearbox lid and try to isolate where the noise is coming from.

Possible Cause	Check This
Headstock manual oil pump failure	Make sure oil is flowing in the site glass. The oil pump is run off a gear in the headstock.
Shift level out of position. Gears are not mating properly.	Move the shift lever in and out. Turn off spindle and put back in gear. Adjust the gear cluster in question to make sure it is mating properly.
Lack of lubrication to gear train	Check level of oil in gearbox
Spindle bearing not being lubricated properly, worn bearing	Check to make sure oil is finding its way to the bearings.
Spindle preload loose	Tighten spindle preload on bearing. The spindle preload should be approximately 10-15 in/lbs.

3.5.5 Headstock is Leaking Oil

A Form-A-Gasket sealant should be use to seal any leaking areas. Make sure the sealant fills the leaking area thoroughly. Sealant must cure for 24 hours for best results.

3.5.5.1 Leaking Oil from Rear of Gearbox

Possible Cause	Check This
Leaking from behind belt drive pulley	Replace shaft seal - o-rings or gaskets.
Oil leaking from behind the spindle encoder.	Remove spindle encoder and check seal.
Oil leaking from the rear bearing assembly.	Make sure the rear backing plate is mounted correctly. There should be a tapped hole located at the 12 o'clock position. If the tapped hole is located at the 6 o'clock position the seal will leak.

3.5.5.2 Leaking Oil From Front of Gearbox

Possible Cause	Check This
Oil leaking from seal between lid and gearbox	Remove gearbox lid and reseal. Thoroughly clean lid before resealing. Make sure the front backing plate matches up with the seal behind the cover.

3.5.6 Tailstock Barrel is Stiff

The tailstock barrel is stiff or not smooth moving through its travel. The tailstock barrel subassembly jams inside the tailstock

Possible Cause	Check This
Misalignment of tailstock housing	Realign bearing housing and tailstock screw. Loosen screw support and realign.
Too much grease.	Disassemble and remove excess grease. Add oil to the tailstock barrel.
Vernier Dial is binding or rubbing on screw support.	Remove dial and machine off a couple of thousandths or shim.

4.0 Diagnostics

This section explains the diagnostic procedures used to isolate service problems.

4.1 The Machine Tool & Set-Up

4.1.1 Leveling

Leveling is one of the most important aspects of setting up the machine properly. Improper leveling can lead to a variety of machining problems.

The machine should be level to within .0008" longitudinally and .0005" transversely. See Leveling Procedures, Section 2.10.

4.1.2 A Special Word About the X & Z Gib

The X gib is vital to the performance of your lathe.

Gibs should be:

- flat
- free of twist
- free of burrs
- free of blockages in the oil passages and channels

Defective or scarred gibs must be replaced. Shimming of gibs will not yield acceptable results.

It is good machining practice to avoid the use of shop air to clean the chips off a machine. This risks blowing chips into the sliding way surfaces and compromising the performance of the machine.

The Z gib is used to keep the carriage firmly planted down to the ways. There are two Z gibs, one located on each way.

See Gib Adjustments, Section 5.2.1.

4.1.3 Lubrication

Lubrication is one of the single, most important maintenance issues and plays a key role in assuring the performance and durability of the lathe. At the beginning of each day manually supply oil to the way surfaces by doing Service Code 300.

Lack of lubrication can lead to a variety of problems with your machine motion due to increased friction in the sliding ways. This increased friction may lead to part inaccuracies and decreased life expectancies of your ball screws and way surfaces.

Make sure the oil pump for the headstock is working properly at the start of each day. Check periodically the site glass for the headstock oil. The site glass is located under the spindle cover or under the shift lever on the nameplate. Lack of lubrication in the headstock can lead to increased wear of the gear train as well as premature wearing or failure of the spindle bearings. For the 1630, 1845 and 2470 oil flows to the site glass only when the spindle is on. For the 1845 oil should be flowing to the site glass whenever the 208-volt power is on. Not applicable to the 1630HS.

4.1.4 Machining Set-Up

The machining set-up itself is always something that can greatly influence the performance of the lathe. The following are some things to keep in mind.

Problems With	Can Contribute To
Feed and Speeds (spindle rpm) See below	Poor finish Excessive speeds and feeds can break cutting tools or wear out too fast.
Tooling Using the wrong cutter for an application	Poor finish Parts incorrect
Cutting too deep	Part dimensions incorrect Driving and cutting forces cause deflections, since no material is totally rigid
No coolant	Poor finish, decrease the life of the cutter

The following is a list of common machining problems and some possible solutions.

Problem	Check or Try This
Poor surface finish	Dull tool Reduce feedrate Increase spindle speed Use a higher rake angle tool Make sure tool is not dull or chipped Use proper grade of cutting tool Use coolant Check to see if tools are on the centerline
Long workpieces out of round	Use a follow or steady rest
Workpiece out of taper	Check headstock alignment
Excessive chatter	Tool bit improperly ground or not on center Avoid extreme negative rake inserts Tool overhang too great, tool deflection Improper feeds and speeds X gib loose. See Gib Adjustment, Section 5.2.1. Work improperly supported Machine tool out of level - See Leveling Procedures, Section 2.10.

4.1.4.1 Spindle Speeds

Spindle speeds are influenced by a number of variables:

- Material
- Rigidity of the Machine Setup
- Coolant
- Insert, geometry and material of insert
- Depth of cut

4.1.4.2 Feedrates

Factors that affect feedrates:

- Depth of cut
- Design or type of insert
- Sharpness of the insert
- Workpiece material
- Type of finish or accuracy required

4.2 The Mechanical Drive Train (X,Z)

Indications:

- Troubleshooting instructions indicate that the drive train is potentially the problem and other, more easily checked, variables have been exhausted.
 - Roughness, looseness, tightness or jamming movement in the carriage or cross slide.
 - Carriage walk-up due to Z ball screw misalignment.
1. Check for machine considerations, especially X gib adjustments and leveling. See Gib Adjustments, Section 5.2.1.
 2. The torque required to manual turn the X and Z-axis ballscrews should be between 10 to 15 in-lbs. These values should be consistent in both directions and along all areas of the axis travel. Values that differ from that of above may correspond to misaligned ball screws.

The following steps take you in logical sequence through the assemblies. If the step doesn't isolate or resolve the problem, it will be necessary to disassemble the indicated item and move to the next step.

See Figures 17 through 22 in Section 5.0. The drawings for the 1845 can be found in the rear of the manual.

1. Ensure that the screws that hold the bearing housing in place are not loose.
2. Ensure that the Clamp Nut is secured. The following applies to the clamp nut: When loosening, make sure to back out the 10-32 screw from the clamp nut.
3. When tightening, drag the 10-32 screw to keep the clamp nut from spreading, tighten it again after the clamp nut is tight. Torque the 10-32 screw to 90 in-lbs. Torque the clamp nut to 50 ft-lbs.
4. Take out the angular contact bearings in the X & Z-axis and inspect them. They should roll smoothly and be lightly greased. If not, replace them. The Z-axis has 2 bearing housings. One housing is on the drive train side with the other on the support housing.

Note: *The bearing housing and spacer rings are matched sets - keep them together.*

1. With the motor and drives removed, inspect the ball screw, ball nut and yoke for the potential problems shown in the chart below.

CAUTION!
Unlike a leadscrew, do not unscrew the ball screw from its nut. This will destroy the ball screw!

Potential Problem	Check By
Bad ball screw	<ul style="list-style-type: none"> • Visual inspection of the ball nut - if the nylon seal is broken or deformed, if contamination has visibly entered the ball nut or if balls are out of the ball nut, replace the ball screw. • Cranking the ball screw through a significant part of its travel. If it jams, feel loose or has rough spots, replace the ball screw. • Dial indicator on a vertical flat of the ball screw indicates backlash between the ball screw and ball nut.
Ball nut not tightened to the yoke	<ul style="list-style-type: none"> • Inspection for space between the head of the bolt and the ball nut i.e. the retaining bolt has bottomed out in its thread and is not securing the ball nut to the yoke properly.
Yoke loose in the carriage	<ul style="list-style-type: none"> • Inspection for any motion of the yoke or looseness in the Yoke mounting screws.
Oil lines sheared	<ul style="list-style-type: none"> • Visual inspection.
Oil line blockage	<ul style="list-style-type: none"> • Pump the oil and ensure that it flows evenly to the ways, ball screws and cross-slide.

Potential Problem	Check By
Z Ball screws not aligned properly	<ul style="list-style-type: none"> Manually turn the ball screw through the length of its travel. Pay particular attention to the movement near the headstock, the middle and the tailstock.

Note: Ball screws are inspected throughout their entire travel for backlash and consistent torque. A ball screw should be good for millions of inches of travel if installed properly. Do not be too quick to replace a ball screw if there is insufficient indication that it is bad; this will just be a costly delay to resolving the real problem.

4.3 Pendant and Computer Module Diagnostics

The following table lists some problems and what these problems can lead to.

Possible problems	Can lead to
Poor cable connections	There are 2 cable connections on the rear of the pendant. This is the Ethernet cable and I/O cable (ends with a DB25 connector). Make sure both cables are properly fastened on both the Pendant and the Computer Module
Pendant locks up	<p>On the rear of the Pendant, identify the "Key Press" LED (third from the top of the right LED group). Press a numerical key and confirm the LED turns on when the key is pressed. Turns off when the key is no longer pressed. This confirms the software is running.</p> <p>Press the E-stop button and see if lock up clears if not then do the following: Turn the pendant off (remove power from the computer module), wait at least 30 seconds, and connect power back to the computer module. Check to see if the malfunction has been remedied.</p>
Low voltage or power problem for the pendant.	<p>Can cause the system to lock up, RSG to fail and the flash drive to act abnormally.</p> <p>Refer to the diagnostic LEDs on the rear of the Pendant. The three power LEDs (+5VDC, +12VDC and +24VDC) should be on.</p> <p>If not, ensure the cables on the rear of the pendant are securely connected to both the pendant and computer module. Ensure power is supplied to the computer module.</p>

Possible problems	Can lead to
Flash drive failure	If the flash drive fails, all programs and machine configurations will be lost. Make sure to back up your flash drive from time to time. Only the flash drive module will need to be replaced.
LCD backlight burns out	If the LCD appears to be blank with no light showing, shine a light onto the LCD. If characters can be seen on the LCD, the LCD backlight is not functioning.

Possible problems	Can lead to
Faulty E-stop switch	<p>Refer to the diagnostic LEDs on the rear of the pendant. When the E-Stop is not engaged (ie out), the "E-STOP1-OUT" LED will be on. Push the E-stop button in (engaged), the LED will go out.</p> <p>It can be stuck open or closed (pressed). If it is stuck closed the pendant will need to be replaced because the user will have no way to get rid of the message. If it is open it will allow the machine to still operate but it will be unsafe for the user. The pendant will still need to be replaced.</p>
Overlay failure (keys on pendant)	Certain buttons on overlay do not work Do code 81 to verify each key beeps.

4.4 Motor Diagnostics

The Motor subsystem is comprised of 2 parts: The Motor Encoder and the Motor. The motors are brushless powered by 200 to 240 volt single phase power input. The servo driver is also an integral part of servo system, which is discussed in the next section.

WARNING!
Do not work with the motors unless the power is disconnected from the machine.
The motors are run by 208 VAC. There is possibility of death by electrocution!

Rarely do both the X and Z motor/servo systems fail at the same time and in the same way. So, if your problem is occurring on both axes, its source is probably somewhere else.

4.4.1 Cable Connections

Check the motor cable connections on the cable breakout box and from the servo to motor. Verify there are no pushed in pins on the connector.

4.5 Servo Drivers

The servo drivers are used to control the motors. They are run on single phase 200-to-240-volt power. The two (2) servo drivers are located in the electrical cabinet. There are two power sources: one for the control circuit which powers the LED display and the main terminals used for the power circuit.

The computer module outputs a command to each servo drive via a signal with a voltage which is between -10 and +10 volts. The + and - voltage dictates the motor rotation direction and the magnitude sets the speed of rotation.

Indications:

- Problems moving just one axis. The axis faults out on the screen.

Servo Types:

- X is a light duty driver
- Z is a heavy duty driver

When the AC servo drive has a fault, the LCD will display "ALnnn". "AL" indicates the alarm and "nnn" indicates the drive fault code. The following is a list of the fault codes:

Servo Drive Fault Messages

Fault Messages		
Display	Fault Name	Fault Description
AL001	Overcurrent	Main circuit current is higher than 1.5 multiple of motor's instantaneous maximum current value.
AL002	Overvoltage	Main circuit voltage has exceeded its maximum allowable value.
AL003	Undervoltage	Main circuit voltage is below its minimum specified value.
AL004	Motor error	The motor does not match the drive. They are not correctly matched for size (power rating).
AL005	Regeneration error	Regeneration control operation is in error.
AL006	Overload	Servo motor and drive is overload.
AL007	Overspeed	Motor's control speed exceeds the limit of normal speed.
AL008	Abnormal pulse control command	Input frequency of pulse command exceeds the limit of its allowable setting value.
AL009	Excessive deviation	Position control deviation value exceeds the limit of its allowable setting value.
AL010	Reserve	Reserve
AL011	Encoder error	Pulse signal is in error.
AL012	Adjustment error	Adjusted value exceeds the limit of its allowable setting value when perform electrical adjustment.
AL013	Emergency stop activated	Emergency stop switch is activated.
AL014	Reverse limit switch error	Reverse limit switch is activated.
AL015	Forward limit switch error	Forward limit switch is activated.

Figure 4.5a Motor Servo Driver Fault Errors

Fault Messages		
Display	Fault Name	Fault Description
AL016	IGBT temperature error	The temperature of IGBT is over high.
AL017	Memory error	EE-PROM write-in and read-out is in error.
AL018	Encoder output error	The encoder output exceeds the rated output frequency.
AL019	Serial communication error	RS232/485 communication is in error.
AL020	Serial communication time out	RS232/485 communication time out.
AL021	Reserve	Reserve
AL022	Input power phase loss	One phase of the input power is loss.
AL023	Pre-overload warning	To warn that the servo motor and drive is going to overload. This alarm will display before ALM06. When the servo motor reach the setting value of P1-56, the motor will send a warning to the drive. After the drive has detected the warning, the DO signal OLV will be activated and this fault message will display.
AL024	Encoder initial magnetic field error	The magnetic field of the encoder U, V, W signal is in error.
AL025	Encoder internal error	The internal memory of the encoder is in error. An internal counter error is detected.
AL026	Encoder data error	An encoder data error is detected for three times.
AL027	Motor internal error	The setting value of the encoder is in error.
AL028	Motor internal error	The encoder U, V, W signals are in error.
AL029	Motor internal error	The internal address of the encoder is in error.
AL030	Motor protection error	In order to protect the motor, this alarm will be activated when the setting value of P1-57 is reached after a period of time set by P1-58.
AL031	U, V, W, GND wiring error	The wiring connections of U, V, W (for servo motor output) and GND (for grounding) are in error.
AL035	Motor temperature error	Motor is working under temperature over 105°C (221°F).
AL048	Excessive encoder output error	The encoder output errors or output pulses exceed hardware tolerance.
AL067	Motor temperature warning	The temperature of motor is over 85°C (185°F).
AL099	DSP firmware upgrade	EE-PROM is not reset after the firmware version is upgraded. This fault can be cleared after setting P2-08 to 30 first, and then setting P2-08 to 28 next and restarting the ervo drive.

Figure 4.5b Motor Servo Driver Fault Errors

4.6 Electrical

For layout and connectivity of the Electrical Cabinets, refer the drawings 29103-x in Section 8.

4.6.1 Checking A/C Voltage

This procedure tests for the 208 VAC for the control. Check the power input to the computer module. Note the 3060 and 30120 lathe runs on 480 volts.

- Use a Voltmeter, reading A/C volts
- Acceptable range is 200V to 240V
- Acceptable range for the 3060 and 30120 is 432 to 528 volts

Note: *Systems running consistently close to the high or low values may have problems when normal voltage fluctuations push the voltage out of the acceptable range.*

4.6.2 Checking Fuses

To locate the fuses and their sizes, refer to the Electrical Cabinet drawing 29103-x found in Section 8.

To check fuses:

1. Use a Multimeter (Volt/Ohmmeter); select "OHM" or " Ω ".
2. Remove the fuse completely from the pendant display or computer module.
3. Place a lead of the meter on each end of the fuse.
 - A good fuse reads 0 (zero) or close to it.
 - A bad fuse reads Open or Infinity or OL (overload).

4.6.3 Main Electrical Box

The electrical box is made up of the following main components:

1. AC drive – used to control the spindle motor.
2. Spindle Motor Braking Resistors: 3 braking resistors – used to brake the spindle motor. To verify the resistors are good, measure the resistance across B1 and B2 of the AC drive. For the 1630, these connected resistors should measure 20 ohms (+-2 ohms). The 1845 and 2470 should read 10 ohms (+- 1 ohm) when the resistors are good. For the 3060 and 30120, these resistors should measure 25 ohms (+/-2) Values lower or higher than this could be one or both resistors are bad. The 1630 uses (3) 500 watt 60 ohm resistors. The 1845 uses (3) 500 watt 30 ohm resistors. The 2470 uses (3) 1000 watt 30 ohm resistors. The 3060 and 30120 uses (3) 1000 watt 75 ohm resistors. When good your meter should read approximately 10 ohms.
3. Computer Module – see section 4.6.4.
4. Servo drivers – servo drivers for the X and Z-axis motors.

4.6.4 Computer Module Connections

The list below describes what takes place through each connection. Power reaches the AC IN directly on the Computer Module. From there power is distributed through the system. This power is used to send power to the Pendant through the I/O cable.

The following is the set of connections for the Computer Module:

- Spindle Encoder input – CPC14
- 2 USB ports – not for users
- Com ports – 1 and 2. COM1 for looking at the computer module BIOS and COM2 is a spare.
- Ethernet connector – master and slave communicate via an Ethernet cable between pendant and computer module
- AC power input – 200 to 240 volt for USA

- Machine ID key – DB25
- Pendant I/O – DB25 – Carries E stop and run panel buttons back and forth from pendant to computer module
- Handwheel/Jog connector – DB25
- Motor and Spindle axis connectors – DB25 – spindle, X, Turret, and Z axis.
- 14 inputs, the following inputs are all 24VDC
 - IN-GRD1 - Used for chuck guard on 3060 and 30120 only
 - IN-GRD2 – not used at this time
 - IN-GRD3 – Door guard
 - IN-X Limit – X limit switch input
 - IN-Z Limit – Z limit switch input
 - IN-AIR PRES – monitors the air pressure of the CNC Turret
 - IN-GEAR 1 - low gear input - (for example low gear on 1845 and 2470 lathe)
 - IN-GEAR 2 – monitors gear switch (not used on USA lathe at moment)
 - IN-GEAR 3 – high gear input (for example high gear on 1845 and 2470 lathe)
 - IN-GEAR PRESS – monitors oil pressure to spindle (used on 3060 and 30120 only)
 - IN LUBE OIL PRESSURE/LOW – input from lube pump to signal low pressure or low oil in reservoir (used on 3060 and 30120 only)
 - IN-SPARE 1 and 2 – extra inputs
 - IN-SPARE 3 and 4 – extra inputs
 - IN-REMOTE ESTOP – the E stop on the apron on each lathe plugs into here.

Note: 3060 and 30120 lathe has a spindle fan overload input, spindle jog switch input, spindle hold input and tailstock engage input not found on other lathes.

- IN-TURRET
 - Clamp – LED on when turret is clamped
 - Unclamp – LED on when turret is unclamped
 - Home – LED on when at home or tool position 1
 - spare
- 9 outputs, the following outputs are all 24VDC
 - OUT-TURRET-INDEX –
 - OUT GRD LOCK – output to add a door lock (used on Euro only)
 - OUT-TURRET UNCLMP
 - OUT LUBE PUMP – output to run lube pump. Software controls frequency and discharge time
 - OUT COOLANT PUMP – output to run coolant pump
 - OUT LIGHTS – output to run work lamp
 - OUT 24DC - Used as part Aux I/O and spare voltage output
 - OUT SPARE 1 – extra output
 - OUT SPARE 2 – extra output

4.6.5 Cable Connections

The lathe machines use several cables to communicate between systems. It is often the case that what appears to be the failure of an electrical component is actually attributable to a poor connection.

Indications:

- Control problems, chronic or intermittent.
- Motor problems.
- Measurement problems.

Explanation:

1. Turn off and *unplug* the system from the wall.

WARNING!

Do not plug and unplug connectors with the system power on. This may cause damage to the connector board and harm to the technician.

2. Visually inspect the connections for excessive debris, moisture, or obvious damage.
3. Carefully clean any chips away from the connectors.
4. One-by-one, take out each connector and then plug them back in. Do the same at the computer/display.
5. Make sure the screws are tightened on each of the connectors.

4.7 Door & Gear

All TRAK lathes use a door interlock switch to verify to the control that the door is closed in various modes of operation. This switch is wired normally open but is forced closed when the door is closed during CNC run mode. There should be continuity between pins 1 and 6 when the switch is forced closed and no continuity when the switch is in the open position. Gear switches in all lathes are electrically the same, however there exist a difference how they are actuated mechanically.

In 1840SX & 2460SX the gear shifter turns OFF the opposite gear switch, when the 1845SX & 2470SX turns the corresponding gear switch ON. It is explained below:

Gear Switch – 1845RX & 2470RX

The switches are mounted on the rear of the headstock (see drawing 27945 for 1845) under the sheet metal belt cover. The switch closest to the headstock casting controls low gear and the other one controls high gear. In HIGH SPEED handle position high speed switch is released. In LOW SPEED handle position low speed switch is released. Both switches are wired normally closed. This means the contact is open when the switch is pushed. If the gear shifter is in the middle of both gears, both switches will be pushed, contacts will open and the spindle will be in neutral. There should be no continuity between pins 1 and 6 when the high gear switch is pushed and continuity when the switch is released in "High speed" handle position. There should be no continuity between pins 2 and 7 when the low gear switch is pushed and continuity when the switch is released in "Low speed" handle position. The spindle control electrical box gear LEDs will indicate GEAR1 for High Speed and GEAR2 for Low Speed and in neutral position both LEDs will remain OFF.

4.8 Service Codes

Service codes are broken down into the 5 following categories: software, machine setup, diagnostics, user options/defaults and lubrication pump control.

All Service Codes are accessed in the SET-UP Mode by pressing the soft key for "SERV CODES". The service codes can be found under one of the headings listed on the main screen. Press the heading you want to access the code in question. If you know the code #, press the CODE # softkey and it will take you directly to the code in question. Press CODE #, enter the number you want, press SET.

4.8.1 Software Codes

The following codes pertain to software functions in the control. To get to any of these codes go to Service Codes, press "A" and press the code you wish to view.

Note: *If you are working with the SWI Customer Service Group, write the values down for Code 33. These values will be valuable for troubleshooting.*

4.8.1.1 CODE 33: Software ID

The Code 33 is the software identification procedure. The two types of software in the control include:

- **Software Version** - the version of the system you have installed
- **Firmware Version** - the version of firmware software that is responsible for control to servo interface.
- **Converter Version** - the version of software that is responsible for converters and options.
- **Operating System Version** – shows the version of the XP operating system

4.8.1.2 CODE 141: Load Configuration File to the Computer

This code allows you to load your configuration file from a selected drive to your hard drive. The configuration file consists of items such as calibration and backlash constants. This code is used when a computer module or hard drive has been replaced.

4.8.1.3 CODE 142: Save Configuration File from the Computer

This code allows you to save your configuration file to an external thumb drive. The configuration file consists of items such as calibration and backlash constants. This code is used when a computer module or hard drive needs to be replaced. This stores the configuration file from the hard drive to an external thumb drive. It is a good idea to do this code after the machine is initially setup so these values can be saved and used in the future. If the computer or hard drive fails, then you will not have the ability to save the configuration file and the machine will need to be re-setup when the computer or hard drive is replaced.

4.8.1.5 CODE 316: Update Master Software

Load upgrade disk in an external drive and press this service code. New software will automatically download and control will reboot.

4.8.1.6 CODE 317: Update Slave Software

Load upgrade disk in an external thumb drive and press this service code. New software will automatically download.

4.8.1.7 CODE 318: Activate Converters or Options

See programming and operating manual.

4.8.2 Machine Set-Up Codes

The following codes are used primarily when setting up a new machine. To get to any of these codes go to Service Codes, press "B" and press the code you wish to view.

4.8.2.1 CODE 123: Calibration

Used to calibrate the RLX control with a standard.

4.8.2.2 CODE 128: Input Backlash Constant

Code 128 allows you to enter the backlash values for each axis. It displays the value after it enters. This code is used only on machines with motor encoders.

4.8.2.3 Code 308: Reverse X Hand Wheel Direction

This service code reverses the direction of the X hand wheel.

4.8.2.4 Code 311: Run Machine with Spindle Off

This service code toggles this function on or off. It defaults to off from the factory, which means the spindle must be on for a program to run. If it is on and you forget to turn the spindle on, the tool will move to Z rapid and wait for the spindle to come on. This function will be needed if you are running a repeatability program with an indicator in the spindle. Make sure this feature is on when cutting parts.

WARNING!
Use only chucks which are rated to the maximum RPM of the lathe.

4.8.2.5 Code 312: Toggle Limit Switches On/Off

This service code toggles the limit switches on or off. Code 313 also displays which state the limit switches are in.

4.8.2.6 Code 510: Spindle RPM Calibration

This service code calibrates the spindle using its encoder, simply follow the on screen instructions. Please note that when installing new machine, or replacing computer module, that if no configuration is present, spindle may not run properly. Press the F4 button to load spindle calibration defaults, if needed. This has no effect on other settings such as calibration, backlash, etc.

4.8.3 Diagnostic Codes

The following codes are used primarily when diagnosing a problem with the machine. To get to any of these codes go to Service Codes, press "C" and press the code you wish to view.

4.8.3.1 Code 1: Program, Configuration File, Log Back up

This service code captures all important data from the RX machine. This includes the users program, master and slave configuration files, master and slave message logs, master and slave fault logs etc. This is meant to be used to help solve problems that may pertain to the software. This file can then be emailed to the SWI service department. The files are saved to a Zip file.

4.8.3.2 Code 54: Program Continuous Run

This Code runs a program continuously without stopping for tool change commands. It is helpful in running a long period to identify an intermittent problem.

1. Prepare a program as you normally would.
2. Press **MODE, SET UP, "C", Code 54, INC SET**. The program run will start automatically.
3. Press **STOP** to stop, and **GO** to continue.

4.8.3.3 Code 81: Keyboard Test

This code is used to check if the keyboard is functioning correctly. It allows you to test each key on the pendant individually. When you press the keys, the corresponding box for that key will highlight on the screen. The pendant will also beep, indicating that the key is working correctly. If one of the keys does not work the pendant assembly may need to be replaced. If none of the keys are working chances are that the computer module will need to be replaced.

4.8.3.4 Code 131: Manual DRO

A manual diagnostic routine to check the motor encoder and table encoders. Turn the X hand wheel to display the encoder readings. This code will display the actual DRO counts and the raw encoder counts before the calibration and backlash factors have been factors into the counts.

4.8.3.5 Code 132 - Electronic Hand Wheel Test

Turn the X or Z-axis electronic hand wheel. The display should show movement as the hand wheel is being turned. There should be no skipping and it should count smoothly while the hand wheel is being turned. One revolution of hand wheel should read 0.4000" for Z and 0.1000" for X in course, and 0.100" & 0.020" for fine mode.

4.8.3.6 Code 314: Toggle Test Lights 'On' in Status Line

This code toggles on and off 2 test lights that appear in status line. The top light signifies if the master software is working. If functioning it should flash a green light. The bottom light signifies if the slave firmware is functioning. It will appear orange in run mode when it is processing information. Pressing the mode key will change this orange box to black. The orange box will also change to black when the program you are running reaches the 3rd event from the end of the program. If the firmware is locked up no keys will work. This code is useful for diagnosing intermittent problems with the control locking up.

4.8.3.7 Code 319: Error Log

This code when turned on captures the commands that were sent to the servo system. It includes items such as positioning commands, errors, stop and go commands, etc. It may be helpful for identifying problems between programmed commands and executed commands. To turn on the error log press the F6 softkey. The page forward and backward keys allow you to scroll through the file one page at a time. The data forward and data backward keys allow you to scroll through the file one line at a time. The data bottom key takes you to the bottom of the file and then changes to data top which will take you back to the top. The file will capture data until the file reaches a size of approximately 600 KB. At this time the file is saved to a backup file and the original file is cleared and data is once again captured. Once again as the file reaches a size of 600 KB it copies over the previous backup file. From here the user can save the file to an external thumb drive by pressing the F8 softkey. Once this is done it prompts for which file you want to save to disk. The F1 key saves the current file to disk and the F2 key saves the backup file to disk. To clear the files press the F7 softkey.

4.8.3.8 Code 326: Look Up Message

Allows user to display safety flashing messages, master messages and slave error messages on screen. Often used by translators converting English language to some other language.

4.8.3.9 Code 327: Display Memory Check

Displays memory availability of various devices.

4.8.4 Operator Defaults/Options Codes

The following codes allow the user to set programming defaults or turn features on or off. To get to any of these codes go to Service Codes, press "D" and press the code you wish to view.

4.8.4.1 Code 79: Beeper On

This turns on the beeper to the control keys.

4.8.4.2 Code 80: Beeper Off

This turns off the beeper to the control keys.

4.8.4.3 Code 143: Toggle Tool Change Spindle Mode

This code allows the spindle to stay on at tool changes when turned to the ON position.

4.8.4.4 Code 328: EPA On/Off

Turn the EPA feature on or off

4.8.5 Lube Pump Codes

The following codes are used for programming and operating the lube pump. To get to any of these codes go to Service Codes, press "E" and press the code you wish to view.

4.8.5.1 Code 300: Lube Pump Switch

This code acts as a switch to turn the lube pump on for the programmed time set in Code 302.

4.8.5.2 Code 301: Set Lube Pump cycle time

This code sets the interval time between lube cycles.

4.8.5.3 Code 302: Set Lube Pump discharge time

This code sets the lube pumps discharge time.

5.0 Procedures for Replacements & Maintenance

5.1 Replacements

5.1.1 Brushless Motor Replacement

WARNING!

Do not work with the brushless motors unless the power is disconnected from the machine. The motors are run by 208 VAC. There is possibility of death by electrocution!

1. Turn off power to the machine.
2. Each X (750Watts) is mounted by the use of (4) M6-25 cap screws. The Z axis motor (2KW) is mounted by the use of (4) M8-25 screws. Be careful not to over-tighten these bolts and strip the threads.

5.1.2 Servo Drive Replacement

WARNING!

Do not remove the Servo Drives unless the power is disconnected from the machine. The servo drives are run by 208 VAC. There is possibility of death by electrocution!

The Servo Drive for each axis is mounted in the electrical cabinet using (2) M5-30 cap screws.

DANGER!

Always engage (push in) the Emergency Stop switch, turn the ProtoTRAK RX Control off, and disconnect the servo motor/driver cable at the cable breakout box.

1. Press in the Emergency Stop.
2. Remove power from the machine.
3. Disconnect the two digital cables with DB connectors (CN1 and CN2).
4. Disconnect the incoming motor power 8 individual wires with lug termination from the drive (labelled L1-6, L2-6, L1-7, L2-8, L3-7, U, V, W). Do not pull on the wires.
5. Remove the green ground wire by removing the green screw on the bottom left corner of the unit.
6. Mount the new servo drive in the cabinet. The servo drive is programmed for either X or Z axis.
7. Reconnect the green ground wire followed by the two digital cables and 8 power wires.



P/N	Description
28164	Motor-Brushless-Delta-750W (1630RX/1630HSRX/1845RX/2470RX: X Axis)
28164-1	Motor-Brushless-Delta-1KW (3060 and 30120RX: X Axis)
28164-2	Motor-Brushless-Delta-2KW (1630RX/1630HSRX/1845RX Z Axis)
28164-3	Motor-Brushless-Delta-2KW (2470RX Z-Axis)
29980-1630US-X	1630RX X-Axis Servo Drive – Delta – Programmed – RX-750W
29980-1630US-Z	1630RX/1630HSRX Z-Axis Servo Drive – Delta – Programmed – RX-2KW
29980-1845-X	1845RX X-Axis Servo Drive – Delta – Programmed – RX-750W
29980-1845-Z	1845RX Z-Axis Servo Drive – Delta – Programmed – RX-2KW
29980-2470RX-X	2470RX X-Axis Servo Drive – Delta – Programmed – RX-750W
29980-2470RX-Z	2470RX Z-Axis Servo Drive – Delta – Programmed – RX-2KW
29980-3060RX-Z	3060RX Z-Axis Servo Drive – Delta – Programmed – RX-3KW
29980-30120RX-Z	30120RX Z-Axis Servo Drive – Delta – Programmed – RX-3KW

Figure 5.1.2 - Servo Drive and Motor Replacement & Part List

5.1.3 Pendant and Computer Module Replacement

5.1.3.1 Pendant Replacement

1. Turn power off to the machine and control.

2. Unplug all the connectors on the back side of the pendant.
3. Remove the pendant from the pendant arm by removing the (4) M6-1.0x25 25B screws that secure it in place.
4. Mount the replacement pendant on the arm with the (4) mounting screws.
5. Reconnect all the previously removed cable connections.

5.1.3.2 Computer Module Replacement

1. Turn power off to the machine and control.
2. Unplug all the connectors connected to the Computer Module.
3. Remove the Computer Module from the Electric Box by removing the (6) M5-0.8x12 SHCS that secure it in place.
4. Replace the Computer Module and reinstall by mounting with the screws used to mount the previous unit.
5. Reconnect all the previously removed cable connections.



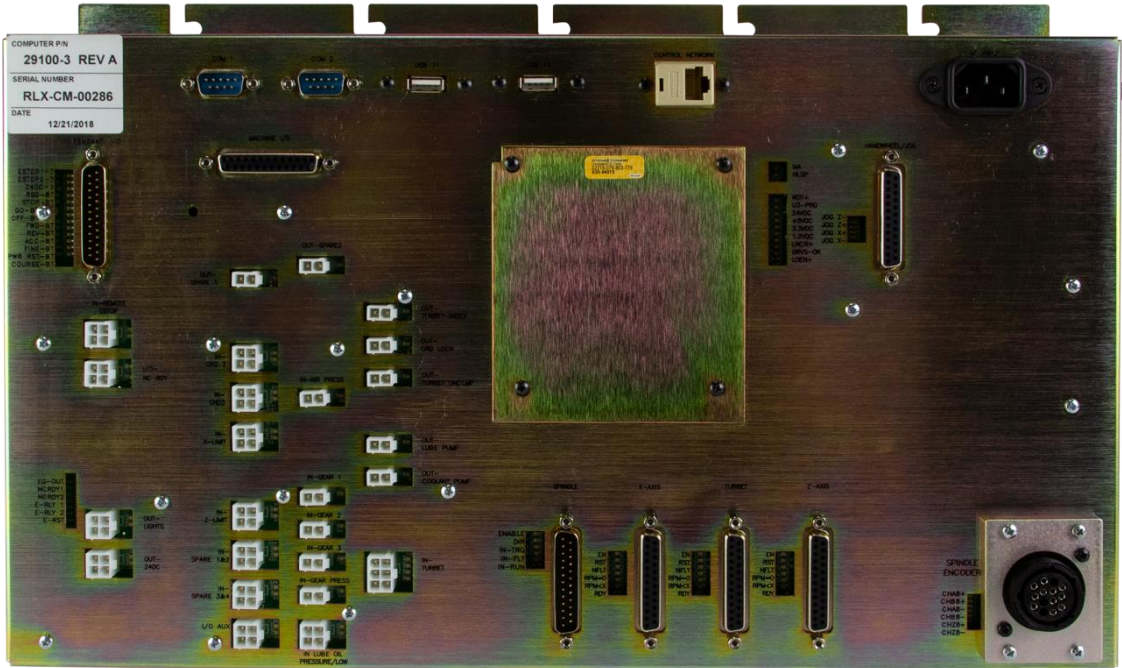


Figure 5.1.3.2 - Pendant & Computer Module Replacement

Item	P/N	Description
1	29006-2	RLX PENDANT
2	29100-3	RLX COMPUTER MODULE

Figure 5.1.3.2 - Pendant & Computer Module Replacement

5.1.4 Updating the Pendant and Computer Module Software

1. On the pendant, touch the "Status" soft key on the upper left portion of the touch screen. This will display the pendant and CM software version.
2. To verify the current software versions, go to <https://www.southwesternindustries.com/software>
 - Click on the "Current ProtoTRAK CNCs Software" tag. Find the RX section and refer to the software versions list.
3. To update to a more current version, first download the software from the website onto a USB Flash Drive.
4. Plug the USB Flash Drive into one of the pendant USB ports.
5. On the Pendant, select the soft key "Service Codes". Type in "316" and press the ABS Set key. Follow the instructions on the screen.

Note: *Your configuration/calibration settings will not be changed by this procedure.*

If you wish to store your settings on a USB Flash drive, install a drive in one of the ports and use Service Code 142 to save the values. Service Code 141 can be used to restore the values on your Flash Drive back onto the pendant.

5.1.5 Cable Routing on Machine & In Electrical Cabinet

Whenever you replace a cable or reroute a cable it is very important to keep the power cables and logic cables separated from each other. The power cables consist of the (2) 208-volt motor cables and (2) 208-volt power cables for the Computer Module and a coolant pump or lube pump cable. The logic cables are used to carry encoder signals between the servos and computer module. Mixing of the power and logic cables may cause noise from the power cables to interrupt the signals in the logic cables. This can lead to intermittent axis faults or repeatability problems.

5.1.6 Electronic Handwheels & Jogstick

There are 2 electronic handwheels on the lathes and 1 jogstick to move the carriage quickly into position. Each unit is replaced as an assembly. Disconnect the handwheels and jogstick from the apron cable. Replace the part and reinstall as the original was connected and mounted.



Figure 5.1.6 - Electronic Handwheels & Jogstick

5.1.7 Spindle Drive Belt Replacement

The spindle drive motor is located inside the base pedestal, underneath the headstock gearbox. Access is gained by opening the upper door on the headstock and removing the lower access panel on the pedestal. When removing the belt, loosen nut "G" and advance nut "H" until the belt has sufficient slack to be removed from the pulleys.

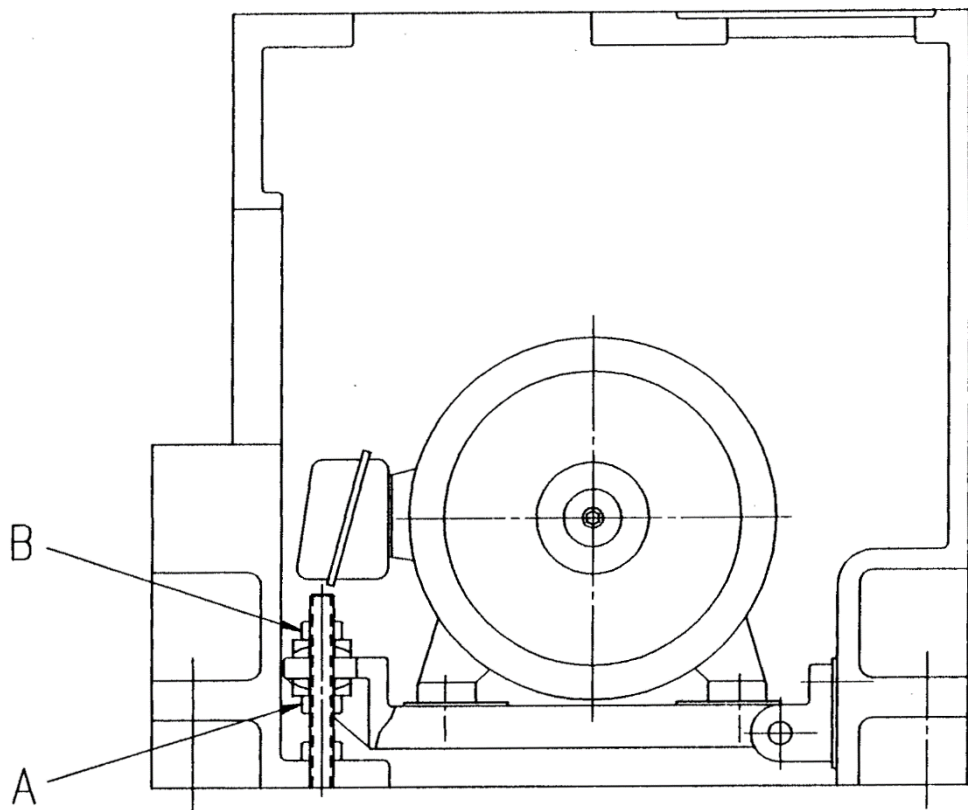
When installing the belt, retract nut "H" and tighten nut "G". Initially, tension the belt such that there is no slippage when the lathe is started at its maximum speed.

Belt tension should be checked frequently during the first days of operation, and periodically thereafter. Keep the pulleys and belt clean and free of any foreign material to ensure long life and maximum traction.

Adjust the belt tensions using the "Pencil Tester" approach. For the 1630RX/1630HSRX, the specification is 3.5 to 4.0 lbs using a ½ deflection. For the 1845RX and 2470, use 3.0-3.5 lbs.

5.1.8 Spindle Encoder Replacement

1. Unplug or remove all power from the lathe.
2. Remove the spindle cover to gain access to the encoder.
3. Loosen setscrews on flexible coupling and the bolts that hold the encoder on.
4. Slide the encoder off.
5. The spindle encoder assembly is only available as a complete unit. Do not disassemble.



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Figure 5.1.8 – 1630RX, 1630HSRX, 1845RX, & 2470RX - Spindle Motor Belt Adjustment

5.1.9 Spindle Motor Removal

1. Unplug or remove all power from the lathe.
2. Loosen the belt tension. See section 5.1.8.
3. Mark and remove motor electrical leads.
4. The motor is secured with four screws to a flange plate. See Figure 5.1.8
5. Because of the weight and size of the spindle motor, and the restricted working space, extreme caution should be used in sliding the motor from its mounting plate.

5.1.10 Aligning Tailstock to Spindle

If there is taper appearing on the workpiece while machining when using the tailstock, the tailstock will need to be realigned to the spindle. Follow the steps below.

1. Insert a gage bar between the spindle and tailstock, attach a base of a dial indicator to the saddle, apply the needle of the indicator to the surface of the bar, then move the saddle through the longitudinal travel. Document the measurement of its maximum difference from end to end for later adjustment.
2. Release the 4 bolts labeled "A" in the drawing.
3. Release the screw labeled "B".
4. Adjust screw "C" until the tailstock is aligned with the spindle.
5. Tighten up the locking nuts "A".

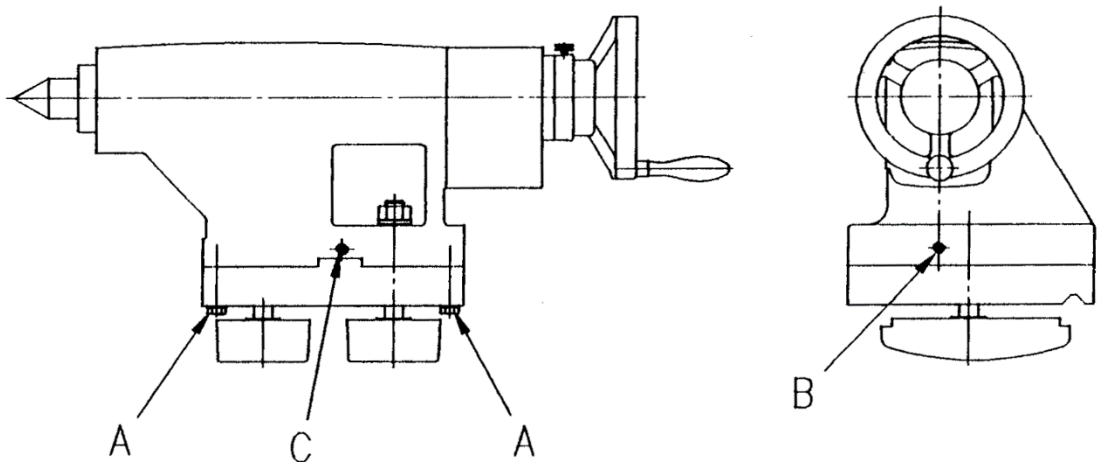


Figure 5.1.10 - All RX Lathes - Tailstock Adjustment

5.1.11 Spindle Motor Wiring

The TRAK Lathe spindle motors are wired for 208 volts (low voltage configuration). The wiring consists of 3-phase power for the motor and 208 volt power for the spindle motor fan. Please see the motor junction box diagram for wiring information.

Each junction box contains 6 terminals. Make sure to hook up the wires to the same terminals after the replacement motor is installed. Failure to do so may cause the motor to run in the wrong direction.

The spindle motor fan wires are also found in the junction box. There is 1 hot wire, 1 neutral wire and 1 ground wire. It does not matter which wires are connected to the hot and neutral wires. All grounds from each cable are connected to either of the screws in the junction box.

5.1.12 Spindle Removal – 1630HSRX only (See Figure 5.1.2)

The following procedure is to remove the spindle for the 1630HS lathe.

1. Remove both spindle pulley belts.
2. Loosen three set screws on locknut item #21. Remove locknut.
3. Remove belt pulley item #20. Mark orientation of pulley to spindle shaft
4. Remove two keys item #19.
5. Loosen three set screws on locknut item 18. Remove locknut.
6. Remove six M6 socket head cap screws item #4
7. Cover end of spindle with aluminum or brass drift to prevent damage. Strike to remove spindle. Carefully remove seal ring item #17 and encoder drive gear item #12 as spindle is driven forward. Remove O-ring item #6.
8. Remove two bearings item #14

Note: The initial design of the spindle was different from what is reflected in Figure 5.1.12a and in the parts list below. The spindle bearings are a 7013 bearing, p/n 24747.

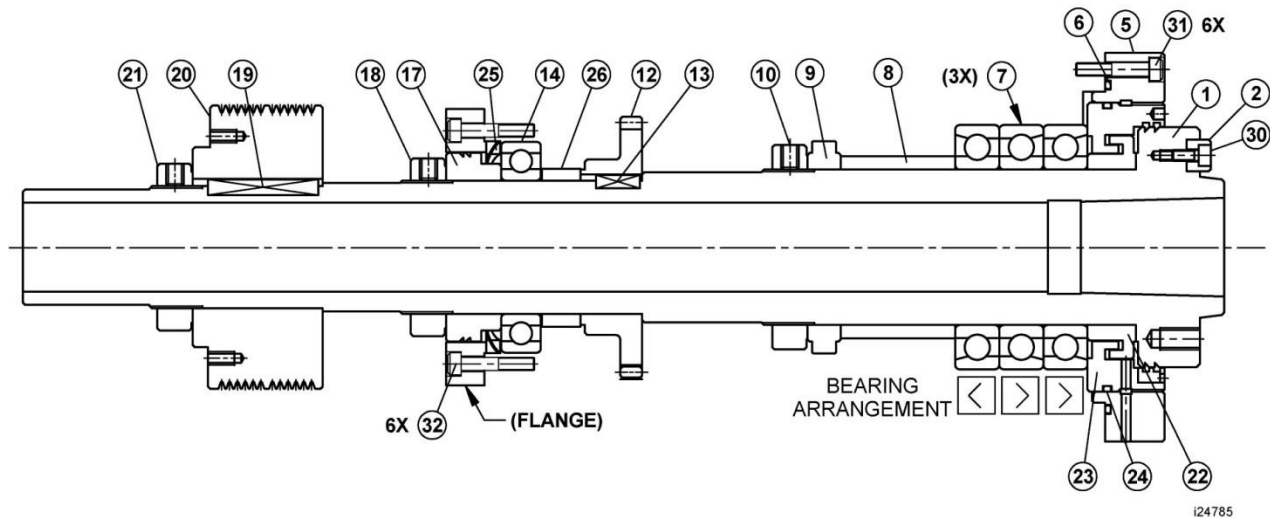


Figure 5.1.12a - 1630HSRX – Spindle Assy P/N 24785 & Parts List Shown

Item	P/N	Title	Qty
1	24751	SPINDLE - 1630HS	1
2	24750	KEY	1
5	24752	COVER, FRONT	1
6	24753	O-RING	1
7	24754	BEARING-ANGULAR CONTACT U/ SET (3)-7014 P4	1
8	24755	SPACER SET	1
9	24756	COLLAR	1
10	24757	NUT-LOCK	1
12	24758	GEAR	1
13	24759	KEY	1
14	24760	BEARING-DEEP GROOVE-6012ZZ	1
17	24762	COLLAR	1
18	24763	NUT-LOCK	1
19	24764	KEY	1
20	24765	PULLEY, SPINDLE	1
21	24766	NUT-LOCK	1
22	24767	COLLAR	1
23	24770	CLAMP RING	1
24	24771	O-RING	1
25	25014	WASHER-WAVE SPRING	1
26	25015	SPACER-REAR BEARING-SPINDLE	1
30	M5-0.8X16 25B	SCREW-SHCS-STL-BO	1
31	M6-1.0X30 25B	SCREW-SHCS-STL-BO	6
32	M6-1.0X20 25B	SCREW-SHCS-STL-BO	6

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Figure 5.1.12b - 1630HSRX – Spindle Assy P/N 24785 & Parts List Shown

5.2 Maintenance

5.2.1 Gib Adjustments

The objective of adjusting the gibs is to eliminate as much play in the cross slide and carriage sliding surfaces as possible without having the tightness of the gib interfere with their free movement and cause a decrease in the accuracy and/or performance of the machine due to excessive friction.

5.2.1.1 Cross Slide Gib Adjustment

1. Remove the yoke bolts from the top of the cross slide and slide it back and forth and feel for any looseness in the system. If it is loose tighten up the adjusting screws.

Note: *Adjustments should be made where the gibs are worn the worst.*

2. Turn the X-axis ball screw with a torque wrench and measure the torque. The torque should be less than 15 in/lb. and consistent over the travel of the X-axis. If the measurement is higher than this then loosen the gib. Make sure the cross slide is aligned properly. One easy way to check for this is to remove the yoke bolts and see if the yoke springs back into position. Misalignment is also evident if the torque is higher when the yoke is up against the rear bearing housing.

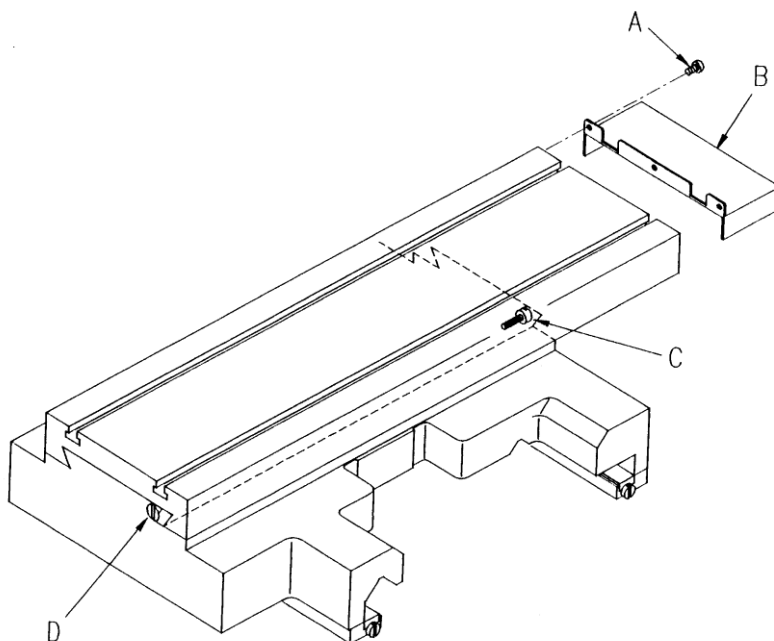


Figure 5.2.1.1 - All RX Lathes - X Axis Gib

5.2.1.2 Z-Axis Gib Adjustment

1. Mount a dial indicator on the Z-axis ways and locate on top of the carriage.
2. Lift the carriage up to measure the amount of play. The dial indicator should not move more than 0.001". If it moves more, tighten the gibs. Make sure not to over tighten the gibs.

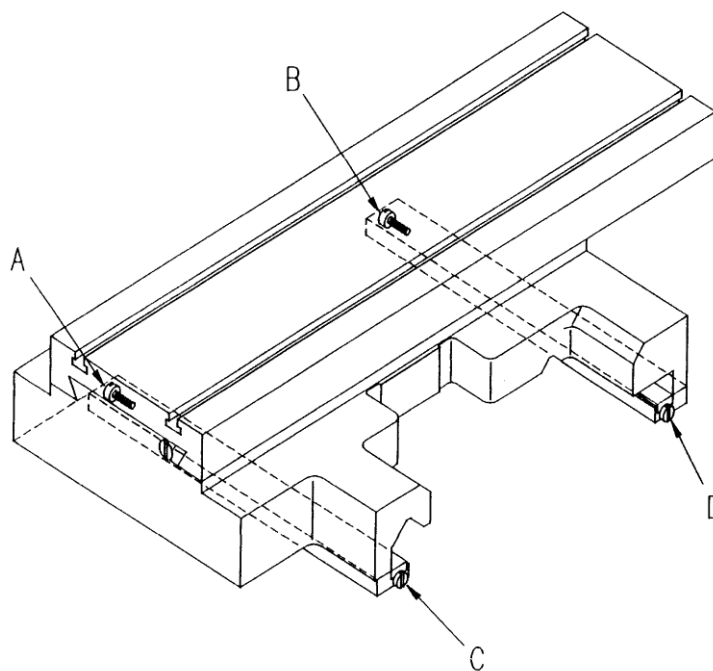


Figure 5.2.1.2 - All RX Lathes - Z Axis Gib

5.2.2 Calibration & Backlash Constants

Calibration and backlash constants were set as part of the installation and set-up of your system. They should be re-set when indicated in the Troubleshooting section or after the replacement of the computer module, or any parts of the drive train.

Calibration is used to teach the machine a known distance. We typically calibrate our machines over a 150 mm distance. There is no limit to how far you can calibrate the machine.

5.2.2.1 Calibration

Note: *Calibration usually is only done after replacing a computer module or adjusting the drive train.*

1. Recheck machine level and adjust as necessary.
2. Press the "SERV CODE" soft key.
3. Input 123 on the keyboard, then press the "INC SET" key.
4. Input the "X" key to tell the control the x-axis is being calibrated.
5. Place the .0001 indicator in the spindle and set up the metric standard on the cross slide. Make sure the standard is parallel to the cross slide by using a combination square. Ensure that the standard is set up so that the readings will be taken with the cross slide extended towards the operator and moving in towards the motor end of the X-axis.
6. When the indicator is zeroed at the beginning of the standard press the "INC SET" key.
7. Move the cross slide towards the motor side of the x-axis until the indicator zeros on the end of the standard. Input 300 on the keyboard.
8. If the calibration was successful the screen will return to the set up screen.
9. Press the "SERV CODE" soft key.
10. Input 123 on the keyboard, then press the "INC SET" key.
11. Press the "Z" key to tell the control that the z-axis is being calibrated.
12. Set up the metric standard on the Z-axis ways.
13. Set up the magnetic base and .0001 indicator on the cross slide.
14. When the indicator is zeroed at the beginning of the standard press the "INC SET" key.
15. Move the saddle towards the chuck until the indicator zeros on the end of the standard, then press the "INC SET" key.
16. Input 150 on the keyboard.
17. If the calibration is successful the screen will change to the set up screen.

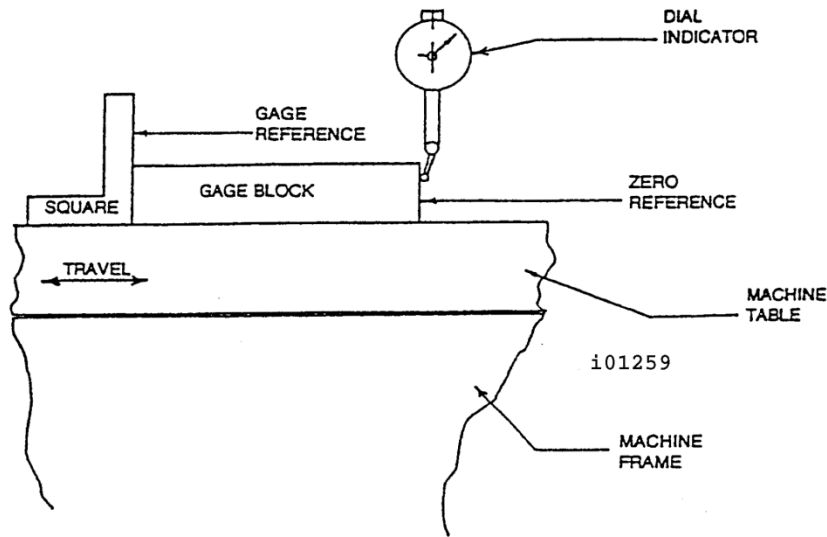


Figure 5.2.2.1 - All RX Lathes - Calibration Set-Up

5.2.2.2 Backlash Compensation

Code 127: Calculate X or Z Backlash Constant

Every mechanical system has at least a little backlash or lost motion. It is produced by the small amount of play between the gibs and ways, and mostly by the accumulative bending or elasticity of all the parts of the drive train under load. The backlash constant is factory set, but may need to be adjusted periodically.

1. Set a .0001-inch dial indicator in the spindle, and touch off on a block or the vise along the direction (X or Z) you wish to check, or set the backlash constant.
2. Turn on the ProtoTRAK and at the Main Menu, follow the procedure below precisely:

Conversation Says	You Do
a. ---	a. Press MODE
b. Select Mode	b. Press SET UP
c. Select	c. Press SERV CODES
d. Select	d. Press "B"
e. Select Code 127	e. Press X or Z
f. Backlash Value = _ _ _ _	f. What is shown is the current value. Follow the instruction on the screen and press the appropriate soft keys. Wait a few seconds between each press of INCR VALUE or DECR VALUE.
g. The following is an example of what you might see when running this code.	For example, if the up and down "Oscillation Value" shown in the conversation line is .00278 inch, and the dial indicator is moving back and forth .0012, then the true backlash value is $.00278 - .0012 = .00158$ inch. Input this by pressing MODE, SET UP, SERV CODE, 128, SET and then .00158, SET, RETURN.

3. The X backlash identified and stored in Step 2 should be less than 0.003" on a new machine. If it is appreciably larger, inspect the drive train for loose bolts, brackets, bearings, etc.

The backlash can also be found manually with a 0.0001" indicator using the following method.

- Load the indicator to zero from one direction and zero out the DRO.
- Move the indicator to 0.002" and then back to zero. Do not over shoot 0, otherwise start over.
- Whatever number appears on the screen is the backlash value.
- Enter this value into service code 128.
- After entering this number redo the process. The DRO and indicator should now both read 0.

CODE 128: Input Backlash Constant

Code 128 allows you to enter the backlash values for each axis. It displays the value after it enters.

Be sure not to enter too much backlash on any given axis. Too much backlash in the system may cause bi-directional repeatability problems or axis motor searching.

5.2.3 Lubrication

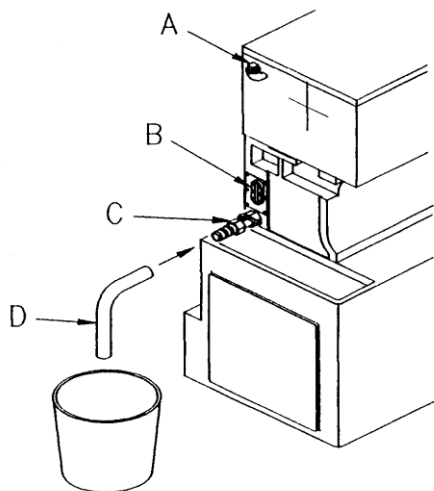
5.2.3.1 Headstock Lubrication

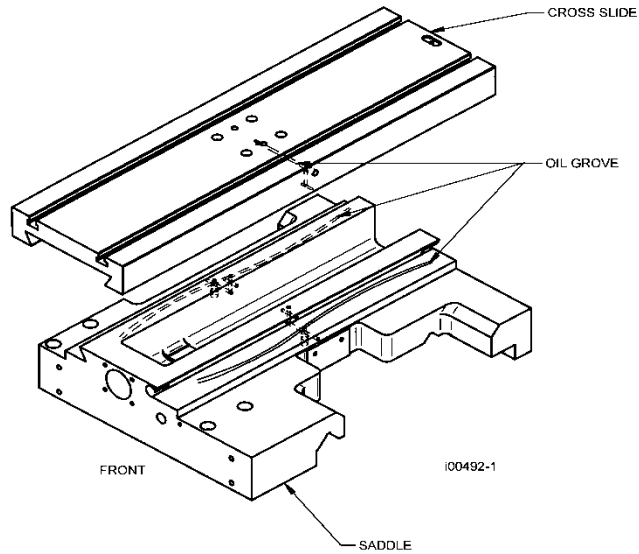
1630, 1845, 2470: The pump needs to be primed if left unused for a couple days. Priming the pump entails turning the spindle on at 1000 RPM for a few seconds.

An oil pump provides lubrication for an even distribution of oil to all the gears and bearings in the headstock. One of the oil lines pumps oil to a site glass located on the headstock. Periodically check to see that oil is flowing. Oil flows to this site glass only when the spindle is running for the 1630, 1845 and 2470. The 1630HS does not require headstock oil.

The plug to drain the headstock is located under the spindle cover towards the bottom of the casting. See the figure below. Oil can be added to the reservoir by a plug in the top of the headstock cover or by removing the cover and pouring it into the headstock. There is a level site glass located under the spindle cover. The headstock reservoir holds different amounts depending on the machine. Fill the headstock with Mobil DTE 24 oil or an equivalent grade.

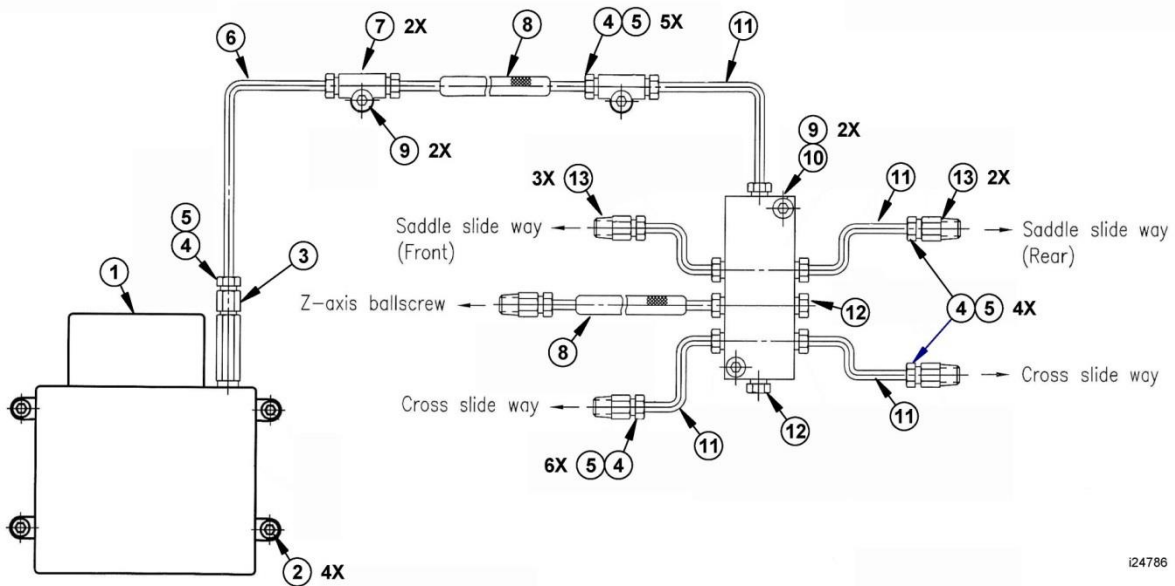
The headstock gearbox oil must be drained and flushed after the first 150 hours of operation. A small percentage of kerosene may be added to the gearbox to flush out dirt and sediment. Operate the machine for several minutes without load so that the flushing oil can circulate through the reservoir and remove the dirt. The flushing oil must then be drained and new oil added. Do not flush with solvents, as that will soften the paint. Thereafter, the oil should be flushed and drained every 1500-2000 hours of operation.





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Figure 5.2.3.1a - Headstock Oil Removal



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Item	P/N	Title	Qty
1	22291	LUBRICATION PUMP-WITH CABLE	1
2	M6-1.0X12 25B	SCREW-SHCS-STL-BO	4
3	PC4	VALVE-CHECK 1/8"	1
4	PA4	NUT-COMPRESSION 4mm	16
5	PB4	SLEEVE-COMPRESSION 4mm	16
6	16386	TUBING NYLON 4MM DIA #5N25C	A/R
7	PN-6	UNION-FEMALE	2
8	106711	HOSE- FLEXIBLE 4MM	A/R
9	M5-0.8X20 25B	SCREW-SHCS-STL-BO	4
10	D12	OIL DISTRIBUTION JUNCTION	1

Item	P/N	Title	Qty
11	A4	TUBING-4MM ALUM	A/R
12	PG004	PLUG- M8 X 1.0	2
13	PD-401	ADAPTER-STRAIGHT	5

i24786

Figure 5.2.3.1b - 1630RX & 1630HSRX – System Lubrication – P/N 24786 & Parts List

For the 1845 and 2470 lathes, see section 8 for a way lubrication diagram.

5.2.3.2 Tailstock

Three oilers located on top of the spindle housing lubricate the spindle and screw. The bedways on which the tailstock slides should be cleaned and oiled frequently.

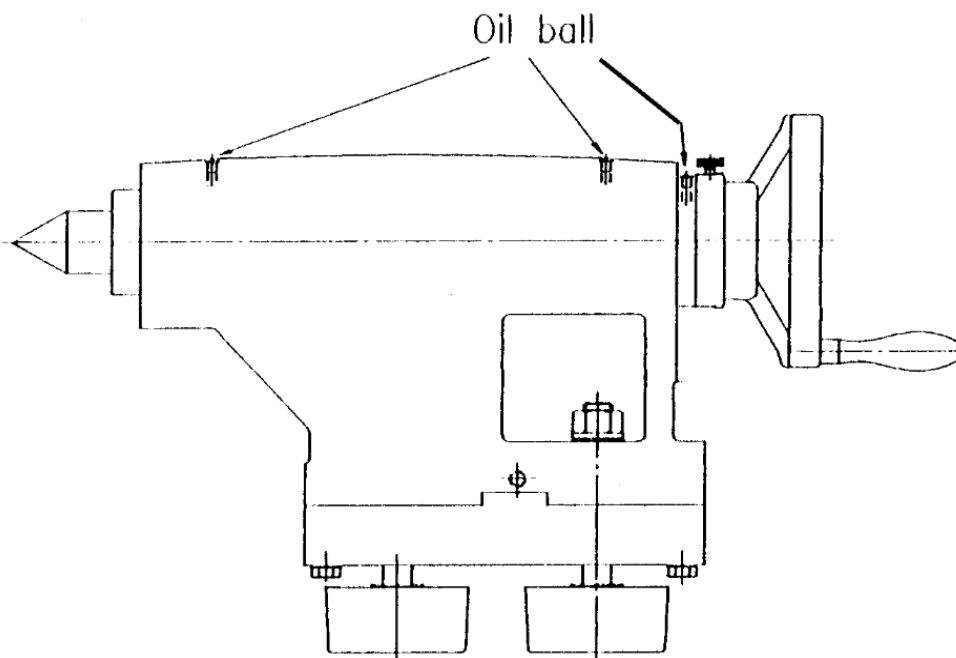


Figure 5.2.3.2 - All RX Lathes - Tailstock Lubrication

5.2.3.3 Miscellaneous Information

For all oilers on the machine, use medium S.A.E. NO. 30 machine oil. Before filling reservoirs or oil cups, always wipe off with a clean rag any accumulation of old oil, grease or dirt that might get into a part being lubricated.

Do not mix detergent type automotive oil, or multi-purpose oils with the regular grade of S.A.E. No. 30 lubricating oil.

5.2.4 X & Z Limit Switch Adjustments

5.2.4.1 X-Axis Limit Switch-Stop Installation & Adjustment

The limit switch-stops for the X-axis are mounted to the side of the crossslide. They are slotted for adjustment front to back. Each limit switch-stop must be set to a specific distance from the end of the crossslide in order to maximize travel and simultaneously prevent serious damage to the machine in the event of a crash. All limit switches are set at the factory for maximum travel. The switch is mounted to the carriage. The switch and the stops are covered by a sheet metal cover.

Procedure for setting X limit switch:

1. Loosen the stops on each side of the crossslide.
2. Slowly move the crossslide to the extremes of travel.
3. In DRO mode set X = 0 ABS.

CAUTION!

The limit switch must be triggered a minimum of 1/2" before the machine reaches its travel limits in both directions. This allows sufficient room for the servomotors to stop when the limit switch is hit at 200 ipm.

4. Using the DRO display, back the table off 1/2".
5. Tighten the stops in place.
6. Jog the table at 250ipm to each side and verify that the limit switches are working properly. Also, make sure that the table does not exceed its travel and crash.

5.2.4.2 Z-Axis Limit Switch-Stop Installation & Adjustment

The limit switch-stops for the Z-axis are mounted on the side of the bed at the headstock side and attached by a bracket to the tailstock for the positive direction. Each limit switch-stop must be set to a specific distance from the headstock and tailstock to maximize travel and simultaneously prevent serious damage to the machine in the event of a crash. The limit switch bracket and stops contains slotted holes, which allow for side-to-side positioning adjustments of the limit switch assembly.

Procedure for setting Z limit switch:

1. Slowly move the carriage to the front of the spindle with the handwheel until you are approximately 3/4" from the spindle.

CAUTION!

The limit switch must be triggered a minimum of 1/2" before the machine reaches its travel limits in both directions. This allows sufficient room for the servomotors to stop when the limit switch is hit at 400 ipm.

2. Lock the stop in place and make sure when you hit the stop the switch is triggered and the carriage comes to rest before hitting the spindle. Make sure you have adjusted the stop far enough away to prevent a crash.

WARNING!

The Z-axis limit switch at the headstock end is set to prevent crashes into the spindle. It is not adjusted for the various chuck or collet closer combinations.

3. Perform a similar adjustment at the tailstock end of the bed. Make sure the carriage does not hit the tailstock when the limit switch is triggered at maximum feedrate. At the tailstock end there is slight adjustment up and down and more adjustment side to side.

6.0 SWI Turret Options

6.1 4 & 8 Tool Pneumatic Turret Option

WARNING!

Due to the turret weight, special handling is required. Personal injury or damage to the turret and/or lathe may occur if not handled properly.

6.1.1 Field Installation Instructions

1. Refer to the Turret Option Drawings if the 4 or 8 tool Turret to be installed on the 1630, 1856 or 2470 lathes.
2. The turret and cabling are installed as per the Turret Option Drawing for the specific lathe.
3. Note that the center line of the turret must be shimmed.
4. Note the connections from the turret and air regulator to the Computer Module as shown in the referenced drawing.
5. Verify air has been hooked up to the machine. The air regulator is mounted to the bottom left of the electrical cabinet. Refer to the Turret Option Drawings in Section 7.
6. Ensure the turret work area is clear and ready to be used.
7. To verify the turret is working properly, run a program with all 4/8 tools. To run the program, enter a home position in Setup Mode. Make sure you set the X and Z absolute zero position 12 to 18 inches from the chuck. Set the home position to X = 3 and Z = 3. Run a program and make sure the turret moves to the correct tool stations programmed. Verify that the turret positions to each tool station.
8. Turn power on to the machine.
9. On the Pendant, press the "POWER RESET" key. Wait for the wait LED to turn ON.
10. You may load a program using the "PROG IN/OUT" key followed by selecting the desired program. Press "OK".
11. Press the "DRO" key. For the tools set up, select the tool number to use.
12. Press the "SET-UP" key followed by the "HOME TURRET" key. Enter the desired Tool # followed by pressing the "ABS SET" key.
13. The message "Turret is now homed and ready to use." should appear. You are ready to run your program.

6.1.2 Removing the 4 Tool Turret from the Lathe

1. Turn the main power off to the machine.
2. Unhook the air line from the air regulator.
3. Disconnect the air lines and electrical lines to the Computer Module. The 2 air lines need to be disconnected at the Air Regulator. Refer to the Turret Option Drawings in Section 8 for the 4 or 8 tool Turret to be installed on the 1630, 1845 or 2470 lathes.

6.1.3 Removing the 8 Tool Turret from a Lathe

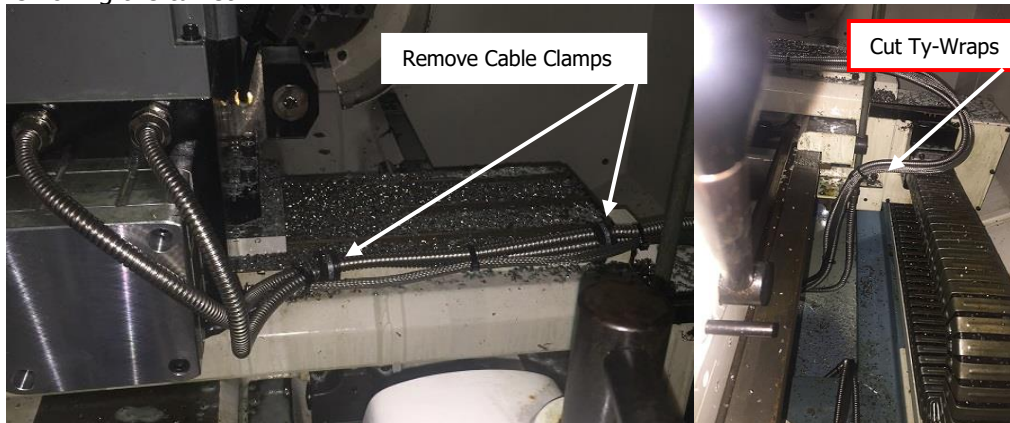
1. To remove the TRAK CNC Turret from a Lathe, position the Z Axis in about the middle of its travel, position the X Axis cross slide to max travel closest to the operator. E-Stop machine for safety. This will also remove power from the turret and turret control box.



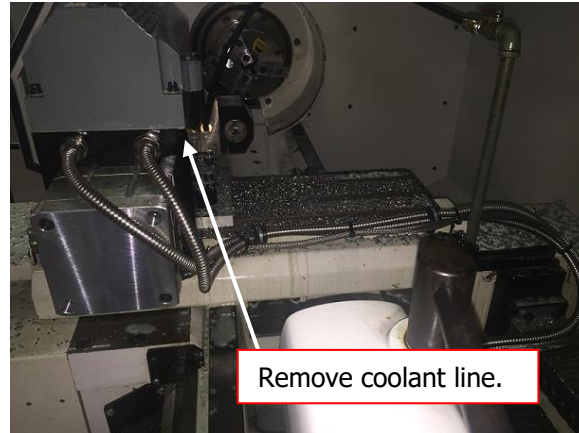
2. Disconnect the main air, then, disconnect the air lines from the solenoid valves. Cut any tie-wraps attaching the airlines to the solenoid wiring and remove from the cable clamps.



3. Disconnect the 2 cables from the turret to the Computer Module. Remove cables from cable clamps mounted to the sheet metal cabinet. Cut any tie-wraps attaching cables to cabinet. Remove cables and cable clamps from the cross slide, cut any ty-wraps attaching cables to the cross slide. Once cables and airlines are detached from machine, coil up in preparation of removing the turret.

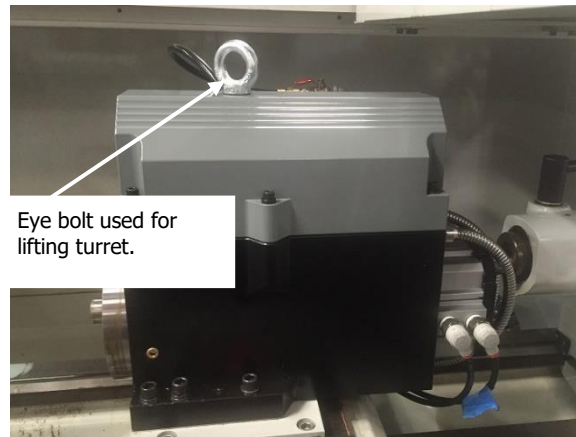


4. Close coolant valve and remove coolant line from the turret.

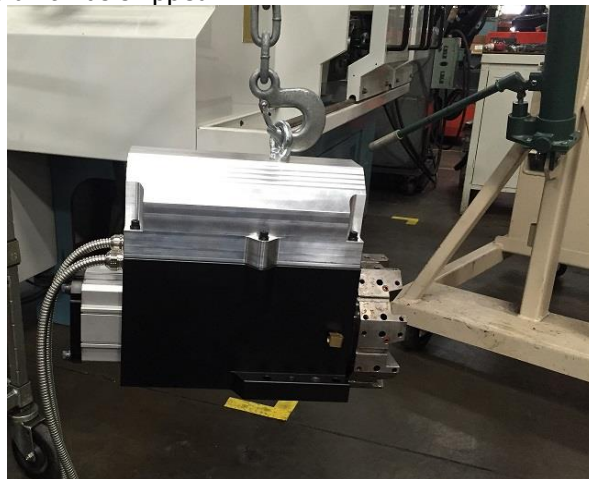


5. Insert the eye bolt that came with the turret into the top cover.

CAUTION!
Heavy! The 1" turret weighs 110 lbs without the mounting base. Use proper lifting equipment to avoid injury and or damage to the turret.



6. Using an engine hoist or chain hoist, attach it to the eye bolt. Remove the 6 screws that mount the turret to the mounting base. Slowly raise the hoist until the turret is clear of the mounting base. Slowly move the hoist away from the machine. Lower the turret onto a cart, pallet or the shipping crate the unit was shipped in.



7. To reinstall reverse the above steps. Ensure all mounting surfaces are clean and free of chips or debris before mounting the turret. Turret is not pinned so it will need to be aligned for maximum accuracy.

6.1.4 Troubleshooting the Turret

The following fault messages will appear on the screen when there is a problem with the turret:

- **Fault 85 – Impossible Tool Position**

This message will appear if the turret goes to a tool number that you did not select. For example, the operator chose Tool 2 and the turret went to Tool Station 6. To fix this problem, re-initialize the system by choosing Service Code 147. Contact Southwestern Industries Customer Service.

- **Fault 86 – Turret Power Problem**

This message will appear if the power is interrupted to the turret. It could indicate that no power or low power is getting to the turret. Check that the Computer Module and AC Drive/Motor (for the 8 Tool Turret) is receiving power.

- **Fault 87 – Turret Air Pressure Problem**

This message will appear if the air pressure sensor senses low air or no air pressure. The recommended air pressure for the turret is 90 psi. The air pressure should be 90 psi and no more than 100 psi for the turret to work correctly. **Do not exceed 100 psi. This will void the warranty on the turret.**

- **Fault 88 – Turret Not Initialized**

This message will appear if the turret does not know its present position. An example of this would be if the turret stops in the middle of a tool change. An interruption of power or air may cause this fault. Pressing the E-stop button can also cause this problem if the tool is not in a known position. In order to initialize the turret, go to SETUP, TOOL GROUP, 4 or 8 TOOL, followed by HOME turret.

Note: *The air flow control fitting for the Turret clamp also plays a part in how long it takes for the turret to finish the initialization routine. Thus, the air flow control clamp should be set to 2.5 turns from full open.*

- **Fault 89 – Turret Time Out**

This message appears if the turret does not get to position after a few seconds. This may be caused by an internal problem inside the turret such as a broken gear or jammed component. Very low air pressure may also cause this fault. It should take no longer than 2 or 3 seconds for the turret to move between positions.

6.1.5 Warranty Issues

The SWI turret is under warranty for 1 year. If it is determined that there is a problem with the turret it will need to be returned for repair. Control problems are warranted by Southwestern Industries, Inc. for 1 year.

6.2 8 Tool Hydraulic Turret Option on the 3060 and 30120

WARNING!

Due to the turret weight, special handling is required. Personal injury or damage to the turret and/or lathe may occur if not handled properly.

6.2.1 Field Installation Instructions

WARNING!

Additional wiring is done in this procedure. Power must be removed from the lathe during the installation of wires, relays, circuit breakers, etc. Personal injury or damage to the turret and/or lathe may occur if not handled properly.

1. Several electric circuits need to be added, refer to drawing 29103-16 for details, also refer to the on-line instructions available on our web site "Big Lathe Turrets – Install Electrical Components in Cabinet".
2. Each turret base is ground to match the lathe and turret centerlines. Verify the base has been ground for the current lathe. Using a crane, lift and secure the base, then the turret. Follow on-line instructions "Big Lathe Turret – Mount Base and Turret".
3. The hoses and electrics for the turret need protection from damage during operation. Install the crossslide covers to protect hoses and a cable using the on-line reference "Big Lathe Turret – Install Crossslide Sheet Metal Cover for Cables and Hoses".
4. Hydraulic 8 Tool turret uses high pressure hoses that supply power for operation. Refer to the on-line installation instructions "Big Lathe Turret – Route Hydraulic Hoses".
5. Test the system, turn power on, make sure E-Stop is not activated, and enable the 8 tool hydraulic turret by pressing SETUP > TOOL GROUPS > 8 HYD TURRET. Button "8 HYD TURRET" displays in red when operational. Cycling between 8 HYD TURRET and SINGLE TOOL buttons will toggle between turret and single tool operation.
6. After installation, align turret in relation to the spindle. Refer to the on-line instructions "Big Lathe Turret – Align Turret to Z – Set Tolerance".

6.2.2 Removing the 8 Tool Hydraulic Turret from the Lathe

Caution: Lifting Turret Requires use of crane – Personal Injury may result without proper equipment.

The turret became an integral part of the lathe when installed. It is a complicated and time consuming task to remove this option. You can toggle the 8 tool turret on and off by selecting SETUP > TOOL GROUP > 8HYD TURRET which enables it, pressing SINGLE TOOL disables operation of the turret. However, hydraulic oil pump is always circulating fluid when the machine servos are powered.

In order to remove the hydraulic turret from the lathe, contact TRAK Customer Service for an experienced service representative for your lathe.

6.2.3 Troubleshooting the 8 Tool Turret

The following fault messages will appear on the screen when there is a problem with the turret:

- **Fault 352 – Hydraulic Pressure Not OK**

Check electrical and hydraulic connections. Check fluid level.

- **Fault 353 – Hydraulic Turret Move to Position Timeout**

Hydraulic turret has taken too long to move to target position. Check Hydraulics

- **Fault 354 – Hydraulic Turret Clamp Timeout**

Hydraulic turret has taken too long to clamp. Check Hydraulics

- **Fault 355 – Hydraulic Turret Unclamp Timeout**

Hydraulic turret has taken too long to unclamp. Check Hydraulics

6.2.4 Maintenance

The following list covers items that need periodic maintenance:

- | | |
|--|---------|
| 1. Check hydraulic oil level in sight glass | Monthly |
| 2. Check pump, tank, and hoses for leaks (high pressure lines) | Monthly |
| 3. Drain and change turret gear oil – 1.2L of SAE 90(ISO VG 220) | Annual |
| 4. Hydraulic Oil – full system hydraulic fluid change | Annual |

6.2.5 Warranty Issues

The SWI turret is under warranty for 1 year. If it is determined that there is a problem with the turret it will need to be returned for repair. Control problems are warranted by Southwestern Industries, Inc. for 1 year.

7.0 Introduction to Self-Service

The objective of this section of the manual is to allow the user of the ProtoTRAK Control to resolve the majority of potential service problems.

This manual assumes that the user is not experienced with CNC troubleshooting and repairs. Special tools are not required for the procedures described in the manual.

Please see Sections 3 for basic troubleshooting sections of the manual.

7.1 When You Have a Service Problem

SWI recommends that you consult this manual or our web site first. We also have a Dozuki site with detailed troubleshooting procedures <https://trakmtsupport.dozuki.com/>. Often it will be possible for you to resolve the problem yourself or isolate the problem to a particular cause.

Your next step is to contact the SWI Customer Service Group for assistance.

7.1.1 Communication with the SWI Customer Service Group

SWI Service Department Direct Line: (800) 367-3165

Web Address – www.trakmt.com

This phone line rings directly into the SWI Customer Service Group. If a Customer Service Representative (CSR) is not available within the first few of minutes, your call is transferred into our voice mail system.

Our voice mail is continuously monitored. If you have an emergency, indicate this in your message. Our Service Voice Mail box number is 555.

SWI Service Department Direct Fax number (310) 886-8029

Customer Service Group hours:

Monday - Friday 7:00 AM to 4:30 PM Pacific Time.

SWI observes a normal holiday schedule.

7.2 Replacements

7.2.1 Exchange Program

SWI keeps in stock the major subassemblies required to resolve service problems. With very few exceptions, the part needed to resolve any given service problem is on the shelf and ready to ship. A little bit of troubleshooting on your part means that we can get the right part to you fast.

After replacing the failed unit with the replacement unit, simply put the failed unit in the same box that the replacement part came in and ship it back to us via UPS ground service.

This unique Exchange program gives our customers access to refurbished "like-new" subassemblies that have been brought up to current design revisions and go through the same QC procedures as our new products. These high-quality replacement units are available at a fraction of the price of a new subassembly.

7.2.2 Return Material Authorization (RMA) Number

All shipments of replacement parts are accomplished through our Return Material Authorization (RMA) system. At the same time the CSR is diagnosing the problem and ordering the part, they will issue an RMA number that will allow us to efficiently process the return part.

TRAK Warranty Policy

Warranty

TRAK products are warranted to the original purchaser to be free from defects in workmanship and materials for the following periods:

Product	Warranty Period	
	Materials	Factory Labor
New TRAK/ProtoTRAK	1 Year	1 Year
Any EXCHANGE Unit	90 Days	90 Days

The warranty period starts on the date of the invoice to the original purchaser from Southwestern Industries, Inc. (SWI) or their authorized distributor.

If a product, subsystem or component proves to be defective in workmanship and fails within the warranty period, it will be repaired or exchanged at our option for a properly functioning unit in similar or better condition. Such repairs or exchanges will be made FOB Factory/Los Angeles or the location of our nearest factory representative or authorized distributor.

Warranty Disclaimers

- This warranty is expressly in lieu of any other warranties, express or implied, including any implied warranty of merchantability or fitness for a particular purpose, and of any other obligations or liability on the part of SWI (or any producing entity, if different).
- Warranty repairs/exchanges do not cover incidental costs such as installation, labor, freight, etc.
- SWI is not responsible for consequential damages from use or misuse of any of its products.
- TRAK products are precision mechanical/electromechanical/electronic systems and must be given the reasonable care that these types of products require. Evidence that the product does not receive adequate Preventative Maintenance may invalidate the warranty. Excessive chips built up around ballscrews and way surfaces is an example of this evidence.
- Accidental damage, beyond the control of SWI, is not covered by the warranty. Thus, the warranty does not apply if a product has been abused, dropped, hit or disassembled.
- Improper installation by or at the direction of the customer in such a way that the product consequently fails, is considered to be beyond the control of the manufacturer and outside the scope of the warranty.
- Warranty does not cover wear items that are consumed under normal use of the product. These items include, but are not limited to: windows, bellows, wipers, filters, drawbars and belts.

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8.0 Drawings & Parts Lists

- 8.1 29531 - DRIVE ASSY - X AXIS - 1630RX**
- 8.2 29533 - DRIVE ASSY - X AXIS - 1845RX**
- 8.3 29535 - DRIVE ASSY - X AXIS - 2470RX**
- 8.4 29532 - DRIVE ASSY - Z AXIS - 1630RX**
- 8.5 29534 - DRIVE ASSY - Z AXIS - 1845RX**
- 8.6 29536 - DRIVE ASSY - Z AXIS - 2470RX**
- 8.7 31101 - DRIVE ASSY - X AXIS – 30120/3060RX**
- 8.8 31102 - DRIVE ASSY - Z AXIS - 30120RX**
- 8.9 31102-1 DRIVE ASSY – Z AXIS – 3060RX**