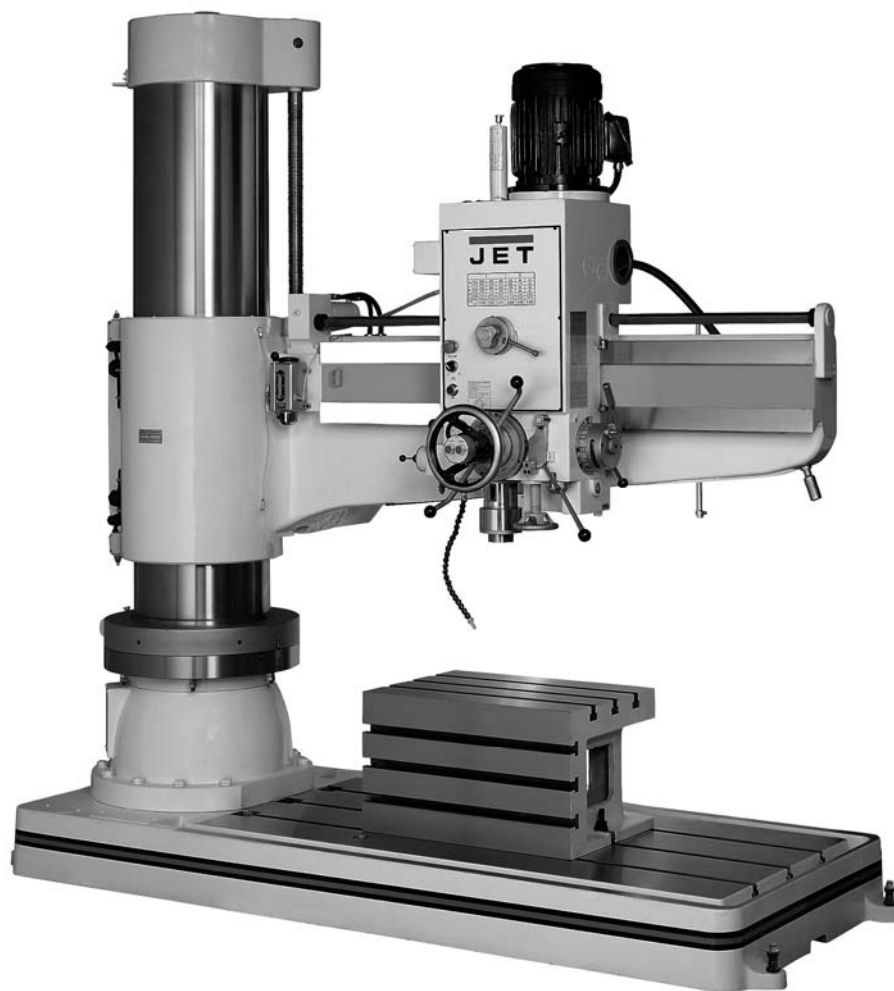




# Operating Instructions and Parts Manual

## 5-ft. Radial Arm Drill Press

Models J-1600R, J-1600R-4



**WALTER MEIER (Manufacturing) Inc.**

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# 1.0 Warranty and Service

Walter Meier (Manufacturing) Inc., warrants every product it sells. If one of our tools needs service or repair, one of our Authorized Service Centers located throughout the United States can give you quick service. In most cases, any of these Walter Meier Authorized Service Centers can authorize warranty repair, assist you in obtaining parts, or perform routine maintenance and major repair on your JET® tools. For the name of an Authorized Service Center in your area call 1-800-274-6848.

## MORE INFORMATION

Walter Meier is consistently adding new products to the line. For complete, up-to-date product information, check with your local Walter Meier distributor, or visit [waltermeier.com](http://waltermeier.com).

## WARRANTY

JET products carry a limited warranty which varies in duration based upon the product (MW = Metalworking, WW = Woodworking).

|                                                                                                                                               |                                                                                                                      |                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                         |                                             |                                                                                                                                                                                                                                                     |                                                                                               |                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>90 DAY WARRANTY</b><br>Lathe Accessories<br>Machine Accessories<br>Mobile Bases<br>Safety Equipment<br>Specialty Items<br>Vise Accessories | <b>1 YEAR WARRANTY</b><br>Air Tools- Contractor<br>Air Tools-Industrial<br>Air Tools-Light Industrial<br>Lubrication | <b>2 YEAR WARRANTY</b><br>Beam Clamps<br>Body Repair Kits<br>Bottle Jacks<br>Cable Pullers<br>Cold Saws<br>Hoists-Air<br>Hoists-Electric<br>Jack Stands<br>Metal forming<br>Mill/Drills<br>Milling Machines<br>MW Bandsaws<br>MW Drill Presses<br>MW Finishing Equipment | <b>2 YEAR WARRANTY</b><br>Trolleys-Air<br>Trolleys-Electric<br>Trolleys-Plain<br>Web Slings<br>Winches-Electric<br>MW Lathes<br>MW Precision Vises<br>Pallet Trucks<br>Rigging Equip.<br>Scissor Lift Tables<br>Screw Jacks<br>Service Jacks<br>Stackers<br>Surface Grinders<br>Tapping | <b>3 YEAR WARRANTY</b><br>WW Benchtop Tools | <b>5 YEAR WARRANTY</b><br>Lever Hoists<br>Pullers-JCH Models<br>Trolleys-Geared<br>Winches-Manual<br>WW Air Filtration<br>WW Bandsaws<br>WW Buffers<br>WW Drill Presses<br>WW Dust Collectors<br>WW Dust Filters<br>WW Dust Fittings<br>WW Jointers | <b>5 YEAR WARRANTY</b><br>WW Lathes<br>WW Planers<br>WW Sanders<br>WW Shapers<br>WW Tablesaws | <b>LIFE WARRANTY</b><br>Fastening Tools<br>Mechanics Hand Tools<br>Striking Tools<br>Vises (no -precision)<br>Clamps<br>Chain Hoist- Manual |
| Warranty reverts to 1 Year Warranty if woodworking (WW) products listed above are used for industrial or educational purposes.                |                                                                                                                      |                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                         |                                             |                                                                                                                                                                                                                                                     |                                                                                               |                                                                                                                                             |

## WHAT IS COVERED?

This warranty covers any defects in workmanship or materials subject to the exceptions stated below. Cutting tools, abrasives and other consumables are excluded from warranty coverage.

## WHO IS COVERED?

This warranty covers only the initial purchaser of the product.

## WHAT IS THE PERIOD OF COVERAGE?

The general JET warranty lasts for the time period specified in the product literature of each product.

## WHAT IS NOT COVERED?

Five Year Warranties do not cover woodworking (WW) products used for commercial, industrial or educational purposes. Woodworking products with Five Year Warranties that are used for commercial, industrial or education purposes revert to a One Year Warranty. This warranty does not cover defects due directly or indirectly to misuse, abuse, negligence or accidents, normal wear-and-tear, improper repair or alterations, or lack of maintenance.

## HOW TO GET SERVICE

The product or part must be returned for examination, postage prepaid, to a location designated by us. For the name of the location nearest you, please call 1-800-274-6848.

You must provide proof of initial purchase date and an explanation of the complaint must accompany the merchandise. If our inspection discloses a defect, we will repair or replace the product, or refund the purchase price, at our option. We will return the repaired product or replacement at our expense unless it is determined by us that there is no defect, or that the defect resulted from causes not within the scope of our warranty in which case we will, at your direction, dispose of or return the product. In the event you choose to have the product returned, you will be responsible for the shipping and handling costs of the return.

## HOW STATE LAW APPLIES

This warranty gives you specific legal rights; you may also have other rights which vary from state to state.

## LIMITATIONS ON THIS WARRANTY

WALTER MEIER (MANUFACTURING) INC., LIMITS ALL IMPLIED WARRANTIES TO THE PERIOD OF THE LIMITED WARRANTY FOR EACH PRODUCT. EXCEPT AS STATED HEREIN, ANY IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS ARE EXCLUDED. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG THE IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

WALTER MEIER SHALL IN NO EVENT BE LIABLE FOR DEATH, INJURIES TO PERSONS OR PROPERTY, OR FOR INCIDENTAL, CONTINGENT, SPECIAL, OR CONSEQUENTIAL DAMAGES ARISING FROM THE USE OF OUR PRODUCTS. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

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**Familiarize yourself with the following safety notices used in this manual:**

**CAUTION** This means that if precautions are not heeded, it may result in minor injury and/or possible machine damage.

**WARNING** This means that if precautions are not heeded, it may result in serious or even fatal injury.



## 3.0 Safety

- Misuse of this machine can cause serious injury.
- For safety, machine must be set up, used and serviced properly.
- Read, understand and follow instructions in the operator's and parts manual which was shipped with your machine.

### When setting up machine:

- Always avoid using machine in damp or poorly lighted work areas.
- Always be sure machine is securely anchored to the floor.
- Always keep machine guards in place.
- Always put start switch in "OFF" position before plugging in machine.

### When using machine:

- Never operate with machine guards missing.
- Always wear safety glasses with side shields (See ANSI Z87.1)
- Never wear loose clothing or jewelry.
- Never overreach — you may slip and fall into the machine.

-Never leave machine running while you are away from it.

-Always shut off the machine when not in use.

### When servicing machine:

-Always unplug machine from electrical power while servicing.

-Always follow instructions in operator's and parts manual when changing accessory tools or parts.

-Never modify the machine without consulting Walter Meier (Manufacturing) Inc.

Read and follow these simple rules for best results and full benefits from your machine. Used properly, JET machinery is among the best in design and safety. However, any machine used improperly can be rendered inefficient and unsafe. It is mandatory that those who use our products be properly trained in how to use them correctly. They should read and understand the Operating Instructions and Parts Manual as well as all labels affixed to the machine. Failure to follow all of these warnings can cause serious injuries.

## 3.1 Machinery General Safety Warnings

1. Always wear protective eye wear when operating machinery. Eye wear shall be impact resistant, protective safety glasses with side shields which comply with ANSI Z87.1 specifications. Use of eye wear which does not comply with ANSI Z87.1 specifications could result in severe injury from breakage of eye protection.
2. Wear proper apparel. No loose clothing or jewelry which can get caught in moving parts. Contain long hair. Rubber soled footwear is recommended for best footing.
3. Do not overreach. Failure to maintain proper working position can cause you to fall into the machine or cause your clothing to get caught — pulling you into the machine.
4. Keep guards in place and in proper working order. Do not operate the machine with guards removed.
5. Avoid dangerous working environments. Do not use stationary machine tools in wet or damp locations, or in an explosive environment. Keep work areas clean and well lit. Special electrics should be used when working on flammable materials.
6. Avoid accidental starts by being sure the start switch is "OFF" before plugging in the machine.
7. Machinery must be anchored to the floor.
8. Never leave the machine running while unattended. Machine shall be shut off whenever it is not in operation.
9. Disconnect electrical power before servicing. Whenever changing accessories or general maintenance is done on the machine, electrical power to the machine must be disconnected before work is done.
10. Maintain all machine tools with care. Follow all maintenance instructions for lubricating and the changing of accessories. No attempt shall be made to modify or have makeshift repairs done to the machine. This not only voids the warranty but also renders the machine unsafe.
11. Secure work. Use clamps or a vise to hold work, when practical. It is safer than using your hands and it frees both hands to operate the machine.
12. Never brush away chips while the machine is in operation.
13. Keep work area clean. Cluttered areas invite accidents.

14. Remove adjusting keys and wrenches before turning machine on.
15. Use the right tool. Don't force a tool or attachment to do a job for which it was not designed.
16. Use only recommended accessories and follow manufacturer's instructions pertaining to them.
17. Keep hands in sight and clear of all moving parts and cutting surfaces.
18. All visitors should be kept a safe distance from the work area. Make workshop completely safe by using padlocks, master switches, or by removing starter keys.
19. Know the tool you are using; its application, limitations, and potential hazards.

### 3.2 General Electrical Cautions

This machine must be grounded in accordance with the National Electrical Code and local codes and ordinances. This work should be done by a qualified electrician. The machine must be grounded to protect the user from electrical shock.

**Caution:** For circuits which are far away from the electrical service box, the wire size must be increased in order to deliver ample voltage to the motor. To minimize power losses and to prevent motor overheating and burnout, the use of wire sizes for branch circuits or electrical extension cords according to the following table is recommended:

| Conductor Length | AWG Number            |                       |
|------------------|-----------------------|-----------------------|
|                  | <i>240 Volt Lines</i> | <i>120 Volt Lines</i> |
| 0 – 50 Ft.       | No. 14                | No. 14                |
| 50 – 100 Ft.     | No. 14                | No. 12                |
| Over 100 Ft.     | No. 12                | No. 8                 |

Table 1

### 3.3 Safety Instructions for Drill Presses

1. All work shall be secured using either clamps or a vise to the drill press table. It is unsafe to use your hands to hold any workpiece being drilled.
2. Drill press head and table shall be securely locked to the column before operating the drill press. This must always be checked prior to starting the machine.
3. Always use the correct tooling. Tooling shall always be maintained and properly sharpened. All tooling must be run at the proper speeds and feeds as they apply to the job. Use only recommended accessories and follow those manufacturer's instructions pertaining to them. Tooling shall not be forced into any workpiece but fed according to the proper specifications. Failure to follow these instructions will not only ruin the tooling as well as the machine, but can cause serious injury.
4. Never brush away shavings or chips while the machine is in operation. All clean up should be done after the machine is stopped.
5. Keep hands in sight. Do not put hands or fingers around, on, or below any rotating cutting tools. Leather safety gloves should be used when handling any sharp objects or cutting tools. See Figure 1A.
6. Always use protective eyewear when operating, servicing or adjusting machinery. Eyewear shall be impact resistant, protective safety glasses with side shields complying with ANSI Z87.1 specifications. Use of eye wear which does not comply with ANSI Z87.1 specifications could result in severe injury from breakage of eye protection. See Figure 1B.
7. When drilling in material which causes dust, a dust mask shall be worn. See Figure 1C.
8. Avoid contact with coolant, especially guarding the eyes.
9. Non-slip footwear and safety shoes are recommended. See Figure 1D.
10. Wear ear protectors (plugs or muffs) during extended periods of operation. See Figure 1E.

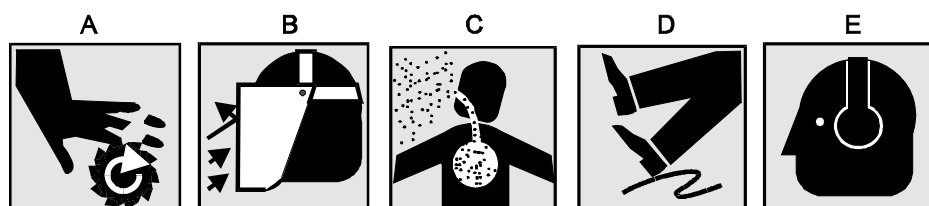


Figure 1

## 4.0 Specifications

The JET Model J-1600R is a powerful and versatile radial arm drill press. The drill head is mounted on an arm and can slide along the arm to position the spindle over the work piece. The arm itself can be rotated on its support column to allow centering the spindle over the work piece.

Drilling can be performed manually or with power feed assistance. In addition, parameters of RPM, power feed rate and drilling depth can be pre-set by the operator, using controls conveniently positioned on the drill head. The drill has an automatic tool ejector, and hydraulic head and column clamping system.

The power train gears and spline shaft are made of high quality heat-treated and ground nickel chrome steel, offering greater strength and smoothness to high-torque loads. The spindle is of case hardened steel and supported by dual row taper roller and thrust ball bearings at the nose, with thrust and radial axis bearings at the top. The frame is made of Meehanite® and high-tensile strength cast iron.

A precision machined box table allows convenient positioning and clamping of smaller work pieces. The box table can be removed from the base to allow larger workpieces to be clamped on the base itself. Both table and base have multiple T-slots for clamping set-ups.

**Model number** ..... J-1600R  
(J-1600R-4 is the same machine but pre-wired for 460V operation)

**Stock numbers:**  
J-1600R..... 320038  
J-1600R-4 ..... 320039

### Head and Spindle:

Push button controls ..... 110V  
Spindle motor (model J-1600R) ..... TEFC Induction, 7.5 HP (5.5 kW), 3 PH,  
230/460V (**pre-wired 230V**), 19/9.5 A, 60Hz  
Spindle motor (model J-1600R-4) ..... TEFC Induction, 7.5 HP (5.5 kW), 3 PH,  
230/460V (**pre-wired 460V**), 19/9.5 A, 60Hz  
Control circuits ..... 115V  
Spindle taper ..... MT-5  
Spindle speeds ..... twelve speeds, within 40-1920 RPM  
Quill (spindle) travel ..... 14-9/16" (370 mm)  
Quill (spindle) travel with powerfeed engaged ..... 13" (330 mm)  
Spindle travel along arm, total ..... 44-7/8" (1140 mm)  
Feed rates (distance per revolution) ..... six at 0.003 - 0.038 in/rev  
Base surface to spindle, maximum (no tooling) ..... 63" (1600 mm)  
Base surface to spindle, minimum (no tooling) ..... 15" (380 mm)  
Column to spindle center distance, maximum ..... 62-1/4" (1580 mm)  
Column to spindle center distance, minimum ..... 13-3/8" (334mm)  
Noise emission (approx. 3-1/4 ft./1m from spindle head) \* ..... 82 dB at 1500 rpm; 79 dB at 88 RPM

### Arm and Column:

Column diameter ..... 17" (432 mm)  
Arm vertical travel on column ..... 33-15/32" (850 mm)  
Arm elevating motor ..... TEFC, 2 HP (1.5 kW), 3 PH, 230/460V, 3.2/1.6A, 60Hz  
Clamping motor ..... TEFC, 1 HP (0.75kW), 3 PH, 230/460V, 3.2/1.6A, 60Hz

### Base and Table:

Box table dimensions ..... 27-1/2"L x 19-3/4"W x 16"H (700 x 500 x 415 mm)  
T-slots in Table (6) ..... 1-1/2"W x 3/4" D, 7/8" W opening (38 x 19, 22 mm)  
Base dimensions ..... 103-1/4"L x 40-1/4"W x 8"H (2623 x 1022 x 203mm)  
T-slots in Base (3) ..... 1-1/2"W x 3/4" D", 7/8"W opening (38 x 19, 22 mm)

### Additional specifications:

Coolant pump motor ..... TEFC, 1/8 HP (0.1kW), 3 PH, 220/440V, 0.2/0.1A, 60Hz  
Machine height (floor to motor at maximum elevation) ..... 125" (3175mm)  
Shipping Dimensions ..... 110"L x 57"W x 115"H (2794 x 1448 x 2921mm)  
Net weight ..... 11,000 lb / 4990 kg  
Shipping weight ..... 11,240 lb / 5098 kg

\* Measured under test conditions SS41 material, 32mm thick, Ø32mm tool.

## 4.1 Machining Capacities

|            | Drilling             | Tapping     | Boring      |
|------------|----------------------|-------------|-------------|
| Mild Steel | 2-1/2 in. (mm)       | 2" (mm)     | 5" (mm)     |
| Cast iron  | 2-5/16 in. (58.75mm) | 2-3/8" (mm) | 7-3/8" (mm) |

Table 2

## 4.2 Machine Environment

1. Do not position the machine where it receives direct sunlight.
2. Normal ambient temperature should be between +5°C (41°F) and 40°C (104°F).
3. Humidity: Between 30% and 95%. At maximum temperature of 40°C/104°F, relative humidity should not be over 50%. Higher humidity is acceptable at relative lower temperatures (e.g. 90% humidity at 20°C°).
4. Keep machine away from gasoline, chemical substances, dust, acid, sulfides, magnetic interference and explosive environments.
5. Keep machine away from electrical interference sources such as welding machines and EDM (Electric Discharge Machining).
6. Illumination of work area should be greater than 500lux.
7. Work area must have adequate ventilation.
8. Floor must be flat.
9. Keep floor around machine free of hydraulic splash to prevent hazard of slipping and falling.

## 4.3 Power Supply Requirements

1. Acceptable voltage fluctuation: normally +/- 10%
2. Acceptable frequency fluctuation: +/- 1Hz (50/60Hz)
3. Acceptable momentary power-off duration: less than 10m.sec
4. Acceptable voltage impulse:  
Peak value: 200% or less than the line voltage of the actual value (rms.value).  
Duration: 1.5m.sec or less.
5. Acceptable AC voltage of the waveform distortion.
6. Acceptable imbalance of the line voltage: 5% or less.
7. Power capacity:  
Main motor: 5.625 Kw (7.5HP)  
Arm elevating motor: 1.5kW (2HP)  
Clamping motor: 0.75kW (1HP)  
Coolant pump motor: 0.1kW (1/8HP)  
Total power requirement: 20.203 KVA

## 4.4 Overall Dimensions, J-1600R

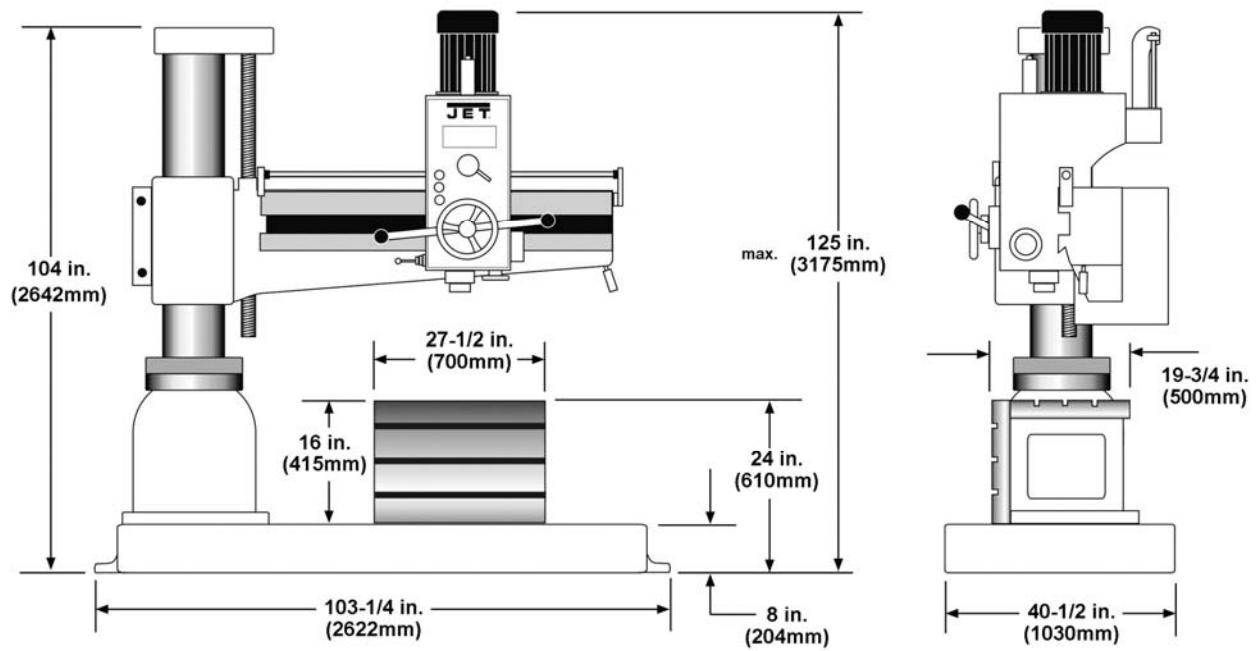


Figure 2

The specifications in this manual were current at time of publication, but because of our policy of continuous improvement, Walter Meier reserves the right to change specifications at any time and without prior notice, without incurring obligations.

## 5.0 General Features and Terminology, J-1600R

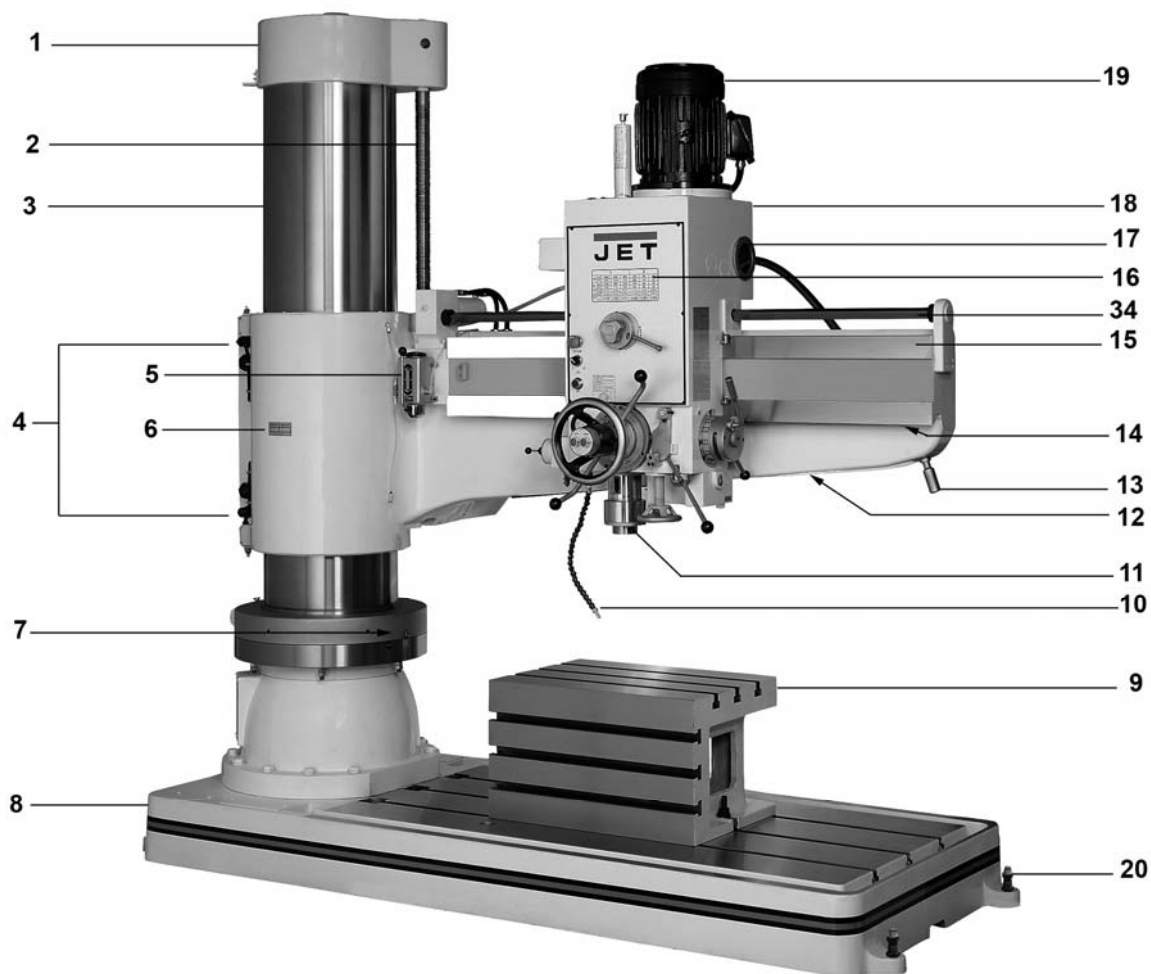


Figure 3

- |                                                |                                       |
|------------------------------------------------|---------------------------------------|
| 1. Column cover (encloses arm elevating motor) | 19. Spindle motor, 7-1/2HP            |
| 2. Elevating lead screw                        | 20. Leveling screws                   |
| 3. Column                                      | 21. Work lamp toggle switch           |
| 4. Locking nuts                                | 22. Support block (for shipping only) |
| 5. One shot lube unit                          | 23. Brace (for shipping only)         |
| 6. Machine identification plate                | 24. Coolant pump                      |
| 7. Column clamping indicators                  | 25. Arm clamping cylinder             |
| 8. Base                                        | 26. Guard panel                       |
| 9. Box table                                   | 27. Electrical cabinet                |
| 10. Coolant nozzle                             | 28. Counterweight system              |
| 11. Spindle                                    | 29. Hydraulic clamping motor, 1HP     |
| 12. Work lamp                                  | 30. Hydraulic tank                    |
| 13. Arm rotation handle                        | 31. Pressure gauge                    |
| 14. Rack                                       | 32. Solenoid valves                   |
| 15. Arm rail                                   | 33. Clamping cylinder                 |
| 16. Spindle speed chart                        | 34. Guide bar                         |
| 17. Sight glass (and clutch access)            |                                       |
| 18. Drill head/gearbox *                       |                                       |

\*See Figure 10 for details on drill head controls.

## General Features and Terminology, J-1600R (cont.)

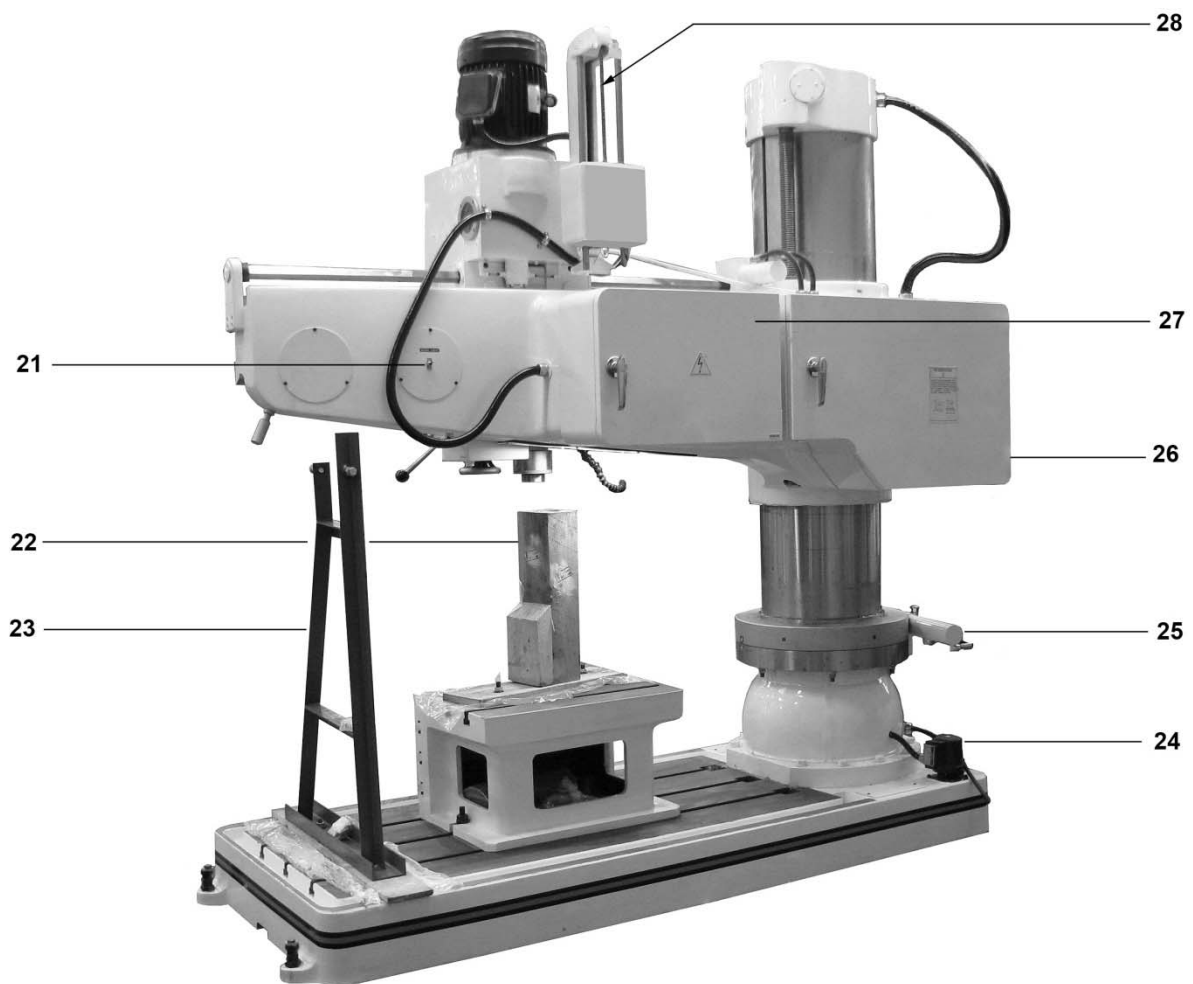


Figure 4

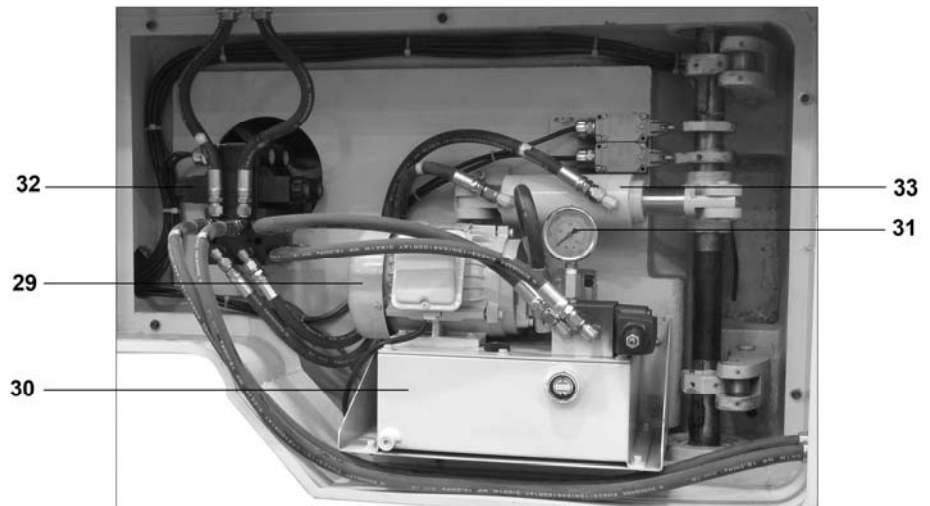


Figure 5

## 6.0 Set-Up and Assembly

### 6.1 Floor Diagrams for J-1600R

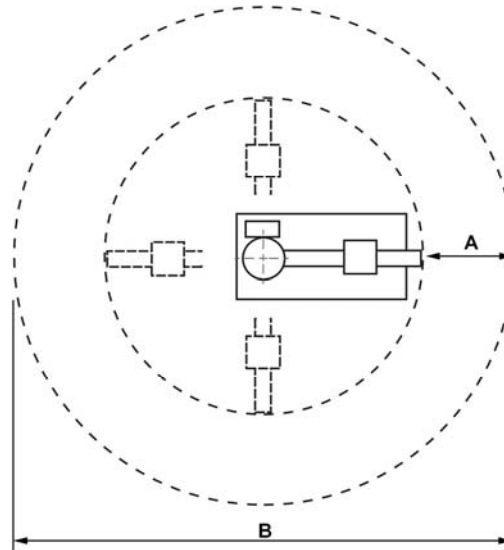


Figure 6

Figure 6 shows spacing for the 360° rotational path of the arm, plus 1000mm (approx. 40 inches) of general maintenance area on each side.

| Distance column center to arm limit | Maintenance area (A) | Total space required (B)    |
|-------------------------------------|----------------------|-----------------------------|
| 2087mm (82 in.)                     | 1000mm (40 in.)      | 6174mm (243 in./20-1/4 ft.) |

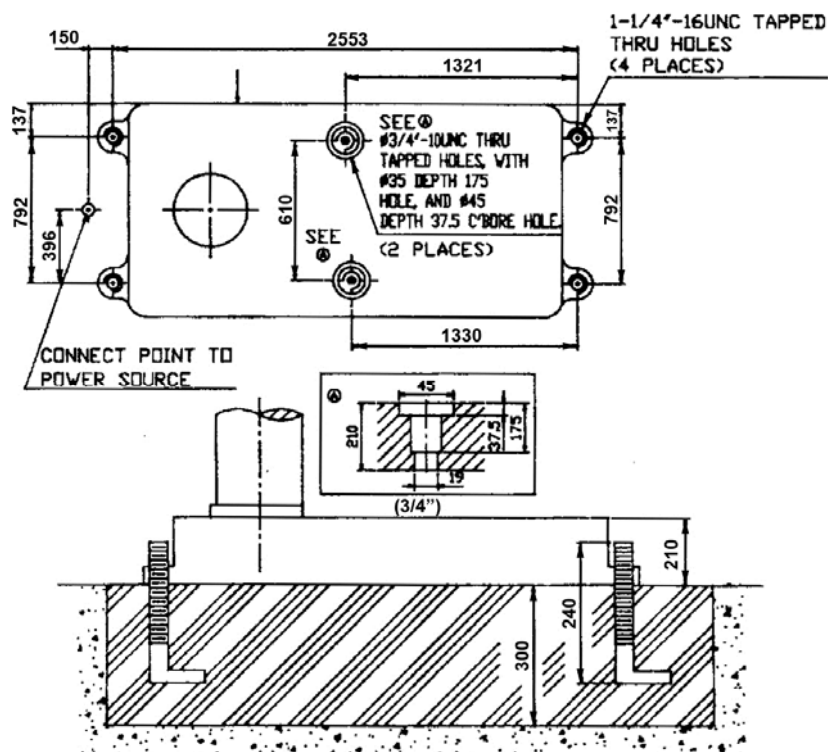


Figure 7

(all dimensions in millimeters unless otherwise noted)

## 6.2 Unpacking

Remove any remnants of shipping crate and check for shipping damage. Report any damage immediately to your distributor and shipping agent. Do not discard any shipping material until the Radial Arm Drill Press is installed and running properly.

Compare the contents of your container with the following parts list to make sure all parts are intact. Missing parts, if any, should be reported to your distributor. Read the instruction manual thoroughly for assembly, maintenance and safety instructions.

## Contents of Shipping Container

(see Figure 8)

- 1 Radial Arm Drill Press (not shown)
- 6 Leveling Pads
- 1 Tool Box, containing:
  - 1 Grease gun
  - 1 Oil bottle
  - 1 Tapered drift
  - 1 Adjustable wrench
  - 1 Set of hex keys
  - 1 Flat blade screwdriver
  - 1 Cross point screwdriver
- 1 Instructions and Parts Manual (not shown)
- 1 Warranty Card (not shown)
- 1 Manufacturer's Test Chart (not shown)



Figure 8: Tools provided

### **⚠ WARNING**

Read and understand the entire contents of this manual before attempting set-up or operation! Failure to comply may cause serious injury.

### 6.3 Machine Set-Up

1. After dismantling crate, remove toolbox and any accessory items from around machine.
2. Place lifting straps as shown in Figure 9. Use cushioning to protect machine surfaces.

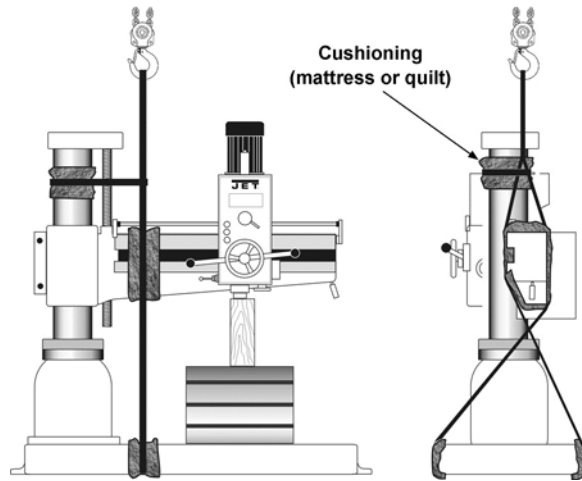


Figure 9: Method of lifting

3. Remove the bolts holding machine to pallet.

**⚠WARNING** All lifting equipment must be rated appropriately to safely sustain weight of drill press. Do not allow anyone near or beneath machine while it is being moved.

4. Lift machine and position it over anchor bolts in an area with good lighting, and a level and well-supported floor.
5. Place provided leveling pads beneath base, using appropriate spacing. Place a level (its tolerance should be within 0.02mm/m) on box table and level the machine.
6. The drill press MUST be anchored to floor. Use layout diagram in Section 6.1 as a guide, and mount the nuts to the ground bolts.

**⚠WARNING** Failure to anchor machine properly, according to the diagrams, could result in machine tipping over and consequent damage to machine and possible injury to machine operator and bystanders.

7. Connect electrical service branch to machine according to instructions which follow in section 6.4, *Electrical Connections*. This work should be done only by a qualified and licensed electrician who is familiar with machine service and national and local codes.
8. Turn on drill press (see section 8.0, *Operation*), push the unlock button, and move arm/spindle control lever to UP, until quill clears the shipping block and the arm clears

the support brace. Remove shipping block and wood platform from box table. Remove shipping brace from base. (Retain these support pieces if machine is to be transported in future.)

9. Surfaces of the machine have been treated with a protective coating for shipment; remove this with mineral spirits or a cleaner/degreaser. Then apply a light coating of oil to exposed metal surfaces. See section 12.0 *Maintenance*, for details.
10. Inspect all sight glasses on machine to be certain they are filled to their level lines. If low, add fluid as necessary according to instructions in section 12.2 *Lubrication*.
11. Perform a lubrication check at all points recommended in section 12.0.

**⚠CAUTION** Verify that the machine is properly lubricated at all points before operating.

12. Follow directions in section 8.0, *Operation*, to check all operation functions of drill press. If coolant is being used, put coolant in the sump and test coolant delivery.
13. When all of the above operations are complete, the machine is ready for service.

## 6.4 Electrical Connections



**WARNING** Electrical set-up should be performed only by a licensed electrician who is familiar with national and local electrical codes. This machine must be properly grounded to help prevent electrical shock and possible fatal injury.

Model J-1600R radial drills are tested before shipping for all functions and circuits under electrical power specified for the machine and motors. The only hook-up requirement should be for correct connection to an appropriate cutout on an appropriate service branch.

Where the following instructions do not agree with local electrical codes and procedures, the applicable codes and procedures should be followed, exclusively.

### Wiring diagram

A wiring diagram for the drill press is found inside the door of the electrical cabinet. A similar diagram is shown in back of this manual. This diagram is for reference by your licensed installing or servicing electrician.

All three motors on the J-1600R are 3-phase motors of the same voltage value. All control circuits are 110 volt circuits. The motor's circuit is **NOT fused**. Thus, fuses for each leg of the 3-phase service branch **must be supplied by the installing electrician**. If a service disconnect with a fuse for each leg of the 3-phase branch is not supplied, then none of the motors are protected from electrical faults.

In addition to using a licensed electrician for connection to the drill press service branch, the servicing of components and circuits inside the control box should be serviced only by a qualified electrician. This includes fuse replacement, if required. If any of these fuses, upon replacement, should continue to fail at short service intervals, the electrician should be asked to check all machine components for excessive loads, short circuits or other failures.

### Electrical branch service

The machine is wired for either a 230V or 460V, 3-phase service branch. The cable supplying the drill press will be tagged with the voltage at which the machine was tested and corresponding to the customer's order.

If the tag has been lost, it will be necessary for you to open the electrical cabinet on the rear of the drill press and examine the connections on the transformer found inside the box. The transformer can be connected to either a 230 or 460 volt source and its taps are labeled for voltage. By locating the source tap on the transformer you will be able to determine the branch voltage required.

A service disconnect is recommended. The use of fuses or circuit breakers for each of the voltage supply wires is required. Use fuses or circuit breakers which are appropriate to the voltage for the motor system delivered.

A positive cut-out/lock-out lever or rocker switch should be located on the outside of the service disconnect to allow the machine operator to disconnect from the branch circuit when working with tooling on the machine.

It is recommended that the **230 volt** Drill Press be connected to a dedicated 25 amp circuit with a 25 amp circuit breaker or time delay fuse. Connect the **460 volt** drill press to a dedicated, 15 amp circuit with 15 amp circuit breaker or time delay fuse. **Local codes take precedence over recommendations.**

### Connecting branch to drill press

1. Disconnect service branch to machine by moving lever or rocker switch on cutout box to OFF.
2. Connect the green wire (or green with white trace) to the branch ground.
3. Connect the remaining three wires in the cable (labeled R, S and T) to the three power lines in the branch.
4. Turn power to the machine ON at the cutout box.
5. Turn coolant switch (See Figure 10) to ON position.



**CAUTION** Make sure there is coolant in flood coolant system before operating pump. Failure to comply may cause damage to pump.

6. Observe rotation through glass atop pump. The shaft should be rotating in direction of arrow cast into pump assembly. If shaft is rotating wrong direction, the power leads need to be switched. Correct as follows:
7. Disconnect power to machine by turning it off at cutout box.
8. Reverse *any two* of the power lead connections, R, S or T.
9. Repeat steps 4, 5, and 6, above, and you should observe pump shaft turning in proper direction. Electrical service to machine is now complete.

## 7.0 Operating Controls

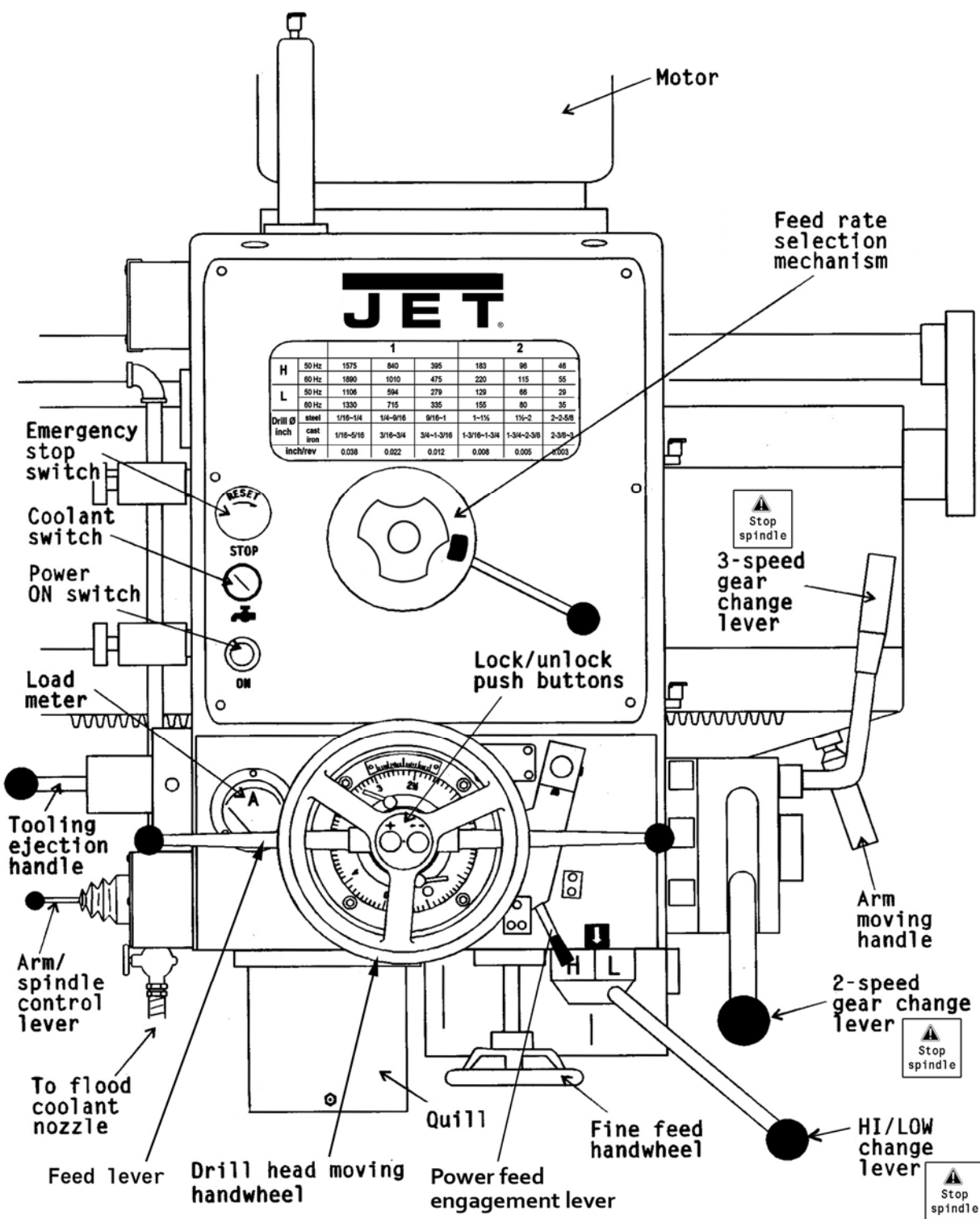


Figure 10: Operating Controls

## 8.0 Operation

### 8.1 Clamping workpieces

To load/unload heavier workpieces, unlock arm and rotate it out of the way. Lift the workpiece with slings or other properly rated lifting equipment.

Both the box table and base surface are slotted to accept a suitably sized T-slot clamp. Before beginning any work on the drill press, anchor the work piece, and box table if used, to be certain that workpiece and/or box table will not move when tool enters workpiece.

If box table will not be used, simply remove the nuts at the base, and move table off using proper lifting equipment.

**⚠WARNING** Failure to properly anchor workpiece and box table could result in damage to machine, damage to workpiece, and severe injury to machine operator. Never work on drill press without clamping the materials using a T-slot system set-up.

### 8.2 Tool insertion

The Model J-1600R uses a No. 5 Morse taper in the spindle to secure tooling. Any drill, milling cutter, or tool holder with an MT-5 can be inserted into the quill.

**⚠CAUTION** The first step in removing or inserting any tooling is to **be absolutely certain the machine cannot be accidentally started during the insertion or removal operation.** The only way to be certain of this fact is to disconnect power to machine. The service box should have a cut-out switch or lever on the outside of the box. Position switch or lever in the OFF position before inserting or removing tooling.

To insert tooling:

1. Verify that machine is disconnected from power.
2. Be certain the spindle is clean, free from oil, and ready to accept the shank of any tooling.
3. Check the shank of tooling to be certain the tooling is free from dirt, nicks or burrs. If nicks or burrs are discovered, file or stone the shank until it is smooth.
4. Pull the tooling ejection handle *out* to be certain the tooling can be inserted. See Figure 10.
5. Be certain quill is in full UP position.
6. Slide shank of tooling into spindle until it seats.
7. Use a soft-faced mallet (such as lead, plastic, brass, etc.) to give the tooling a sharp tap on its tip. This will secure the tooling in the taper.

8. Re-establish power to machine, and the drill is ready to use.

#### To remove tooling:

9. Verify that machine is disconnected from power.
10. Place a wood block under the tooling in spindle, to prevent it being damaged should it fall out during the removal process.
11. Use the feed levers to lower quill enough to allow tooling ejection handle to be pushed fully *inward*.
12. While using leather gloves to hold the tooling and prevent it from falling loosely out of the spindle taper, use the feed levers to give the quill a sharp upward stroke against the top of its travel and the tooling will be released from the taper in the spindle.
13. Remove tooling and pull tooling ejection handle *out* to allow new tooling to be inserted.

### 8.3 Tool positioning over workpiece

After workpiece has been clamped to base or table, position the tooling over workpiece, using any or all of the following methods:

1. Adjusting height of arm on support column.
2. Moving drill head along arm.
3. Rotating column upon which arm and head are attached.

### 8.4 Unlocking arm and column mechanisms

A motorized locking system is used to lock the head to the arm, the arm to the column, and the column to the base.

The buttons which control the locks are located in center of drill head handwheel (see Figure 10). Press and hold UNLOCK (green) button until arrow (Figure 11) points to "B". Release button. Clamping device is now disengaged. When locking, press and hold LOCK (red) button until arrow points to "A". Clamping device is now re-engaged.

NOTE: When you push UNLOCK, *all* of the locks are disengaged. When you push LOCK, *all* of the locks are engaged.

**⚠CAUTION** Always be certain the locks are engaged before using drill press. Pull on arm handle and try to rotate handwheel at front of head, before starting spindle. Failure to have all locks secure may result in damage to tooling, damage to workpiece, and possible injury to operator.

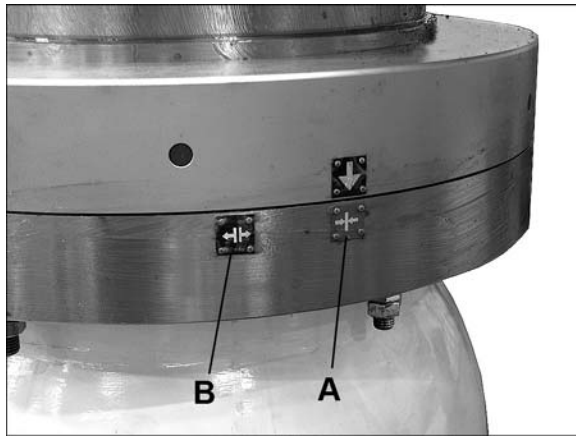


Figure 11: Locking indicators

## 8.5 Raising and lowering radial arm

1. Power to drill press must be ON – then release machine locks by pushing UNLOCK button in center of handwheel.
2. Raise or lower arm to required height using arm/spindle control lever (see Figure 10). See also section 8.24, *Arm/spindle control lever*.
3. When arm is at required height and if no other adjustments to spindle location are required, press LOCK button to engage all machine locks.

## 8.6 Moving drill head along arm

1. Power to drill press must be ON – then release machine locks by pushing UNLOCK button.
2. Turn handwheel to move drill head along arm. See Figure 10.
3. When drill head is at desired position on arm and if no other adjustments to spindle location are required, push LOCK button to engage all machine locks.

**⚠ WARNING** NEVER swing drill press arm on support column unless you are absolutely certain the drill press base is firmly attached to shop floor. You can tell if base is bolted to floor by checking the mounting pads at the four corners of base. There should be a securing bolt through each mounting pad. If the arm is moved off its position directly above base and base is not bolted to floor, **THE DRILL MAY TIP OVER AND CAUSE SERIOUS INJURY TO THE DRILL PRESS OPERATOR**, and will certainly result in damage to drill press itself.

## 8.7 Rotating arm on support column

1. Power to drill press must be ON – then release machine locks by pushing UNLOCK button on front of handwheel.
2. Swing arm using handle (see Figure 10) to required spindle position.

3. When spindle is positioned correctly and no other adjustments are required, push LOCK button to engage all machine locks.

## 8.8 Setting spindle speed

Spindle speeds are established using gear change levers on lower right-hand side of drill head. The shorter of the two levers (C, Figure 12) operates a two-speed mechanism which puts the gearbox in either high or low gear. The longer gear change lever (D) operates a three speed gearbox mechanism. A detent in the middle of the three-speed lever travel indicates when lever is in intermediate gear position.

The spindle speed readout (F) is located on the three-speed change mechanism housing.

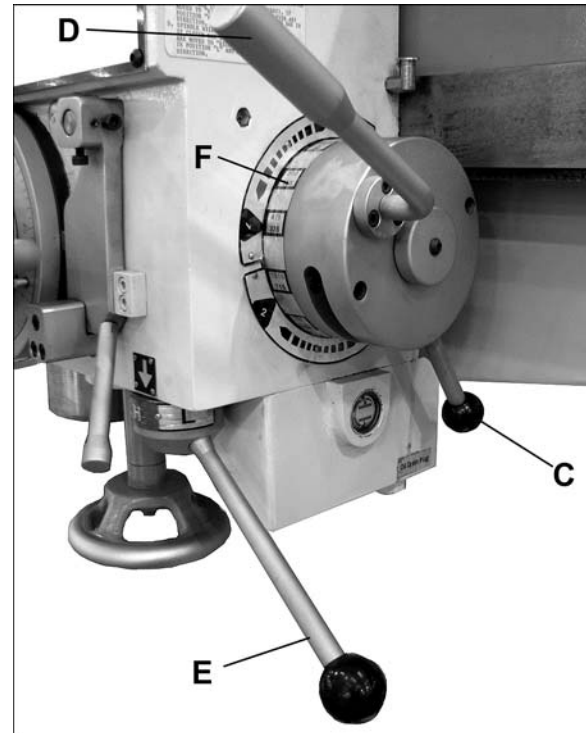


Figure 12: Gear change levers

This gearbox set-up allows a total of six spindle speeds which may be selected. Adding the two speeds possible with the HI/LOW change lever (E, Figure 12) increases the number of available speeds to twelve.

A chart on front of drill head shows gear change values required to select each speed. A similar chart is included in Table 4 of this manual.

Also on the spindle speed chart are recommended drill and tap sizes for the various speeds which are selectable. **These recommendations are only approximate.** With the wide variety of drill types and coatings available, as well as cutting fluids, and the even wider variety of workpiece materials which you might be machining – you need to consult with your tooling, coolant and/or workpiece suppliers to determine best spindle speed to use for any specific drilling operation.

## ⚠CAUTION

**Do not try to change gears while spindle is turning. This may cause serious damage to spindle drive system.**

To select spindle speed:

1. Allow spindle to stop rotating.
2. Press emergency stop button.
3. Move short lever (C, Figure 12) to position “1” or “2”.
4. Move long lever (D) to appropriate position. (If lever C is in position “1”, refer to arrow marker “1” for the reading. If lever C is in position “2” refer to arrow marker “2” for correct reading.)
5. Move HI/LOW change lever (E) to desired position. When this lever is in HI setting, use the red numbers on the spindle speed readout (F). When this gear is in LOW setting, use the black numbers on the spindle speed readout.

Note: An instruction plate is located near the gear change levers for quick reference to this procedure.

Allow spindle to stop completely before attempting to change gears. If gear change lever you want to move does not slip easily into new position, jog the motor for a second using the control lever. Then allow spindle to come to a stop before attempting to change gears again. Repeat this jogging process, as necessary, until gears match up properly for changing.

## ⚠CAUTION

**Plan for quill movement if selecting high speed spindle rotation. High speed rotation without quill travel will increase spindle temperatures.**

### 8.9 Feed rate and depth of cut

The J-1600R has limit switches on the quill which cut power to drive motor when quill has reached either upper or lower limit of its travel. This system is designed to prevent gearbox damage if power feed mechanism is engaged – damage which would occur if quill were to bottom out against upper or lower limit of quill travel. In the event of failure of either limit switch there is also a safety clutch mechanism which will slip when travel limits are reached.

However, while you are able to use virtually full travel of the quill for drilling or other operations, the drill press operator typically sets both rate of feed (travel-per-revolution of spindle), and depth of cut (quill travel to make required cut).

These two operations are described here:

### 8.10 Setting feed rate

The feed rate is set using dial/lever combination on front of drill head. See Figure 13. The dial can be rotated to select different feed rates, and the lever

can be moved to two positions, thus providing six different feed rates. The selected rate is displayed in the readout window on the dial.



*Figure 13: Feed rate setting mechanism*

Any of three feed rates are available for selection using any of the spindle speeds available. There will be a recommended feed rate for any drilling or boring operation, and this rate must be determined by consulting appropriate machinery handbooks or by consulting with your tooling, coolant and workpiece suppliers.

### 8.11 Feed methods

The J-1600R has three feed methods: power feed, hand feed and fine hand feed. When using the power feed system it is possible to establish a pre-set depth of cut.

### 8.12 Setting depth of cut using power feed system

There is a mechanism for engaging power feed and there is also a “trip” mechanism which can be set to disengage power feed when a pre-set depth has been reached.

1. Set feed rate according to instructions in *section 8.10; Setting feed rate*.
2. Set spindle speed appropriate to desired cut (*section 8.8; Setting spindle speed*).
3. Push power feed engagement lever to left to engage power feed system.
4. Turn power switch to ON.
5. Move spindle/arm control lever to required spindle rotation direction.
6. Pull feed levers outward, away from drill head, to engage power feed clutch. In this power feed position, quill and spindle will be driven until one of the following happens:
  - Spindle reaches limit of travel and the limit switches disable power; or
  - The “trip” mechanism automatically disengages power feed; or
  - Drill press operator pushes feed levers into disengaged position; or

- Drill press operator pulls power feed engagement lever into disengaged (toward right) position.

#### To set depth of cut for power feeding:

Refer to Figure 14.

1. Unlock both levers (A, Figure 14).
2. Rotate feed levers (B) to lower drill until it touches workpiece.
3. Rotate dial (C) until required feed depth on scale is at zero reference mark (D).
4. Lock both levers (A).
5. Push power feed engagement lever (F) toward the left.
6. Pull feed levers (B) out to engage power feed clutch. The power feed mechanism will feed drill into workpiece at the rate selected on feed rate dial, until selected depth of cut is complete.

**Note:** The depth limit for power feed drilling is 4.0 inches (100mm). If deeper holes are needed, the machining must be done in steps.

**IMPORTANT:** Feed rate must be set (out of neutral position) before power feed can be engaged.

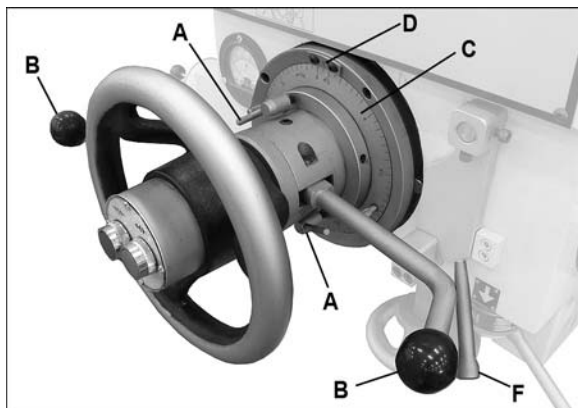


Figure 14: Depth setting; power feed engagement

#### 8.13 Spindle direction and power feed

Spindle rotation direction is managed by the arm/spindle control lever on left side of drill head. See Figure 15.



Figure 15: Spindle/arm control lever

Clockwise or "forward" rotation is the direction of rotation for right-hand tooling – the vast majority of tooling used in machine operations. Reverse spindle rotation for left hand tooling.

Power feed direction is determined by the spindle direction. When spindle is set to its most common direction – clockwise or forward – the quill and spindle are driven downward. When spindle direction is set counterclockwise (reverse), quill and spindle are driven upward.

#### 8.14 Hand feed – roughing operations

When the feed levers are pushed toward the drill head the power feed mechanism is disengaged. In this position, the feed levers can be used to move the quill and spindle and perform manual drilling or other machining operations.

#### 8.15 Fine hand feed using power feed system

The fine feed handwheel is located on underside of front of drill head. See Figure 10. The fine feed control is used as follows:

1. Set feed rate lever to far right to disengage.
2. Pull feed levers out to engage power feed clutch.
3. Turn drill press power switch to ON, and set arm/spindle control lever to desired direction.
4. Manually turn fine feed handwheel. Quill and spindle will move downward or upward (depending upon which way you turn handwheel and the direction spindle is turning) until you stop turning the handwheel.

#### 8.16 Tapping

1. Insert screw tap into spindle.
2. Move spindle into position.
3. Set spindle control to Forward.
4. Rotate feed levers counterclockwise until desired tapping depth is reached.
5. Reverse spindle direction and allow tap to withdraw completely from workpiece.
6. Stop spindle by moving spindle control switch to center (neutral).

#### 8.17 Power ON/OFF

If your J-1600R was connected to its service branch correctly, there will be a service disconnect with an external power cutoff lever or switch which disconnects the drill press from the service branch. This is your ultimate protection against accidental machine start-up when clamping work pieces or inserting and removing tooling. Always be certain

you have turned off power at this disconnect before beginning such procedures.

Once your workpiece is clamped securely and tooling is installed, you can reestablish power to machine by turning cut-out panel back ON.

## 8.18 Coolant control

The flood coolant system is controlled by the switch on front of drill head (Figure 10). If coolant has been turned on but does not flow, check pump rotation by observing pump shaft. It should be rotating in the direction of arrow on pump casting. If rotation is incorrect, see Section 6.4 *Electrical Connections*, for more information.

Open valve to coolant nozzle using handle at left of head (see Figure 10). The proximity of nozzle can be adjusted by loosening the two knobs and sliding coolant pipe up or down as needed. Retighten knobs.

## 8.19 Spindle motor controls

Power to spindle motor is controlled as follows:

1. The cutout box control lever must be in ON position.
2. The Emergency Stop switch must be disengaged (rotate clockwise), and the drill press power switch pushed ON.
3. The feed levers must be used to move quill slightly off its seat.
4. The arm/spindle control lever must be engaged for selected rotation. See Section 8.24 *Arm/spindle control lever*.

**NOTE:** The limit switch will prevent spindle rotation when quill is seated. Also, quill must be off seat before control lever is used – a safety interlock system prevents spindle rotation unless quill is off seat before control lever is used.

## 8.20 Turning off spindle drive

To turn power OFF on the spindle drive motor do one of the following:

1. Push power switch OFF, *or...*
2. Put arm/spindle control lever in neutral, *or...*
3. Push STOP switch, *or...*
4. When servicing tooling or other machine components, put service disconnect lever in OFF position.

Once STOP switch has been pushed (step 3 above), none of the other switches on the panel can be used to control power to spindle drive motor or coolant pump until STOP switch has been reset.

## 8.21 Resetting STOP switch

When pressed, the red emergency stop button remains engaged. Turn switch clockwise in direction of arrow to disengage. The switch is re-set and the other spindle motor controls can be used.

## 8.22 Using load ammeter

An ammeter on the control console is used to monitor load on spindle drive motor. It is connected into one of the three power lines which supply main drive motor.

When drive motor is ON and up to speed, and there is no tooling being used to drill, tap or bore a hole, the ammeter should read approximately 2.5 amps. If it exceeds this value there is a problem internally (such as lack of lubrication in the gearboxes, bad bearings, etc.). You should turn off machine and determine the cause of any excessive free-running load.

Monitor the ammeter during machining operations. The ammeter should stay below 9 amps of current draw during machining. You should adjust spindle speed, feed rate and coolant use to maintain full load current draw below the 9 amp value.

If current draw exceeds 9 amps, a thermal overload switch in the electrical control panel will trip. If this occurs, a licensed electrician should locate and re-set the thermal switch.

## 8.23 Tapping operations

1. Determine most efficient tapping speed (spindle speed) by consulting appropriate machinist's tables, your tap supplier, coolant supplier and/or workpiece supplier. (Note that the figures on the chart on front of drill head are only approximations of appropriate tapping speed.)
2. Be certain that power feed lever is in **disengaged** position (all the way to right).
3. Turn on spindle motor. Also, turn on coolant pump if coolant is being used.
4. Move arm/spindle control lever to *Forward*.
5. Use the feed levers to move tap into its pilot hole until tap makes its initial thread cut and is engaged in work piece.
6. Allow tap to "self-feed" into pilot hole until it has completed its tapping operation.
7. Move arm/spindle control lever to neutral (center position) and allow spindle to stop completely.
8. Move arm/spindle control lever to reverse, so that tap unscrews itself from hole it has just threaded.

## 8.24 Arm/spindle control lever

The four-position arm/spindle control lever is located on left hand side of drill head console. See Figure 10. It controls spindle rotation direction and raising and lowering of the arm.

The ability to control the height of the arm is available when:

1. Main power to machine is ON at its branch service panel.
2. Emergency STOP switch is disengaged.
3. Power switch is pushed ON.
4. The column and arm UNLOCK button (right hand side of drill head – see Figure 10) is pressed to disengage machine locks.

NOTE: The control lever does not return to neutral when released, but remains in position. This means unless you return it to neutral, the arm will keep raising or lowering until it contacts a limit switch.

## 9.0 Adjustments

After extended use – usually several years – the radial arm drill may require adjustment of certain parts. Two areas require particular attention:

- The clamping device.
- The gap between head and rail.

### 9.1 Clamping device

If there is backlash in the clamping device, correct as follows.

Refer to Figure 16.

1. Press and hold *unlock button* (see Figure 10) until arrow (Figure 16) points to “B”. Release button. Clamping device is now disengaged.
2. Loosen the five *locking nuts* (C).

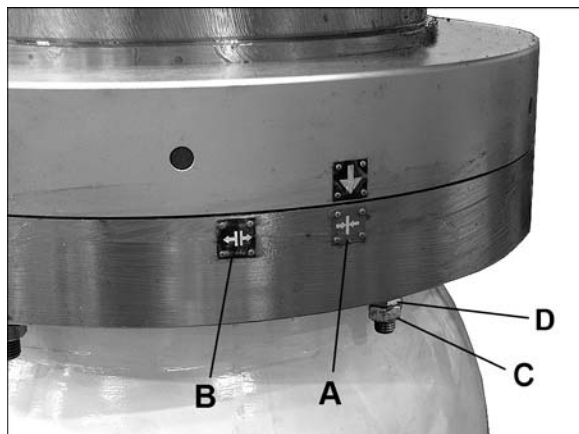


Figure 16: Clamp adjustments

3. Turn the five upper *adjusting nuts* (D) counterclockwise approximately 180°.
4. Re-tighten the five locking nuts (C).

5. Move arm/spindle control lever to Arm UP.
6. Press emergency stop button after arm has elevated a short distance.
7. Press unlock button to release clamping device.
8. Release locking nut. (E, Figure 16).
9. Rotate adjustment nut (F) approximately 180° clockwise.
10. Retighten locking nut (E).
11. Move arm/spindle control lever to neutral.
12. Reset emergency stop button.

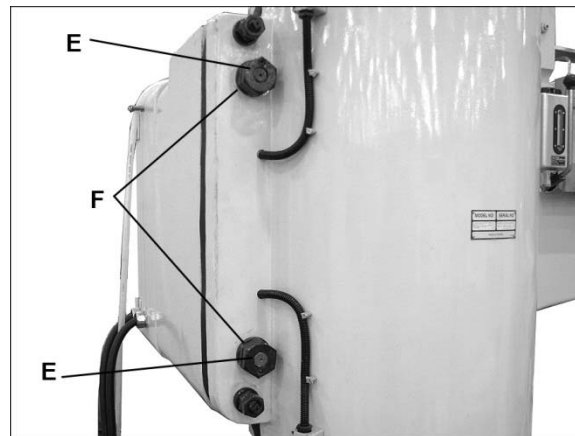


Figure 17: Clamp adjustments

### 9.2 Head/rail backlash

If backlash ever appears between gearbox head and arm rail, the tightness between rail and bearings can be corrected, as follows.

Refer to Figure 18.

1. Remove side plate (G) by removing screws.
2. Loosen set screws (H).
3. Insert hex key into holes (J), and rotate the bearing shaft. Rotate handwheel on front of head; it should be snug but still easily turned.
4. Tighten set screws (H).
5. Repeat steps 1 through 4 for opposite side of head.
6. Install side plates (G) on both sides of head.

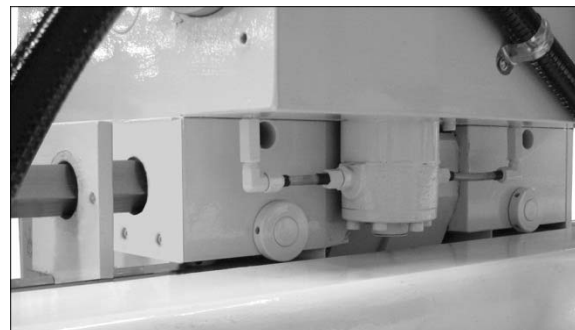


Figure 18: Head/rail backlash adjustments

### 9.3 Clutch adjustment

If the spindle, in Hi or Low speed, won't rotate fully while drilling, the clutch requires adjustment. Proceed as follows;

1. Change gear speed to highest speed, then turn off power.
2. Remove large sight glass at right side of drill head.
3. Rotate spindle with your left hand until clutch turns to the best position for adjustment, with the clutch's key facing toward you.
4. Push out upper key (K, Figure 19), and turn collar (L) right or left until key returns to notch.
5. Reinstall sight glass.
6. Operate drill to verify proper spindle rotation.

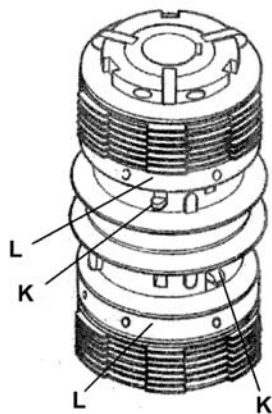


Figure 19: Clutch adjustment

### 9.4 Hydraulic pressure adjustment

If there is little or no hydraulic pressure during normal operation, adjust as follows:

1. Insert small screwdriver into valve switch and hold it there.
2. Rotate valve clockwise to increase pressure. (Counterclockwise decreases pressure.) Default pressure is 38 bar (kg/cm<sup>2</sup>).
3. Remove screwdriver.

## 10.0 Troubleshooting the J-1600R

| Trouble                                   | Probable Cause                                               | Suggested Remedy                                                                                                                                                                                                                                                                                              |
|-------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Spindle overloads, causing relay to trip. | Drill bit too large.                                         | Turn off power, wait three minutes after spindle stops turning, then push re-set on the relay in the control box.<br>Correct initial problem by using shorter drill bit or lower feed rate; consult appropriate feed and speed rate tables.<br>Replace fuse if needed. Verify proper voltage at power source. |
|                                           | Feed rate too fast.                                          |                                                                                                                                                                                                                                                                                                               |
|                                           | Operation not in compliance with speed and feed rate tables. |                                                                                                                                                                                                                                                                                                               |
|                                           | Fuse burned out.                                             |                                                                                                                                                                                                                                                                                                               |
|                                           | Low voltage.                                                 |                                                                                                                                                                                                                                                                                                               |
| Spindle overloads, causing fuse to blow.  | Drill bit too large.                                         | Replace fuse in control box.                                                                                                                                                                                                                                                                                  |
|                                           | Feed rate too fast.                                          | Correct initial problem by using smaller drill bit or lower feed rate; consult appropriate feed and speed rate tables.                                                                                                                                                                                        |
|                                           | Operation not in compliance with speed and feed rate tables. |                                                                                                                                                                                                                                                                                                               |

Table 3

### If drill bit gets broken in spindle:

1. Move arm/spindle control lever to neutral.
2. Press emergency stop button.
3. Push head/gearbox out of the way.
4. Pinch the end of broken bit with pliers.
5. Rotate counterclockwise and pull it out.

### If screw tap gets broken in spindle:

1. Move arm/spindle control lever to neutral.
2. Press emergency stop button.
3. Using a thread releaser, rotate screw tap counterclockwise until it comes out.

### If something becomes entangled during operation:

1. Press emergency stop button.
2. Disconnect power.
3. Switch speed change lever to highest gear.
4. Rotate spindle by hand in reverse direction from that used during the operation, until the obstruction is free.

## 11.0 Spindle speed chart (J-1600R)

Note: A similar chart is found on front of drill head.

|                               |                      | <b>1</b>        |          |            | <b>2</b>     |             |         |
|-------------------------------|----------------------|-----------------|----------|------------|--------------|-------------|---------|
| <b>H</b>                      | 50 Hz                | 1575            | 840      | 395        | 183          | 96          | 46      |
|                               | 60 Hz                | 1890            | 1010     | 475        | 220          | 115         | 55      |
| <b>L</b>                      | 50 Hz                | 1106            | 594      | 279        | 129          | 66          | 29      |
|                               | 60 Hz                | 1330            | 715      | 335        | 155          | 80          | 35      |
| <b>Drill Ø<br/>inch</b>       | <b>steel</b>         | 1/16~1/4        | 1/4~9/16 | 9/16~1     | 1~1½         | 1½~2        | 2~2-5/8 |
|                               | <b>cast<br/>iron</b> | 1/16~5/16       | 3/16~3/4 | 3/4~1-3/16 | 1-3/16~1-3/4 | 1-3/4~2-3/8 | 2-3/8~3 |
| <b>inch/rev</b>               |                      | 0.038           | 0.022    | 0.012      | 0.008        | 0.005       | 0.003   |
| <b>Threading<br/>(metric)</b> |                      | Not recommended |          |            | M3~M6        | M6~M16      | M16~M20 |

Table 4

## 12.0 Maintenance for J-1600R

Regularly scheduled maintenance is crucial to ensure a long service life for your machine. The schedule below shows general cleaning, lubrication points and coolant replacement information for the J-1600R Radial Arm Drill Press. Item numbers are located in Figures 20-22. Using proper eye protection, clean parts using a metal brush and a rag dipped with oil (Mobil Vactra AA or equivalent). **Press E-stop button and power off before lubricating.** Follow local regulations for disposal of used coolant/lubricants.

### 12.1 General Cleaning

| No. | Item                      | Action                                                          | Interval     | Lubricant            |
|-----|---------------------------|-----------------------------------------------------------------|--------------|----------------------|
| 1   | Column                    | Clean and lightly wipe with oil                                 | Daily        | Mobil Vactra oil AA  |
| 2   | Arm Rail                  | Clean and lightly wipe with oil                                 | Daily        | Mobil Vactra oil AA  |
| 3   | Spindle                   | Clean and lightly wipe with oil                                 | Daily        | Mobil Vactra oil AA  |
| 4   | Box Table                 | Clean and lightly wipe with oil                                 | Daily        | Mobil Vactra oil AA  |
| 5   | Base                      | Remove shavings; clean and wipe exposed metal surfaces with oil | Daily        | Mobil Vactra oil AA  |
| 6   | Ball Screw                | Clean with metal brush and oiled rag                            | Weekly       | Mobilux Grease No. 3 |
| 7   | Counterweight guide rails | Clean and lightly wipe with oil                                 | Daily        | Mobil Vactra oil AA  |
| 8   | Spindle motor             | Blow dust from fan housing with compressed air                  | Periodically | --                   |

Table 5

### 11.2 Lubrication

| No. | Item                                 | Location                              | Action                                                                                                                                                                               | Interval                                 | Lubricant *                                                                       |
|-----|--------------------------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------------------------------------------------------------------------|
| 9   | Oil Cup (for column clamp)           | On cylinder rest, at bottom of column | Add lubricant to full capacity                                                                                                                                                       | Daily                                    | Mobil Vactra oil AA                                                               |
| 10  | Oil Cup (for spindle)                | Top of drill head                     | Add lubricant to full capacity.                                                                                                                                                      | Daily                                    | Mobil Vactra oil AA                                                               |
| 11  | 2 Oil Cups (for arm rail slide-ways) | Right side of drill head              | Add lubricant to full capacity                                                                                                                                                       | Daily                                    | Mobil Vactra oil AA                                                               |
| 12  | Elevating gear                       | Fill hole at top of column cap        | Top off using fill hole (12a). Fill to sight glass full level (12b).                                                                                                                 | Check sight glass daily                  | Mobil Vactra oil AA                                                               |
| 13  | Counterweight Chain                  | Behind drill head                     | Wipe with oiled rag                                                                                                                                                                  | Weekly                                   | Mobil Vactra oil AA                                                               |
| 14  | Coolant                              | Reservoir in base                     | Monitor for cleanliness and efficiency. Replace when dirty or when cutting becomes inefficient. <b>Capacity = 30 liters (8 gal.)</b>                                                 | Frequent inspection; top off as needed   | Use high quality coolant of choice. (Follow coolant manufacturer's instructions.) |
| 15  | Grease nipple (for spindle)          | On quill                              | Lubricate with lube gun                                                                                                                                                              | Daily                                    | Mobilux Grease No. 3                                                              |
| 16  | Rack                                 | Front of arm                          | Lubricate with lube gun                                                                                                                                                              | Every 3 days                             | Mobil Vactra oil AA                                                               |
| 17  | Hydraulic oil reservoir              | Rear of machine inside guard panel    | Add lubricant into fill hole (17a) to full level of sight glass (17b).                                                                                                               | Check sight glass daily                  | Mobil Vactra oil AA                                                               |
|     |                                      |                                       | Replace annually; drain at (17c). Use sight glass (17b) to fill to capacity. <b>NOTE: Put pipe thread compound on drain plug before re-installing. Capacity: 4.5L (1.2 gal.)</b>     | After first 6 months, then once per year | Mobil Vactra oil AA                                                               |
| 18  | Gearbox                              | Top and right side of drill head      | Top off at fill hole (18a). Fill to sight glass full level (18b).                                                                                                                    | Check sight glass daily                  | Mobil Vactra oil AA                                                               |
|     |                                      |                                       | Replace annually; drain at (18c). Use sight glass (18b) to fill to capacity. <b>NOTE: Put pipe thread compound on drain plug before re-installing. Capacity: 3 liters (3/4 gal.)</b> | After first 6 months, then once per year |                                                                                   |
| 19  | One shot lube unit (for column)      | On arm near column                    | Push lever down to disperse oil. Keep filled to capacity.                                                                                                                            | Push lever once per hour                 | Mobil Vactra oil AA                                                               |

Table 6

\* **IMPORTANT:** If switching brands of lubricants, prevent compatibility issues by thoroughly draining and, if possible, cleaning the reservoir before filling with the replacement brand.

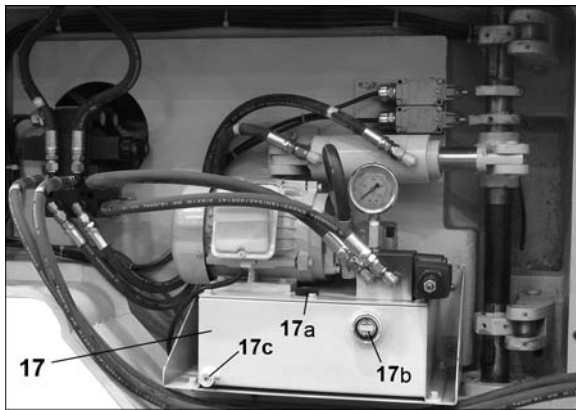


Figure 20



Figure 21

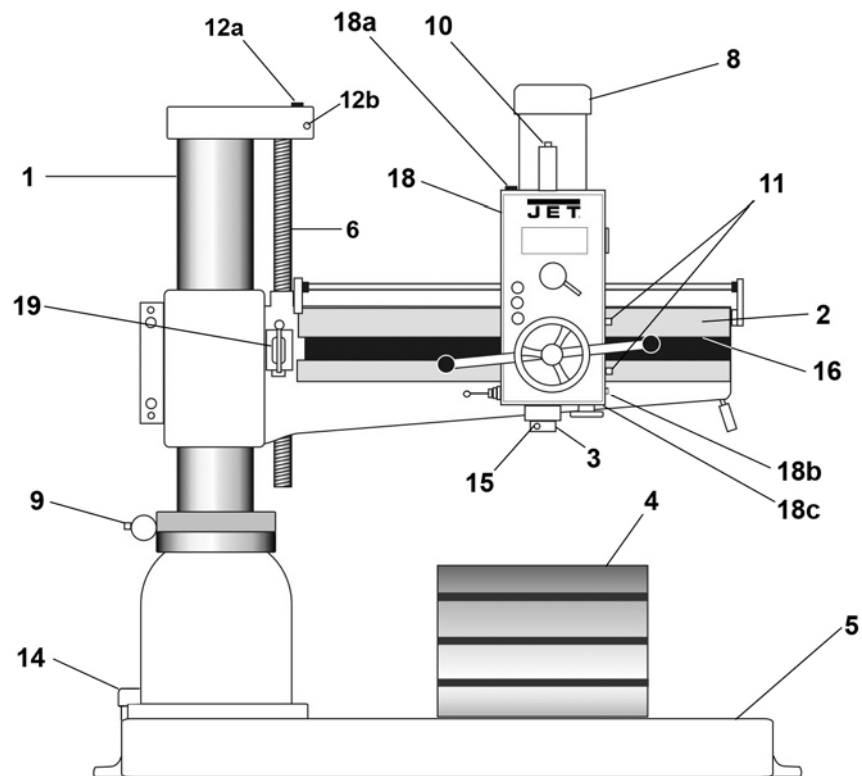
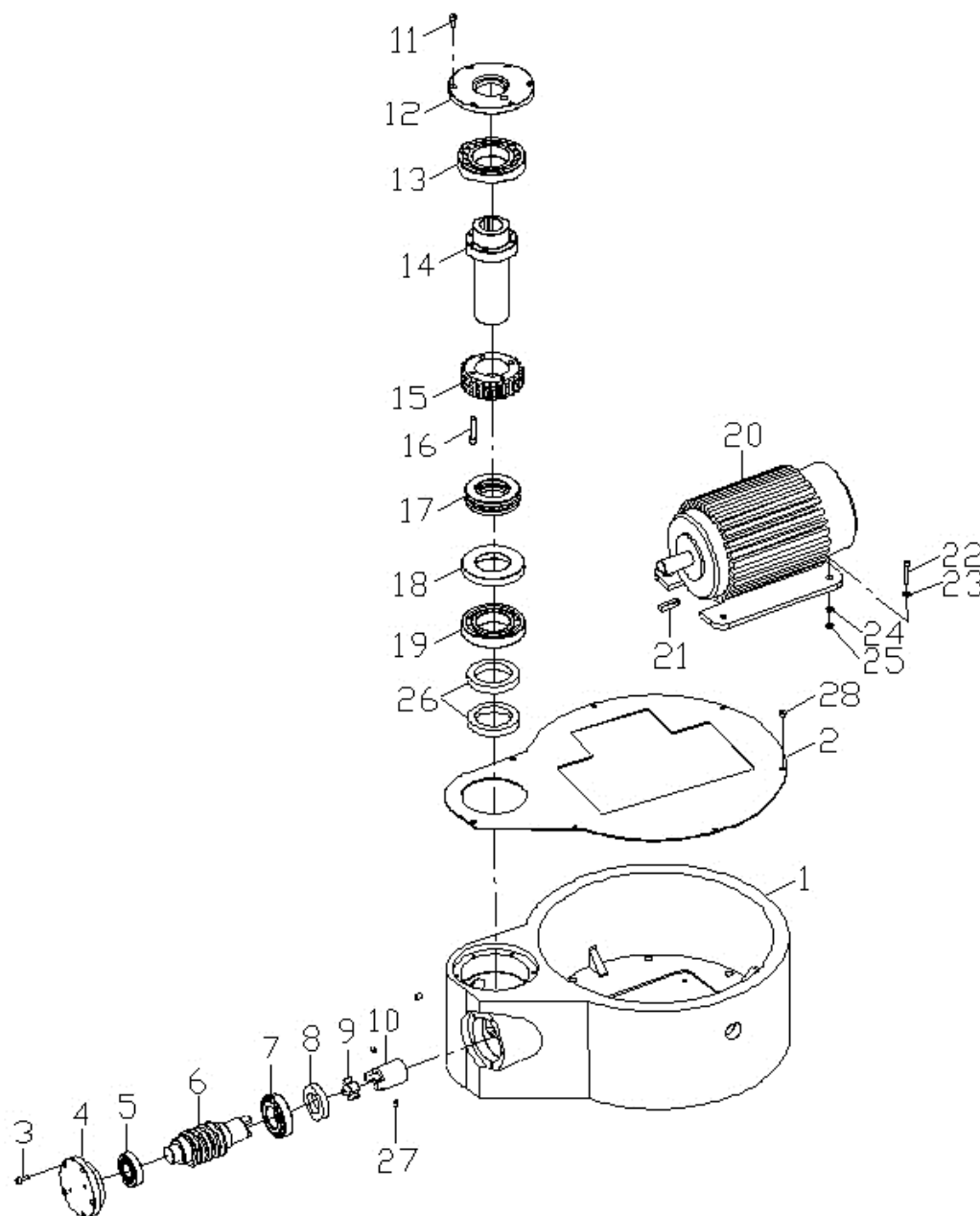


Figure 22

## 13.0 Replacement Parts – J-1600R Radial Arm Drill

Replacement parts are listed on the following pages. To order parts or reach our service department, call 1-800-274-6848, Monday through Friday (see our website for business hours, [www.waltermeier.com](http://www.waltermeier.com)). Having the Model Number and Serial Number of your machine available when you call will allow us to serve you quickly and accurately.

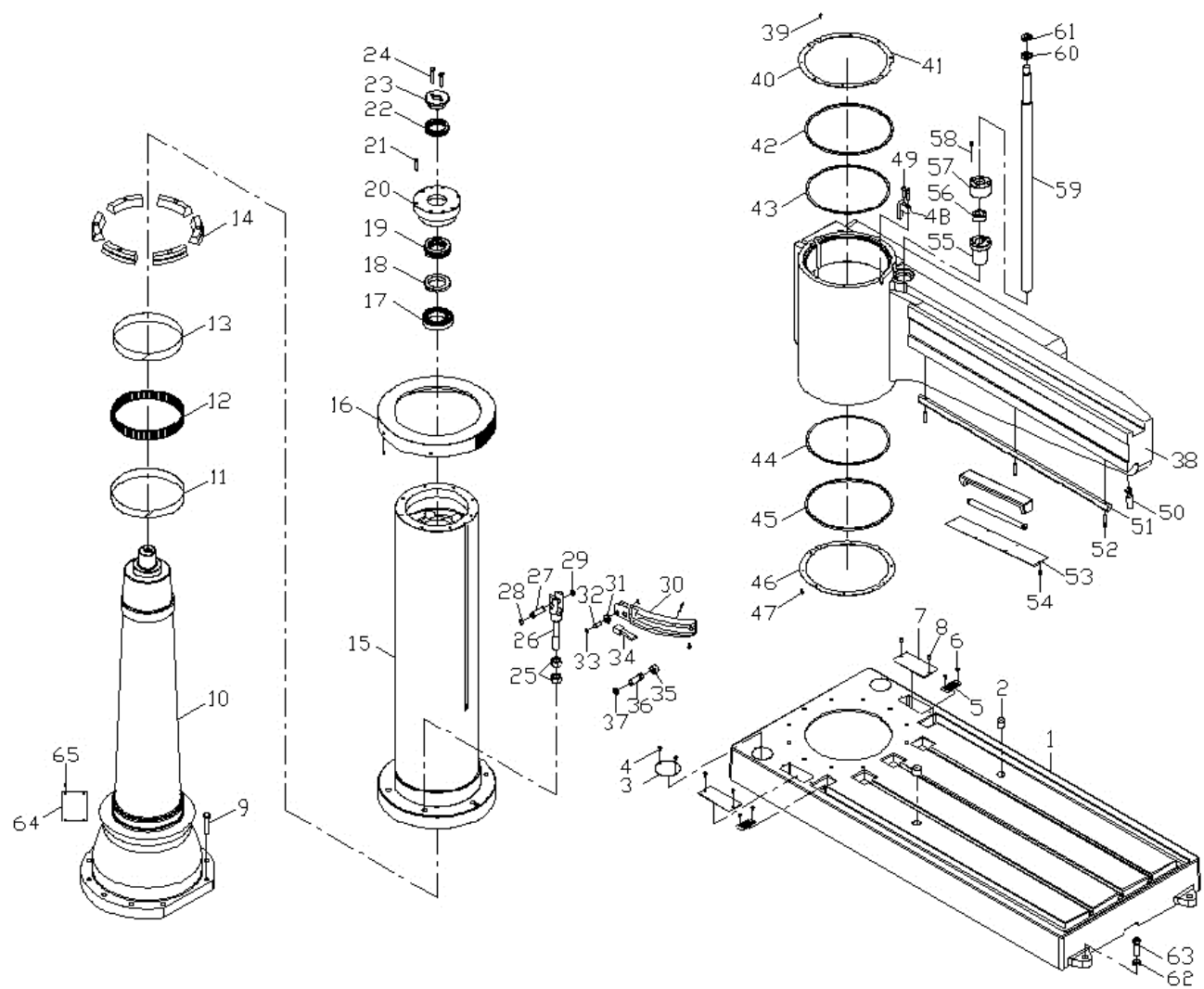
### 13.1.1 Riser Mechanism: Exploded View



### 13.1.2 Riser Mechanism: Parts List

| Index No. | Part No.   | Description               | Size                | Qty |
|-----------|------------|---------------------------|---------------------|-----|
| 1         | J-5241361  | Column Cover              |                     | 1   |
| 2         | 10431      | Nut Cover Seat            |                     | 1   |
| 3         | TS-1503041 | Socket Head Cap Screw     | M6x16L              | 5   |
| 4         | J-524124   | Bearing Cover             |                     | 1   |
| 5         | BB-30206   | Bearing                   | 30206               | 1   |
| 6         | 5241261    | Worm Shaft                |                     | 1   |
| 7         | BB-30208   | Bearing                   | 30208               | 1   |
| 8         | 5241281    | Oil Seal                  | TC40x65x12          | 1   |
| 9         | 5241291    | Adapting Sheet            |                     | 1   |
| 10        | 5241311    | Adaptor                   |                     | 1   |
| 11        | TS-1503041 | Socket Head Cap Screw     | M6x16L              | 6   |
| 12        | J-524148   | Compressing Cover         |                     | 1   |
| 13        | 524147     | Bearing                   | 30213               | 1   |
| 14        | 5241451    | Elevating Shaft           |                     | 1   |
| 15        | 5241441    | Worm Gear                 |                     | 1   |
| 16        | TS-1504081 | Socket Head Cap Screw     | M8x40L              | 4   |
| 17        | 524142     | Bearing                   | 51212               | 1   |
| 18        | 524141     | Collar                    |                     | 1   |
| 19        | 524139     | Bearing                   | 6212                | 1   |
| 20        | J-5241381  | Motor (for arm elevation) | 2HP, 230/460V, 60Hz | 1   |
| 21        | 524133     | Key                       | 8mmx35L             | 1   |
| 22        | TS-1503091 | Socket Head Cap Screw     | M6x40L              | 4   |
| 23        | TS-1550041 | Flat Washer               | M6                  | 4   |
| 24        | TS-2361061 | Spring Washer             | M6                  | 4   |
| 25        | TS-1540041 | Nut                       | M6                  | 4   |
| 26        | 524137     | Oil Seal                  | TC60x82x12          | 2   |
| 27        | TS-1523021 | Set Screw                 | M6x8L               | 2   |
| 28        | TS-1534032 | Pan Head Machine Screw    | M6x10L              | 7   |

### 13.2.1 Column and Base: Exploded View

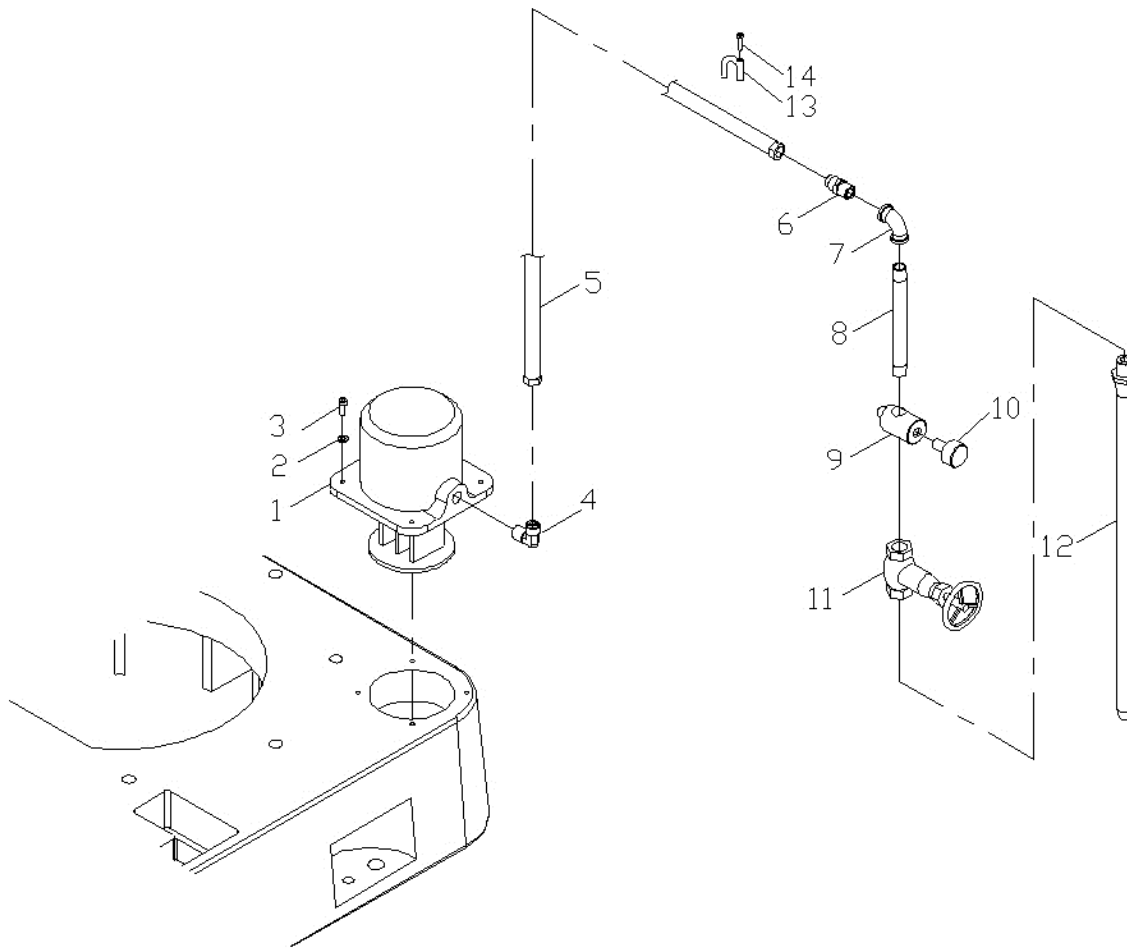


### 13.2.2 Column and Base: Parts List

| Index No. | Part No.    | Description                            | Size        | Qty |
|-----------|-------------|----------------------------------------|-------------|-----|
| 1         | J-524389    | Base                                   |             | 1   |
| 2         | 524391      | Cover                                  |             | 2   |
| 3         | J-524393    | Cover                                  |             | 1   |
| 4         | 524394      | Pan Head Machine Screw                 | 3/16"x3/8"L | 2   |
| 5         | 10277       | Filter Screen                          |             | 2   |
| 6         | 524394      | Bolt                                   | 3/16"x3/8"L | 4   |
| 7         | J1600R-307  | Cover                                  |             | 2   |
| 8         | TS-1534042  | Pan Head Machine Screw                 | M6x12L      | 4   |
| 9         | 524392      | Bolt                                   | M20x110L    | 11  |
| 10        | J-524395    | Internal Column                        |             | 1   |
|           | 524398      | Needle Roller (includes #11,12,13)     |             | 1   |
| 11        |             | Steel Band                             |             | 1   |
| 12        |             | Needle                                 |             | 129 |
| 13        |             | Steel Band                             |             | 1   |
| 14        | 524401      | Wedge                                  |             | 6   |
| 15        | 524404      | External Column                        |             | 1   |
| 16        | 524399      | Locking Cover                          |             | 1   |
| 17        | BB-6218     | Bearing                                | 6218        | 1   |
| 18        | 524407      | Collar                                 |             | 1   |
| 19        | BB-51218    | Bearing                                | 51218       | 1   |
| 20        | 524405      | Fixed Bearing Cover                    |             | 1   |
| 21        | TS-1505101  | Socket Head Cap Screw                  | M10x60L     | 6   |
| 22        | BB-51118    | Bearing                                | 51118       | 1   |
| 23        | J1600R-323  | Spindle Sleeve                         |             | 1   |
| 24        | 5232951     | Bolt                                   | 1/2"-12Nx3L | 2   |
| 25        | 5233111     | Nut                                    | 5/8"-11UNC  | 12  |
| 26        | 524425      | Elevating Shaft                        |             | 6   |
| 27        | 524427      | Fixing Shaft                           |             | 6   |
| 28        | HVBS462-060 | Retainer                               | S10         | 6   |
| 29        | HVBS462-060 | Retainer                               | S10         | 6   |
| 30        | 5244291     | Slip Block                             |             | 6   |
| 31        | 5244361     | Roller                                 |             | 6   |
| 32        | 524435      | Fixing Shaft                           |             | 6   |
| 33        | 618M-158    | Retainer                               | S9          | 12  |
| 34        | 524428      | Slip Bracket                           |             | 6   |
| 35        | 524431      | Roller                                 |             | 6   |
| 36        | 524432      | Slip Bar                               |             | 6   |
| 37        | 524433      | Washer                                 |             | 6   |
| 38        | J-524439    | Arm                                    |             | 1   |
| 39        | TS-1534032  | Pan Head Machine Screw                 | M6x10L      | 10  |
| 40        | 524437      | Cover                                  |             | 1   |
| 41        | 524437A     | Cover (notched)                        |             | 1   |
| 42        | 524438      | Gasket                                 | U-10-16-14  | 1   |
| 43        | J1600R-343  | Dust Seal                              | 5mm         | 1   |
| 44        | J1600R-343  | Dust Seal                              | 5mm         | 1   |
| 45        | 524438      | Gasket                                 | U-10-16-14  | 1   |
| 46        | 524411      | Cover                                  |             | 2   |
| 47        | TS-1534032  | Bolt                                   | M6x10L      | 10  |
| 48        | 524441      | Key                                    |             | 1   |
| 49        | TS-1504071  | Socket Head Cap Screw                  | M8x35L      | 2   |
| 50        | 524442      | Handle                                 |             | 1   |
| 51        | 524443      | Arm Rack                               |             | 1   |
| 52        | 524444      | Socket Head Cap Screw                  | M6x40L      | 3   |
| 53        | 524446      | Glass Plate                            |             | 1   |
| 54        | 5513357     | Bolt                                   | 3/16"x3/8"L | 8   |
| 55        | 10419/6     | Brass Sleeve (includes #59 Lead Screw) |             | 1   |
| 56        | 10417       | Safety Nut                             |             | 1   |
| 57        | 10418       | Safety Device Cover                    |             | 1   |
| 58        | J1600R-358  | Socket Head Cap Screw                  | M12x95L     | 4   |
| 59        | 10419/6     | Lead Screw (includes #55 Brass Sleeve) |             | 1   |

| Index No. | Part No.   | Description                    | Size   | Qty |
|-----------|------------|--------------------------------|--------|-----|
| 60        | J1600R-360 | Setting Nut                    |        | 1   |
| 61        | J1600R-361 | Setting Nut                    |        | 1   |
| 62        | J1600R-362 | Nut                            |        | 4   |
| 63        | J1600R-363 | Bolt                           |        | 4   |
| 64        | J1600R-364 | Electric Wire Cover            |        | 1   |
| 65        | TS-1534042 | Pan Head Machine Screw         | M6x12L | 4   |
|           | 5515232    | One Shot Lube Unit (not shown) |        | 1   |

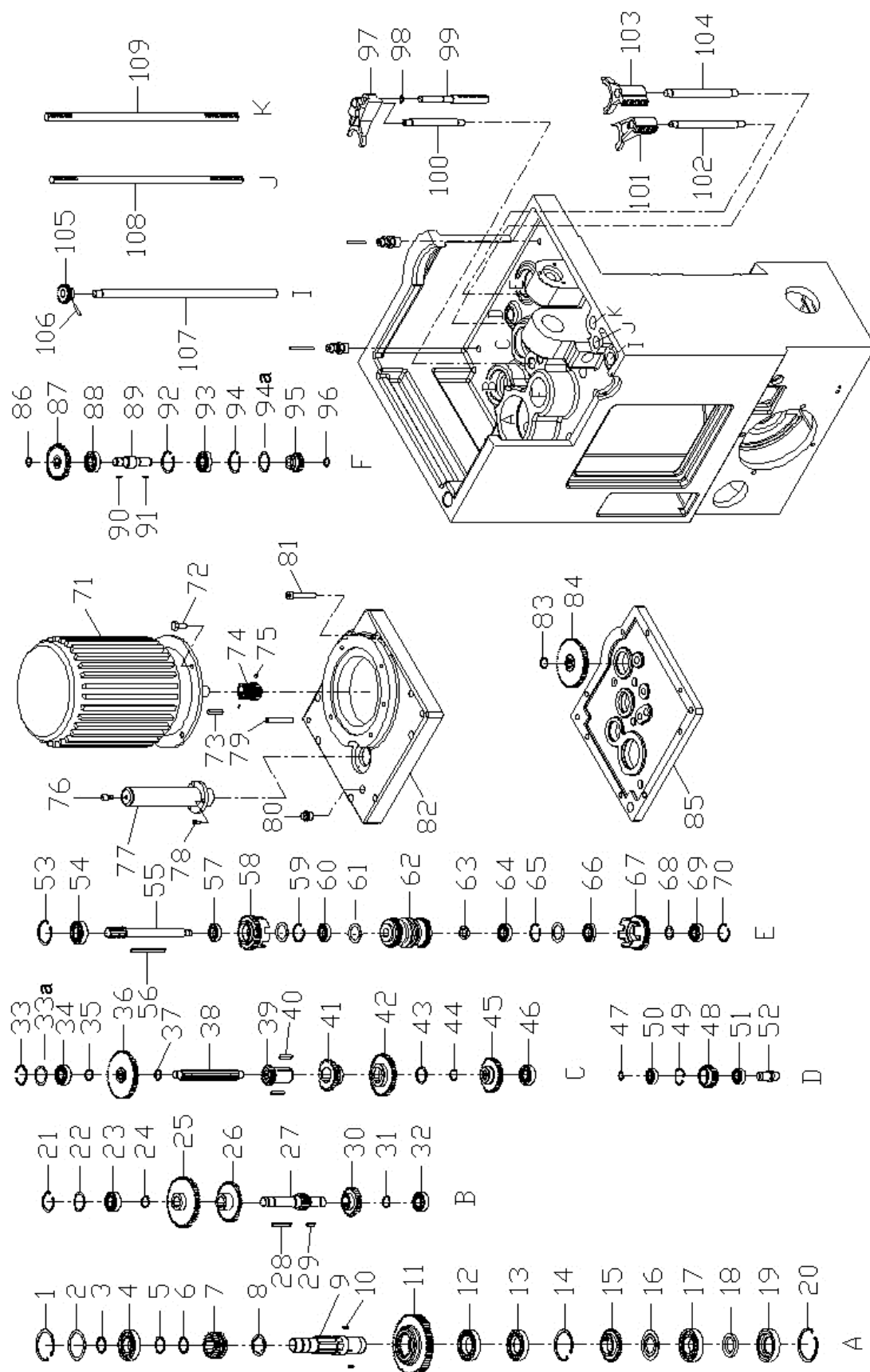
### 13.3.1 Coolant System: Exploded View



### 13.3.2 Coolant System: Parts List

| Index No. | Part No.   | Description                     | Size                  | Qty |
|-----------|------------|---------------------------------|-----------------------|-----|
| 1         | 5712921A   | Coolant Pump                    | 150L 220/440V 3PH     | 1   |
| 2         | TS-1550041 | Flat Washer                     | M6                    | 4   |
| 3         | TS-1503041 | Socket Head Cap Screw           | M6 x 16L              | 4   |
| 4         | M0602001   | 90-Degree Elbow                 | PT3/8" x PS3/8" x 90° | 1   |
| 5         | M0506002   | Hose                            | PT3/8" x 192"L        | 1   |
| 6         | 5232411    | Male Connector                  | PT3/8" x PS3/8"       | 1   |
| 7         | 5232341    | 90-Degree Elbow                 | 3/8" x 90°            | 1   |
| 8         | M0510002   | Tube                            | 3/8" x 22"L           | 1   |
| 9         | 10014      | Tube Sleeve                     |                       | 2   |
| 10        | 5232391    | Knurled Screw                   | M10 x 25L             | 2   |
| 11        | 5232421    | Brass Valve                     | 3/8"                  | 1   |
| 12        | 5232431    | Coolant Hose                    | 3/8" x 450L           | 1   |
| 13        | M1315017   | Tube Holder                     | UC-5                  | 2   |
| 14        | 5513357    | Phillips Pan Head Machine Screw | 3/16" x 3/8"L         | 2   |

#### 13.4.1 Gearbox Assembly (Upper Section): Exploded View

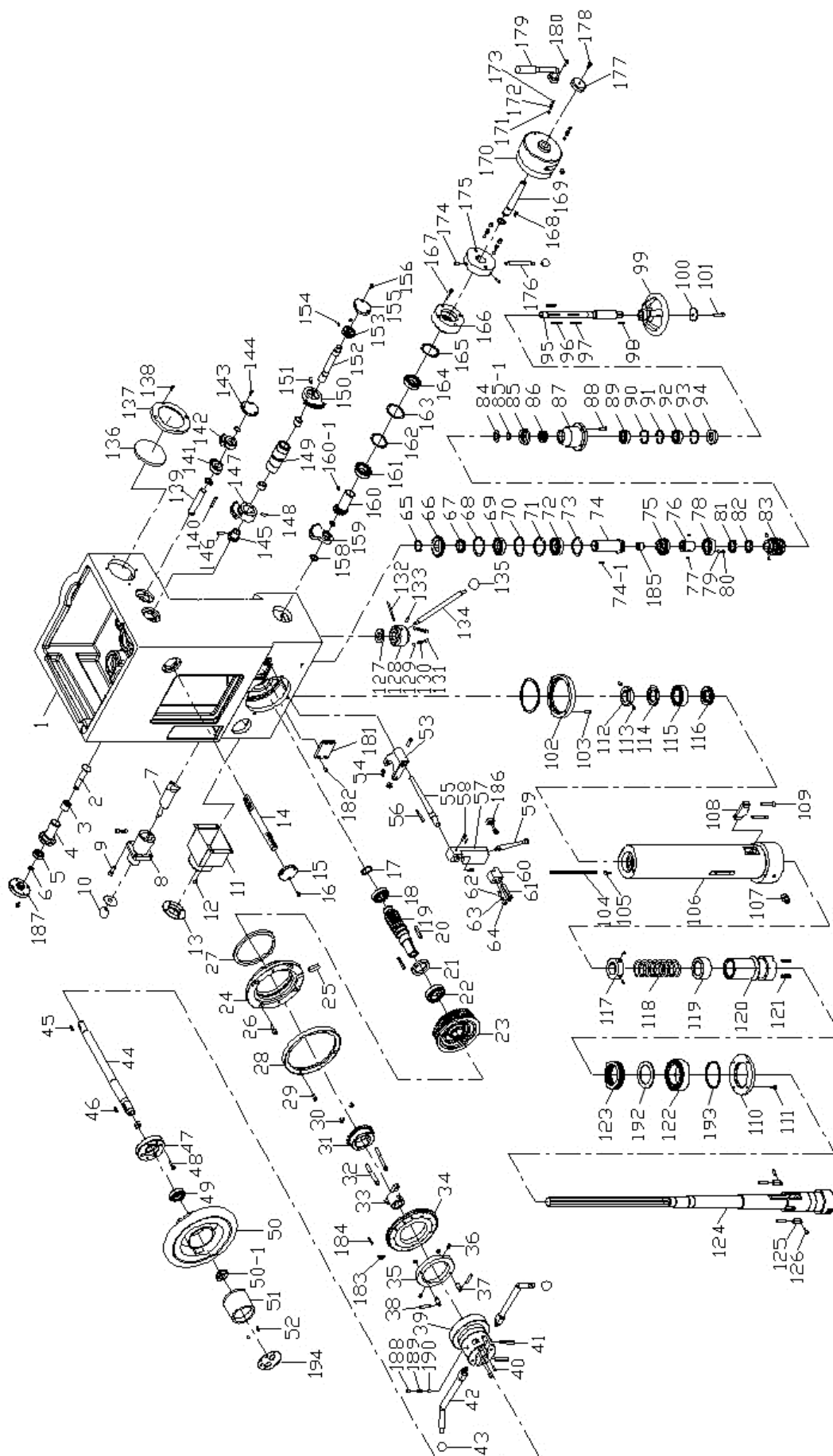


### 13.4.2 Gearbox Assembly (Upper Section): Parts List

| Index No. | Part No.      | Description            | Size      | Qty |
|-----------|---------------|------------------------|-----------|-----|
| 1         | 5237011       | Retainer               | R80       | 1   |
| 2         | 5237021       | Spacer                 |           | 1   |
| 3         | 5237041       | Retainer               | S40       | 1   |
| 4         | BB-6208ZZ     | Bearing                | 6208ZZ    | 1   |
| 5         | 5237041       | Retainer               | S40       | 1   |
| 6         | 5237041       | Retainer               | S40       | 1   |
| 7         | 5237061       | Gear                   |           | 1   |
| 8         | 5237071       | Spacer                 |           | 1   |
| 9         | 5237081       | Spindle                |           | 1   |
| 10        | 5237091       | Key                    | 5mmx18L   | 2   |
| 11        | 5237111       | Gear                   |           | 1   |
| 12        | BB-6010ZZ     | Bearing                | 6010Z     | 1   |
| 13        | BB-6010ZZ     | Bearing                | 6010Z     | 1   |
| 14        | 5237011       | Retainer               | R80       | 1   |
| 15        | 5237131       | Gear                   |           | 1   |
| 16        | 5237141       | Washer                 |           | 1   |
| 17        | BB-6209ZZ     | Bearing                | 6209ZZ    | 1   |
| 18        | 5237161       | Oil Seal               | TC44x62x8 | 1   |
| 19        | 5237171       | Seal Housing           |           | 1   |
| 20        | 523718        | Retainer               | R85       | 1   |
| 21        | HBS916W-94-17 | Retainer               | R52       | 1   |
| 22        | 523721        | Spacer                 |           | 1   |
| 23        | BB-6205ZZ     | Bearing                | 6205ZZ    | 1   |
| 24        | 523723        | Retainer               | S28       | 1   |
| 25        | 5237241       | Gear                   |           | 1   |
| 26        | 5237251       | Gear                   |           | 1   |
| 27        | 5237261       | 4th Transmission Shaft |           | 1   |
| 28        | 523727        | Key                    | 7mmx58L   | 1   |
| 29        | 523728        | Key                    | 7mmx26L   | 1   |
| 30        | 5237291       | Gear                   |           | 1   |
| 31        | 523723        | Retainer               | S28       | 1   |
| 32        | BB-6205ZZ     | Bearing                | 6205ZZ    | 1   |
| 33        | 523719        | Retainer               | R52       | 1   |
| 33a       | 5237321       | Spacer                 |           | 1   |
| 34        | 523733        | Bearing                | 6304      | 1   |
| 35        | 523723        | Retainer               | S28       | 1   |
| 36        | 5237351       | Gear                   |           | 1   |
| 37        | 523723        | Retainer               | S28       | 1   |
| 38        | 5237341       | 3rd Transmission Shaft |           | 1   |
| 39        | 5237361       | Gear                   |           | 1   |
| 40        | 5237371       | Key                    | 7mx40L    | 2   |
| 41        | 5237381       | Gear                   |           | 1   |
| 42        | 5237391       | Gear                   |           | 1   |
| 43        | 5237041       | Retainer               | S40       | 1   |
| 44        | 523723        | Retainer               | S28       | 1   |
| 45        | 5237411       | Gear                   |           | 1   |
| 46        | BB-6304ZZ     | Bearing                | 6304      | 1   |
| 47        | AB1012W-F13   | Retainer               | S20       | 1   |
| 48        | 523744        | Gear                   |           | 1   |
| 49        | 523746        | Retainer               | R42       | 1   |
| 50        | BB-6004Z      | Bearing                | 6004Z     | 1   |
| 51        | BB-6004Z      | Bearing                | 6004Z     | 1   |
| 52        | 523747        | 2nd Transmission Shaft |           | 1   |
| 53        | 5237481       | Retainer               | R62       | 1   |
| 54        | BB-6206ZZ     | Bearing                | 6206ZZ    | 1   |
| 55        | 523751        | Clutch                 |           | 1   |
| 56        | 523752        | Key                    | 7mmx110L  | 1   |
| 57        | BB-6005ZZ     | Bearing                | 6005ZZ    | 1   |
| 58        | 5237531       | Clutch Upper Gear      |           | 1   |
| 59        | 20EVS-T44-1   | Retainer               | R47       | 1   |

| Index No. | Part No.      | Description                     | Size            | Qty |
|-----------|---------------|---------------------------------|-----------------|-----|
| 60        | BB-6005ZZ     | Bearing                         | 6005ZZ          | 1   |
| 61        | 5237561       | Collar                          |                 | 1   |
| 62        | 5237571       | Clutch Pipe                     | OD-257          | 1   |
| 63        | 5237561       | Collar                          |                 | 1   |
| 64        | BB-6005ZZ     | Bearing                         | 6005ZZ          | 1   |
| 65        | 20EVS-T44-1   | Retainer                        | R47             | 1   |
| 66        | BB-6005ZZ     | Bearing                         | 6005ZZ          | 1   |
| 67        | 5237531       | Clutch Upper Gear               |                 | 1   |
| 68        | 523759        | Collar                          |                 | 1   |
| 69        | BB-6204ZZ     | Bearing                         | 6204ZZ          | 1   |
| 70        | 20EVS-T44-1   | Retainer                        | R47             | 1   |
| 71        | J-523763      | Motor (for spindle)             | 7.5HP, 230/460V | 1   |
| 72        | 523764        | Bolt                            | 1/2x1-1/4L      | 4   |
| 73        | 523765        | Key                             | 8mmx50L         | 1   |
| 74        | 5237661       | Motor Gear                      |                 | 1   |
| 75        | TS-1523021    | Set Screw                       | M6x8L           | 2   |
| 76        | 5237721       | Oil Cup                         | PT1/8"x3/4"     | 1   |
| 77        | J-523773      | Cover                           |                 | 1   |
| 78        | 523771        | Bolt                            | M6x14L          | 3   |
| 79        | 523774        | Pin                             |                 | 2   |
| 80        | M0604005      | Plug                            | PT1/2"          | 2   |
| 81        | 523775        | Socket Head Cap Screw           | M12x75L         | 8   |
| 82        | J-523769      | Upper Cover of Gear Box         |                 | 1   |
| 83        | 523723        | Retainer                        | S28             | 1   |
| 84        | 5237761       | Gear                            |                 | 1   |
| 85        | J-5237781     | Middle Cover of Gear Box        |                 | 1   |
| 86        | 523782        | Retainer                        | S19             | 1   |
| 87        | 5237841       | Gear                            |                 | 1   |
| 88        | 523742        | Bearing                         | 6304            | 1   |
| 89        | 523786        | Shaft                           |                 | 1   |
| 90        | GHD20PF-207   | Key                             | 5mmx16L         | 1   |
| 91        | GHD20PF-207   | Key                             | 5mmx16L         | 1   |
| 92        | HBS916W-94-17 | Retainer                        | R52             | 1   |
| 93        | 523742        | Bearing                         | 6304            | 1   |
| 94        | HBS916W-94-17 | Retainer                        | R52             | 1   |
| 94a       | 523788        | Spacer Ring                     |                 | 1   |
| 95        | 523789        | Gear                            |                 | 1   |
| 96        | 523782        | Retainer                        | S19             | 1   |
| 97        | 5237911       | Swing Seat, 2 Step Speed Change |                 | 1   |
| 98        | 523793        | Retainer                        | S18             | 1   |
| 99        | 5237921       | Rack                            |                 | 1   |
| 100       | 523794        | Shaft                           |                 | 1   |
| 101       | 5237791       | Swing Seat, 3 Step Speed Change |                 | 1   |
| 102       | 523781        | Shaft                           |                 | 1   |
| 103       | 5237951       | Swing Seat for Clutch           |                 | 1   |
| 104       | 523796        | Shaft                           |                 | 1   |
| 105       | 5237971       | Gear                            |                 | 1   |
| 106       | 523798        | Spring Pin                      | 5mmx35L         | 1   |
| 107       | 523799        | Clutch Shaft                    |                 | 1   |
| 108       | 523801        | Rack, 2-Step Speed Change       |                 | 1   |
| 109       | 523802        | Rack, 3-Step Speed Change       |                 | 1   |

### 13.5.1 Gearbox Assembly (Lower Section): Exploded View



### 13.5.2 Gearbox Assembly (Lower Section): Parts List

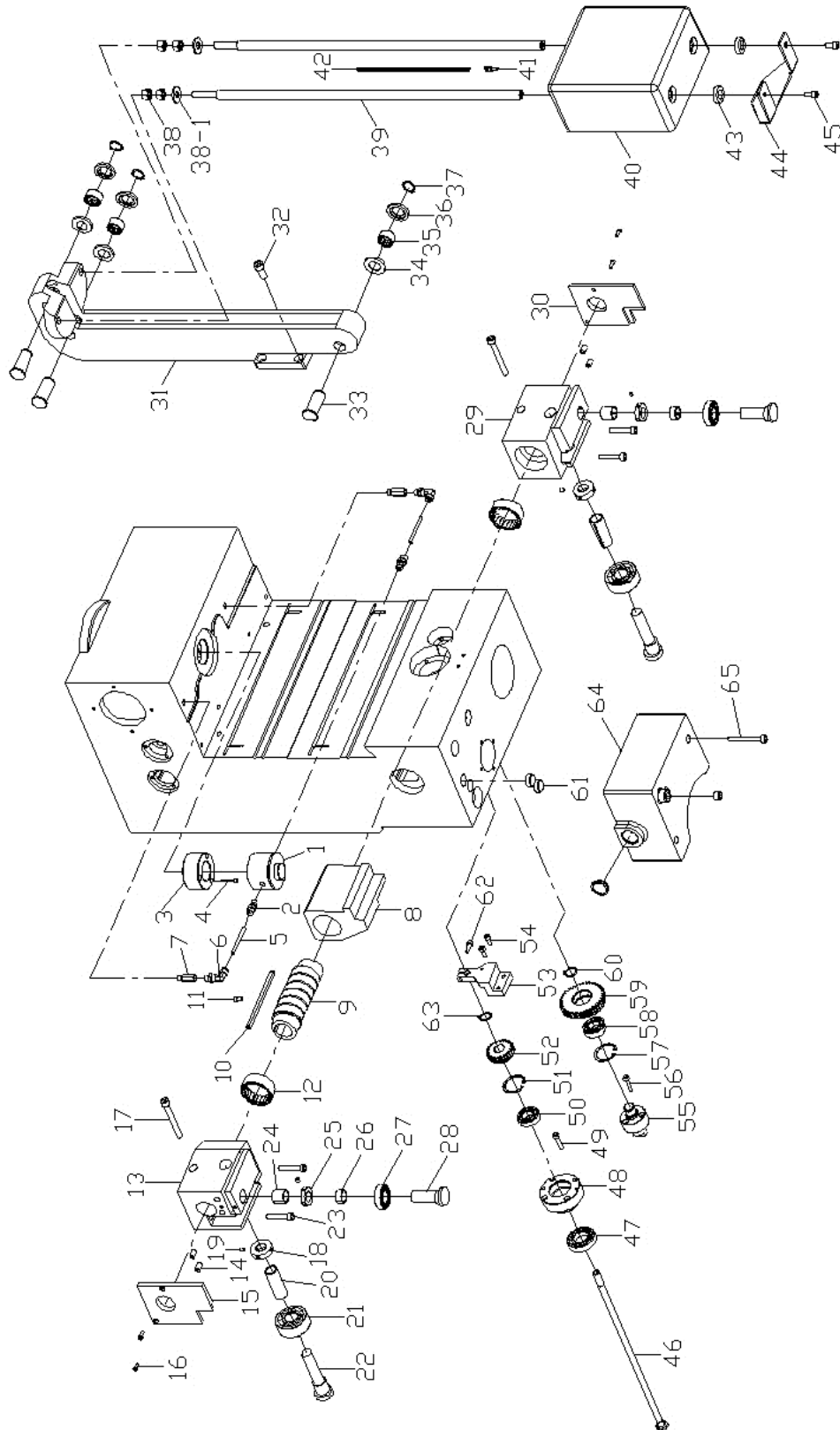
| Index No. | Part No.   | Description                 | Size        | Qty |
|-----------|------------|-----------------------------|-------------|-----|
| 1         | J-523805   | Gear Box Housing            |             | 1   |
| 2         | 523806     | Roller                      |             | 1   |
| 3         | 523807     | Bearing                     | TAF172520   | 1   |
| 4         | 523808     | Roller Housing              |             | 1   |
| 5         | BB-6002ZZ  | Bearing                     | 6002ZZ      | 1   |
| 6         | 5640491    | Retainer                    | S15         | 1   |
| 7         | 10490      | Eject Bar                   |             | 1   |
| 8         | 523813     | Frame for Eject Bar         |             | 1   |
| 9         | TS-1504051 | Socket Head Cap Screw       | M8x25L      | 4   |
| 9a        | 523815     | Nameplate                   |             | 1   |
| 10        | 5238171    | Plastic Ball                | 3/8"        | 1   |
| 11        | 523819     | Frame for Cross Switch      |             | 1   |
| 12        | 5238211    | Pan Head Machine Screw      | 3/16"x3/8"L | 4   |
| 13        | 523822     | Cover                       |             | 1   |
| 14        | 523825     | Rack                        |             | 1   |
| 15        | 523826     | Cover                       |             | 3   |
| 16        | TS-1502021 | Socket Head Cap Screw       | M5x10L      | 3   |
| 17        | 5233751    | Retainer                    | S30         | 1   |
| 18        | BB-6006ZZ  | Bearing                     | 6006ZZ      | 1   |
| 19        | 10495      | Gear Shaft                  |             | 1   |
| 20        | 5238291    | Key                         | 6mmx45L     | 2   |
| 21        | 5238311    | Oil Seal                    | TC40x55x8   | 1   |
| 22        | BB-6007ZZ  | Bearing                     | 6007ZZ      | 1   |
| 23        | 5238331    | Worm Gear                   |             | 1   |
| 24        | 5238351    | Setting Ring for Dial       |             | 1   |
| 25        | 5238361    | Key                         |             | 1   |
| 26        | TS-1504051 | Socket Head Cap Screw       | M8x25L      | 4   |
| 27        | 5238341    | Urethane Band               | 7mmx430L    | 1   |
| 28        | 5238561    | Ring                        |             | 1   |
| 29        | JHM610-22  | Socket Head Cap Screw       | M6x14L      | 4   |
| 30        | 5238381    | Nut                         | M8          | 2   |
| 31        | 5238391    | Auto Feed Bolt              |             | 1   |
| 32        | 5238411    | Bolt                        |             | 2   |
| 33        | 5238421    | Swing Frame                 |             | 1   |
| 34        | 5238551    | Dial                        |             | 1   |
| 35        | 5238591    | Set Nut                     |             | 1   |
| 36        | TS-1504011 | Socket Head Cap Screw       | M8x10L      | 2   |
| 37        | 5238631    | Set Nut                     |             | 2   |
| 38        | 5238641    | Handle Lever Assembly       |             | 2   |
| 39        | 5238431    | Feed Lever Housing          |             | 1   |
| 40        | TS-1523051 | Set Screw                   | M6x16L      | 2   |
| 41        | 5238451    | Spring Pin                  | 5mmx50L     | 2   |
| 42        | 5238511    | Feed Lever                  |             | 2   |
| 43        | 523852-1   | Plastic Ball                | 1/2"        | 2   |
| 44        | 10510      | Handwheel Shaft             |             | 1   |
| 45        | 5783961    | Key                         | 5x5x18L mm  | 1   |
| 46        | 5783961    | Key                         | 5x5x18L mm  | 1   |
| 47        | 523867     | Bearing Case                |             | 1   |
| 48        | TS-1503051 | Socket Head Cap Screw       | M6x20L      | 4   |
| 49        | BB-6005ZZ  | Bearing                     | 6005ZZ      | 1   |
| 50        | J-5238691  | Handwheel                   |             | 1   |
| 50-1      | 10513      | Setting Nut                 |             | 1   |
| 51        | 5238721    | Case for Push Button Switch |             | 1   |
| 52        | TS-1532032 | Pan Head Machine Screw      | M4x10L      | 2   |
| 53        | 5238831    | Swing Block                 |             | 1   |
| 54        | 523884     | Swing Key                   |             | 2   |
| 55        | 5238761    | Shaft for Swing Lever       |             | 1   |
| 56        | 523877     | Key                         | 5mmx50L     | 1   |
| 57        | 5238791    | Swing Lever Seat            |             | 1   |
| 58        | TS-1503041 | Socket Head Cap Screw       | M6x16L      | 2   |

| Index No. | Part No.   | Description                              | Size       | Qty |
|-----------|------------|------------------------------------------|------------|-----|
| 59        | 5238811    | Swing Lever                              |            | 1   |
| 60        | 523885     | Swing Lever Frame                        |            | 1   |
| 61        | 523888     | Bolt                                     | M6x50L     | 2   |
| 62        | SB-3/8     | Steel Ball                               | 3/8"       | 1   |
| 63        | 523886     | Spring                                   |            | 1   |
| 64        | TS-1525011 | Set Screw                                | M10x10L    | 1   |
| 65        | 523889     | Retainer                                 | S30        | 1   |
| 66        | 5238911    | Gear                                     |            | 1   |
| 67        | 523892     | Spacer                                   |            | 1   |
| 68        | 523893     | Retainer                                 | R55        | 1   |
| 69        | BB-6006ZZ  | Bearing                                  | 6006ZZ     | 1   |
| 70        | 523893     | Retainer                                 | R55        | 1   |
| 71        | 523893     | Retainer                                 | R55        | 1   |
| 72        | BB-6006ZZ  | Bearing                                  | 6006ZZ     | 1   |
| 73        | 523893     | Retainer                                 | R55        | 1   |
| 74        | 5238951    | Clutch                                   |            | 1   |
| 74-1      | 523896     | Key                                      | 5mmx14L    | 1   |
| 75        | 5238991    | Clutch                                   |            | 1   |
| 76        | 5238971    | Clutch Collar                            |            | 1   |
| 77        | 5233811    | Key                                      | 5mmx12L    | 2   |
| 78        | 5239031    | Buffer Sleeve                            |            | 1   |
| 79        | SB-5/16    | Steel Ball                               | 5/16"      | 10  |
| 80        | 5239021    | Spring                                   |            | 10  |
| 81        | 5239041    | Setting Nut                              |            | 1   |
| 82        | 5239041    | Setting Nut                              |            | 1   |
| 83        | 5239061    | Worm                                     |            | 1   |
| 84        | 10566      | Washer                                   |            | 1   |
| 85        | 10528      | Washer                                   |            | 1   |
| 85-1      | 5239081    | O-Ring                                   | P18        | 1   |
| 86        | BB-51104   | Bearing                                  | 51104      | 1   |
| 87        | 10529      | Bearing Case                             |            | 1   |
| 88        | TS-1503051 | Socket Head Cap Screw                    | M6x20L     | 4   |
| 89        | BB-6004ZZ  | Bearing                                  | 6004ZZ     | 1   |
| 90        | 523746     | Retainer                                 | R42        | 1   |
| 91        | 523746     | Retainer                                 | R42        | 1   |
| 92        | BB-6004ZZ  | Bearing                                  | 6004ZZ     | 1   |
| 93        | 523746     | Retainer                                 | R42        | 1   |
| 94        | 5239151    | Oil Seal                                 | TC25x45x8  | 1   |
| 95        | 5239171    | Shaft                                    |            | 1   |
| 96        | 523916     | Key                                      | 5mmx38L    | 2   |
| 97        | 523918     | Key                                      | 5mmx40L    | 1   |
| 98        | 5783961    | Key                                      | 5mmx18L    | 1   |
| 99        | J-5239211  | Manual Feed Handwheel                    |            | 1   |
| 100       | 10123      | Washer                                   |            | 1   |
| 101       | 523923     | Bolt                                     | M6x35L     | 1   |
| 102       | 10541      | Dust Proof Cover                         |            | 1   |
| 103       | TS-1502041 | Socket Head Cap Screw                    | M5x16L     | 4   |
| 104       | 5239291    | Chain                                    | 3/8x154    | 1   |
| 105       | 5239311    | Special Bolt                             |            | 1   |
| 106       | 10534      | Quill                                    |            | 1   |
| 107       | 5239351    | Grease Nipple                            | PT1/8"     | 1   |
| 108       | 10535A     | Ejection Rammer (s/n 0809188 and higher) |            | 1   |
| 109       | TS-1504091 | Socket Head Cap Screw                    | M8x45L     | 2   |
| 110       | 5239471    | Cover                                    |            | 1   |
| 111       | TS-1502041 | Socket Head Cap Screw                    | TS-1502041 | 4   |
| 112       | 5239241    | Setting Nut                              |            | 1   |
| 113       | TS-1524021 | Set Screw                                | M8x10L     | 2   |
| 114       | 5239261    | Collar                                   |            | 1   |
| 115       | 5239271    | Needle Bearing                           | NN3007P5   | 1   |
| 116       | 5239281    | Bearing                                  | 51107      | 1   |
| 117       | 5239361    | Setting Nut                              |            | 1   |
| 118       | 5239381    | Spring                                   |            | 1   |

| Index No. | Part No.    | Description                                  | Size      | Qty |
|-----------|-------------|----------------------------------------------|-----------|-----|
| 119       | 5239391     | Collar                                       |           | 1   |
| 120       | 10539       | Eject Collar                                 |           | 1   |
|           | 10539A      | Eject Collar (s/n 0809188 and higher)        |           | 1   |
| 121       | 5239421     | Spring                                       |           | 2   |
| 122       | 5239451     | Needle Bearing                               | NN3012KP5 | 1   |
| 123       | BB-51112    | Thrust Bearing                               | 51112     | 1   |
| 124       | 5239491A    | Spindle (re:5239491SA)                       |           | 1   |
|           | 5239491SA   | Spindle Assembly (includes #7,9,108,120,124) |           | 1   |
| 125       | 5239511     | Spring Guide Pin                             |           | 2   |
| 126       | TS-1503041  | Socket Head Cap Screw                        | M6x16L    | 2   |
| 127       | 5239531     | Oil Seal                                     | TC22x40x8 | 1   |
| 128       | 5239541     | Hi/Low Setting Seat                          |           | 1   |
| 129       | SB-5/16     | Steel Ball                                   | 5/16"     | 2   |
| 130       | 523957      | Spring                                       |           | 2   |
| 131       | 523958      | Bolt                                         | M8x10L    | 2   |
| 132       | 523962      | Spring Pin                                   | 5mmx60L   | 1   |
| 133       | TS-1523051  | Set Screw                                    | M6x16L    | 1   |
| 134       | 5239591     | Three Step Speed Change Lever                |           | 1   |
| 135       | 5239611     | Ball                                         | 3/8"      | 2   |
| 136       | 523963      | Oil Sight Glass                              |           | 1   |
| 137       | 523964      | Cover for Oil Sight Glass                    |           | 1   |
| 138       | TS-1502031  | Socket Head Cap Screw                        | M5x12L    | 1   |
| 139       | 523967      | Shaft                                        |           | 1   |
| 140       | 523966      | Key                                          | 6mmx36L   | 1   |
| 141       | 5239681     | Swing Gear                                   |           | 1   |
| 142       | 5239691     | Swing Gear                                   |           | 1   |
| 143       | 523971      | Cover                                        |           | 1   |
| 144       | TS-1502021  | Socket Head Cap Screw                        | M5x10L    | 3   |
| 145       | 5239741     | Gear                                         |           | 1   |
| 146       | 523973      | Spring Pin                                   | 5mmx25L   | 1   |
| 147       | 5239751     | Swing Gear                                   |           | 1   |
| 148       | TS-1523031  | Set Screw                                    | M6x10L    | 1   |
| 149       | 5239781     | Pipe                                         |           | 1   |
| 150       | 5239811     | Swing Gear                                   |           | 1   |
| 151       | TS-1523031  | Set Screw                                    | M6x10L    | 1   |
| 152       | 5239771     | Shaft                                        |           | 1   |
| 153       | 5239831     | Swing Gear                                   |           | 1   |
| 154       | TS-1523031  | Set Screw                                    | M6x10L    | 1   |
| 155       | 523985      | Cover                                        |           | 1   |
| 156       | TS-1502021  | Socket Head Cap Screw                        | M5x10L    | 3   |
| 158       | AB1012W-F13 | Retainer                                     | S20       | 1   |
| 159       | 5239871     | Swing Gear                                   |           | 1   |
| 160       | 5239891     | Gear Pipe                                    |           | 1   |
| 160-1     | 523991      | Key                                          | 5mmx10L   | 1   |
| 161       | BB-6006ZZ   | Bearing                                      | 6006ZZ    | 1   |
| 162       | 523893      | Retainer                                     | R55       | 1   |
| 163       | 523893      | Retainer                                     | R55       | 1   |
| 164       | BB-6006ZZ   | Bearing                                      | 6006ZZ    | 1   |
| 165       | 523893      | Retainer                                     | R55       | 1   |
| 166       | 523992      | Bearing Case                                 |           | 1   |
| 167       | TS-1502081  | Socket Head Cap Screw                        | M5x35L    | 4   |
| 168       | 523999      | Key                                          | 6mmx15L   | 1   |
| 169       | 5240011     | Shaft                                        |           | 1   |
| 170       | 5240021     | Cover                                        |           | 1   |
| 171       | SB-5/16     | Steel Ball                                   | 5/16"     | 2   |
| 172       | 524006      | Spring                                       |           | 2   |
| 173       | 524007      | Set Screw                                    | M8x10L    | 2   |
| 174       | TS-1503041  | Set Screw                                    | M6x16L    | 2   |
| 175       | 523996      | 2-Step Speed Change Wheel                    |           | 1   |
| 176       | 5234861     | 3-Step Speed Change Lever                    |           | 1   |
| 177       | 524008      | Cover                                        |           | 1   |
| 178       | TS-1503021  | Socket Head Cap Screw                        | M6x10L    | 1   |

| Index No. | Part No.    | Description            | Size        | Qty |
|-----------|-------------|------------------------|-------------|-----|
| 179       | 524004      | Change Lever           |             | 1   |
| 180       | TS-1502031  | Socket Head Cap Screw  | M5x12L      | 3   |
| 181       | J1600R-5181 | Cover                  |             | 1   |
| 182       | 5238211     | Pan Head Machine Screw | 3/16"x3/8"L | 4   |
| 183       | 523854      | Swing Key              |             | 1   |
| 184       | 523853      | Spring Pin             | 5mmx20L     | 2   |
| 185       | J1600R-5185 | Bearing                | TAF182620   | 1   |
| 186       | J1600R-5186 | Fixed Flange           |             | 1   |
| 187       | J1600R-5187 | Cover                  |             | 1   |
| 188       | 5238481     | Set Screw              | 7/16"x3/8"L | 1   |
| 189       | 5238471     | Spring                 |             | 1   |
| 190       | SB-3/8      | Steel Ball             | 3/8"        | 1   |
| 191       | 523793      | Retaining Ring         | S18         | 1   |
| 192       | 5239441     | Collar                 |             | 1   |
| 193       | 5239461     | Felt Wick              |             | 1   |
| 194       | 5238741     | Name Plate             |             | 1   |

### 13.6.1 Rear of Head: Exploded View

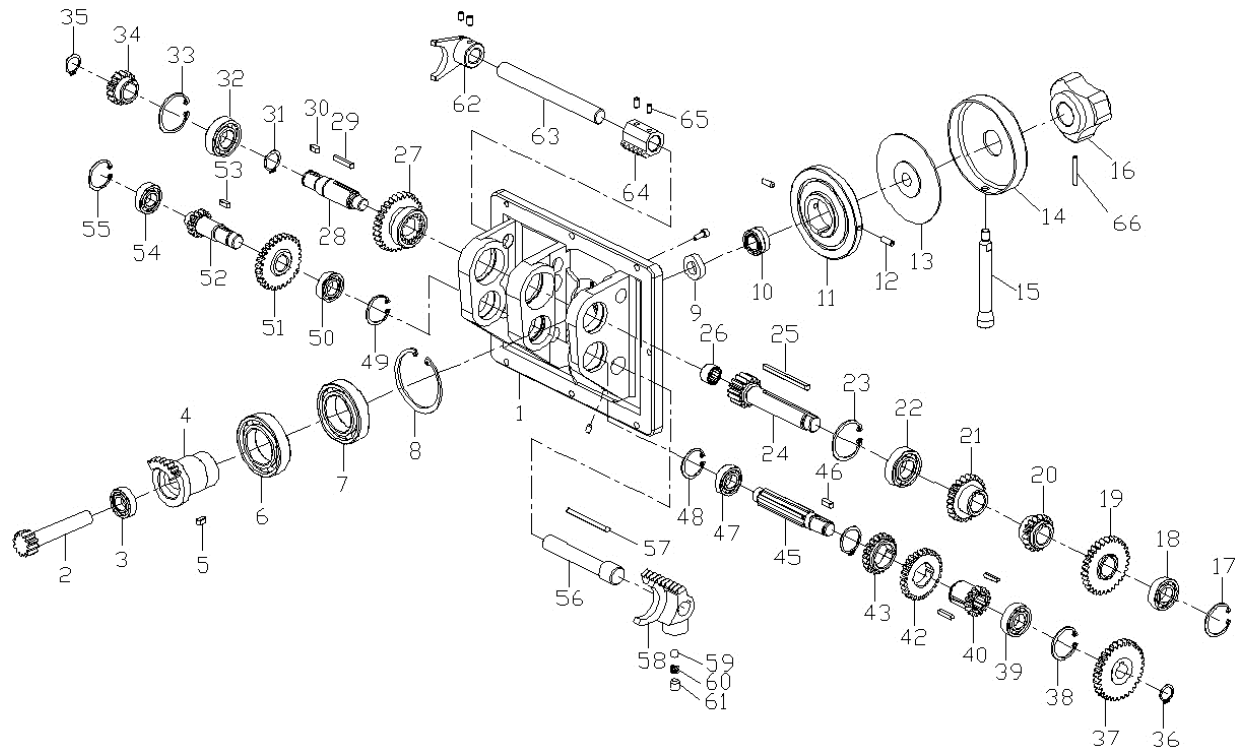


### 13.6.2 Rear of Head: Parts List

| Index No. | Part No.   | Description                 | Size            | Qty |
|-----------|------------|-----------------------------|-----------------|-----|
| 1         | 5240651    | Oil Feed Pump               | AM2             | 1   |
| 2         | 5240661    | Male Fitting                | PT1/4"x1/4"H    | 2   |
| 3         | 524067     | Oil Pump Seat               |                 | 1   |
| 4         | TS-1503091 | Socket Head Cap Screw       | M6x40L          | 3   |
| 5         | 524068     | Nylon Pipe                  | 1/4"x100L       | 2   |
| 6         | 524069     | Male Stud Elbow Fitting     | PT1/8"x1/4"Hx90 | 2   |
| 7         | 524071     | Straight Joint              |                 | 2   |
| 8         | J-5240721  | Cam Shaft Sleeve            |                 | 1   |
| 9         | 5240731    | Eccentric Shaft             |                 | 1   |
| 10        | 524074     | Key                         | 7mmx150L        | 1   |
| 11        | TS-1502021 | Socket Head Cap Screw       | M5x10L          | 3   |
| 12        | 524075     | Bearing                     | RNA4908         | 2   |
| 13        | J-524088   | Left Bearing Bracket        |                 | 1   |
| 14        | 524093     | Bolt                        | M10x16L         | 4   |
| 15        | J-524092   | Aluminum Plate              |                 | 1   |
| 16        | 524089     | Bolt                        | 3/16"x1/2"L     | 4   |
| 17        | J1600R-617 | Socket Head Cap Screw       | M10x85L         | 2   |
| 18        | 524077     | Adjustable Collar           |                 | 2   |
| 19        | TS-1523021 | Set Screw                   | M6x8L           | 4   |
| 20        | 524078     | Sleeve                      |                 | 2   |
| 21        | 524086     | Bearing                     | 2305            | 2   |
| 22        | 5240791    | Eccentric Shaft             |                 | 2   |
| 23        | TS-1504091 | Socket Head Cap Screw       | M8x45L          | 4   |
| 24        | 524084     | Eccentric Bushing           |                 | 2   |
| 25        | 524083     | Adjustable Collar           |                 | 2   |
| 26        | 524087     | Eccentric Bushing           |                 | 2   |
| 27        | BB-6005ZZ  | Bearing                     | 6005ZZ          | 2   |
| 28        | 5240821    | Eccentric Shaft             |                 | 2   |
| 29        | J-524076   | Right Bearing Bracket       |                 | 1   |
| 30        | J1600R-630 | Aluminum Plate              |                 | 1   |
| 31        | J-524094   | Chain Frame                 |                 | 1   |
| 32        | TS-1505031 | Socket Head Cap Screw       | M10x25L         | 4   |
| 33        | 524095     | Shaft                       |                 | 3   |
| 34        | 524097     | Retaining Collar            |                 | 3   |
| 35        | 524098     | Bearing                     | TA223016Z       | 3   |
| 36        | 524097     | Retaining Collar            |                 | 3   |
| 37        | 5234591    | Retainer                    | S22             | 3   |
| 38        | 5235811    | Nut                         | 1/2"            | 4   |
| 38-1      | TS-0680061 | Washer                      | 1/2"            | 2   |
| 39        | J-5241051  | Leading Bar                 |                 | 2   |
| 40        | J-524106   | Cast Iron Block             |                 | 1   |
| 41        | 10352      | Special Bolt                |                 | 1   |
| 42        | 524103     | Chain                       | 3/8"x154        | 1   |
| 43        | 5235771    | Oil Seal Bushing            | TC19x32x8       | 2   |
| 44        | 10600      | Block                       |                 | 1   |
| 45        | TS-1504031 | Socket Head Cap Screw       | M8x16L          | 2   |
| 46        | 5241191    | Pipe (includes #53 Support) |                 | 1   |
| 47        | BB-6006ZZ  | Bearing                     | 6006ZZ          | 1   |
| 48        | 524115     | Bearing Case                |                 | 1   |
| 49        | TS-1503071 | Socket Head Cap Screw       | M6x30L          | 4   |
| 50        | BB-6004Z   | Bearing                     | 6004Z           | 1   |
| 51        | 523746     | Retainer                    | R42             | 1   |
| 52        | 5241181    | Gear                        |                 | 1   |
| 53        | 5241191    | Support (includes #46 Pipe) |                 | 1   |
| 54        | TS-1503041 | Socket Head Cap Screw       | M6x16L          | 2   |
| 55        | 5241131    | Special Key                 |                 | 1   |
| 56        | TS-1503071 | Socket Head Cap Screw       | M6x30L          | 3   |
| 57        | 523746     | Retainer                    | R42             | 1   |
| 58        | BB-6004Z   | Bearing                     | 6004Z           | 1   |
| 59        | 5231141    | Gear                        |                 | 1   |

| Index No. | Part No.    | Description           | Size    | Qty |
|-----------|-------------|-----------------------|---------|-----|
| 60        | AB1012W-F13 | Retainer              | S20     | 1   |
| 61        | J1600R-661  | Plug                  |         | 2   |
| 62        | TS-1503051  | Socket Head Cap Screw | M6x20L  | 1   |
| 63        | AB1012W-F13 | Retainer              | S20     | 1   |
| 64        | 10874       | Oil Tank              |         | 1   |
| 65        | TS-2238911  | Bolt                  | M8x100L | 3   |

### 13.7.1 Feed Change Mechanism: Exploded View

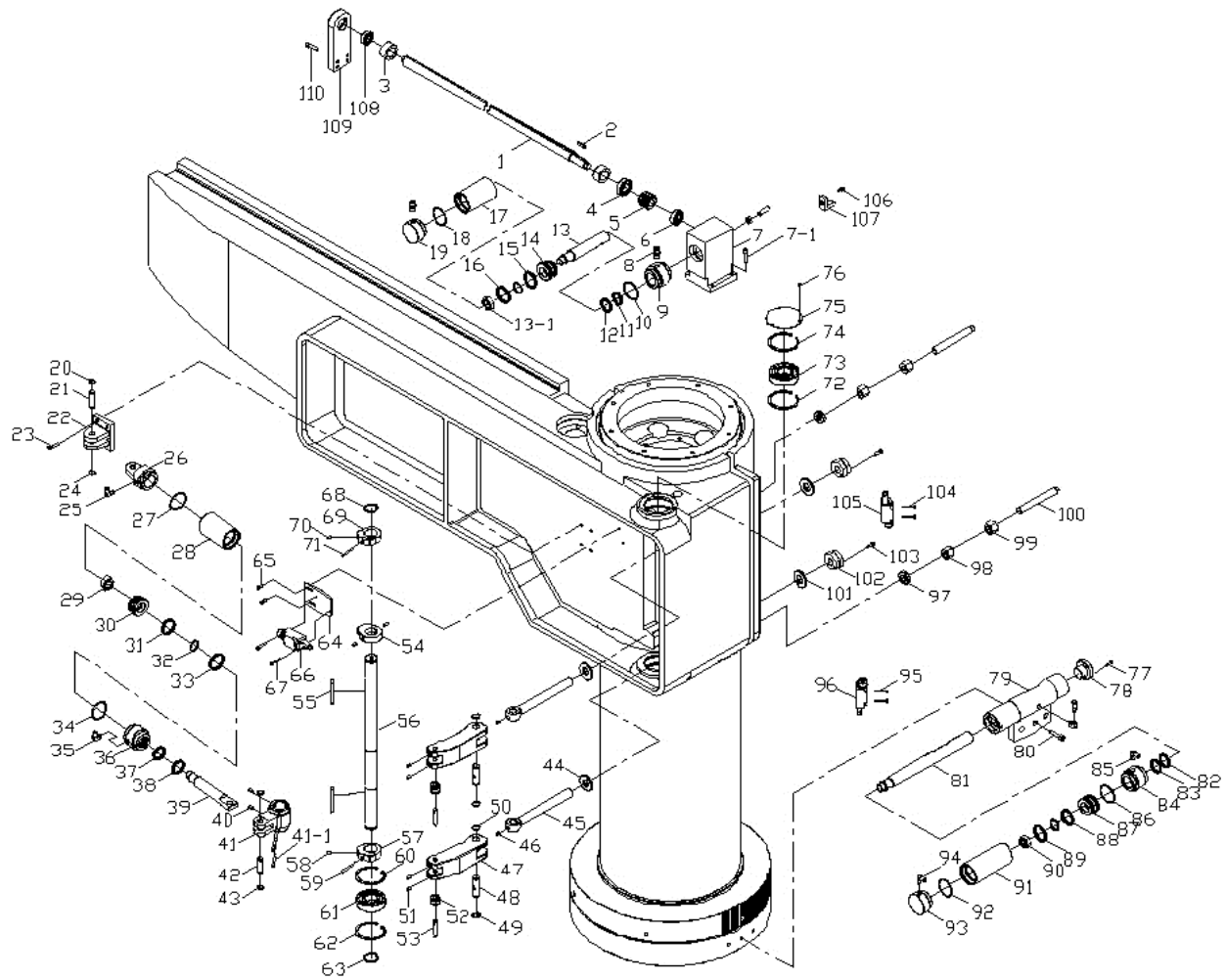


### 13.7.2 Feed Change Mechanism: Parts List

| Index No. | Part No.   | Description             | Size      | Qty |
|-----------|------------|-------------------------|-----------|-----|
| 1         | J-5240111  | Feed Gear Frame         |           | 1   |
| 2         | 5240121    | Gear Shaft              |           | 1   |
| 3         | BB-6002ZZ  | Bearing                 | 6002ZZ    | 1   |
| 4         | 5240141    | Pipe Gear               |           | 1   |
| 5         | 5233811    | Key                     | 5mmx12L   | 1   |
| 6         | BB-6008ZZ  | Bearing                 | 6008ZZ    | 1   |
| 7         | BB-6008ZZ  | Bearing                 | 6008ZZ    | 1   |
| 8         | 524016     | Retainer                | R68       | 1   |
| 9         | 5240171    | Oil Seal                | TC15x27x7 | 1   |
| 10        | J1600R-710 | Bearing                 | NA4902    | 1   |
| 11        | 524019     | Feed Speed Change Wheel |           | 1   |
| 12        | TS-1523051 | Set Screw               | M6x16L    | 2   |
| 13        | 524021     | Dial Seat               |           | 1   |
| 14        | 524023     | Cover                   |           | 1   |
| 15        | 5240311    | Swing Lever             |           | 1   |
| 16        | 524025     | Change Wheel            |           | 1   |
| 17        | 524037     | Retainer                | R35       | 1   |
| 18        | BB-6003ZZ  | Bearing                 | 6003ZZ    | 1   |
| 19        | 5240391    | Large Gear              |           | 1   |
| 20        | 5240411    | Small Gear              |           | 1   |
| 21        | 524042     | Middle Gear             |           | 1   |
| 22        | BB-6004ZZ  | Bearing                 | 6004ZZ    | 1   |
| 23        | 523746     | Retainer                | R42       | 1   |
| 24        | 5240441    | Gear Shaft              |           | 1   |
| 25        | J1600R-725 | Key                     | 5mmx70L   | 1   |

| Index No. | Part No.     | Description      | Size     | Qty |
|-----------|--------------|------------------|----------|-----|
| 26        | J1600R-726   | Bearing          | TLA1412Z | 1   |
| 27        | 524045       | Gear Collar      |          | 1   |
| 28        | 5240461      | Shaft            |          | 1   |
| 29        | HVBS462-073  | Key              | 5x5x30L  | 1   |
| 30        | 5233811      | Key              | 5x5x12L  | 1   |
| 31        | AB1012W-F13  | Retainer         | S20      | 1   |
| 32        | BB-6004ZZ    | Bearing          | 6004ZZ   | 1   |
| 33        | 523746       | Retainer         | R42      | 1   |
| 34        | 5240491      | Gear             |          | 1   |
| 35        | J1600R-735   | Retainer         | S18      | 1   |
| 36        | 524062       | Retainer         | S16      | 1   |
| 37        | 5240611      | Gear             |          | 1   |
| 38        | 524051       | Retainer         | R35      | 1   |
| 39        | BB-6003ZZ    | Bearing          | 6003ZZ   | 1   |
| 40        | 524053       | Gear Collar      |          | 1   |
| 42        | 524054       | Gear             |          | 1   |
| 43        | J1600R-743   | Gear             |          | 1   |
| 45        | 524052       | Hexagon Shaft    |          | 1   |
| 46        | GHB1340A-G87 | Key              | 5x5x14L  | 1   |
| 47        | BB-6002ZZ    | Bearing          | 6002ZZ   | 1   |
| 48        | AB1012W-E22  | Retainer         | R32      | 1   |
| 49        | AB1012W-E22  | Retainer         | R32      | 1   |
| 50        | BB-6002ZZ    | Bearing          | 6002ZZ   | 1   |
| 51        | 5240571      | Gear             |          | 1   |
| 52        | 5240581      | Gear Shaft       |          | 1   |
| 53        | GHB1340A-G87 | Key              | 5x5x14L  | 1   |
| 54        | BB-6002ZZ    | Bearing          | 6002ZZ   | 1   |
| 55        | AB1012W-E22  | Retainer         | R32      | 1   |
| 56        | 524034       | Shaft            |          | 1   |
| 57        | J1600R-757   | Key              | 5mmx65L  | 1   |
| 58        | J1600R-758   | Gear Shift Lever |          | 1   |
| 59        | SB-5/16      | Steel Ball       | 5/16"    | 1   |
| 60        | J1600R-760   | Spring           |          | 1   |
| 61        | TS-1525011   | Set Screw        | M10x10L  | 1   |
| 62        | 524033       | Swing Seat       |          | 1   |
| 63        | J1600R-763   | Shaft            |          | 1   |
| 64        | 5240321      | Swing Rack       |          | 1   |
| 65        | TS-1523031   | Bolt             | M6x10L   | 4   |
| 66        | 524024       | Spring Pin       | 5mmx45L  | 1   |

### 13.8.1 Hydraulic Clamping Mechanism: Exploded View

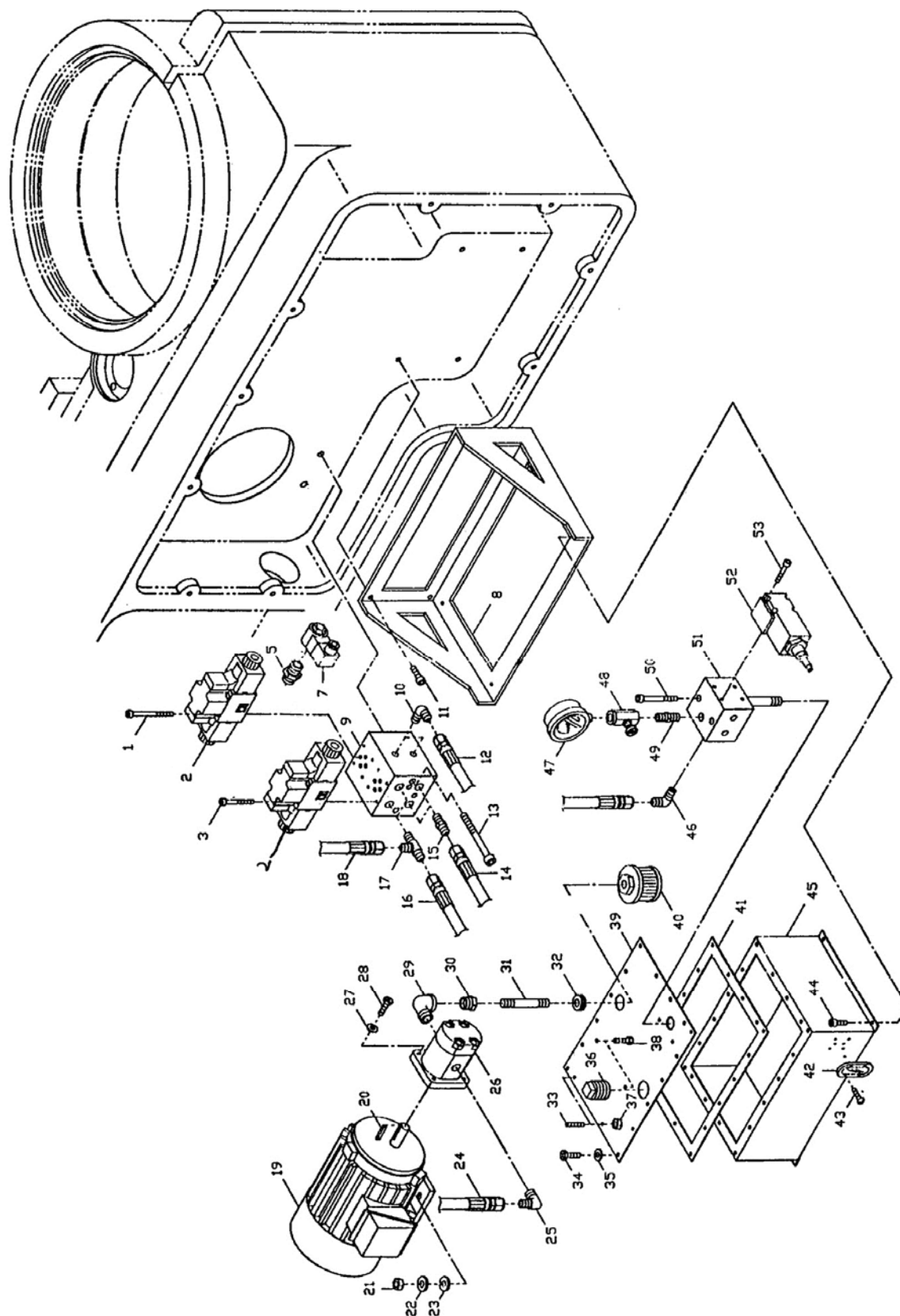


### 13.8.2 Hydraulic Clamping Mechanism: Parts List

| Index No. | Part No.      | Description           | Size             | Qty |
|-----------|---------------|-----------------------|------------------|-----|
| 1         | 524296        | Leading Bar           |                  | 1   |
| 2         | 524297        | Key                   | 7mmx30L          | 1   |
| 3         | 524298        | Limit Rubber          |                  | 2   |
| 4         | BB-6205ZZ     | Bearing               | 6205ZZ           | 1   |
| 5         | 524299        | Gear                  |                  | 1   |
| 6         | BB-6204ZZ     | Bearing               | 6204ZZ           | 1   |
| 7         | J-524309      | Cylinder Rest         |                  | 1   |
| 7-1       | TS-1504071    | Socket Head Cap Screw | M8x35L           | 4   |
| 8         | 524304        | Male Connector        | PT3/8"xPS3/8"    | 2   |
| 9         | J-524303      | Cylinder Joint        |                  | 1   |
| 10        | 5515638       | O-Ring                | G55              | 1   |
| 11        | 524302        | Oil Seal              | UHS35            | 1   |
| 12        | 524302        | Oil Seal              | UHS35            | 1   |
| 13        | 524321        | Rod                   |                  | 1   |
| 13-1      | 524316        | Nut                   | M24              | 1   |
| 14        | 524318        | Piston                |                  | 1   |
| 14-1      | 524319        | O-Ring                |                  | 1   |
| 15        | 524317        | Oil Seal              | UHS45A           | 1   |
| 16        | 524317        | Oil Seal              | UHS45A           | 1   |
| 17        | 524315        | Arm Clamping Cylinder |                  | 1   |
| 18        | 5515638       | O-Ring                | G55              | 1   |
| 19        | J-524313      | Cylinder Cover        |                  | 1   |
| 20        | 524323        | Retainer              | S16              | 1   |
| 21        | 524324        | Pin                   |                  | 1   |
| 22        | 524326        | Cylinder Rest         |                  | 1   |
| 23        | TS-1504061    | Bolt                  | M8x30L           | 4   |
| 24        | A076          | Retainer              | S16              | 1   |
| 25        | 524327        | 90° Elbow             | PS3/8"xPT1/4"x90 | 1   |
| 26        | 524328        | Joint                 |                  | 1   |
| 27        | 5515638       | O-Ring                | G55              | 1   |
| 28        | 524331        | Arm Clamping Cylinder |                  | 1   |
| 29        | 524332        | Nut                   | M24              | 1   |
| 30        | 524318        | Piston                |                  | 1   |
| 31        | 524333        | Oil Seal              | UHS45A           | 1   |
| 32        | 524335        | O-Ring                | P30              | 3   |
| 33        | 524333        | Oil Seal              | UHS45A           | 1   |
| 34        | 5515638       | O-Ring                | G55              | 1   |
| 35        | 524327        | 90° Elbow             | PS3/8"xPT1/4"x90 | 1   |
| 36        | J-524338      | Cylinder Joint        |                  | 1   |
| 37        | 524302        | Oil Seal              | UHS35            | 1   |
| 38        | 524302        | Oil Seal              | UHS35            | 1   |
| 39        | 524336        | Rod                   |                  | 1   |
| 40        | TS-1524021    | Bolt                  | M8x10L           | 2   |
| 41        | J1600R-841    | Rocker Arm            |                  | 1   |
| 41-1      | 13-6030-001-2 | Taper Pin             | #4x64L           | 2   |
| 42        | 524352        | Pin                   |                  | 1   |
| 43        | AB1012W-A52   | Retainer              | S16              | 2   |
| 44        | 524378        | Washer                |                  | 2   |
| 45        | 524345        | Clamping Bolt         |                  | 2   |
| 46        | TS-1525011    | Set Screw             | M10x10L          | 2   |
| 47        | J1600R-847    | Swing Key             |                  | 2   |
| 48        | J1600R-848    | Pin                   |                  | 2   |
| 49        | AB1012W-F13   | Retainer              | S20              | 2   |
| 50        | AB1012W-F13   | Retainer              | S20              | 2   |
| 51        | TS-1524011    | Set Screw             | M8x8L            | 4   |
| 52        | J1600R-852    | Roller                |                  | 2   |
| 53        | J1600R-853    | Pin                   |                  | 2   |
| 54        | J1600R-854    | Stopper               |                  | 1   |
| 55        | J1600R-855    | Key                   | 12mmx8x90L       | 2   |
| 56        | J1600R-856    | Revolving Spindle     |                  | 1   |

| Index No. | Part No.      | Description            | Size             | Qty |
|-----------|---------------|------------------------|------------------|-----|
| 57        | J1600R-857    | Cam                    |                  | 1   |
| 58        | TS-1524031    | Set Screw              | M8x12L           | 1   |
| 59        | 13-6030-001-2 | Taper Pin              | #4x64L           | 1   |
| 60        | J1600R-860    | Retainer               | R90              | 1   |
| 61        | BB-6308ZZ     | Bearing                | 6308ZZ           | 1   |
| 62        | J1600R-860    | Retainer               | R90              | 1   |
| 63        | 5237041       | Retainer               | S40              | 1   |
| 64        | 524353        | Limit Switch Rest      |                  | 1   |
| 65        | TS-1503031    | Socket Head Cap Screw  | M6x12L           | 2   |
| 66        | E0901010      | Micro Switch           | WL-D2            | 1   |
| 67        | TS-2285352    | Bolt                   | M5x35L           | 2   |
| 68        | 5237041       | Retainer               | S40              | 1   |
| 69        | J1600R-857    | Cam                    |                  | 1   |
| 70        | TS-1524031    | Set Screw              | M8x12L           | 1   |
| 71        | 13-6030-001-2 | Taper Pin              | #4x64L           | 1   |
| 72        | J1600R-860    | Retainer               | R90              | 1   |
| 73        | BB-6308ZZ     | Bearing                | 6308ZZ           | 1   |
| 74        | J1600R-860    | Retainer               | R90              | 1   |
| 75        | J1600R-875    | Cover                  |                  | 1   |
| 76        | TS-1532032    | Pan Head Machine Screw | M4x10L           | 3   |
| 77        | TS-1502041    | Socket Head Cap Screw  | M5x16L           | 3   |
| 78        | 5243581       | Plug                   |                  | 1   |
| 79        | J-5243591     | Cylinder Rest          |                  | 1   |
| 80        | TS-1505061    | Socket Head Cap Screw  | M10x40L          | 3   |
| 81        | 524364        | Rod                    |                  | 1   |
| 82        | 524302        | Packing                | UHS35            | 1   |
| 83        | 524302        | Packing                | UHS35            | 1   |
| 84        | J-524366      | Cylinder Joint         |                  | 1   |
| 85        | 524327        | 90° Elbow              | PS3/8"xPT1/4"x90 | 1   |
| 86        | 5515638       | O-Ring                 | G55              | 1   |
| 87        | 524318        | Piston                 |                  | 1   |
| 88        | 524317        | Oil Seal               | UHS45A           | 1   |
| 89        | 524317        | Oil Seal               | UHS45A           | 1   |
| 90        | TS-1540231    | Nut                    | M24              | 1   |
| 91        | 524374        | Arm Clamping Cylinder  |                  | 1   |
| 92        | 5515638       | O-Ring                 | G55              | 1   |
| 93        | J-524377      | Cylinder Cover         |                  | 1   |
| 94        | 524327        | 90° Elbow              | PS3/8"xPT1/4"x90 | 1   |
| 95        | 524382        | Bolt                   | M5x35L           | 2   |
| 96        | E0901013      | Micro Switch           | WL-D             | 1   |
| 97        | 524378        | Washer                 |                  | 2   |
| 98        | J1600R-898    | Screw Nut              |                  | 2   |
| 99        | J1600R-898    | Screw Nut              |                  | 2   |
| 100       | 524382        | Bolt                   |                  | 2   |
| 101       | J1600R-8101   | Washer                 | d25xD44x4T       | 2   |
| 102       | J1600R-8102   | Lock Nut               |                  | 2   |
| 103       | TS-1503051    | Socket Head Cap Screw  | M6x20L           | 2   |
| 104       | TS-2285352    | Pan Head Screw         | M5x35L           | 2   |
| 105       | E0901010      | Micro Switch           | WL-D2            | 1   |
| 106       | TS-1503031    | Socket Head Cap Screw  | M6x12L           | 1   |
| 107       | J1600R-107    | Mounting Bracket       |                  | 1   |
| 108       | BB-6004ZZ     | Bearing                | 6004ZZ           | 1   |
| 109       | J-5236641     | Block                  |                  | 1   |
| 110       | TS-1504081    | Socket Head Cap Screw  | M8x40L           | 4   |

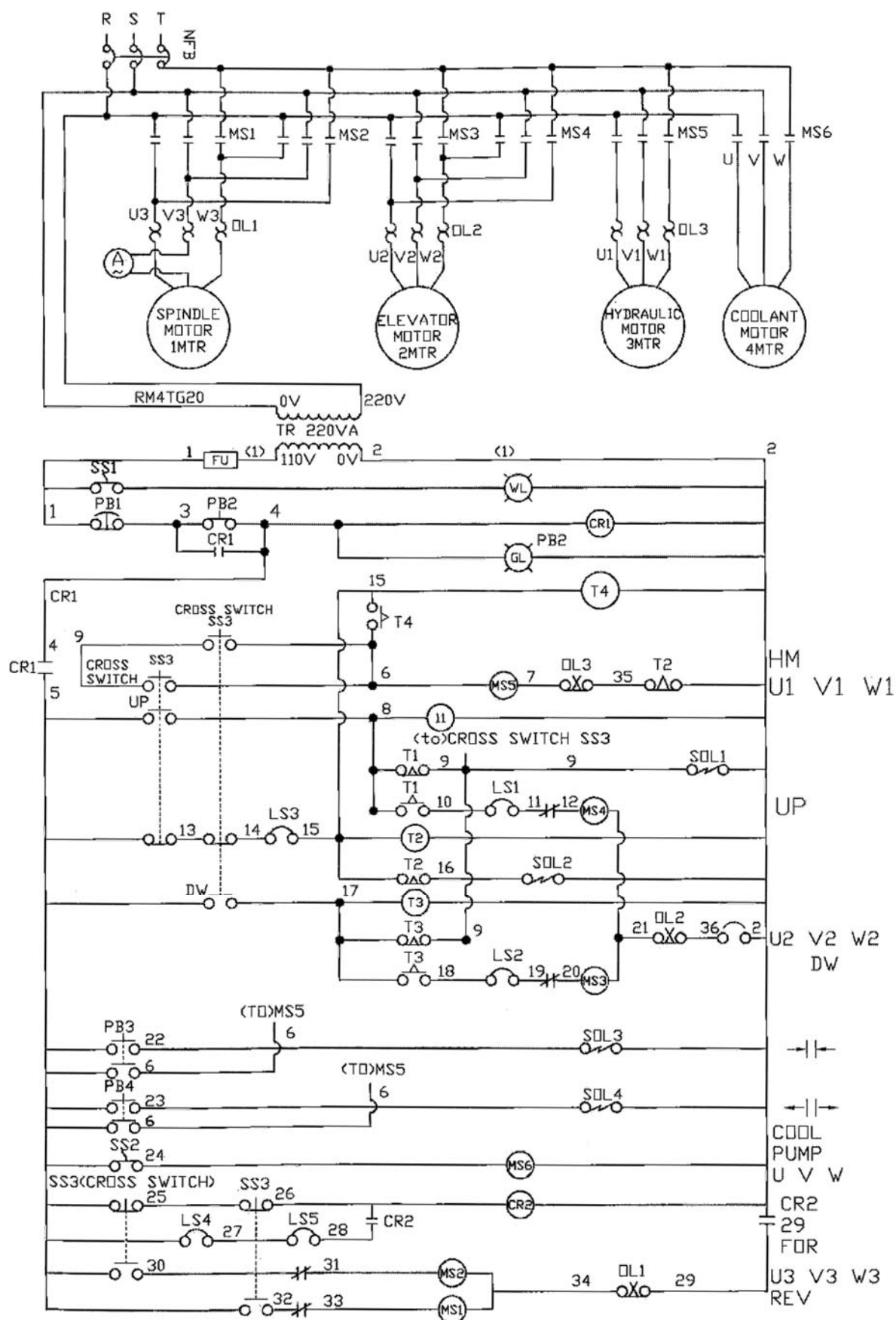
### 13.9.1 Hydraulic System: Exploded View



### 13.9.2 Hydraulic System: Parts List

| Index No. | Part No. | Description                                       | Size    | Qty |
|-----------|----------|---------------------------------------------------|---------|-----|
| 1         | 524235   | Bolt.....                                         |         | 2   |
| 2         | 5242361  | Solenoid Valve.....                               | DSG-3C2 | 2   |
| 3         | 524237   | Bolt.....                                         |         | 2   |
| 4         | 5242381  | Pilot Check Valve Assembly.....                   |         | 1   |
| 5         | 524239   | Fitting.....                                      |         | 1   |
| 7         | 5242421  | Solenoid Valve.....                               |         | 1   |
| 8         | 524243   | Oil Tank Frame.....                               |         | 1   |
| 9         | 524244   | Manifold.....                                     |         | 1   |
| 10        | 524245   | Elbow.....                                        |         | 1   |
| 11        | 524246   | Bolt.....                                         |         | 4   |
| 12        | 524247   | Hydraulic Hose (Manifold to Manifold).....        |         | 1   |
| 13        | 524248   | Bolt.....                                         |         | 1   |
| 14        | 524249   | Hydraulic Hose (Cylinder Arm to Manifold).....    |         | 1   |
| 15        | 524251   | Fitting.....                                      |         | 1   |
| 16        | 524252   | Hydraulic Hose (Cylinder Column to Manifold)..... |         | 1   |
| 17        | 524253   | T-Fitting.....                                    |         | 1   |
| 18        | 524254   | Hydraulic Hose (Cylinder Head to Manifold).....   |         | 1   |
| 19        | 5242551  | Hydraulic Motor.....                              |         | 1   |
| 20        | 524256   | Key.....                                          |         | 1   |
| 21        | 524257   | Hex Nut.....                                      |         | 4   |
| 22        | 524258   | Plain Washer.....                                 |         | 4   |
| 23        | 524259   | Spring Washer.....                                |         | 4   |
| 24        | 524261   | Hydraulic Hose (Gear Pump to Manifold).....       |         | 1   |
| 25        | 524262   | Elbow.....                                        |         | 1   |
| 26        | 524263   | Gear Pump.....                                    |         | 1   |
| 27        | 524264   | Plain Washer.....                                 |         | 4   |
| 28        | 524265   | Bolt.....                                         |         | 4   |
| 29        | 524266   | Elbow.....                                        |         | 1   |
| 30        | 524267   | Fitting.....                                      |         | 1   |
| 31        | 524268   | Nipple.....                                       |         | 1   |
| 32        | 524269   | Oil Tight Rubber Ring.....                        |         | 1   |
| 33        | 524271   | Bolt.....                                         |         | 2   |
| 34        | 524272   | Bolt.....                                         |         | 6   |
| 35        | 524273   | Plain Washer.....                                 |         | 6   |
| 36        | 524274   | Plastic Plug, Oil Fitting.....                    |         | 1   |
| 37        | 524275   | Nut.....                                          |         | 2   |
| 38        | 524276   | Bolt.....                                         |         | 2   |
| 39        | 524277   | Oil Tank Cover.....                               |         | 1   |
| 40        | 524278   | Oil Filter.....                                   |         | 1   |
| 41        | 524279   | Gasket.....                                       |         | 1   |
| 42        | 524281   | Oil Sight Glass.....                              |         | 1   |
| 43        | 524282   | Bolt.....                                         |         | 4   |
| 44        | 524283   | socket Head Cap Screw.....                        |         | 4   |
| 45        | 524284   | Oil Tank.....                                     |         | 1   |
| 46        | 524285   | Elbow.....                                        |         | 1   |
| 47        | 5242861  | Oil Pressure Gauge.....                           |         | 1   |
| 48        | 524287   | Stop Valve.....                                   |         | 1   |
| 49        | 524288   | Bolt.....                                         |         | 1   |
| 50        | 524289   | Bolt.....                                         |         | 1   |
| 51        | 524291   | Manifold.....                                     |         | 1   |
| 52        | 524292   | Relief Valve.....                                 |         | 1   |
| 53        | 524293   | Bolt.....                                         |         | 2   |

## 14.0 Electrical Connections for J-1600R



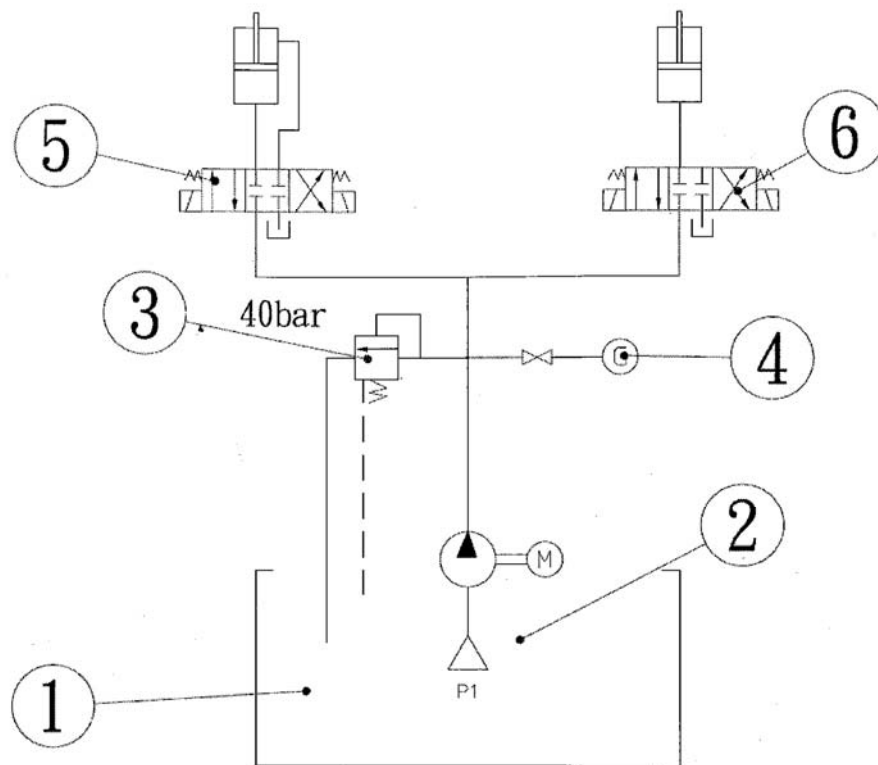
## 14.1 Electrical Connections for J-1600R: Parts List

| Part No. | Symbol    | Description                   | Size                        | Qty |
|----------|-----------|-------------------------------|-----------------------------|-----|
| E0701022 | MS1       | Magnetic Contactor            | CU27, 110V                  | 1   |
| E0701022 | MS2       | Magnetic Contactor            | CU27, 110V                  | 1   |
| E0701020 | MS3       | Magnetic Contactor            | CU11,3a1b,110V              | 1   |
| E0701020 | MS4       | Magnetic Contactor            | CU11,3a1b,110V              | 1   |
| E0701020 | MS5       | Magnetic Contactor            | CU11,3a1b,110V              | 1   |
| E0701020 | MS6       | Magnetic Contactor            | CU11,3a1b,110V              | 1   |
| E0701020 | CR1       | Magnetic Contactor            | CU11,3a1b,110V              | 1   |
| E0701020 | CR2       | Magnetic Contactor            | CU11,3a1b,110V              | 1   |
| E0208004 | T1        | Timer Relay                   | ASTP-N,6S,110V              | 1   |
| E0208005 | T2        | Timer Relay                   | AH3-2,6S,110V               | 1   |
| E0208004 | T3        | Timer Relay                   | ASTP-N,6S,110V              | 1   |
| E0403003 | NFB       | Circuit Breaker               | 3P,30A,220V or 3P,20A,440V  | 1   |
| E0208004 | T4        | Timer Relay                   | ASTP-N,6S,110V              | 1   |
| 5242361  | SOL1,SOL2 | Solenoid Valve                | DSG-3C2-02, 110V            | 1   |
| 5242361  | SOL3,SOL4 | Solenoid Valve                | DSG-3C2-02, 110V            | 1   |
| E1801029 | TR        | Transformer                   | 250VA(1:0,220,380,415,440V) | 1   |
| E3101019 | Fu        | Fuse Seat                     | 10*38                       | 1   |
| E3101025 | Fu        | Fuse                          | 10*38, 6A                   | 1   |
| 5511707  | OL1       | Overload Relay (for 380-460V) | RHN-10/8.5-12.5             | 1   |
| E0207037 | OL1       | Overload Relay (for 200-230V) | RHN80/17-25AP               | 1   |
| E0207017 | OL2       | Overload Relay (for 200-230V) | RHN10/5.5-8.5               | 1   |
| E0207016 | OL2       | Overload Relay (for 380-460V) | RHN-10/3.5-5                | 1   |
| E0207016 | OL3       | Overload Relay (for 200-230V) | RHN-10/3.5-5                | 1   |
| E0207018 | OL3       | Overload Relay (for 380-460V) | RHN-10/1.8-2.7              | 1   |
| E1604001 | SS1       | Selector Switch               | SN1021                      | 1   |
| E1303001 | SS2       | Coolant Switch                | ST-302                      | 1   |
| E1605002 | SS3       | Cross Switch                  | 5-Joint, Up 2a1b, Down 2a1b | 1   |
| E1701002 | WL        | Work Lamp                     | FS 51441                    | 1   |
| E1203002 | PB1       | Emergency Push Button         | SBT-307                     | 1   |
| E1618001 | PB1       | Emergency Push Button         | YK30Φ 1B                    | 1   |
| E1203003 | PB2       | Push Button (Green)           | YK30Φ, 110V                 | 1   |
| E0901013 | LS1       | Limit Switch                  | WLD                         | 1   |
| E0901010 | LS2       | Limit Switch                  | WLD2                        | 1   |
| E0901010 | LS3       | Limit Switch                  | WLD2                        | 1   |
| E0901008 | LS4       | Limit Switch                  | TZ-8104                     | 1   |
| E0901008 | LS5       | Limit Switch                  | TZ-8104                     | 1   |
| E0901010 | LS6       | Micro Switch                  | WLD2                        | 1   |
| E1202004 | PB3       | Push Button                   | YK22Φ, 2A(Red)              | 1   |
| E1202005 | PB4       | Push Button                   | YK22Φ, 2A(Green)            | 1   |
| E3602004 | Ⓐ         | Ammeter                       | SO65, 50A                   | 1   |
| E0303002 |           | Terminal Block                | 20P, 20A                    | 1   |
| E0303004 |           | Terminal Block                | TS015, 28P                  | 1   |
| E0303001 |           | Terminal Block                | 12P*20A                     | 1   |
| E0303003 |           | Terminal Block                | 3P*30A                      | 1   |
| *        |           | Hydraulic Clamping Motor      | 1HP, 3PH, 4P                | 1   |
| *        |           | Elevating Motor               | 2HP, 3PH, 4P                | 1   |
| *        |           | Main (Spindle) Motor          | 7.5HP,3PH,4P                | 1   |
| *        |           | Coolant Pump                  | 1/8HP, 2P, 3PH, L:130mm     | 1   |

\* see relevant breakdowns for stock numbers

## 15.0 Hydraulic system of J-1600R

**P1: The pressure set to 38 bar.**



- 1 – Tank
- 2 – Hydraulic Pump
- 3 – Release Valve (40 bar)
- 4 – Pressure Gauge, 2-1/2" x 70 bar
- 5 – Solenoid Valve
- 6 – Solenoid Valve

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