

SHARP

OD-1324HE
Cylindrical Grinder
Operation Manual

Sharp Industries, Inc.

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SPECIAL NOTIFICATION:

When requesting the parts for the replacement, please kindly indicate as following :

1. Machine serial number
2. Machine produce year
3. Part number and specification as per request
4. If the requesting parts does not mentioned on the parts list so please make an simple drawing or take a picture to indicate the request part and to prevent of sending the wrong part.

Forward

A. Preface

This booklet is the operation and maintenance manual of our precision cylindrical grinder machine. The manual should be kept at a place where it can be reached easily by the operator for reference. Notice that the operator should be well-trained in order to operate all the functions of the machine safely and without any problems.

Our design personnel applied the principles of ergonomics in the design stage of this machine to assure safety operation of our machine. However, any improper or misused operation will still be dangerous to operators. Therefore it is always necessary to make known to operators the safety precaution when operating the machine at all time. By observing the proper operating of machines, it will not only prolong the life span of the machines, but also will reduced the chances of accident from happening. Thus, the company must make sure all operators understand and follow the safety requirements before actually operating the machines. In the event of accident happened, it is necessary to find out the cause of the accident immediately and analyze the problem so that it will not happen again in the future. Any safety recommendations or opinions from the end-user is always welcome and appreciated by the management of SHARP INDUSTRIES, INC.. Please be informed that modification on any parts of the machine is strictly not allowed : for example, the modification on electrical circuit system, hydraulic system etc. SHARP INDUSTRIES, INC.. will not hold responsibility for any injuring to operator if any modification has been done without the prior permission from SHARP INDUSTRIES, INC..

All the drawings and charts, in this operation manual are used for illustration purpose only. There is no other special regulation for the detail of dimensions and tolerance of parts. SHARP INDUSTRIES, INC.. reserves the right of continuous improvement on our products in performance and engineering amendment. This machine is provided with one-year warranty for material and workmanship under normal operation and maintenance. However, any improper use or maintenance are not recommended by us and will be excluded of warranty period.

It is required to check all the accessories and parts listed in the packing list and the machine condition upon receiving the machine. Please inform your dealer or SHARP INDUSTRIES, INC.. immediately if there is any shortage of shipments or damage of the machine. Also, if any service or complain you would want to have, please do not hesitate to contact us. It is, however, very important to indicate the serial number of the machine to the company for speedy services.

B. General Safety Notices

1. This machine is only used for metal material processing, or any non-flammable material.
2. The machine should be operated and maintained only by an operator who is well trained and has good knowledge about the surface grinding.
3. The owner of the machine shall ask the operator to attend the relative safety and practical seminar.
4. It is required to read this Operation Manual before starting the operation of the machine. Please pay attention on the explanation labels on the machine while you are operating or maintaining this machine.
5. All the protection guard and door should be in close condition unless the necessity of the maintenance operation.
6. Do not unload/load workpiece while the grinding wheel is rotating or the table is moving.
7. Never clean or remove chips of the workpiece before the grinding operation is finished.
8. It is required to check the wheel condition and be sure the rotation is in clockwise direction, then, let the spindle test run for at least 5 minutes.
9. Before starting the machine, be sure the Stop Button and the Emergency Button are in the "OFF" position.
10. The operator is required to wear protection goggles, muffler, and safety shoes while she/he is operating the machine.
11. Loose fitting clothes are forbidden. Clothing should be comfortable, but for safety reason, long sleeve, neckties, etc. should not be worn.
12. Cover long hair with a hair cap or net.
13. Please keep the working area clean and dry all the time, and always remove chips, obstacles, away from the working zone.
14. It is required that the magnetic chuck surface should be cleaned before the workpiece is placed, and the magnetic chuck should be regrind if there is any damage on it.
15. Be aware of the high temperature and the sharp edges of the workpiece while you are loading or unloading workpiece.
16. Verify that the workpiece is firmly fixed by the magnetic chuck before grinding it. Be sure the safety height between the grinding wheel and workpiece so that it can avoid the workpiece being hit by the wheel when the spindle spins.
17. The operator should be sure that the main power is switched off before she/he walks away from the machine. Do not leave the machine during the operation while the machine is still at Switch On status.
18. It is required to remove all the unnecessary things or obstacles on the worktable except the workpiece before start grinding.
19. Do not attempt to brake or slow down the wheel spindle or any moving parts of the machine with your hands. The spindle should be stopped with the way of free run after it is turned off.
20. When wet grinding, it is not allowed to adjust the coolant nozzle after the spindle is started, and the coolant should be turn off before stopping the spindle.
21. It is strictly not allowed to make any changes of the machine's mechanical

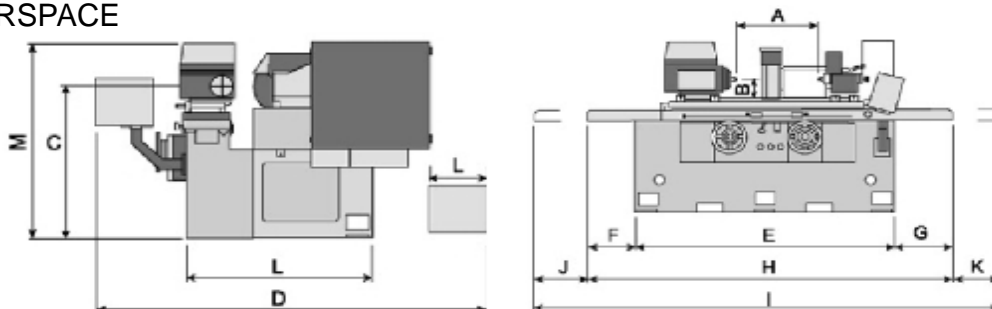
structure or function.

22. The operator should not stand in front of the machine but in front of the control box/panel to monitor the grinding operation. No one is allowed to access the machine except the operator, especially the left side of the machine.
23. It is strictly not allowed to open the electrical cabinet if there is any failure or malfunction happened to the electrical system. When this situation happened, the operator should ask electrical technician or qualify person for further assistance.
24. It is strictly not allowed to use this machine in an explosive environment.

1.SPECIFICATION

		Unit	OD-13/15/18-24/40/60/80SE			
General capacity	Disatance between centers	mm	600	1000	1500	2000
	Swing over table	mm	Æ320/Æ380/Æ450 (Æ12.6" /Æ15" /Æ18")			
	Max. grinding diameter	mm	Æ300/Æ360/Æ430 (Æ12" /Æ14" /Æ17")			
	Max. load held between centers	kgs	150kgs (330l bs)			
Grinding wheel	Diameter x width x bore	mm	Æ450x50xÆ127(Æ16" /Æ2" /Æ5")			
	Spindle speed(60HZ/50HZ)	mm	1650			
Wheel head	Swivelling angle(R&L)	deg.	±30°			
	Infeed travel	mm	245(9.6")			
	Hand feed travel	mm	200(7.9")			
	Top slide travel	mm	180(7")			
	Automatic rapid travel	mm	45(1-3/4")			
	Handwheel per revolution	mm	Æ2(0.1")			
Table	Swivelling angle(R&L)	deg.	±9°	±7°	±5°	±3°
	Traverse speed	mm/min	30~7000mm/mi n(1-1/5-275i n/mi n)			
	Handwheel per revolution	mm	10(4")			
Workhead	Swivelling angle(R&L)	deg.	90°			
	Center taper	MT	MT4(opt. MT5、5C)			
	Spindle speed	rpm	30~350rpm(vari abl e speeds)			
Tailstock	Center taper	MT	MT4(opt. MT5)			
	Quill travel	mm	25(1")			
Motor	Wheel spindle motor	HP	7.5HP(4P)			
	Workhead motor	HP	2HP(4P)			
	Coolant pump	HP	1/4HP(2P)			
	Hydraulic pump	HP	2HP(4P)			
	Internal grinding motor	HP	2HP(4P)			

FLOORSPACE



Unit : mm(n)

	A	B	C	D	E	F	G	H	I	J	K	L	M
OD-1324HE/SE	600 (24")	162 (6.38")	1090 (42.91")	2600 (102.36")	1960 (77.17")	390 (15.35")	405 (15.94")	2755 (108.46")	3420 (134.65")	386 (15.20")	279 (10.98")	1220 (48.03")	1397 (55")
OD-1340HE/SE	1000 (40")	162 (6.38")	1090 (42.91")	2600 (102.36")	2630 (103.54")	570 (22.44")	585 (23.03")	3785 (149.02")	4855 (191.14")	561 (22.09")	509 (20.04")	1220 (48.03")	1397 (55")
OD-1360HE/SE	1500 (60")	162 (6.38")	1090 (42.91")	2600 (102.36")	3690 (145.28")	475 (18.70")	500 (19.69")	4665 (186.66")	6265 (246.65")	796 (31.34")	804 (31.65")	1220 (48.03")	1397 (55")
OD-1380HE/SE	2000 (80")	162 (6.38")	1090 (42.91")	2600 (102.36")	4890 (192.52")	456 (17.95")	479 (18.86")	5825 (229.33")	7997 (314.84")	1086 (42.76")	1086 (42.76")	1220 (48.03")	1397 (55")
OD-1524HE/SE	600 (24")	192 (7.56")	1120 (44.10")	2600 (102.36")	1960 (77.17")	390 (15.35")	405 (15.94")	2755 (108.46")	3420 (134.65")	386 (15.20")	279 (10.98")	1220 (48.03")	1427 (56.18")
OD-1540HE/SE	1000 (40")	192 (7.56")	1120 (44.10")	2600 (102.36")	2630 (103.54")	570 (22.44")	585 (23.03")	3785 (149.02")	4855 (191.14")	561 (22.09")	509 (20.04")	1220 (48.03")	1427 (56.18")
OD-1560HE/SE	1500 (60")	192 (7.56")	1120 (44.10")	2600 (102.36")	3690 (145.28")	475 (18.70")	500 (19.69")	4665 (186.66")	6265 (246.65")	796 (31.34")	804 (31.65")	1220 (48.03")	1427 (56.18")
OD-1580HE/SE	2000 (80")	192 (7.56")	1120 (44.10")	2600 (102.36")	4890 (192.52")	456 (17.95")	479 (18.86")	5825 (229.33")	7997 (314.84")	1086 (42.76")	1086 (42.76")	1220 (48.03")	1427 (56.18")
OD-1824HE/SE	600 (24")	230 (9.06")	1158 (45.60")	2600 (102.36")	1960 (77.17")	390 (15.35")	405 (15.94")	2755 (108.46")	3420 (134.65")	386 (15.20")	279 (10.98")	1220 (48.03")	1465 (57.68")
OD-1840HE/SE	1000 (40")	230 (9.06")	1158 (45.60")	2600 (102.36")	2630 (103.54")	570 (22.44")	585 (23.03")	3785 (149.02")	4855 (191.14")	561 (22.09")	509 (20.04")	1220 (48.03")	1465 (57.68")
OD-1860HE/SE	1500 (60")	230 (9.06")	1158 (45.60")	2600 (102.36")	3690 (145.28")	475 (18.70")	500 (19.69")	4665 (186.66")	6265 (246.65")	796 (31.34")	804 (31.65")	1220 (48.03")	1465 (57.68")
OD-1880HE/SE	2000 (80")	230 (9.06")	1158 (45.60")	2600 (102.36")	4890 (192.52")	456 (17.95")	479 (18.86")	5825 (229.33")	7997 (314.84")	1086 (42.76")	1086 (42.76")	1220 (48.03")	1465 (57.68")
OD-2024HE/SE	600 (24")	255 (10.04")	1183 (46.58")	2600 (102.36")	1960 (77.17")	390 (15.35")	405 (15.94")	2755 (108.46")	3420 (134.65")	386 (15.20")	279 (10.98")	1220 (48.03")	1490 (58.67")
OD-2040HE/SE	1000 (40")	255 (10.04")	1183 (46.58")	2600 (102.36")	2630 (103.54")	570 (22.44")	585 (23.03")	3785 (149.02")	4855 (191.14")	561 (22.09")	509 (20.04")	1220 (48.03")	1490 (58.67")
OD-2060HE/SE	1500 (60")	255 (10.04")	1183 (46.58")	2600 (102.36")	3690 (145.28")	475 (18.70")	500 (19.69")	4665 (186.66")	6265 (246.65")	796 (31.34")	804 (31.65")	1220 (48.03")	1490 (58.67")
OD-2080HE/SE	2000 (80")	255 (10.04")	1183 (46.58")	2600 (102.36")	4890 (192.52")	456 (17.95")	479 (18.86")	5825 (229.33")	7997 (314.84")	1086 (42.76")	1086 (42.76")	1220 (48.03")	1490 (58.67")

2.MACHINE TRANSPORTATION & INSTALLATION

2-1. TRANSPORTATION:

Hydraulic oil and coolant is not included when the machine is checked for shipment to allow convenient transportation.

The wires outside the electrical cabinet and control panel are covered in a flexible conduit for easy transportation.

Upon arrival, the machine may be transported to the location designated for installation through cable wires or a forklift. While transporting the machine, appropriate cable wires and

2 steel bars need to be furnished; two steel bars shall first be retained to the machine through the two hook-holes and then hooked by the cable wires (as shown in Fig. 2-1). While lifting the machine, attention shall be paid to the following matters:

- (1) The crane must be adequate of lifting a minimum weight of 7,000 kilograms ("Kg").
- (2) Packing or cotton cloths shall be placed between the machine body and the cable wires so as to prevent from damaging the machine appearance.
- (3) Each of the cable wires must have a minimum diameter of 12 millimeters ("mm").
- (4) The workbench needs to be secured during the entire transporting course so as to avoid slippage of the workbench due to tilting.
- (5) The oil tank and the coolant tank can be transported by labor or machines.

2-2. CLEANING

Prior to transportation, all components with sliding or smooth surfaces have been evenly applied with antirust grease for protection purpose, which antirust grease may be removed by kerosene.

2-3. INSTALLATION OF MACHINE

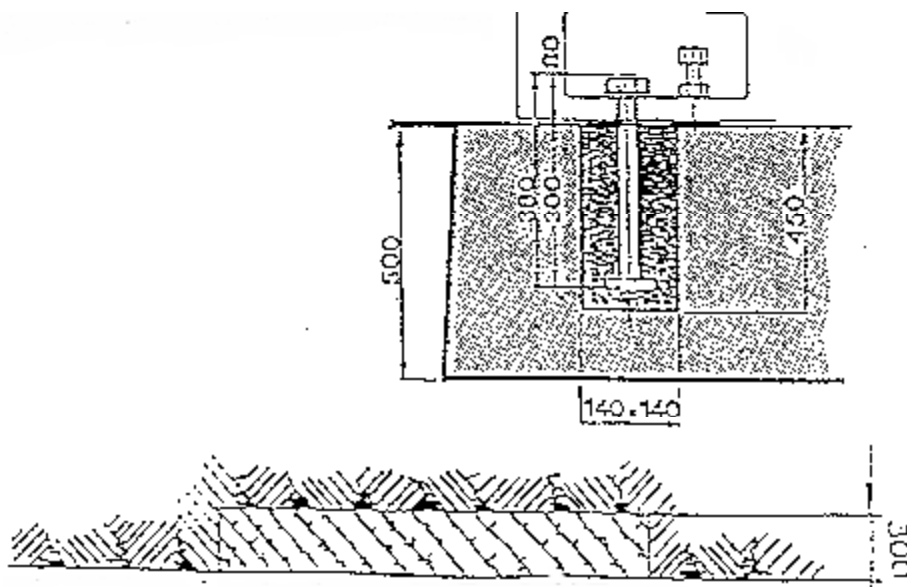
During installation of the machine, attention shall be paid to the following matters.

- (1) To reduce adverse effects to the machine precision, the machine shall avoid exposure of direct sunlight and be installed at an indoor location where the temperature is within the range of 5-40°C and the humidity level is within the range of 30-95%.
- (2) The machine shall not be installed at a location that is exposed to dust and shall be kept away from machines that generate excessive vibration, such as a compressor and a stamping machine.
- (3) To facilitate adjustment of levelness and elimination of vibration of the machine bed, the machine is furnished with leveling blocks and leveling bolts that may be used to adjust the levelness in accordance with conventional machine maintenance procedures.
- (4) A predetermined space required for the machine shall be reserved in advance by referring to the illustrations of basic installation (as shown in Fig. 2-2).

2-4. ADJUSTMENT OF LEVELNESS

It is essential to adjust the levelness of the machine. Attention shall be paid to the following matters while performing the adjustment.

- (1) A level that is specified to be 0.01/1000 shall be used.
- (2) The table has to be moved to the middle of machine base.
- (3) The retaining surface of table shall be neat without any contamination.
- (4) The level is placed at the center of the tool carriage and the bolts underneath the machine bed shall be adjusted; after resetting, a deviation within 0.02 mm is deemed an acceptable value.
- (5) Within one month of the installation of the machine, the levelness may slightly deviate due to loading or other factors; the levelness shall be re-investigated to ensure precision of the workpiece.
- (6) Please see the drawing.(2-2-1)(2-2-2)(2-2-3)(2-2-4)



LIFTING DIAGRAM

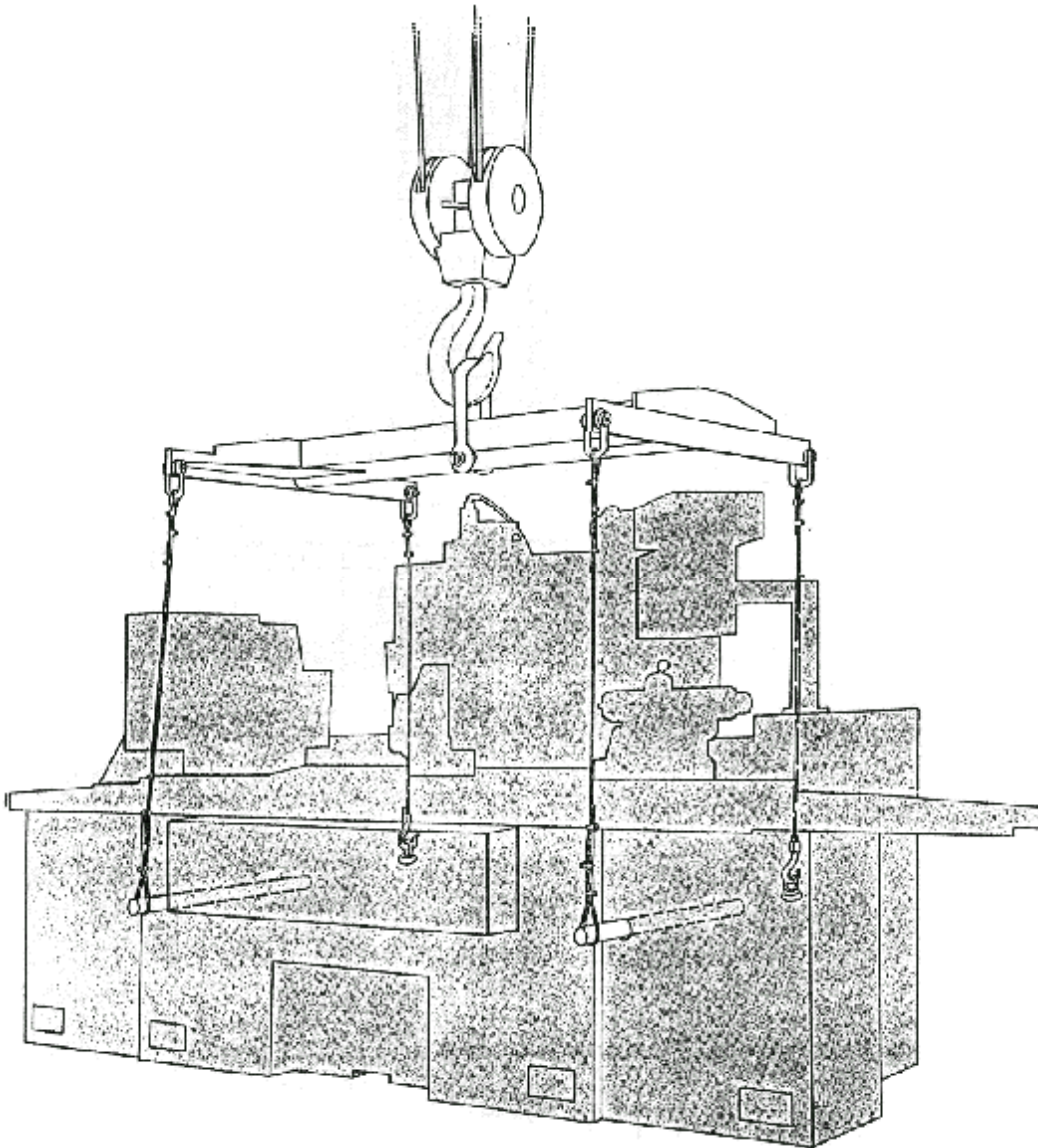
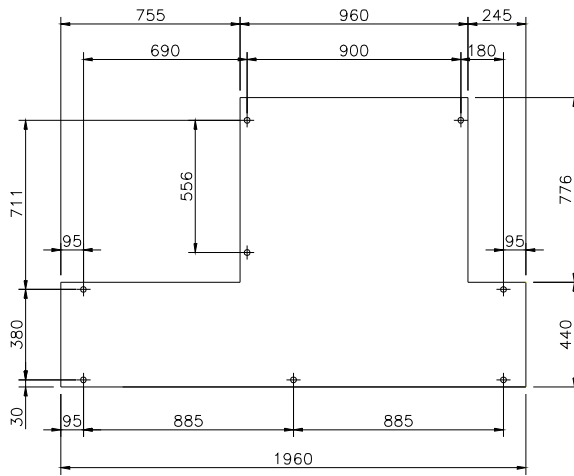


FIG. 2-1

FOUNDATION DRAWINGS

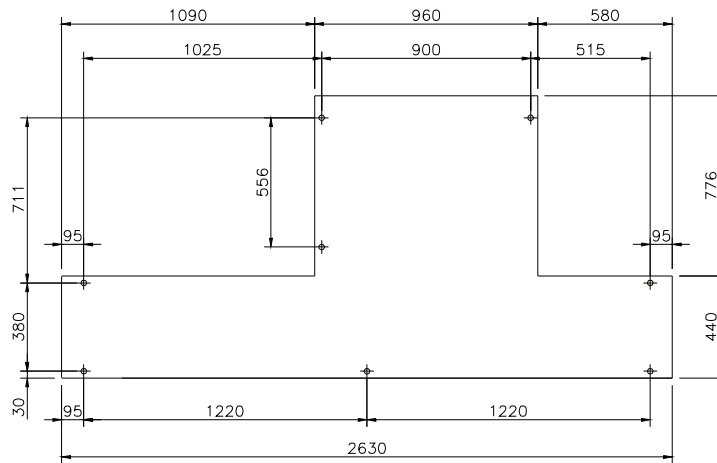
Please see the drawing.(2-2-1)(2-2-2)(2-2-3)(2-2-4)

OD-24SE/HE **P**



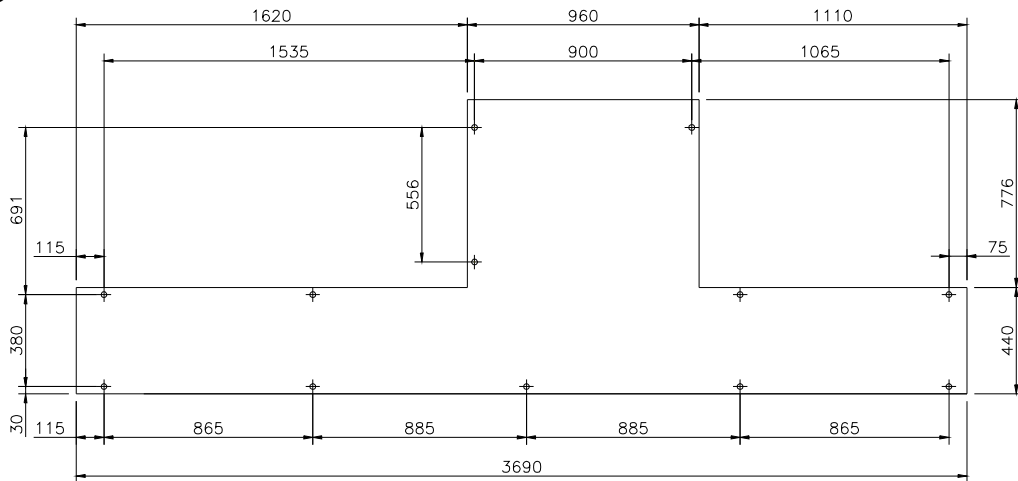
2-2-1

OD-40SE/HE **P**



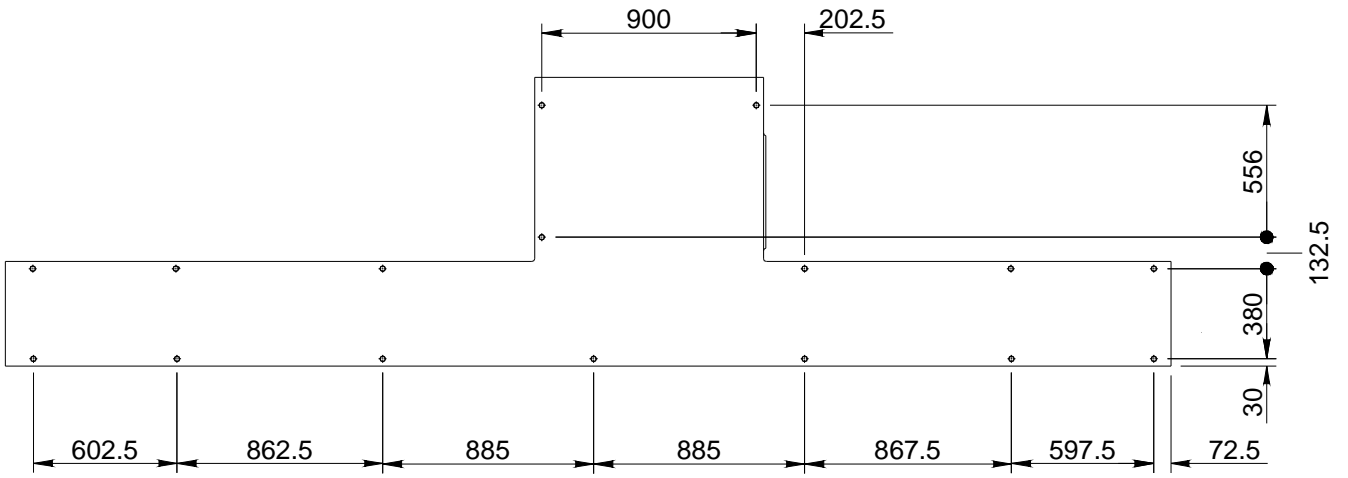
2-2-2

OD-60SE/HE **P**



2-2-3

OD-80SE/HE **P**



2-2-4

3.DESCRPTION OF MACHINE.

3-1. ILLUSTRATION OF MACHINE (Fig.3-1)

1. Sub-table
2. Bottom table slide
3. Workhead
4. Workhead spindle "JOG" button
5. Table traverse handwheel
6. Table travel limit dog
7. Dwell time adjusting knob (L)
8. Table "MANUAL/AUTO" feed selection lever
9. Table speed adjusting knob
10. Table reversing shifter
11. Internal grinding attachment(Option)
12. Dwell time adjusting knob (R)
13. Wheelhead
15. Machine base
16. Tailstock
17. Control panel
18. Electrical cabinet

ILLUSTRATION OF MACHINE

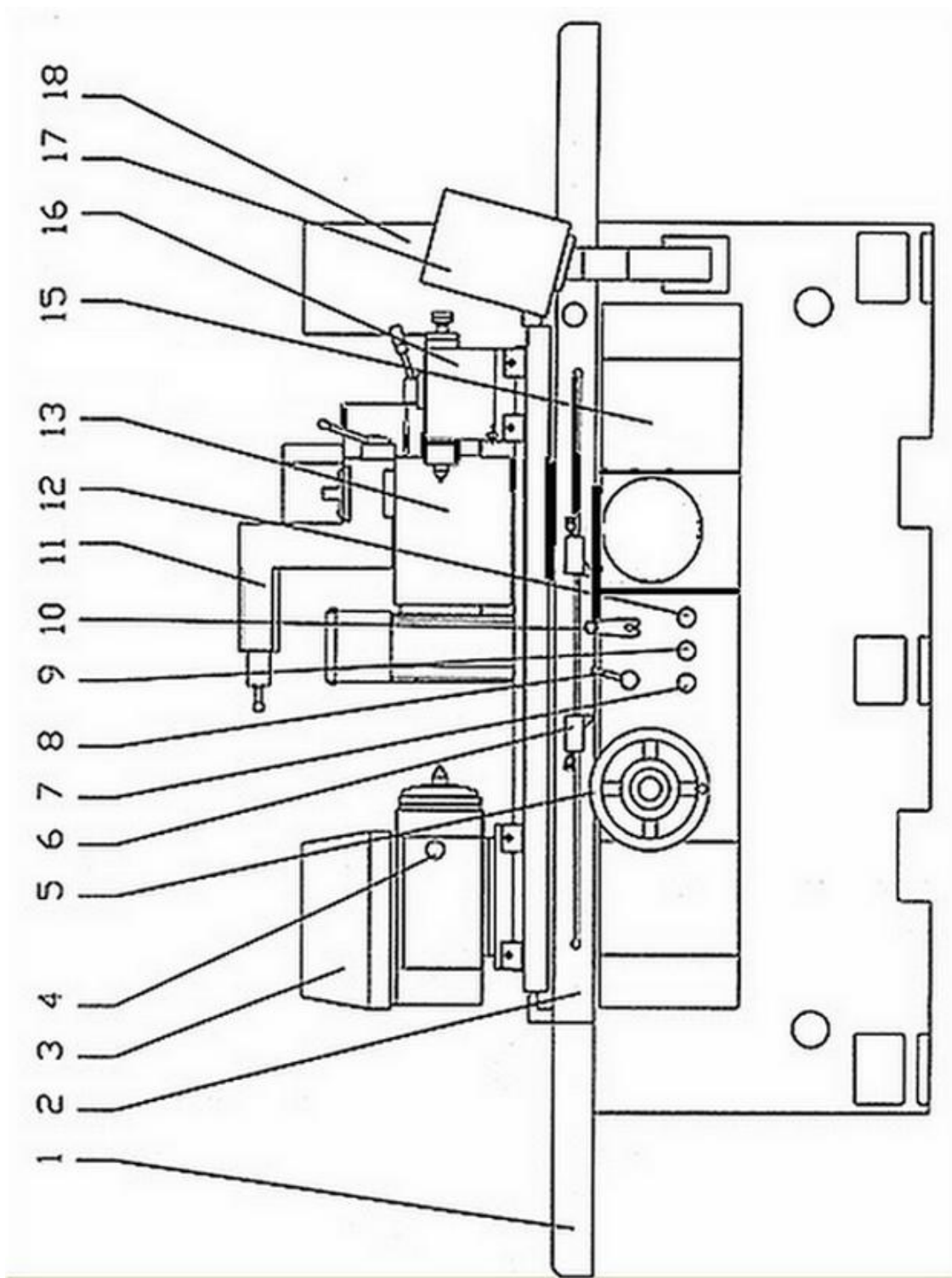


Fig. 3-1

3-2. ILLUSTRATION OF CONTROL PANEL (Fig.3-2)

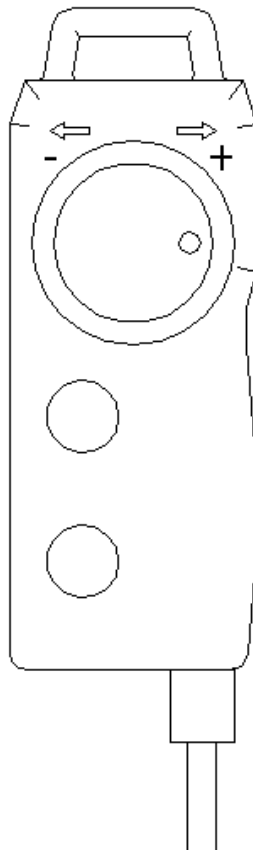
1. Wheelhead rapid infeed / retract button.
2. Cycle start button.
3. Mode selection switch (Manual/Auto).
4. Power on /off button.
5. Hydraulic system start/stop button.
6. Wheel start /stop button.
7. Coolant start/stop button.
8. Workhead spindle start /stop button.
9. I/D spindle start/stop button.(Option)
10. Workhead & coolant manual/auto button.

 : MANUAL

 : AUTOMATIC

11. Emergency STOP button.
12. Touch screen.

MPG/Wheelhead infeed handwheel



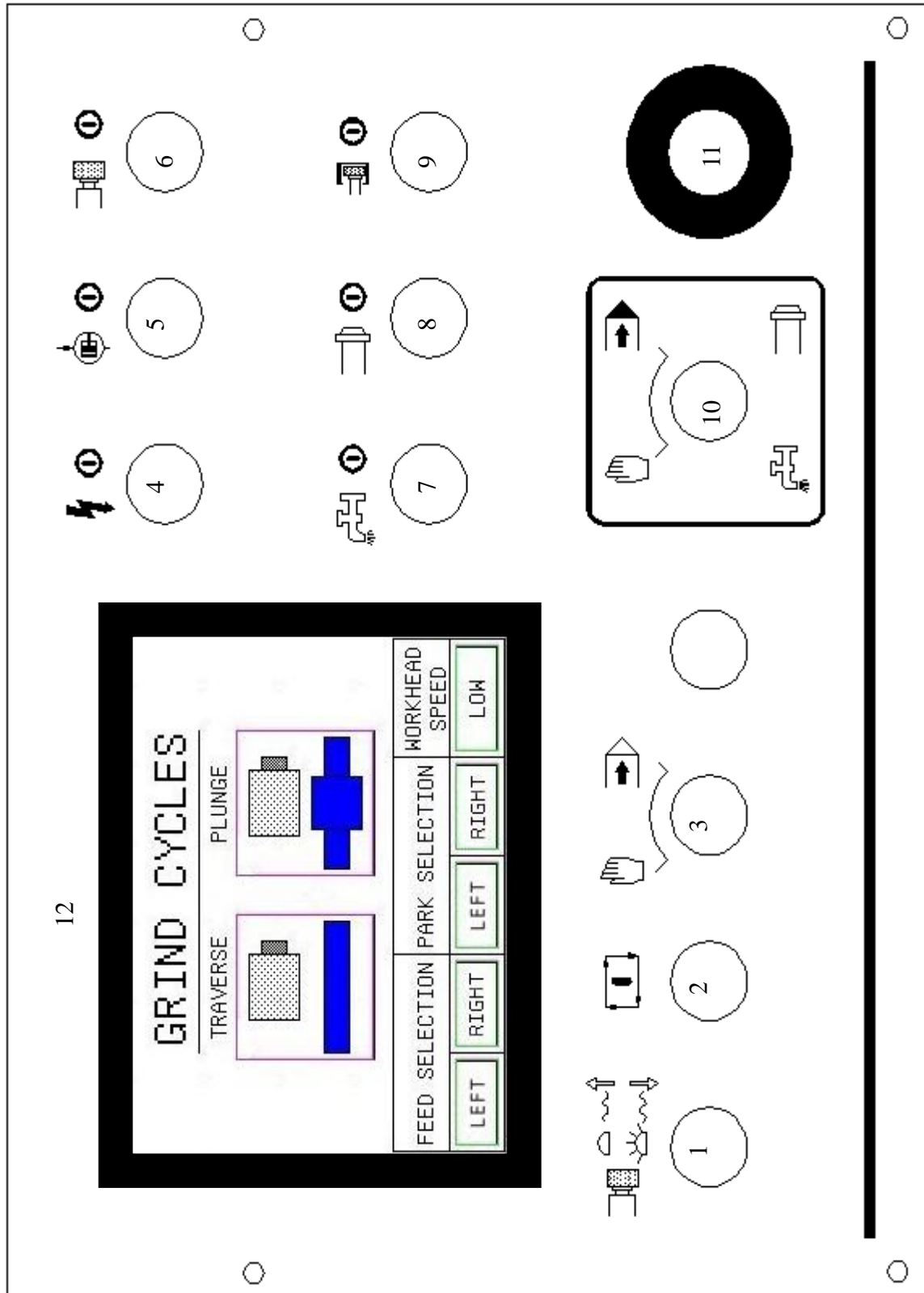


Fig.3-2

4.HYDRAULIC SYSTEM

The hydraulic system, that is separate from machine to guard against any heat transmission and vibration, comprises of hydraulic tank, pump, pressure gauge and solenoid valve.

The main hydraulic control unit is located closed to machine base for easy operation and maintenance. The volume of hydraulic tank is of 80 liters (20 US gallons) and the hydraulic oil of MOBIL 1405 or its equivalent (refer to indicate plate) are recommended which have high hydraulic property and high viscosity, mostly suitable for slide ways lubrications.

The oil level can be monitored from the oil sight glass.

5.ELECTRICAL POWER

- A. Check the machine voltage with power source before connection.
- B. Check the rotation of wheelhead before operating the machine.

The grinding wheel should rotate inward in the operator direction.

In the case of grinding wheel running in opposite direction, please switch the R/S/T” cables in the electrical cabinet.

6. LUBRICATIONS & COOLANT

6-1. LUBRICATION SYSTEM

The machine utilize an independent piping system that can be adjusted & controlled by throttle valve and pressure valve to ensure a sufficient lubrication on all slide ways. The lubrication flow can be adjusted by the flow controlled valve, and can be monitored from the oil sight glass at the base.

6-2. COOLANT

- 1、The maximum capacity of coolant tank is approximately 130 liters (31US gallons) .prior to connecting to the electric power , a hose shall be used to connect the coolant tank to the coolant nozzle of the machine.
- 2、In a precision grinding operation , the grinding fluid dictates the precision of workpiece and life span of the grinding wheel ,and should thus be selected in deliberation . the grinding fluid within the coolant tank shall be changed twice to thrice every month.

(1) Basic Functions of the Grinding Fluid

- a. To inhibit temperature increment of the workpiece
- b. To wash away grinding chips or fallen granules; and
- c. To serve as a lubricant.

(2) Different Types of Cutting and Grinding Fluid

- a. Water soluble cutting and grinding fluid : mainly consisting of water soluble, inorganic salts and being most suitable in grinding cast iron or cast steel.

(i) Emulsion Type : where mineral oil is emulsified by means

of anionics and renders a milky color after being dissolved in water ; such a type of cutting and grinding fluid features lubricity but is poor in permeability and cooling capability.

(ii) Soluble Solution Type : where oil substances including

pressurized additive,oily additive grease, and antiseptic are emulsified by means of surface activator and render a transparent color after being dissolved in water.

(iii)Solution Type : where the mixed solution of inorganic salts

and organic amine is dissolved in water and renders a transparent color ; such a type of cutting and grinding fluid features anti-permeability and antirust capability for metal surfaces.

(3) Water insoluble cutting and grinding fluid : where mineral oil is added to animal or plant oil

that is added with sulfur to feature lubricity.

7. TABLE

7-1. TABLE TRAVERSE AND ADJUSTMENT

The table can be driven both by manual and hydraulic:

1. MANUAL TRAVERSE:

place the table "MANUAL/AUTO" feed selection lever to "manual" position (Fig. 7-1-1) to close the hydraulic valve. Then turn the table hand wheel to move the table. Feed per turn is 12mm.

2. HYDRAULIC TRAVERSE:

press the hydraulic "START" button switch at the control panel to start the hydraulic system. (The oil pressure is preset at 18-20kg/cm² .) Place the table "MANUAL/AUTO" feed selection lever to "AUTO" position (Fig. 7-1-1) to move table under hydraulic when the table hand wheel is disengaged with the table rack for safety reason. Set the travel limit dog and table speed ranging from 0.03-0.07m/min.

7-2. ADJUSTMENT OF TABLE INCLINATION

The table consists of upper & bottom table slides. The upper table slide can be indexed as below. (Fig.7-2)

1. Release the 2 sunk head screws at both table ends.
2. Turn the angle adjusting knob in conjunction of the indicator and dial gauge to the required angle.

7-3. DWELL

Turn the table dwell adjusting knob (L&R) to adjust dwell time before table reverses.

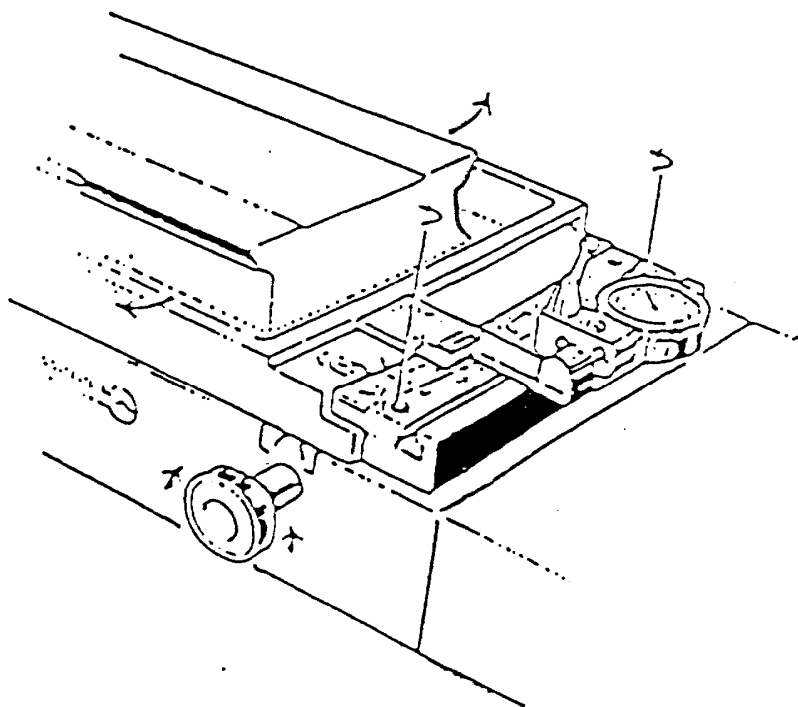
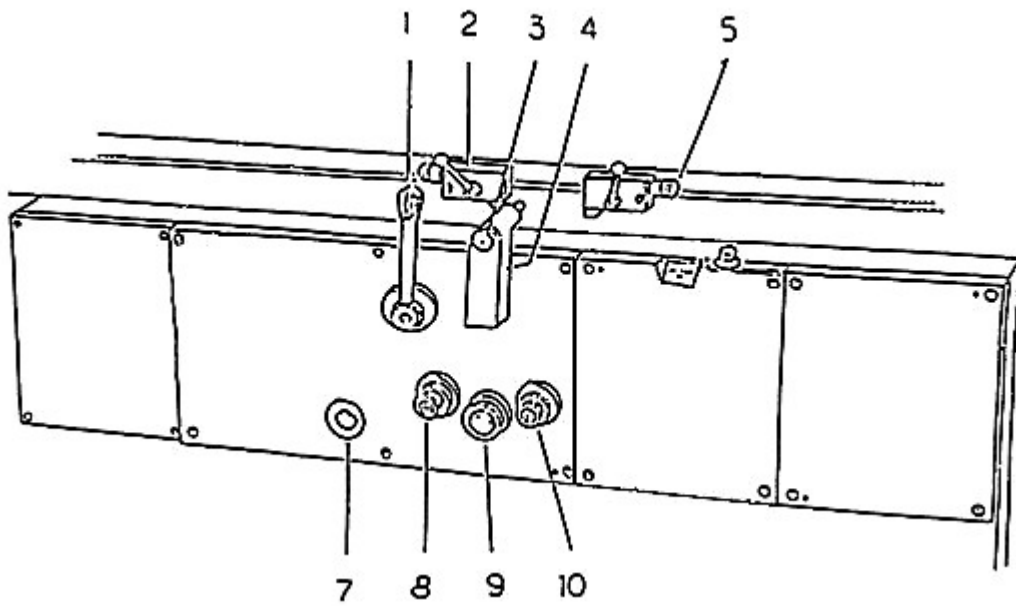


Fig. 7-1

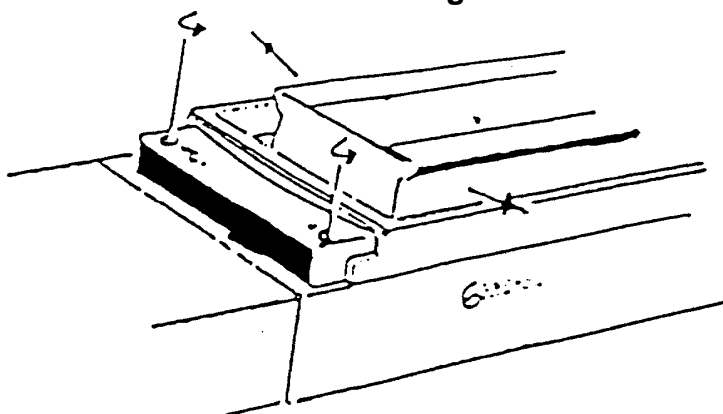


Fig.7-2

8. WORKHEAD

8-1. STRUCTURE OF WORKHEAD

- The workhead is equipped with high precision angular contact ball bearings, suitable for heavy-duty grinding.
- Dead center or revolving center can be used alternatively for external grinding while a 3-jaw or 4-jaw chuck can be used for I/D grinding.

8-2. ADJUSTMENT OF WORKHEAD

- Speed setting: set the required speeds ranging from 30-350rpm.
- Movement of workhead : release the 2 bolts at the workhead to move workhead. Tighten it up when it is moved in position.
-----clean the table surface before moving is to be made.-----
- Inclination of workhead : release the 3 set bolts at the bottom of workhead to swivel workhead counterclockwise (9~90°) to required angle, then tighten them up.
- Change of dead center or revolving center : the spindle rotates when a chuck is used. Pull out the cotter at rear of workhead and press the clutch of driving plate into the groove of spindle nose for free spindle rotation. Start the procedures reversibly while changing the revolving center to dead center.

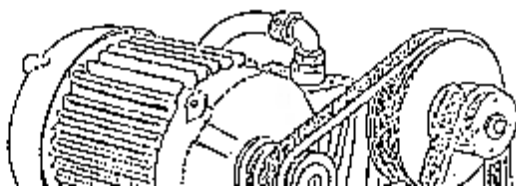
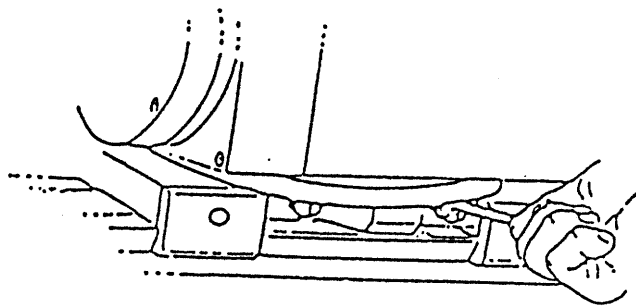
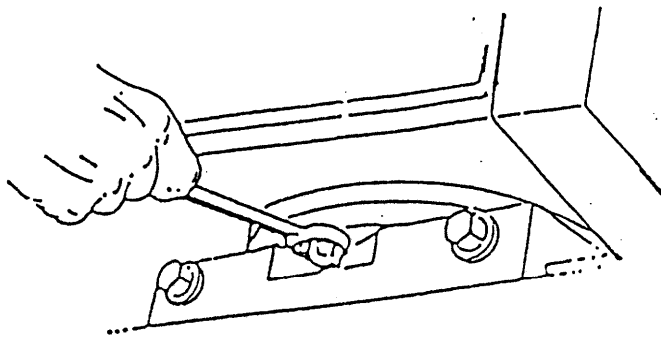


Fig.8-1

9. TAILSTOCK

- A. Move the tailstock in position according to work piece length. Clean the table surface before moving the tailstock to maintain accuracy.
- B. Adjust the tension of carbide tip center from the knob at rear of tailstock according to work piece length and forms. Turn the knob clockwise to increase tension while turn counterclockwise to release. The work piece may possibly be deflected or center bore expended in case the center tension is too great. To the contrary, work piece would vibrate if it is small.
- C. Clean the center bore of work piece and tailstock center before clamping to ensure grinding accuracy.

10. WHEELHEAD

The wheelhead comprises of wheelhead base, rotary base, saddle and saddle slide, etc., that can driven both by manual and automatically and is inclined for taper grinding.

10-1. WHEEL SPINDLE AND BEARINGS

Wheelhead spindle is very important for grinding machine. We made up this model by highly precision & rigidity angular contact ball bearings it can make sure the workpiece precise & extend the spindle life even under high speed rotation.

10-2. WHEEL SPINDLE DRIVE MECHANISM & ADJUSTMENT

The wheel spindle is driven by 3 vee belts. A big tension may cause a poor surface finish while a small tension cause vibration. Thus, it is imperative to keep an adequate belt tension which can be adjusted through the bolts at back of motor.

10-3. ADJUSTMENT OF WHEELHEAD AND INCLINATION

- Wheelhead movement: The wheelhead is capable of hand feed travel for 195mm and auto rapid travel for 45mm.
- Wheelhead inclination: The wheelhead can be tilted up to 30 degree to grind tapered parts. To tilt the workhead, release the 2 T-bolt at the rotary base and then swivel the wheelhead to desired degree. Tighten the T-bolts.

Note:

1. This inclination is only permissible when it comes to grind a taper smaller than the grinding wheel.
2. Clean the rotary surface before the inclination is to be made.

10-4. WHEELHEAD FEEDS MACHANISM



Hydraulic rapid infeed & retract: press the wheelhead rapid infeed and retract button switch to move the wheelhead forward and backward (the hydraulic system “START” button must be pressed first) rapidly for 45mm. In case the workhead and coolant AUTO/MANUAL” selection switch is set at “AUTO” position, the workhead spindle and coolant system will be activated simultaneously while the wheelhead approaching rapidly. The wheelhead retract to the original setting point and coolant system and workhead spindle stops, after cycle grinding is completed.

⇒ Manual infeed: turn the wheelhead handwheel for manual infeeds. Feeds per division is 0.002” .

B. Manual infeed operation for “SE” type:

1. Measure the work piece dimension for grinding allowance.
 2. Press the power “ON” button.
 3. Set the table Manual/Auto selection lever at “MANUAL” position.
 4. Press the hydraulic system “ON” button.
 5. Press the wheel spindle “START” button.
 6. Up to this stage, the I/D attachment will not be activated. Turn the I/D spindle Start/stop switch to “STOP” position.
 7. Set the workhead spindle/coolant system “AUTO/MANUAL” selection switch at “AUTO” position.
 8. Select the workhead spindle speed from H/L switch.
 9. Set the Manual/Auto/Edit mode selection switch at “MANUAL” position.
 10. Press the workhead spindle “START” button when the spindle will not rotate immediately.
 11. Set the coolant “START/STOP” switch at “START” position.
 12. Press the wheelhead rapid infeed button to start the workhead spindle and the coolant system simultaneously.
 13. Turn the wheelhead handwheel till the wheel approaches the workpiece.
 14. Set the table Manual/Auto selection lever at “AUTO” Position.
(For horizontal grinding only)
 15. Grinding begins.
 16. Grinding completed.
 17. Switch the setting knob counterclockwise.
 18. Release the fixed knob on the handwheel and turn the dial ring clockwise to “0” position then tight fixed knob.
 19. Press the wheelhead rapid retract switch to stop the coolant and the workhead spindle
-

simultaneously.

20. To grind next identical parts, just press the wheelhead rapid infeed button and turn the handwheel till "0" position is reached to regain the same grinding size.

11. GRINDING WHEELS

11-1. SELECTION OF GRINDING WHEELS

A successful grinding is based on a qualified operator who knows well about the forms, types and property of grinding wheels and knows how to use them in different conditions.

Standard Marking System Chart

Sequence	1	2	3	4	5	6		
Prefix	Abrasive type	Abrasive (Grain) Size	Grade	Structure	Bond Type	manufactures Records		
51	A	36	L	5	V	23		
Manufacture's symbol indicating exact kind of abrasive (use optional) Aluminum Oxide-A Silicon Carbide-C Aluminum Zirconium-Z Soft		Coarse Medium Fine Fine 8 30 70 220 10 36 80 240 12 46 90 280 14 54 100 320 16 60 120 400 20 150 500 24 180 600	very Medium Hard	Dense 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 etc. (Use optional)	Manufacture's private marking to identify wheel (use optional) B Resinoid BF Resinoid Reinf. E Shellac O Oxychloride R Rubber RF Rubber Reinfo. S Silicate V Vitrified			
	A B C D E F G H I J K L M N O P Q R S T U V W X Y Z							
	GRADE SCALE							

The letter & number of the above chart represents the meanings described as below. The basic abrasives of a grinding wheel are grains, bond agent, class & structure.

u Abrasive:

The abrasive of a grinding wheel widely used are ALUMINUM OXIDE & SILICON CARBIDE. The crystal of Aluminum Oxide is softer and more crispy than Silicon Carbide and is suitable for high tensile parts grinding such as Carbide & Alloy Steel. The crystal of Silicon Carbide

is extremely crispy. This abrasive of grinding wheel is mostly suitable for grinding high tensile material such as cast iron, bronze, brass, aluminum, copper, etc.

u Grain Density:

The grain density is denominated by the sifting capacity. When a grain that passes a sifter with 24 net-eye/inch, its grain density is 24. A rough grain density wheel is used for parts that need not fine finish, vice versa.

u Bond Agent:

It sticks the agent and supports wheel abrasive. “Soft” or “Hard” stands for bonding strength. The bigger the bonding of wheel abrasive is, the thicker and stronger and harder the bonding films surround the abrasive is.

u Grade:

Grinding wheels are classified according to the bonding strength. We address “soft” class for those abrasive likely to shell off, and “hard” class for those binds intensively.

u Structure:

It stands for the distance among grains, namely, DENSITY. A wide-bonded wheel is likely to wear out than those which have intensive bonding. A hard & crispy workpiece must use an intensive-bonded wheel for better finish.

NOTE:

As described above, the property of workpiece is the key factor for selecting a Grinding wheel.

RECOMMENDED WHEELS FOR EXTERNAL GRINDINGS

(with coolant, finish 1 - 6 μm)

PARTS MATERIAL			HARDNESS (HRC)	WHEEL SPECS	
STEEL	CARBON STEEL	STEEL PLATE CARBON STEEL	BELOW HRC 25	A 54M	
		CARBON STEEL PIPE CARBON STEEL CASTINGS CARBON STEEL CASTINGS	ABOVE HRC 25	WA 54L	
	ALLOY STEEL	NI-CR ALLOY STEEL NI-CR-MO STEEL CHROME STEEL	BELOW HRC 55	SA 54L WA	
		CH-MO STEEL AL-CR-MO STEEL HIGH CARBON CHROME ALLOY BEARING ALLOY CAST STEEL TOOL CARBON STEEL	ABOVE HRC 55	SA 54K WA	
		TOOL STEEL	HIGH-SPEED STEEL ALLOY TOOL STEEL	BELOW HRC 60	SA 54K WA
				ABOVE HRC 60	SA 54K WA
	STAINLESS STEEL	STAINLESS STEEL HEAT RESISTENCE STEEL		WA 54K 46L	
	CAST IRON	GRAY CAST IRON SPECIAL CAST IRON CHILLED CAST IRON MALLEABLE CAST IRON		C 54K	
				GC 54J	
				GC 54J	
			WA 54M		
NON-FERROUS PART	BRASS BRONZE ALUMINUM ALLOY SINTERED CARBIDE		C 46J		
			WA 54L		
			C 46J		
			GC 80I		

u Main factors for choosing a grinding wheel

A. Fixed factors:

1. Property of workpiece
2. Accuracy required
3. Contact area of grinding
4. Procedures of grinding operation

B. Variable factors:

1. Wheel speeds
2. Infeed rate
3. Condition of machine
4. Operator's skill

I \ FIXED FACTORS:

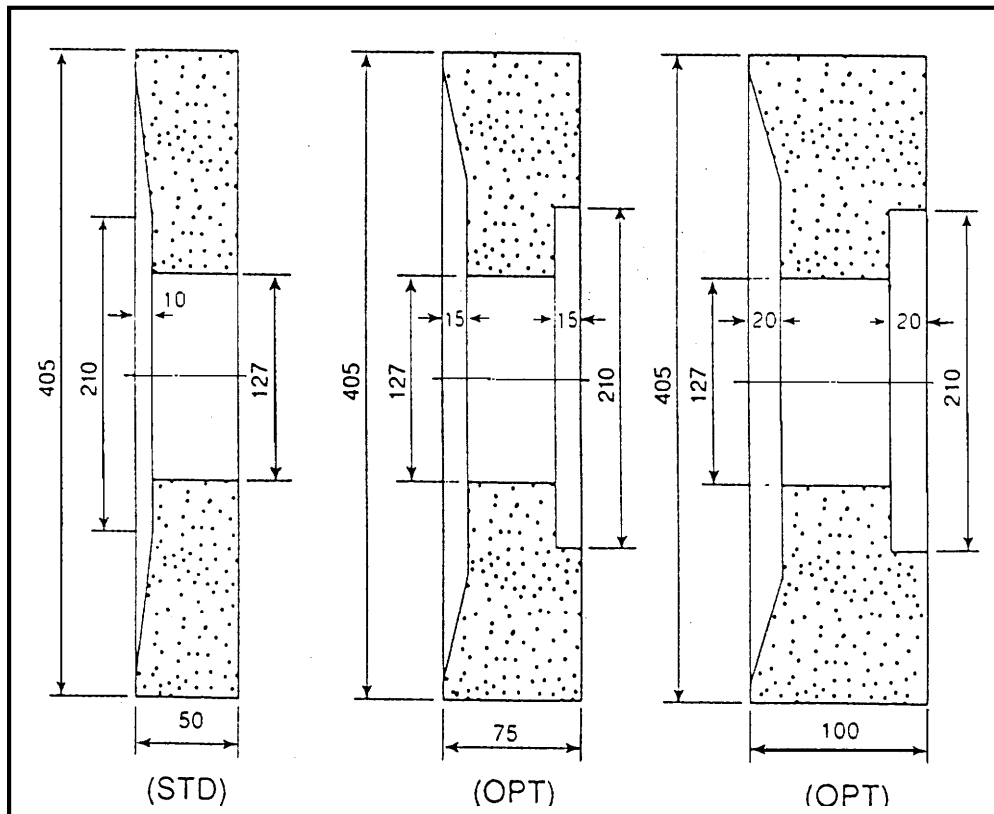
- (1) If a workpiece is made of steel or alloy steel, use an aluminum oxide wheel. For cast irons, non-ferrous metal and non-metal, use a silicon carbide wheel. Fine grain wheels are ideal for soft and malleable materials while hard wheels are ideal for soft parts. Soft wheels are ideal for hard parts. Nevertheless, a soft grinding wheel is recommended for soft materials such as brass so as to prevent congestion and overload from grinding. Intensive-bonded wheels are suitable for hard and crispy material while wide-bonded wheels are suitable for soft and malleable parts.
- (2) In case a rough grain wheel is used for precision and fine finish grinding, use the highest spindle speeds. Normally a fine grain wheel is used for fine finish grinding.
- (3) Use a harden & fine grain wheel for small area grinding. Intensive grain wheel is suitable for small area grinding whilst rough grain wheel is for big area grinding.
- (4) In view of grinding operations, for precision grinding, a glass bond wheel is normally required, and for a super finish grinding, a resin or rubber bonded or shellac-bonded wheel is more suitable.

II \ VARIABLE FACTORS:

- (1) In case a high speed grinding is required, use a soft wheel. Otherwise, lower the spindle speeds to make the Grinding wheel like a soft wheel and increase wheel speeds to make the Grinding wheel like a hard wheel.
- (2) A high infeed rate, the grinding pressure is & a hard wheel is required.
- (3) A hard wheel is more suitable for jobs paid by time.

11-2. GRINDING WHEEL

A. Dimension of grinding wheel



C. Assembly of grinding wheel

1. Place a piece of blotter paper with 0.25mm between wheel and flange.
2. Check the support surface, groove of wheel flange, nut, and screw holes for any defects.
3. Put the flange into wheel bore slightly. The clearance between the wheel bore and flange must be equal, namely, the wheel flange can
4. not stay at one side.
5. Screw up the flange cover with spanner.
6. Tighten the wheel nut again after 1 - 2 days running.

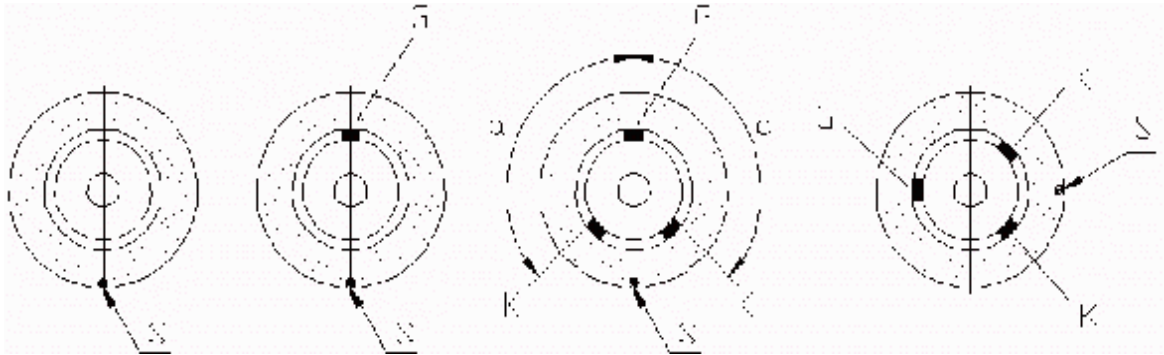
D. Installation of wheel

1. Clean the wheel bore and flange surface before mounting.
2. Put the assembled wheel onto spindle slightly.
3. Turn nut CCW to clamp the flange.

E. Extract of grinding wheel

1. Remove the splash guard (if used) and open the wheel door.
 2. Insert & turn the wheel extractor CW to remove the wheel clamping nut.
 3. Insert the wheel extractor into the wheel flange, till the bottom of extractor contacts the wheel surface to remove the wheel flange slightly.
- In no any condition, it is strictly prohibited to use a hammer or punch to take off the wheel forcibly.

11-3. BALANCE OF GRINDING WHEEL



1. Insert the flange into wheel and tighten it.
2. Mount the wheel onto spindle. Switch on the spindle and dressing the wheel with coolant. Stop the coolant after dressing and let the wheel rotate for 10 minute or so to drop the water off the wheel.
3. Dismantle the wheel set from spindle and put the balancing arbor thru flange bore, and put the wheel set on balance stand. – Clean the flange bore and balance arbor tapered surface before mounting.
4. Set the wheel for free rotation to locate its gravity center “S” and mark it with a chalk.
5. Put a balance weight at “G” position. Turn the wheel for 90 degree see in which side (S&G) weights more.
6. Place 2 balance weight “K” at weightier side with same distance from “G”.
7. Turn the wheel for 90 degree see if the wheel is balanced. If not, move the balance weight “K” till the wheel is balanced no matter in which position the wheel rotates.

11-4. DRESSING OF GRINDING WHEEL

A. Installation of diamond dresser.

- (1) fix the diamond seat onto table.
- (2) put the diamond bit into the seat and tighten it.

B. Notes for wheel dressing:

- (1) A sufficient coolant is required while dressing the wheel. In the event of insufficient coolant, the diamond bit will become carbonized due to high heat generated because of friction. In this case, the life of diamond bit will be shortened and deteriorated if keep using.
- (2) The feed rate for each dressing should not be large as the diamond is an element of hard and crispy & is unbearable of impact. In order to prevent the diamond bit from impact against grinding wheel, start the dressing from the middle of wheel thru both ends.
- (3) A fixed moderate dressing rate: less than 5mm for precision dressing, and 10-30um for fine dressing whilst 40mm (above) for rough dressing.
- (4) The diamond bit shall become wearing after use for a period of time and cause a poor dressing. Therefore it is suggested to change the diamond bit position at times to regain a good & sharp dressing angle.

(5) Formula of dressing speed:

$$F = \frac{d \times N}{2.5 \times 1000}$$

F: feed rate (mm/min)

d: wheel grain size (m)

N: wheel speeds (RPM)

11-5. REFERENCE TABLE OF GRINDING CONDITIONS

A. Work piece periphery speed

TABLE 1: WORKPIECE PERIPHERY SPEED RANGE

UNIT: m/min

TYPE OF GRINDING		SOFT STEEL	QUENCHED STEEL	TOOL STEEL	CAST STEEL	BRONZE ALLOY	ALUMINUM ALLOY
EXTERNAL	COARSE	10 - 20	15 - 20	15 - 20	10 - 15	25 - 30	25 - 40
	FINE	6 - 15	6 - 16	6 - 16	6 - 15	14 - 20	18 - 30
	PRECISION	5 - 10	5 - 10	5 - 10	5 - 10	---	---
INTERNAL	FINE	20 - 40	16 - 50	16 - 40	20 - 50	40 - 60	40 - 70

B. Wheel infeed rate

TABLE 2: FEED RATE PER GRINDING

UNIT: mm

TYPE OF GRINDING			SOFT STEEL	QUENCHED STEEL	TOOL STEEL	STAINLESS/ HEAT RESISTENCE STEEL	CAST STEEL
EXTERNAL	PLUNGE GRINDING	COARSE	0.02 - 0.04	0.03 - 0.04	0.02 - 0.03	0.02 - 0.03	0.02 - 0.04
		FINE	0.005 - 0.01	0.01 - 0.02	0.005 - 0.01	0.005 - 0.01	0.005 - 0.01
	HORIZONTAL GRINDING	COARSE	0.015 - 0.04	0.02 - 0.04	0.005 - 0.01	---	0.015 - 0.04
		FINE	0.005-0.015	0.005 - 0.01	0.002 -0.005	---	0.015 - 0.04
INTERNAL	COARSE		0.015 - 0.03	0.015 - 0.03	0.005 -0.015	---	0.015 - 0.03
	FINE		0.005 - 0.01	0.005 - 0.01	- 0.005	- 0.005	0.005 - 0.01

SHARP

Influence of mechanical condition & grinding results

Influence of feed rate

	feed rate	
small	←————→	big
	grinding resistance	
small	←————→	big
	heat generation	
small	←————→	big
	ground surface	
fine	←————→	rough
	wheel surface	
smooth	←————→	stuff shell off
	wheel wearing	
small	←————→	big

Influence on traverse speed

Provided feed rate for rough grinding is set at 100 - 150 mm/min and fine grinding is set at 50 mm/min based on workpiece per rotation, the traverse distance is set about $\frac{1}{2}$ - $\frac{3}{4}$ of the wheel width for rough grinding and at $\frac{1}{8}$ - $\frac{1}{4}$ for fine grinding.

	traverse	
Small	←————→	big
	grinding resistance	
Small	←————→	big
	heat generation	
Small	←————→	big
	ground surface	
Fine	←————→	rough
	wheel surface	
Smooth	←————→	stuff drops
	wheel wearing	
Small	←————→	big

Influence of wheel periphery speed

	← wheel periphery speed	
small		big
	← grinding resistance	
big		small
	← wheel wearing	
big		small
	← heat generation	
big		small
	← safety	
good		bad

Influence of workpiece periphery speed

	workpiece periphery speed	
small		big
	← grinding resistance	
small		big
	← wheel wearing	
small		big
	← ground surface	
fine		rough
	← heat generation	
big		small

12. INTERNAL GRINDING ATTACHMENT

12-1. INSTALLATION OF INTERNAL GRINDING ATTACHMENT

1. Pull the fixed pin outward to turn for 90 degree & release. (Fig. 12-1)
2. Swing down the unit gently till touching the wheelhead from end.
3. Clamp the unit with 2 screws & spanner supplied.

12-2. INSTALLATION OF 3-JAW/4-JAW CHUCK

1. Press the clutch of driving plate into the groove of spindle nose.
2. Attach the chuck plate onto the spindle.
3. Clamp the back plate and spindle with a connecting rod.
4. Pull out the cotter at rear of workhead to enable spindle for free rotation.

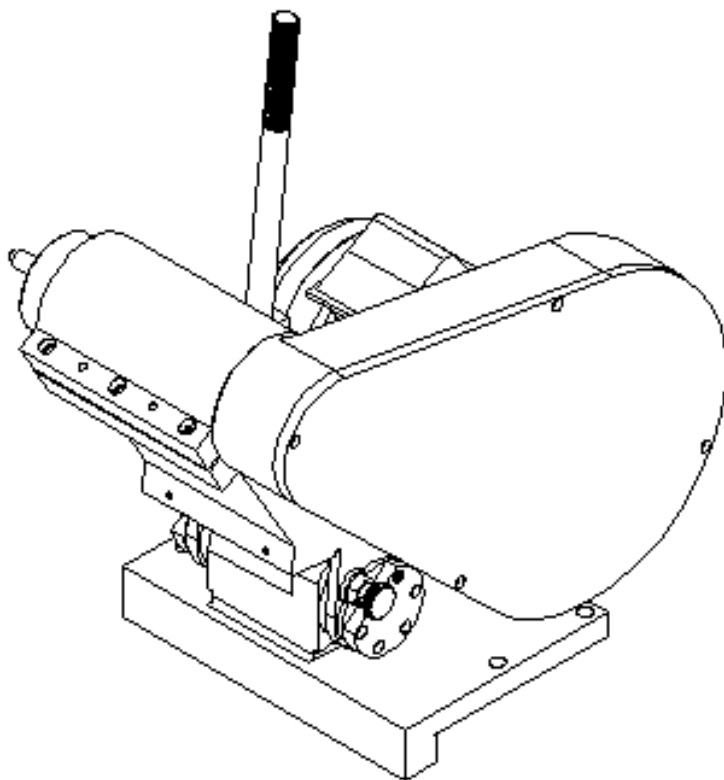
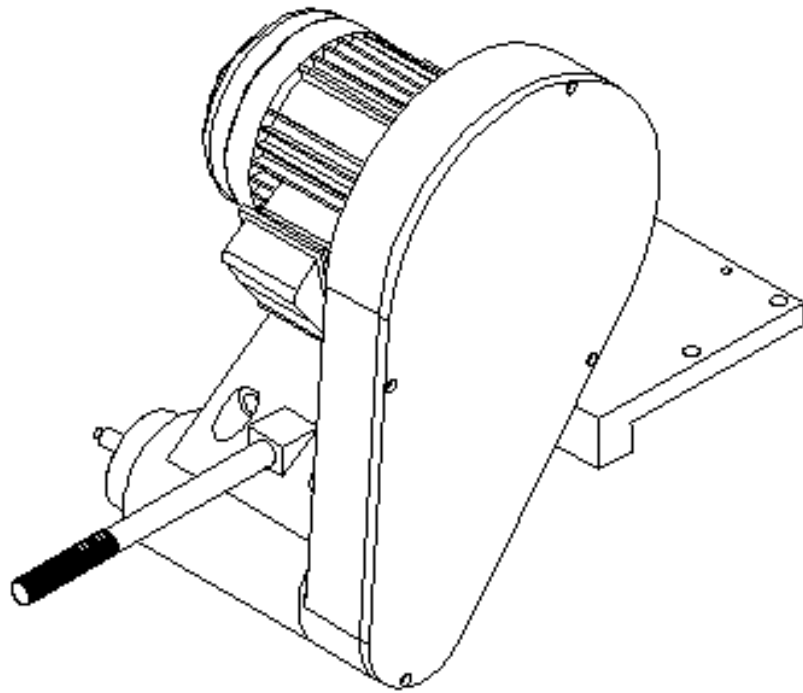


Fig 12-1

13. MACHINE ALIGNMENT & AIR RELEASE

13-1. MACHINE ALIGNMENT:

Check the machine accuracy as below in maintenance.

A. Alignment of table (Fig. 13-1)

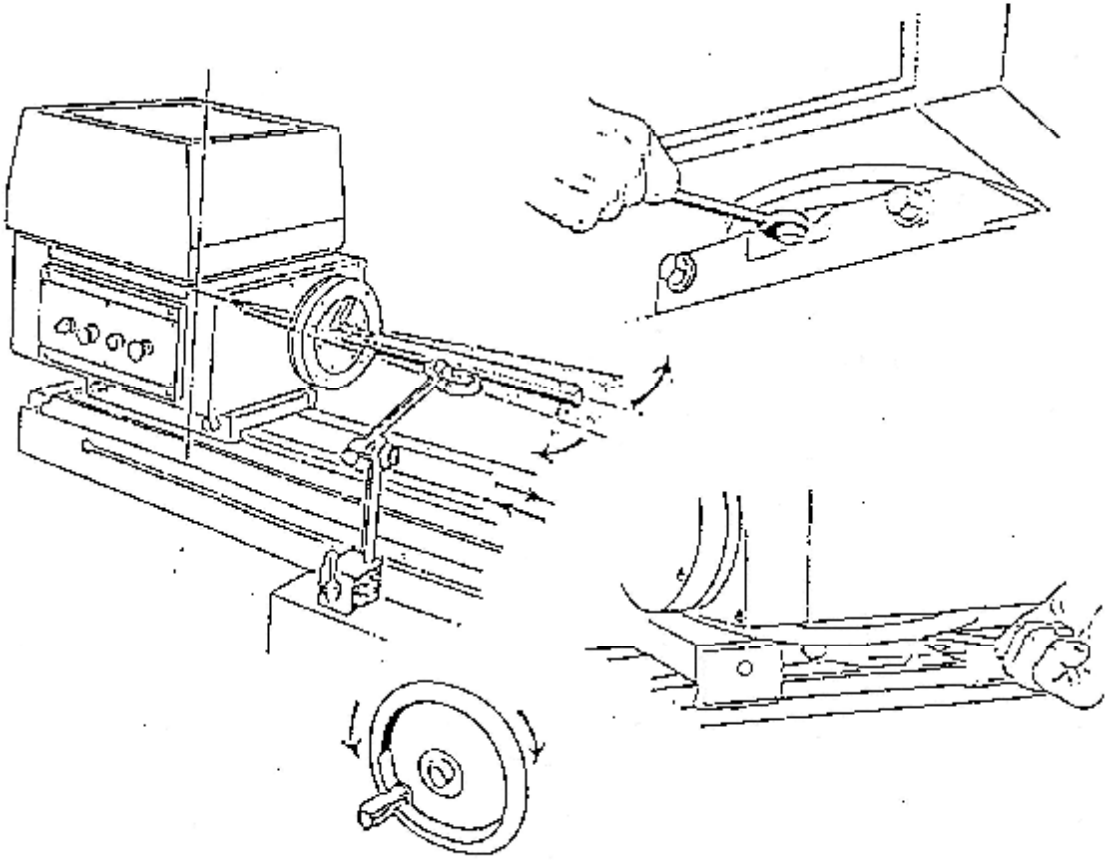
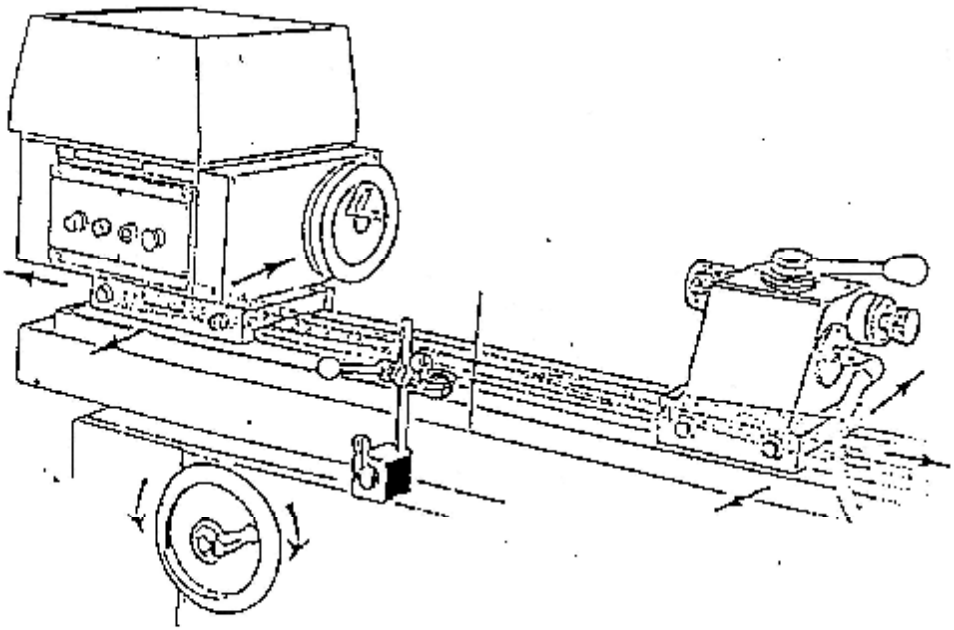
- (1) Place a dial gauge on top of table and against dovetail surface of the upper table.
- (2) Turn the table hand wheel to check if the zero-setting is obtained.
- (3) If not, adjustment can be made in reference of procedures as stated in paragraph 7-2.

B. Alignment of workhead & tailstock (Fig. 13-2)

- (1) Place a dial gauge on top of table and a test bar into the spindle bore.
- (2) Direct the stylus to the test bar.
- (3) Turn the table hand wheel to check if the zero-setting is obtained.
- (4) If not, adjust it in reference of procedures as stated in paragraph 8-2-2. (adjustment of workhead inclination)
- (5) Test grind a bar of 300 mm long and measure the diameter at both ends see if it has the same diameter. If not, realign the table.

13-2. AIR RELEASE

When table traverse to cause vibration, pull down the air release handle located at side of apron to release air and maintain a smooth movement.



14. TROUBLE SHOOTINGS & CORRECTIONS

14-1. RIPPLE MARKS:

SITUATIONS	CAUSES	REMEDY
Ripple marks	* wheel unbalanced	* rebalance the wheel
	* wheel out of roundness	* redress the wheel
	* hard wheel grains	* use a softer wheel
	* out off center or no align support or insufficient lube	* check the center, alignment and supply sufficient lube
	* dressing	* choose a sharp wheel

14-2. SCRATCH MARKS:

SITUATIONS	CAUSES	REMEDY
Deep & narrow constant marks	* a rough wheel is used	* use a fine grain wheel
A different deep & narrow & non-constant marks	* a soft wheel is used	* use a harder wheel
A wide spot	* oil stains, poor finish	* redress the wheel

14-3. SCRATCH MARKS:

SITUATIONS	CAUSES	REMEDY
A fine thread marks	* poor wheel dressing	* replace the diamond bit and dressing slowly
	* abnormal operation	* use steady rest to decrease wheel pressure
Ripple stream line	* uneven wheel edge	* dress wheel edge
Chatter marks	* incorrect wheel	* always keep diamond bit sharpen dressing & brush the wheel after cleaning
	* rough grains or dirt on wheel	* redress the wheel
	* bond agent breaks off and grains shell out	* more organic compounds in coolant & less soda compounds

14-4. SCRATCH MARKS:

SITUATIONS	CAUSES	REMEDY
Irregular scratch	* dirt left-over	* clean machine constantly
Irregular wide & long mark or ripple finish	* dirty coolant	* clean coolant tank constantly
Deep but irregulars Scratch	* wheel flange loosened	* tighten the wheel flange
Grains marks	* a rough or soft wheel is used	* use a fine grains or hard wheel
	* uneven bond density	* use an even bond wheel
	* rough dressing	* slow dressing rate & speed
	* incorrect fine grinding	* slow table speed to allow a complete spark-out

14-5. THREADING MARKS:

SITUATIONS	CAUSES	REMEDY
Rolling thread marks	* out off-center alignment	* adjust the alignment of workhead & tailstock
	* dressing	* redress the wheel slowly

14-6. GRINDING EFFECTS:

SITUATIONS	CAUSES	REMEDY
Insufficient grinding capacity, lack of luster, workpiece searing	* wheel is too hard	* increase the workpiece traverse speed * decrease the wheel speed * wheel diameter & width * don't use resin coolant * use a rough grain & soft wheel
Wheel life shortened & has high wearing	* wheel is too soft	* slow workpiece speed & feed rate * increase wheel speed, wheel diameter & width * dress wheel slowly * use high density coolant

15. LUBRICATIONS & MAINTENANCE

15-1. LUBRICATIONS:

Hydraulic oil:

Fill up the oil tank from the intake. The oil circulate in the system when machine is turned on. The volume capacity is 58 liters and the following oils are recommended.

Mobil 1405

Replace the oil semiannually and keep the oil at moderate level at all times which can be monitored from the oil sight glass. Clean the oil tank while replacing oils.

15-2. Maintenance

A. Check: turn on the power and press each button switch:

ITEM	FREQ.	MEASURES
Hydraulic oil	Daily	Check the oil sight gage at back of oil tank
Wheel spindle oil	Daily	Check the oil sight gage at back of oil tank
Coolant oil	Daily	Check the coolant level from the coolant tank oil sight glass
Hydraulic oil pressure	Daily	Check the oil meter on the hydraulic tank (about 18-20kg/cm ²)
Wheel spindle oil pressure	Daily	Check the oil meter on the hydraulic tank (about 1-3kg/cm ²)

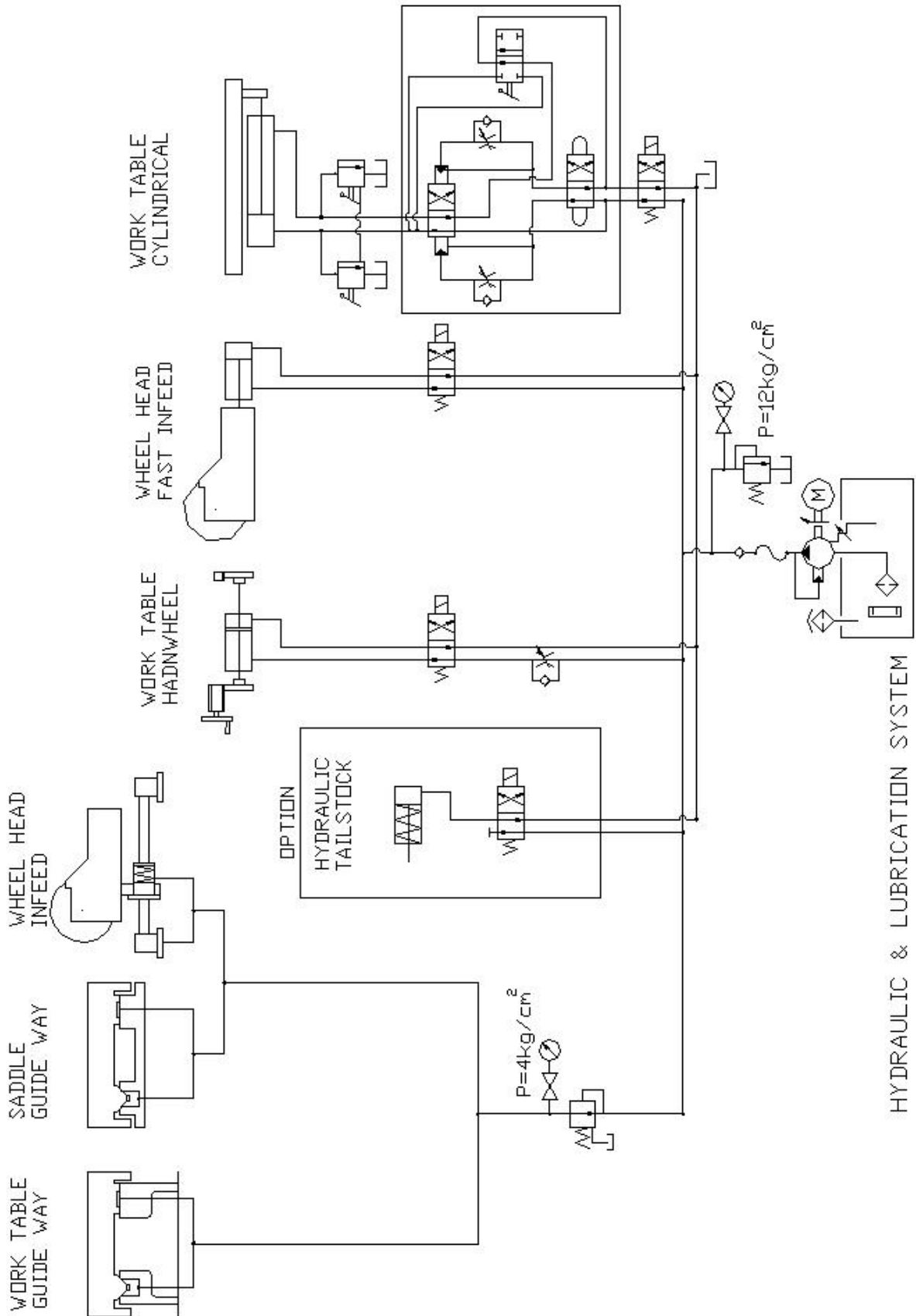
B. Oil feeds

LOCATIONS	FREQUENCY	VOLUME
Hydraulic oil	semi-annually	58 liters
Spindle bearing oil	semi-annually	35 liters
Tailstock	daily	3 c.c.
Table	monthly	3 c.c.

15-3. TEST RUNS

SEQ.	OPERATIONS	NOTES
1	Place the table Manual/Auto selection lever at "Manual" position	Ensure the gear is engaged with rack.
2	Press the wheel spindle "Start" button switch start the spindle lube pump that the oil flow thru the oil pressure micro switch to start wheel spindle.	Rotation of lub. Pump & to wheel spindle. Set the oil pressure at 1-3kg/cm ²
3	Press the hydraulic system "Start" button switch.	Rotation of motor, set the pressure at 18-20 kg/cm ²
4	Press the wheel rapid infeed button switch to move the wheelhead forward rapidly for button switch.	Keep the table off to prevent possible impact against workhead & tailstock.
5	Select the workhead speed (H or L) and press the start button.	
6	Press the coolant system "Start" button switch.	Stop the coolant before switching off the wheel spindle to avoid any vibration due to dampened wheel.
7	Adjust the travel limit dog according to work piece length.	
8	Shift the table Manual/Auto selection lever to "Auto" position to start table traverse.	
9	Adjust table speed	Higher speed for CW rotation
10	Press the wheel spindle rapid "retract" button switch.	Wheelhead retracts 45mm
11	Manual infeeds	
12	Auto infeed settings	
13	Press the emergency stop button to stop machine.	All operations and movements are shut off

15-4 DIAGRAM OF HYDRAULIC SYSTEM



16.OPERATION INSTRUCTION

16-1 MANUAL INFEEED OPERATION

1. Measure the workpiece diameter to have the actual grinding allowance.
2. Press the power "ON" button.(panel no.4)
3. Press the wheel spindle "START" button.(panel no.6)
4. At this stage, the I/D attachment remain inactivated. Set the I/D attachment ON/OFF selection switch at "OFF" position. (panel no.9) Select grinding mode selection. Set the workhead & coolant AUTO/MANUAL selection switch to "MANUAL" position (panel no.10)
5. Set the MANUAL/AUTO mode selection switch to "MANUAL" position. (panel no.3)
6. Press the workhead "START" button. (Panel8)
7. Press the coolant ON button (panel no.7)
8. Turn the wheelhead handwheel till the wheel approaches the workpiece.
9. set the lever of the table RIGHT/LEFT movement to AUTO position (Fig. 16-1-4)

This step is only for the horizontal grinding.

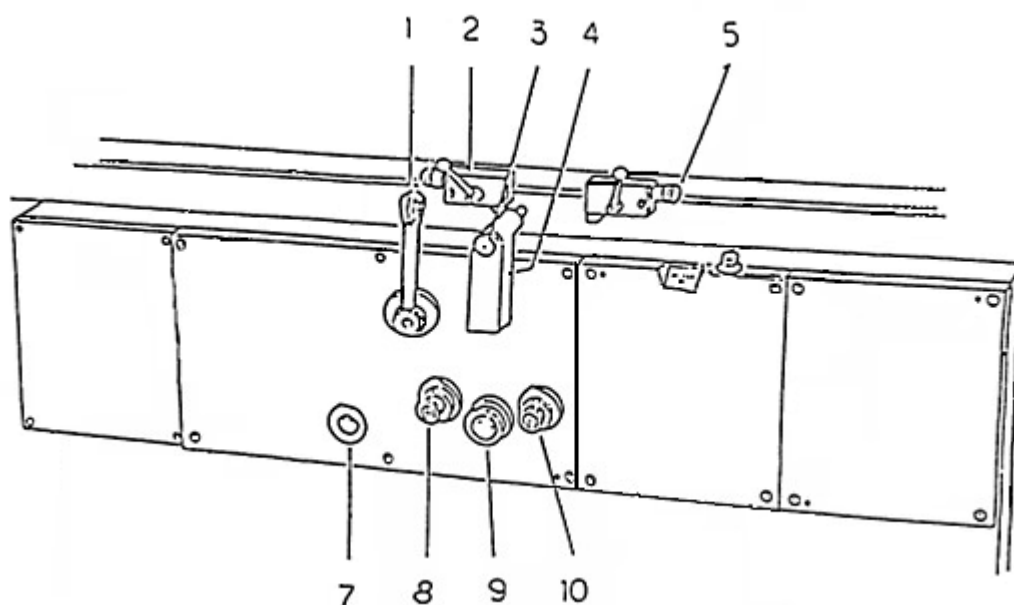
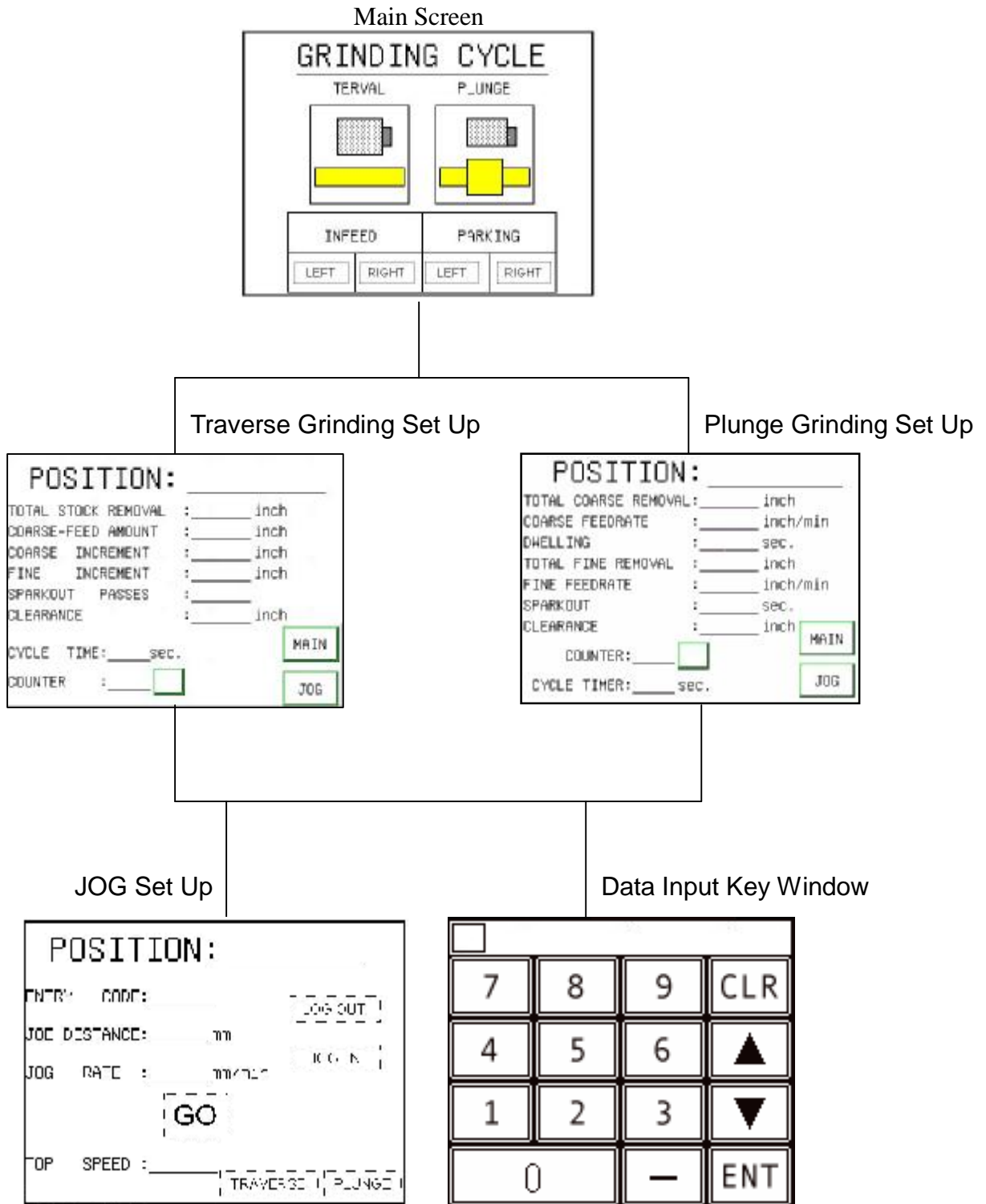


Fig. 16-1

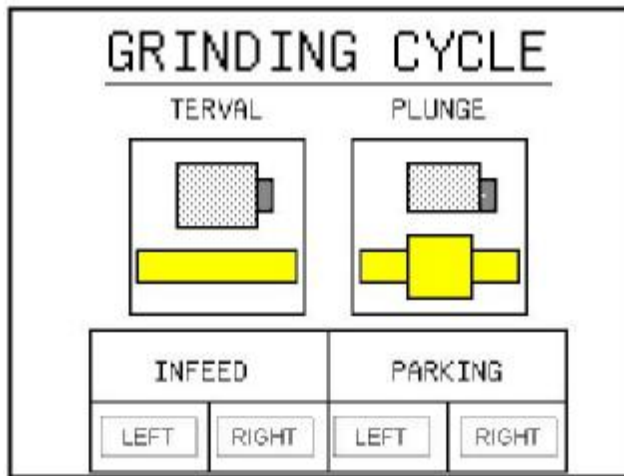
16-2 OPERATION OF AUTO INFEEED CONTROL (FOR "SE" TYPE)

16-2-1 All SCREENS DISPLAY



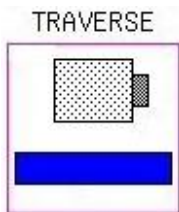
16-2-2 Grinding Type Selection

2-2-1 Main Screen

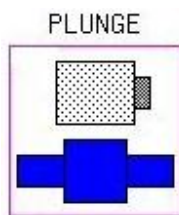


The main screen is the first screen displayed after turn on the power. On this main screen, you can choose the grinding type, feeding position, parking position.

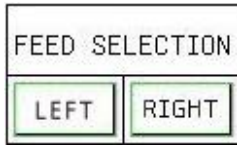
2-2-2 Function



By touching this area, you can get into "TRAVERSE GRINDING" data set up screen.



By touching this area, you can get into "PLUNGE GRINDING" data set up screen.



This area is to choose feeding position.

※You can change feeding position during grinding.

	Infeed At Left Side ONLY		Infeed At Both Side
	INFEEED AT RIGHT SIDE ONLY		No Infeed



This area is to choose parking position.

※You can change parking position during grinding.

	STOP AT LEFT SIDE ONLY		STOP AT EITHER SIDE
	STOP AT RIGHT SIDE ONLY		NO STOP

16-2-3 Data Set Up

16-2-3-1 Traverse grinding set up screen

POSITION: _____

TOTAL STOCK REMOVAL : _____ inch

COARSE-FEED AMOUNT : _____ inch

COARSE INCREMENT : _____ inch

FINE INCREMENT : _____ inch

SPARKOUT PASSES : _____

CLEARANCE : _____ inch

CYCLE TIME: _____ sec.

COUNTER : _____

The numbers will be displayed when you touch the data input area

$$\begin{aligned} \text{Total Stock Removal} &= \text{Total Coarse Feed Amount} + \text{Total Fine Feed Amount} \\ \text{Total Coarse Feed Amount} &= \text{Coarse Increment} \times \text{Number of Passes} + \text{Auto Coarse Feed Compensation} \\ \text{Total Fine Feed Amount} &= \text{Total Stock Removal} - \text{Total Coarse Feed Amount} \\ &= \text{Fine Increment} \times \text{Number of Passes} + \text{Auto Fine Feed Compensation} \end{aligned}$$

※CLEARANCE = Safety distance away from the workpiece. Wheel will retract to starting point plus clearance first, then retract again rapidly to home position by hydraulic. When grinding the next workpiece, the wheelhead will move in from home position first by hydraulic rapid infeed, then slowly move in at clearance distance until starting point.

Examples	•	,
TOTAL STOCK REMOVAL	: 0.0135 inch	0.0135 inch
COARSE-FEED AMOUNT	: 0.0126 inch	0.0126 inch
COARSE INCREMENT	: 0.0012 inch	0.0025 inch
FINE INCREMENT	: 0.0002 inch	0.0003 inch
SPARKOUT PASSES	: 1	3
CLEARANCE	: 0.005 Inch	0.005 inch

Example : •

$$\begin{aligned} \text{Total Stock Removal} &= 0.0135\text{inch} \\ \text{Total Coarse Feed Amount} &= 0.0126\text{inch} \\ \text{Total Fine Feed Amount} &= \text{Total Stock Removal} - \text{Total Coarse Feed Amount} \\ &= 0.0135 - 0.0126 \\ &= 0.0009 \end{aligned}$$

During grinding, the program will automatically calculate the number of passes and remaining balance...etc by the data you input.

From the above example :

1. $0.0126 \div 0.0012 = 10(\text{passes})$ balance is 0.0006
Coarse increment by 0.0012 inch for 10 passes, & the 11th pass by 0.0006 inch.
(When the balance is larger than fine increment, it will execute the balance by coarse grinding)
2. $0.0009 \div 0.0002 = 4(\text{passes})$ balance is 0.0001.
Fine increment by 0.0002 inch for 4 passes, the 5th pass by 0.0001 inch.
3. After fine grinding, the program will execute sparkout 1 pass, then retract to Home position.

Example : • Total Stock Removal = 0.0135inch
Total Coarse Feed Amount = 0.0126inch
Total Fine Feed Amount = Total Stock Removal – Total Coarse Feed Amount
= 0.0135 – 0.0126
= 0.0009

During grinding, the program will automatically calculate the number of passes and remaining balance by the data you input. From the above example :

1. $0.0126 \div 0.0025 = 5(\text{passes})$ balance is 0.0001
Rough increment by 0.0025 inch for 5 passes.
(When the balance is smaller than fine increment, add this balance into fine amount grinding)
2. $(0.0009 + 0.0001) \div 0.0003 = 3(\text{passes})$ balance is 0.0001.
Fine increment by 0.0003 inch for 3 passes, & the 4th pass by 0.0001 inch.
3. After fine grinding, the program will execute sparkout 3 passes, then retract to Home position.

- ※ Grinding data can not be changed again during grinding, otherwise, the program will execute abnormal and cause danger seriously.
- ※ After finish the 1st workpiece, measure if there is any tolerance. If so, reset the data before next grinding.
- ※ The screen will be displayed "SETTING VALUE ERROR" message when entering incorrect data, please correcting the data to dismiss the alarm message.

CYCLE TIME : 000.0
sec.

————— To accumulate the grinding time per cycle

COUNTER : 00000

————— To count the grinding cycles Reset (Return to zero)

MAIN

————— Touch it to get back to main screen

JOG

————— Touch it to get into JOG Set up screen

16-2-3-2 Plunge Grinding Set up Screen

POSITION: 012.456

ENTRY CODE: 0123456

JOG DISTANCE: 0123.456 mm

JOG RATE: 0123.56 mm/min

MAX. SPEED: 0123.56 mm/min

BACKLASH: 0123.456 mm

WORKHEAD OFF DWELL: 0233 sec.

MO1 JOG OUT

MO1 JOG IN

MO1 TRVERSE

MO1 PLUNGE

GO

The numbers will be displayed when you touch the data input area

Total Stock Removal = Total Coarse Feed Amount + Total Fine Feed Amount

※CLEARANCE = Safety distance away from the workpiece. Wheel will retract to starting point plus clearance first, then retract again rapidly to home position by hydraulic. When grinding the next workpiece, the wheelhead will move in from home position first by hydraulic rapid infeed, then slowly move in at clearance distance until starting point.

Example	•
TOTAL COARSE REMOVAL	: 0.005 inch
COARSE FEEDRATE	: 0.001 inch/min
DWELLING	: 3 sec.
TOTAL FINE REMOVAL	: 0.002 inch
FINE FEEDRATE	: 0.0005 inch/min
SPARKOUT	10
CLEARANCE	: 1 inch

Ex : • Total Coarse Removal = 0.005 inch

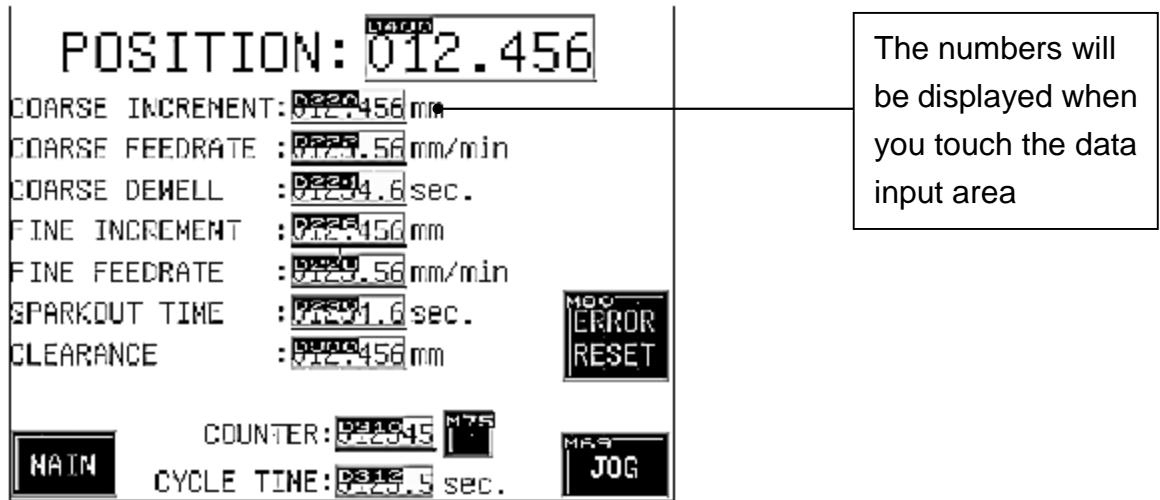
Total Fine Removal = 0.002 inch

Total Coarse Removal 0.005 inch + Total Fine Removal 0.002 inch

= Total Stock Removal 0.007inch

- (1) After coarse removal 0.005 inch by feedrate of 0.001 inch/min, dwell for 3 seconds, then fine.
- (2) Fine removal 0.002 inch by feedrate of 0.0005 inch/min, then sparkout.
- (3) After fine grinding, the program will execute sparkout for 10 seconds, then the wheelhead will retract to Home Position.

16-2-3-3 JOG SET UP



1. Error reset
When over traver on Xaxis, you can press this button to reset thr funtoin.
2. Back lash
Enter the amount to compensate thr backlash.
3. Workhead off dewll
Enter the figure to delay the workhead turn off time after grinding cycle.
4. X axis rapid infeed
Press this button to excute rapid infeed on X axis under manual mode.

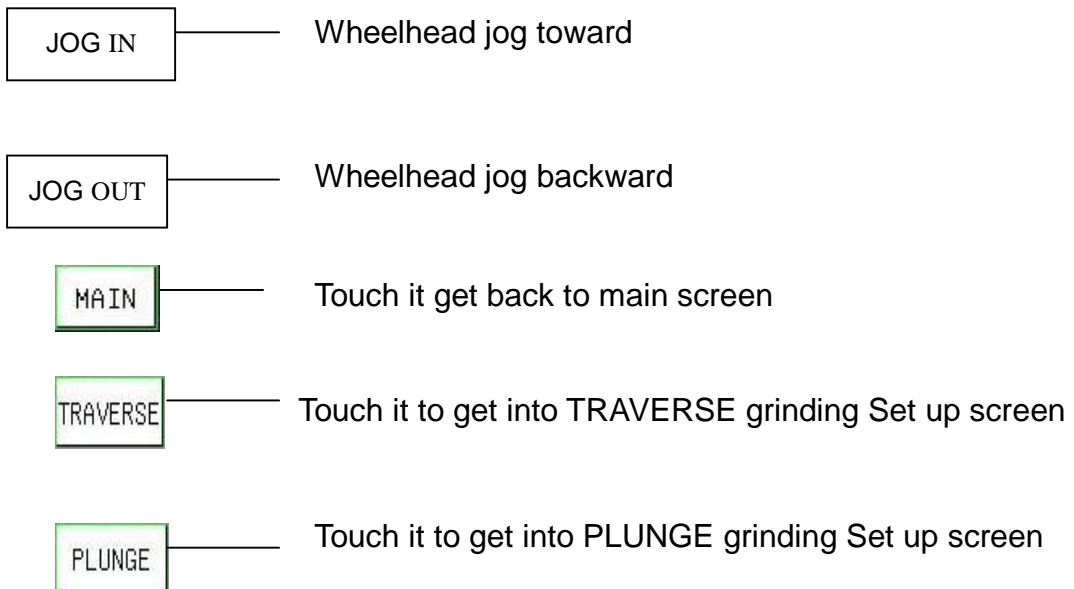
ENTRY CODE : 000000 ——— This data is a preset value for service use only

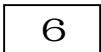
JOG DISTANCE : 00.99999 inch ——— To adjust the distance for wheelhead to move

◎After entering the data, press "GO" to move the wheelhead.

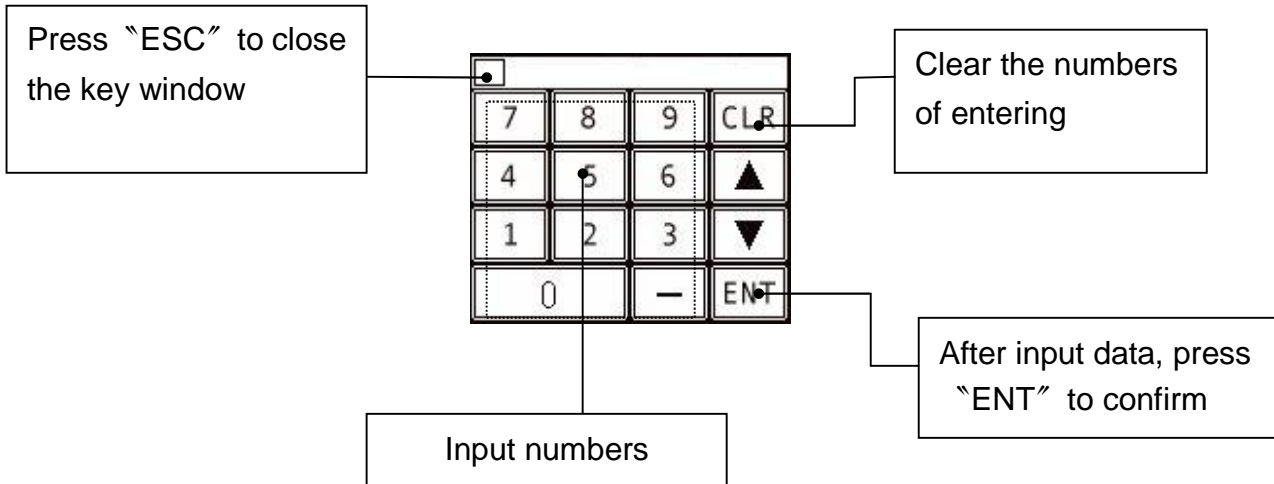
JOG RATE : 0.0012 inch/min ——— To Set up the moving speed for wheelhead

◎After entering the data, press "JOG+" or "JOG-" to move the wheelhead.

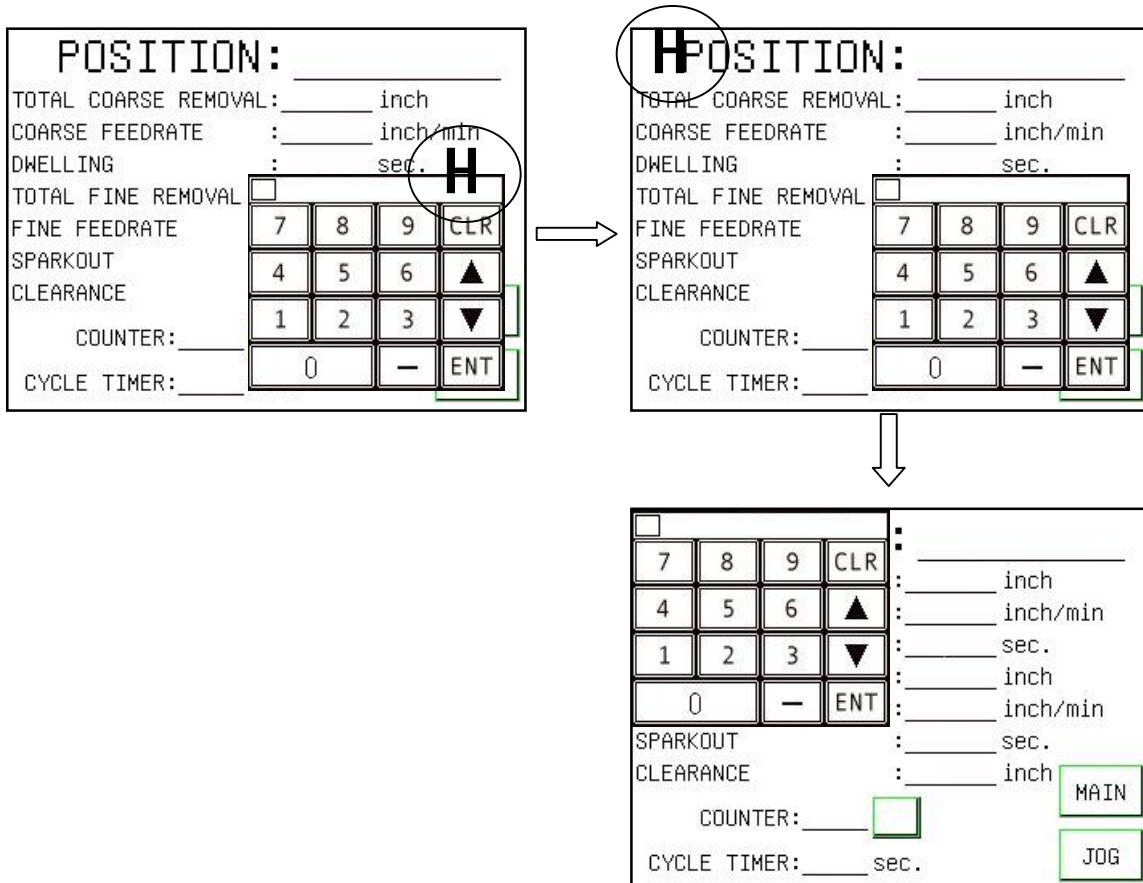


※When entering the incorrect data, the system will display “SET NUMBER IS INCORRECT” message, press  to dismiss the alarm message, and the previous data will be displayed.

16-2-3-4 Data Input Key Window



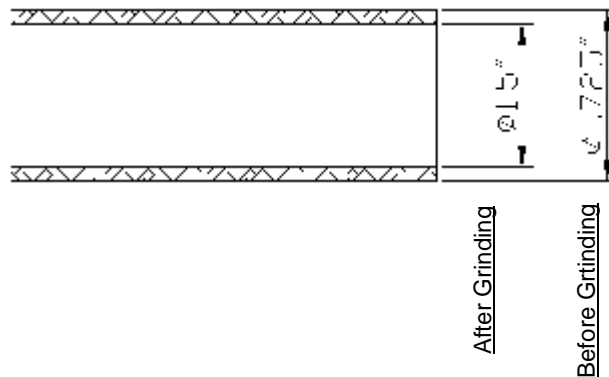
The key window will be displayed when you touch the data input area. If the key window block the area you want to see, touch the top blank area of key window, then point to any desired position, the key window will be displayed at pointed position. (Fig. Below)



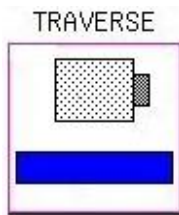
16-3. EXAMPLE

16-3-1 TRAVERSE GRINDING

- a. Measure the workpiece, and find out the total stock removal amount. Ex: Diameter of 1.725 inch






- b. (b) Select Type Of Grinding
(1) Press





- (1) Input grinding data

TOTAL STOCK REMOVAL	:	0.045	inch
COARSE-FEED AMOUNT	:	0.0436	inch
COARSE INCREMENT	:	0.003	inch
FINE INCREMENT	:	0.0003	inch
SPARKOUT PASSES	:	2	
CLEARANCE	:	0.03	inch

- c. Start the wheel spindle (Control Pane ) & hydraulic system control panel
- d. Adjust MAN/AUTO switch to MANUAL mode (Control Pan )
- e. Press wheel head rapid infeed button (Control panel
- f. Move handwheel to let the wheel touch the workpiece slightly

g. Adjust MAN/AUTO switch to AUTO mode (Control Panel )

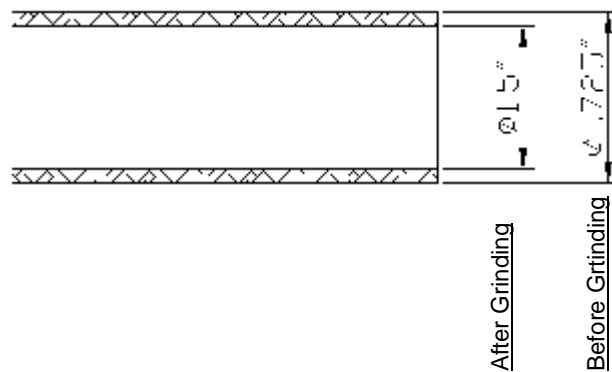
and also switch the workhead & coolant to auto (Control Panel )

h. Press the Cycle button to start the cycle (Control Panel )

i. Set the lever of the table RIGHT/LEFT movement to AUTO position (Fig.16-1-4) This step is only for the horizontal grinding.

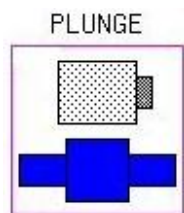
16-3-2 PLUNGE GRINDING

a. Measure the workpiece, and find out the total stoke removal . Ex: Diameter of 1.725




b. Select type of grinding


(1) Press




(2) Input Grinding Data


TOTAL COARSE REMOVAL	:	0.0425 inch
COARSE FEEDRATE	:	0.001 inch/min
DWELLING	:	10 sec.
TOOTAL FINE REMOVAL	:	0.0025
FINE FEEDRATE	:	0.0005 inch/min
SPARKOUT		2
CLEARANCE	:	0.03 inch

C. Start the wheelhead spindle (Control Panel )

D. Adjust MAN/AUTO switch to manual mode (Control Panel )

E. Move handwheel to let the wheel touch the workpiece slightly

F. Adjust MAN/AUTO switch to auto mode (Control Panel )

and also switch the workhead & coolant to auto (Control Panel )

G. Press the Cycle Button to start the cycle (Control Panel )

16-4 INTERNAL GRINDER WORKING MANUAL PROCEDURE

1. Press Wheel head rapid in feed/retract button to move the wheel head to be forwarded
2. Run I/D spindle by pushing the I/D spindle start button, this action can be done before Doing item 1.
3. Use the wheel head in feed hand wheel to find the center of the I/D of work piece
4. Adjust the distance of the two limit blocks length area with depend on the length of the work piece.
5. Use the wheel head in feed hand wheel for touching the grinding wheel to the work piece
6. Use the table traverse hand wheel to touch the whole length of the work piece
7. Move out the grinding wheel far from the work piece by table traverse hand wheel then Measure the I/D of the work piece for make sure the last stock removal to find the request Dimension.
8. Do as item 5 and continue to grind the work piece by wheel head infeed handwheel with each downfeed amount 0.05mm for example, then select the table feed selection lever to auto position to grind the whole workpiece till find the actual internal diameter of the workpiece, then move out the grinding wheel by table traverse handwheel.
9. Adjust the micro of the wheelhead infeed handwheel to zero position.
10. Move back the position of the wheel head to the safety position for doing the second workpiece.

17. OPERATING PROCEDURES OF HYDRAULIC PARALLEL DRESSING ATTACHMENT (OPTION)

1. Adjust the dressing speed knob (No.1) to appropriate level.
2. Turn the wheel dressing knob (No.2) downward till contacting the wheel surface.
3. Turn the wheel dressing direction control knob (No.3) to start dressing.

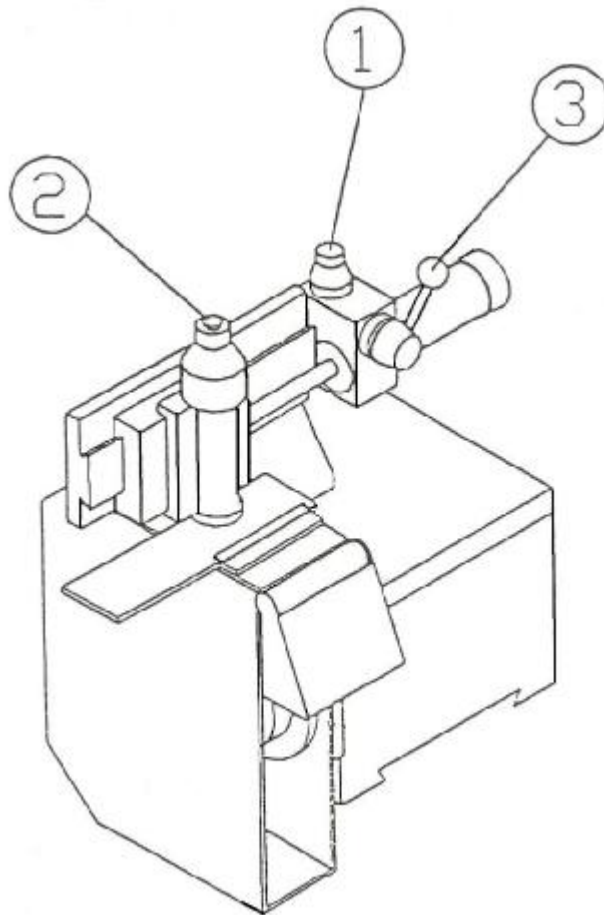


Fig.17

18. INSTALLATION OF I/D ATTACHMENT&HYDRAULIC PARALLEL DRESSING ATTACHEMENT (OPTION)

18-1. Due to the fact that the internal grinding attachment and hydraulic parallel dressing attachment are individually installed on top of the wheelhead. In case both items are ordered at same time, please exchange them according to the following procedures.

1. Swing down the internal grinding attachment and screw it onto the bracket.
2. Place a strap cross the internal grinding attachment and hang it up by a overhead crane.(Fig. 18-1)
3. Remove the 4setting screws (No. 1) at the bracket and the taper pin (No. 2).
4. Remove the internal grinding attachment from wheelhead.
5. Place a strap cross the hydraulic parallel dressing attachment. (Fig. 18-1).
6. Mount the attachment onto the wheelhead. Insert the taper pin(No. 4) and screw up the 4 setting screw (No. 3).

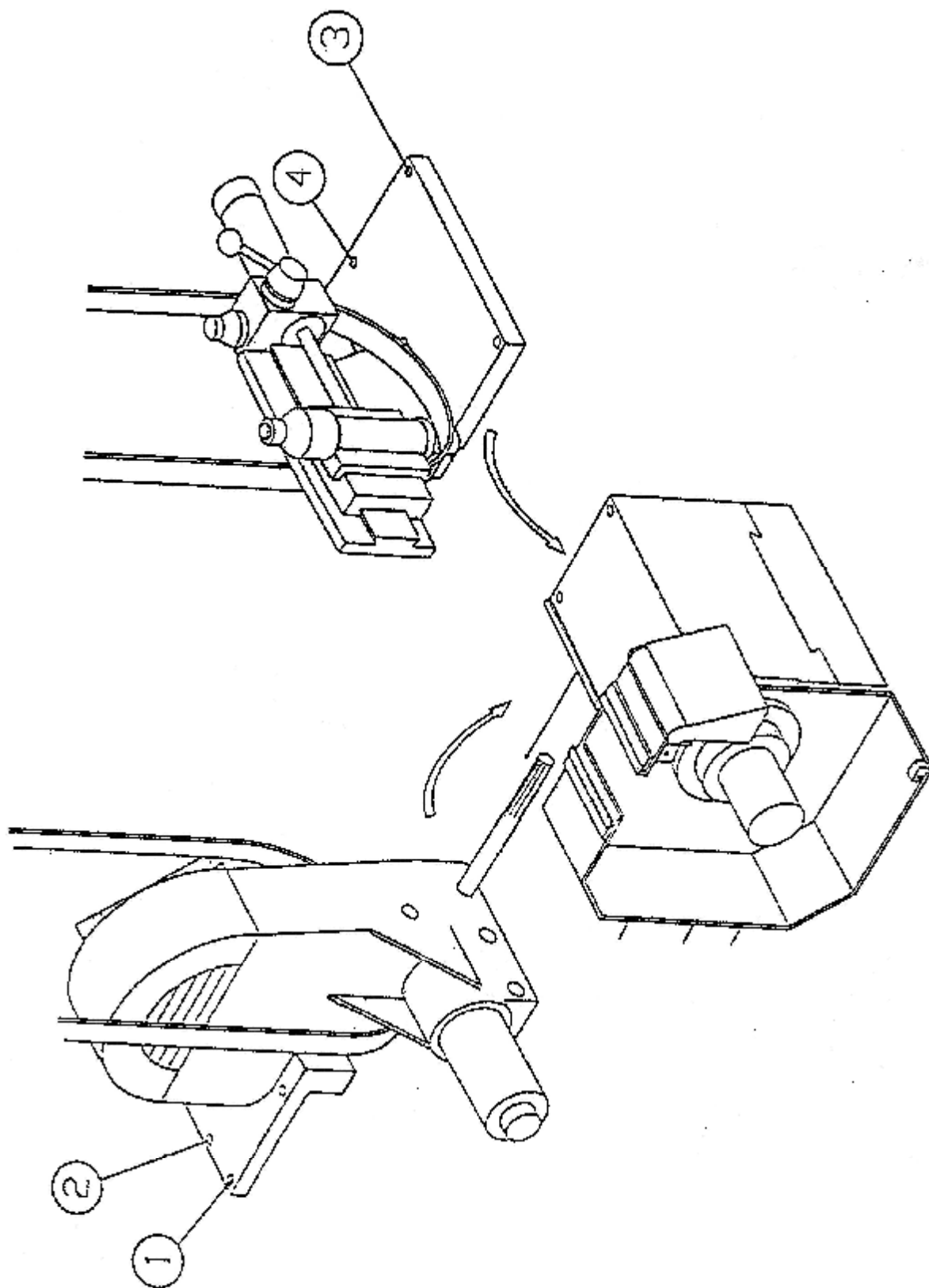


Fig. 18-1

18-2.ALIGNMENT OF INTERNAL GRINDING ATTACHMENT

1. Place a dial indicator (No. 1&2) on table surface and release the setting screws a bit lightly (No. 4).
2. Move the table left & right manually to check the parallel between the centerline of workhead & tailstock, and the I/D attachment vertical & horizontal direction (No. 3).
3. Tighten the 4 setting screws (No. 4) and check the parallel again.
Repeat item provided the parallel goes astray.

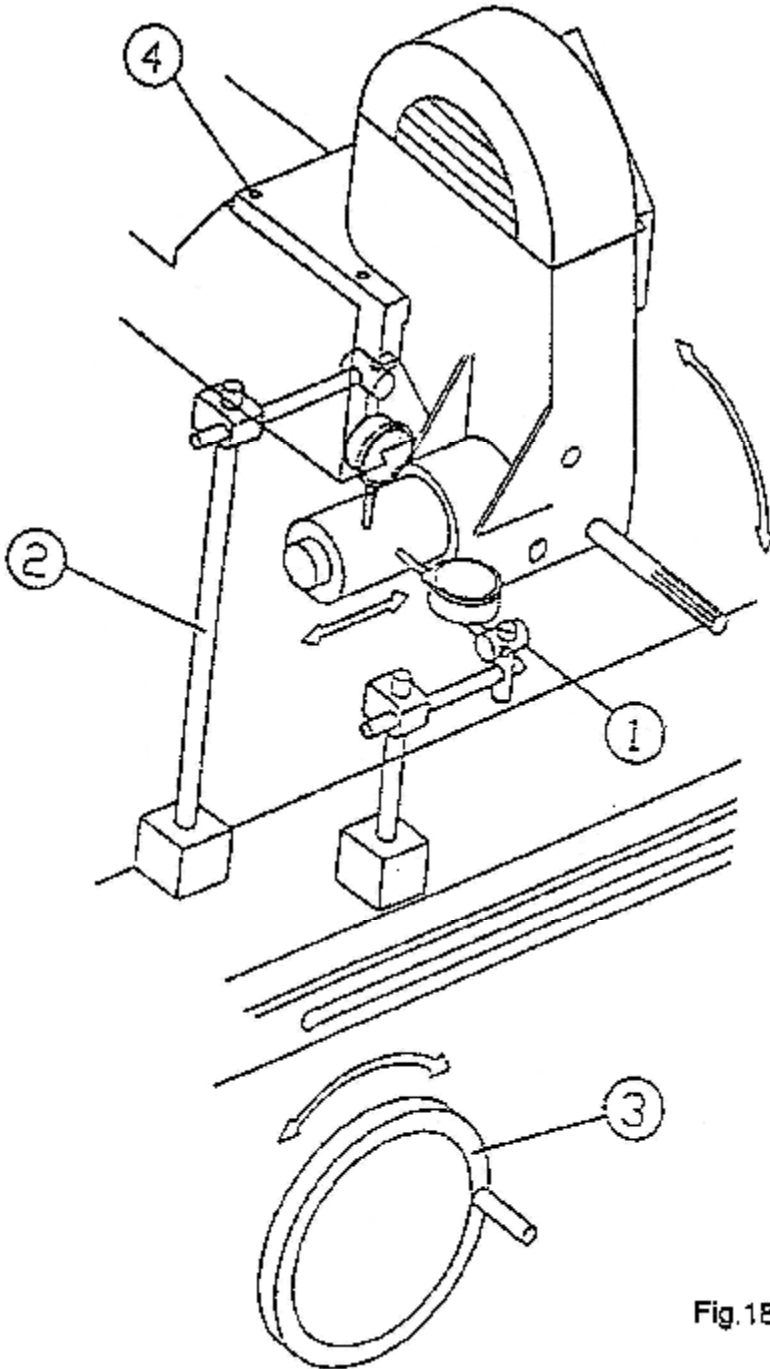


Fig.18-2

18-3. ALIGNMENT OF HYDRAULIC PARALLEL DRESSING ATTACHMENT

1. Place a dial indicator onto the sleeve (No. 1&2) of the hydraulic parallel dressing attachment and release the 4 setting screws (No. 4) a little bit at the bracket.
2. Turn the dressing control switch (No. 3) left & right to check the parallel between the wheel spindle center line and hydraulic dressing attachment movement on horizontal & vertical direction.
3. Tighten the 4 setting screws and check the parallel again. Repeat item 1 & 2 in case the parallel goes astray.