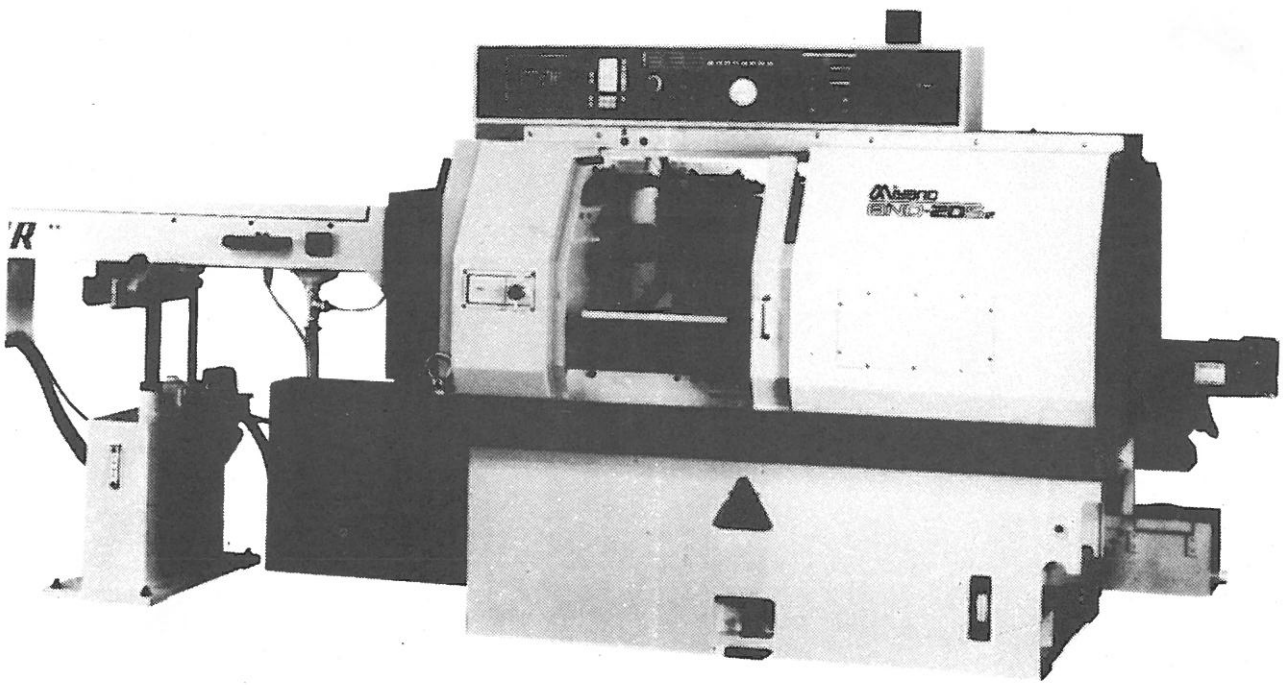
BND – 20S$_2$
BND – 34S$_2$



Miyano

Gentleman!

Thank you for the purchase of our BND-20S/BND-34S machine.
We are sure that you will be well pleased with the performance of your fine machine tool. Our engineering staff is always at your disposal concerning any technical or service questions you may have.

* BND-20S described in this manual is identical to BND-$20S_2$, and BND-34S to BND-$34S_2$.

Miyano
The World Leader in Precision

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SAFETY PRECAUTIONS

The purpose of this notation is to protect operators and machines against unexpected accidents. Users are kindly requested to take due note of the following cautions and carry out a safety operation.

1. GENERAL NOTATION

The following rules will help create an accident-free enviroment and raise productivity.

1) Wear safety spectacles and safety shoes.
2) Work with right dress; Wear a work cap properly. Avoid any flap on your work clothes.
3) Do not operate machine with gloves on.
4) The area around a machine should be well lit and dry. Keep the area in order and do not leave obstacles recklessly.
5) Clean off the chips and dust on the machine, panel of the control unit, NC unit, and the floor around the machine. Avoid use of compressed air as much as possible.
6) Do not put tools or other objects on any part of the machine, not to mention its moving parts.

2. NOTATION CONCERNING MACHINE OPERATION

Read the machine operation manual thoroughly before operation the machine.

(1) Before Power Switch is Engaged

1) Do not put any object, inside and outside of the machine, which may become an obstacle against safety operation.
2) Make sure the door of NC unit is closed.
3) Check oil level according to the periodical inspection of oil quantity in the oil supplying standard.
4) Choose coolant out of our recommended coolants.
Use of coolant other than our recommended ones may cause peeling of coating, early deterioration of switches, damage to packings and rubbers, damage to resin parts, breakage of wiring cables due to hardening, rust on the metal portion of bearings, slideways, etc., galling and the like.

(2) Maintenance

1) An operator and a person in charge of preservation have to read and observe the notation on the caution plate attached to the machine. Make sure the caution plate is not soiled, damaged, or taken off.
2) Always Shut all doors and covers of the machine except during adjustment. Use caution especially on the NC and panel of control unit.
3) Do not remove or modify the machanisms and electric circuit installed for various safety reasons, such as the limit switches for the stroke check of the slide or the interlocking against splashing.
4) Use proper spanners and wrenches for repairing and adjusting.

(3) Machine Operation

1) Make sure the chucking presure is adequate.
2) Check to see if chucking is perfectly done.
3) Check the chucking pressure again if the chuck opens and closes abnormally slow.

4) Regularly disassemble and clean chucks.
5) When applying hooks to top-jaw, use one that is machined to fit the shape of the work piece.
6) Keep the top-jaw from overhanging to ensure a good chucking operation.
7) Clean the filters regularly.
8) Never use the selector switch of spindle chuck when the main axis is rotating.
9) Chuck safety cover must always be in place.
10) Always close front door during the operation.
11) Observe the restriction of chucking.
12) Always make trial run after any tool change.
13) Never take away chips and touch a work during operation.
14) Before machining, always operate manual zero return and check.
15) High voltage electricity is running in various part of the NC unit. Never touch inside the NC unit unless it needs to be fixed.
16) Shut off the power source during fuse changes.
17) Shut off no-fuse breaker when operation is suspended by power failure. Shut down the main power switch especially in case of the falling of a thunderbolt.
18) Make sure the voltage of the power supply for the machine is proper.
19) Remember well the position of the emergency stop botton so that you are always ready to push it immediately at any moment.
20) Never allow your hands near rotating parts during the operation.
21) It is dangerous to pull and remove tangling chips by hand. Always stop the machine to dispose of chips.
22) Shut off the machine to adjust the direction of the coolant nozzle.

(4) Tool Setting

1) Stop the main spindle and each axis during tool setting.
2) Install tools within proper length and size. If they are longer, the tool edge might interfere with slide, cover, or tailstock during the rapid traverse motion.
3) When using a turret, arange tools in good balance. Because the turret indexing speed is high, if the tool arrangement is extremely unbalanced, the indexing may not be done accurately.

(5) Barwork

Always use proper vibration arresting bar guide.

(6) Chuck Work

1) When attaching a work on the chuck, care should be taken on its balance. Never turn the main spindle in excessively bad balance.
2) Use specified hooks and attach them to set inside the OD of the chuck.
3) For the setting of chuck cylinder pressure, refer to the column of the adjustment of chucking.
4) Use care on the shape and the position to grip the molded rings of hooks. After paring the hooks, make sure they grasp the work securely and the chucking pressure is adequate.
5) In the case of a center work, use care on the hole, its shape, and the driving force of the center. There is a danger that a work may pop out if heavy load is applied on a small center hole.

(7) End of Operation

Shut off no fuse breaker and the main power switch. Clean the machine, coat anticorrosive on each slide surfaces and parts of machine after the operation is finished. Use special care if water soluble paring agent is used.

3. SAFETY CAUTION AGAINST NC UNIT AND ELECTRIC INSTRUMENT

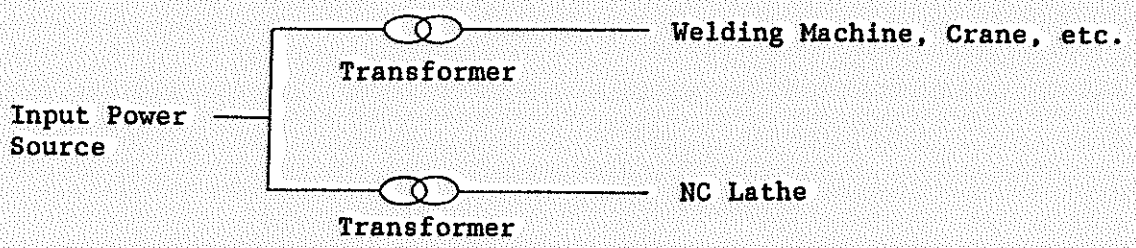
Please care about the following points when using NC units and electric instruments for machine operation or maintenance.

1) Avoid shock on the NC unit and the panel of the control unit.
2) For the main power line to the machine, use a cable of proper thickness specified in the manual. Avoid using excessively long cable. If the main power line has to crawl on the floor, means have to be provided to protect it from damage by chips.
3) On trial run, make sure the parameters of the NC unit are proper values according to the parameter lists on the machine.
4) Do not change the set values of the power supply for the thermal relay in the control box. Do not change the set values of various volumes.
5) Do not apply force to band the connector of Cannon plug, flexible tube and capture code. For conservation and inspection, press emergency stop botton on the control panel. Shut off the main switch. Turn off open-close select switch to shut off the power source. After confirming all of above, proceed the conservation or the inspection. Lock the power off state and put a sign of caution on the board and the operation bottons of the machine. Prohibit operation except by the participants.
6) Use extra caution in the treatment of the electric instrument. Never touch switches with fingers wet with paring oil.
7) Use specified instrument in the panel of control box. Especially, use a specified fuse. Avoid over capacity and never use copper cables.

4. PROTECTION AGAINST ELECTRO MAGNETIC NOISE

To protect human life and machines against unexpected accidents caused by the electromagnetic noise, users are kindly requested to take due note of the following cautions and carry out the safety operation.

1) In case of lightning, immediately shut down the machine operation and shut both the no-fuse breaker and the primary power switch.
2) Install the transformers to separate the power source for electric welding machine, crane or other large-noise generating machines from the power source for the NC lathe. Provide further shieldings to insulate the noises from other machines.



3) Perfectly ground the NC lathe using 3 grounding work (with the electric resistance against earth less than 100.)
4) Use the proper cable of the specified thickness.
5) Supply voltage 200, 220, 230V+10%, -10%, 50/60Hz± 1Hz
An excessive voltage drop, which may be caused by lack of the plant power supply may lead to the mulfunction of the NC lathe. Appropriate measures should then be required to power supply.
6) Where the power supply is insufficient or inadequate, or where lightning is often expected, it is recommended to install the Line Surge Protector.

5. PROTECTION AGAINST FIRE

Because NC lathes are operated at high rotation speed. They yield more chances of fire hazzard, we recommend you to observe the following points.

1) Where paring oil is used, make sure to install automatic fire extinguisher.
2) The standard models are not meant to be automatic operation system. Make sure that operating machines are always under watch. There may be possibility of fire caused by the braking of bits or drills which may ignite some type of cutting oil.
3) We recommend to insure the machines against the fire.
4) Before operation, be sure to confirm that the cooling fun motor for the spindle motor and the cooling fun motor inside the control box are rotating. Especially, pay the full attention to this respect at the time of operation after a long interval.
   It is dangerous due to overheating of the spindle motor and the control box if you start operation while these fun motors are not rotating.

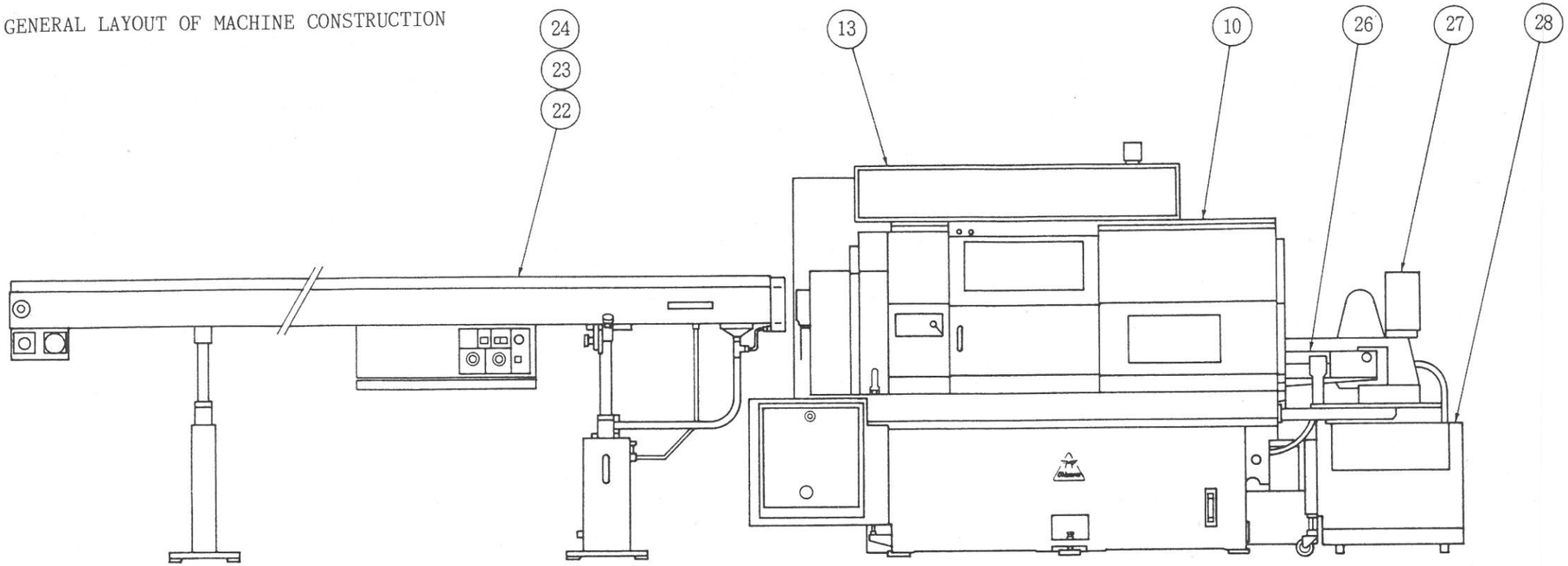
BND-S OUT 0-TC 92/7

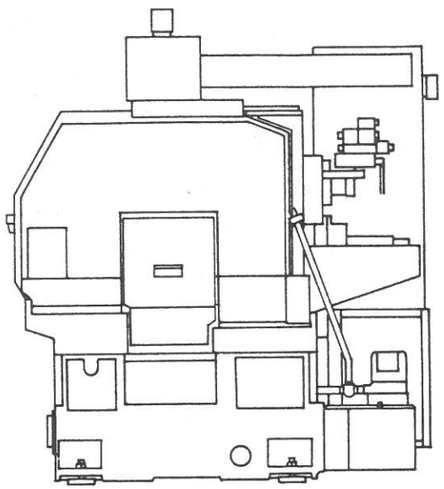
OUTLINE

OCT. 1989
EDITION 3-0

CONTENTS

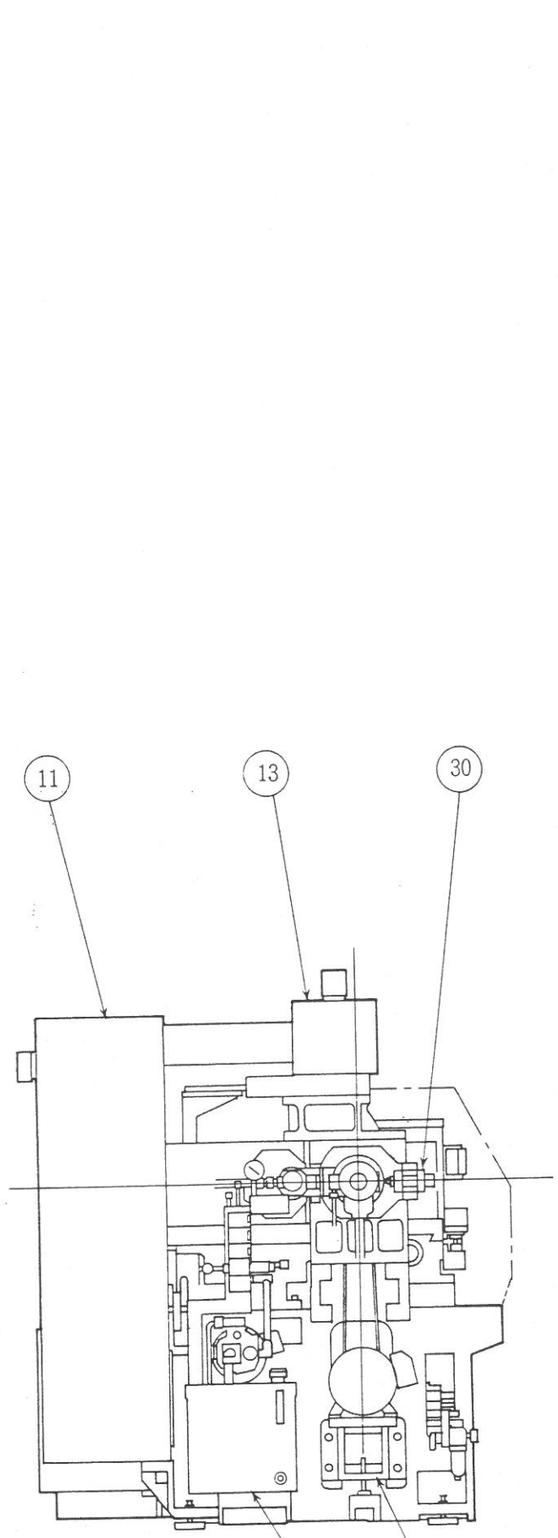
1. GENERAL LAYOUT OF MACHINE CONSTRUCTION





Code	Nomenclature of device	
1	Base	
2	Spindle	
3	Main turret slide	
4	Sub spindle and B slide	
5	Spindle drive	
6	Hydraulic equipment	
7	Spindle assembly S for spring collet	
8	Spindle assembly S for rubber flex collet	
9	Spindle assembly H for power chuck	
10	Oil guard	
11	NC box	Electrical equipment
12	Invertor box	
13	Control box	
14	Lubricating system	
15	Pneumatic (OPT)	
16	Coolant	Coolant
17	Level switch (OPT)	

Code	Nomenclature of device
18	Work ejector and inner coolant B (Air cylinder type)
19	Work ejector and inner coolant A (Spring type)
20	Spindle Ass'y S for sub spindle spring collet
21	Spindle Ass'y S for sub spindle rubber flex collet
22	ASR F single bar feeder (Basic OPT)
23	MS tube outside bar feeding (Specially designated OPT)
24	PF-V magazine bar feeder
25	Part catcher (OPT)
26	Part conveyor (OPT)
27	Hinge type chip conveyor (OPT)
28	Chip box (OPT)
29	High pressure coolant (OPT)
30	Main spindle positioning (OPT)
31	Sub spindle positioning (OPT)
32	Revolving tool drive unit (OPT)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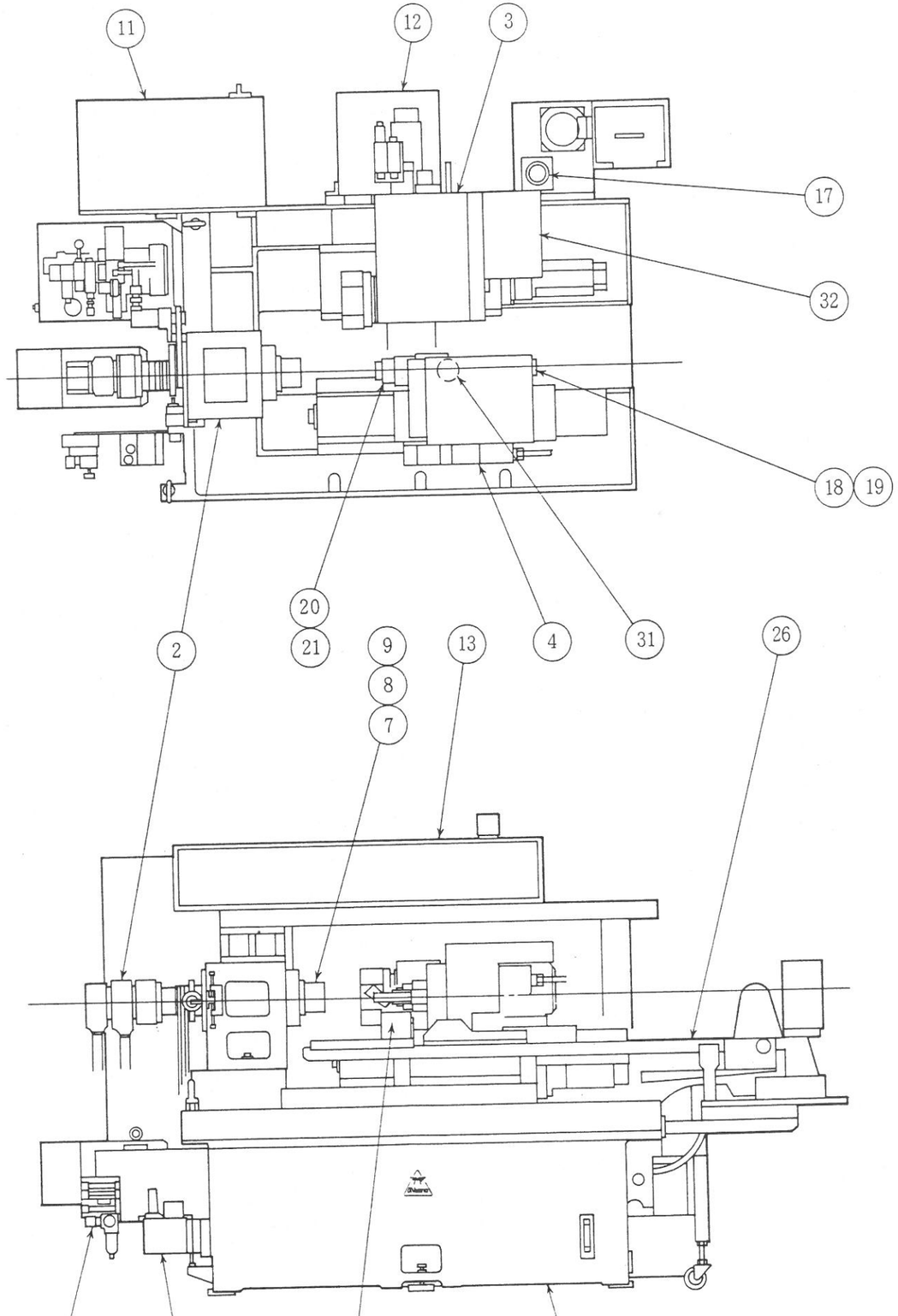
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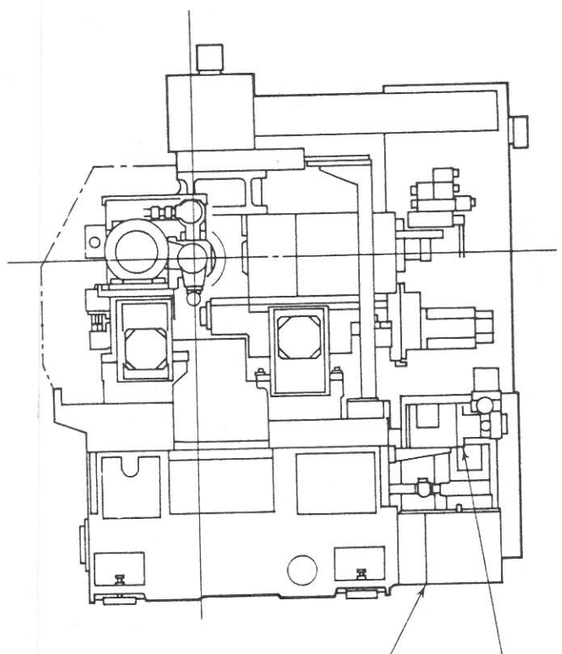
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2. SPECIFICATIONS AND TECHNICAL DATA

2-1. Machine Specifications

	BND-20S$_2$	BND-34S$_2$
Machining Capacity		
Bar capacity, Rd.	Max.13/16"(20mm) Min. 1/4" (6mm)	Max.1-1/4"(34mm) Min.1/2" (12mm)
Chucking work capacity, Rd.	2" (50mm)	3" (75mm)
Max. work length		
for bar work	4"(100mm)	5"(125mm)
for chucking work	4"(100mm)	5"(125mm)
Main Spindle		
Collet chuck system	<u>USA</u> o B&S #11 o B&S #11C o HARDINGE 5C Collet chuck o HARDINGE 5C Step chuck o HARDINGE S10 Pad type o Rubber-Flex RF#20 <u>Europe</u> o DIN 148E o Rubber-Flex RF#18	<u>USA</u> o B&S #22 o B&S #22C o HARDINGE 5C Collet chuck o HARDINGE 5C Step chuck o HARDINGE S12 Pad type o HARDINGE S15 Pad type o Rubber-Flex RF#36 <u>Europe</u> o DIN 171E o Rubber-Flex RF#36 o Crowford M673
Spindle Nose	Flat	Flat
O.D. of spindle nose	3.346"(85mm)	4.331"(110mm)
Inner dia. of draw tube	.866"(22mm)	1.417"(36mm)
Chucking System	Hydraulic rotary cylinder	
Spindle Speed Range	220 to 6500 rpm	170 to 5000 rpm
Spindle Drive		
Spindle Motor (Variable speed AC)	5 HP (3.7kW)	7.5 HP (5.5kW)
Spindle Speed Drive System	Infinitely variable V-belt	
Main Turret Slide		
Axis Controlled	2	2
Tooling Stations	8	8
Max. Indexing Clearance	18.5" (ϕ 470mm)	19.291" (ϕ 490mm)
Distance Across Flat	8.268"(210mm)	8.268"(210mm)
I.D. Tool Hole Size	3/4" (20mm)	1" (25mm)
Tool Shank Size	3/4"Sq (20mm)	3/4"Sq (20mm)
Max. Slide Stroke (X-Axis)	4.05"(103mm)	5.5"(140mm)
(Z-Axis)	6.5"(165mm)	8.3"(210mm)
Rapid traverse rate (X-Axis)	472 IPM (12m/min)	
(Z-Axis)	472 IPM (12m/min)	
X-Axis Servo-motor	FANUC Model 0 AC 0.68 HP (0.55kW)	
Z-Axis Servo-motor	FANUC Model 5 AC 1.1 HP (0.9kW)	
Indexing Time	0.5 sec/1pos 1.0 sec/180°	0.5 sec/1pos 1.0 sec/180°
Index Motor	AC0.67HP(0.5kW)	AC0.67HP(0.5kW)

	BND-20S$_2$	BND-34S$_2$
Subspindle Collet chuck system	<u>USA</u> o B&S #11SC o Jacobs rubber flex RF #18 <u>Europe</u> o Jacobs rubber flex RF #18 o DIN 148E	<u>USA</u> o B&S #22SC o Jacobs rubber flex RF #36 <u>Europe</u> o Jacobs rubber flex RF #36 o DIN 171E o B&S22 o Crowford M673
Spindle Nose	Flat	Flat
O.D. of spindle nose	3-5/16" (84mm)	4.331" (110mm)
Inner dia. of draw tube	25/32" (20mm)	1.023" (26mm)
Chucking System	Hydraulic rotary cylinder	
Spindle Speed Range	220 to 6500 rpm	170 to 5000 rpm
Spindle Drive Spindle Motor (Variable speed AC)	1.97 HP (1.5kW)	2.87HP (2.2kW)
Spindle Speed	Infinitely Variable	
Drive System	Poly banrope	
Axis Controlled	B-Axis only	
Max. Slide stroke (B-Axis)	11" (280mm)	12.8"(235mm)
Rapid traverse rate (B-Axis)	472 IPM (12m/min)	
B-Axis Servo-motor	FANUC Model 0 AC 0.68HP (0.55kW)	FANUC Model 5 AC 1.1HP (0.9kW)
Hydraulic Equipment Tank Capacity	10 Gal. (40ℓ)	
Pump Motor	AC 200V 2 HP (1.5kW)4P	
Pump Capacity	50Hz:3.9Gal/min (15ℓ/min) 60Hz:4.7Gal/min (18ℓ/min)	
Hydraulic Pressure	640 PSI (45kgf/cm^2)	
Insufficient oil detection method	Level Switch (Standard equipment)	
Lubricating Tank Capacity	0.26Gal (1ℓ)	
Pump Motor	AC 100V 0.005 HP (4W)	
Pump Capacity	1 to 3 cc/cy	
Standard setting discharge	2 cc/cy	
Insufficient oil detection method	Level switch (Standard equipment)	
Distribution method	Resistance type distribution method	
Coolant Tank Capacity	43 Gal. (165ℓ)	
Pump Motor	AC 200V 0.53HP (0.4kW)2P	
Pump Capacity	52Gal/min (200ℓ/min)	

BND-S2 OUT 0-TC 92/7

	BND-20S$_2$	BND-34S$_2$
Size of the Machine Floor Space without Bar Guide Weight	62-3/8" × 96-7/16" (1585mm × 2450mm) 7238Lbs (3290kg)	62-3/8" × 97-13/16" (1585mm × 2485mm) 7964Lbs (3620kg)
Power Supply Voltage Cycle Capacity	AC 200/220V + 10%, -15% 50/60Hz ± 1Hz 3 Phases 12.5kW/21KVA	15kW/26KVA
*Revolving Tool (OPT) Number of Revolving Tool Installed Rotation Speed of Revolving Tool Motor for Revolving	Max 4 133 to 4000 rpm 0.64/0.53HP 1.47/1HP (AC 0.48/0.4kW)(AC 1.1/0.75kW)	
*Spindle Positionning Indexing Number Indexing Angle	48 dividents 7.5°	
*High Pressure Coolant Pump Motor Pump Capacity	0.53HP (0.4kW) 2.86Gal(11ℓ/min)	

2-2. Specifications of the NC (MIYANO-FANUC 0-TC)

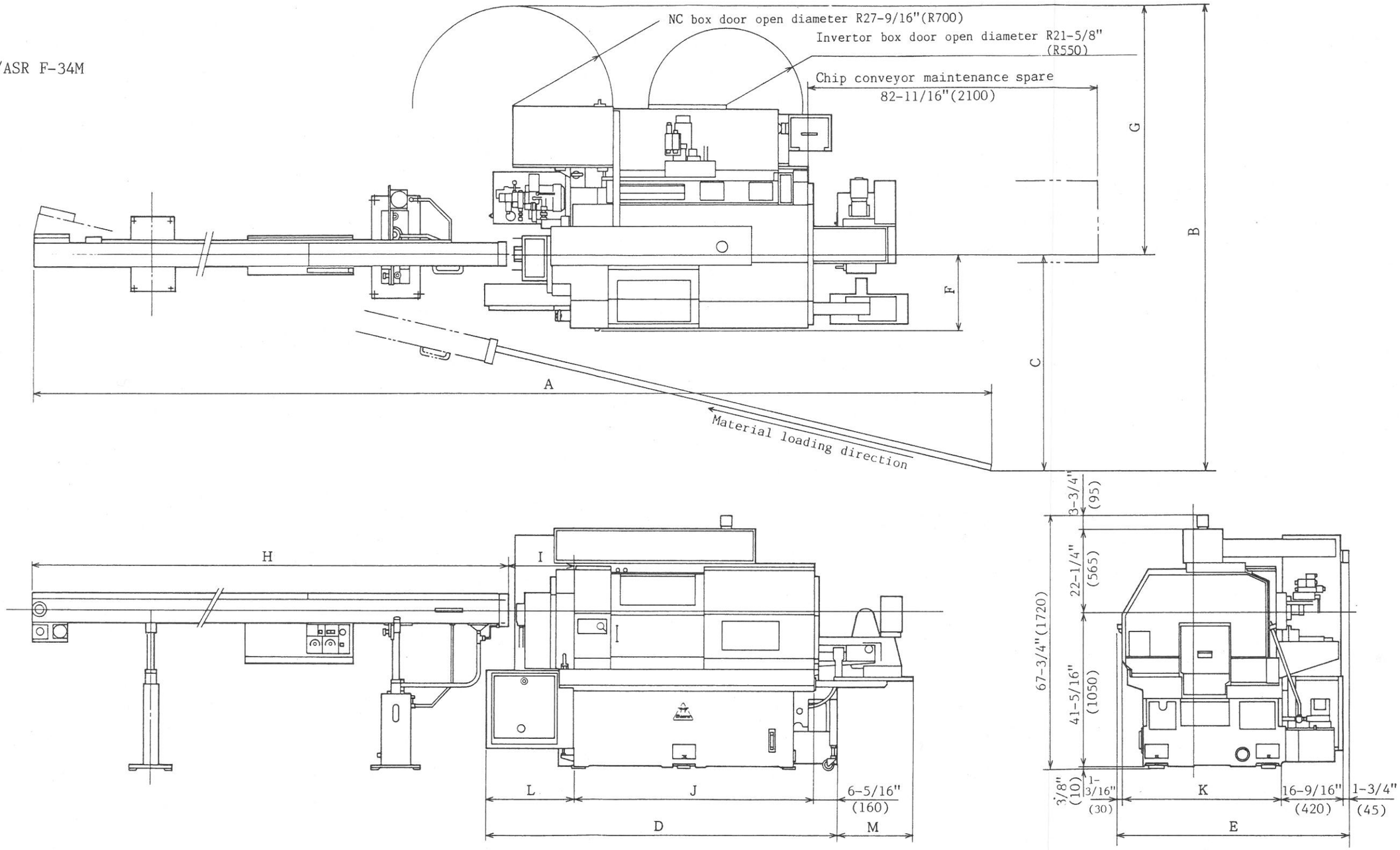
	Inch	Metric
Controlled Axis	2 Axis, X and Z axis are controlled simultaneously	
Control axis motor	AC Servo motor	
Min. Input Increment	.0001 in	0.001mm
Min. Output Resolution	X-Axis: .0001 in Z-Axis: .0001 in	X-Axis: 0.001mm Z-Axis: 0.001mm
Interpolation Function	Linear and Circular	
Program Format	O4, N4, G2, X(U)± 4.4, Z(W)± 4.4, R(C)± 4.4, B± 4.4, I(K)± 4.4, F1.6 (inch/rev), F3.2(inch/ min), S5/4, T2+2, M3, P4(7), Q4	O4, N4, G2, X(U)± 5.3, Z(W)± 5.3, R(C)± 5.3, B± 5.3, I(K)± 5.3, F3.4 (mm/rev), F6.0(mm/min), S5/4, T2+2, M3, P4(7), Q4
Rapid Traverse Rate	X, Z-Axis: 472 IPM	X, Z-Axis: 12m/min
Feed Rate	In G98 mode: .01 to 472 IPM In G99 mode: .000001 to 9.999999 inch/rev	In G98 mode: 1 to 12,000mm/min In G99 mode: 0.0001 to 50.0000mm/rev
Threading	Lead Range F:.000001 to 9.999999 in	F: 0.0001 to 500.0000mm
Work Coordinate System Shift	Work coordinate system can be shifted	
Manual Feed	Range of the jog feed speed: 0 to 50 inch/min	0 to 1260 mm/min
Manual Data Input and CRT Character Display	Keyboard-type manual data input, CRT display and memory. o CRT display of sign (+ or -) and 8 digit number. o Input and display of programs. o Display of various alarm signals. o Display of self-diagnostic results. o Setting and display of various functions and parameters. o Setting and display of tool offset value.	
Graphic Display	Programmed tool path can be displayed on the CRT screen during processing	
G-Function	Refer to the list of functions	
M-Function	Refer to the list of functions	
S-Function	Specify the spindle speed or the surface speed by using a 4-digit number following the address S.	

	Inch	Metric
T-Function	T-code is designated by 4-digits. Tool station 1 ~ 8, 9 ~ 16, 17 ~ 32 and work coordinate system 1-32 are selected simultaneously at variable slide positions.	
Tool Offset	16 Pairs, 0 to ± 99.9999" (0 to ± 999.999mm) either absolute or incremental.	
Diagnostic Function	On-line self diagnostic o Display of 3-digits alarm code o Total check of the system memory o Display of input/output signal	
Canned Cycles	G90 Turning cycle G92 Thread cutting cycle G94 Facing cycle	
Multiple Repetitive Cycles	G70 Finish cutting cycle G71 Stock removal cutting cycle in turning G72 Stock removal cutting cycle in facing G73 Pattern repeated cutting cycle G74 Longitudinal pecking cycle G75 Cross pecking cycle G76 Thread cutting cycle	
Tool Nose Radius Compensation	Tool path is automatically compensated by G41 or G42 command and offset data specified by offset number.	
Other Functions	Backlash compensation, Error detect ON/OFF, Feed hold, Stored stroke limit, Program protect, Run hour/piece Counter display, Load meter, etc.	
B-axis	B-axis is used to control sub spindle. The B-axis can be commanded independently from X-axis and Z-axis. (However, the B-axis has no functions of coordinate system, override and feed per revolution.)	
Environmental Capabilities	Ambient temperature; 32° to 113° F (0 to 45℃) Humidity; 75% relative humidity or less Vibration; 0.5G or less	

Note: Tape reader is not equipped on this machine, and loading of program is performed by RS232C interface.

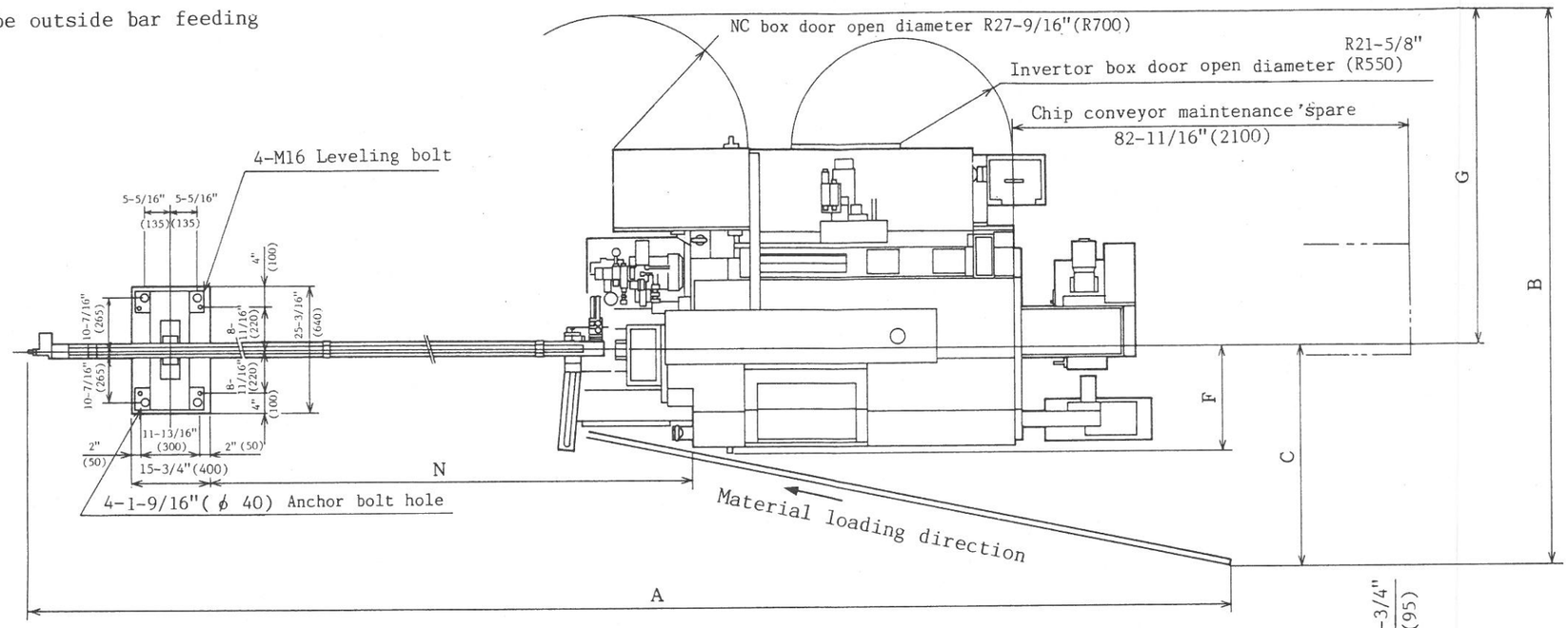
2-3 EXTERNAL VIEW

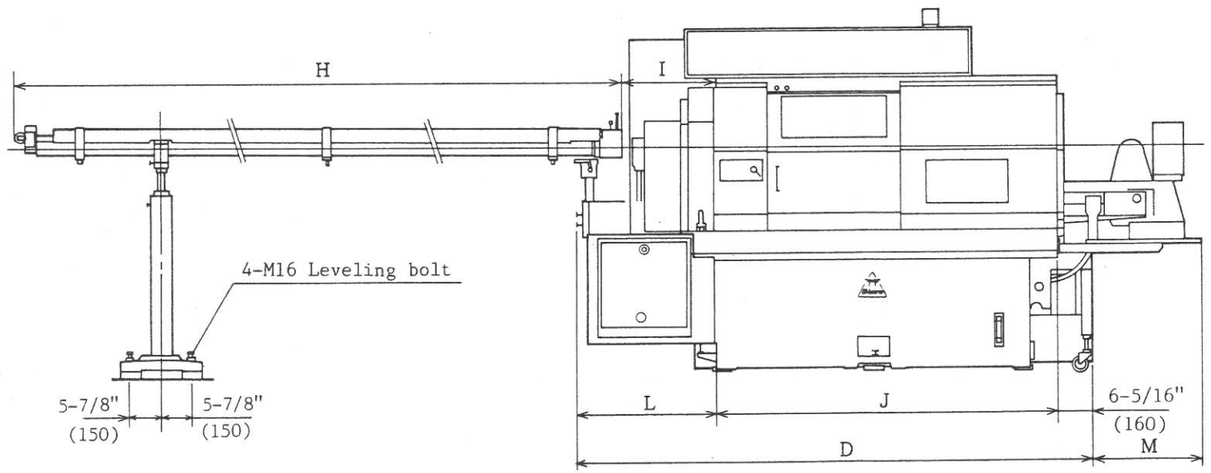
(1) With ASR F-20M/ASR F-34M

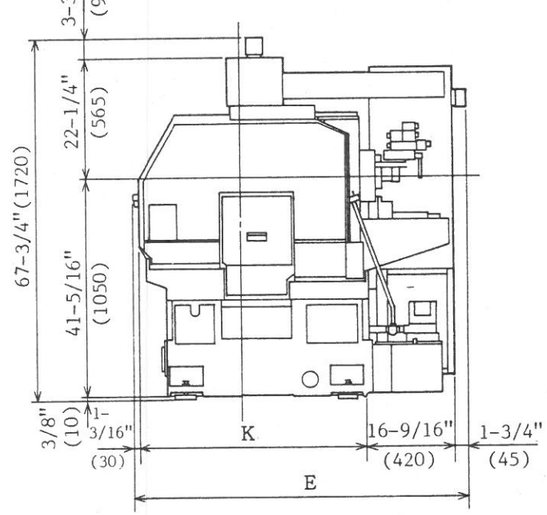


Model	Bar feeder model	Material length	A	B	C	D	E	F	G	H	I	J	K	L	M	
BND-20S	ASR F-20M	12ft	341-3/4"	104-1/8"	36-13/16"	96-7/16"	62-3/8"	20-1/4"	67-5/16"	184-1/4"	15-3/8"	66-5/16"	42-15/16"	23-13/16"	21-1/16"	INCH
		4m	8680	2645	935	2450	1585	515	1710	4680	390	1685	1090	605	535	MM
BND-34S	ASR F-34M	12ft	341-3/4"	104-1/8"	36-13/16"	97-13/16"	62-3/8"	20-1/4"	67-5/16"	184-1/4"	17-1/8"	67-3/4"	42-15/16"	23-13/16"	22-7/16"	INCH
		4m	8680	2645	935	2485	1585	515	1710	4680	435	1720	1090	605	570	MM

(2) With MS tube outside bar feeding

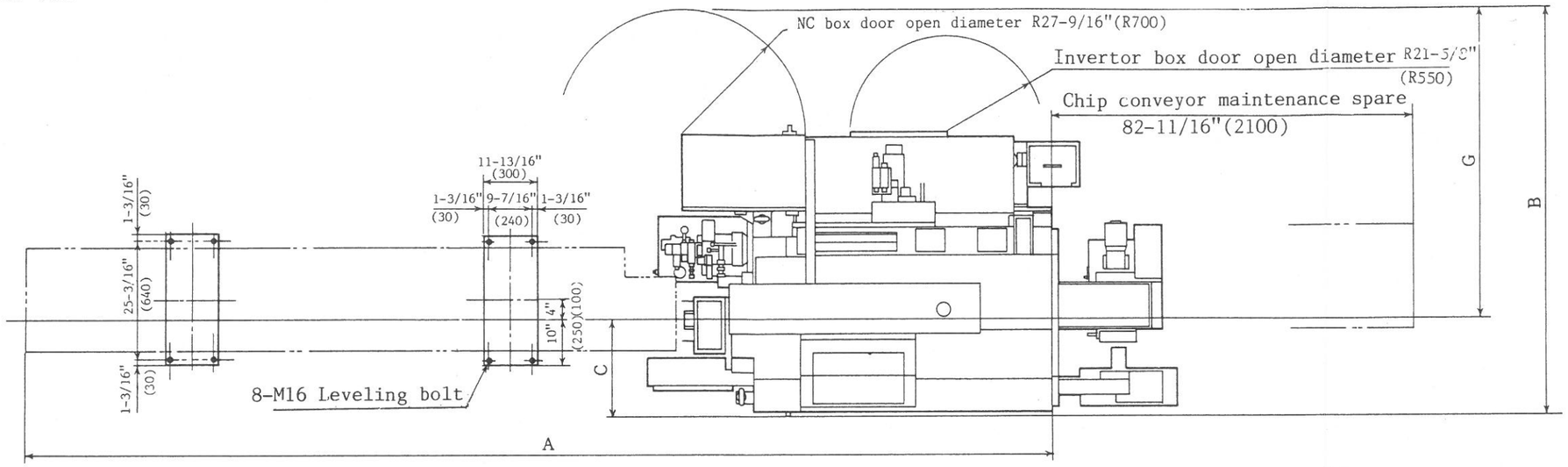


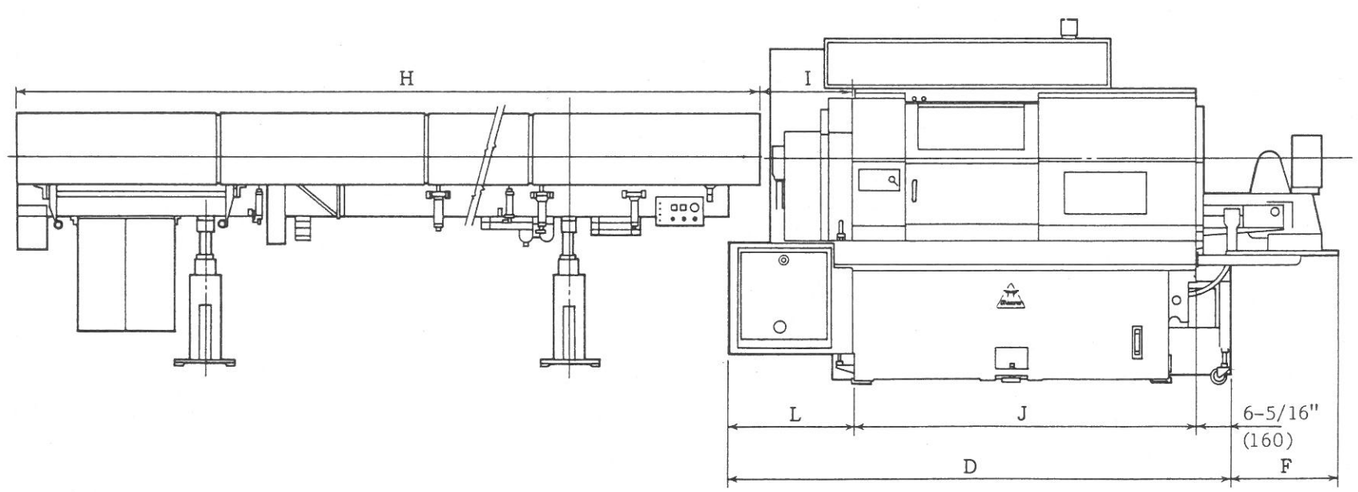


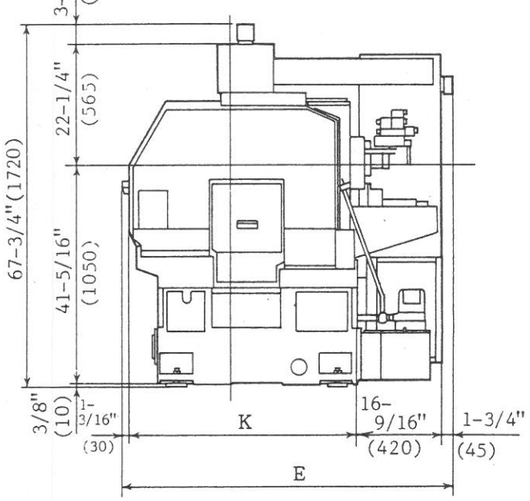


Model	Bar feeder model	Material length	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
BND-20S	MS tube outside bar feeding	12ft	352-9/16"	111-1/4"	43-7/8"	97-1/16"	62-3/8"	20-1/4"	67-5/16"	195-1/16"	16-1/8"	66-5/16"	42-15/16"	24-3/8"	21-1/16"	134-3/16"	INCH
		4m	8955	2825	1115	2465	1585	515	1710	4955	410	1685	1090	620	535	3408	MM
BND-34S	MS tube outside bar feeding	12ft	352-9/16"	111-1/4"	43-7/8"	100-3/8"	62-3/8"	20-1/4"	67-5/16"	195-1/16"	17-15/16"	67-3/4"	42-15/16"	26-3/8"	22-7/16"	136-1/4"	INCH
		4m	8955	2825	1115	2550	1585	515	1710	4955	455	1720	1090	670	570	3460	MM

(3) With PF-V2M/PF-V3M





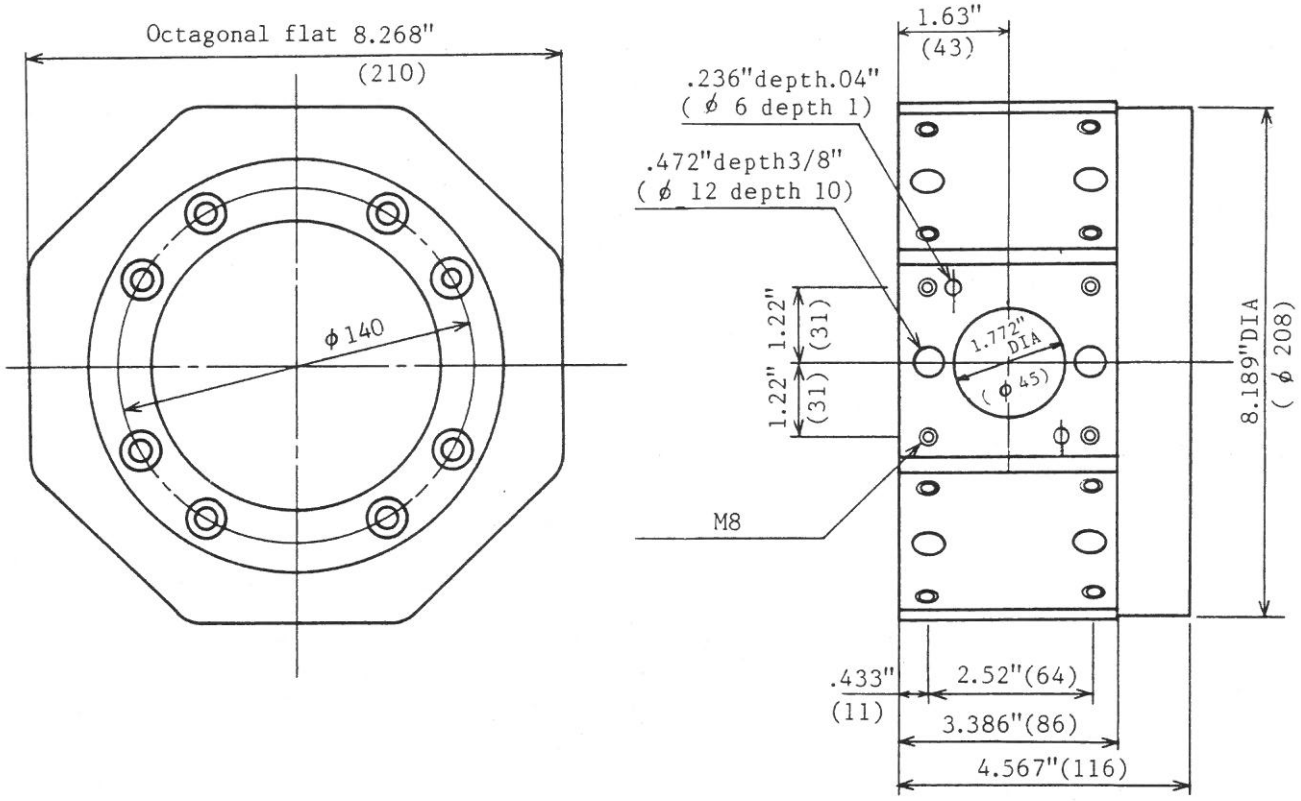


Model	Bar feeder model	Material length	A	B	C	D	E	F	G	H	I	J	K	L	
BND-20S	PF-V2M	12ft	266-15/16"	87-5/8"	20-1/4"	96-7/16"	62-3/8"	21-1/16"	67-5/16"	182-11/16"	17-15/16"	66-5/16"	42-15/16"	23-13/16"	INCH
		4m	6780	2225	515	2450	1585	535	1710	4640	455	1685	1090	605	MM
BND-34S	PF-V3M	12ft	266-15/16"	87-5/8"	20-1/4"	97-13/16"	62-3/8"	22-7/16"	67-5/16"	179-1/2"	19-11/16"	67-11/16"	42-15/16"	23-13/16"	INCH
		4m	6780	2225	515	2485	1585	570	1710	4560	500	1720	1090	605	MM

2-4. Turret

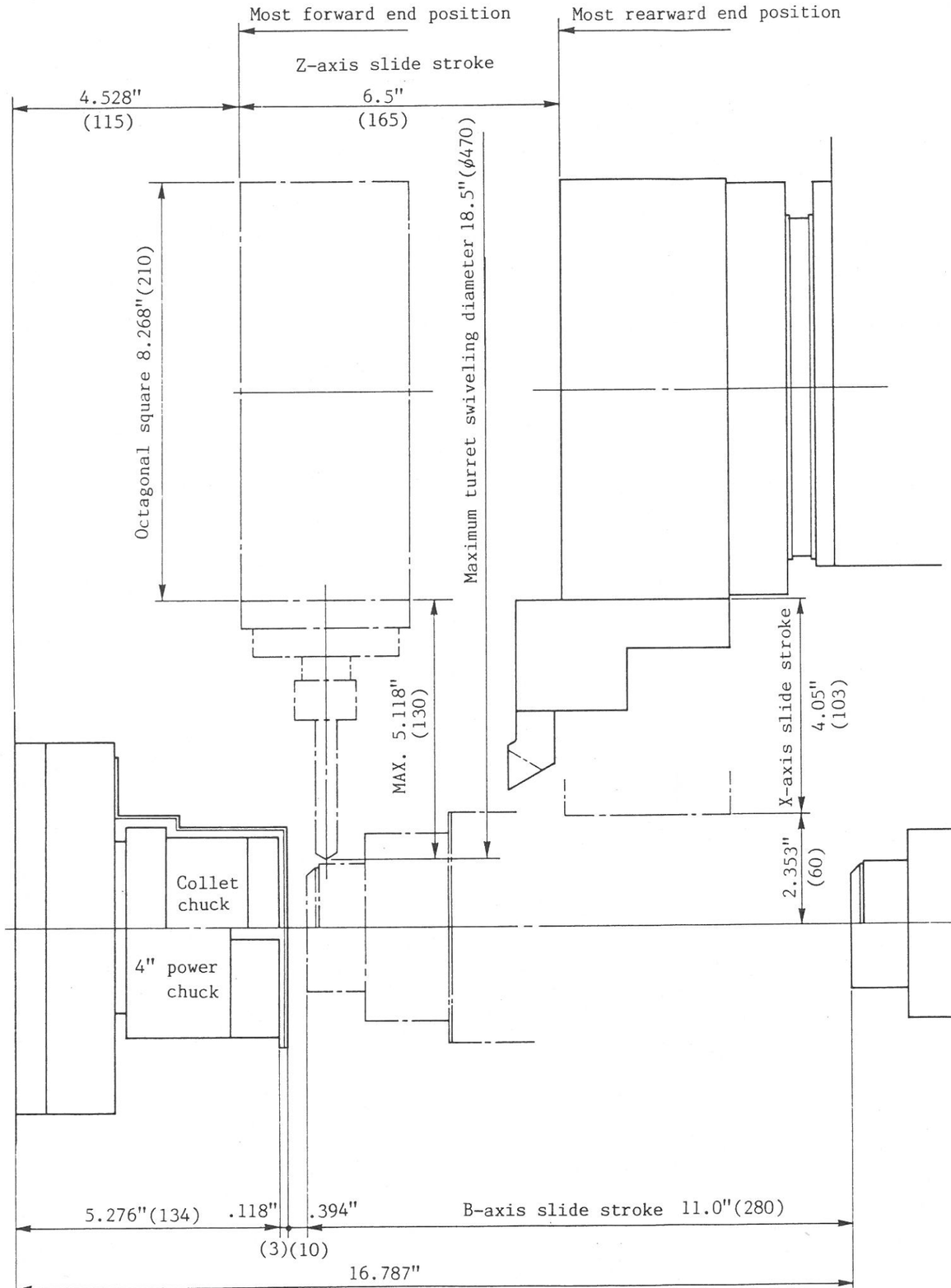
There are 4 tapped holes and 2 locating pin holes on each turret face for mounting the tool head.

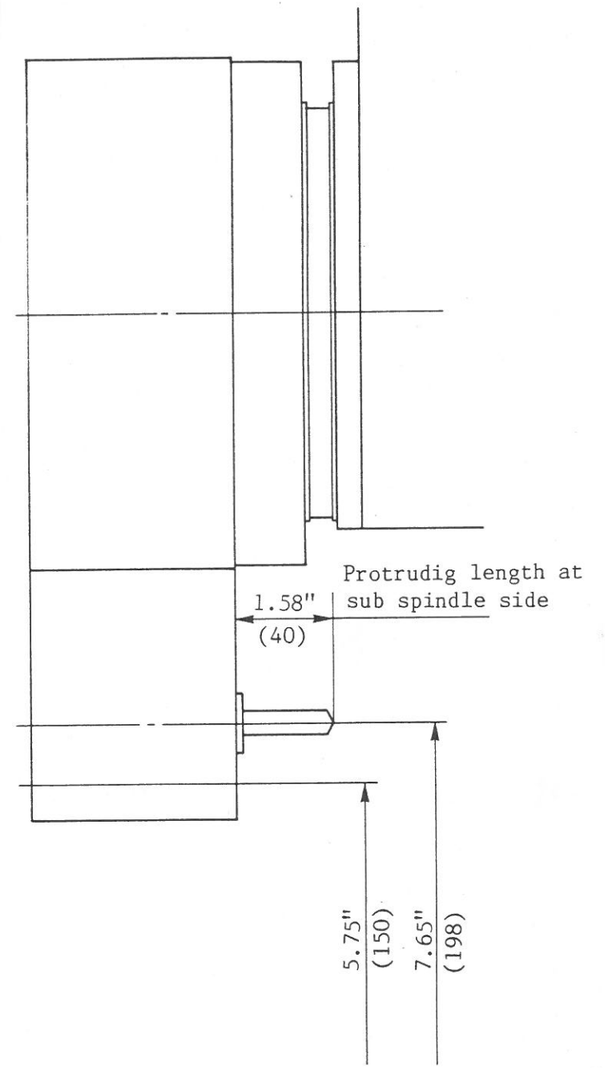
BND-20S, BND-34S Tool Setting Face



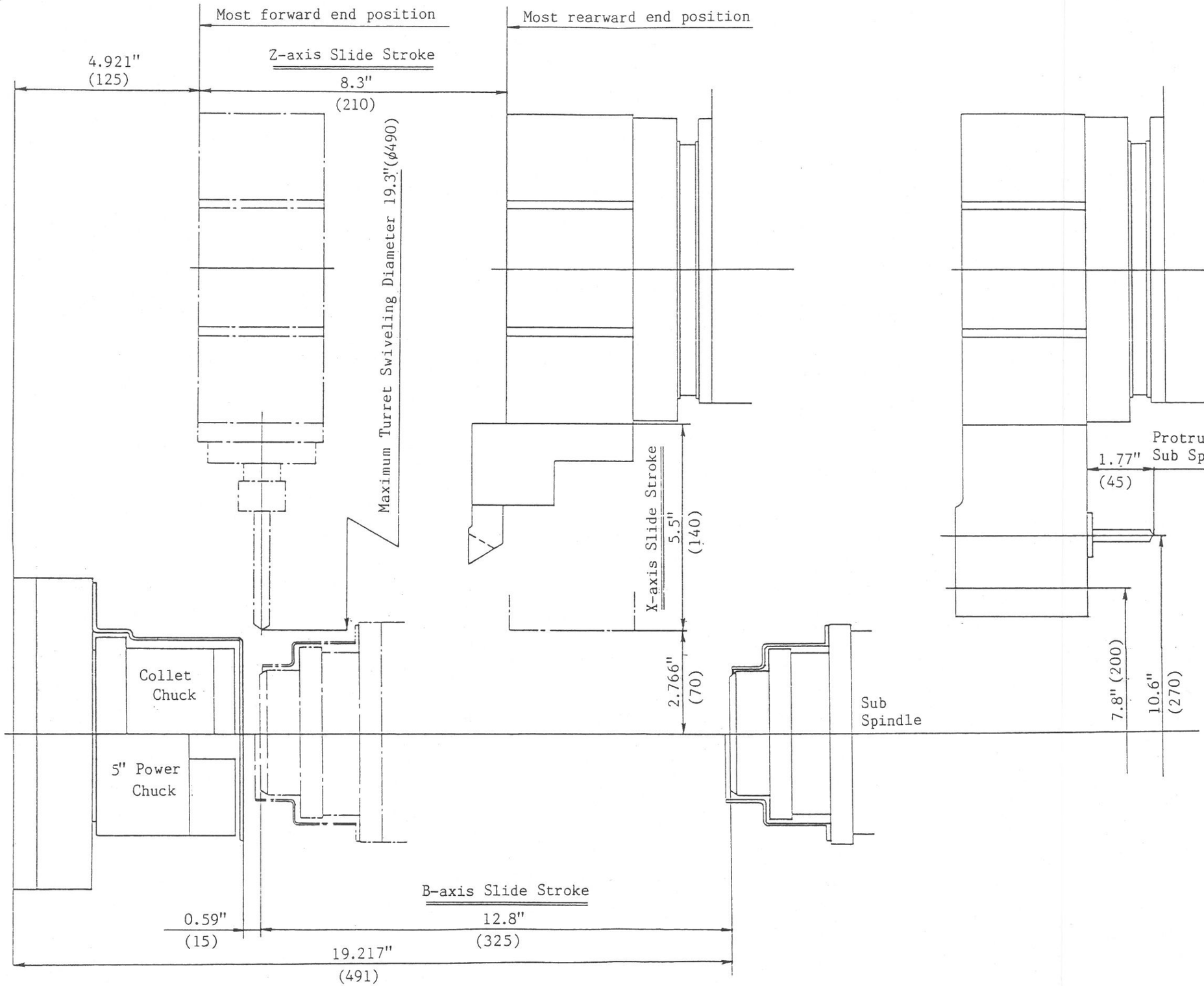
2-5. Slide Travel

BND-20S₂





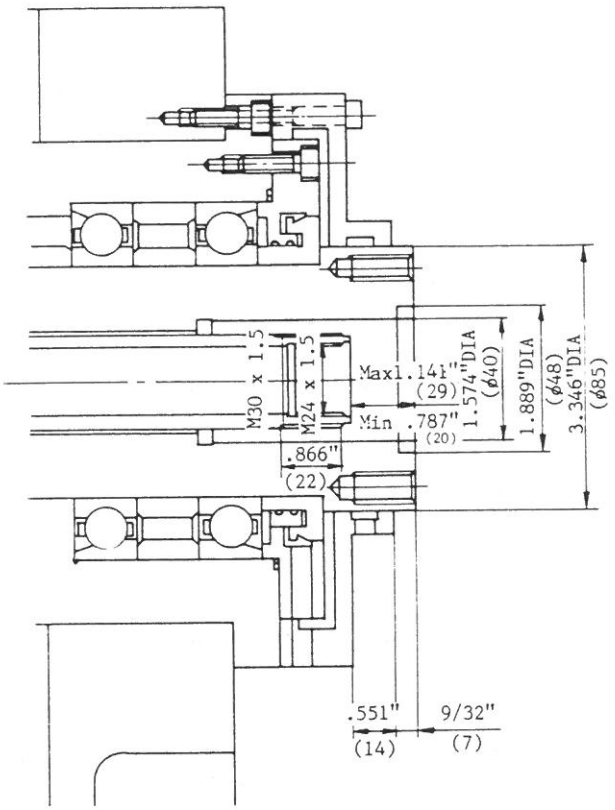
• BND-34S₂

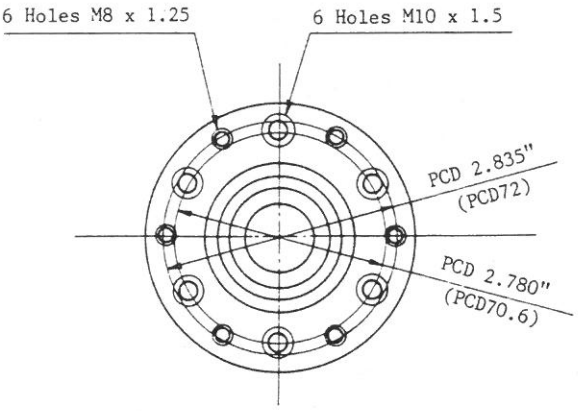

Most forward end position
Most rearward end position
4.921"
(125)
Z-axis Slide Stroke
8.3"
(210)
Maximum Turret Swiveling Diameter 19.3"(ϕ490)
X-axis Slide Stroke
5.5"
(140)
2.766"
(70)
Collet
Chuck
5" Power
Chuck
Sub
Spindle
B-axis Slide Stroke
0.59"
(15)
12.8"
(325)
19.217"
(491)
Protruding Length at
Sub Spindle Side
1.77"
(45)
7.8" (200)
10.6"
(270)

2-6. Spindle

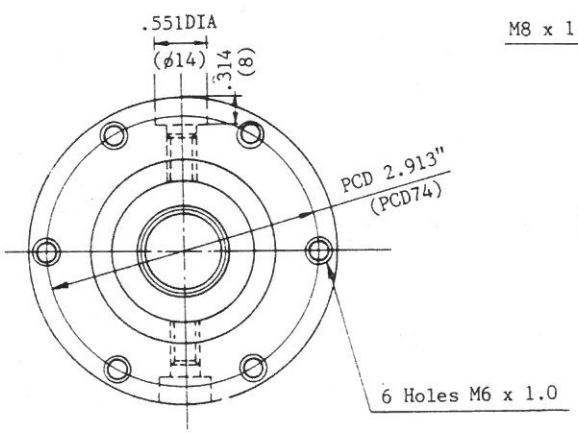
BND-20S

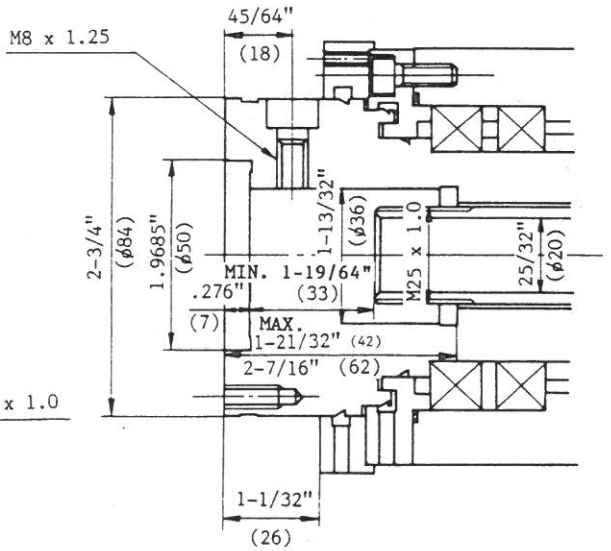
(1) Main Spindle Nose



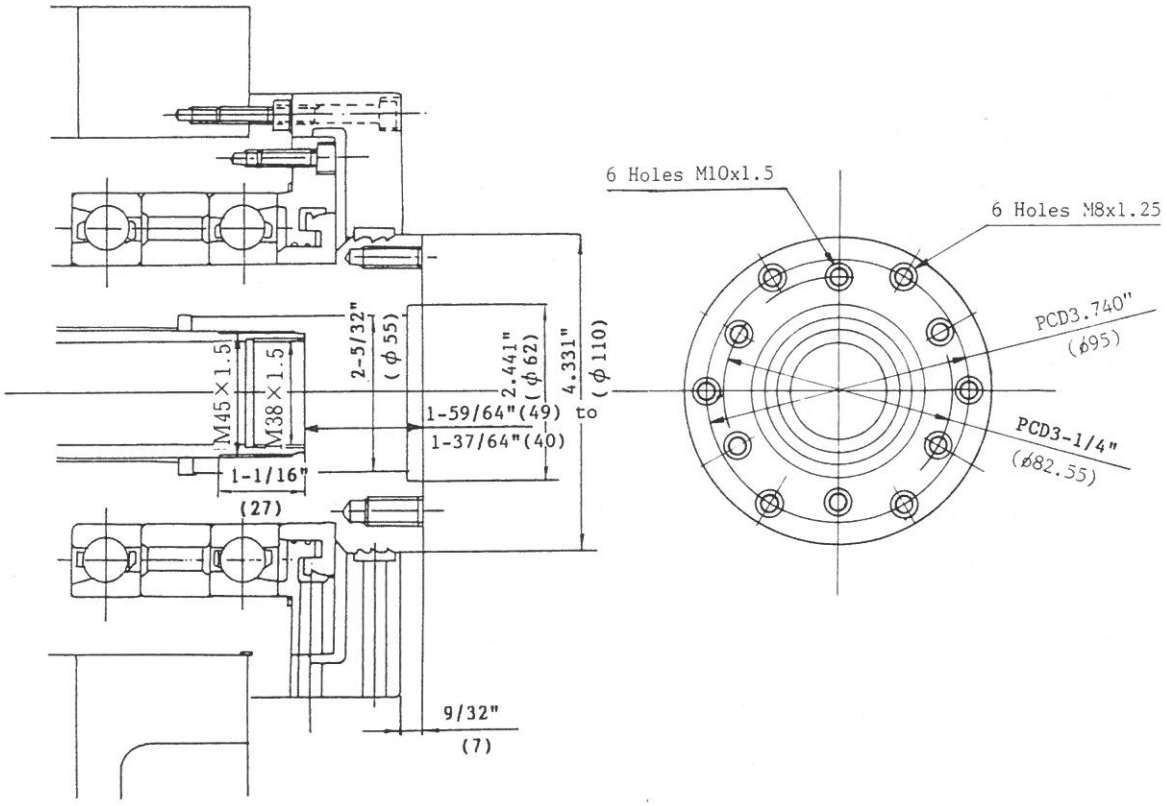


(2) Sub Spindle Nose

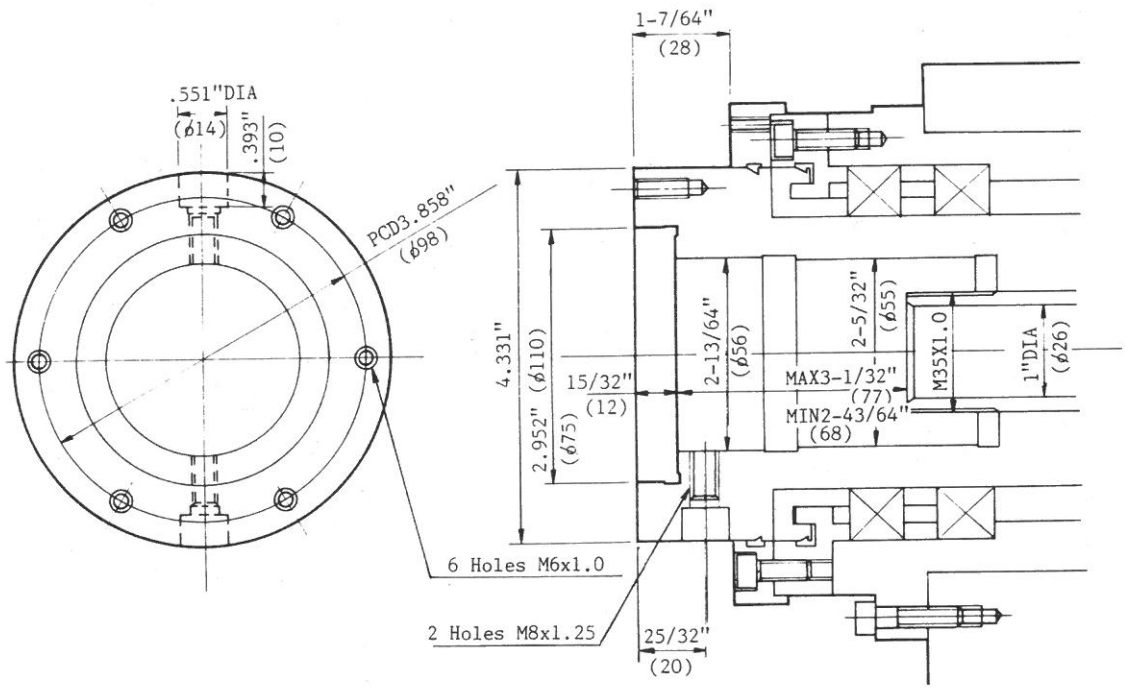




[1] Main spindle

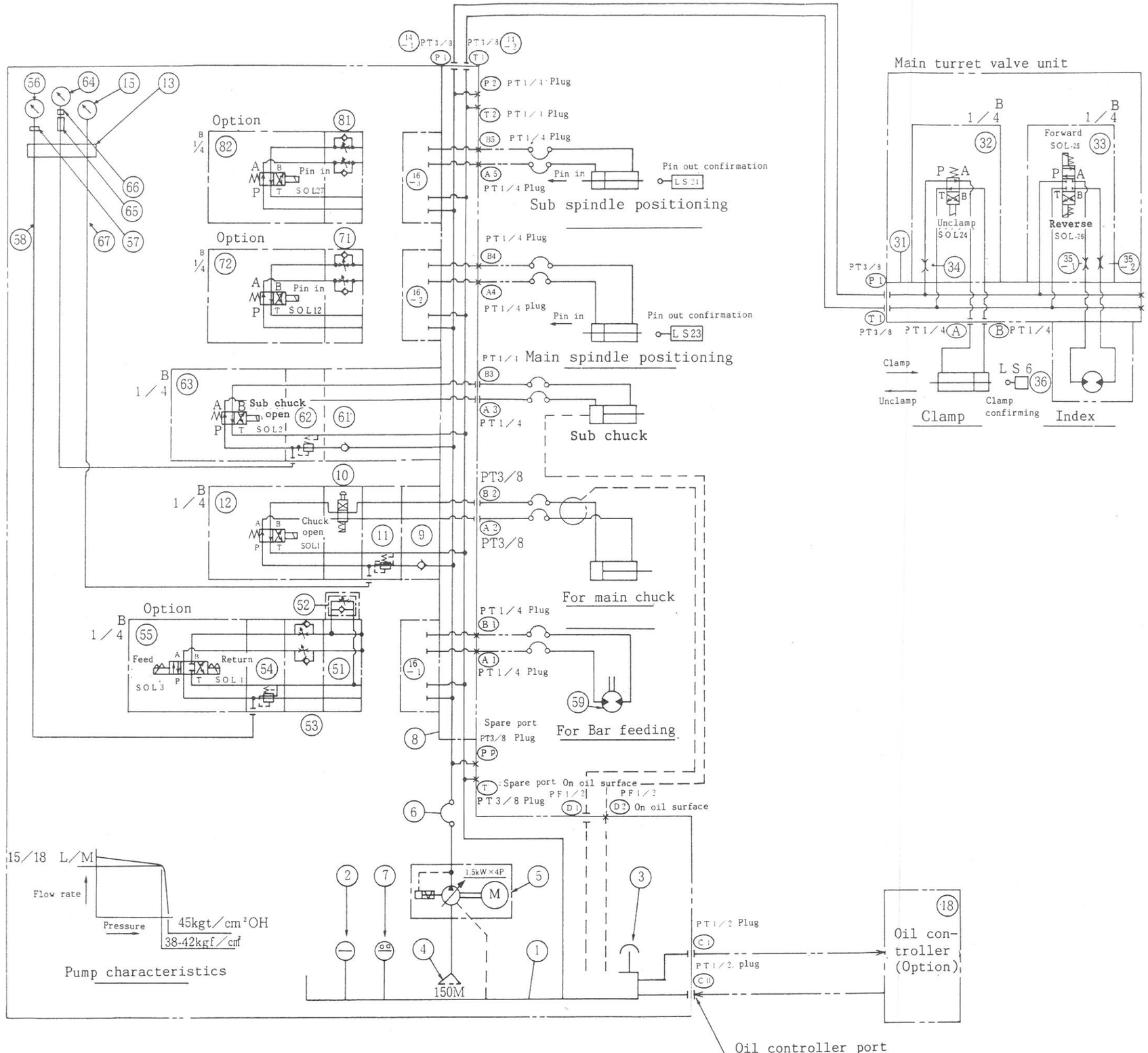


[2] Sub spindle



2-7. Hydraulic Circuit Diagram

[1] Hydraulic Circuit Diagram



[2] List of Part

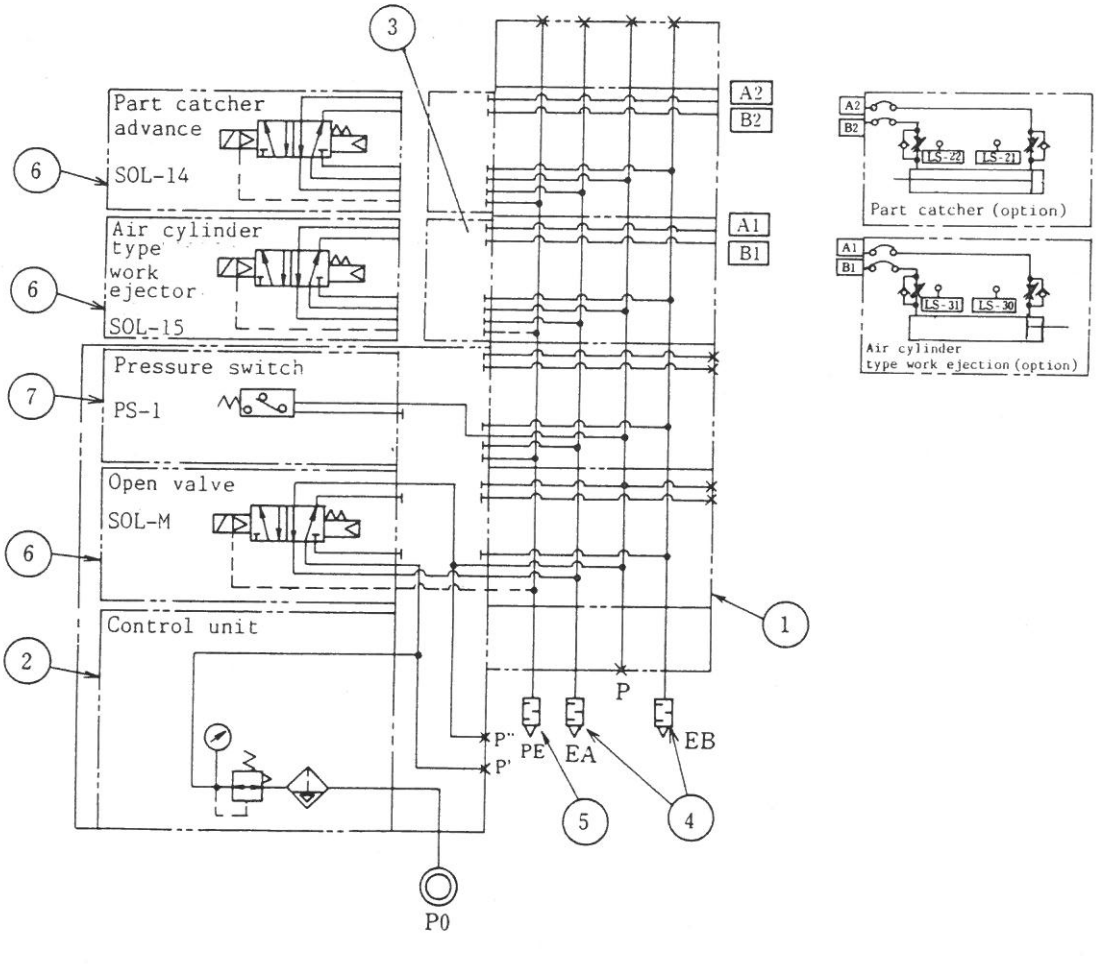
Code	Type	Name	Manufacturer's Name	Q'ty	Remark
Following is the pump unit.					
1	10Gal(40ℓ)	Oil tank	Daikin Industry	1	
2	KLA-80A	Oil level gauge	Kyowa	1	
3	FA-35	Oil supply port and air breezer	Daisei Industry	1	
4	SFT-06-150	Suction strainer	Daisei Industry	1	
5	M15A1Y-2-50	M15 motor pump	Daikin Industry	1	
6		Flexible hose		1	
7	OLV-2B-2-93	Float switch	Noken	1	
8	M1	Manifold	Daikin Industry	1	
9	MC-02P-05-50	P port check valve	Daikin Industry	1	
10	MM-02-2N-10	Manual operating valve	Daikin Industry	1	
11	MG8-02P-03 -50-GT-30	Pressure Reducing valve	Daikin Industry	1	
12	LS-G02-2BP -10-N	Solenoid Valve	Daikin Industry	1	
13		Pressure gauge block	Daikin Industry	1	
14	3021-06	Hose connector	Bridgestone	2	
Following is the pump unit.					
15	OPG.ATPF1/4 ϕ 60 x 100K x 1500 psi	Pressure gauge	Asami Equipment	1	Red colored for more than 35K
16	P-BS02	Spacer block	Daikin Industry	*4	
18	AKS 55K	Oil controller	Daikin Industry	1	Option

Code	Type	Name	Manufacturer's Name	Q'ty	Remark
Following is the main turret valve unit.					
31	M	Manifold	Daikin Industry	1	
32	LS-G02-2BP -10-N	Solenoid Valve	Daikin Industry	1	
33	LS-G02-2CP -10-N	Solenoid Valve	Daikin Industry	1	
34		Fixed Orifice	Daikin Industry	1	ϕ 1.1
35		Fixed orifice	Daikin Industry	2	ϕ 1.6
36	ORB-S-070-4FM	Hydraulic motor	N.O.P.	1	For 20S/34S
Following is the bar feeding unit (Option).					
51	M3	Manifold	Daikin Industry	1	
52	TSC-G01	Throttle valve	Daikin Industry	1	
53	MT-02W-50	AB port throttle valve	Daikin Industry	1	
54	MG-02P-03-50 -PT-32	Pressure Reducing valve	Daikin Industry	1	
55	LS-G02-9CP -10-N	Solenoid Valve	Daikin Industry	1	
56	OPG.ATPF1/4 ϕ 60 x 100K x 1500 psi	Pressure gauge	Asami Equipment	1	Red colored for more than 35K
57		Connector for pressure gauge	Sakura	1	
58		Piping for pressure gauge	Sakura	1	
59	ORB-M26-4F	Hydraulic motor	N.O.P.	1	
Following is the sub chuck unit.					
61	MC-02P-05-50	P port orifice	Daikin Industry	1	
62	MG8-02P-03-50 -GT-30	Pressure Reducing valve	Daikin Industry	1	

Code	Type	Name	Manufacturer's Name	Q'ty	Remark
63	LS-G02-2BP -10-N	Solenoid Valve	Daikin Industry	1	
64	OPG.ATPF1/4 ϕ 60 x 50K x 700 psi	Pressure gauge	Asami Equipment	1	Red colored for more than 25K
65		Connector for pressure gauge	Sakura	1	
66		Connector for pressure gauge	Sakura	1	
67		Piping for pressure gauge	Sakura	1	
Following is the main SP positioning unit (Option).					
71	MT-02W-50	AB port orifice	Daikin Industry	1	
72	LS-G02-2BP -10-N	Solenoid Valve	Daikin Industry	1	
Following is the sub SP positioning unit (Option).					
81	MT-02W-50	AB port check valve	Daikin Industry	1	
82	LS-G02-2BP -10-N	Electromagnetic operation valve	Daikin Industry	1	

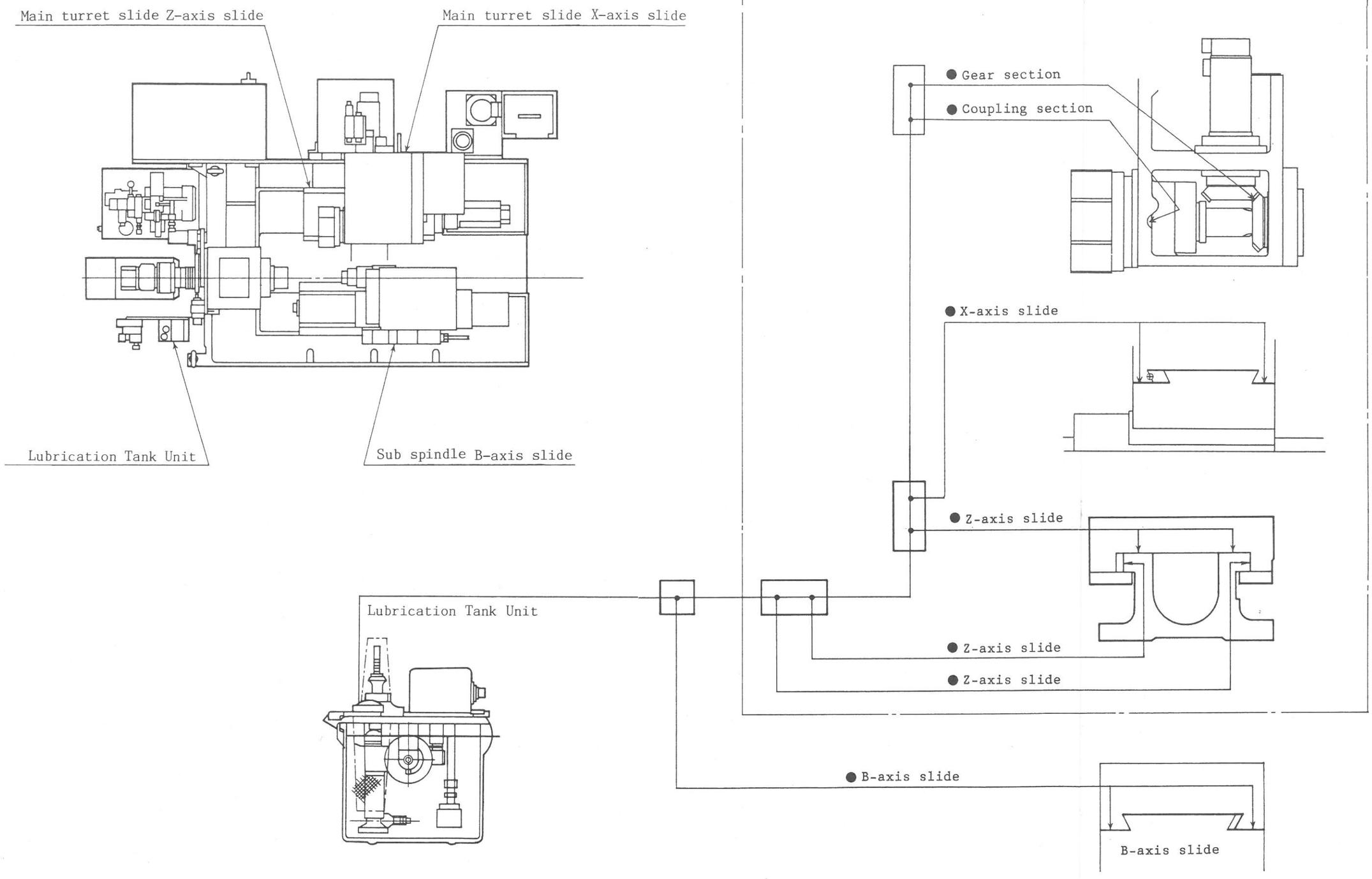
The quantity in the column marked with * differs depending on the number of option attached.

2-8. Pneumatic Circuit Diagram



Code	Type	Name	Q'ty	Manufacturer's Name
1	VV5FS2-01T-061-01-MP5	Base Unit	1	SMC
2	TVAW-MPB-L-*	Control Unit	1 set	SMC
3	AXT625-15-1	Blank Cover	*	SMC
4	AN200-02	Silencer	2	SMC
5	AN110-01	Silencer	1	SMC
6	VFS2100-5FZ	Pilot operated solenoid valve	*	SMC
7	IS1000P-1	Pressure switch	1	SMC

The quantity in the column marked with * differs depending on the number of option attached.


Main turret slide Z-axis slide
Main turret slide X-axis slide
Lubrication Tank Unit
Sub spindle B-axis slide
Main turret slide
● Gear section
● Coupling section
● X-axis slide
● Z-axis slide
● Z-axis slide
● Z-axis slide
Lubrication Tank Unit
● B-axis slide
B-axis slide

3. MACHINE INSTALLATION

3-1. The Preparations for the Installation

Before installing the BND-20S, BND-34S the following details should be observed. This machine has been drained of all lubricants and hydraulic oil when shipped.

[1] Power source capacity ; AC 200, 220, 230 V 3 Phase
50/60 Hz
The machine will draw **21KVA (BND-20S$_2$)**
The machine will draw **26KVA (BND-34S$_2$)**

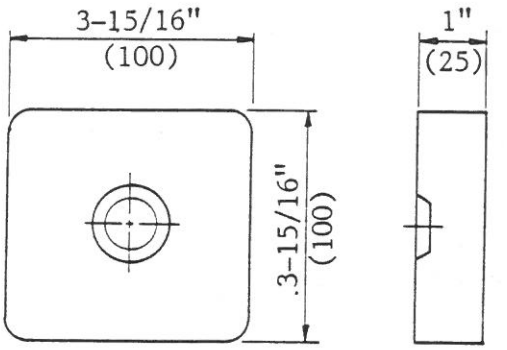
[2] Hydraulic oil ; Tank capacity 10.6 Gal. (40 ℓ)
[3] Lubricating oil (Auto lub. system) ; .13 Gal. (1 ℓ)
[4] Coolant ; Tank capacity 43 Gal. (165ℓ) BND-20S/BND-34S.

[5] Levelling plates ; (6) for machine base BND-20S, BND-34S.
See below for recommended use.

[6] Floor ; Recommended thickness of concrete for main base of the machine is approx 6" (150 mm). If concrete exceeds this thickness anchoring of main machine base is not necessary.
Barfeed stand MUST be anchored.

[7] Floor space ; See diagram of machine dimension for area needed for proper installation.

Steel plate for the base of the machine and barfeed stand.



3-2. Transportation of Machine

Observe following items and pay enough attention for transportation to the installation location of the machine.

[1] Slinging of machine

Since danger accompanies slinging of the machine, perform it by qualitied crane operation and hooking.

(1) Use the dedicated slinging bracket for slinging.

(2) Use undamaged wire rope with more than 5/8" (ø14mm) and 24 wires (6 strands).

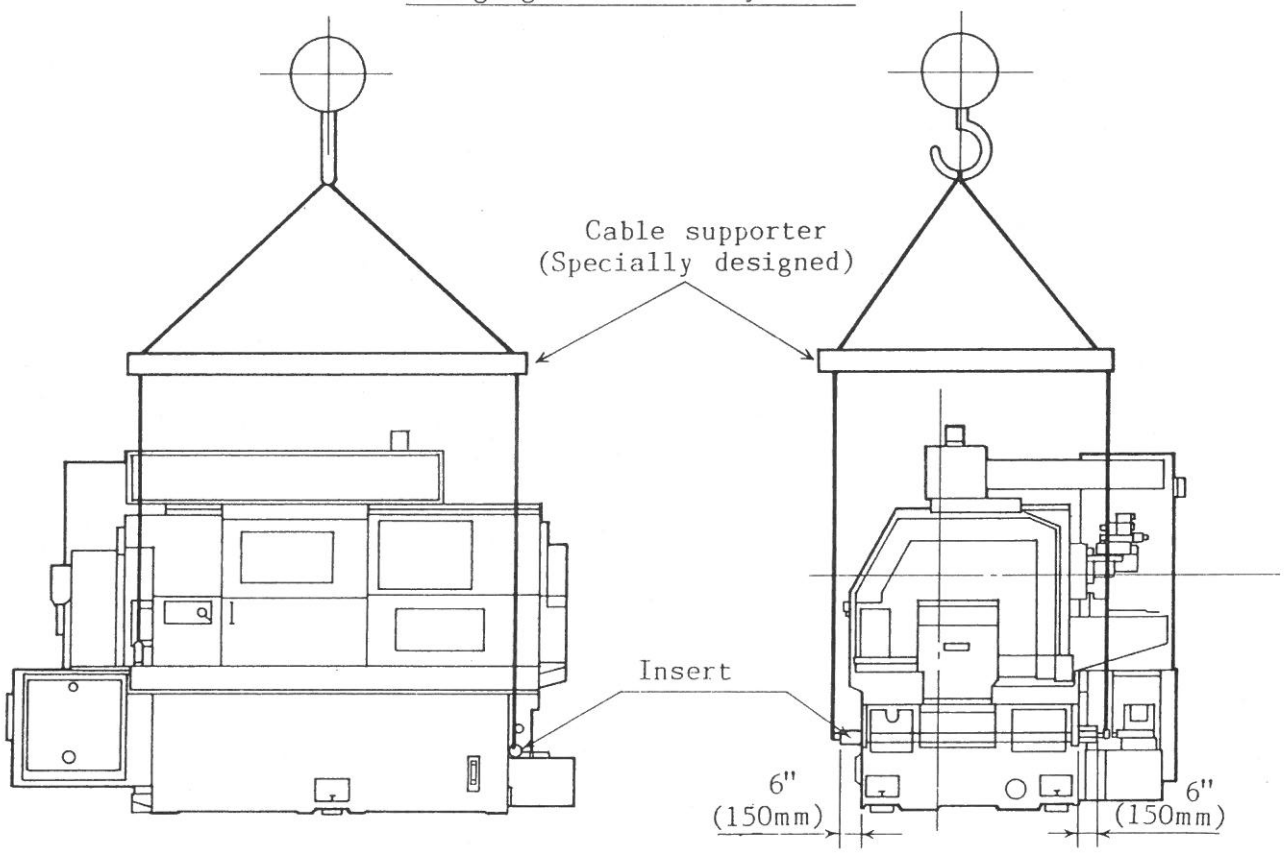
(3) Pay enough attention for balance of the load and avoid shifted load.

(4) To prevent the wire rope from touching with weak sections of the machine such as the slide section and protruded section, apply the pad for the required section.

(5) Avoid abrupt raising, lowering and moving.

(6) Use the crane with slinging capability more than 5 ton.

Slinging of machine by crane



[2] Movement by forklift

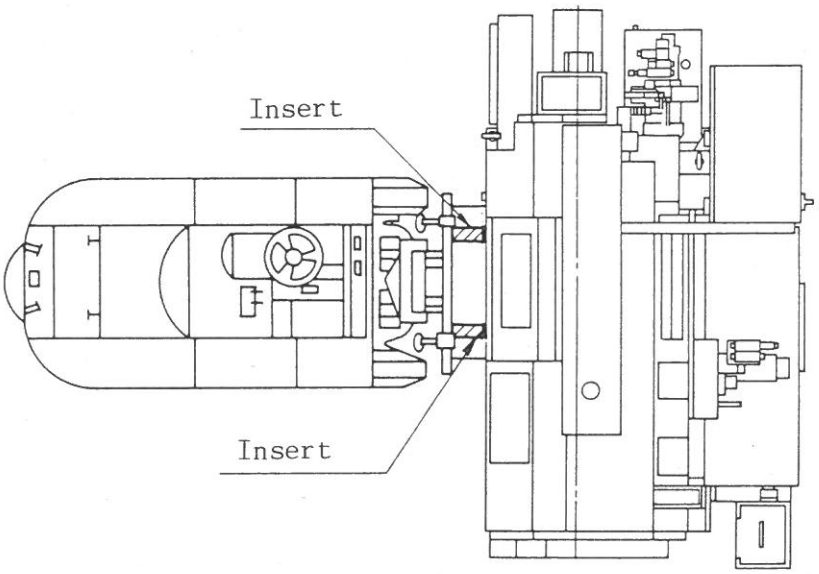
Since danger accompanies movement of the machine, perform it by qualified forklift operator.

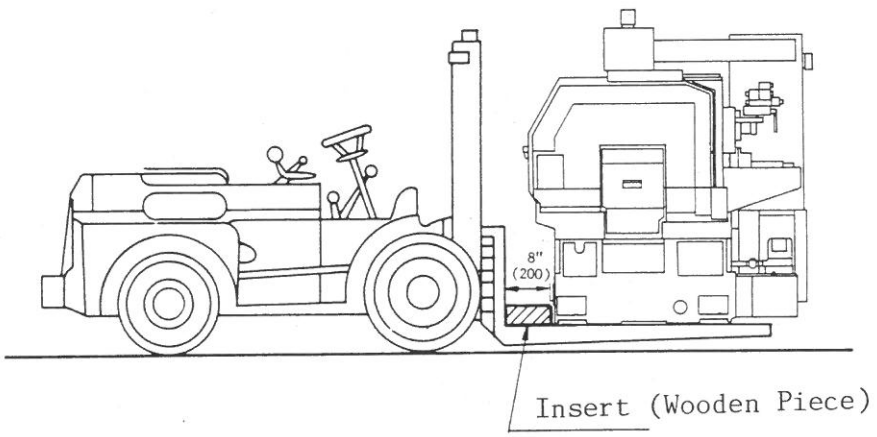
(1) Use the forklift with loading capability more than 5 ton at the location 31-1/2" (800mm) apart from the root of the fork.

(2) Pay attention so that the forklift way not directly touch weak sections of the machine such as the slide section and protruded section. Attach a wooden piece for presenting slide between the fork and machine.

(3) Pay enough attention for balance of the load and avoid shifted load.

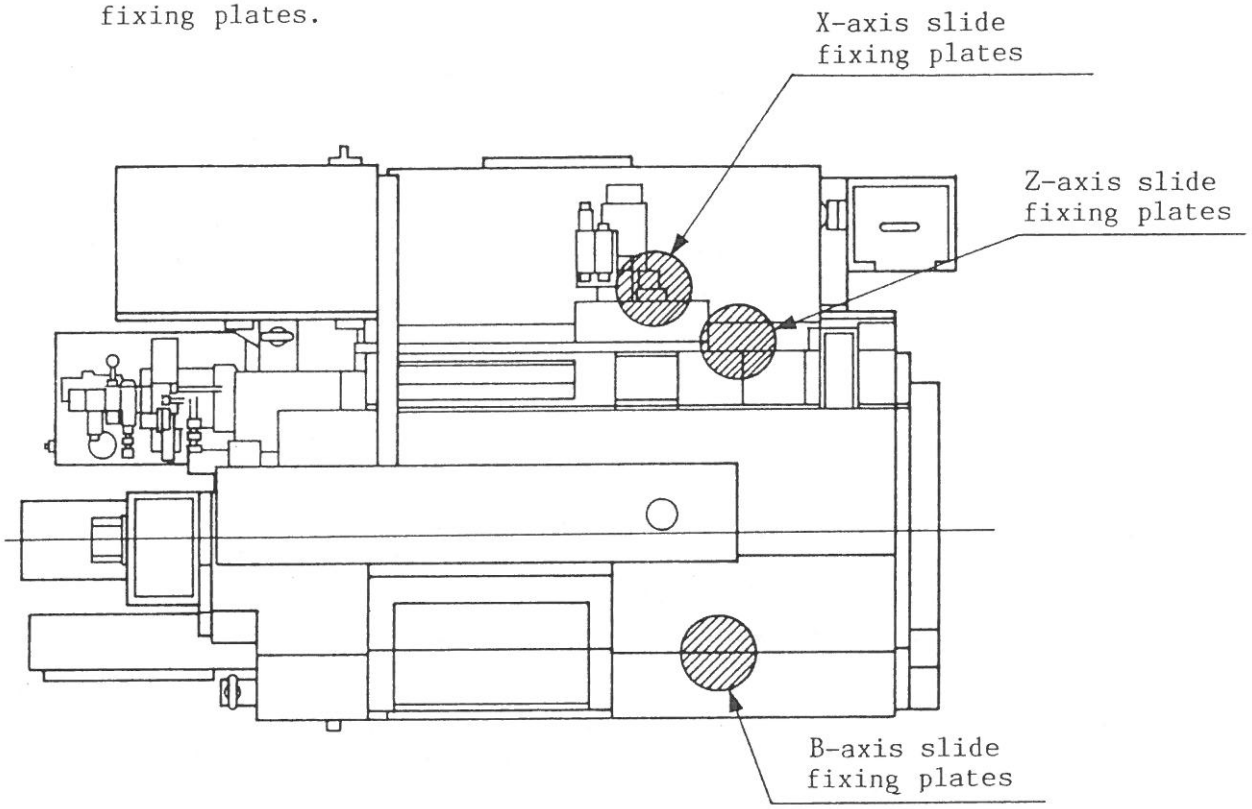
(4) Avoid abrupt raising, lowering, moving, stating and stopping.



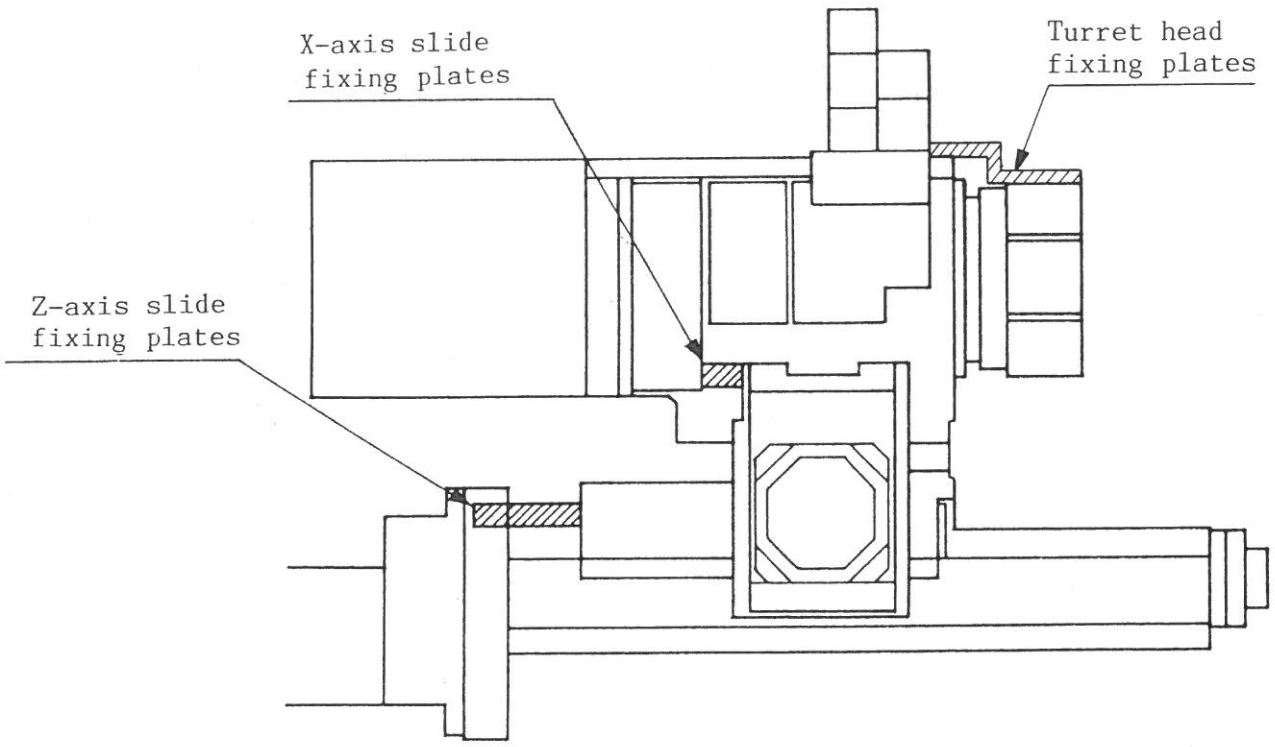


3-3 Removal of Each Axis Slide Fixing Plates

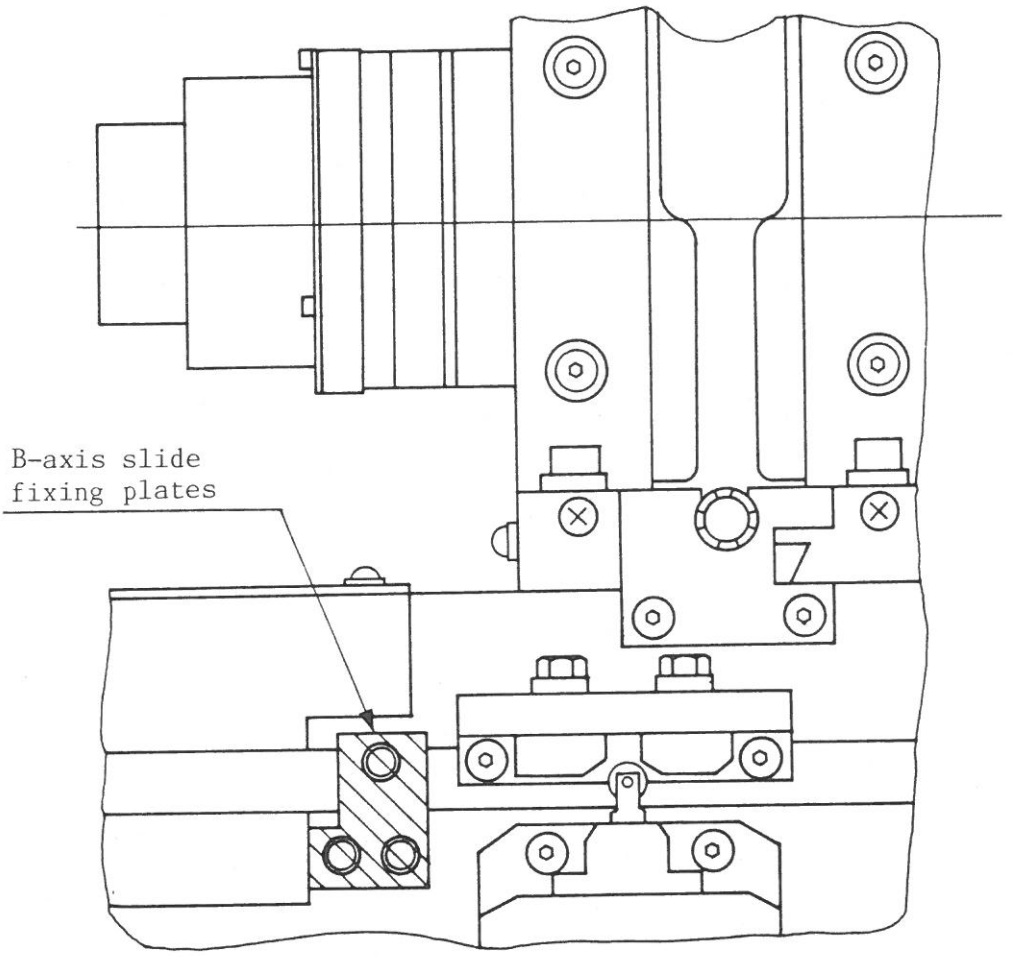
Since each axis slide is secured by the fixing plates to prevent movement of each axis slide during transportation, remove the fixing plates.



(1) X-, Z-axis slide fixing plates



(2) B-axis slide fixing plates



3-4 Levelling procedure

Use the level with one graduation of .0008" (0.02mm) and the length equivalent to 6" (150mm).

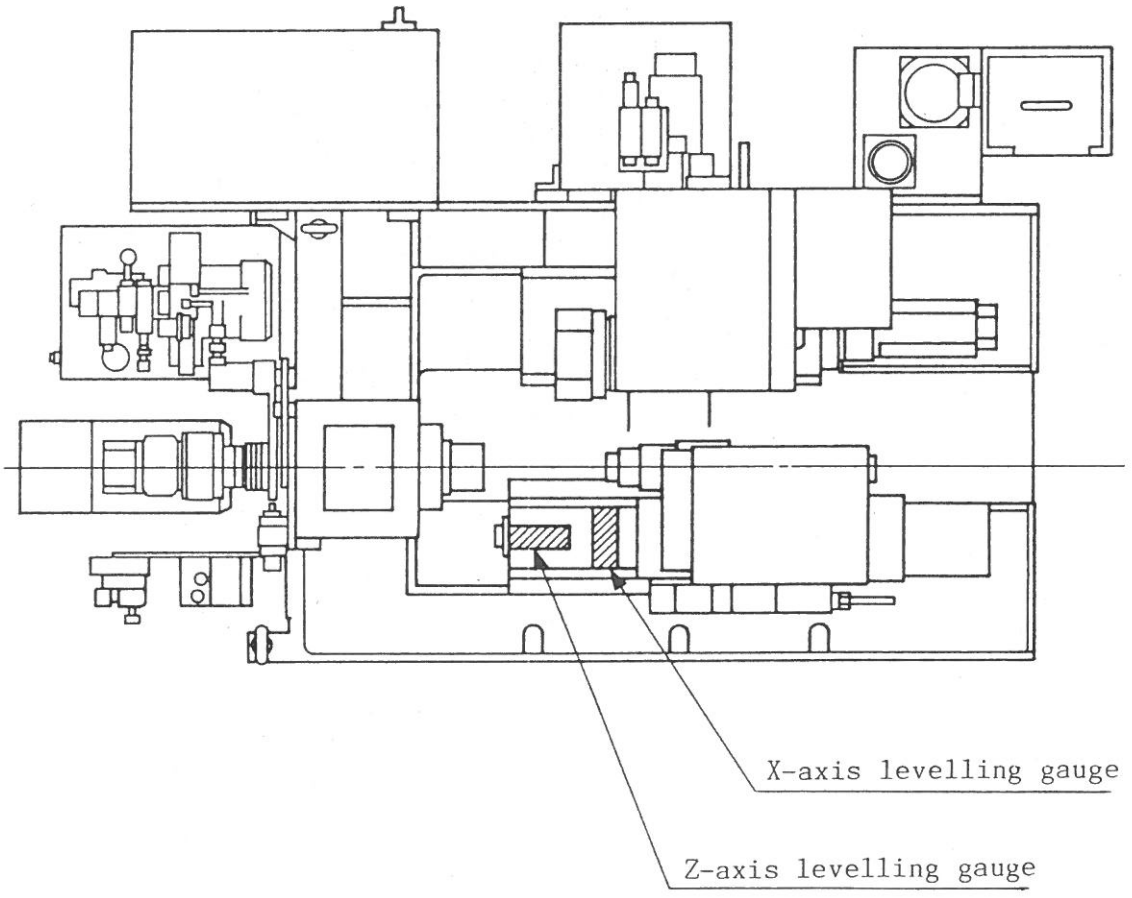
(1) Place the levelling gauge as shown below.

(2) Place the level on the installation position of B-axis slide appear.

(3) Adjust the levelling bolt so that reading of the level placed X and Z direction may become within one graduation .0008" (0.02) respectively. Incidentally, confirm that each levelling bolt securely grasps the base plate.

(4) Fix each levelling bolt by lock nut so that reading of the level may not change.

(5) Always install the chute of the part catcher.



3-5. Power Connection

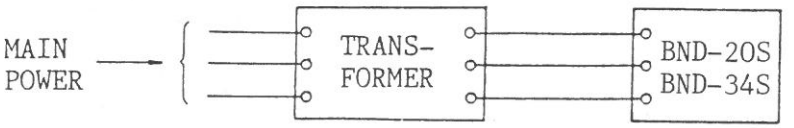
(1) Electrical power requirement

Less capacity of the main power and smaller size of the wires may cause the trouble of the machine.
The followings are the electrical power requirements of BND-20S, BND-34S.

Electrical capacity	:	21KVA (BND-20S$_2$) 26KVA (BND-34S$_2$)
Input voltage	:	AC 200V, 220V, 230V +10%, -15% 50/60 Hz ± 1 Hz, 3 Phase
Size of power source wire	:	AWG No.5 (14 mm^2)
Size of ground wire	:	AWG No.5 (14 mm^2) BND-20S, BND-34S.

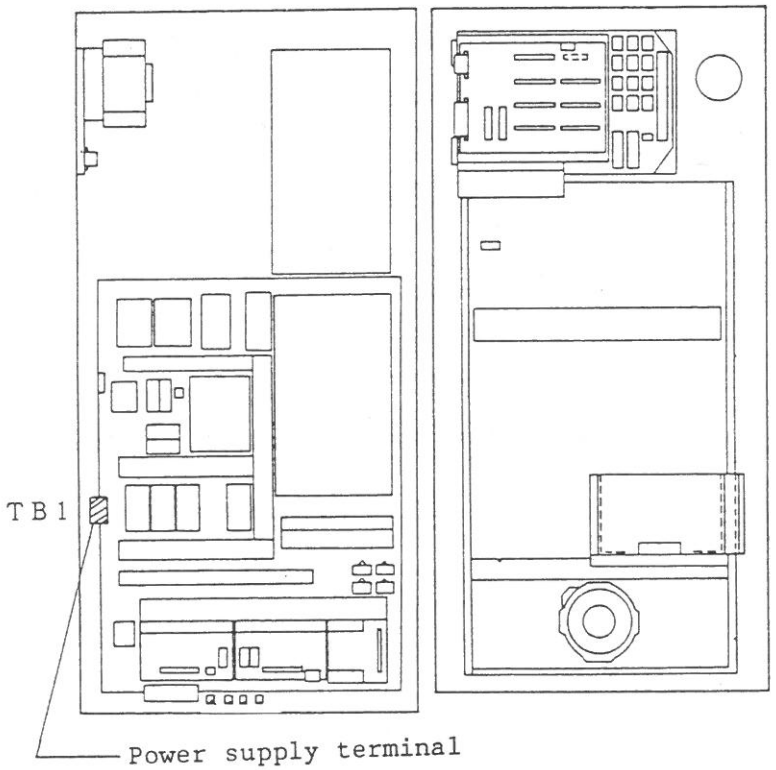
Grounding resistance of ground wire : 100 Ohms or less

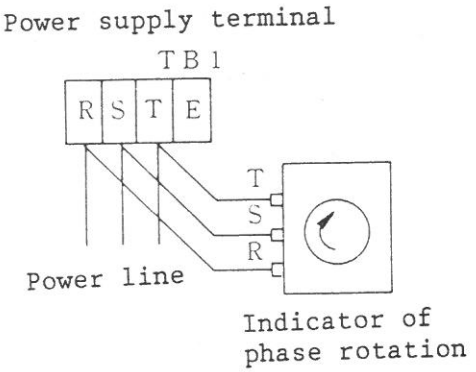
(NOTE)
If the voltage of the power supply is other than the above, a transformer must be used to get the proper voltage through the machine.



(2) Connection of the input power supply and check out of the phase rotation.

The power supply terminal TB1 is located in the electrical control box. Connect the power line to the terminal R, S, T and the ground wire to the terminal E. Then, check out the phase rotation with the phase meter.
The rotation of the phase meter must be in clockwise direction. (See sketch below.)
If the rotation of the phase is incorrect, the spindle servo unit will not operate correctly and the fuses may blow out.

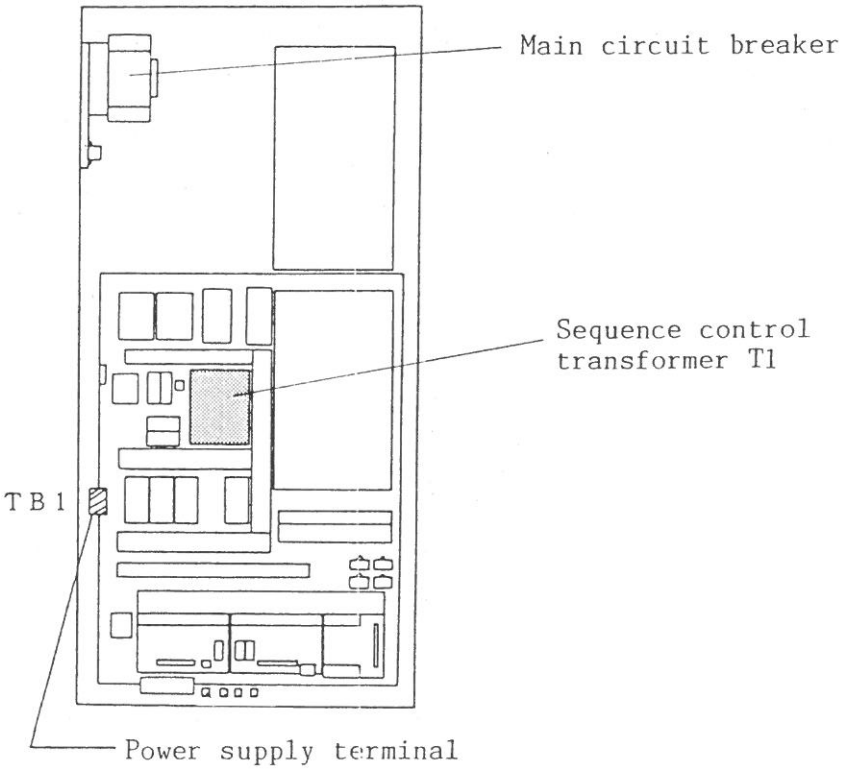




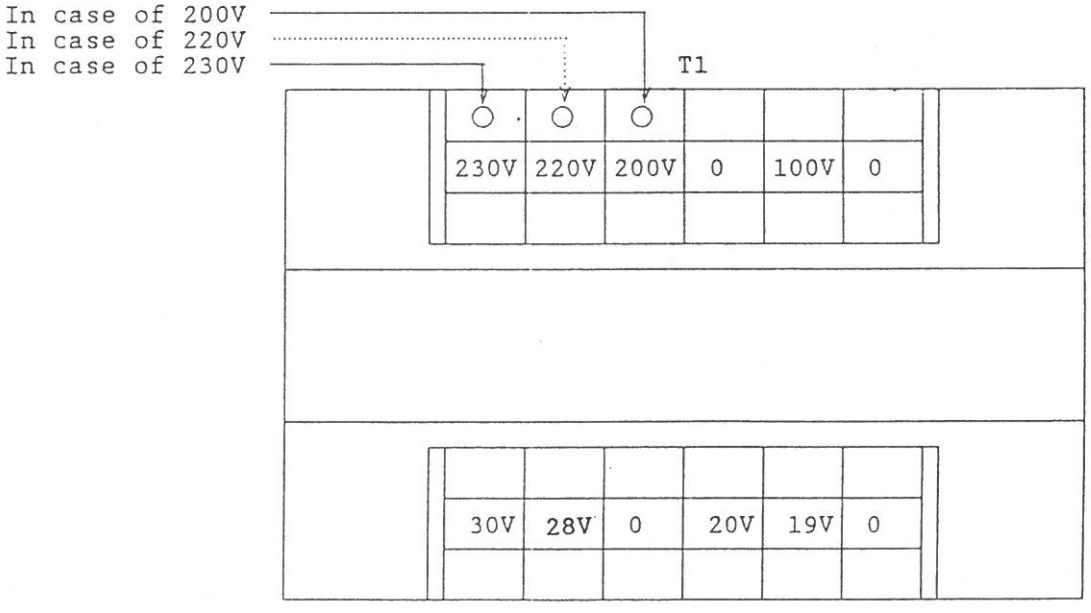
(3) Confirmation of the power supply voltage

1) Changing tap on the transformer

Make sure if each terminals and the connectors of the sequence control transformer are matched with the supplied voltage. If they are not matched, change wiring.

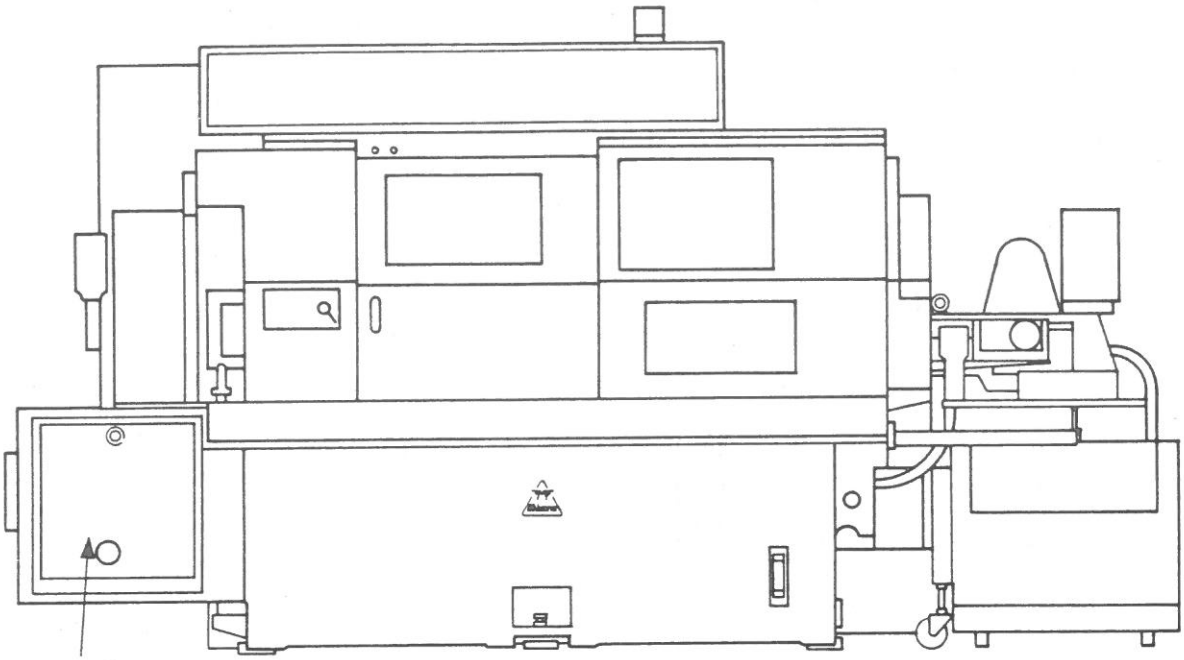


a) Sequence control transformer



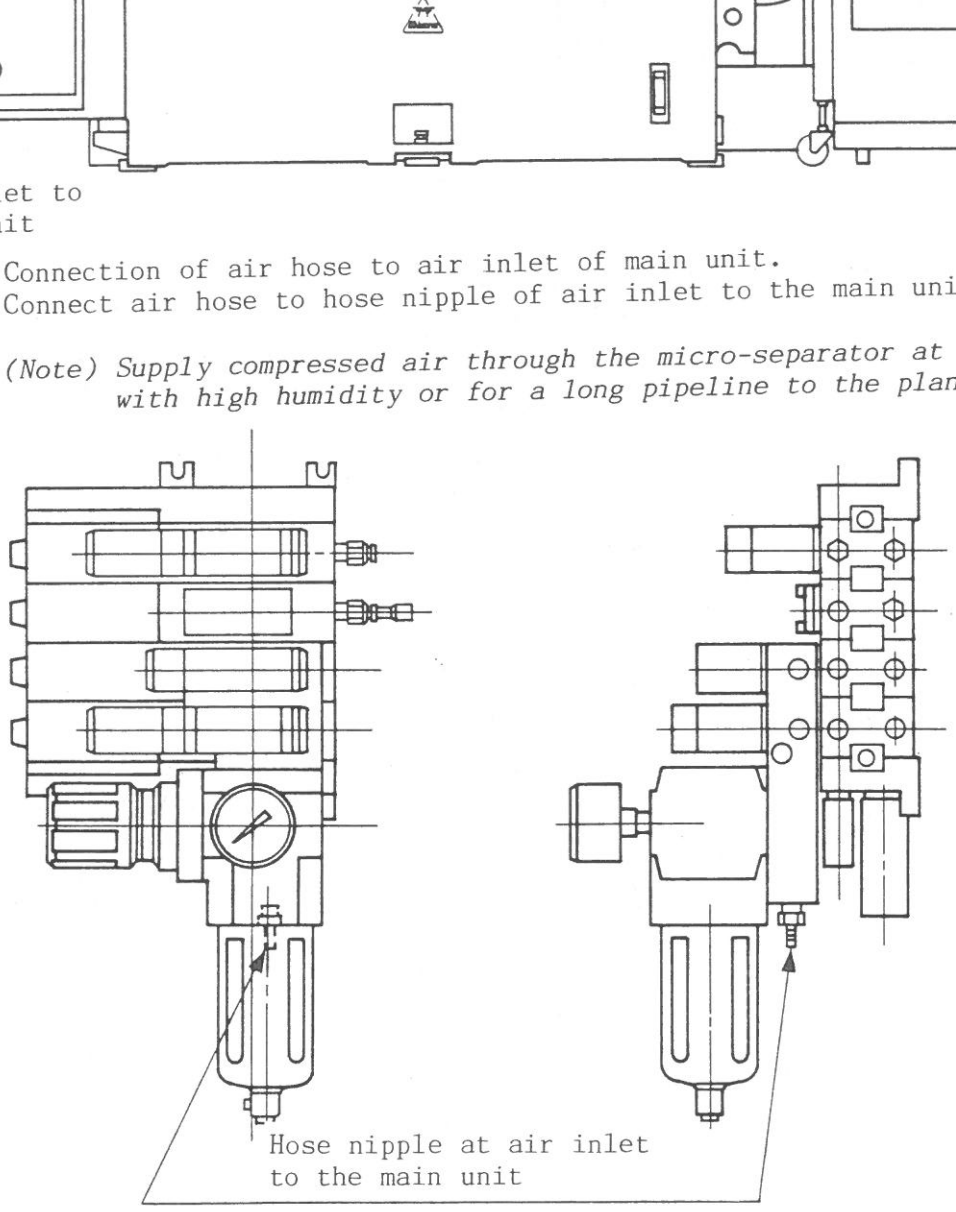
3-6 Connection of compressed air supply

Connect air hoses (inner dia. 3/8"(ϕ10mm)) to the air inlet as shown below.



(1) Connection of air hose to air inlet of main unit.
Connect air hose to hose nipple of air inlet to the main unit.

(Note) Supply compressed air through the micro-separator at area with high humidity or for a long pipeline to the plant.

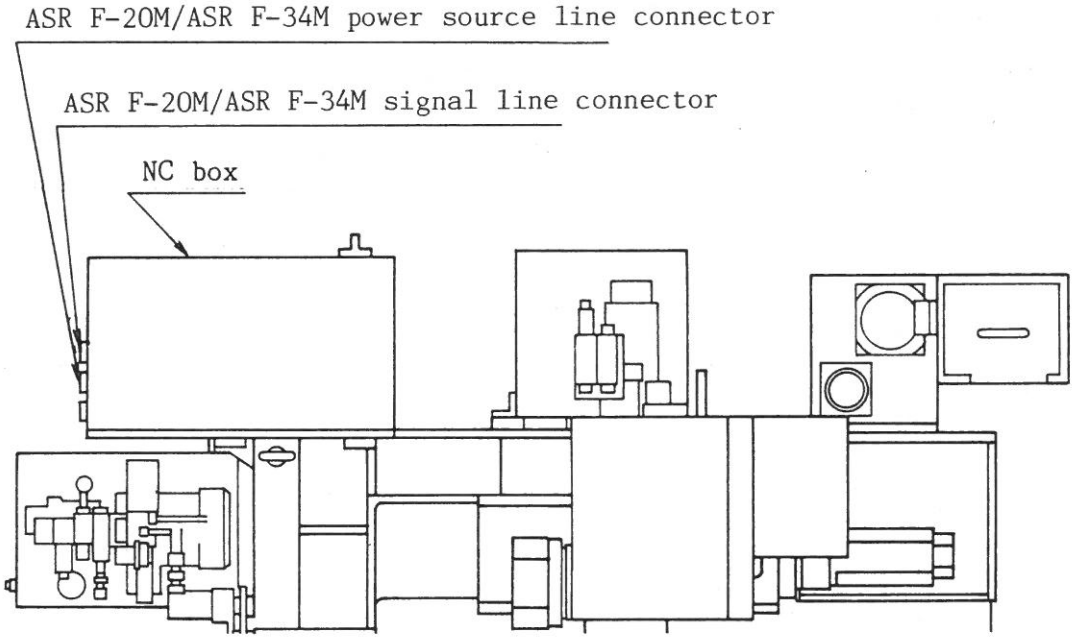


3-7 Installation of Bar Feeder

(1) When ASR F-20M/ASR F-34M is equipped

In stall on the position of installation external view.
Refer to ASR F-20M/ASR F-34M instruction manual for detail.
Here, only items which are not described in ASR F-20M/ASR F-34M instruction manual are described.

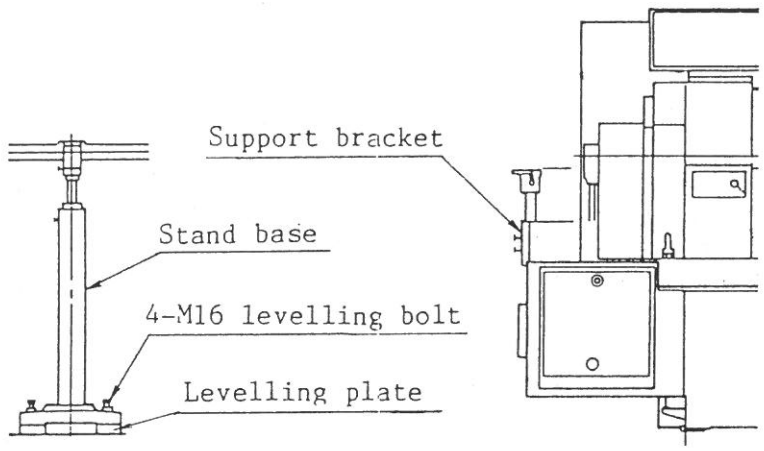
Connect the power source line and signal line of ASR F-20M/ASR F-34M to a cannon connector of NC box shown below.



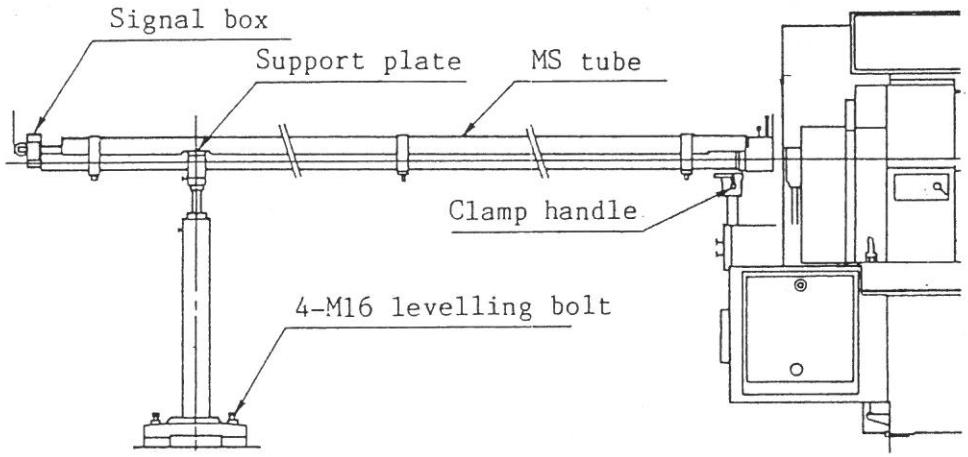
(2) In the case of MS tube type outside bar feeding is equipped

Since MS tube (outside bar feeding) system is divied into MS tube, stand base and machine side support base bracket section at the time of shipment, assemble them in the following procedure.

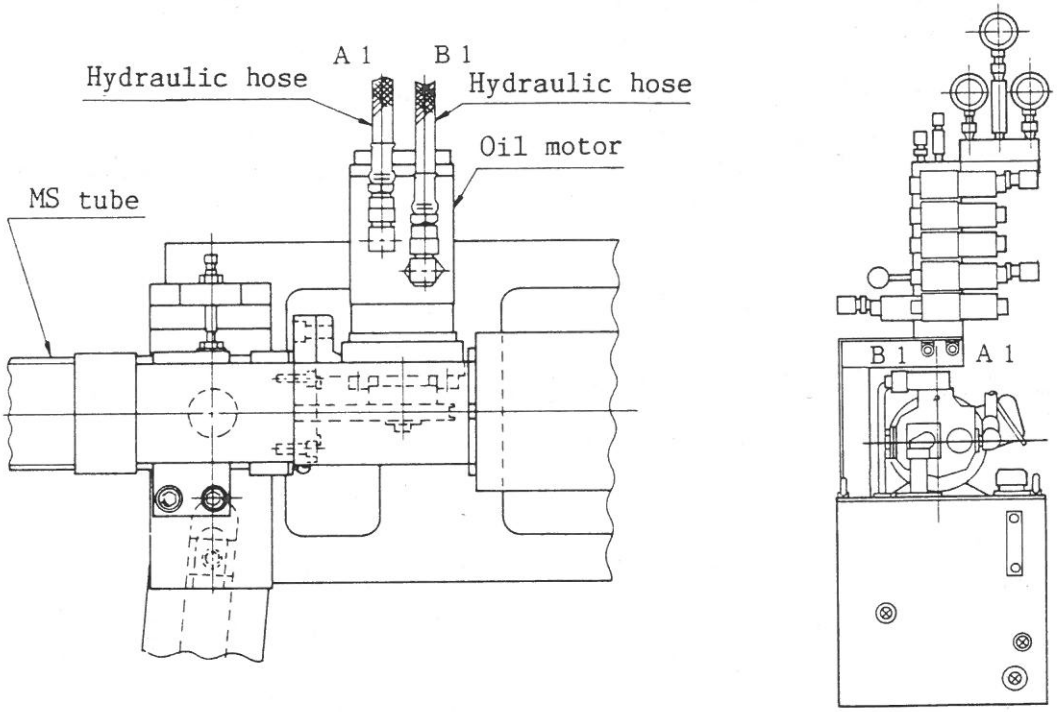
1) Install the leveling plate (Floor plate) at the position of the leveling bolt by referring to the external appearance diagram on P9 and install the stand base on it as shown in the figure below.



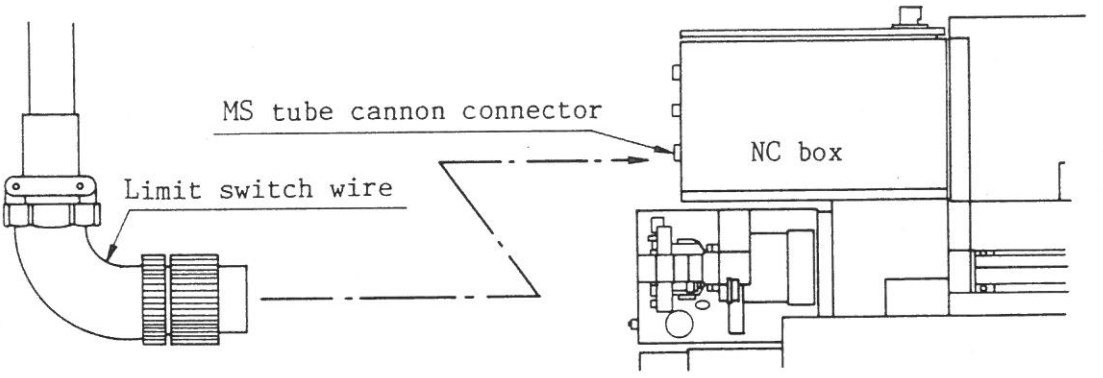
2) Place MS tube on support bracket and stand base as shown in the figure below and fix MS tube by support plate and clamp handle.



3) Connect hydraulic hose between oil motor and hydraulic tank as shown in the figure below.
Connect oil motor A1 port and hydraulic tank A1 port and connect oil pump B1 port and hydraulic tank B1 port. Machine operation becomes reverse when a hose is connected reversely.



4) Connection of signal line
Connect the limit switch wire coming from signal box on the MS tube to NC box shown in the figure below.

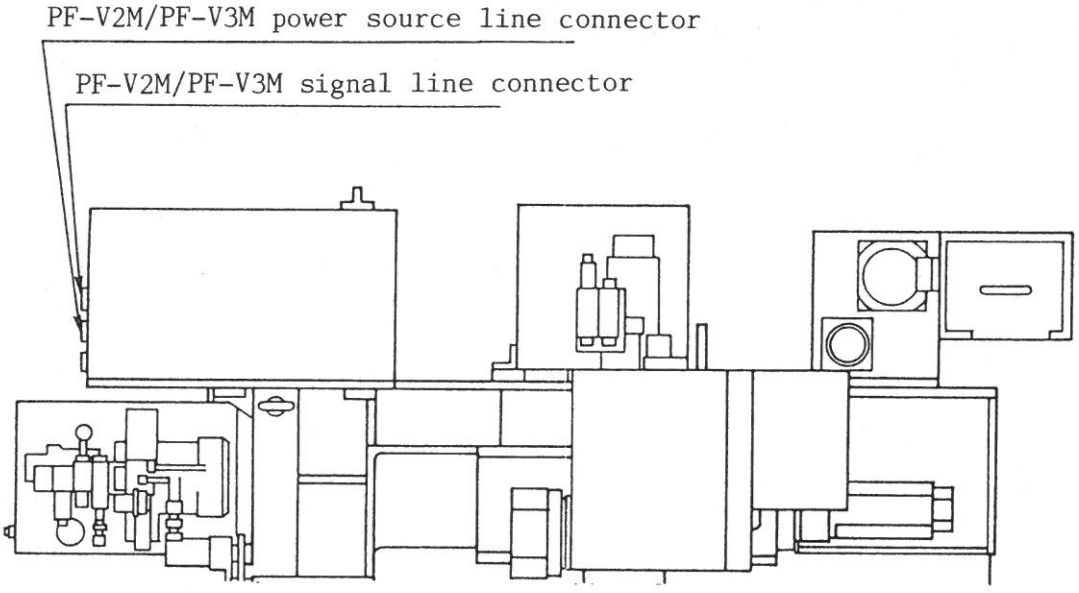


(3) When PF-V2M/PF-V3M is equipped

Install these equipments at the position of the external view drawing. Refer to PF-V2M/PF-V3M instruction manual for the detail of installation.
Here, only items which are not described in PF-V2M/PF-V3M Instruction Manual are described.

1) Connection of power source line and signal line

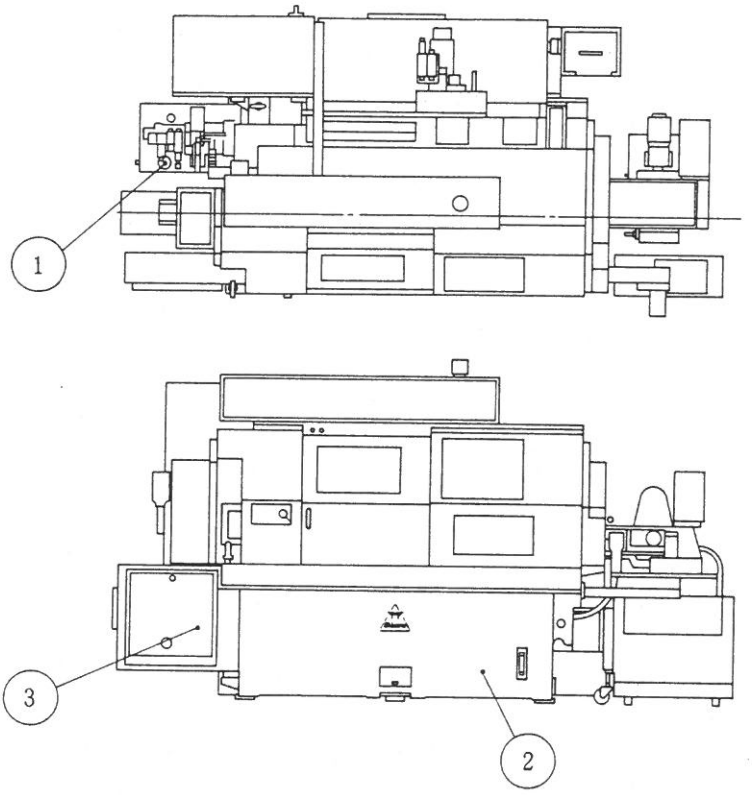
Connect the power source line and signal line of PF-V2M/PF-V3M to the cannon connector of NC box shown in the figure below.



3-8. Oiling

Supply oil to each section in accordance with lubrication and oiling list.

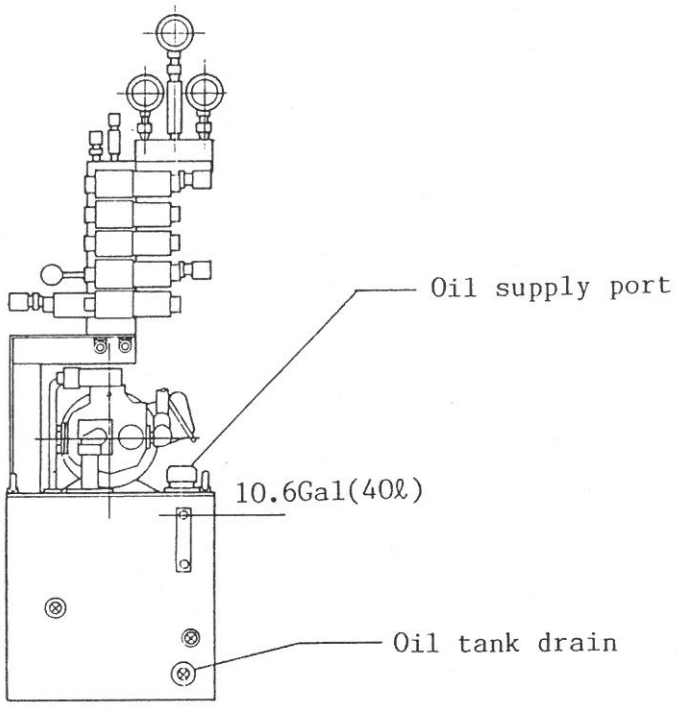
(1) Lubrication and oiling list



No.	1	2	3
TYPE OF OIL	Hydraulic oil	Coolant	Lubrication oil
PLACE OF OIL SUPPLY	Hydraulic tank	Coolant tank	Lubrication oil
CAPACITY	10.6Gal (40ℓ)	BND-20S2,34S2 43.5Gal(165ℓ)	0.26Gal (1ℓ)
SHELL	TELLUS No.32	Refer to [2] Lubrication Chart of the maintenance manual.	Use MOBIL VECTRA No.2S or equivalent.
MOBIL	DTE 24		
ESSO	NUTO H32		
EXXON	TERESSTIC No.32		

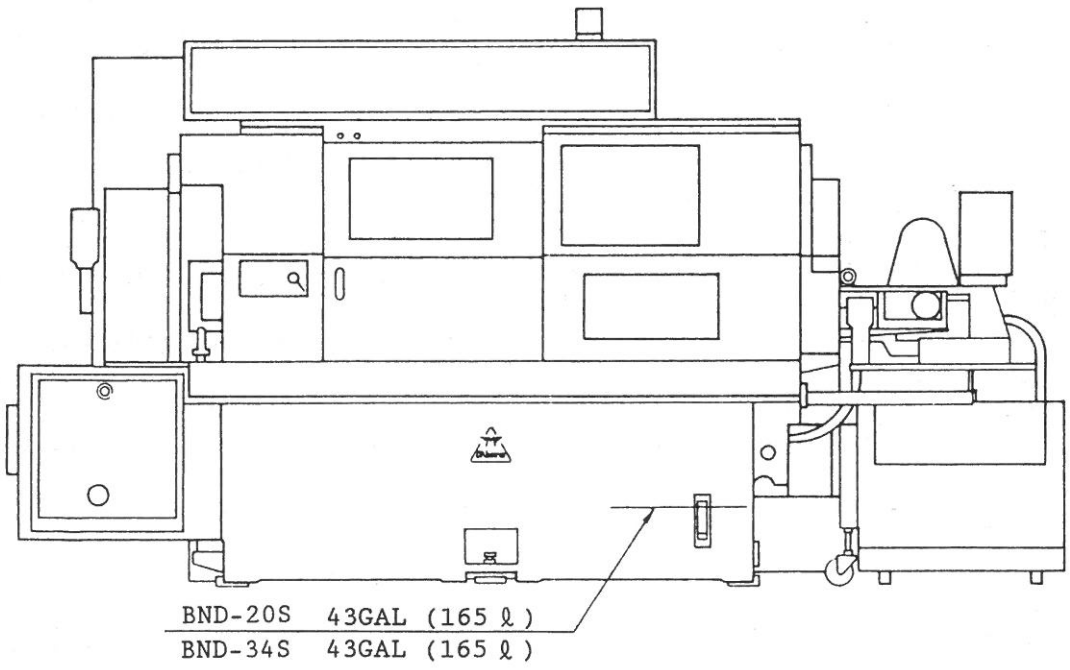
(2) Supply of hydraulic oil

In accordance with the lubrication and oiling list, select hydraulic oil to be used and supply it from hydraulic tank supply port to the level of yellow line of the oil level gauge by passing a filter.



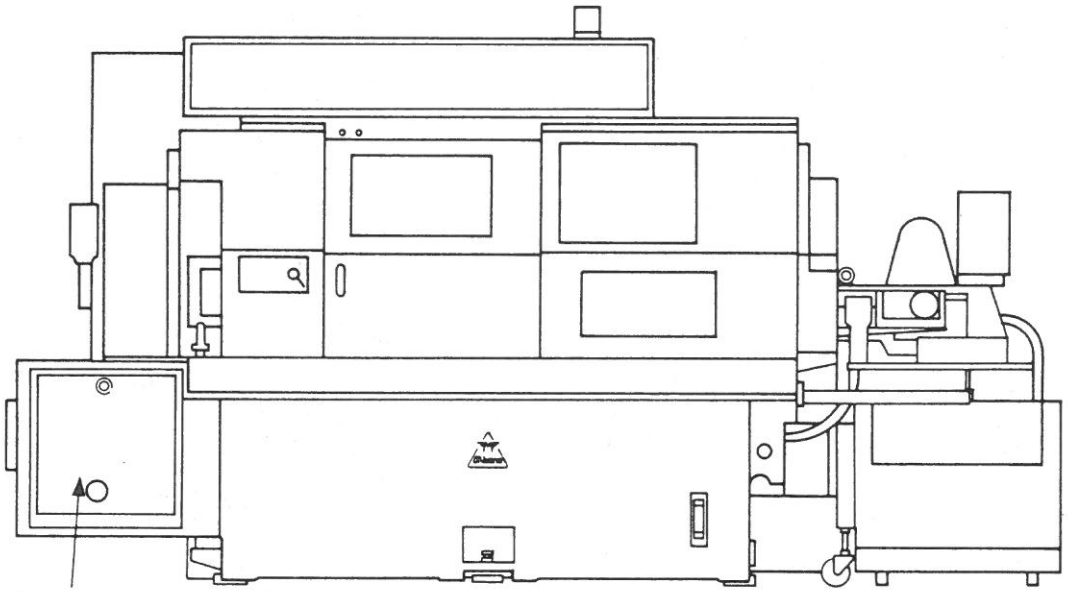
(3) Supply of cutting oil

Select proper cutting oil for work piece to be cut. Supply it to level H of the level indicator.

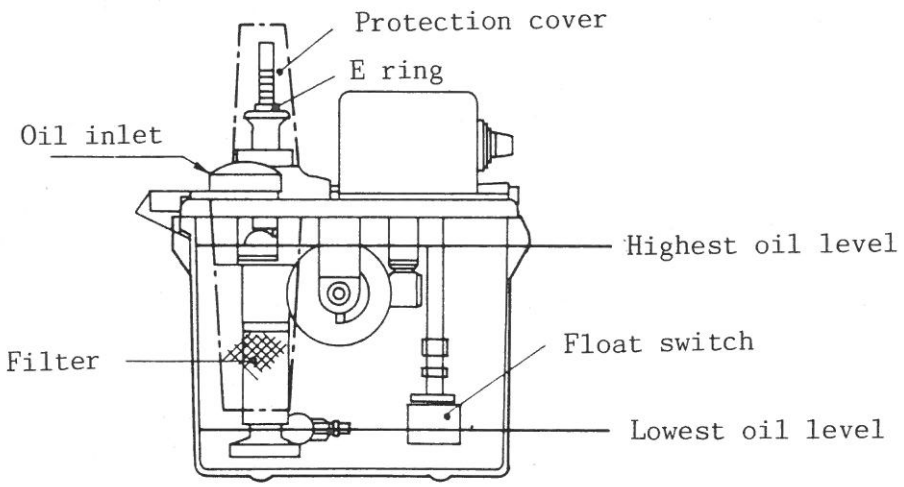


(4) Supply of oil to lubrication tank unit

Select proper lubricating oil according to the lubrication and oiling list.
Supply it up to the highest level as shown below through a filter and oil inlet.

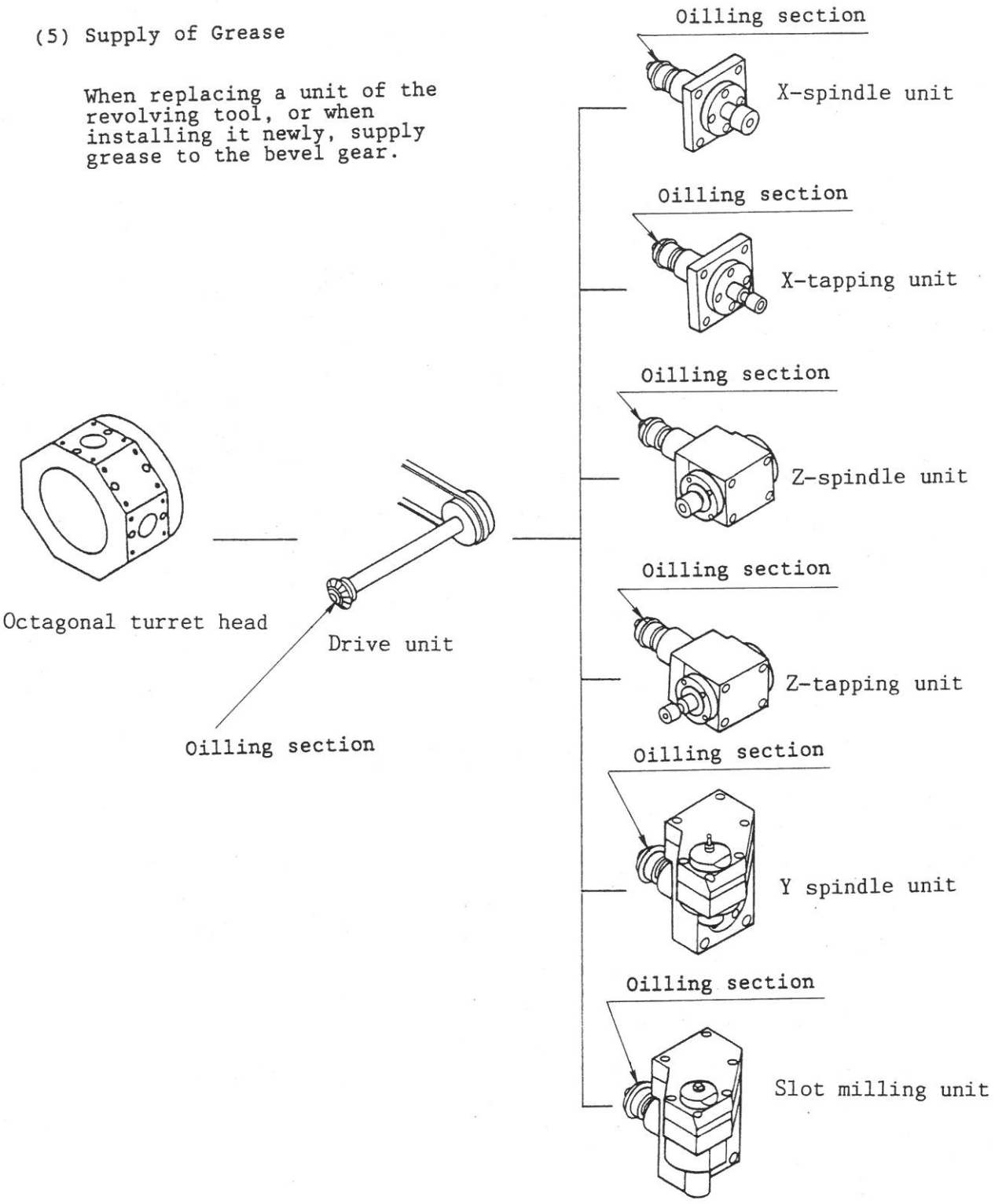


Detail of Lubrication tank unit



(5) Supply of Grease

When replacing a unit of the revolving tool, or when installing it newly, supply grease to the bevel gear.



3-9. Cleaning of machine

Wipe out with waste cloth dusts etc. which were attached when transporting and installing. After cleaning, oil thinly each sliding surface and metal surface with slide lubricant.

(Note 1) Don't use compressed air for cleaning.
(Note 2) Don't use such solvent as gasoline, thinner for cleaning.

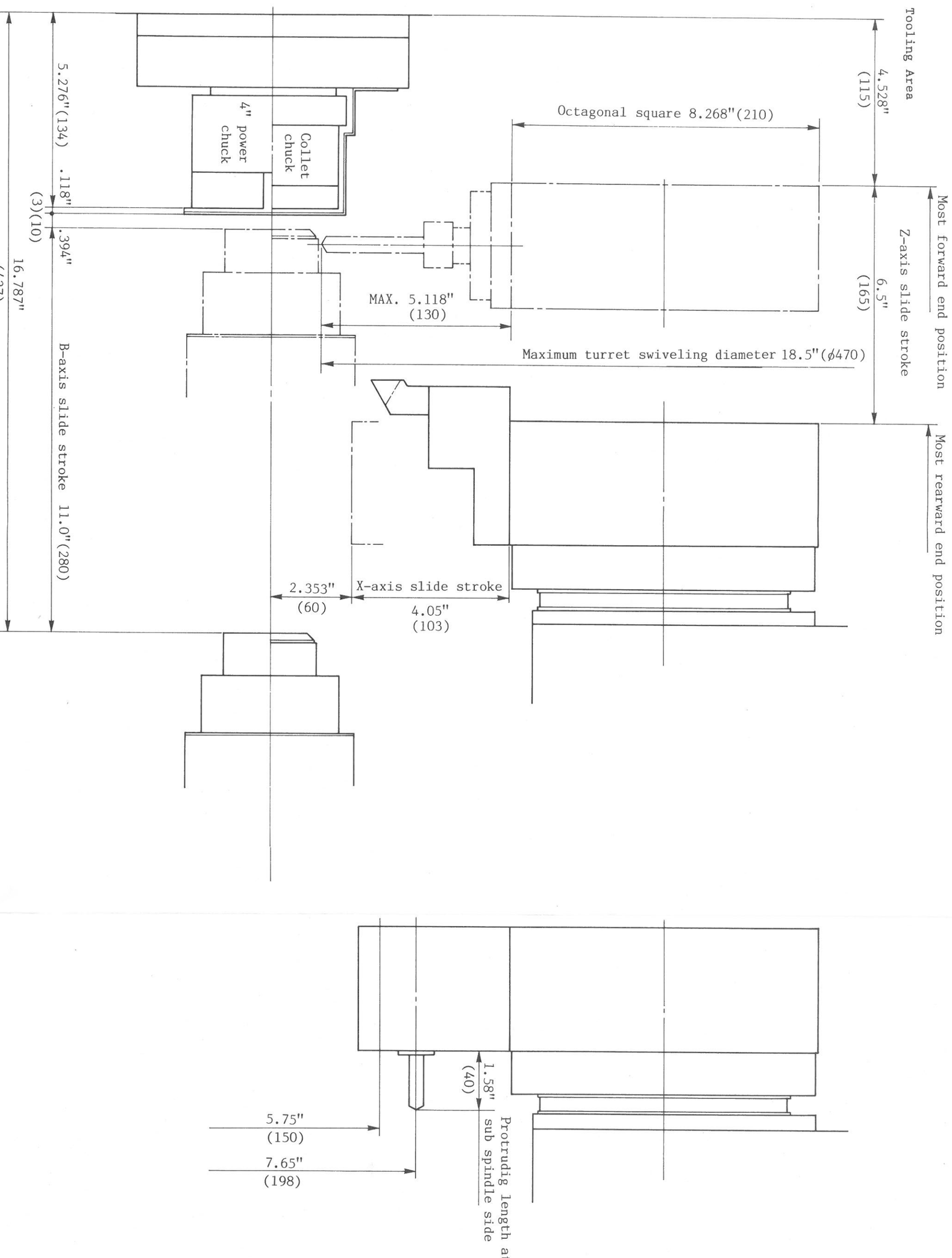
TOOLING

OCT. 1989
EDITION 3—0

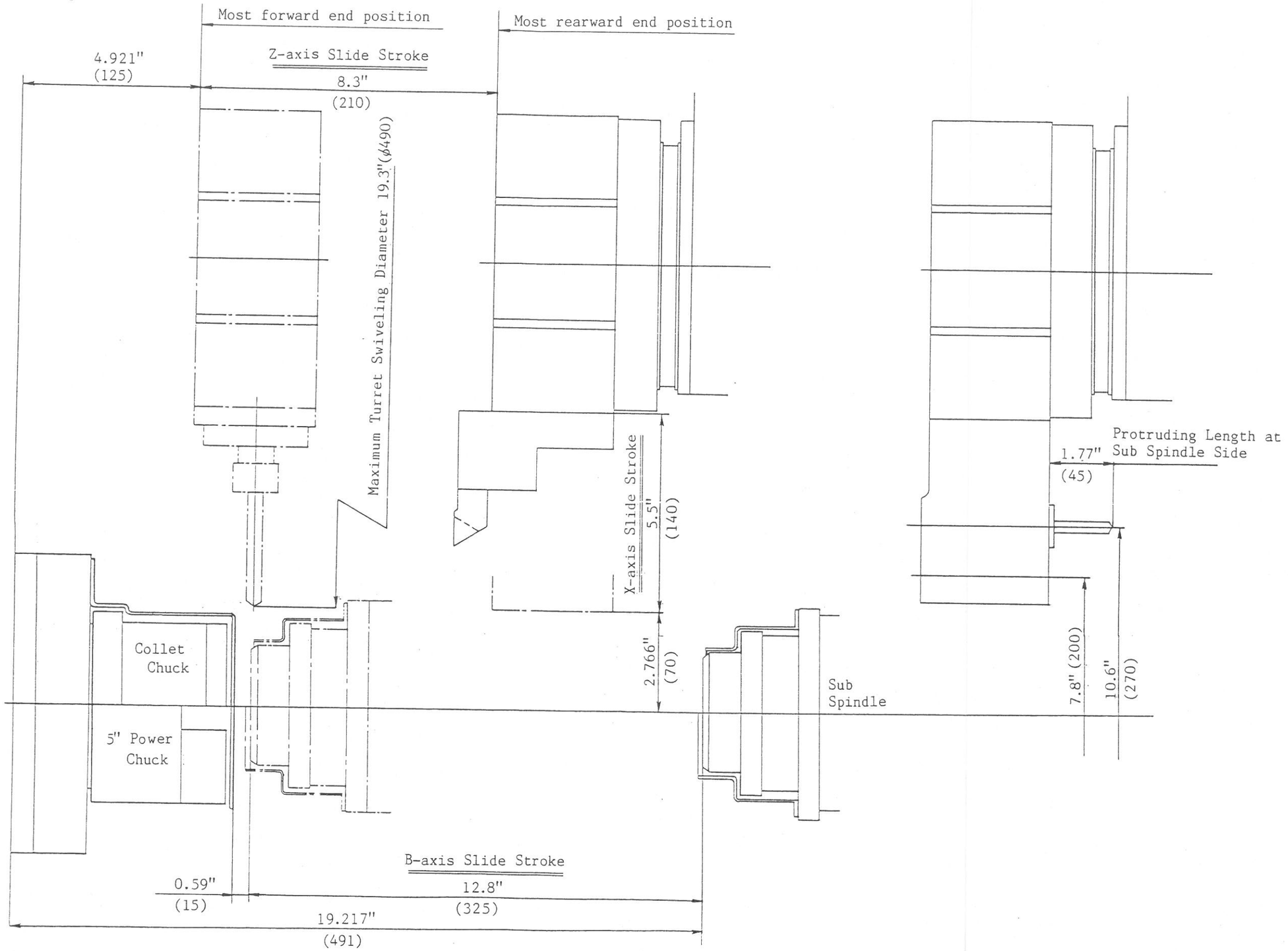
CONTENTS

1. TOOLING AREA

BND-20S₂ Tooling Area

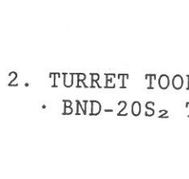


· BND-34S₂ Tooling Area



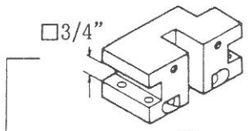
2. TURRET TOOL SYSTEM DIAGRAM

· BND-20S₂ Turret Tool System (INCH SYSTEM)

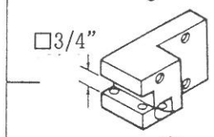


Octagonal turret head

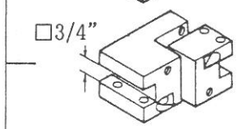
Revolving tool specification



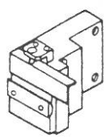
□3/4" Double turning holder A #6L784430A



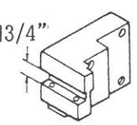
□3/4" Turning tool holder #6L78450A



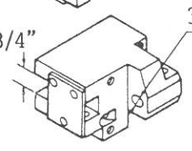
□3/4" Double turning holder B #6L78470A



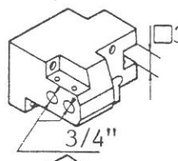
Cut-off tool holder A #6L78460A



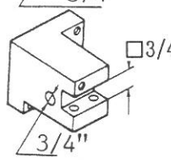
□3/4" Cut-off tool holder B #6L78490A



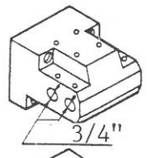
□3/4" 3/4" Double and turning holder F #6L78440A Stopper Plate #6L780320



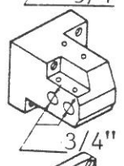
□3/4" 3/4" Double and turning holder R #6L78480A



□3/4" 3/4" Turning and plain holder #6L78500A



3/4" Double plain head A #6L78410A



3/4" Double plain head B #6L78420A

Cover(ϕ45) #6M780900

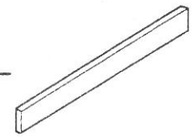
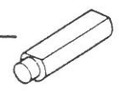


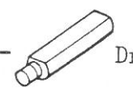
Plate bite Empire Cutoff Tool P-3-W ON Y

Bush #5D78 430A (3/8") #5D78 440A (1/2") #5D78 450A (5/8")

Bush #5D78 460A (1/4")



Stopper #5V78 460A

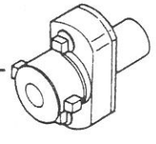


Drill chuck arber (JTO) #5V78 470A

Drill chuck

Drill holder #5D78 370A

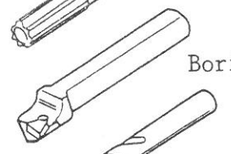
Bush #2178 3600



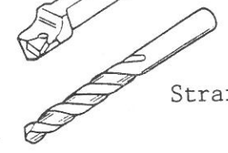
Tap holder #5D78 420A

Bush #2178 3600

Straight shank reamer



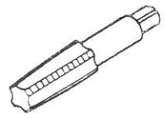
Boring bar



Straight shank drill

Center drill

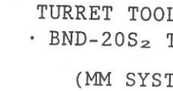
Boring bite (Round)



Tap

TURRET TOOL SYSTEM DIAGRAM
· BND-20S₂ Turret Tool System

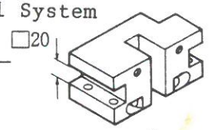
(MM SYSTEM)



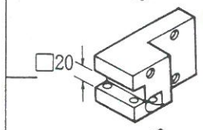
Octagonal turret head

Revolving tool specification

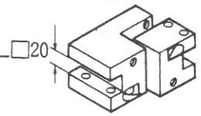
Shim attached



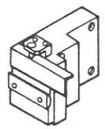
Double turning holder A #6L784300



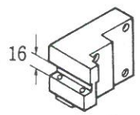
Turning tool holder #6L784500



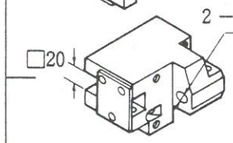
Double turning holder B #6L784700



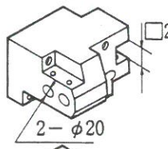
Cut-off tool holder A #6L784600



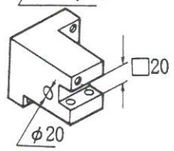
Cut-off tool holder B #6L784900



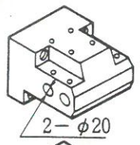
Double and turning holder F #6L784400
Stopper Plate #6L780320



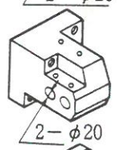
Double and turning holder R #6L784800



Turning and plain holder #6L785000



Double plain head A #6L784100



Double plain head B #6L784200

Cover(φ45) #6M780900

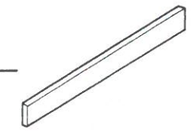
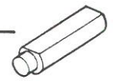


Plate bite t3 x H16

Bush
#5D78 0700 (φ10)
#5D78 0800 (φ12)
#5D78 0900 (φ16)

Bush
#5D78 0600 (φ8)



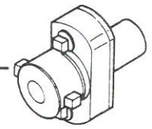
Stopper
#5V78 4060

Drill chuck arber (JT0)
#5V78 4080

Drill chuck
Max φ4mm

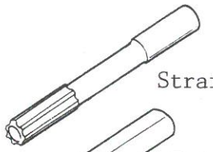
Drill holder(φ16)
#5D78 1100

Bush
#2178 3600

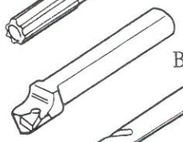


Tap holder
#2178 8100

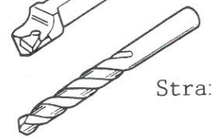
Bush
#2178 3600



Straight shank reamer



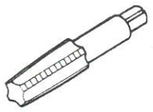
Boring bar



Straight shank drill

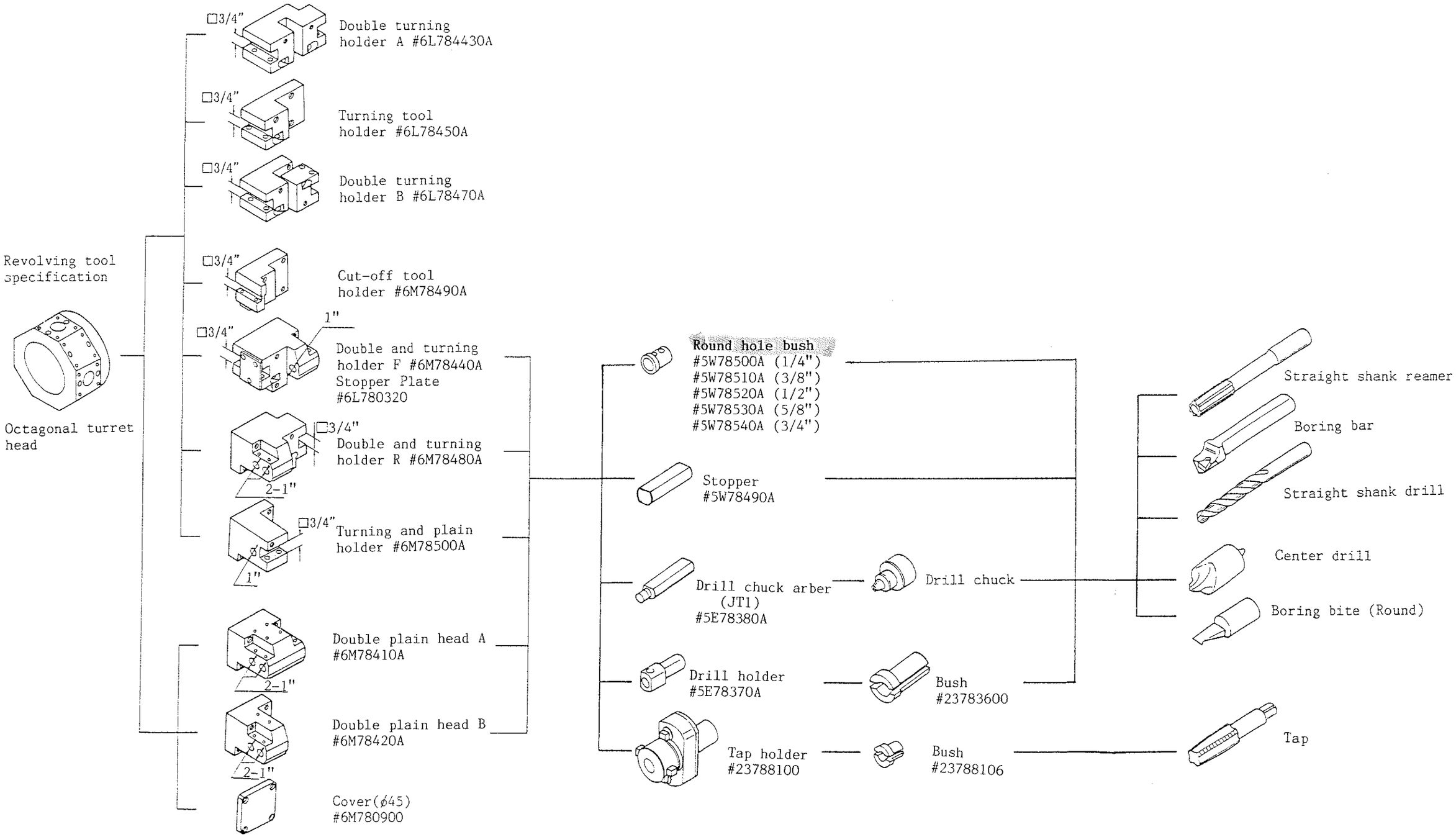
Center drill

Boring bite (Round)

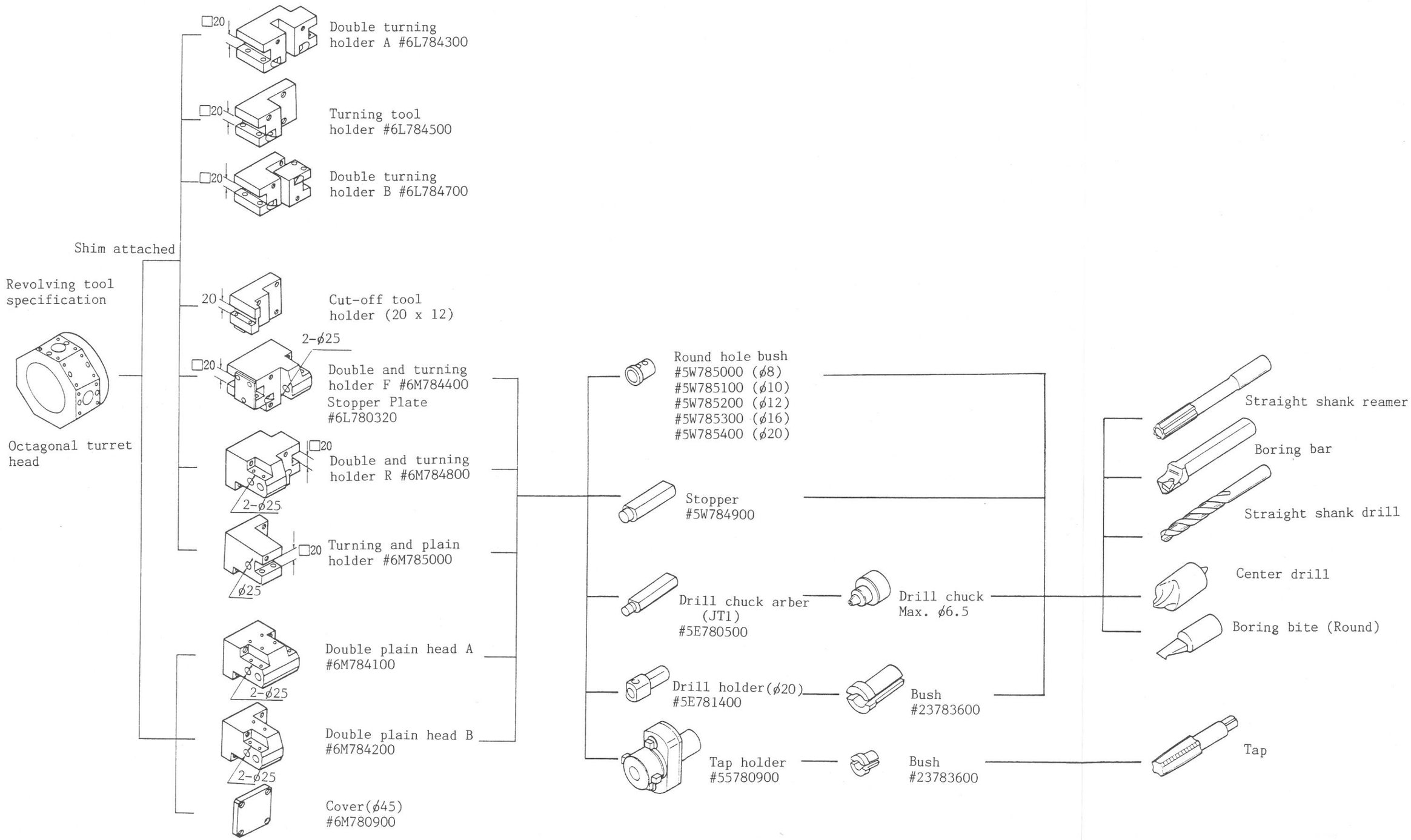


Tap

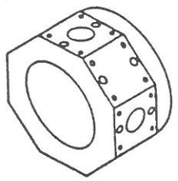
TURRET TOOL SYSTEM DIAGRAM
· BND-34S₂ Turret Tool System (INCH SYSTEM)



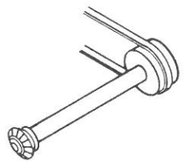
TURRET TOOL SYSTEM DIAGRAM
· BND-34S2 Turret Tool System
(MM SYSTEM)



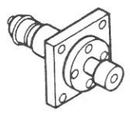
3. REVOLVING TOOL SYSTEM DIAGRAM
   · BND-20S₂ Revolving Tool System (INCH & MM SYSTEM)



Octagonal turret head



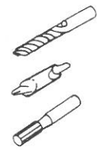
Drive unit



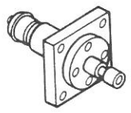
X-spindle unit
#6M781000

NA16 nut
(With Unit)

ESX16-D
Collet Chuck
MAX. ϕ10(3/8")
(Schavblin)



Drill
Center drill
End mill

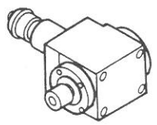


X-tapping unit
#6M78110A

NA16 nut
(With Unit)

ESX12-D
Collet Chuck
MAX. ϕ10(3/8")
(Schavblin)

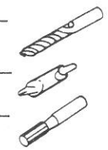
Screw tap



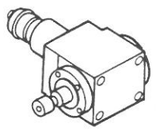
Z-spindle unit
#6M781200

NA16 nut
(With Unit)

ESX16-D
Collet Chuck
MAX. ϕ10(3/8")
(Schavblin)



Drill
Center drill
End mill

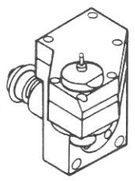


Z-tapping unit
#6M78130A

NA16 nut
(With Unit)

ESX12-D
Collet Chuck
MAX. ϕ10(3/8")
(Schavblin)

Screw tap

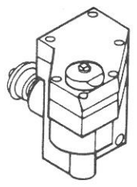


Y spindle unit
#6M781400

NA16 nut
(With Unit)

ESX16-D
Collet Chuck
MAX. ϕ10(3/8")
(Schavblin)

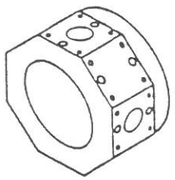
End mill



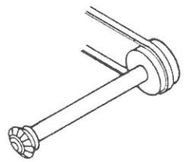
Slot milling unit
#6M78150A(U.S.A) -- 5/8" X 2.5"(MAX)
#6M781500(EUR) ---- ϕ16 x ϕ63(MAX)

Cutter(Diameter ϕ63)

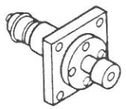
REVOLVING TOOL SYSTEM DIAGRAM
· BND-34S$_2$ Revolving Tool System (INCH & MM SYSTEM)



Octagonal turret head



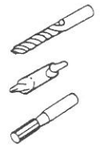
Drive unit



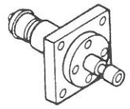
X-spindle unit
#6M781000

NA16 nut
(With Unit)

ESX16-D
Collet Chuck
MAX. ø10(3/8")
(Schavblin)



Drill
Center drill
End mill

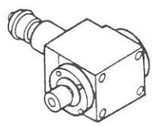


X-tapping unit
#6M78110A

NA16 nut
(With Unit)

ESX12-D
Collet Chuck
MAX. ø10(3/8")
(Schavblin)

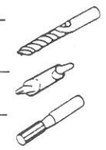
Screw tap



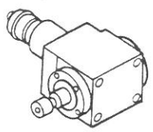
Z-spindle unit
#6M786000

NA16 nut
(With Unit)

ESX16-D
Collet Chuck
MAX. ø10(3/8")
(Schavblin)



Drill
Center drill
End mill

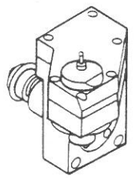


Z-tapping unit
#6M78610A

NA16 nut
(With Unit)

ESX12-D
Collet Chuck
MAX. ø10(3/8")
(Schavblin)

Screw tap

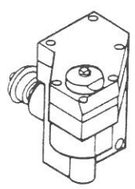


Y spindle unit
#6M786200

NA16 nut
(With Unit)

ESX16-D
Collet Chuck
MAX. ø10(3/8")
(Schavblin)

End mill



Slot milling unit
#6M78630A (U.S.A).. 3" x 1" (Max)
#6M786300 (EUR) ... ø75 x ø22 (Max)

Cutter(Diameter ø63)

Revolving Tool System

Outline

1. Various revolving tool units which are valid for drilling, threading, milling, etc. from X-axis and Z-axis directions are provided for BND-20S_2.
   Composite machining without necessity for change of setting-up because drilling and tapping can be performed from the cross and front by one chucking due to this revolving system.

2. Various revolving tool units can be set at 4 positions of No.2, 4, 6 and 8 of the main turret and a revolving tool unit which corresponds to the content of machining of the work can be used.

3. The revolving tool system consists of the drive unit, various drill units, various tapping units and milling units.

   Drive unit

   BND-20C_2, BND-20T_2 --- 0.4/0.48kW(CONT/10MIN)

   BND-34C_2, BND-34T_2
   BND-20S_2, BND-34S_2 --- 0.75/1.1kW(CONT/10MIN)

   Since the rotation speed of the tool can be directly commanded by the AC invertor motor, the optimum cutting condition can be obtained.

4. Main spindle indexing of the machine main unit is possible for 360° by evey 7.5°.

X-Spindle Unit (6M781000) For BND-20S$_2$/BND-34S$_2$

Outline

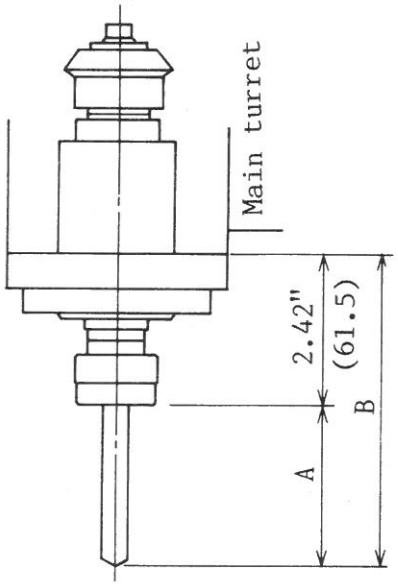
1. This is installed to the main turret head and performs drilling, end milling, etc from X-axis direction.

2. The frill axis rotates at a numerical value of code S commanded in the same block as code M.

Specification

Collet used	. Schavblin ESX16-D (D= MAX. 3/8" or ϕ10)
Code M No.	. M43 Normal rotation (In the case of right drill) . M44 Reverse rotation (In the case of left drill) . M45 Stop
Speed ratio (Drill axis /drive axis)	1.5:1
Rotation area used	. 133 to 4000 R.P.M
Installable position and number	. 4 positions of No.2, 4, 6 and 8 of the main turret

Tool Setting Diagram



Note 1) When tools such as the drill, end mill, etc. and installed, set them within the dimension shown in the diagram.

	A	B
BND-20S$_2$	Max.2.7" (68.5mm)	Max.5.12" (130mm)
BND-34S$_2$	Max.3.09" (78.5mm)	Max.5.51" (140mm)

X-Tapping Unit (6M78110A) For BND-20S₂/BND-34S₂

Outline

1. This is installed to the main turret head and performs tapping from X-axis direction.

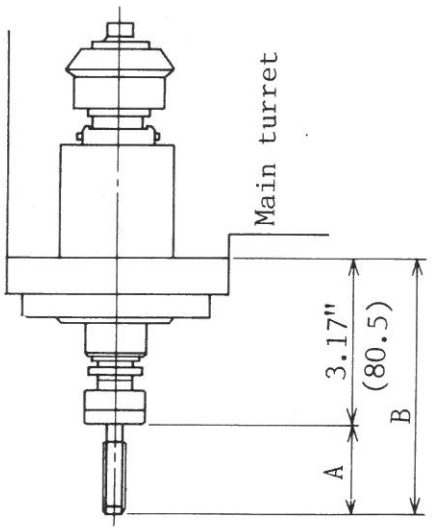
2. The drill axis rotates at a numerical value of code S commanded in the same block as code M.

Specification

Collet used	. Schavblin ESX16-D (D= MAX. 3/8" or ϕ10)
Usable tap size	. Non-iron: MAX M8 x 1.25 . Iron : MAX M6 x 1.0
Code M No.	. M43 Normal rotation M44 Reverse rotation . M45 Stop
Speed ration (Drill axis /drive axis)	1.5:1
Rotation area used	. 133 to 4000 R.P.M
Installable position and number	. X positions of No.2, 4, 6 and 8 of the main turret

Tool Setting Diagram

Note 1) When the tap is installed, set it within the dimension shown in the diagram.



	A	B
BND-20S₂	Max.1.2" (30.5mm)	Max.4.37" (111mm)
BND-34S₂	Max.1.6" (40.5mm)	Max.4.72" (120mm)

Z-Spindle Unit (6M781200) For BND-20S₂

Outline

1. This is installed to the main turret head and performs drilling, end milling, etc. from Z-axis direction.

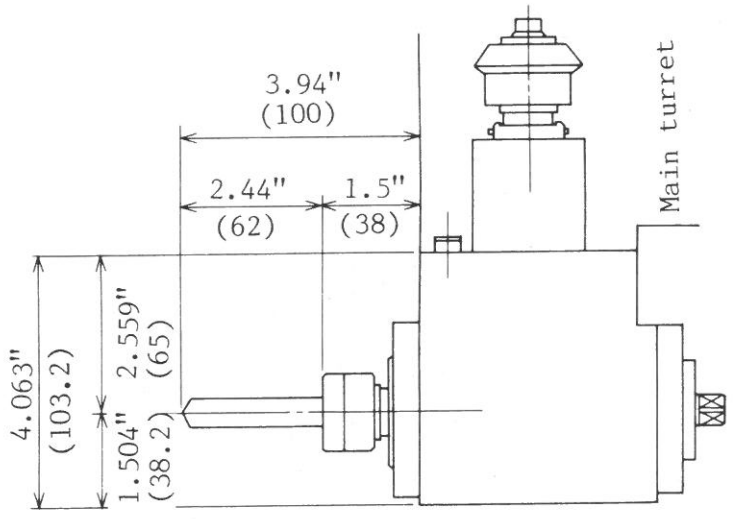
2. The drill axis rotates of a numerical value of code S commanded in the same block as code M.

Specification

Collet used	. Schavblin ESX16-D (D= MAX. 3/8" or ϕ10)
Code M No.	. M43 (In the case of left drill) . M44 (In the case of right drill) . M45 Stop
Speed ratio (Drill axis /drive axis)	1.5:1
Rotation area used	. 133 to 4000 R.P.M
Installable position and number	. 4 positions of No.2, 4, 6 and 8 of the man turret

Tool Setting Diagram

Note 1) When tools such as the drill, end mill, etc. are installed, set them within the dimension shown in the diagram.



Z-Tapping Unit (6M78130A) For BND-20S₂

Outline

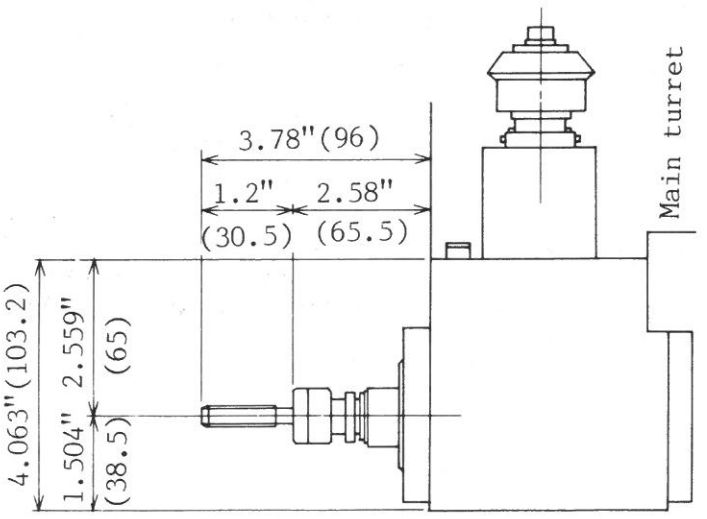
1. This is installed to the main turret head and performs tapping from Z-axis direction.

2. The drill axis rotates at a numerical value of code S commanded in the same block as code M.

Specification

Collet used	. Schavblin ESX16-D (D= MAX. 3/8" or ϕ10)
Usable tap size	. Non-iron: MAX M8 x 1.25 . Iron: MAX M6 x 1.0
Code M No.	. M43 . M44 . M45 Stop
Speed ration (Drill axis /drive axis)	1.5:1
Rotation area used	. 133 to 4000 R.P.M
Installable position and number	. 4 positions of No.2, 4, 6 and 8 of the main turret

Tool Setting Diagram



Note 1)

In the case of right threading
Go : M44
Return : M43

In the case of left threading
Go : M43
Return : M44

Y-Spindle Unit (6M781400) For BND-20S₂

Outline

1. This is installed to the main turret head and performs milling from Y-axis direction.

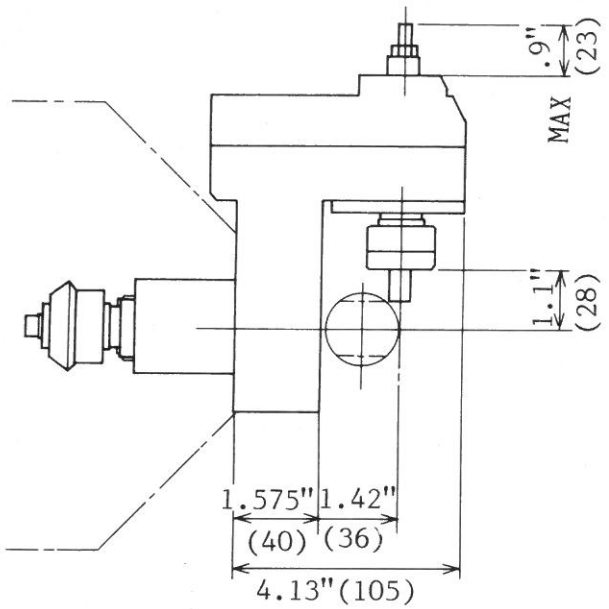
2. The drill axis rotates at a numerical value of code S commanded in the same block as code M.

3. This unit is for plane machining.

Specification

Collet	. Schavblin ESX16-D (D= MAX. 3/8" or ϕ10)
Code M No.	. M43 . M44 (For right end mill) . M45 Stop
Speed ratio (Drill axis /drive axis)	1.5:1
Rotation area used	. 133 to 4000 R.P.M
Installable position and and number	. 4 position s of No.2, 4, 6 and 8 of the main turret

Tool Setting Diagram



Note 1) Select a stopper bolt of proper size depending on the length of the tool. Incidentally, install it within the dimension shown in the diagram.

Note 2) In the case of machining by the end mill for right rotation (standard tool), rotate it by "M44" command.

Note 3) When Y-spindle unit is used, the tool cannot be installed to the next turret station.

Slot Milling Unit (6M781500) - EUR For BND-20S₂
6M78150A - U.S.A

Outline

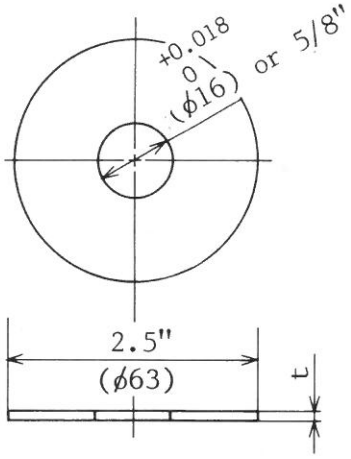
1. This is installed to the main turret head and performs slot milling in X-axis direction.

2. The cutter axis rotates at a numerical value of code S commanded in the same block as code M.

Specification

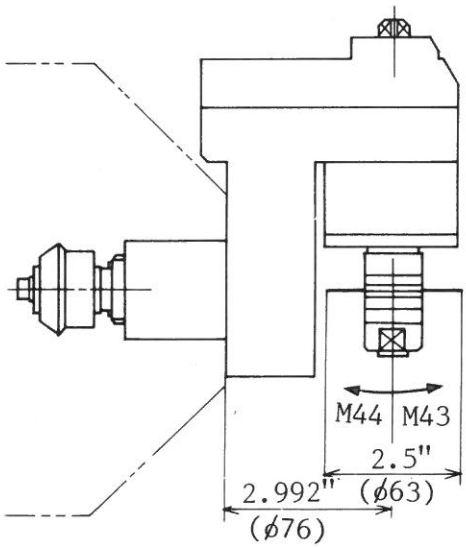
Cutter diameter used	. (ø63 or 2.5") (Refer to Fig.1 for the shape.)
Code M No.	. M43 . M44 . M45 Stop
Speed ration (Drill axis /drive axis)	1.5:1
Rotation area used	. 133 to 4000 R.P.M
Installable position and number	. 4 positions of No.2, 4, 6 and 8 of the main turret

Fig.1 Slot milling cutter



Tool Setting Diagram

Note 1) When the slot milling unit is used, the tool cannot be installed to the next turret station.



Z-Spindle Unit (6M786000) For BND-34S$_2$

Outline

1. This is installed to the main turret head and performs drilling, end milling, etc. from Z-axis direction.

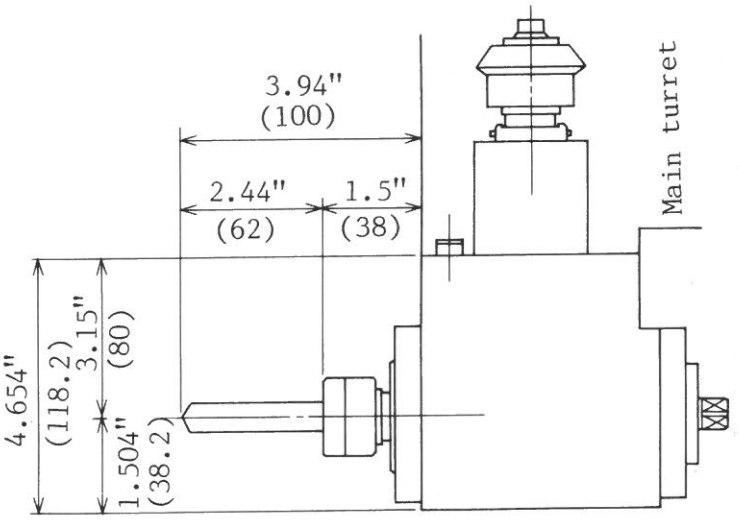
2. The drill axis rotates of a numerical value of code S commanded in the same block as code M.

Specification

Collet used	. Schavblin ESX16-D (D= MAX. 3/8" or ϕ10)
Code M No.	. M43 (In the case of left drill) . M44 (In the case of right drill) . M45 Stop
Speed ratio (Drill axis /drive axis)	1.5:1
Rotation area used	. 133 to 4000 R.P.M
Installable position and number	. 4 positions of No.2, 4, 6 and 8 of the man turret

Tool Setting Diagram

Note 1) When tools such as the drill, end mill, etc. are installed, set them within the dimension shown in the diagram.



Z-Tapping Unit (6M78610A) For BND-34S$_2$

Outline

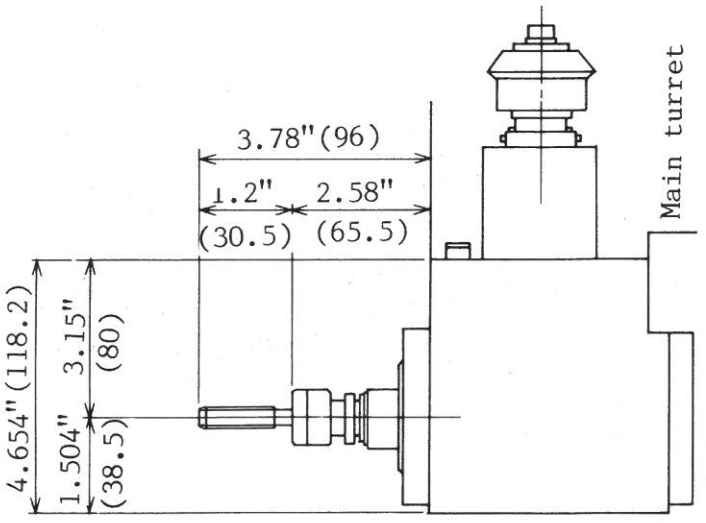
1. This is installed to the main turret head and performs tapping from Z-axis direction.

2. The drill axis rotates at a numerical value of code S commanded in the same block as code M.

Specification

Collet used	. Schavblin ESX16-D (D= MAX. 3/8" or ϕ10)
Usable tap size	. Non-iron: MAX M8 x 1.25 . Iron: MAX M6 x 1.0
Code M No.	. M43 . M44 . M45 Stop
Speed ration (Drill axis /drive axis)	1.5:1
Rotation area used	. 133 to 4000 R.P.M
Installable position and number	. 4 positions of No.2, 4, 6 and 8 of the main turret

Tool Setting Diagram



Note 1)

In the case of right threading
Go : M44
Return : M43

In the case of left threading
Go : M43
Return : M44

Y-Spindle Unit (6M786200) For BND-34S$_2$

Outline

1. This is installed to the main turret head and performs milling from Y-axis direction.

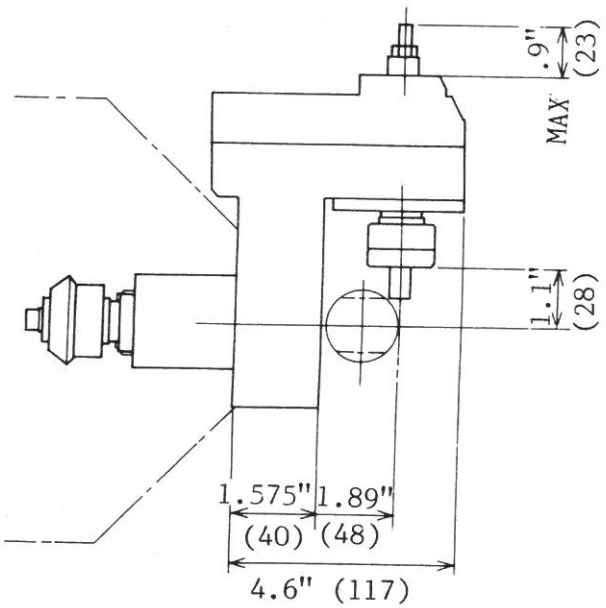
2. The drill axis rotates at a numerical value of code S commanded in the same block as code M.

3. This unit is for plane machining.

Specification

Collet	. Schavblin ESX16-D (D= MAX. 3/8" or ϕ10)
Code M No.	. M43 . M44 (For right end mill) . M45 Stop
Speed ratio (Drill axis /drive axis)	1.5:1
Rotation area used	. 133 to 4000 R.P.M
Installable position and and number	. 4 position s of No.2, 4, 6 and 8 of the main turret

Tool Setting Diagram



Note 1) Select a stopper bolt of proper size depending on the length of the tool. Incidentally, install it within the dimension shown in the diagram.

Note 2) In the case of machining by the end mill for right rotation (standard tool), rotate it by "M44" command.

Note 3) When Y-spindle unit is used, the tool cannot be installed to the next turret station.

Slot Milling Unit 6M786300 ... EUR **For BND-34S₂**
6M78630A ... USA

Outline

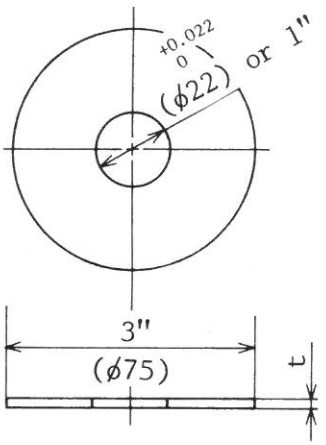
1. This is installed to the main turret head and performs slot milling in X-axis direction.

2. The cutter axis rotates at a numerical value of code S commanded in the same block as code M.

Specification

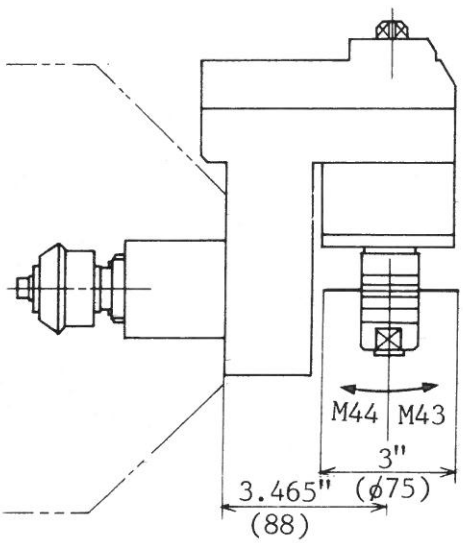
Cutter diameter used	. (ϕ75 or 3") (Refer to Fig.1 for the shape.)
Code M No.	. M43 . M44 . M45 Stop
Speed ration (Drill axis /drive axis)	1.5:1
Rotation area used	. 133 to 4000 R.P.M
Installable position and number	. 4 positions of No.2, 4, 6 and 8 of the main turret

Fig.1 Slot milling cutter

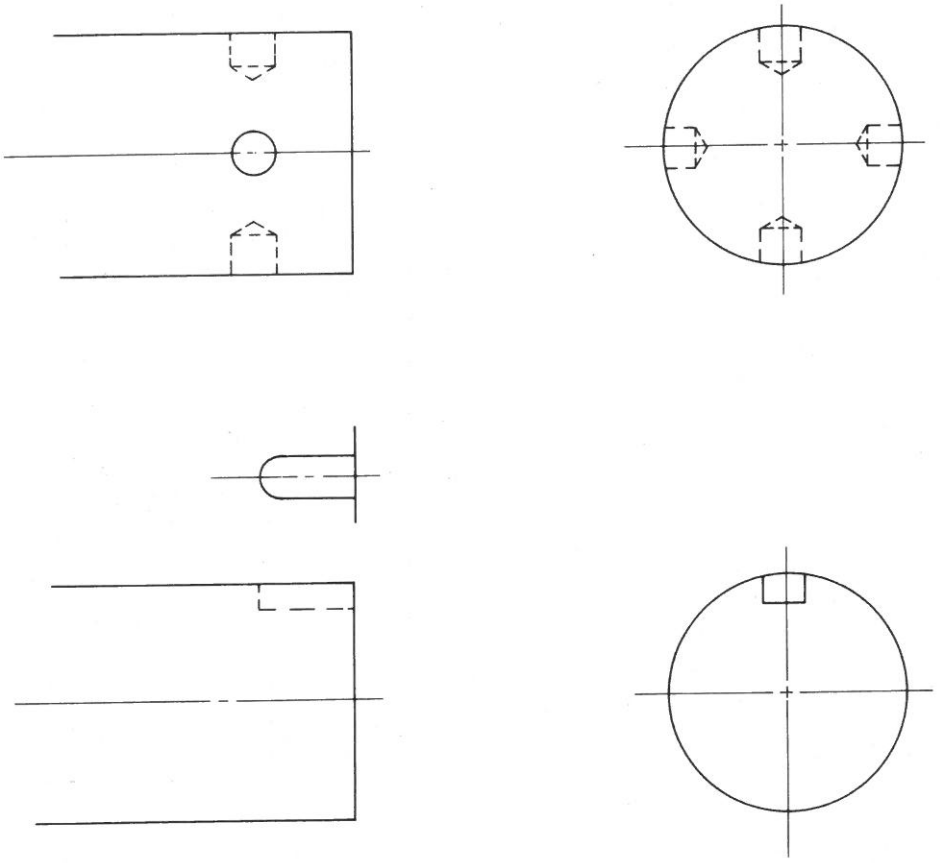


Tool Setting Diagram

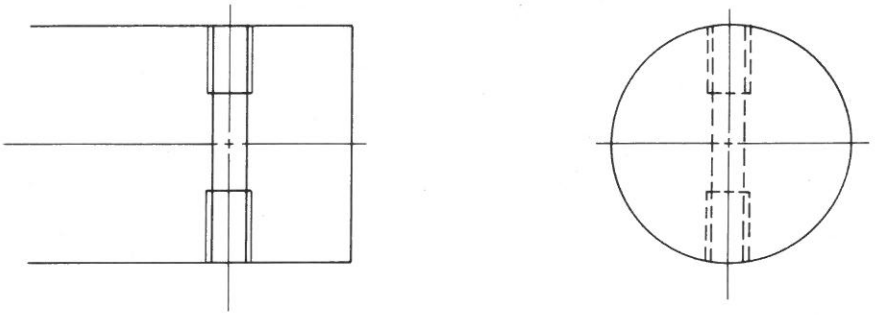
Note 1) When the slot milling unit is used, the tool cannot be installed to the next turret station.



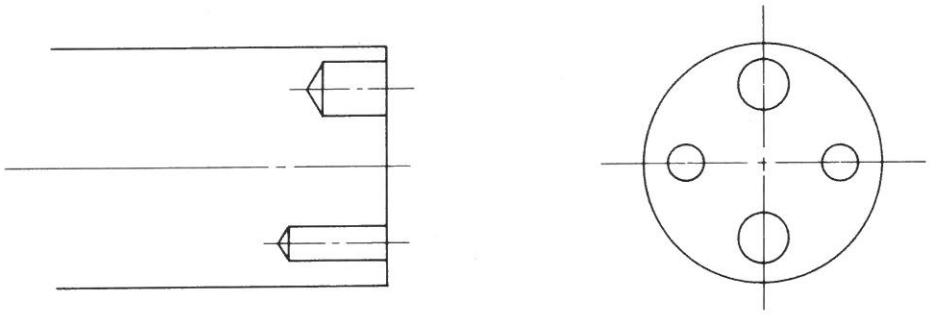
Example of X-spindle Unit Machining



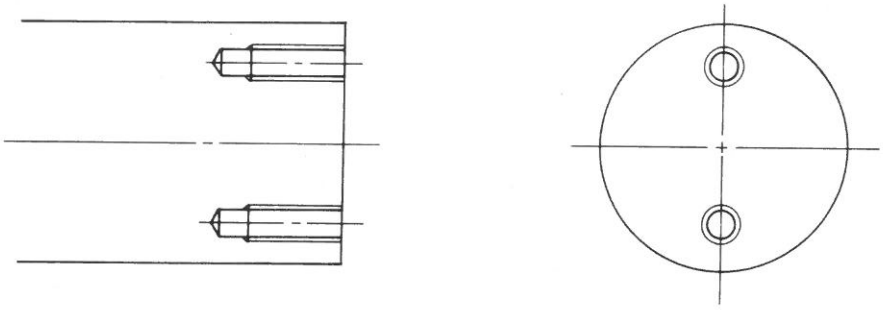
Example of X-Tapping Unit Machining



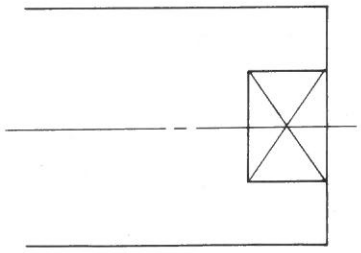
Example of Z-Spindle Unit Machining

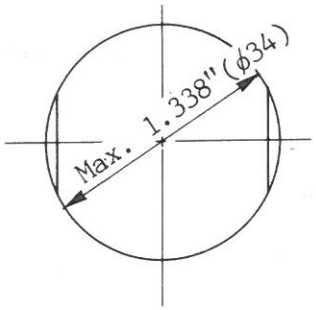


Example of Z-Tapping Unit Machining

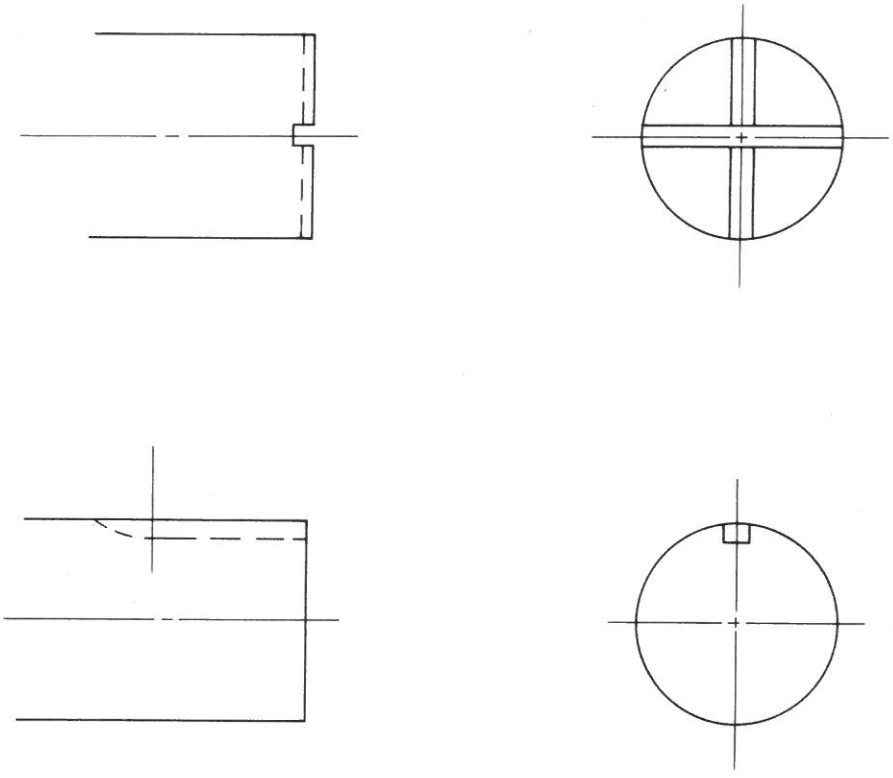


Example of Y-Spindle Unit Machining





Example of Slot Milling Unit Machining



MAINTENANCE

OCT. 1989
EDITION 3–0

CONTENTS

1. MAINTENANCE AND PREVENTIVE MAINTENANCE

Maintenance is done to keep machines in good conditions and to take adequate actions immediately when a trouble occurs.
Preventive maintenance is done to check operating conditions of machines and, in accordance to results of the check, to take necessary measures for preventing troubles before it is brought up to reality. Therefore, the preventive maintenance is very important to operate this machine without any trouble as long as possible. This section describes regular inspection and adjustment of the preventive maintenance, setting of NC unit parameters, and trouble shooting.
Clients of the NC unit are requested to wake an agreement with the manufacturer on the maintenance of the unit after two years from installation.

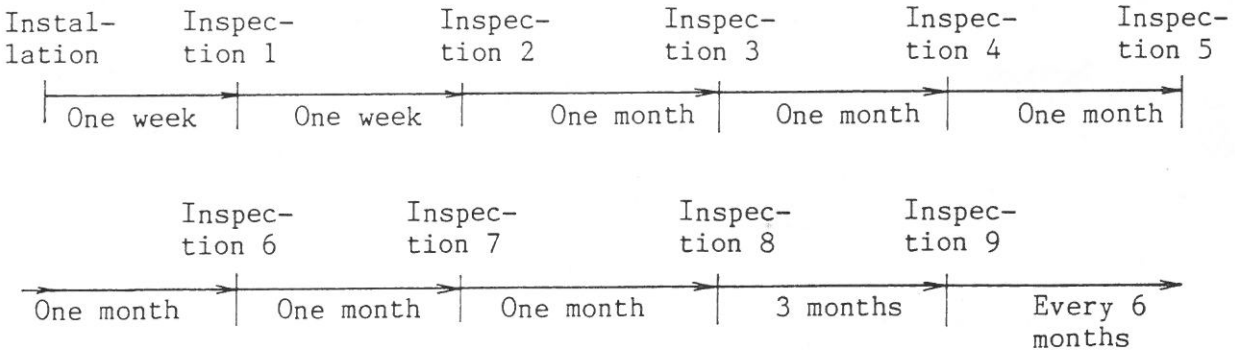
2. REGULAR INSPECTION

[1] Inspection at the beginning after initial installation

Lubricating oil should be changed after the installation at shorter intervals than normal.
Levelling of the machine should be inspected, too. Refer to the inspection cycle chart shown below.

1) Inspection of levelling the machine

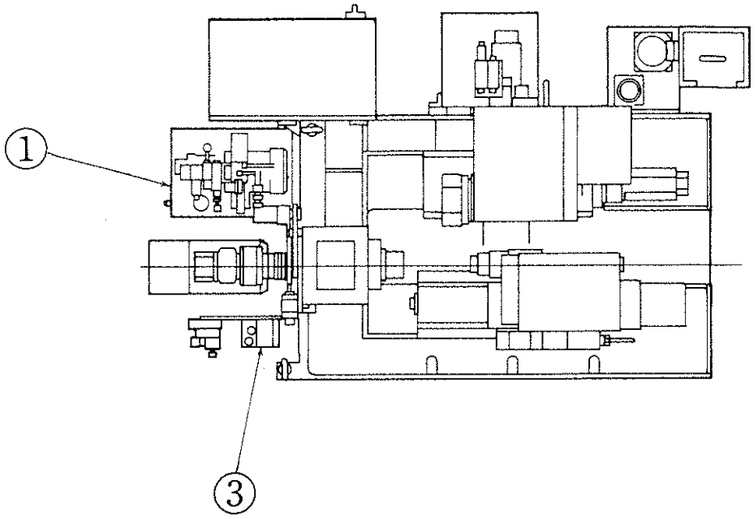
Inspection should be performed in the same way as described in Page 27. " Outline of Machine in Instruction Manual"

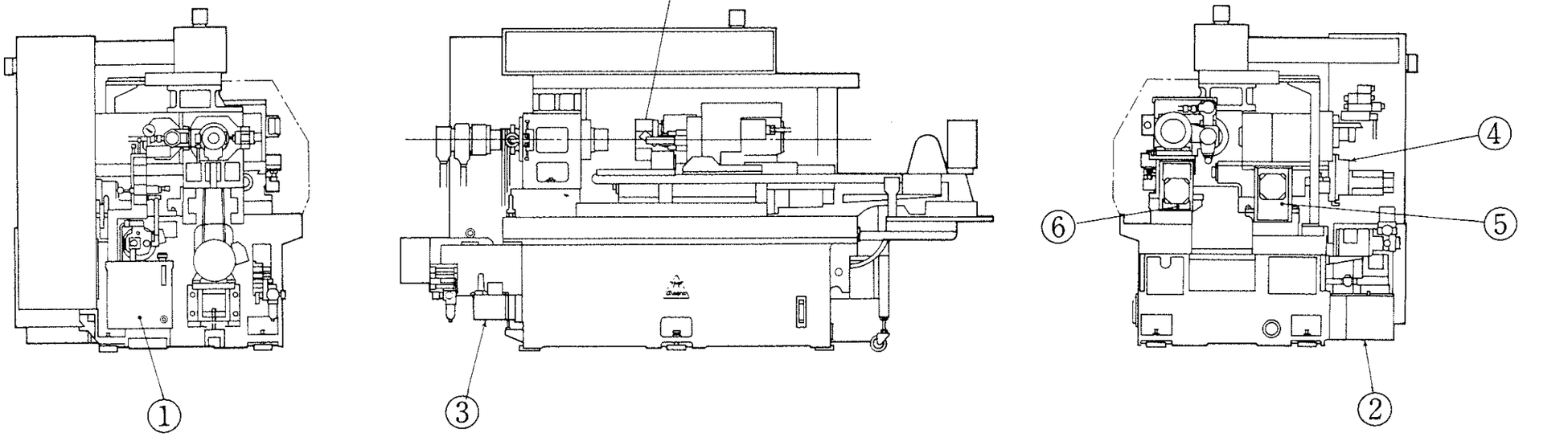


2) Replacement of lubrication oil

Replace the oil in the gear box of X-, Z-, B-axes and hydraulic oil in the hydraulic tank at one month after installation.
Replace lubrication oil thereafter in accordance with lubrication chart in the following page.

[2] Lubrication Chart





*1. Use proper volume and oil as listed below or similar.

*2. Inspection and renewal cycle are based on a 8 hours day. These cycle should be adjusted in according to actual operation hours.

*3. Do not mix the oil with different grades and makers.

*4. D: Day
W: Week
M: Month
Y: Year

No.	TYPE OF OIL	PLACE OF OIL SUPPLY	CAPACITY	METHOD OF OIL SUPPLY	INSPECTION CYCLE	CLEANING CYCLE OF FILTER	RENEWAL CYCLE	NAME OF OIL BY COMPANY			
								SHELL	MOBIL	ESSO	EXXON
1	Hydraulic oil	Hydraulic tank	10.6 Gal (40ℓ)	Manual	1M	6M	6M	TELLUS No.32	DTE24	NUTO H32	TERESSTIC No.32
2	Coolant	Coolant tank (BND-20S/34S)	43 Gal (165ℓ)	Manual	1D	1W	—	Refer to the table of recommended coolant.			
3	Lubrication oil	Lubrication oil tank	0.26 Gal (1ℓ)	Manual	1W	1M	—	MOBIL VECTRA No. 2S or equivalent			
4	Lubrication oil	X-axis gear box	0.08 Gal (0.3ℓ)	Manual	1M	—	6M	TELLUS No.32	DTE LIGHT	TERESSTIC No.3	TELLUS No.32
5	Lubrication oil	Z-axis gear box	0.08 Gal (0.3ℓ)	Manual	1M	—	6M				
6	Lubrication oil	B-axis gear box	0.08 Gal (0.3ℓ)	Manual	1M	—	6M				
7	Grease	Bevel gear of the revolving tool	————	Manual	—	—	When installing or replacing a unit.	ALVANIA No.2	MOBILUX No.2	BICON 2	UNIREX N-2

Table of recommended coolant

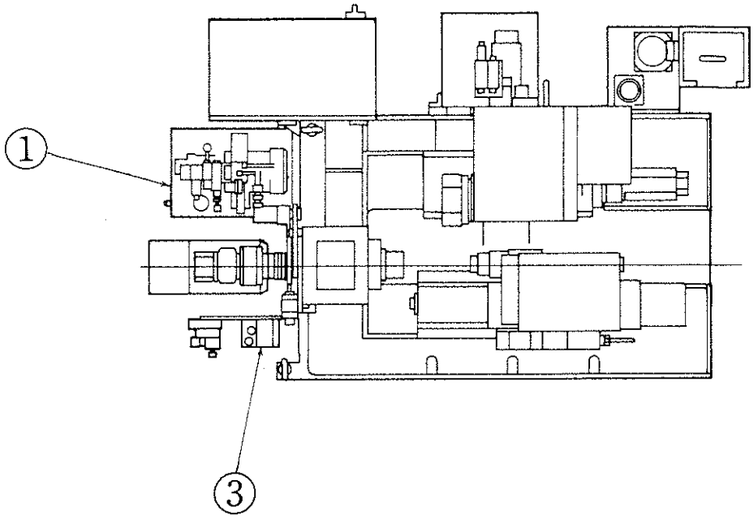
Kind of oil	Manufacturer	Brand	JIS	Viscosity cST	Sulfur content	Fatty oil content	Chlorine content	Copper corrosion	Features described in manufacturer's catalog
Water insoluble coolant	Mitsubishi Sekiyu	DIAMOND CUT 203AF	Similar to type 2 No.3	13	——	2.0%	1.5%	1a	Good finished surface accuracy, prolonged tool service life. universal type.
	Nihon Sekiyu	UNICUT GS-30	Type 2 No.3	20	——	5%	1.7%	1	Extreme pressure agent of chlorine system is added to mineral oil. General purpose coolant with wide applications.
	Nihon Sekiyu	UNICUT GS-15	Type 2 No.3	11	——	5%	1.7%	1	Extreme pressure agent of chlorine system is added to mineral oil of low viscosity. Good permeability . Extra less derma-stimulant coolant.
	Yushiro Chemical	YUSHIRO OIL NS102	———	10.2	——	———	1.2%	1	Available as both lubricating oil and coolant.
	Mobil Oil	MOBILMET411	Type 2 No.1	9.78	0.2%	0%	0.8%	1	Multi-metal and multi-service type of coolant
	Mobil Oil	MOBILMET414	Equivalent to Type 2 No.3	11	0.3%	0%	1.4%	1	Multi-metal and multi-service type of coolant
	Mobil Oil	VACMUL F1	———	22	0.2%	0%	1.2%	1a	General purpose coolant, Inactive type of coolant
Water soluble coolant	Mitsubishi Sekiyu	DIAMOND CUTWAY68	Type W1 No.1 to No.3	68.2				1a	Usable both slide surface oil and water soluble coolant (Dissimilar oil mixing is not allowed).
	Nihon Sekiyu	UNISOLUBLE EM-L	Type W1 No.1	——				Catalog ○	Lubricating oil, Rust prevention, Prolonged liquid life which is excellent in anti-corrosion quality.
	Yushiro Chemical	YUSHIROKEN EZ20	Type W1 No.2	47				Catalog ○	
	Mobil Oil	MOBILMET 110	Type W1 No.3		——		Nil	1a	General purpose coolant, Good anti-corrosion quality, Good stability of emulsion.
	Mobil Oil	MOBILMET 120	Type W2 No.1		——		Nil	1a	Excellet rust preventive ability, Good anti-corrosion quality, Good stability of emulsion.
	Mobil Oil	MOBILMET 150	Type W1 No.2		——		10.3%	1a	General purpose coolant, Good anti-corrosion quality, Good stability of emulsion.
	Mobil Oil	SOLVAC 1535G	———						General purpose coolant, Good anti-corrosion quality, Good stability of emulsion.

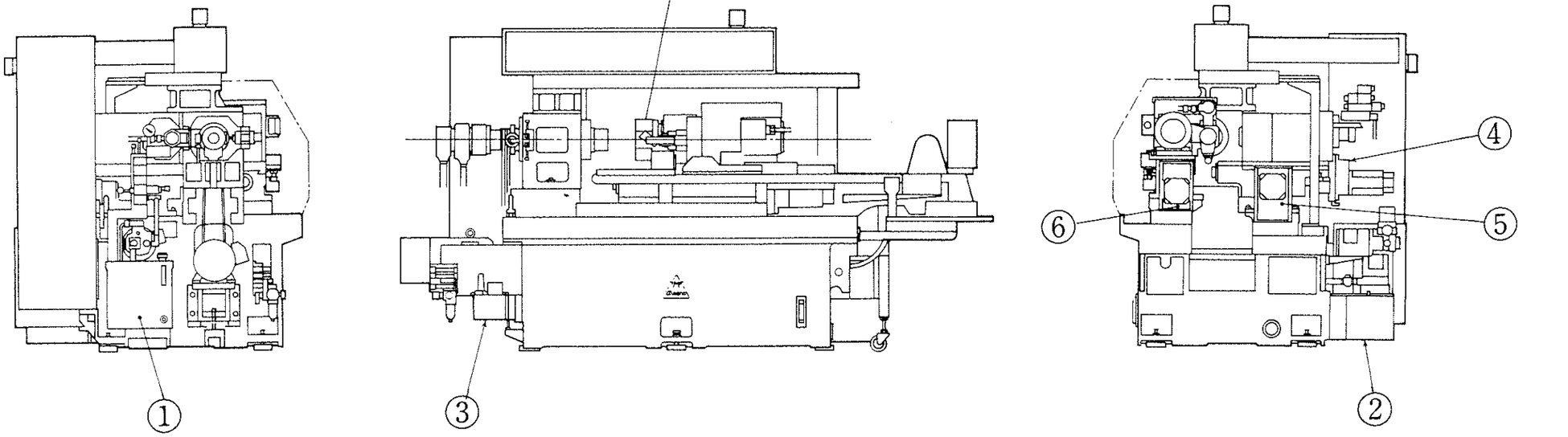
[3] List of Maintenance Check Points

* Cycles of oil changing and of inspection have been worked out, based on eight hours operation per day.
Then, change the cycles properly, according to your actual operation hours.

EQUIPMENT	ENFORCEMENT POINT			METHOD OF INSPECTION & ADJUSTMENT	INSPECTION CYCLE	STANDARD OF JUDGMENT	METHOD OF REPAIRING OR ADJUSTMENT, WHEN ABNORMAL
	PLACE	NO.	ITEM				
MAIN SPINDLE	Front bearing	1	Abnormal noise at running	Hearing check	Daily	Compare with noise when the machine was installed	Replacement of bearing
		2	Abnormal heat rise	Touch check	Daily	After running at 3000 rpm, temperature should stay within room temperature + 59°F (15°C)	
		3	Radial clearance	Check with dial gauge	1 year	Within .00008" (2 μm). Refer to "Procedures for preventive maintenance"	
		4	Thrust clearance	Check with dial gauge	1 year	Within .00008" (2 μm). Refer to "Procedures for preventive maintenance"	
	Rear bearing	5	Abnormal noise at running	Hearing check	Daily	Compare with noise when the machine was installed	Replacement of bearing
		6	Abnormal heat rise	Touch check	Daily	After running at 3000 rpm, temperature should stay within room temperature + 59°F (15°C)	
		7	Radial clearance	Check with dial gauge	1 year	Within .00008" (2 μm). Refer to "Procedures for preventive maintenance"	
	Runout of spindle nose	8	Runout of outer diameter	Check with dial gauge	6 months	Max. .0004" (10μm). Refer to "Machine accuracy test sheet."	Overhaul
		9	Runout of face				
	Collet system	10	Wear of chuck	Visual check and accuracy of workpiece	1 month	No one-side wear when disassembled	Replacement
		11	Wear of chuck sleeve	Visual check and accuracy of workpiece	6 months	No one-side wear when disassembled	Replacement
		12	Wear of chuck cap	Visual check and accuracy of workpiece	6 months	No one-side wear when disassembled	Replacement
		13	Chuck opening and closing time	Use stop watch	1 month	Within 1.0 sec. under 72 lb/in² (5 kgf/cm²) chucking pressure	Disassembling and cleaning
	Chuck cylinder	14	Abnormal noise at running	Hearing check	Daily	No abnormal noise	Disassembling and replacement of parts
		15	Abnormal heat rise	Touch check	Daily	Within 167°F (75°C)	Disassembling and replacement of parts
		16	Oil level in drain	Visual check	1 month	Compare with oil level at installation. 0.4 Gal/min. (1.5ℓ/min)122°F(50°C),362 lb/in²(25 kgf/cm²)	Disassembling and replacement of parts

[2] Lubrication Chart





*1. Use proper volume and oil as listed below or similar.

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2	Coolant	Coolant tank (BND-20S/34S)	43 Gal (165ℓ)	Manual	1D	1W	—	Refer to the table of recommended coolant.			
3	Lubrication oil	Lubrication oil tank	0.26 Gal (1ℓ)	Manual	1W	1M	—	MOBIL VECTRA No. 2S or equivalent			
4	Lubrication oil	X-axis gear box	0.08 Gal (0.3ℓ)	Manual	1M	—	6M	TELLUS No.32	DTE LIGHT	TERESSTIC No.3	TELLUS No.32
5	Lubrication oil	Z-axis gear box	0.08 Gal (0.3ℓ)	Manual	1M	—	6M				
6	Lubrication oil	B-axis gear box	0.08 Gal (0.3ℓ)	Manual	1M	—	6M				
7	Grease	Bevel gear of the revolving tool	————	Manual	—	—	When installing or replacing a unit.	ALVANIA No.2	MOBILUX No.2	BICON 2	UNIREX N-2

EQUIPMENT	ENFORCEMENT POINT			METHOD OF INSPECTION & ADJUSTMENT	INSPECTION CYCLE	STANDARD OF JUDGMENT	METHOD OF REPAIRING OR ADJUSTMENT, WHEN ABNORMAL
	PLACE	NO.	ITEM				
MAIN TURRET SLIDE	X-axis slide	35	Abnormal noise of AC motor	Hearing check	Daily	No abnormal noise	Contact with FANUC or Miyano
		36	Loosen connector	Touch check	3 months	No loosening	Tightening
		37	Abnormal noise when slide is moving	Touch check	Daily	No abnormal noise	Contact with Miyano
		38	Right angle degree between movement of slide and main spindle center line	Measure with dial gauge	1 year	Max. .0004" (10μm). Refer to "Machine accuracy test sheet."	Contact with Miyano
		39	Repeating accuracy	Measure with dial gauge	1 year	Max. .0004" (10 μm). Refer to "Machine accuracy test sheet."	Contact with Miyano
		40	Positioning accuracy	Measure with dial gauge	1 year	Max. .0004" (10 μm). Refer to "Machine accuracy test sheet."	Contact with Miyano
	Z-axis slide	41	Slide clearance	Measure with dial gauge	1 year	Within .00008" (2 μm) Refer to "Procedures for preventive maintenance"	Adjustment of gib
		42	Backlash of driving system	Measure with dial indicator	1 year		Reset parameter
		43	Abnormal noise of AC motor	Hearing check	Daily	No abnormal noise	Contact with FANUC or Miyano
		44	Loosen connector	Touch check	3 months	Not loose	Tightening
		45	Abnormal noise from moving slide	Hearing check	Daily	No abnormal noise	Contact with Miyano
		46	Parallelism between movement of slide and main spindle center line	Assume by workpiece accuracy. (A taper is provided.)	1 year	Refer to "Machine accuracy test sheet."	Contact with Miyano
		47	Repeating accuracy	Measure with dial gauge	1 year	Max. .0002" (5 μm). Refer to "Machine accuracy test sheet."	Contact with Miyano
		48	Positioning accuracy	Measure with dial gauge	1 year	Max. .0004"(10 μm). Refer to "Machine accuracy test sheet."	Contact with Miyano
	Others	49	Turret indexing repeating accuracy	Accuracy of workpiece	1 year	Refer to "Machine accuracy test sheet".	Contact with Miyano

EQUIPMENT	ENFORCEMENT POINT			METHOD OF INSPECTION & ADJUSTMENT	INSPECTION CYCLE	STANDARD OF JUDGMENT	METHOD OF REPAIRING OR ADJUSTMENT, WHEN ABNORMAL
	PLACE	NO.	ITEM				
SUB-SPINDLE UNIT & B-AXIS SLIDE	Front bearing	50	Abnormal noise at running	Hearing check	Daily	Compare with noise when the machine was installed	Replacement of bearing
		51	Abnormal heat rise	Touch check	Daily	After running at 3000 rpm, temperature should stay within room temperature + 59°F (15°C)	
		52	Radial clearance	Use dial indicator	1 year	Within .00008" (2 μm) Refer to "Procedures for preventive maintenance"	
		53	Thrust clearance				
	Rear bearing	54	Abnormal noise when running	Hearing check	Daily	Compare with noise when the machine was installed	Replacement of bearing
		55	Abnormal heat rise	Touch check	Daily	After running at 3000 rpm, temperature should stay within room temperature + 59°F (15°C)	
		56	Radial clearance	Check with dial gauge	1 year	Within .00008" (2 μm) Refer to "Procedures for preventive maintenance"	
	Runout of spindle nose	57	Run out of outer diameter	Use dial indicator	6 months	Max. .0004" (10 μm) Refer to "Procedures for preventive maintenance"	Overhaul
		58	Runout of face				
	Collet and work ejector	59	Wear of chuck	Visual check and accuracy of workpiece	1 month	No one-side wear when disassembled	Replacement
		60	Wear of chuck sleeve	Visual check and accuracy of workpiece	6 months	No one-side wear when disassembled	Replacement
		61	Wear of chuck cap	Visual check and accuracy of workpiece	6 months	No one-side wear when disassembled	Replacement
		62	Chuck opening and closing time	Use stop watch	1 month	Within 1.0 sec. under 72 lb/in^2 (5 kgf/cm^2) chucking pressure	Disassembling and cleaning
		63	Movement of work ejector	Visual check	At the beginning of work	Make sure work ejecting action	Disassembling, cleaning or replacement of parts
	Chucking cylinder	64	Abnormal noise under running	Hearing check	Daily	No abnormal noise	Disassembling and replacement of parts
		65	Abnormal heat rise	Touch check	Daily	Within 167°F (75°C)	Disassembling and replacement of parts
		66	Oil level in drain	Visual check	1 month	Compare with oil level at installation. 362 lb/in^2 (25kgf/cm^2)	Disassembling and replacement of parts
	Belt	67	Wear	Visual check	6 months	No crack or damage	Replacement of parts
		68	Tension of belt	Visual and touch check	6 months	No slip of belt while cutting	Disassembling and adjustment

EQUIPMENT	ENFORCEMENT POINT			METHOD OF INSPECTION & ADJUSTMENT	INSPECTION CYCLE	STANDARD OF JUDGMENT	METHOD OF REPAIRING OR ADJUSTMENT, WHEN ABNORMAL
	PLACE	NO.	ITEM				
SUB-SPINDLE UNIT & B-AXIS SLIDE	AC variable speed motor	69	Abnormal running noise	Hearing check	Daily	No abnormal noise	Contact with Miyano
	Pulley	70	Wear	Visual check	1 year	No abnormal wear	Replacement of parts
	Head stock	71	Out of alignment with main spindle	Accuracy of work-piece	1 year	Within max. .0004" (10 µm)	Contact with Miyano
		72	Parallelism with turret Z slide	Accuracy of work-piece	1 year	Within max. .0004" (10 µm)	Contact with Miyano
	B-axis slide	73	Slide clearance	Measure with dial gauge	1 year	Within .00008" (2 µm) Refer to "Procedures for preventive maintenance"	Adjustment of gib
		74	Backlash of driving system	Measure with dial gauge	1 year	Refer to "Lost moting" in "Machine accuracy inspection list"	Resetting of parameter
		75	Abnormal noise of AC motor	Hearing check	Daily	No abnormal noise	Contact with FANUC or Miyano
		76	Loosen of connector	Touch check	3 months	Should be no play	Tightening
		77	Noise of slide movement	Hearing check	Daily	No abnormal noise	Contact with Miyano
		78	Parallelism between movement of sub spindle slide and main spindle center line.	Accuracy of workpiece	1 year	Refer to "Machine accuracy test sheet."	Contact with Miyano
		79	Repeating accuracy	Measure with dial gauge	1 year	Max. .0002" (5 µm). Refer to "Machine accuracy test sheet."	Contact with Miyano
		80	Positioning accuracy	Measure with dial gauge	1 year	Max. .0004" (10 µm). Refer to "Machine accuracy test sheet."	Contact with Miyano
PNEUMATIC UNIT	Filter	81	Volume of drain	Visual check	Daily	Not much drain at filter	Discharge of drain
		82	Clogged filter	Visual check	6 months	Filter should not be clogged	Cleaning. Replacement
	Solenoid valve	83	Confirmation of operation	Neon lamp	Daily	Neon lamp should be lit when its on	Replacement of parts
	Pressure switch	84	Operation of pressure switch	Alarm lamp for low level is lit on the operating panel	6 months	Does the alarm lamp for low level on the operating panel come on when pressure is low	Replacement of parts
	Reducing valve	85	Variation of pressure	Pressure gauge	6 months	Confirmation of pressure setting. Lock nut is not loosen	Replacement of parts. Readjustment

EQUIPMENT	ENFORCEMENT POINT			METHOD OF INSPECTION & ADJUSTMENT	INSPECTION CYCLE	STANDARD OF JUDGMENT	METHOD OF REPAIRING OR ADJUSTMENT, WHEN ABNORMAL
	PLACE	NO.	ITEM				
SUB-SPINDLE UNIT & B-AXIS SLIDE	AC variable speed motor	69	Abnormal running noise	Hearing check	Daily	No abnormal noise	Contact with Miyano
	Pulley	70	Wear	Visual check	1 year	No abnormal wear	Replacement of parts
	Head stock	71	Out of alignment with main spindle	Accuracy of work-piece	1 year	Within max. .0004" (10 μm)	Contact with Miyano
		72	Parallelism with turret Z slide	Accuracy of work-piece	1 year	Within max. .0004" (10 μm)	Contact with Miyano
	B-axis slide	73	Slide clearance	Measure with dial gauge	1 year	Within .00008" (2 μm) Refer to "Procedures for preventive maintenance"	Adjustment of gib
		74	Backlash of driving system	Measure with dial gauge	1 year	Refer to "Lost moting" in "Machine accuracy inspection list"	Resetting of parameter
		75	Abnormal noise of AC motor	Hearing check	Daily	No abnormal noise	Contact with FANUC or Miyano
		76	Loosen of connector	Touch check	3 months	Should be no play	Tightening
		77	Noise of slide movement	Hearing check	Daily	No abnormal noise	Contact with Miyano
		78	Parallelism between movement of sub spindle slide and main spindle center line.	Accuracy of workpiece	1 year	Refer to "Machine accuracy test sheet."	Contact with Miyano
		79	Repeating accuracy	Measure with dial gauge	1 year	Max. .0002" (5 μm). Refer to "Machine accuracy test sheet."	Contact with Miyano
		80	Positioning accuracy	Measure with dial gauge	1 year	Max. .0004" (10 μm). Refer to "Machine accuracy test sheet."	Contact with Miyano
PNEUMATIC UNIT	Filter	81	Volume of drain	Visual check	Daily	Not much drain at filter	Discharge of drain
		82	Clogged filter	Visual check	6 months	Filter should not be clogged	Cleaning. Replacement
	Solenoid valve	83	Confirmation of operation	Neon lamp	Daily	Neon lamp should be lit when its on	Replacement of parts
	Pressure switch	84	Operation of pressure switch	Alarm lamp for low level is lit on the operating panel	6 months	Does the alarm lamp for low level on the operating panel come on when pressure is low	Replacement of parts
	Reducing valve	85	Variation of pressure	Pressure gauge	6 months	Confirmation of pressure setting. Lock nut is not loosen	Replacement of parts. Readjustment

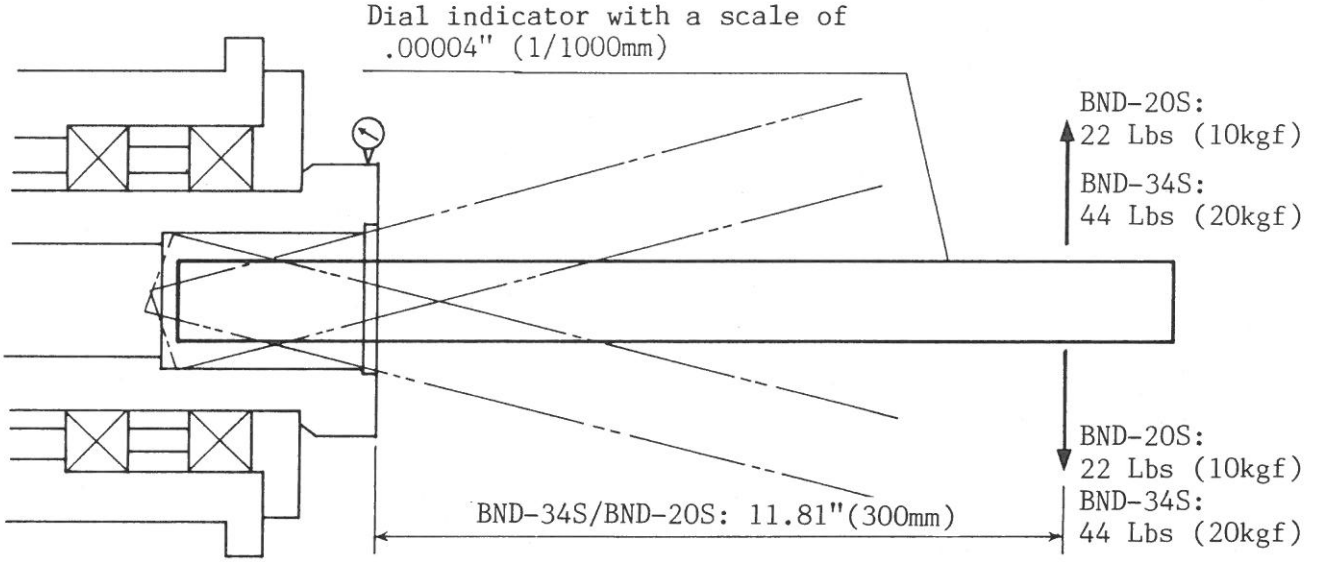
EQUIPMENT	ENFORCEMENT POINT			METHOD OF INSPECTION & ADJUSTMENT	INSPECTION CYCLE	STANDARD OF JUDGMENT	METHOD OF REPAIRING OR ADJUSTMENT, WHEN ABNORMAL
	PLACE	NO.	ITEM				
PNEUMATIC UNIT	Piping	86	Air leak	Touch check	6 months	No air leak from piping and joints	Tightening. Replacement, of hose, joints and packings
COVER	Bolt	87	Loosen bolt	Touch check	6 months	Not loose	Tightening
	Wiper	88	Wear of wiper	Visual check	6 months	No abnormal wear	Replacement of parts
LUBRICATING OIL	Lubricating oil unit	89	Consumption rate	Visual check	Weekly	Whether being more or less as compared with the time of installation	Adjustment of discharge rate
		90	Condition of oil supply to lubricating points	Visual check	3 months	Oil supply condition of each lubricating points	Replacement of flow proper unit. Replacement of pipings
		91	Oil level	Visual check	Weekly	Oil level should be above the center of oil gauge	Oil supply
		92	Check of flow proper unit		1 year	Flow proper unit should not be clogged	Replacement of flow proper unit
	Others	93	In accordance with lubrication chart				
COOLANT	Filter	94	Clogged filter	Visual check	Weekly	Refer to "Procedures for preventive maintenance"	Cleaning of filter
	Cutting oil	95	Quality of cutting oil	Visual check	Weekly	Not deteriorated as compared with new oil	Replacement
	Others	96	Contamination of inside tank	Visual check	3 months	No chip to be accumulated	Regular cleaning
		97	Confirmation of discharge rate	Visual check	Daily	With cock fully open	Replacement of pump piping. Check filter
Accessary Tool		98	Deformation, Wear	Visual check	3 months	No deformation or wear	Replacement of parts
		99	Quantity	Visual check	3 months	Whole number must be present	Replacement of parts
CHIP CONVEYOR		100	Abnormal noise	Hearing check	Daily	No abnormal noise	Check by reversed rotation
PARTS CATCHER		101	Motion	Visual check	Daily	Smooth operation	Cleaning
PARTS CONVEYOR	Noise	102	Abnormal noise	Hearing check	Daily	No abnormal noise	Contact with Miyano
	Belt	103	Wear of belt	Visual check	3 months	Abnormal wear. No crack	Replacement of parts
AIR BLOW	Discharge condition	104	Volume of discharged air	Touch check	Daily	Is there any difference as compared with the time of installation.	Adjustment. Inspection of piping
	Piping	105	Air leakage	Touch check	3 months	No air leakage from piping and fittings	Tightening Replacement of hose

[4] Procedures for Preventive Maintenance

Methods of inspection, adjustment for preventive maintenance are described below.

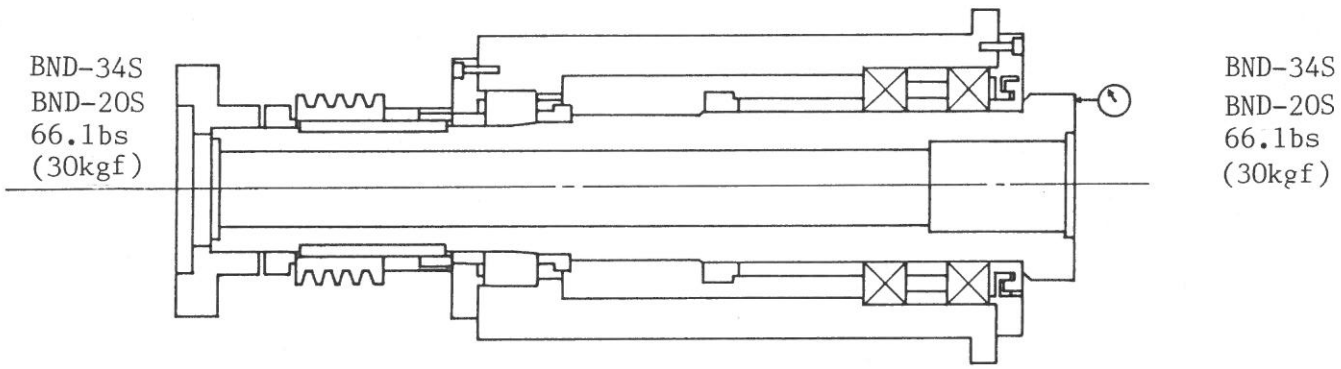
1) No.3 Inspection of radial clearance of front bearing

To measure radial clearance of front bearing of main spindle, apply an upward load with wooden or aluminum stick as shown below, and remove it. Set reading of a dial indicator placed on the outer diameter of spindle. Set the indicator to "0". Then, apply a downward load using wooden stick and remove the load. Read the dial indicator. The difference between this reading and "0" should be within .00008" (2 μm) as an absolute value. Material of bar in the chuck can be used instead of wooden or aluminum stick. The belt should be kept loose during this determination.



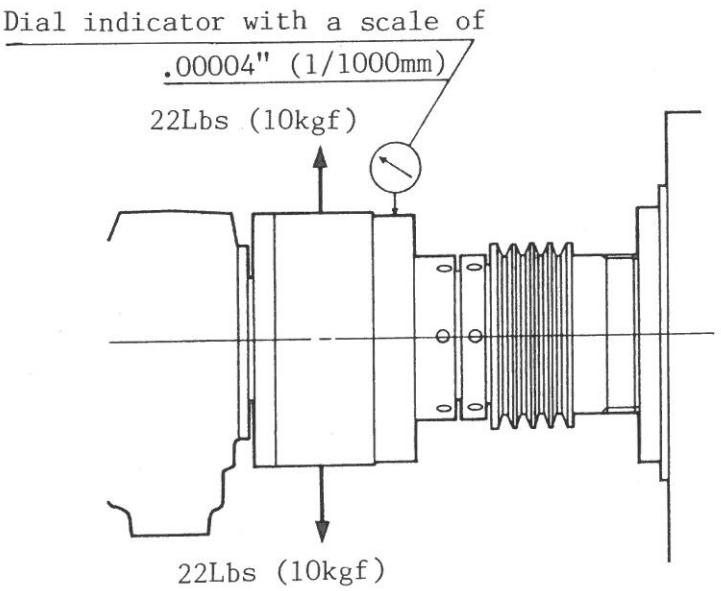
2) No.4 Measurement of thrust clearance of front bearing

To measure thrust clearance of the front bearing, apply a load from the right side and remove it. Use reading of a dial indicator .00004" (1/1000 mm). Place it on the main spindle front face, and set it to "0". Then apply a load from the left and remove it. Read the dial indicator. The difference between the reading should be within .00008" (2 μm) as an absolute value. This measurement can be done when chuck is mounted. Keep the belt loose during the measurement. (This inspection is possible when hydraulic rotary cylinder is attached as is.)



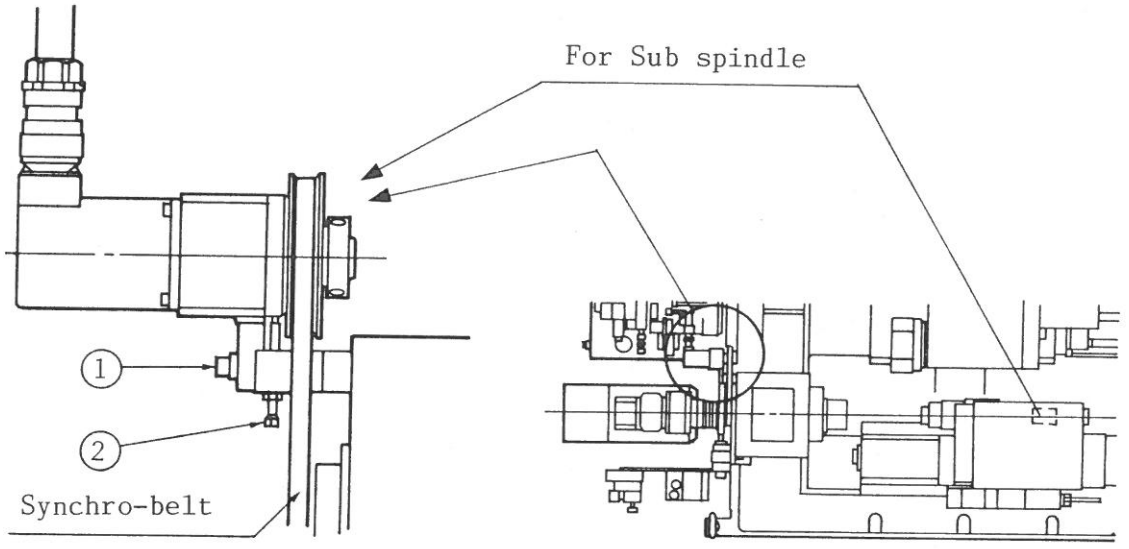
3) No.7 Radial clearance of rear bearing

To measure radial clearance of rear bearing, remove belt as shown below (or loosen the belt). Apply an upward load to hydraulic cylinder and remove the load. Use reading of a dial indicator .00004" (1/1000 mm). Place it on the outer diameter of adapter and set it to "0". Then, apply a downward load and remove it. Read the dial indicator.
Difference between this reading and "0" should be within .00008" (2 μm) as absolute value.



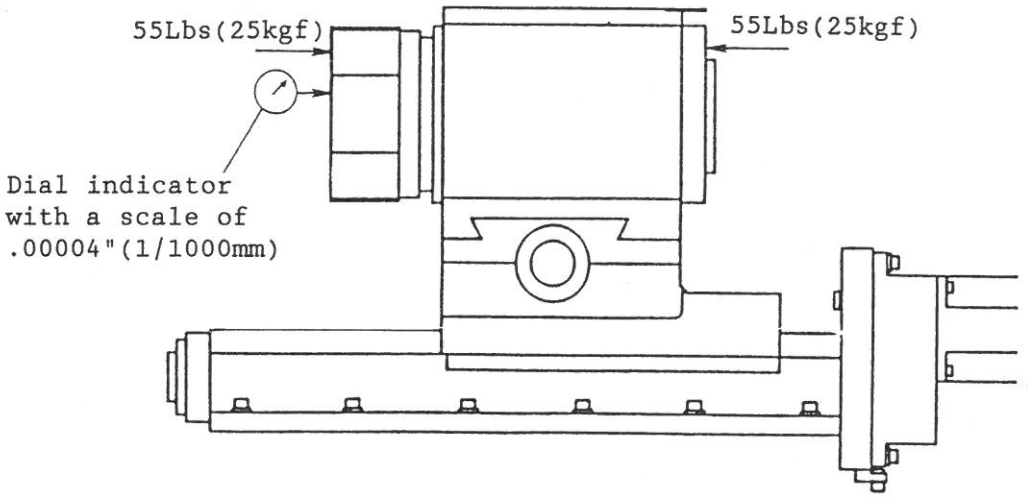
4) No.17 Tension of synchronous belt

Main spindle rotation detector (position coder) and main spindle are connected with a synchro-belt to get synchronize feeding of each axis, as shown below. Tension of this belt shall be low but not causing sag by its own weight. Loosen a bolt in the figure below and apply tension to synchro belt by square head bolt②.



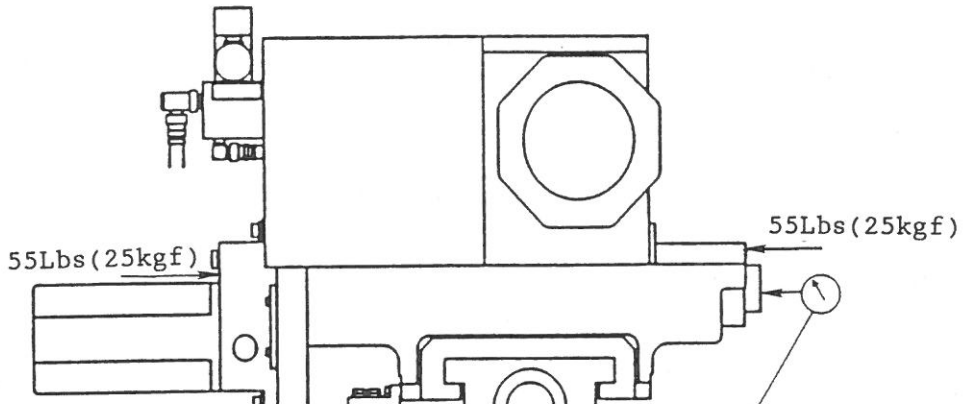
5) No.32 Measurement of the clearance of X-axis slide

To measure clearance of X-axis slide, apply a load to X-axis slide (turret slide) from the right hand of the figure, then remove it. Use reading of a dial indicator .00004" (1/1000 mm) and place on the X-axis slide and set to "0". Then, apply a load from the left hand of the figure and remove it. Read the dial indicator. Difference between this reading and "0" should be less than .00008" (2 μm), as an absolute value. If this value exceeds .00008" (2 μm),gib should be adjusted as described later.



6) No.41 Measurement of the clearance of Z-axis slide

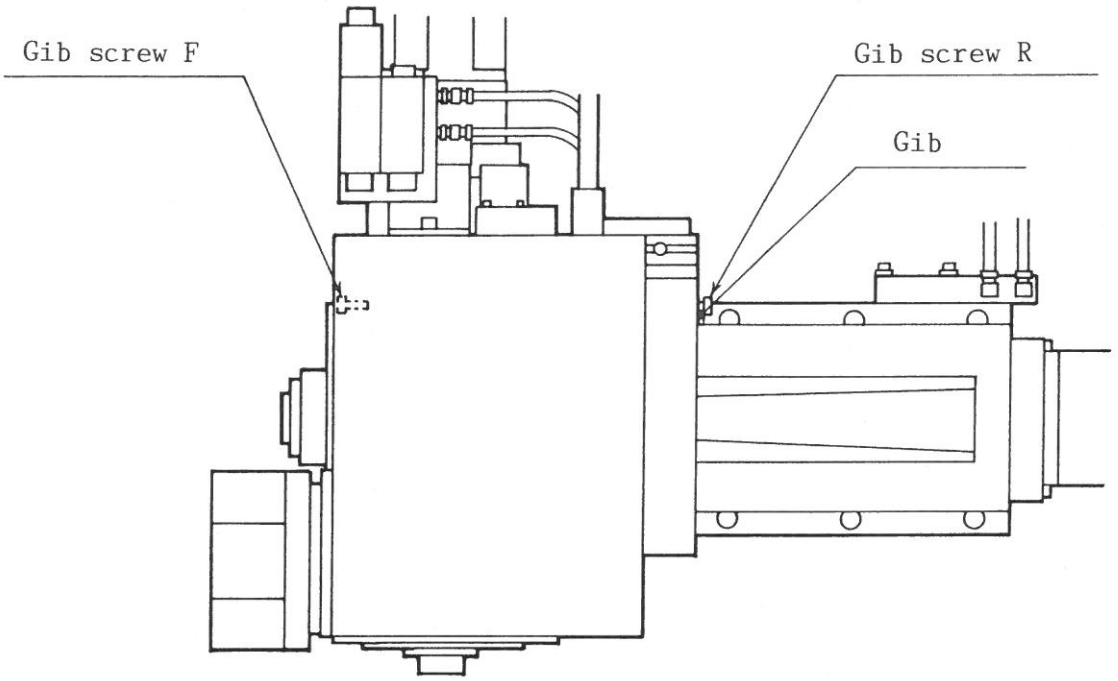
To measur clearance of Z-axis slide, apply a load to Z-axis slide from the right hand of the below figure, and remove it. Use reading of a dial indicator .00004"(1/1000 mm) and place on the Z-axis slide and set to "0". Then, apply a load from the left hand of the figure and remove it. Read the dial indicator. Difference between the reading and "0" should be less than .00008"(2μm) as an absolute value.
If this value exceeds .00008"(2μm), gib should be adjusted.



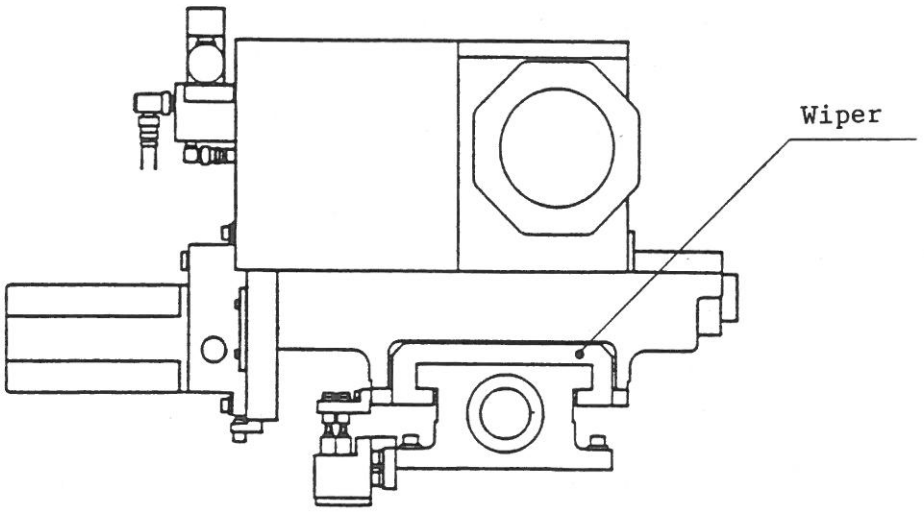
7) Gib adjustment of each slide

If measurement of clearance of each slide is more than .00008" (2 μm), adjust gib in the following procedures.
These procedures apply similarly to all axes, Z-axis is taken as an example here.

Gib and gib screws of Z-axis are located as shown in the below figure.



a) Remove wiper as shown below.



Gib screw F is visible when the wiper is removed.

b) Loosen gib screw F. (about 1/8 revolution). The gib screw F is right hand thread. Turn it counter-clockwise to loosen.

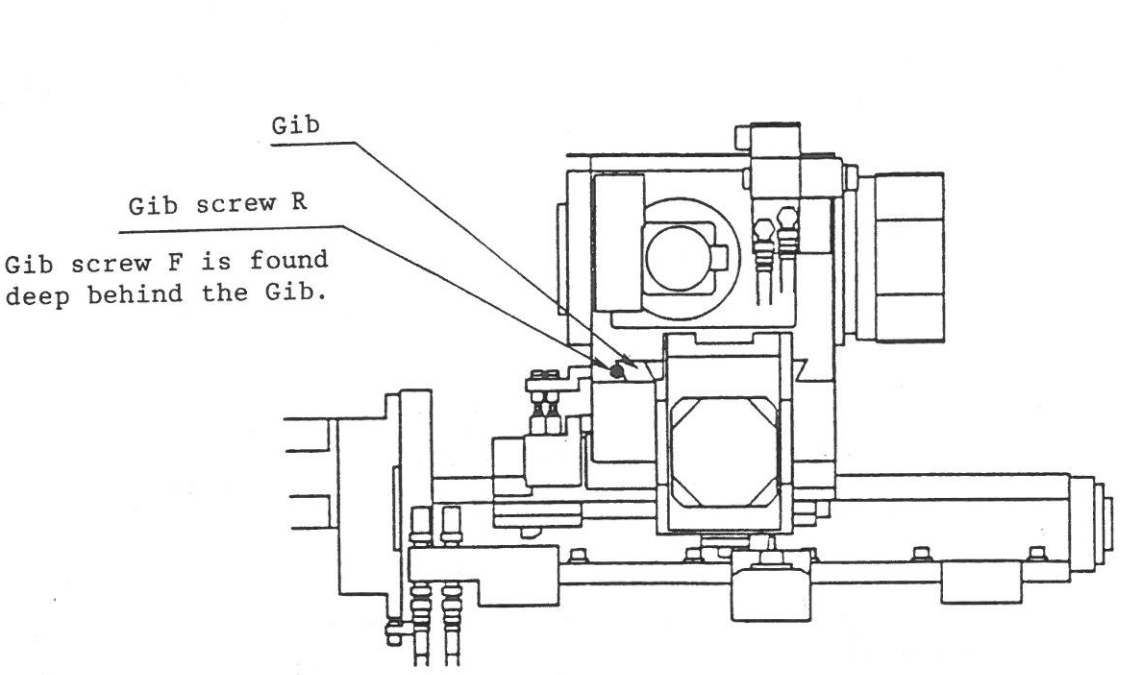
c) Tighten gib screw R on opposite side.
Gib screw R is also right hand thread. Turn it clockwise to tighten.

d) Measure the clearance of the slide and determine whether or not it is smaller than .00008" (2 μm).

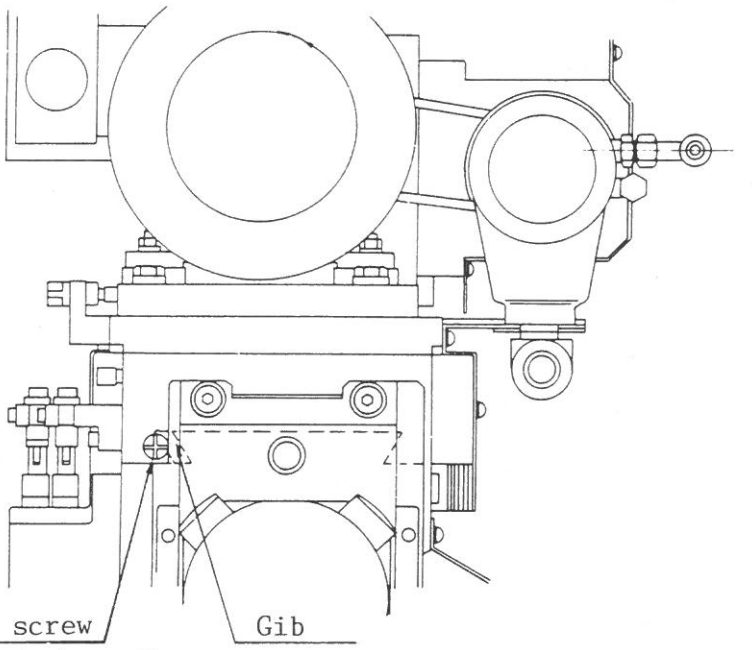
e) Repeat procedures b) ∿ d) until the slide clearance becomes less than .00008" (2 μm). Don't turn gib screws F and R large amount at a time. It may cause too deep engagement of gib, which will result in damage of slide and gib screws. Check the clearance described in f) when gib screw is turned every 1/4 revolution.

f) Move the slide by "jog" and return to reference point.
If gib is excessively tightened, motor running noise may change or NC alarm may be occurred. In such a case, loosen the gib.
If gib is excessively tightened without getting slide clearance less than .00008" (2 μm), irregular wear of slide way is possible. Overhaul is necessary.

g) Upon completion of the adjustment, confirm that gib screws F and R are tightened enough to prevent loosening then put back the wiper.
Gib and gib screws of X-axis are located as shown below.

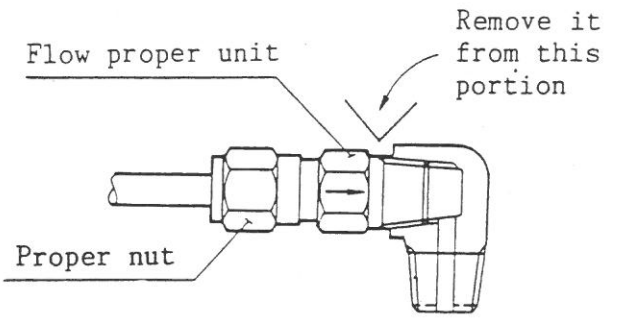


Gib and gib screws of B-axis slide are located as shown below.



8) Inspection and cleaning of flow proper unit

Remove flow proper unit and check supply of lubrication oil with proper nut tightened. If lubrication oil is not running, remove flow proper unit and supply compressed air in the arrowed direction and clean it, or replace it. (We recommend replacement.) However, inspection should be done by manual operation as the centralized oil pump runs intermittently once in every 15 min.

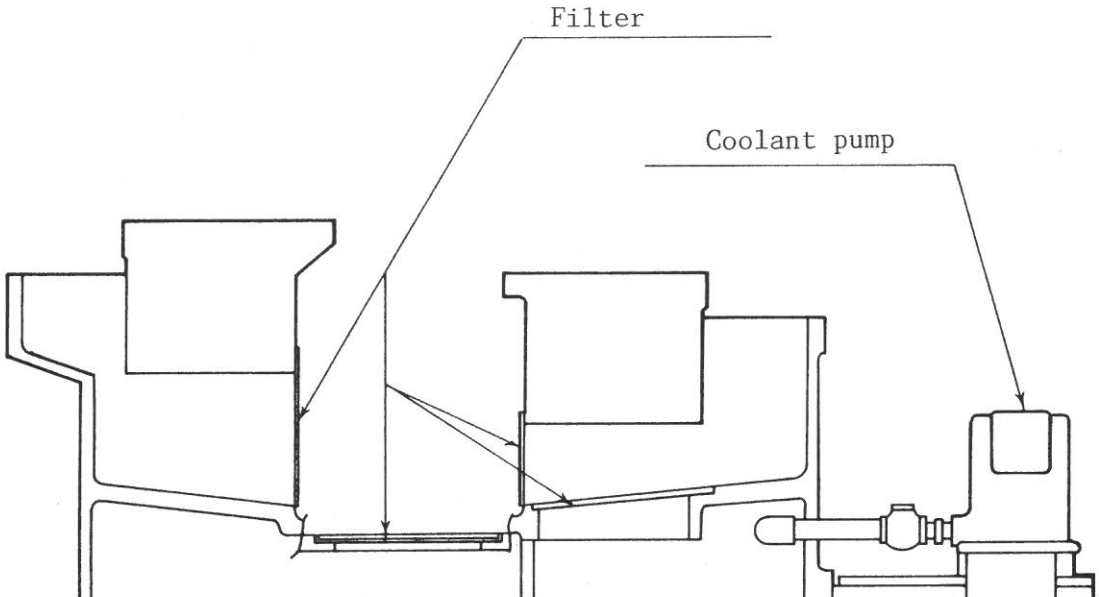


Order for a flow proper unit, should be accompanied with part No., which is marked on the unit.

Example: "PST-0"

9) No.65 Cleaning of filter

Filter for cutting oil is located as shown in a figure in next page. Discharge rate may be reduced by accumulated chips. Clean the filter frequently.

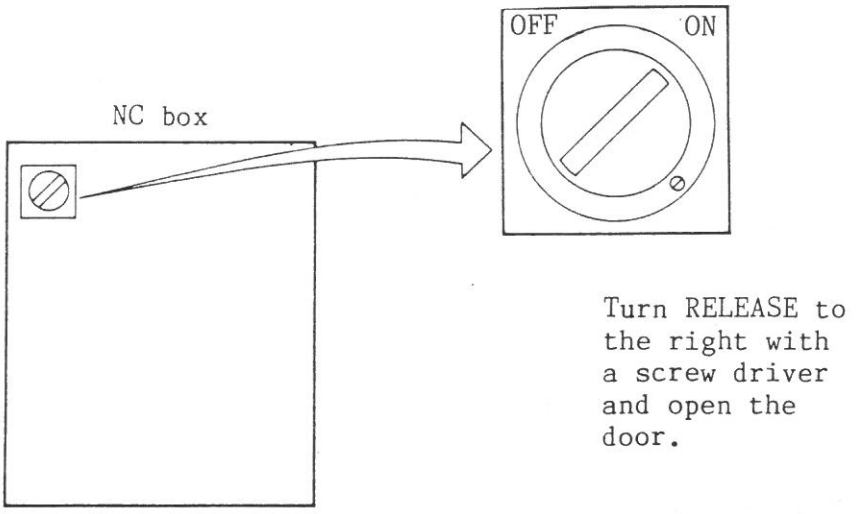


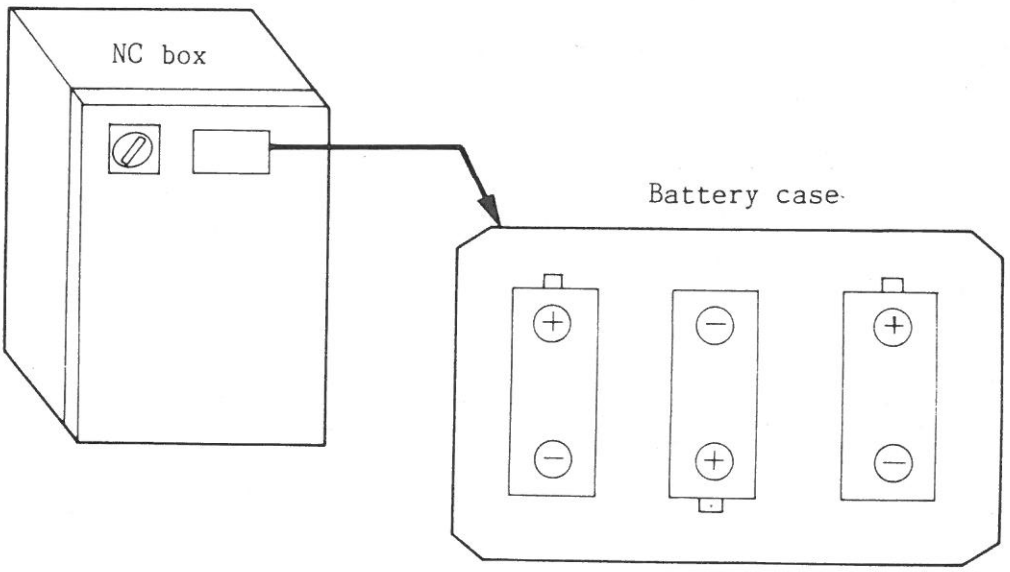
Layout of Coolant, Filter

10) Replacement of NC unit battery

When the power supply is disconnected, the memory is protected by battery to store program, parameter and tool compensation value. When voltage of this battery becomes low, alarm will be shown on CRT screen. When this alarm is occurred, the battery should be replaced. If the battery is not replaced, the data in the memory will be destroyed.
Use three alkali manganese dry batteries to change the old ones. The life of the battery is about one year.
Replace the dry battery regularly once a year even the alarm does not occur. Replace the battery while the power supply is being turned on. If it replaced while the power supply is disconnected, the data in the memory will be destroyed.

Note: Open the electrical control box with the power supply is being turned on.





Be careful not to insert batteries reversely.

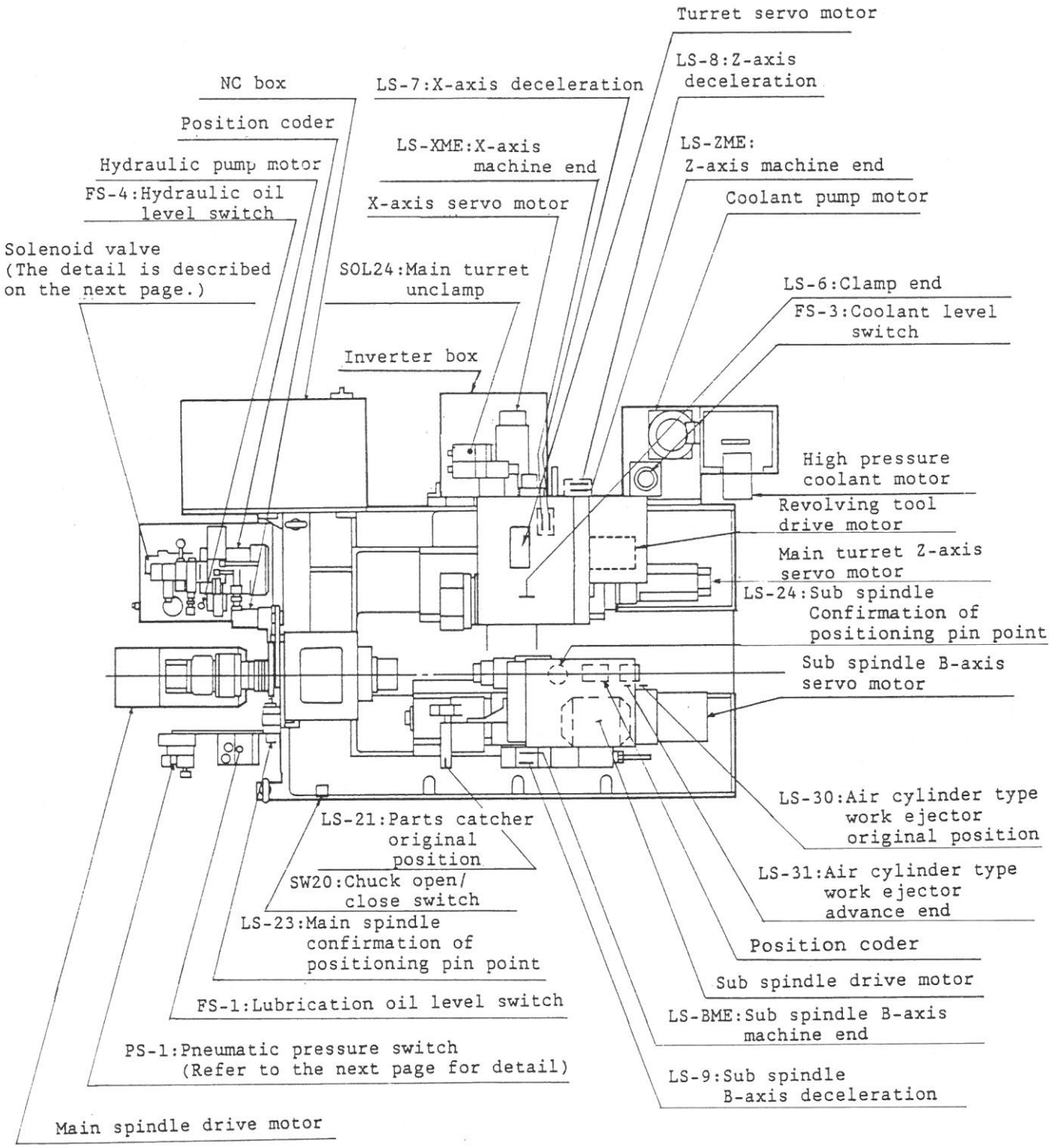
When the replacement is completed, confirm that the battery alarm on the CRT screen disappeared.

3. ELECTRICAL CONTROL

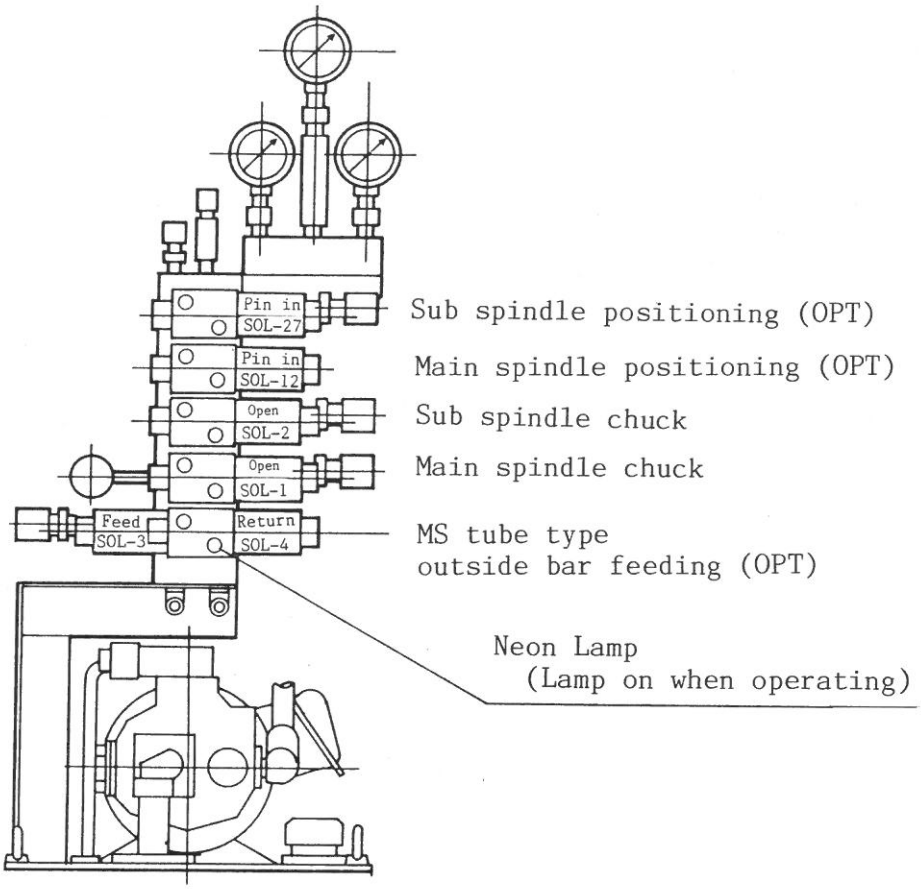
FANUC-0T is employed as the control unit of NC lathe on Model BND-20S$_2$/34S$_2$. The NC box is completely sealed by indirect cooling for stable operation under extreme conditions.

[1] Electrical Equipments

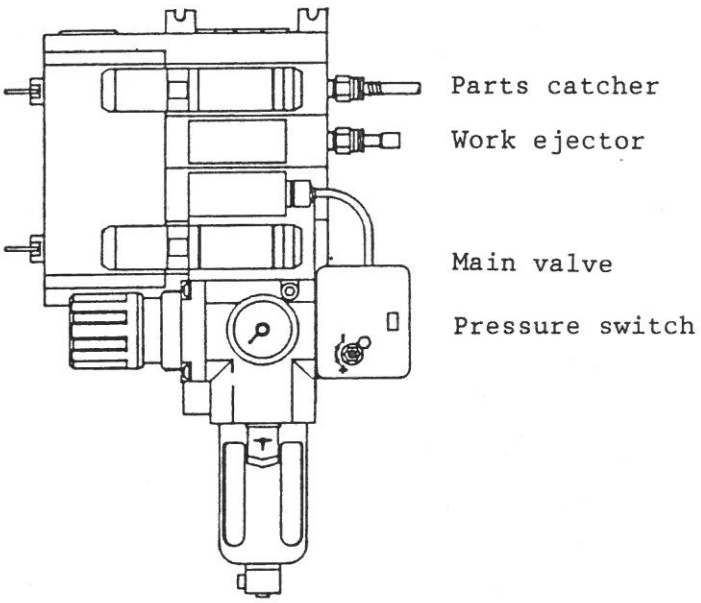
1) Layout of electrical equipments



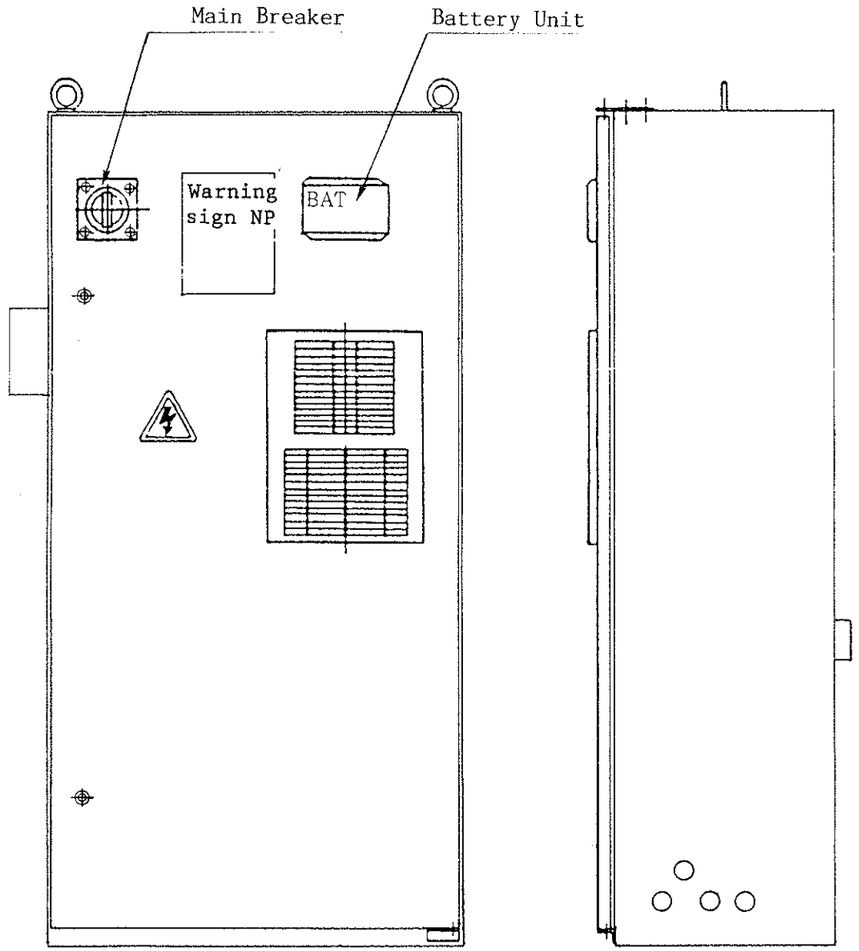
Detail of hydraulic solenoid valve arrangement



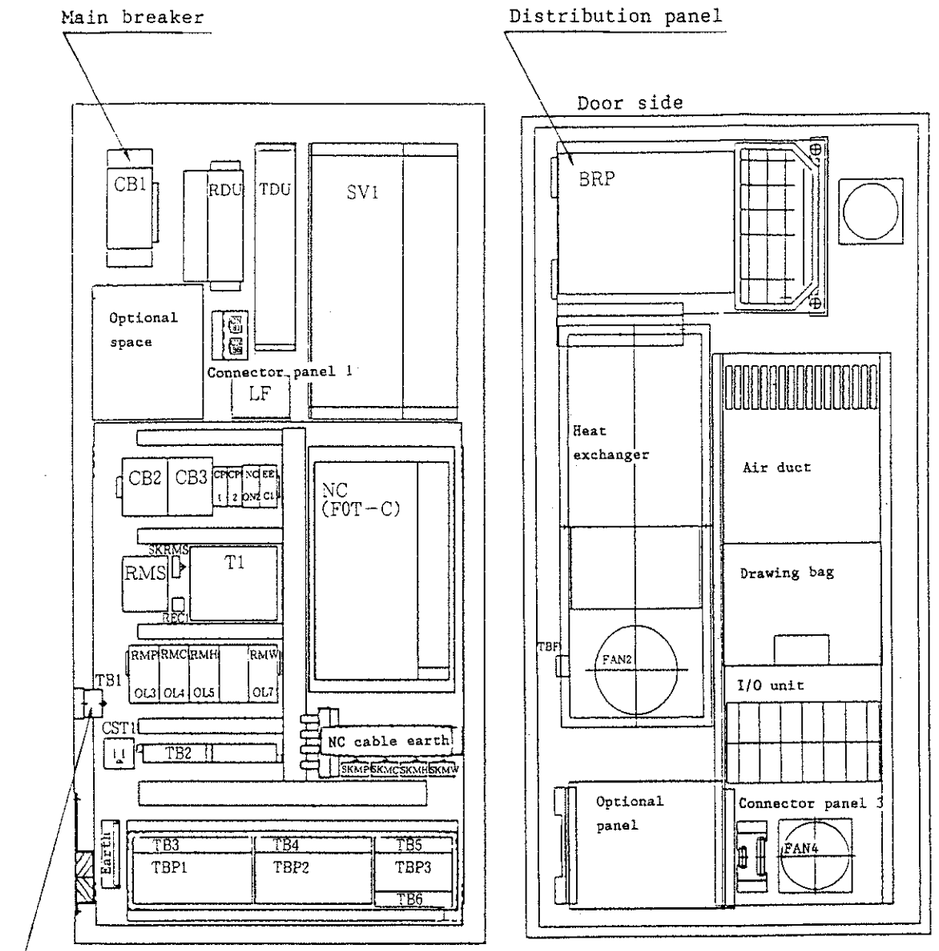
Detail of solenoid valve for pneumatic control



2) Layout of equipments in the NC box



Layout of equipments in NC box



Power terminal

TB1 terminal

1	2	3	4
R	S	T	E

TB7 terminal

1	2	3
	101	100

TB2 terminal

1	2	3	4	5	6	7	8	9	10	11	12
HI	SI	T1	E	RE	SI	T1	0V2	0S2	101	EXLK	RMG

13	14	15	16	17	18	19	20	21	22	23	24
101	100	U5	V5	W5	5E						

TB3 terminal

OS	22	23	27	24S	30	39	24S	32	24S	34	36	38	249	24N	57	58	59	60
2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	3N
24S	OS1	24S	24	28	29	249	25	26	33	31	35	37	OSZ	79	63	24N	EM	59B	60B
1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39

TB4 terminal

78	24N	48	49	24N	69	70	OL	62	54	24N	51	52	24N	OL	64	66	67	OL
2	4	5	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38
24N	97	47	24N	D1	D2	24N	96	24N	53	73	74	24N	98	99	63	65	24N	68	NOF
1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39

TB5 terminal

ST	24N	81	41	45	75	77	411	413
2	4	6	8	10	12	14	16	18
84	SP	80	24N	45	71	76	NNC	412	414
1	3	5	7	9	11	13	15	17	19

TB6 terminal

1	3	5	7	9	11	13	15	17	19
24N	OL	90	88	HM	24N	NNC	62	AF11	AF13
2	4	6	8	10	12	14	16	18	
24N	89	85	87	86	77	BOT	75	AF12	

TB31 terminal

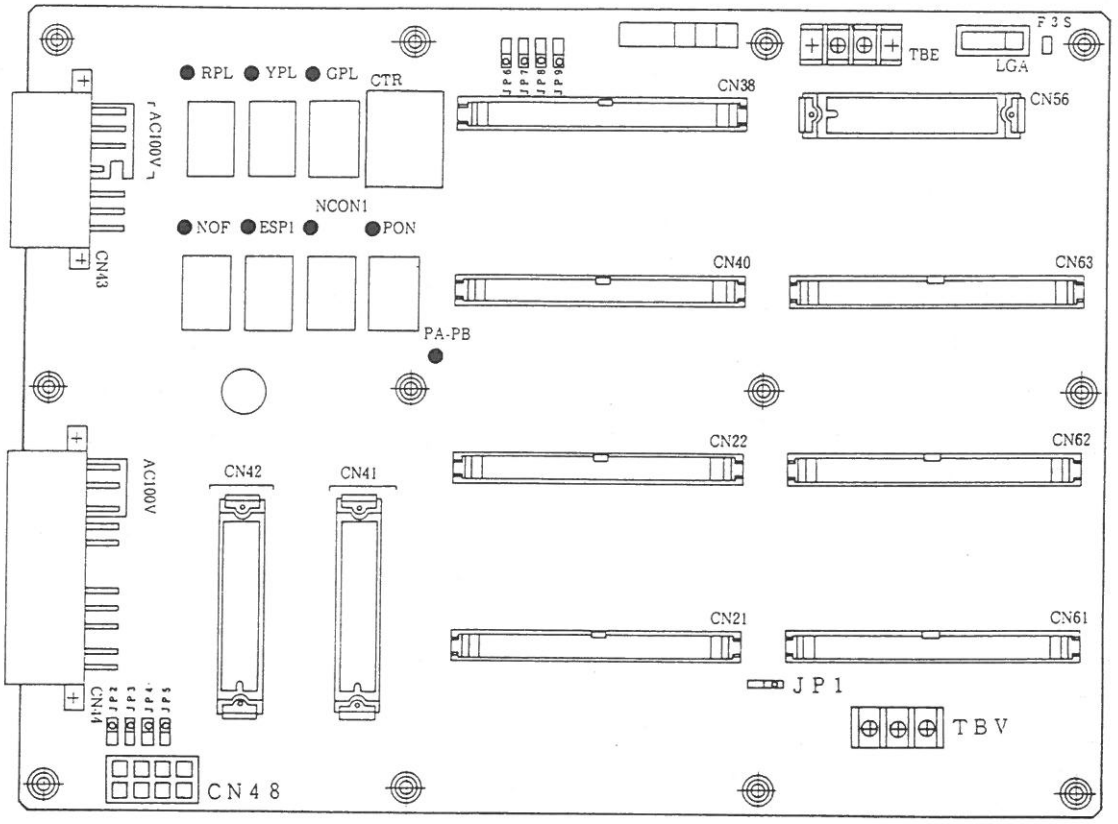
1	2	3	4
SLYO	40	MELS	MELS

TB5 terminal

1	2	3	4	5
SLY	SLO	SE	SVC	OV

3) Layout of relay panel

Relay panel is located on the door side of NC box.

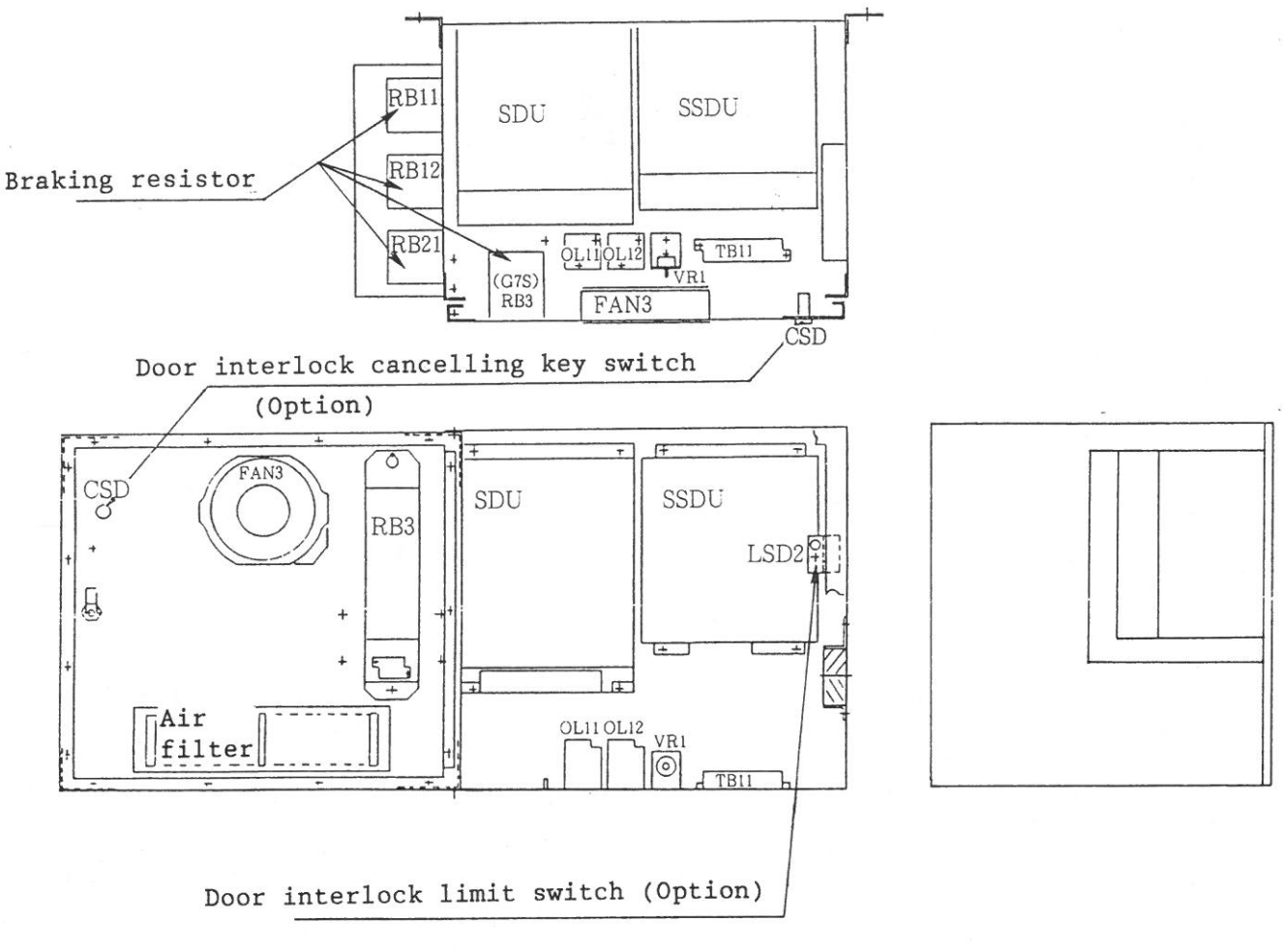


The following relay is provided to this printed board as a control axis. ON and OFF of relay are confirmed by attached light emitting diode (LED). (However, lamp display only is provided for PA-PB.)

Name	Application
NCON1	NC Power ON
PON	Power supply ON command
ESP1	Emergency Stop Release
NOF	Main Breaker OFF(Automatic power off, Option)
RPL	Alarm lamp (Red lamp)
YPL	Cycle completed (Yellow lamp is option)
GPL	Green Light (Option)
PA-PB	NC Power Ready

* CRT is the output relay for the counter.

4) Layout of invertor box unit



5) Magnetic switch, magnetic contactor

Magnetic relays and contactors are installed in the NC box and inverter box for control of motor and inverter power supply. "Machine ready lamp" is turned off when thermal relays OL3, 4, 5, or 7 trips. It becomes invertor alarm when thermal relays OL11, OL12, OL13 for protection of invertor braking resistors trips. In the case that thermal relays trip, it can be reset by depression of reset buttons of thermal relays.

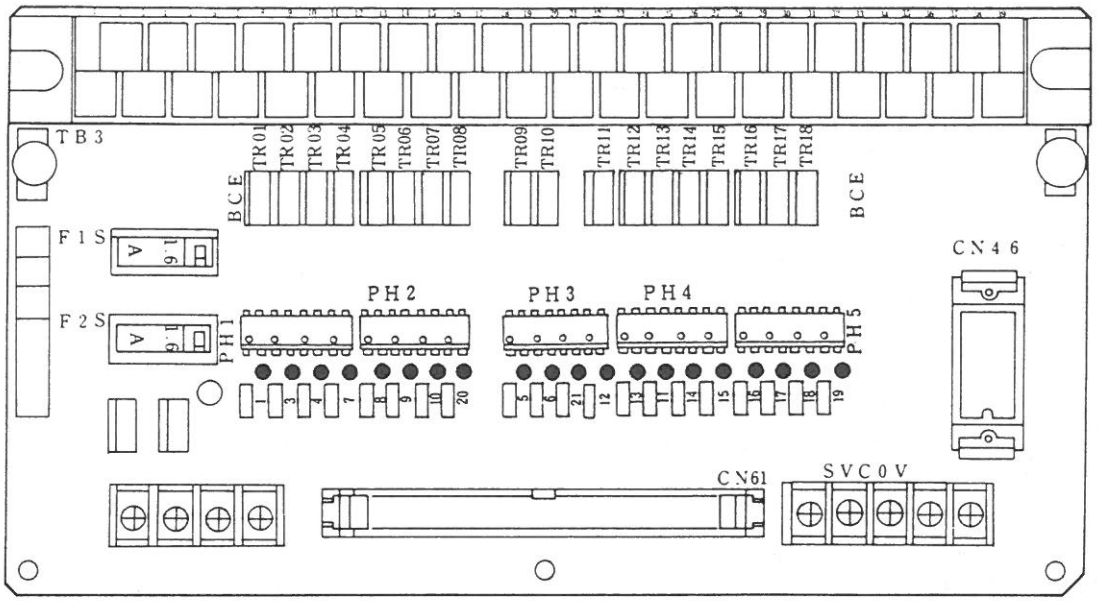
Name	Thermal relay	Application	Setting 50/60 Hz
RMP	OL-3	Hydraulic pump	3.7/3.3A
RMC	OL-4	Coolant motor	2.4A
RMH	OL-5	High pressure coolant	2.2/1.9A
RMW	OL-7	Parts conveyor motor	0.25A
RMS		Inverter power supply	
	OL-11	Protection of braking resistors for main spindle	9.7A
	OL-12	Protection of braking resistors for sub spindle	3.7A

(Note) Don't change the set value of the thermal relay for protection of the devices used.

6) Printed board for control (This is located at the lower section in the NC box.)

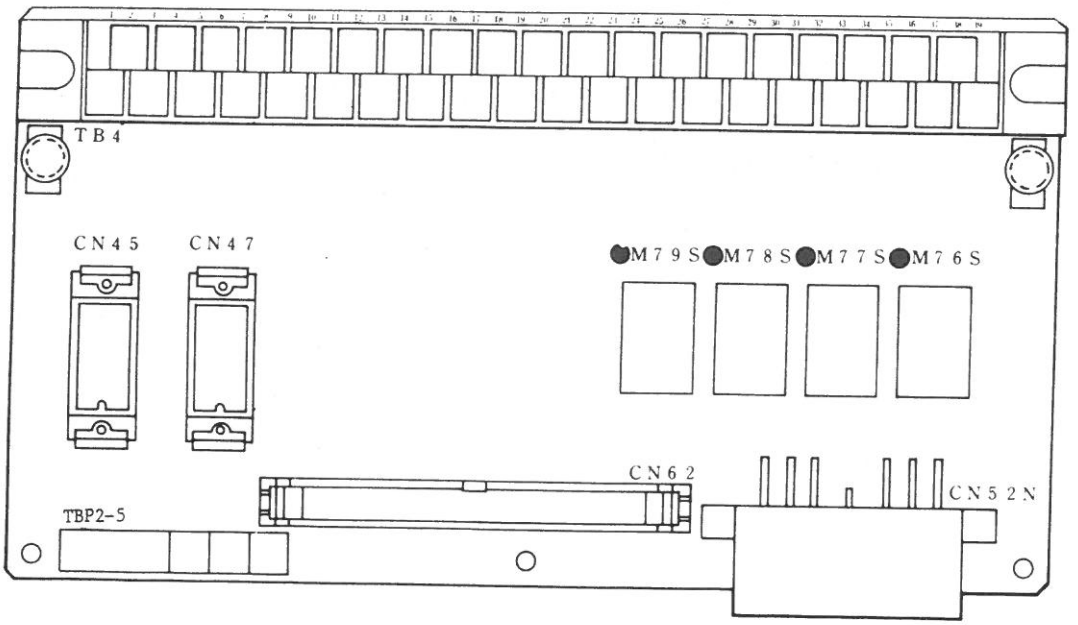
Three printed boards are incorporated in the NC box for the control of input signal from each switch and limit switch or output signal of solenoid valve, etc.
Each output can be confirmed by red light emitting diode (LED) incorporated in the printed board.

a) TBP1



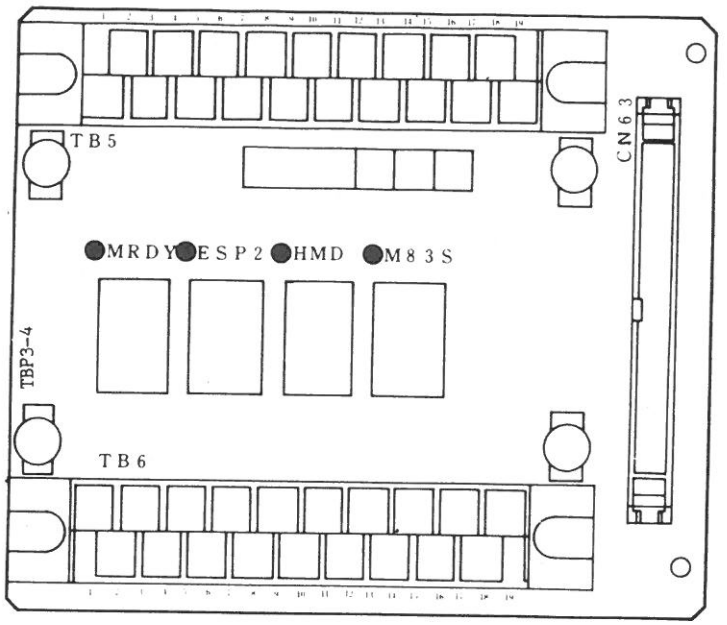
LED. NO	APPLICATION
1	Main chuck open
3	Bar feed forward
4	Bar feed rearward
5	Main turret normal rotation index
6	Main turret reverse rotation index
7	Sub chuck open
8	
9	
10	Sub spindle positioning pin inserted
11	Air blow
12	Main spindle positioning pin inserted
13	Sub air blow
14	Part catcher forward
15	Work ejector B forward or part carrier forward
16	Auto door forward
17	Auto door rearward
18	Main turret unclamp
19	Spare
20	Cut-off confirmation cylinder forward

b) TBP2



* Normally, M76S to M79S are not used.

c) TBP3



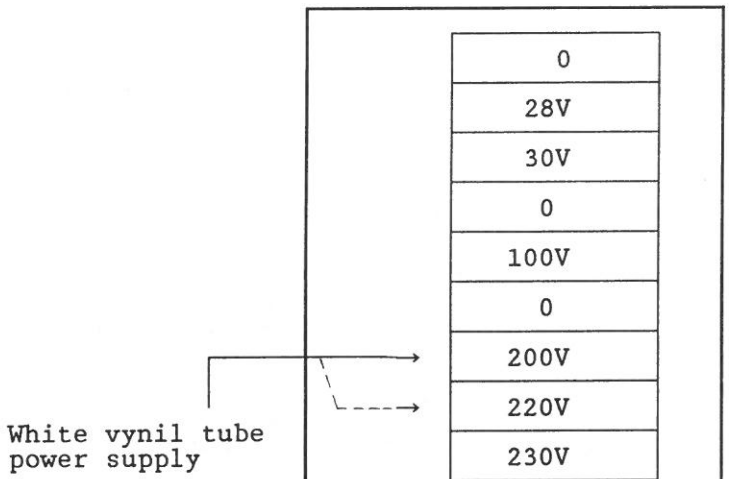
LED.NO	Note
MRDY	Machine Ready
ESP2	Emergency Stop
HMD	Hand Mode
M83S	Auto Barfeeder Start Signal

[2] Power Supply Voltage

The input power of the unit is AC 200V for 50 Hz or 220V for 60 Hz, when shipped from the factory.
Allowance for power voltage is ±10%. If the input voltage is out of the range, the correct operation is impossible and the equipments may go wrong. Confirm the power voltage and, if it is necessary, change it as shown in the following procedures.

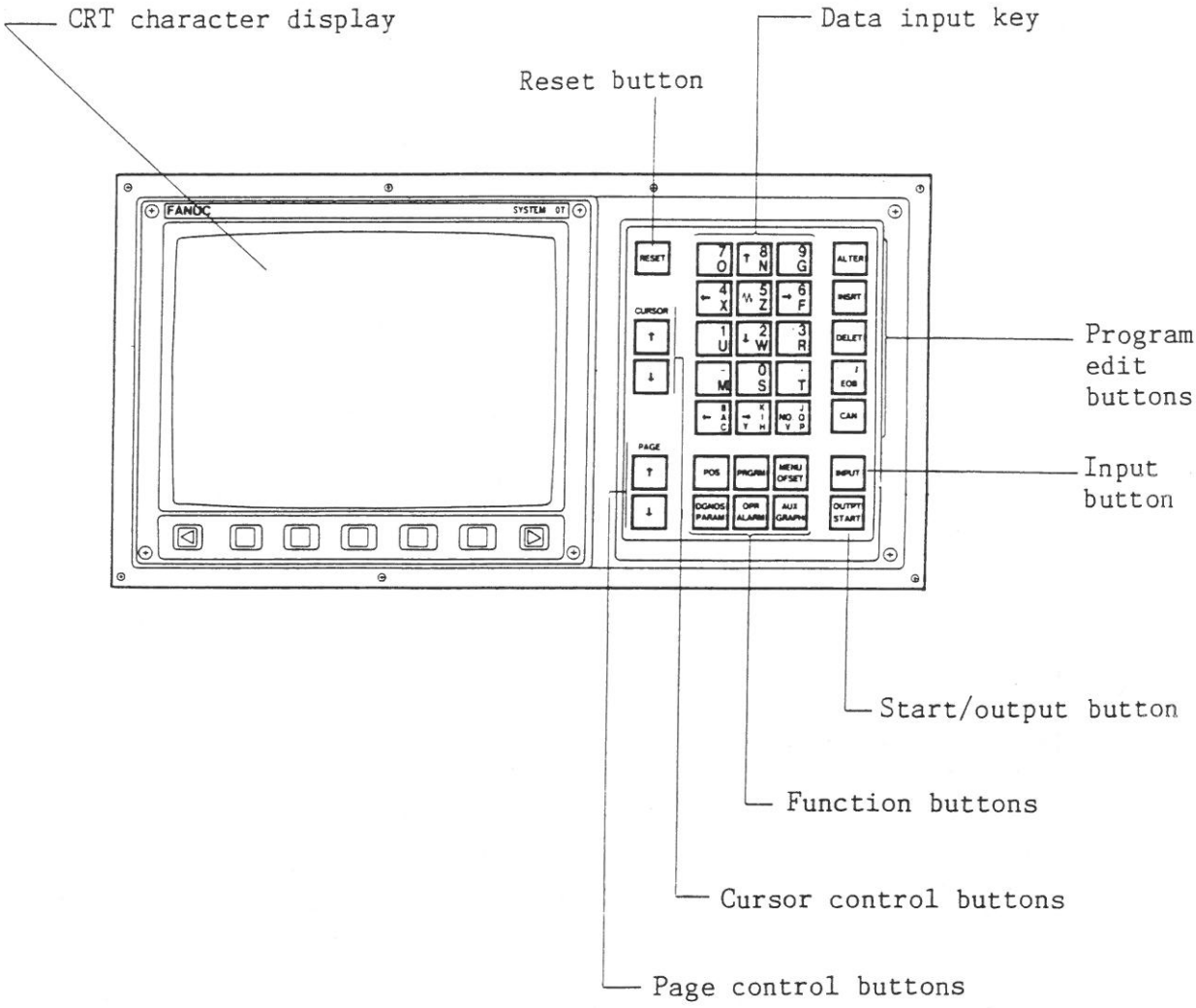
o Modification procedure of Control transformer T1

Change the white PVC tube connected to the terminal marked by 200V or 220V of the control transformer T1 in the NC box to the appropriate power voltage.



[3] Display and setting of input/output parameter

1) Display and change of input/output setting parameters



1. Push [DGNOS PARAM] function button.

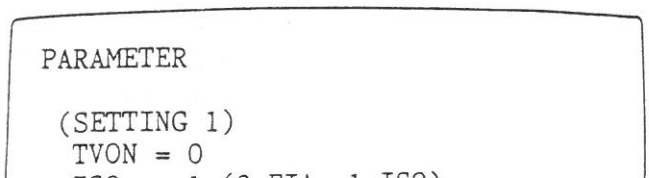
2. Push PAGE button to display the setting parameter.

(a) TVON

It specifies if the TV check function is performed, when the program is transfered from the paper tape into the memory.
1: Perform TV check
0: No TV check

(b) ISO

It specifies which code is used, ISO or EIA, when the program in the memory is punched on a paper tape.
1: ISO code
0: EIA code



(c) INCH

It specifies the unit used, inch or metric.
1: Inch
0: Metric

(d) I/O

Selecting I/O device for program input/output with I/O interface.

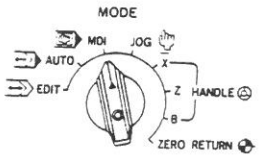
1: Select a device set by parameters (NO. 0012, NFED, ASR33, STP2) (No. 0553 BRATE1)
0: Select a device set by parameters (No. 0002, NFED, ASR33, STP2) (No. 0552 BRATE0)

(e) SEQ

Setting sequence number insertion automatically when registering a program in the memory using the keys on the MDI panel. (See FANUC OPERATOR'S MANUAL P486 for detail)

1: Perform automatic sequence number insertion
0: Does not perform automatic sequence number insertion.

3. Set the mode select switch to MDI.



4. Push a CURSOR ↓ button and set the CURSOR to the position to be changed.
5. Input 0 or 1 according to the following description.

```
PARAMETER

 (SETTING 1)
_TVON = 0
 ISO  = 0 (0:EIA  1:ISO)
 INCH = 0 (0:MM   1:INCH)
 I/O  = 0
 SEQ  = 1


[PARAM] [DGNOS] [     ] [     ] [     ]
```

```
PARAMETER

 (SETTING 1)
 TVON = 0
_ISO  = 1 (0:EIA  1:ISO)
 INCH = 0 (0:MM   1:INCH)
 I/O  = 0
 SEQ  = 1


[PARAM] [DGNOS] [     ] [     ] [     ]
```

6. Press input button [INPUT] .

Note) Refer to the paragraph III-10.2 of the operating section of Instraction manual of FANUC-OT.

The content of other setting parameter is as follows.

INCH : Whether input unit is inch or mm is set.
1 : Inch input
0 : mm input

Sequence: When the program is resistered in the memory by MDI key, automatic insertion of sequence number.
1 : Automatic insertion is made.
0 : automatic insertion is not made.

2) Setting parameter No. for input/output devices

BND-20S use RS232C interface for input-output device.
The setting of the machine is set to use NC Processor at the factory, so it is not necessary to change any settings when NC Processor is used.

0	0	0	2	NFED 0					ASR33 0		STP2 1
Bit number				7	6	5	4	3	2	1	0

NFED 1: Feed is not output before and after when the program is punched out thru the reader/puncher interface. (Set "1" for FANUC cassette.)
0: Feed is output before and after when the program is punched out thru the reader/puncher interface. (Effective when the setting parameter I/O is 0.)

ASR33 1: The 20mA current loop interface is used as the reader/puncher interface.
0: FANUC PPR, FANUC cassette, or portable tape reader is used as the reader/puncher interface. (Effective when the setting parameter I/O is 0.)

STP2 1: In the reader/puncher interface, the 2 stop bits is used.
0: In the reader/puncher interface, the 1 stop bit is used. (Effective when the setting parameter I/O is 0.)

0	5	5	2

BRATEO

BRATEO	10

This setting is used to change the baud rate when the reader/puncher interface is used.
(Effective when the setting parameter I/O is 0.)

Relation between the setting value and the baud rate is as follows:

Setting value	Baud rate
1	50
2	100
3	110
4	150
5	200
6	300
7	600
8	1200
9	2400
10	4800
11	9600

0	0	1	2	NFED					ASR33		STP2
				0					0		1
Bit number				7	6	5	4	3	2	1	0

NFED 1: Feed is not output before and after when the program is punched out through the reader/puncher interface. (Set to "1" when FANUC cassette is used.)
0: Feed is output before and after the program is punched out through the reader/puncher interface. (Effective when the setting parameter I/O is 1.)

ASR33 1: The 20mA current loop interface is used as the reader/puncher interface.
0: FANUC PRR, FANUC cassette, or portable tape reader is used as the reader/puncher interface. (Effective when the setting parameter I/O is 1.)

STP2 1: In the reader/puncher interface, the 2 stop bits is used.
0: In the reader/puncher interface, the 1 stop bit is used. (Effective when the setting parameter I/O is 1.)

0	5	5	3

BRATEO

BRATEO	10

This setting is used to change the baud rate when the reader/puncher interface is used. (Effective when the setting parameter I/O is 1.)

Relation between the setting value and the baud rate is as follows:

Setting value	Baud rate
1	50
2	100
3	110
4	150
5	200
6	300
7	600
8	1200
9	2400
10	4800
11	9600

[4] Parameter and PC Parameter

Parameters are used to set being effective or ineffective of the machine functions.
Parameters include those simply called as parameters which set conditions for NC devices and PC parameters which set specifications of the machine.
Both of them can be displayed in any mode. However, the operation of the display is different.

1) Parameter
Refer to the appendix (page A7-1) of the instruction manual for the FANUC 0-TC for the content of parameter(NC parameter) which sets the conditions of the NC device.
Refer to the list of parameter number and parameter setting of the drawing accomodating case in the NC box.

2) PC parameter
This content is described below. Refer to the list of parameter number and parameter setting for the setting values as in the case of the paragraph 1).
A list of PC parameter is shown in the next page.

List of PC parameter

DGN＼Bit	7	6	5	4	3	2	1	0
310								

P.MRVT P.MPIN P.MCLS

DGN	PC PARAMETER	CONTENT
310.0		
310.1		
310.2		
310.3		
310.4	P.MCLS	Chuck close limit switch of main spindle 0 = NO 1 = YES
310.5	P.MPIN	Knock pin of main spindle 0 = NO 1 = YES
310.6		
310.7	P.MRVT	Revolving tool 0 = NO 1 = YES

DGN＼Bit	7	6	5	4	3	2	1	0
311								
	P.SSWE	P.SPIN				P.SYN	P.SSP	P.SUBT

DGN	PC PARAMETER	CONTENT
311.0	P.SUBT	Existence of sub turret (T type 1) 0 = NO 1 = YES
311.1	P.SSP	Existence of sub spindle (S type 1) 0 = NO 1 = YES
311.2	P.SYN	Whether spindle synchronized operation is performed 0 = NO 1 = YES
311.3		
311.4		
311.5	P.SPIN	Knock pin of sub spindle 0 = NO 1 = YES
311.6	P.SSWE	Work ejector B of sub spindle 0 = NO 1 = YES (Related parameter 315.3)
311.7		

DGN＼Bit	7	6	5	4	3	2	1	0
312								
	P.HYD	P.ABF	P.BAR			P.YPL	P.TAIL	P.PACA

DGN	PC PARAMETER	CONTENT
312.0	P.PACA	Existence of parts catcher 0 = NO 1 = YES (Related parameter 322.7)
312.1	P.TAIL	Existence of tailstock (Only C type) 0 = NO 1 = YES (Related parameter 315.1)
312.2	P.YPL	Existence of yellow patrol light 0 = NO 1 = YES (Related parameter 314.2 314.3 323.2 323.3)
312.3		
312.4		
312.5	P.BAR	Existence of MS tube type outside bar feeding 0 = NO 1 = YES
312.6	P.ABF	Existence of automatic bar feeder 0 = NO 1 = YES
312.7	P.HYD	Existence of europe type hydro bar 0 = NO 1 = YES

DGN＼Bit	7	6	5	4	3	2	1	0
313								

P.CHSW P.EEC P.ITLK P.ITOF

DGN	PC PARAMETER	CONTENT
313.0	P.ITOF	Door interlock function 0 = Effective 1 = Ineffective (Related parameter 324.6)
313.1	P.ITLK	Specification of door interlock 0 = External interlock (Slide movement STOP) 1 = Export spec. interlock (Related parameter 313.2 314.0)
313.2	P.EEC	EEC safety guard interlock 0 = NO 1 = YES
313.3	P.CHSW	Main spindle chuck operation switch (Effective when P.FTSW 318.6=1) 0 = Reciprocal action with one switch 1 = Exclusive closing switch available
313.4		
313.5		
313.6		
313.7		

DGN＼Bit	7	6	5	4	3	2	1	0
314								

P.HMD P.XAL2 P.XAL1 P.CLFL P.YNW P.YCND P.MSAR P.ITGR

DGN	PC PARAMETER	CONTENT
314.0	P.ITGR	Machine operation when P.ITLK(313.1)=1 0 = All operations ineffective 1 = Effective only for chuck and tailstock operations
314.1	P.MSAR	Instruction of main air blowing (M76) stop 0 = In accordance with M79 1 = In accordance with time up of timer TMR7(D360)
314.2	P.YCND	When P.YPL(312.2)=1, yellow patrol light is lit 0 = At the time of material finish, count up and completion of one cycle 1 = In accordance with P.YNW(314.3)
314.3	P.YNW	When P.YCND(314.2)=1, yellow patrol light is lit 0 = Count up 1 = Material used up
314.4	P.CLFL	Alarm treatment during coolant level switch operation 0 = Immediate stop 1 = Stop after cycle completed
314.5	P.XAL1	Treatment of external alarm 1 0 = Immediate stop 1 = Stop after cycle
314.6	P.XAL2	Treatment of external alarm 2 0 = Immediate stop 1 = Stop after cycle
314.7	P.HMD	Relay HMD operation 0 = ON only for JOG 1 = ON while automatic operation lamp is turned OFF

DGN＼Bit	7	6	5	4	3	2	1	0
315								
	P.M25	P.WELS	P.CUT	P.SSAR	P.PTSP	P.BIT	P.TLCH	P.EXSW

DGN	PC PARAMETER	CONTENT
315.0	P.EXSW	External instruction of main chuck when P.FTSW (318.6)=0 0 = Open 1 = Close
315.1	P.TLCH	When P.TAIL(312.1)=1 0 = Tailstock specification 1 = Traverse specification (M21 can be used)
315.2	P.BIT	B axis operation when B axis zero returned lamp is turned on 0 = Possible only when sub spindle chuck is opened 1 = Always possible
315.3	P.PTSP	Part carrier equipment (Effective when work ejector B is not equipped 311.6=0) 0 = Not equipped 1 = Equipped
315.4	P.SSAR	Instruction of sub air blowing (M176) stop 0 = In accordance with M179 1 = In accordance with time up of timer TMR7(D360)
315.5	P.CUT	With or without of cutting off confirmation device 0 = Without 1 = With
315.6	P.WELS	Original position switch and forward end switch of work ejector B 0 = Valid 1 = Invalid
315.7	P.M25	Treatment of M25 completion signal 0 = Output completion signal after confirming count up 1 = Output completion signal without confirming count up

DGN＼Bit	7	6	5	4	3	2	1	0
316								

P.TAUT　　P.MIDX

DGN	PC PARAMETER	CONTENT
316.0	P.MIDX	Main turret indexing conditions under JOG mode 0 = Possible for any position 1 = Only possible when all axes original point lamps are turned ON.
316.1		
316.2		
316.3	P.TAUT	Automatic designation of main turret index 0 = Valid 1 = Invalid
316.4		
316.5		
316.6		
316.7		

DGN＼Bit	7	6	5	4	3	2	1	0
317								

P.SAUT　　P.SIDX

DGN	PC PARAMETER	CONTENT
317.0	P.SIDX	Sub turret indexing conditions under JOG mode 0 = Possible for any position 1 = Only possible when all axes original point lamps are turned ON.
317.1		
317.2		
317.3	P.SAUT	Automatic designation of sub turret index 0 = Valid 1 = Invalid
317.4		
317.5		
317.6		
317.7		

DGN＼Bit	7	6	5	4	3	2	1	0
318								

P.FTSW P.CHJG P.MSCH P.ZRCH

DGN	PC PARAMETER	CONTENT
318.0	P.ZRCH	Chuck operation by main spindle chuck operating switch during automatic operations 0 = Invalid 1 = Valid only when a main spindle stops
318.1	P.MSCH	Chuck opening while main spindle rotating (M17) 0 = Impossible 1 = Possible
318.2		
318.3		
318.4		
318.5	P.CHJG	Effective mode of main spindle chuck operation switch 0 = Effective in any mode 1 = Effective only in JOG mode
318.6	P.FTSW	Switch for main chuck open and close 0 = Alternate 1 = Momentary (Related parameter 313.3)
318.7		

DGN＼Bit	7	6	5	4	3	2	1	0
319								

P.SCSW　　P.SSCH P.SSSW

DGN	PC PARAMETER	CONTENT
319.0	P.SSSW	Operation of sub chuck open and close switch during automatic operation 0 = Valid 1 = Invalid
319.1	P.SSCH	Chuck opening while sub spindle rotating (M117) 0 = Possible 1 = Impossible
319.2		
319.3		
319.4		
319.5		
319.6	P.SCSW	Switch for sub chuck open and close 0 = Momentary 1 = Alternate
319.7		

DGN＼Bit	7	6	5	4	3	2	1	0
320								
			P.ZRNK				P.MOPB	

DGN	PC PARAMETER	CONTENT
320.0		
320.1	P.MOPB	Air blow by main spindle chuck open 0 = NO 1 = YES
320.2		
320.3		
320.4		
320.5	P.ZRNK	Push button switch of +X, +Z and +B with manual zero return 0 = Self maintain (one push) 1 = Not self maintain
320.6		
320.7		

DGN＼Bit	7	6	5	4	3	2	1	0
321								

P.SOPB

DGN	PC PARAMETER	CONTENT
321.0		
321.1	P.SOPB	Air blowing by sub spindle chuck open 0 = NO 1 = YES
321.2		
321.3		
321.4		
321.5		
321.6		
321.7		

DGN＼Bit	7	6	5	4	3	2	1	0
322								

P.PALS　　P.DEN

DGN	PC PARAMETER	CONTENT
322.0		
322.1		
322.2		
322.3	P.DEN	Execution of M code related to stop (M05,M09,M29,M45,M79,M95,M105,M179,M195,M205) 0: Execute after completion of slide movement 1: Execute at the same time of slide movement
322.4		
322.5		
322.6		
322.7	P.PALS	Forward end limit switch of parts catcher 0 = YES 1 = NO

DGN＼Bit	7	6	5	4	3	2	1	0
323								

P.RED P.PRSP

DGN	PC PARAMETER	CONTENT
323.0		
323.1		
323.2	P.PRSP	During stop by M00 or M01, cycle completion lamp is 0 = OFF 1 = ON (Related parameter 312.2)
323.3	P.RED	During stop by M02 or M30, cycle completion lamp is 0 = ON (Related parameter 312.2) 1 = OFF
323.4		
323.5		
323.6		
323.7		

DGN＼Bit	7	6	5	4	3	2	1	0
324								

P.M2DK P.PLOF P.DLKJ P.NOWR

DGN	PC PARAMETER	CONTENT
324.0	P.NOWR	Treatment of material used up 0 = Immediate stop 1 = Cycle stop
324.1		
324.2		
324.3		
324.4		
324.5	P.DLKJ	Door interlock by JOG mode 0 = Valid 1 = Invalid
324.6	P.PLOF	Red display lamp when door interlock is compulsorily released (P.ITOF 313.0=1, key switch OFF) 0 = ON 1 = OFF
324.7	P.M2DK	Door interlock release when cycle is completed 0 = Ineffective 1 = Effective

DGN＼Bit	7	6	5	4	3	2	1	0
325								

P.OGPP P.OGPT P.OGPZ P.OGPX

DGN	PC PARAMETER	CONTENT
325.0		
325.1	P.OGPX	X-axis zero return is included in machine original position signal, or not 0 = Included 1 = Not included
325.2	P.OGPZ	Z-axis zero return is included in machine original position signal, or not 0 = Included 1 = Not included
325.3	P.OGPT	Tailstock (B-axis) zero return is included in machine original position signal, or not 0 = Included 1 = Not included
325.4	P.OGPP	Part catcher zero return is included in machine original position signal, or not 0 = Included 1 = Not included
325.5		
325.6		
325.7		

DGN＼Bit	7	6	5	4	3	2	1	0
326								

P.TCLS P.SDRL P.MDRL P.DRDL P.AUDR

DGN	PC PARAMETER	CONTENT
326.0	P.AUDR	Auto door device 0 = NO 1 = YES (Related parameter 326.1)
326.1	P.DRDL	With or without of auto door original position for starting condition 0 = Without 1 = With
326.2	P.MDRL	With or without of main turret drill breakage detecting device 0 = Without 1 = With (Related parameter 326.4)
326.3	P.SDRL	With or without of sub turret drill breakage detecting device 0 = Without 1 = With (Related parameter 326.4)
326.4	P.TCLS	Specification of drill breakage detecting device 0 = Normal close 1 = Normal open
326.5		
326.6		
326.7		

DGN＼Bit	7	6	5	4	3	2	1	0
327								

DGN	PC PARAMETER	CONTENT
327.0		
327.1		
327.2		
327.3		
327.4		
327.5		
327.6		
327.7		

DGN＼Bit	7	6	5	4	3	2	1	0
328								

DGN	PC PARAMETER	CONTENT
328.0		
328.1		
328.2		
328.3		
328.4		
328.5		
328.6		
328.7		

Don't change the set-up values because they are parameter for maintenance

DGN＼Bit	7	6	5	4	3	2	1	0
329	0	0	0	0	0	0	0	0
	P.AIR		P.OVER		P.CLMP		P.CHEK	P.DEC

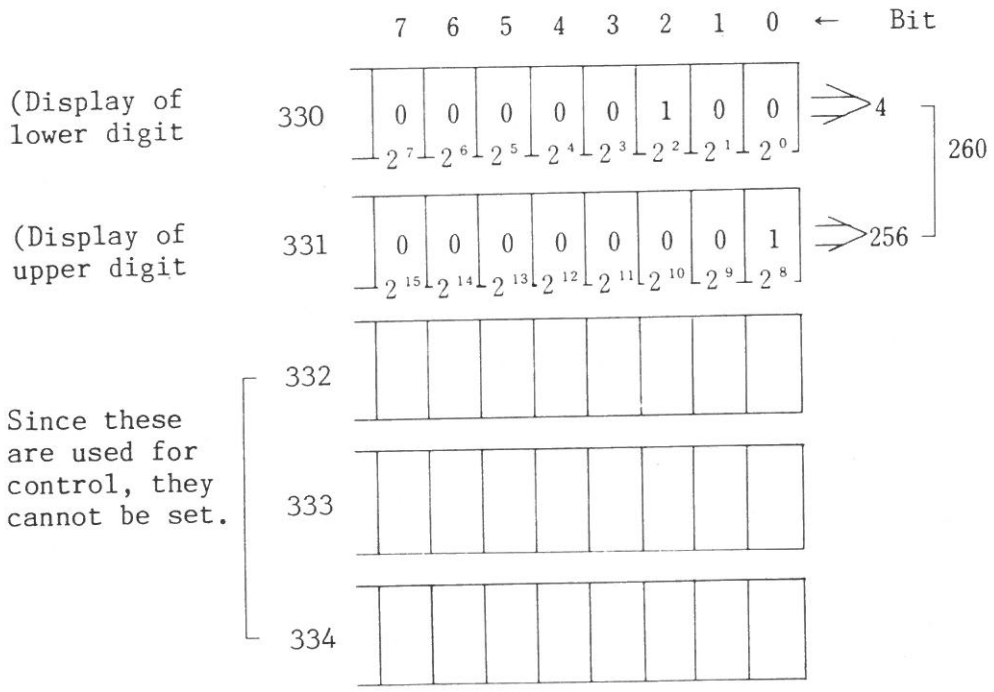
DGN	PC PARAMETER	CONTENT
329.0	P.DEC	Red display lamp when deceleration LS of each axis is ON 0 = OFF 1 = ON
329.1	P.CHEK	M code M76, M77, M78 for B-axis is used for measuring device 0 = Can not be used 1 = Used
329.2		
329.3	P.CLMP	Main turret confirming operation 0 = Ordinary operation 1 = Maintenance operation · Indexing button: Alternate operation of clamping and unclamping · Inching button : Index inching operation · MDI operation : Turret position setting
329.4		
329.5	P.OVER	Checking cycle time over 0 = Effective 1 = Ineffective
329.6		
329.7	P.AIR	Checking air pressure 0 = Effective 1 = Ineffective

[5] Timer

1) Setting and change

A soft timer is incorporated in the electrical control circuit and each timer is used to satisfy various conditions of the machine. When a change is required, select the most appropriate value after an objective of each timer is well understood.
Refer to the list of PC parameter put in the drawing accomodation pocket at door side of the NC box for setting value at the time of deliver from the plant.
In addition, when a change is made, correct a section of the list.
Setting time of timer is 50ms to 50ms x 32,767.
The time cannot be directly set. A value taking 50ms as 1 is converted and its value is set by binary bit pattern.

(Example) When the time of 13 seconds is set in timer No.1 (TMR1, address No.D330 to D334).
13sec = 13000ms ÷ 50ms = 260
260 is set in diagnosis No. 330 and 331 by binary bit pattern.



Consecutive 5 bytes are used by one timer and the time is set in the first and second bytes. Therefore, TMR 2 is set by D335 to D339 and setting time is set by 335 and 336.

2) Table of timers

address

Setting No.	Timer	Description
330 331	TMR 1	Main spindle chuck open completion It sets a period of time after chuck opening signal is turned on until the chuck opening is regarded as completed.
335 336	TMR 2	Main spindle chuck close completion It sets a period of time after chuck opening signal is turned off until the chuck closing is completed.
340 341	TMR 3	Sub spindle chuck open completion It sets a period of time after sub spindle chuck opening output is turned on until the chuck opening is regarded as completed.
345 346	TMR 4	Sub spindle chuck close completion It sets a period of time after sub spindle chuck opening is turned off until the chuck opening is completed.
350 351	TMR 5	Main or sub chuck close abnormality (Option) When a chuck close end confirmation switch is equipped on the main or sub chuck, it sets a period of confirmation time of chuck closing. (If this switch is off when times up, an alarm occurs.)
355 356	TMR 6	Bar feed forward movement completion time. It sets a period of time after bar feed is advanced until it is regarded as completed.
360 361	TMR 7	It sets a air blowing time when M76 or M176 is commanded or when chuck is opened.
365 366	TMR 8	Work ejector B advancing end dwell This sets length of time until work ejector B advancing end starts moving backward after its starting movement during a series of the movements.
370 371	TMR 9	Work ejector B movement time This sets length of time until work ejector B confirms each advancing end or original position after its starting forward or backward movement. (Alarm occurs when time is up.)
375 376	TMR 10	Lubrication oil level down alarm time This sets the time from when a lubrication oil level down switch is activated to when an alarm is realized. A level down lamp flashes during this timer is activated.
380 381	TMR 11	Air pressure down It sets a period of time for generating an alarm after air pressure drops.

Setting No.	Timer	Description
385 386	TMR 12	Flicker OFF time This sets the turning off time when machine alarm, NC alarm and level down lamp is flashing.
390 391	TMR 13	Flicker ON time This sets the turning on time when machine alarm, NC alarm and level down lamp is flashing.
395 396	TMR 14	Cycle start button trouble detection It sets a period of time for generating an alarm when the cycle button remains on.
400 401	TMR 15	Automatic power supply on (Option) When an automatic power supply on system is equipped, it sets a period of time after machine ready is on until automatic cycle starts.
405 406	TMR 16	Part catcher advancing completion time It sets a period of time after the parts catcher is advanced by M35 command until it is regarded as completed.
410 411	TMR 17	Oil level down It sets a period of time for generating an alarm when hydraulic oil or coolant (option) level down detection switch is turned on.
415 416	TMR 18	Tail stock intermediate stop dwell
420 421	TMR 19	Tail stock forward movement completion
425 426	TMR 20	Tail stock forward movement completion It sets a period of time after the tail stock advanced end LS is turned on until it is regarded as completed.
430 431	TMR 21	Traverse advanced end dwell It sets a period of time after the traverse slide advanced end LS is turned on until it is regarded as completed.
435 436	TMR 22	Emergency stop by automatic power supply shut off (Option) When an automatic power supply shut off system is equipped, it sets a period of time after power supply is turned off until hydraulic pump stops.
440 441	TMR 23	NC power OFF by automatic power supply shut off (Option) It sets a period of time after hydraulic pump is turned off by TMR 22 until NC unit power supply off.

Setting No.	Timer	Description
445 446	TMR 24	M code completion signal abnormality It sets a period of time for generating an alarm when M code output signal is abnormal.
450 451	TMR 25	Main turret clamp and unclamp abnormality This sets the time of an alarm when ON or OFF of the clamp end LS cannot be detected after clamp or unclamp command.
455 456	TMR 26	Export specification door interlock alarm (Option) It sets a period of time for generating an alarm when the door is opened during automatic cycle.
460 461	TMR 27	Cut off tool breakage detection (Option) When the breakage of cut off tool is detected, the time required for an alarm is set.
465 466	TMR 28	Drill breakage detection (Option) When the breakage of drill is detected, the time required for an alarm is set.
470 471	TMR 29	Turrets index time over This sets the time of an alarm when the main or sub turret does not move to the commanded position even though index command is output due to defect of the index valve or index mechanism.
475 476	TMR 30	Main turret unclamp confirmation This sets the time from when a clamp end LS is made OFF to when it is deemed to be unclamped after unclamp command.
480 481	TMR 31	Cycle time over This sets the time more than one cycle time during continuous operation.
485 486	TMR 32	Forward movement of part career completed (Option) A part career moves forward by M70 and the time required for the completion of forward movement is set.
490 491	TMR 33	Main spindle orientation completion (Option) This sets the time from when a signal is received from the invertor for the main spindle to when the orientation is deemed to be completed.
495 496	TMR 34	Main spindle orientation angle reading completion (Option) This sets the time when reading of designated angle is deemed to be completed after orientation angle reading command.

Setting No.	Timer	Description
500 501	TMR 35	Orientation angle reading command (Option) This sets the time when reading of angle is started after orientation command.
505 506	TMR 36	Sub spindle orientation angle reading completion (Option for only type S) This sets the time when reading of designated angle is deemed to be completed after orientation angle reading command.
510 511	TMR 37	Sub spindle orientation completion (Option for only type S) This sets the time when a signal is received from the invertor for the sub spindle to when the orientation is deemed to be completed.
515 516	TMR 38	Revolving tool rotation speed reading (Option) This sets the time when reading of rotation speed data is started after start command of the revolving tool.
520 521	TMR 39	Revolving tool rotation speed reading completion (Option) This sets the time from when reading of the rotation speed data is started to when reading is deemed to be completed.
525 526	TMR 40	Revolving tool completion signal supplement This sets the time from when a start signal of the revolving tools is read to when reading is deemed to be started up.
530 531	TMR 41	Main positioning knock pin abnormality In main spindle positioning this sets length of time until alarm occurs when pin in or off confirmation is not detected after pin in or off instruction.
535 536	TMR 42	Sub positioning knock pin abnormality In sub spindle positioning this sets length of time until alarm occurs when pin in or off confirmation is not detected after pin in or off instruction.
540 541	TMR 43	Count pulse output time This sets output time to the counter, when the counter command is executed by M25. * Time of output setting shall be 0.5 sec or more.
545 546	TMR 44	
550 551	TMR 45	
555 556	TMR 46	

Setting No.	Timer	Description
560 561	TMR 47	
565 566	TMR 48	
570 571	TMR 49	
575 576	TMR 50	
580 581	TMR 51	
585 586	TMR 52	
590 591	TMR 53	

3) List of bit pattern for timer setting

TIME	Bit pattern								TIME	Bit pattern							
	7	6	5	4	3	2	1	0		7	6	5	4	3	2	1	0
0.05 sec	0	0	0	0	0	0	0	1	4.0 sec	0	1	0	1	0	0	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
0.10 sec	0	0	0	0	0	0	1	0	4.5 sec	0	1	0	1	1	0	1	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
0.15 sec	0	0	0	0	0	0	1	1	5.0 sec	0	1	1	0	0	1	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
0.20 sec	0	0	0	0	0	1	0	0	5.5 sec	0	1	1	0	1	1	1	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
0.25 sec	0	0	0	0	0	1	0	1	6.0 sec	0	1	1	1	1	0	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
0.30 sec	0	0	0	0	0	1	1	0	6.5 sec	1	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
0.35 sec	0	0	0	0	0	1	1	1	7.0 sec	1	0	0	0	1	1	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
0.40 sec	0	0	0	0	1	0	0	0	7.5 sec	1	0	0	1	0	1	1	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
0.45 sec	0	0	0	0	1	0	0	1	8.0 sec	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
0.50 sec	0	0	0	0	1	0	1	0	8.5 sec	1	0	1	0	1	0	1	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
0.55 sec	0	0	0	0	1	0	1	1	9.0 sec	1	0	1	1	0	1	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
0.60 sec	0	0	0	0	1	1	0	0	9.5 sec	1	0	1	1	1	1	1	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
0.65 sec	0	0	0	0	1	1	0	1	10 sec	1	1	0	0	1	0	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
0.70 sec	0	0	0	0	1	1	1	0	11 sec	1	1	0	1	1	1	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
0.75 sec	0	0	0	0	1	1	1	1	12 sec	1	1	1	1	0	0	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
0.80 sec	0	0	0	1	0	0	0	0	13 sec	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	1
0.85 sec	0	0	0	1	0	0	0	1	14 sec	0	0	0	1	1	0	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	1
0.90 sec	0	0	0	1	0	0	1	0	15 sec	0	0	1	0	1	1	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	1
0.95 sec	0	0	0	1	0	0	1	1	16 sec	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	1
1.0 sec	0	0	0	1	0	1	0	0	17 sec	0	1	0	1	0	1	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	1
1.5 sec	0	0	0	1	1	1	1	0	18 sec	0	1	1	0	1	0	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	1
2.0 sec	0	0	1	0	1	0	0	0	19 sec	0	1	1	1	1	1	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	1
2.5 sec	0	0	1	1	0	0	1	0	20 sec	1	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	1
3.0 sec	0	0	1	1	1	1	0	0	21 sec	1	0	1	0	0	1	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	1
3.5 sec	0	1	0	0	0	1	1	0	22 sec	1	0	1	1	1	0	0	0
	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	1

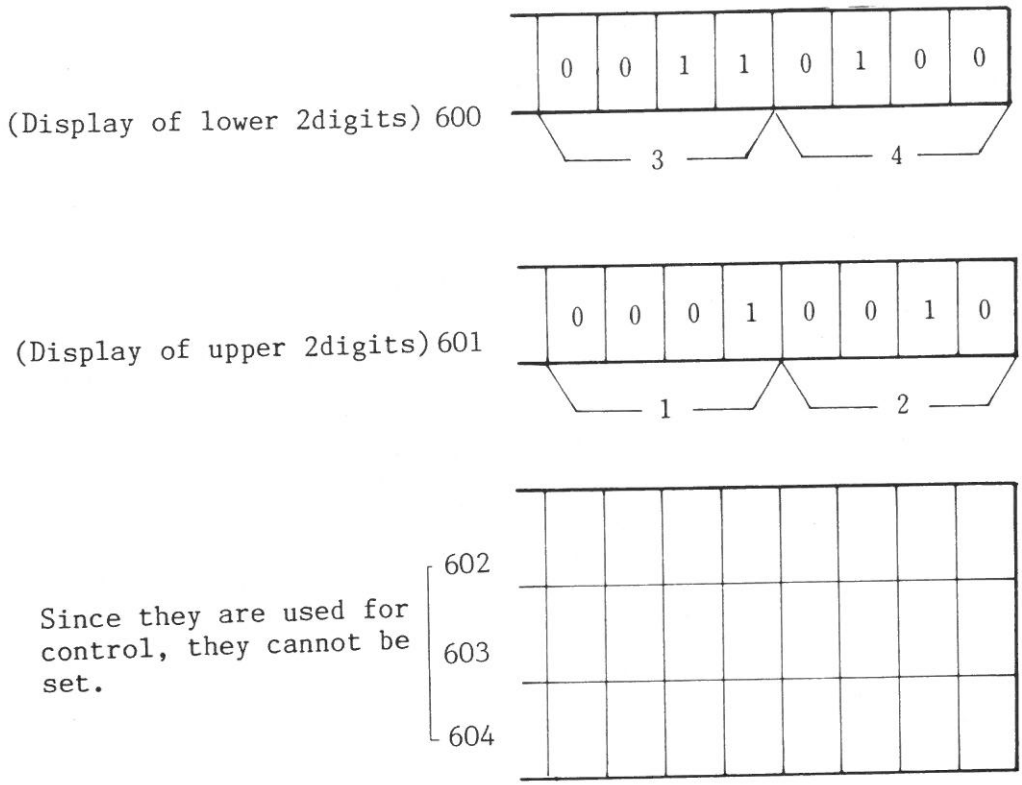
TIME	Bit pattern								TIME	Bit pattern							
	7	6	5	4	3	2	1	0		7	6	5	4	3	2	1	0
23 sec	1	1	0	0	1	1	0	0	7 min	0	0	1	0	1	0	0	0
	0	0	0	0	0	0	0	1	30 sec	0	0	1	0	0	0	1	1
24 sec	1	1	1	0	0	0	0	0	8 min	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1		0	0	1	0	0	1	0	1
25 sec	1	1	1	1	0	1	0	0	8 min	1	1	0	1	1	0	0	0
	0	0	0	0	0	0	0	1	30 sec	0	0	1	0	0	1	1	1
26 sec	0	0	0	0	1	0	0	0	9 min	0	0	1	1	0	0	0	0
	0	0	0	0	0	0	1	0		0	0	1	0	1	1	0	0
27 sec	0	0	0	1	1	1	0	0	9 min	1	0	0	0	1	0	0	0
	0	0	0	0	0	0	1	0	30 sec	0	0	1	0	1	1	1	0
28 sec	0	0	1	1	0	0	0	0	10 min	1	1	1	0	0	0	0	0
	0	0	0	0	0	0	1	0		0	0	1	0	1	1	1	0
29 sec	0	1	0	0	0	1	0	0	11 min	1	0	0	1	0	0	0	0
	0	0	0	0	0	0	1	0		0	0	1	1	0	0	1	1
30 sec	0	1	0	1	1	0	0	0	12 min	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	1	0		0	0	1	1	1	0	0	0
35 sec	1	0	1	1	1	1	0	0	13 min	1	1	1	1	0	0	0	0
	0	0	0	0	0	0	1	0		0	0	1	1	1	1	0	0
40 sec	0	0	1	0	0	0	0	0	14 min	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	1	1		0	1	0	0	0	0	0	0
45 sec	1	0	0	0	0	1	0	0	15 min	0	1	0	1	0	0	0	0
	0	0	0	0	0	0	1	1		0	1	0	0	0	1	1	0
50 sec	1	1	1	0	1	0	0	0	16 min	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	1		0	1	0	0	1	0	1	1
55 sec	0	1	0	0	1	1	0	0	17 min	1	0	1	1	0	0	0	0
	0	0	0	0	0	1	0	0		0	1	0	0	1	1	1	1
60 sec	1	0	1	1	0	0	0	0	18 min	0	1	1	0	0	0	0	0
(1 min)	0	0	0	0	0	1	0	0		0	1	0	1	0	1	0	0
1 min	0	0	0	0	1	0	0	0	19 min	0	0	0	1	0	0	0	0
30 sec	0	0	0	0	0	1	1	1		0	1	0	1	1	0	0	0
2 min	0	1	1	0	0	0	0	0	20 min	1	1	0	0	0	0	0	0
	0	0	0	0	1	0	0	1		0	1	0	1	1	1	0	1
2 min	1	0	1	1	1	0	0	0	21 min	0	1	1	1	0	0	0	0
30 sec	0	0	0	0	1	0	1	1		0	1	1	0	0	0	1	0
3 min	0	0	0	1	0	0	0	0	22 min	0	0	1	0	0	0	0	0
	0	0	0	0	1	1	1	0		0	1	1	0	0	1	1	1
3 min	0	1	1	0	1	0	0	0	23 min	1	1	0	0	0	0	0	0
30 sec	0	0	0	1	0	0	0	0		0	1	1	0	1	0	1	1
4 min	1	1	0	0	0	0	0	0	24 min	1	0	0	0	0	0	0	0
	0	0	0	1	0	0	1	0		0	1	1	1	0	0	0	0
4 min	0	0	0	1	1	0	0	0	25 min	0	0	1	1	0	0	0	0
30 sec	0	0	0	1	0	1	0	1		0	1	1	1	0	1	0	1
5 min	0	1	1	1	0	0	0	0	26 min	1	1	1	0	0	0	0	0
	0	0	0	1	0	1	1	1		0	1	1	1	1	0	0	1
5 min	1	1	0	0	1	0	0	0	27 min	1	0	0	1	0	0	0	0
30 sec	0	0	0	1	1	0	0	1		0	1	1	1	1	1	1	0
6 min	0	0	1	0	0	0	0	0									
	0	0	0	1	1	1	0	0									
6 min	0	1	1	1	1	0	0	0									
30 sec	0	0	0	1	1	1	1	0									
7 min	1	1	0	1	0	0	0	0									
	0	0	1	0	0	0	0	0									

[6] Counter

1) Setting and change

A soft counter is incorporated in the electric control circuit. When a change is required, select the most appropriate value after an objective is well understood. Refer the list of parameter put in the drawing accommodation pocket at door side of the NC box for set-up value at the time of delivery from the plant. In addition, when a change is made, correct a section of the list. A preset value and standard value of counter is indicated by BCD 4digits (0 to 9999) and setting and display are performed by bit pattern.

Example) When 1234 is set in the counter number 1 (CTR 1, address No. D600 to D604)



One counter uses 5 consecutive bytes.

2) Table of counter

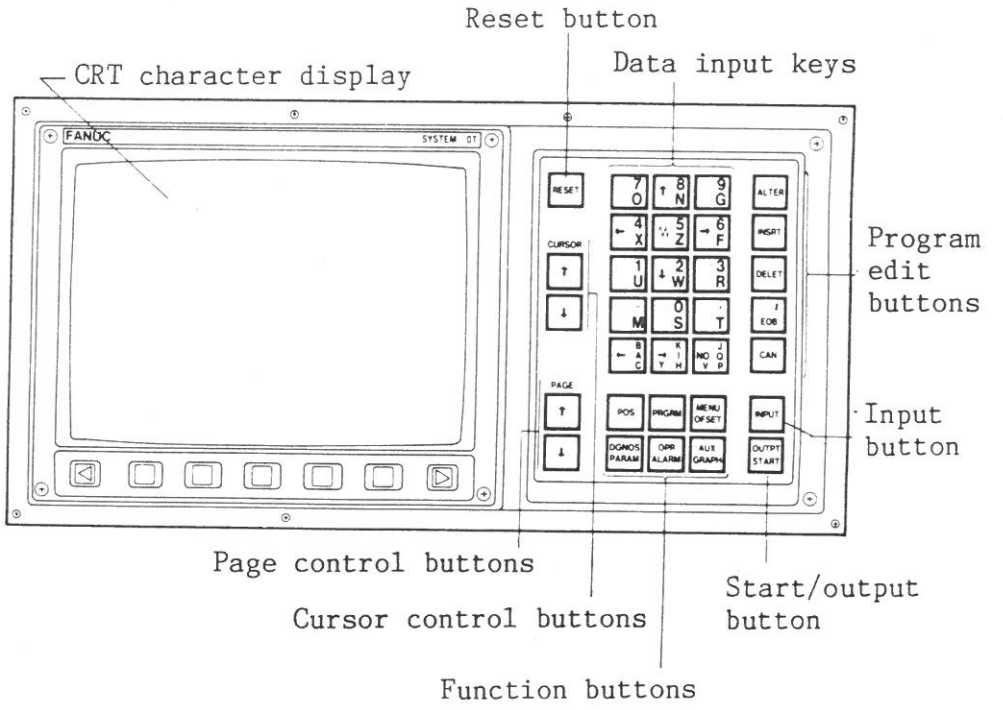
Address

Setting No.	Timer	Description
600 601	CTR1	Index relation of main and sub turret when an alarm is realized. This sets the index rotation when an alarm is realized if the turret starts to rotate without index command.

[7] Input/output signal display

It is possible to display input signals of limit switchs and push buttons to NC unit and signals of lamps and relays on the CRT screen to check input/output signals.

1) Display procedures

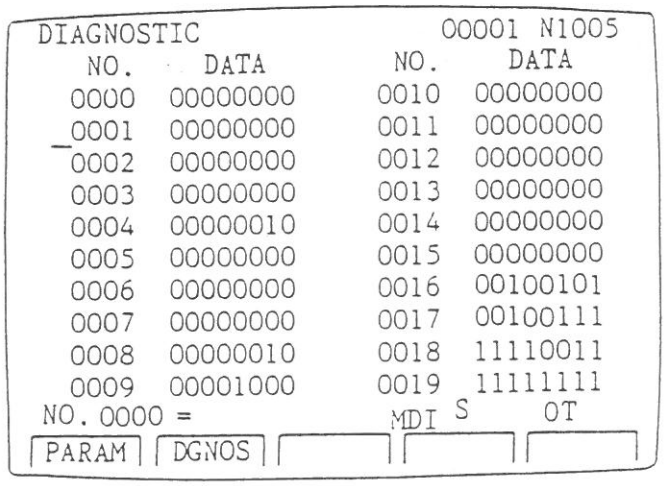


(1) Procedures

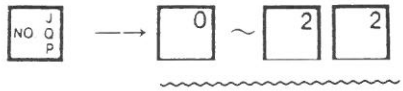
1 By pressing [DGNOS PARAM] button, display [DIAGNOSTIC] screen.

(If [PARAMETER] is displayed. [DIAGNOSTIC] is displayed by pressing once again.)

2 Input signals to NC are 0000 ∿ 0022.
Output signals from NC are 0048 ∿ 0086.

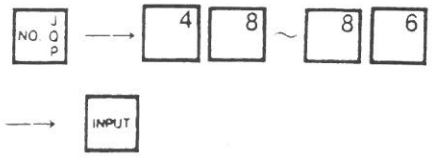


When input signal is confirmed, search by



(Diagnosis No to be confirmed)

When output signal is confirmed, search by



(2) Meanings of CRT screen.

By above-mentioned operations, the status of input or output can be judged depending on "0" or "1" of bit of diagnostic number.

0: Signal is off. Contact point (coil) is open.

1: Signal is on. Contact point (coil) is closed.

(Example)

Bit	→ 7	6	5	4	3	2	1	0
0016	0	0	1	0	1	0	0	1

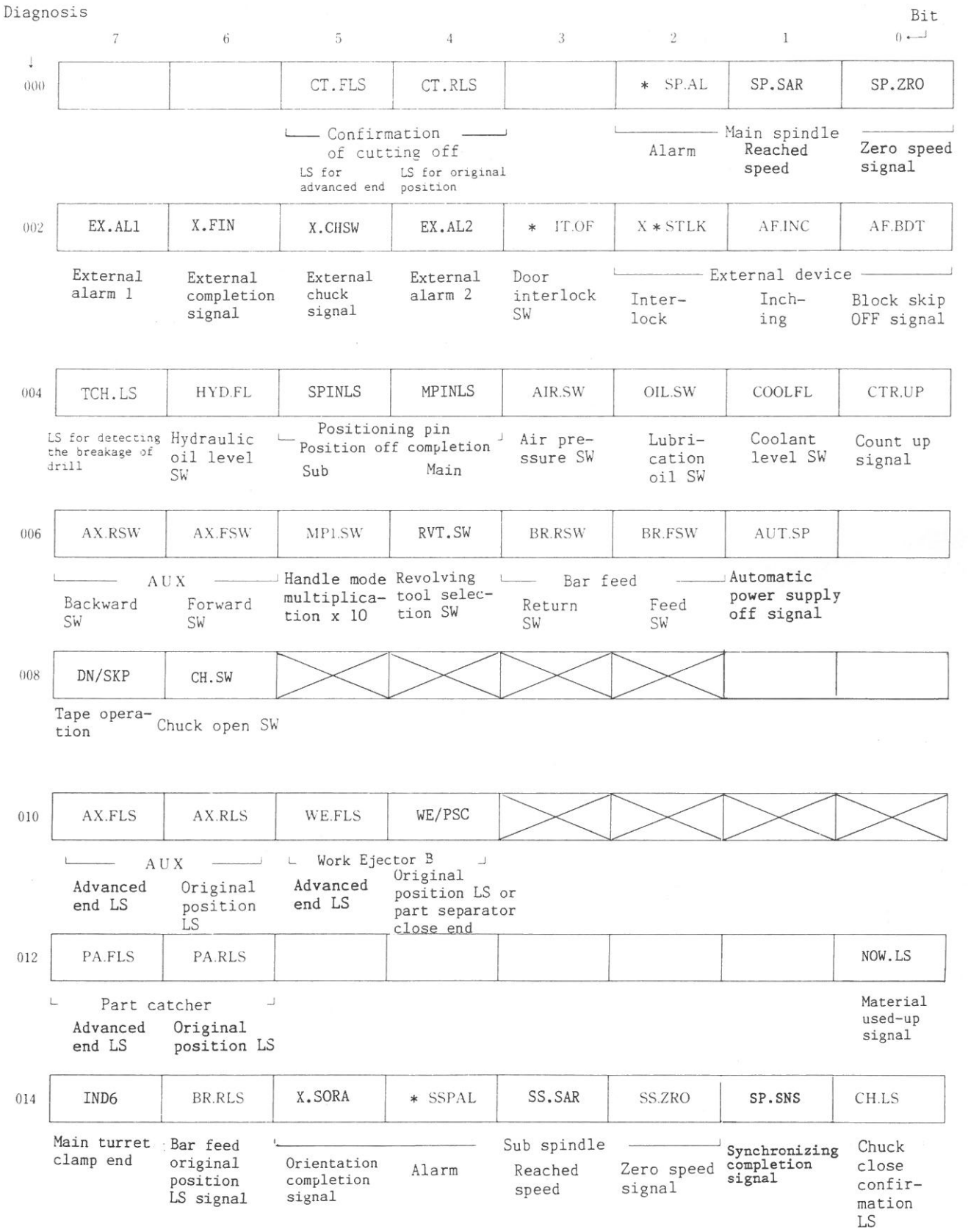
↑ Diagnosis address No.

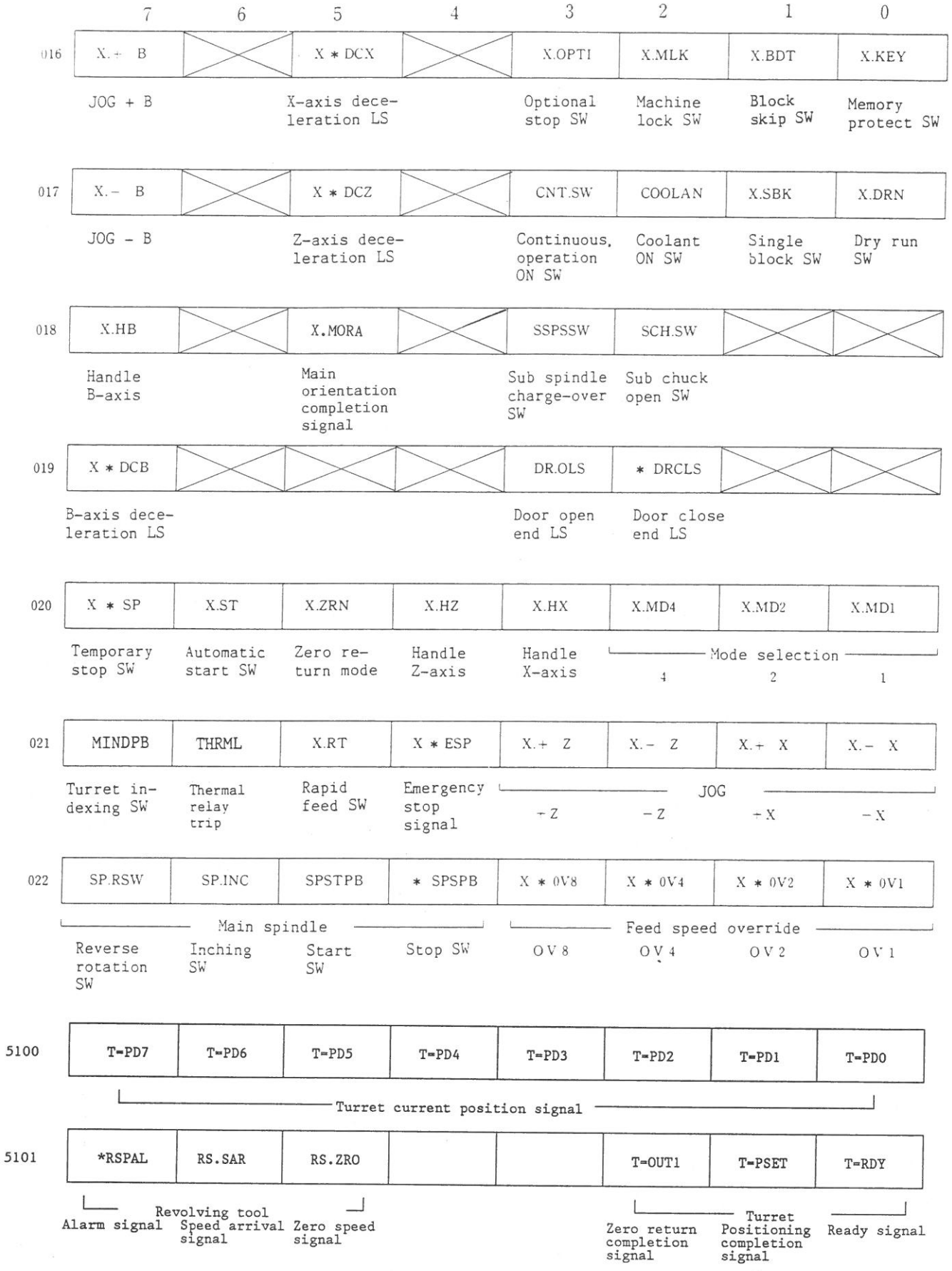
↑ Optional stop switch ON

↑ Machine lock switch OFF

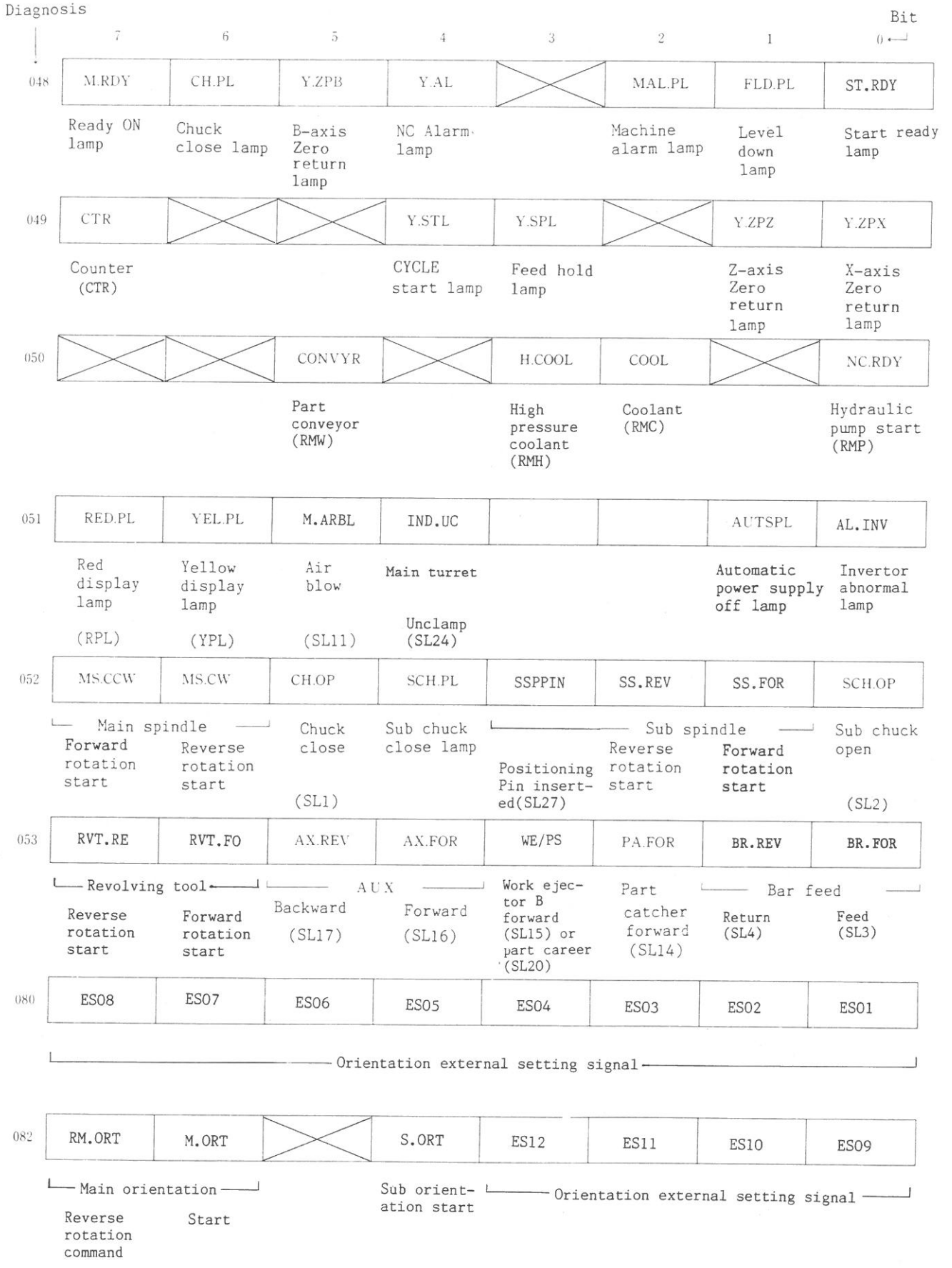
A bit 2 of diagnosis No.16 (normally, expressed as 16.2) means a machine lock switch of the operating panel and 16.3 means input signal of optional stop switch. Output signal can be confirmed in the similar manner.

2) Input signal (Signal from push-button and limit switch to NC)




7 6 5 4 3 2 1 0
016
X.+ B
X * DCX
X.OPTI
X.MLK
X.BDT
X.KEY
JOG + B
X-axis deceleration LS
Optional stop SW
Machine lock SW
Block skip SW
Memory protect SW
017
X.- B
X * DCZ
CNT.SW
COOLAN
X.SBK
X.DRN
JOG - B
Z-axis deceleration LS
Continuous, operation ON SW
Coolant ON SW
Single block SW
Dry run SW
018
X.HB
X.MORA
SSPSSW
SCH.SW
Handle B-axis
Main orientation completion signal
Sub spindle charge-over SW
Sub chuck open SW
019
X * DCB
DR.OLS
* DRCLS
B-axis deceleration LS
Door open end LS
Door close end LS
020
X * SP
X.ST
X.ZRN
X.HZ
X.HX
X.MD4
X.MD2
X.MD1
Temporary stop SW
Automatic start SW
Zero return mode
Handle Z-axis
Handle X-axis
Mode selection
4
2
1
021
MINDPB
THRML
X.RT
X * ESP
X.+ Z
X.- Z
X.+ X
X.- X
Turret indexing SW
Thermal relay trip
Rapid feed SW
Emergency stop signal
JOG
+Z
-Z
+X
-X
022
SP.RSW
SP.INC
SPSTPB
* SPSPB
X * 0V8
X * 0V4
X * 0V2
X * 0V1
Main spindle
Feed speed override
Reverse rotation SW
Inching SW
Start SW
Stop SW
0V 8
0V 4
0V 2
0V 1
5100
T=PD7
T=PD6
T=PD5
T=PD4
T=PD3
T=PD2
T=PD1
T=PD0
Turret current position signal
5101
*RSPAL
RS.SAR
RS.ZRO
T=OUT1
T=PSET
T=RDY
Alarm signal
Revolving tool Speed arrival signal
Zero speed signal
Zero return completion signal
Turret Positioning completion signal
Ready signal

3) Output signal (Signal from NC to lamp and relays)



	7	6	5	4	3	2	1	0
084	ABF.FO	M.ARB2	CT.FOR	M.ORG	ABF.ST	PWR.OF	SS.PC	MP.PIN
	Automatic material feeder delivery signal	Main second air blow (SLO)	Cut off confir-mation forward	Machine original point	Automatic bar feed start(M83S)	NC power OFF (NOF)	Position coder sub Selection	Main positioning pin inserted (SL12)

086	CHOPOK	CHCLOK	RESET	SPSPOK	DOR.OP	HM	AMD.	S.ARBL
	Chuck open completion output	Chuck close completion output	Reset button output	Main spindle stop confirmation	Door open end	Single block mode (HMD)	Automode	Sub air blow (SL13)

(Note) The name of output relay is shown in the parenthesis.

5200	T=STA	T=WRT	T=ORG	T=REV	T=FWD	T=RST	T=EMG	T=RUN
	Start command	Position setting	Zero return	Manual reverse	Manual forward	Alarm reset	Emergency stop	Ready ON
5201	T=-SGN	T=DIR	T=VEL	T=INC	T=D3	T=D2	T=D1	T=D0
	Reverse	Forward	Low speed rotation	Incremental command	Positioning command 4	3	2	1
5202							SY=SET	SY=MOD
							Position setting	Mode selection
5203	OUT.4	OUT.3	OUT.2	OUT.1	LODR.4	LODR.3	LODR.2	LODR.1
	Spare output 4	3	2	1	Loader output 4	3	2	1

Turret

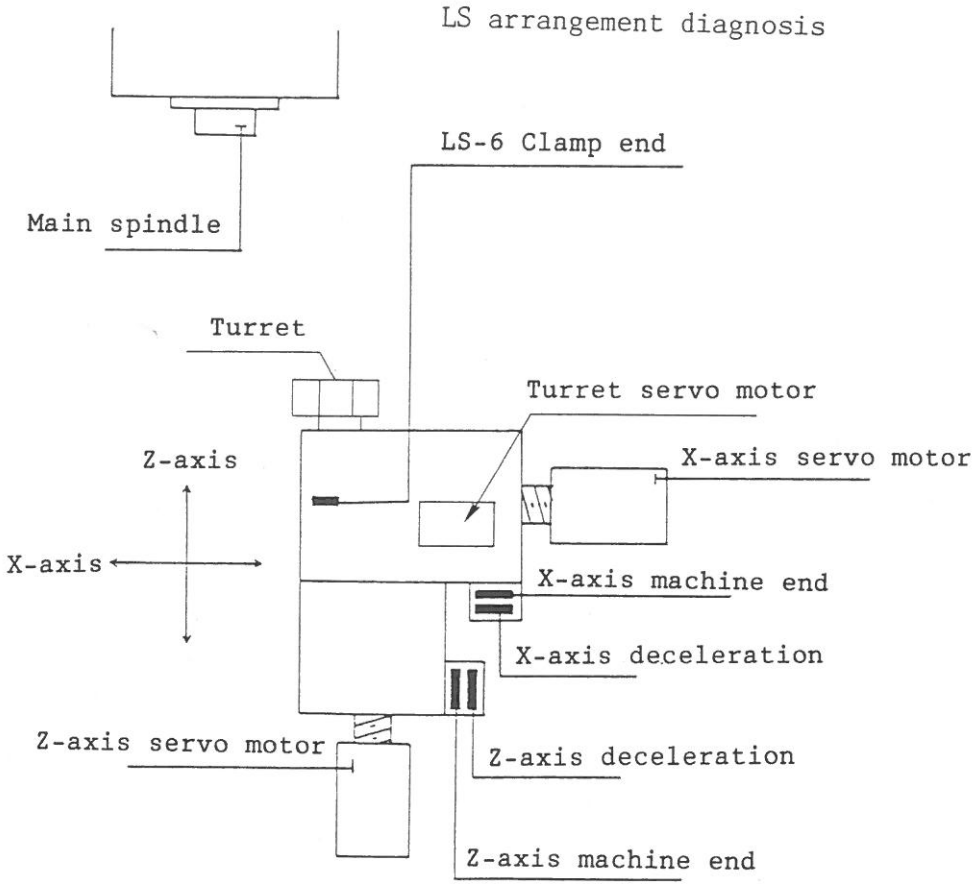
Turret

Sychronizing

[8] Relationship between turret position and detecting switch

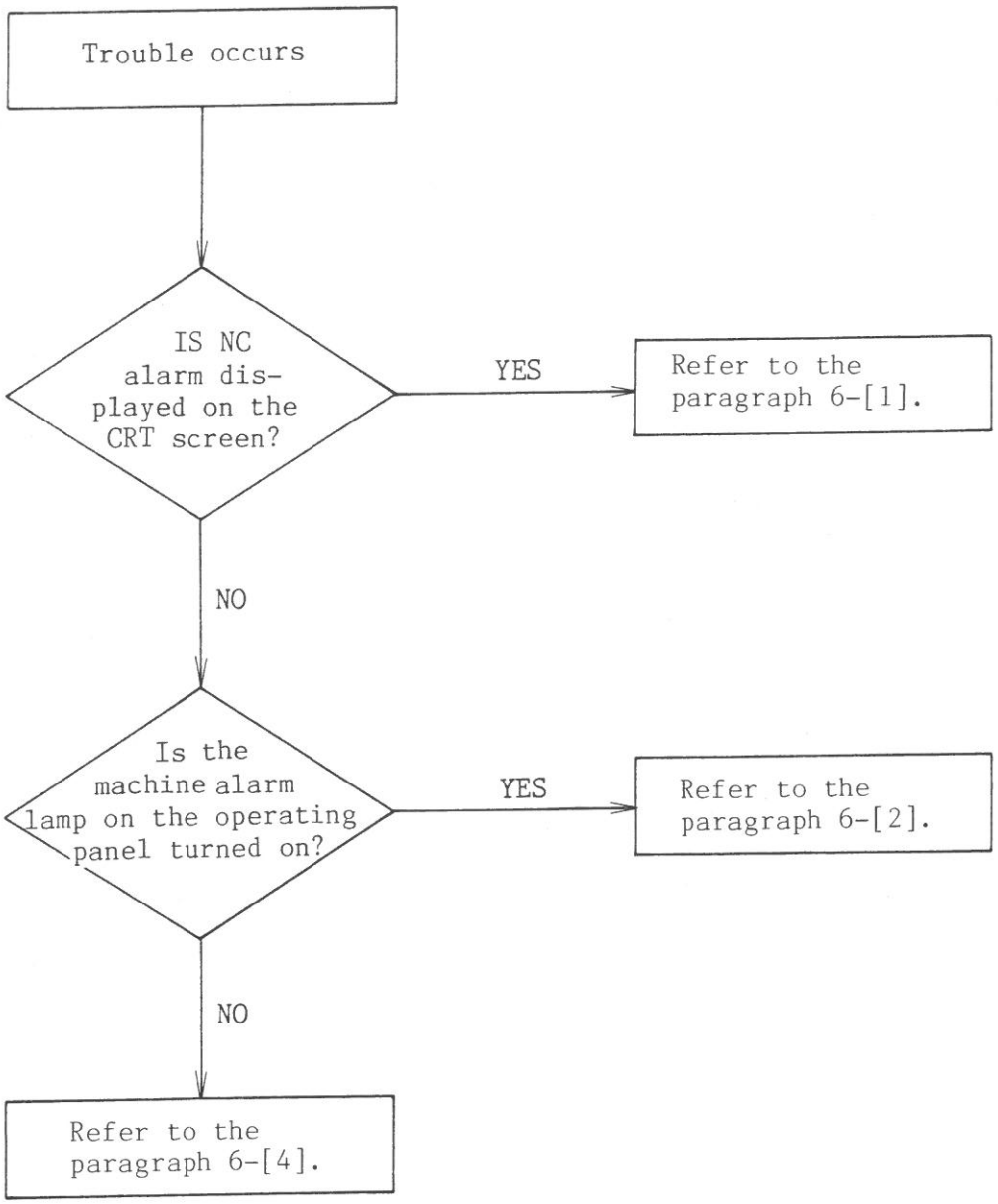
Detection of turret position is performed by the pulse encoder of servomotor in the servo amplifier. Current position display in the servo amplifier can be observed by diagnosis.

Turret position	T code No.	Diagnosis No.5100 7 6 5 4 3 2 1 0 ← Bit
1	T1 T9 T17 T25	0 0 0 0 0 0 0 1
2	T2 T10 T18 T26	0 0 0 0 0 0 1 0
3	T3 T11 T19 T27	0 0 0 0 0 0 1 1
4	T4 T12 T20 T28	0 0 0 0 0 1 0 0
5	T5 T13 T21 T29	0 0 0 0 0 1 0 1
6	T6 T14 T22 T30	0 0 0 0 0 1 1 0
7	T7 T15 T23 T31	0 0 0 0 0 1 1 1
8	T8 T16 T24 T32	0 0 0 0 1 0 0 0



4. MEASURES FOR TROUBLES

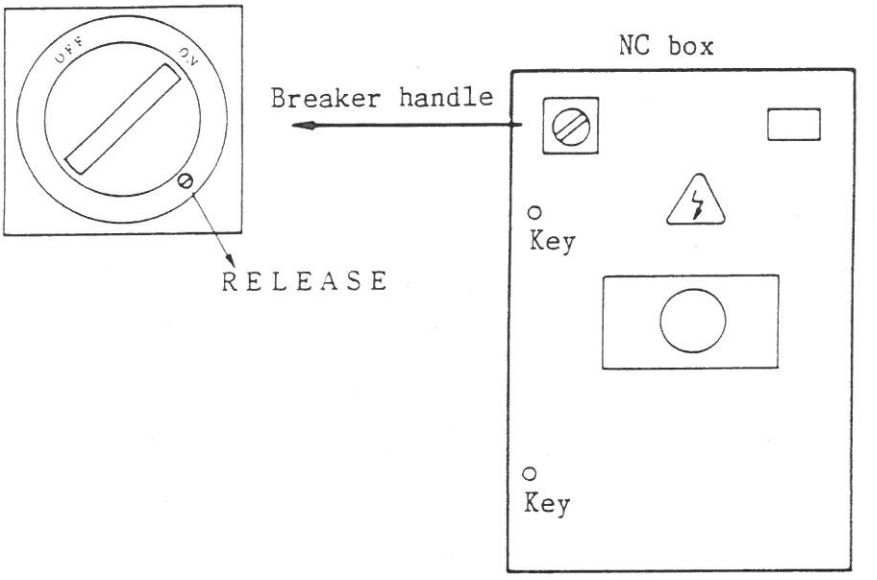
When a trouble occurs, NC unit trouble is displayed as a NC alarm, machine trouble is displayed as a machine alarm. Most of these truobles can be easily detected and rapaired. Read this section carefully when a trouble occurs. Troubles can be found if it is a NC alarm or machine alarm by following chart.



5. OPENING METHOD OF NC BOX DOOR

When a trouble occurs, it is necessary to check the inside of NC box without disconnecting power supply.

o Open the NC box door without disconnecting power supply by the following procedures.

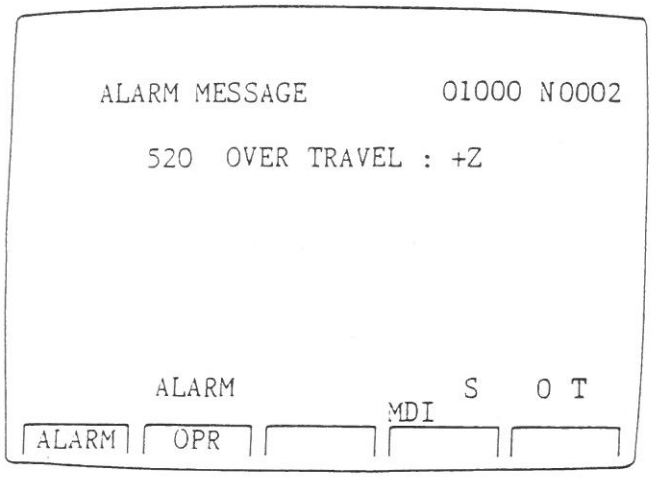


Open two keys of NC box door. Keep the breaker on and push the door lightly, turn RELEASE to the right using a minus screw driver to open the door.

6. VARIOUS ALARMS AND THEIR REMEDIES

[1] Remedies for troubles with NC alarm

When a trouble occurs in the NC unit, the screen is changed to alarm message screen automatically, the NC alarm lamp on the operating panel is lit and the machine stops. At this time, alarm message is displayed as shown in the screen below.



Note) Normally, when NC alarm occurs, alarm display automatically appears on the screen. If "ALARM MESSAGE" is not displayed on the screen, depress [OPR ALARM] *button.*

Alarm description is described in the error code list in appendix 9 of FANUC OT-C operation manual.
Therefore, this section will describe servo alarm and overtravel which are related to this machine.

1) Servo alarm

a) 400 overload alarm

Overload signal of either axis becomes ON.

Cause
a) A servo motor is overloaded.
b) A thermostat of servo motor operates.

Countermeasure
a) Mitigate cutting condition.
b) If an alarm occurs without load, readjustment of machine is required.

(Note) Continuous rated current of serve motor
in 4.6A for model "0"
6.8A for model "5".

b) READY signal of 401 speed control unit (VRDY) is OFF.

READY signal of speed control unit of either axis (VRDY) is made OFF.

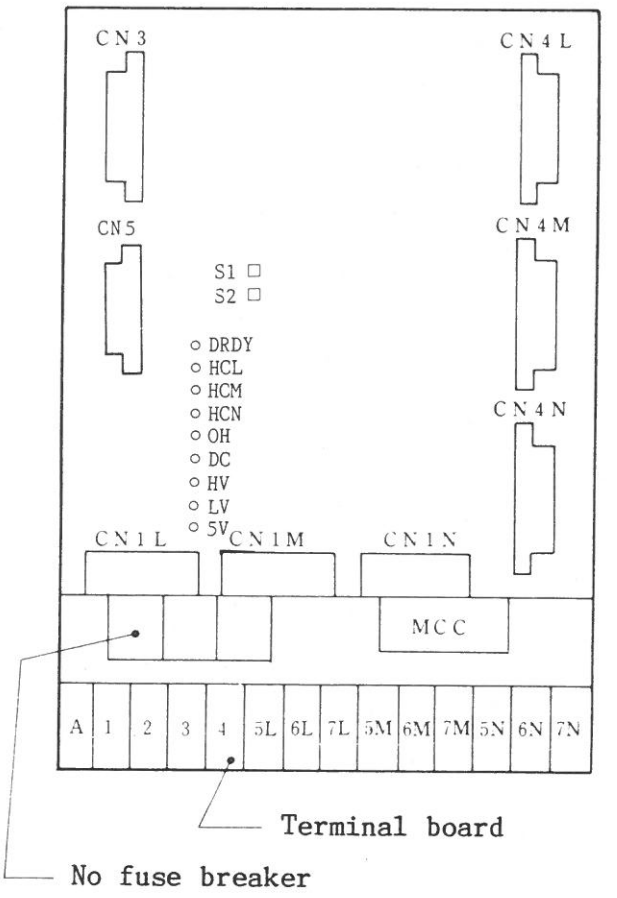
Cause

a) AC100V is not supplied to the speed control unit.
b) Power supply for control of speed control unit printed board is abnormal.
c) Speed control unit becomes the status of alarm. Confirm that various alarm lamps on the speed control unit printed board are turned on.
d) A no fuse breaker of speed control unit is made OFF.

Countermeasure

a) Check whether AC100V is supplied between terminals 3 and 4 on the speed control unit or not. If not supplied, check that each breaker and circuit protector is not made OFF according to NC box equipment arrangement diagram 3-1-2 of the maintenance section.
b) When AC100V is supplied between terminals 3 and 4, a failure exists in the speed control unit.
c) When an alarm lamp on the printed board is turned on, confirm which lamp and treat, in accordance with each item.

Position of alarm lamp and no fuse breaker for the speed control unit.



HV ON

Cause of trouble	Confirmation content	Treatment
Input AC power supply voltage is too high	Check input power supply voltage.	Make input voltage normal.
Defective servo motor	Is insulation resistance between armature of motor (power line) and body normal?	Replace a motor

HC ON (HCL, HCM, HCN)

Cause of trouble	Confirmation content	Treatment
Mistaken connection of motor power line	If motor power line is removed and power supply is turned ON, an alarm does not occur.	Correct the connection of motor power line.
A servo unit is defective.	When the above item is confirmed, and alarm occurs.	Replace a servo unit.

LV ON

Cause of trouble	Confirmation content	Treatment
Input AC power supply voltage is too low.	Check input power supply voltage	Make input voltage normal.
Fuse for +5V is blown.	Check whether a fuse for +5V is not blown.	Replace a fuse.
Print plate of servo is defective.	When the above item is confirmed, on alarm occurs.	Replacement of printed board.

DC ON

Cause of trouble	Confirmation content	Treatment
Defective printed board	An alarm occurs when power supply is turned ON.	Replacement of printed board.
Acceleration and deceleration frequency is too high	Does not positioning frequency by rapid feed exceed 1 to 2 time/sec? In addition, when this frequency decreases, the alarm is not displayed.	Reduce acceleration and deceleration frequency.

OH ON

Refer to the paragraph b) on P82.

c) In case of servo alarm 404

Even though READY signal of positional control (PRDY) is made OFF, READY signal of speed control unit (VRDY) becomes ON.

Cause of fault	Content of confirmation	Treatment
A cable is defective.	Alarm No. 404 does not occur.	Confirm cable between NC master printed board and servo unit. M34 - CN1L M37 - CN1M M44 - CN1N Replace or repair a defective cable.
A servo amplifier is defective.	When there is no abnormality of the above item	Change a servo amplifier.
A master printed board is defective.	Alarm No. 404 occurs.	Replace a master printed board.

d) 405 original position return is defective.

This is abnormality of positional control system.

During reference point return, there is abnormality in CNC or servo system and correct original point return cannot be made. Restart again from manual reference point return, a defective master point board is also considered.

e) 411, 421, 431 Excessive positional deviation alarm.

Cause of fault	Content of confirmation	Treatment
Content of positional deviation amount becomes larger than setting value.	Confirm that the content of parameters (504 - 506) is as specified by the parameter table attached to NC.	Reset to a correct parameter value.
Input power supply voltage decreases.	Measure input power supply voltage and confirm that it falls in a size of +10 % and -15%.	Correct power supply voltage.
Power supply voltage is abnormal.	Confirm voltage of control section.	Repair defective section.
Connection is defective.	Confirm connection of tacho generator and motor power line.	Repair defective section.

f) 413,423,433 speed command abnormality

(1) Positional deviation of corresponding axis exceeds ±32767. However, when setting of limit value (parameter 504 to 506) of positional deviation is correct, alarms 411, 421 and 431 are displayed first.

(2) Speed command of D/A converter exceeds the range of -8192 to +8191.
Confirm that the following parameters are specified in the parameter table.

517	Servo loop gain
100 to 102	Command multiply
4 to 6	Capacity of detection multiplier and reference counter
518 to 520	Rapid feed speed

g) Servo alarm 414, 424, 434

This is abnormality of each servo axis. Detailed content is displayed in diagnosis No. "720" "721" and "722" is the order of X-, Z- and B-axis.

720 to 722	OVL	LV	OVC	HCAL	HVAL	DCAL	FBAL	OFAL
	7	6	5	4	3	2	1	0

OFAL : Overflow alarm occurs.

FBAL : Broken line alarm occurs.

DCAL : Regenerative discharge circuit alarm occurs.
(Speed control unit alarm lamp DC is turned on.)

HVAL : Overvoltage alarm occurs.
(Speed control unit alarm lamp HV is turned on.)

HCAL : Abnormal current alarm occurs.
(Speed control unit alarm lamp HC is turned on.)

OVC : Overcurrent alarm occurs.

LV : Insufficient voltage alarm occurs.
(Speed control unit alarm lamp LV is turned on.)

OVL : Overload alarm occurs.

h) 416, 426, 436 broken line alarm

Cause of trouble	Confirmation content	Treatment
Defective cable connection	Confirm connection and wiring of pulse coder return signal cable.	Correct connection.

i) 417, 427 and 437 parameter setting defective

417	This alarm occurs when any of the following condition of X-axis is realized. i) A value other than specified is set in the motor type of parameter 8120. ii) A correct value (111 or -111) is not set in the motor rotation direction of parameter 8122. iii) Incorrect value such as below zero is set in the speed feedback pulse number per motor revolution of parameter 8123. iv) Incorrect value such as below zero is set in the position feedback pulse number per revolution of motor of parameter 8124.	
427	This alarm occurs when any of the following condition of Z-axis is realized. i) A value other than specified is set in the motor type of parameter 8220. ii) A correct value (111 or -111) is not set in the motor rotation direction of parameter 8222. iii) An incorrect data such as below zero is set in the speed feedback pulse number per rotation of motor of parameter 8223. iv) An incorrect data such as below zero is set in the position feedback pulse number per rotation of motor of parameter 8224.	
437	This alarm occurs when any of the following condition of B-axis is realized. i) A value other than specified is set in the motor type of parameter 8320. ii) A correct value (111 or -111) is not set in rotation direction of motor of parameter 8322. iii) An incorrect data such as below zero is set in the speed feedback pulse number per rotation of motor of parameter No. 8323. iv) An incorrect data such as below zero is set in the position feedback pulse number per rotation of motor of parameter 8324.	only S and T type

Note) Subsequent to servo alarm No. 411 to 419 means X-axis, 420 to 429 means Z-axis and 430 to 439 means B-axis.

2) Stored stroke limit alarm

When the machine reaches stored stroke limit, the following message is displayed on the CRT. When this alarm occurs during automatic operation, feed of slide stops immediately.

a) 510 Stored stroke limit of + side of X-axis is exceeded.
b) 511 Stored stroke limit of - side of X-axis is exceeded.
c) 520 Stored stroke limit of + side of Z-axis is exceeded.
d) 521 Stored stroke limit of - side of Z-axis is exceeded.
e) 530 Stored stroke limit of + side of B-axis is exceeded. } S, T type only
f) 531 Stored stroke limit of - side of B-axis is exceeded. } S, T type only

(Cause)
a) Error of program
b) Setup of stored stroke limit is not correct.

(Confirmation)
The position of machine from reference point can be seen in the position display screen. In addition, it can be also confirmed by DGNOS. Check the relationship with stored stroke limit by these.
DGN 820 ... Slide position from X-axis reference point
DGN 821 ... Slide position from Z-axis reference point
DGN 822 ... Slide position from B-axis reference point (Only S/T type)

(Countermeasure)
a) Correction of program
b) Reset stored stroke limit (Parameter 700, 701, 702, 704, 705 and 706) in accordance with the parameter table.

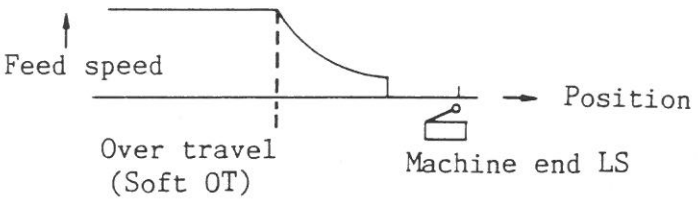
(Procedures to release)
a) Move in reverse direction in Jog mode and push [RESET] button.
b) When the slide cannot be got out of prohibited area, disconnect the power supply (Main breaker of NC box must be disconnected.) Then turn on the main breakder again. Push the button [P] and [CAN] same time and hold them, and turn on the power supply. [P] and [CAN] button is located on the operating panel and both button should be hold until a display appears on the CRT screen. By this operation, stored stroke limit is not checked until the first zero return is completed. After this procedures are completed, perform zero return.

* Stored stroke limit setup value

Parameter \ Model	BND-20S	BND-34S
700	2000	2000
701	1000	1000
702	1000	1000
704	-208000	-282000
705	-166000	-211000
706	-281000	-326000

g) In the case of machine end limit switch is actuated, when machine end LS on each slide is actuated, the machine becomes emergency stop condition and the alarm lamp for machine end LS on the operating panel is turned ON.

Cause i) Error of zero point setting in the coordinate system
ii) Error of program
iii) Maladjustment of dog for the deceleration switch or defective switch



Procedures to release

Push the machine end LS release button on the operating panel.
(Machine ready lamp comes on.)
Then hold the button and move the slide to the opposite direction in Jog mode and release the button.

3) Overheat alarm

a) 700 Overheat alarm in the NC locker

When temperature in the NC locker becomes more than allowable value, this alarm is turned on. When temperature becomes lower than specified value, this alarm is automatically released. Till then, this alarm cannot be released by reset button.

Cause of trouble	Treatment
Ambient temperature is too high.	Lower ambient temperature.
An air filter of NC is clogged.	Clean the air filter.
A fan motor in the NC locker is failed.	Replace the fan motor.

b) 702, 703 Over heat alarm of servo motor

Speed control unit alarm lamp OH turned on.

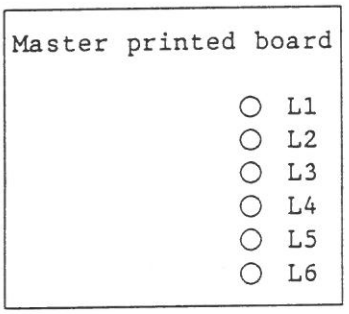
Cause of trouble	Confirmation content	Treatment
Overload	Measure armature current of motor and confirm that rated current is not exceeded.	Reduce load torque.
Defective winding insulation	Check insulation between motor power line terminal A1 or A2 and body by megger or tester. In case of megger, more than 1 MΩ is normal for 500V and in case of tester, ∞ is normal.	Replace the motor.
Short circuit inside winding	Remove the motor from the machine and measure current without load. When current increases in proportion to rotation speed, it is judged that there is short circuit inside.	Replace the motor.
Master printed board or B-axis printed board is defective.		Replace the printed board.

4) System alarm

a) 910, 911 RAM parity error
b) 920 Watch dog alarm
c) 930 CPU error
When above alarm occurs, NC master printed board or ROM of NC software is defective. Request the service to FANUC.
d) 998 ROM parity error
ROM of corresponding number is defective.

5) LED on the master printed board turned on

Normally, although an alarm message is displayed on the CRT screen When an alarm occurs, in case of display function is defective, alarm message can not be displayed. In this case, the alarm is displayed by LED on the master printed board as shown below.



When LED No. "L1" to "L6" on the master printed board is turned on, take measures in accordance with the table below.

LED		Content	Treatment
No.	Color		
L1	Green	Not alarm display	
L2	Red	This is turned on when any alarm occurs.	Alarm number is displayed on the CRT at the same time. Remove the cause in accordance with the number.
L3	Red	The memory card was detached.	Check whether memory printed board has been detached.
L4	Red	1. Watch dog alarm 2. Servo alarm of 1 to 4 axis. 3. The card of 1 to 4 axis was detached.	1. Replace master printed board, or memory printed board. 2. Check whether the card of 1 to 4 axis has been detached. 3. Replace the card of 1 to 4 axis.
L5	Red	1. Watch dog alarm of SUB CPU.	1. Replace SUB CPU.
L6	Red	Spare	

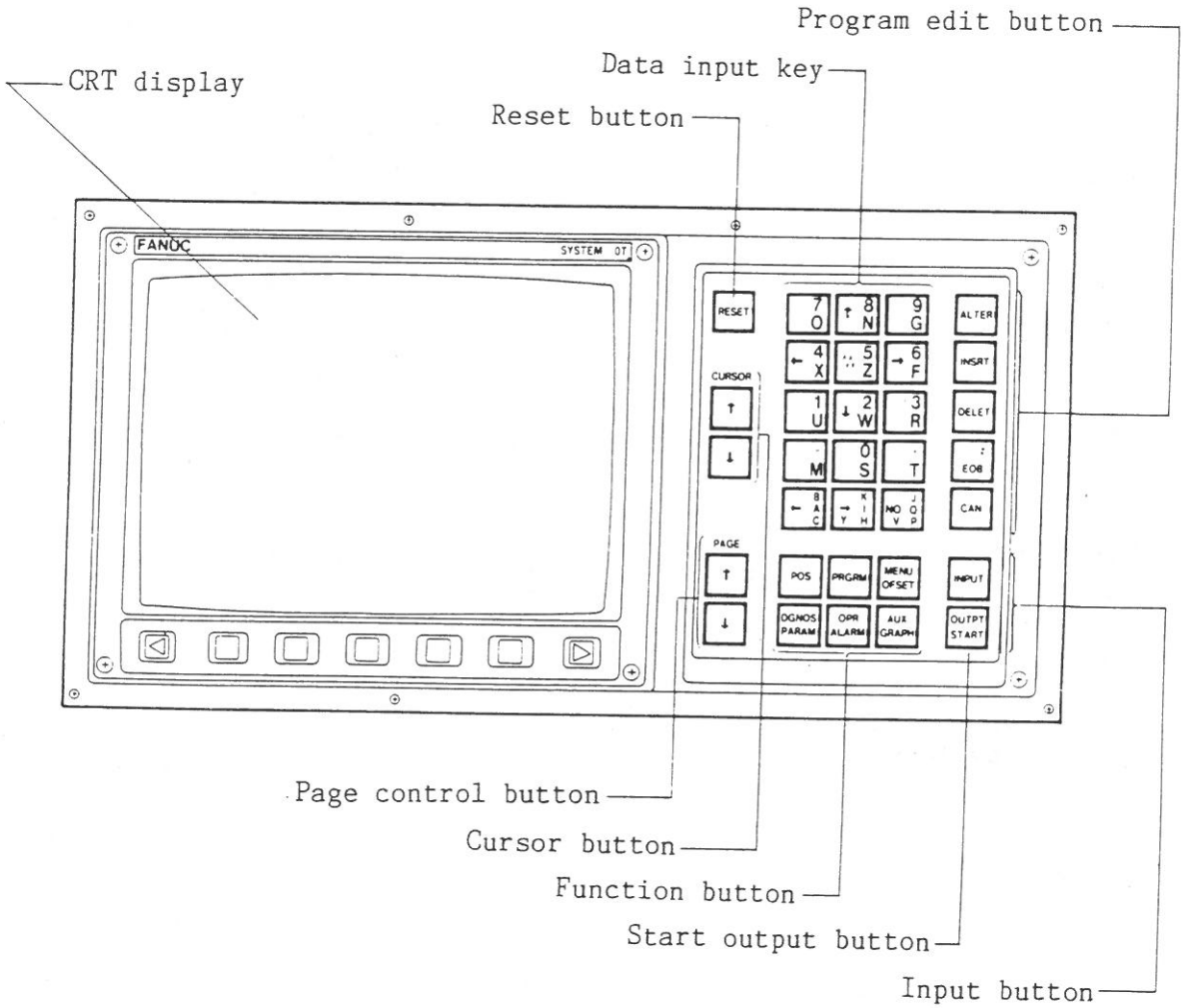
6) Other NC alarms

When P/S alarm is displayed, refer to the pages 73 to 81 of the operation section. In addition, it is also described in the appendix 9 "Error Code Table" of FANUC OT-C Instruction Manual.

[2] Measures for when machine alarm lamp or invertor alarm lamp or level down lamp and large indicator lamp is lit.

When power supply is connected to the machine, the failure detection circuit comes into effect, so if a trouble occurs, machine alarm lamp or low level lamp and large indicator lamp is lit according to the trouble, and the machine stops.
Trouble descriptions are simply shown by following procedures.

1) Procedures for display



1. OGNOS PARAM Select diagnosis screen. If parameter display appears first, press this button again.)

2. Search by NO. → 3 0 0 → INPUT .

3. Confirm that in which bit of diagnosis No. 300 to 309 is shown "1" and check in accordance with the alarm display of the next paragraph.

2) Alarm display

When machine alarm lamp, invertor alarm lamp or level down lamp on the operating panel is turned on, confirm that in which alarm display is shown "1" by diagnosis on the CRT screen and remove the cause in accordance with the item of corresponding alarm No.

Alarm display diagnosis

Diagnosis No.	Bit 7	6	5	4	3	2	1	0
300	AL8	AL7 ☆	AL6	AL5	AL4	AL3	AL2	AL1
301	AL16	AL15	AL14	AL13	AL12	AL11	AL10	AL9
302	AL24	AL23	AL22	AL21	AL20	AL19	AL18	AL17
303	AL32	AL31	AL30	AL29	AL28	AL27	AL26	AL25
304	AL40	AL39 ☆	AL38	AL37	AL36	AL35	AL34	AL33
305	AL48	AL47	AL46	AL45	AL44	AL43	AL42	AL41
306	AL56	AL55	AL54	AL53	AL52	AL51	AL50	AL49
307	AL64	AL63	AL62	AL61	AL60	AL59	AL58	AL57
308	AL72	AL71	AL70	AL69	AL68	AL67	AL66	AL65
309	AL80	AL79	AL78	AL77	AL76	AL75	AL74	AL73

3) Description of alarm and measures

AL1 (300.0) Main turret servo motor alarm
Machine alarm lamp is turned on.
An alarm occurs to the main turret servo amplifier. When the alarm is indicated in the servo amplifier, follow the item [4] "Countermeasures against faulty main turret servo amplifier and remedies".

To Reset Mach Alarm due to Turret fault "CRASH"

1. Zero Reference
2. Hold Spindle STOP Button & press Turret Index
   Turret should Rotate to Stn 1
3. Hit Reset.
4. Alarm light should begin flashing
5. Auto Mode may begin.

AL2 (300.1) Clamp or unclamp time over

Machine alarm lamp is turned on.

Clamp or unclamp of main turret is not completed in certain time.

Check and adjust the clamp end LS (DGN 14.7) and the unclamp valve (SOL24).

After removing the cause, release the alarm by pressing RESET button.

AL3 (300.2) Main turret index time over

Machine alarm lamp is turned on.

Even though turret indexing is commanded, a turret does not index in certain time after unclamping.

Check and adjust index action.

After removing the cause, release the alarm by pressing RESET button.

AL5 (300.4) Main turret reference point proximity SW alarm

Machine alarm lamp is turned on.

Proximity switch for main turret reference point is failed.

Check and adjust the switch.

After removing the cuase, release the alarm by pressing RESET button.

AL7 (300.6) Main spindle alarm

Invertor alarm lamp is turned on.

Alarm is occurred to the invertor for main spindle.

When the alarm is indicated in the invertor, follow the item [3]"Correspondence and disposition against the invertor abnormality".

When thermal relay (OL11) in invertor box is operated by over-loading of braker, reduce the acceleration and deceleration cycle of the motor.

After removing the cause, release the alarm by pressing RESET button followed by depressing "reset" button in the invertor.

AL8 (300.7) Revolving tool drive alarm

Invertor alarm lamp is turned on.

Alarm is occurred to the invertor for revolving tool drive.

When the alarm is indicated in the invertor (in NC box), follow the item [3]"Correspondence and disposition against the invertor abnormality".

When thermal relay (OL13) in invertor is operated by overloading braker, reduce the acceleration and deceleration cycle of the motor.

After removing the cause, release the alarm by pressing RESET button followed by depressing "reset" button in the invertor.

(Note) There is the substance of invertor in NC box, the braker and thermal relay are attached to NC box.

AL9 (301.0) Sub turret stop position alarm (Only for T type)
Machine alarm lamp is turned on.
Index position of sub turret is not in normal position. The reasons are follows:
① Abnormality of Index valve
② Reset is applied during indexing (Other alarm is occurred.)
③ Tool valance is not good
Check and adjust upper items. When oil pressure get OFF, load hydraulic pressure after removing the cause.
After adjusting to the normal position, release the alarm by pressing RESET button.

AL11 (301.2) Sub turret index time over (Only for T type)
Machine alarm lamp is turned on.
Even though sub turret indexing is commanded, a sub turret does not index in certain time after unclamping.
Check and adjust solenoid valve for index (SOL21) and index mechanism.
After removing the cause, release the alarm by pressing RESET button.

AL12 (301.3) Sub turret position detection alarm (Only for T type)
Machine alarm lamp is turned on.
Proximity switch for the turret index detection does not turn ON/OFF by failure or maladjustment. Indicator lamp lights up at the dog or the lamp put out at the position without the dog is defective switch.
And, the alarm is also indicated when index end proximity switch (DGN 14.5) stays ON and does not turn OFF and when the position setting drum is shifted.
After removing the cause, release the alarm by pressing RESET button.

AL13 (301.4) Sub turret stop position detection alarm (Only for T type)
Machine alarm lamp is turned on.
Proximity switch for sub turret indexing completion end is failed.
Check and adjust the switch (DGN 14.5).
After removing the cause, release the alarm by pressing RESET button.

AL15 (301.6) Sub spindle alarm (Only for S type)
Invertor alarm lamp is turned on.
Alarm is occurred to the invertor for Sub spindle.
When the alarm is indicated in the invertor, follow the item [3]"Correspondence and disposition against the invertor abnormality".
When thermal relay (OL12) in invertor box is operated by over-loading of braker, reduce the acceleration and deceleration cycle of the motor.
After removing the cause, release the alarm by pressing RESET button followed by depressing "reset" button in the invertor.

AL18 (302.1) Main chuck close end detection alarm
Machine alarm lamp is turned on.
When the chuck close end detection switch is attached to main chuck cylinder, detection switch is not completed in certain time by commanding "Chuck open" or "chuck close".
Check and adjust the detection switch (DGN 14.0) or cylinder.
After removing the cause, release the alarm by pressing RESET button.

AL21 (302.4) Main positioning knock pin alarm
Machine alarm lamp is turned on.
When the positioning device is attached to main spindle, the signal of "confirmation of pin sticks in" or "confirmation of pin pulls out" is not detected in a certain time.
Check and adjust the switch (DGN 4.4) for pin position confirmation, solenoid valve(SOL12) or cylinder.
Pin position confirmation switch is normal in "ON" condition for pin sticks in and pulls out and "OFF" condition for mid position.
After removing the cause, release the alarm by pressing RESET button.

AL22 (302.5) Main positioning knock pin LS alarm
Machine alarm lamp is turned on.
The switch turns without giving a command. Pin position confirmation switch (LS 23) is defective or imperfect in adjustment. After eliminating the cause, release the alarm by pressing RESET button.

AL24 (302.7) M code and cycle execution time over
Machine alarm lamp is turned on
① Completion signal is not accepted in certain time after M code is commanded.
Check and adjust the related signals of operative systems for the devices by the corresponding M code.
② Main chuck is opened and shut or main turret indexing is not operated in a certain time at all during automatic cycle.
Check the condition again by diagnosis number "700", "701" and "702". (See the paragraph "[4]-7) Start lamp is turned on but the machine is not started".)
After removing the cause, release the alarm by pressing RESET button.

AL27 (303.2) Ejector B and part carrier switch alarm (Only for S_2 type)
Machine alarm lamp is turned on.
· When work ejector B is attached
The original position (DGN 10.4) and forward end (DGN 10.5) are turned on simultaneously. Or after giving a backward command, the signal of original position (DGN 10.4) is not detected in a certain time.
· When part carrier is attached.
The original position (DGN 10.4) keeps operating due to the failure of switch, etc. Check and adjust the switch or cylinder. After eliminating the cause, release the alarm by pressing RESET button.

AL28 (303.3) Work ejector B forward time over (Only for S_2 type)
Machine alarm lamp is turned on.
When work ejector B is attached, the forward end (DGN 10.5) is not completed in a certain time after forward end is commanded.
After removing the cause, release the alarm by pressing RESET button.

AL29 (303.4) Sub positioning knock pin alarm (Only for S type)
Machine alarm lamp is turned on.
When the positioning device is attached, the signal of "confirmation of pin sticks in" or "confirmation of pin pulls out" is not detected in a certain time.
Check and adjust the switch for pin position confirmation (DGN 4.5), solenoid valve (SOL27) or cylinder. Pin position confirmation switch is normal in "ON" condition for pin sticks in and pulls out and "OFF" condition for mid position.
After removing the cause, release the alarm by pressing RESET button.

AL30 (303.5) Sub positioning knock pin LS alarm (Only for S_2 type)
Machine alarm lamp is turned on.
The switch turns without giving a command. Pin position confirmation switch (LS 24) is defective or imperfect in adjustment. After eliminating the cause, release the alarm by pressing RESET button.

AL33 (304.0) Air pressure down alarm
Level down lamp is turned on.
Air pressure is down for longer than the setting time of timer.
After adjustment of air pressure (usually 71PSI 5kg/cm²) and confirmation of red lamp of pressure switch in air unit is turned off, release the alarm by pressing RESET button.

AL34 (304.1) Hydraulic oil level down
Level down lamp is turned on.
Hydraulic oil is insufficient.
After hydraulic oil is supplied and confirmation of oil level switch (DGN 4.6=0) is turned OFF, release the alarm by pressing RESET button.

AL35 (304.2) Coolant level down alarm
Level down lamp is turned on.
Coolant is insufficient.
After coolant is supplied and confirmation of coolant level switch (DGN 4.1=0) is turned OFF, release the alarm by pressing RESET button.

AL36 (304.3) Lubrication oil level down alarm

Level down lamp is turned on.

Lubrication oil is insufficient.

After lubrication oil is supplied and confirmation of coolant level switch (DGN 4.2=0) is turned OFF, release the alarm by pressing RESET button.

AL39 (304.6) External alarm 1

Machine alarm lamp is turned on.

Alarm is occurred in external equipment.

After removal alarm according to operation manual of external equipment and confirmation of DGN 2.7 is "0", release the alarm by pressing RESET button.

AL40 (304.7) External alarm 2

Machine alarm lamp is turned on.

Alarm is occurred in external equipment.

After removal alarm according to operation manual of external equipment and confirmation of DGN 2.4 is "0", release the alarm by pressing RESET button.

AL41 (305.0) Count up indication

Only large indication lamp is turned on.

Preset counter is counted up.

After clearance coefficient of counter, release the alarm.

AL42 (305.1) Material used up indication

Only large indication lamp is turned on.

Materials in material feeding equipment is used up.

After replenishing materials, release the alarm.

AL47 (305.6) Thermal relay trip

Machine alarm lamp is turned on.

Any of thermal relay attached to each motor is acted.

Check thermal relay in NC box and remove the cause of overload of that motor.

After that, release the alarm by pressing RESET button.

AL50 (306.1) Part catcher switch alarm

Machine alarm lamp is turned on.

Automatic operation is started although part catcher is not in the original position.

Move the part catcher back or check and adjust the original position switch (DGN 12.6) if it is moved back.

After removing the cause, release the alarm by pressing RESET button.

AL52 (306.3) Tail stock limit switch alarm (Only for C type)

Machine alarm lamp is turned on.

The switch of original position (DGN 19.7) and advanced end (DGN 14.3) of tail stock is turned on in the same time. Check the switch.

In 2 position tail stock, it is involved the both case of upper end (DGN 14.5) and lower end (DGN 14.4), advanced end (DGN 14.3) and temporally stop position (DGN 14.2) is ON at the same time.

After removing the cause, release the alarm by pressing RESET button.

AL53 (306.4) Tail stock advanced end over (Only for C type)

Machine alarm lamp is turned on.

The tail stock advanced end dog passed over the limit switch.

Bar feeding is defective or setting of advanced end dog is maladjusted.

After removing the cause, release the alarm by pressing RESET button.

AL56 (306.7) Automatic door switch alarm

Machine alarm lamp is turned on.

When automatic door is attached, the original position (DGN 10.6) and Advanced end (DGN 10.7) is turned ON at the same time. Check the switch.

After removing the cause, release the alarm by pressing RESET button.

AL61 (307.4) Door interlock alarm

Machine alarm lamp is turned on.

When door interlock is attached, turret indexing button or automatic start button is depressed without releasing door interlock.

After the door is shut, release the alarm by pressing RESET button.

AL64 (307.7) PC parameter setting mistake alarm

Machine alarm lamp is turned on.

PC parameter, not be set in the same time, is inputted.

Reset in accordance with PC parameter list.

AL73 (309.0) NC alarm

NC alarm lamp is turned on.

NC alarm is occurred.

After confirmation of alarm message on the CRT screen, remove the cause in accordance with the item of NC alarm.

AL74 (309.1) Cut off confirmation equipment alarm

Machine alarm lamp is turned on.

When cut off equipment is attached, the advanced end (DGN 0.5) is not run by the damage of cut off bit, etc..

And, the advanced end and original position (DGN 0.4) is turned ON by the defect of switch, etc..

Check and replacement of cutting off bit, or check and adjustment of switch.

After removing the cause, release the alarm by pressing RESET button.

AL75 (309.2) Drill breakage equipment alarm

Machine alarm lamp is turned on.

Detection switch (DGN 4.7) is not operated by breakage of drill, etc..

Or, the switch is always operating status due to a defect of switch itself.

Check or replace the drill and check and adjust the switch.

After removing the cause, release the alarm by pressing RESET button.

AL77 (309.4) Mode change alarm

Machine alarm lamp is turned on.

Mode selection switch is changed during automatic running or pausing automatic running to manual operation.

After confirmation of the machine condition, release the alarm by pressing RESET button.

AL78 (309.5) Program command mistake alarm

Machine alarm lamp is turned on.

The program, not be commanded in the same time, is inputted.

After correcting the program, release the alarm by pressing RESET button.

AL80 (309.7) Cycle start button switch alarm

Machine alarm lamp is turned on.

Cycle start button is staying on.

After the switch is checked or replaced, release the alarm by pressing RESET button.

4) Alarm display table

DGNOS.	Alarm No.	Alarm message	Remarks
D300.0	AL1	Main turret servo amplifier alarm	
D300.1	AL2	Clamp or unclamp time over	
D300.2	AL3	Main turret index time over	
D300.3	AL4		
D300.4	AL5	Main turret zero point proximity switch	
D300.5	AL6		
D300.6	AL7	Main spindle alarm	
D300.7	AL8	Revolving tool drive alarm	
D301.0	AL9	Sub turret stop position alarm	
D301.1	AL10		
D301.2	AL11	Sub turret index time over	
D301.3	AL12	Sub turret position detection alarm	
D301.4	AL13	Sub turret stop position detection alarm	
D301.5	AL14		
D301.6	AL15	Sub spindle alarm	
D301.7	AL16		
D302.0	AL17		
D302.1	AL18	Main chuck close end detection alarm	
D302.2	AL19		
D302.3	AL20		
D302.4	AL21	Main positioning knock pin alarm	
D302.5	AL22	Main positioning proximity switch alarm	
D302.6	AL23		

DGNOS.	Alarm No.	Alarm message	Remarks
D302.7	AL24	M code and cycle execution time over	
D303.0	AL25		
D303.1	AL26		
D303.2	AL27	Ejector B and part carrier switch alarm	
D303.3	AL28	Work ejector B time over	
D303.4	AL29	Sub positioning knock pin alarm	
D303.5	AL30	Sub positioning proximity switch alarm	
D303.6	AL31		
D303.7	AL32		
D304.0	AL33	Air pressure down alarm	
D304.1	AL34	Hydraulic oil level down	
D304.2	AL35	Coolant level down alarm	
D304.3	AL36	Lubrication oil level down alarm	
D304.4	AL37		
D304.5	AL38		
D304.6	AL39	External alarm 1	
D304.7	AL40	External alarm 2	
D305.0	AL41	Count up indication	
D305.1	AL42	Material used up indication	
D305.2	AL43		
D305.3	AL44		
D305.4	AL45		
D305.5	AL46		
D305.6	AL47	Thermal relay trip	

DGNOS.	Alarm No.	Alarm message	Remarks
D305.7	AL48		
D306.0	AL49		
D306.1	AL50	Part catcher switch alarm	
D306.2	AL51		
D306.3	AL52	Tail stock limit switch alarm	
D306.4	AL53	Tail stock advanced end over	
D306.5	AL54		
D306.6	AL55		
D306.7	AL56	Automatic door switch alarm	
D307.0	AL57		
D307.1	AL58		
D307.2	AL59		
D307.3	AL60		
D307.4	AL61	Door interlock alarm	
D307.5	AL62		
D307.6	AL63		
D307.7	AL64	PC parameter setting mistake alarm	
D308.0	AL65		
D308.1	AL66		
D308.2	AL67		
D308.3	AL68		
D308.4	AL69		
D308.5	AL70		
D308.6	AL71		

DGNOS.	Alarm No.	Alarm message	Remarks
D308.7	AL72		
D309.0	AL73	NC alarm	
D309.1	AL74	Cut off confirmation equipment alarm	
D309.2	AL75	Drill breakage equipment alarm	
D309.3	AL76		
D309.4	AL77	Mode change alarm	
D309.5	AL78		
D309.6	AL79		
D309.7	AL80	Cycle start button switch alarm	

5) Alarm lamp

In the following case, remedy as fast as possible before alarm is indicated.

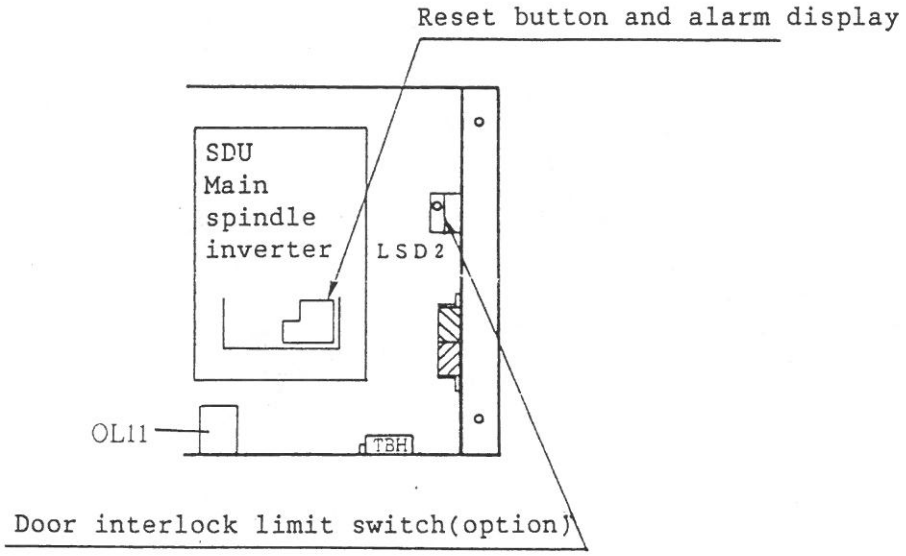
a) Turn on and off of level down
Lubrication oil is not enough. Supply specified lubrication oil in the tank.

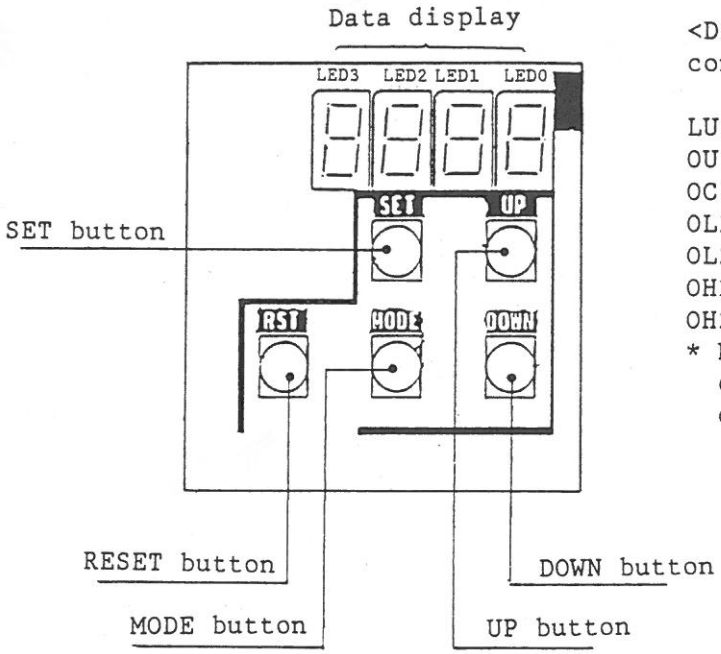
b) Turn on and off of NC alarm lamp
The battery voltage level of NC unit is down. Replace the new battery. For replacement, refer "Replacement of battery in the NC box" in the paragraph of maintenance section.

c) Turn on and off of start ready lamp
In AUTO mode (Auto operation, MDI operation), feed override is set to other than 100 percent.
Be sure to check this lamp when a feed on the program is necessary.

[3] Correspondence and treatment concerning invertor abnormality

This machine performs rotation control at the main spindle by invertor and when overload and fault occur, a invertor alarm is realized and the machine stops. At this time, a failure display lamp of invertor is turned on.
When a failure reset button is pressed, and [RESET] button of the operating panel is pressed after a failure display lamp vanishes, a invertor alarm is released.
Invertor alarm of main spindle can be confirmed by 6 bit of DGN 300 and invertor alarm of sub spindle can be confirmed by 6 bit of DGN 301.

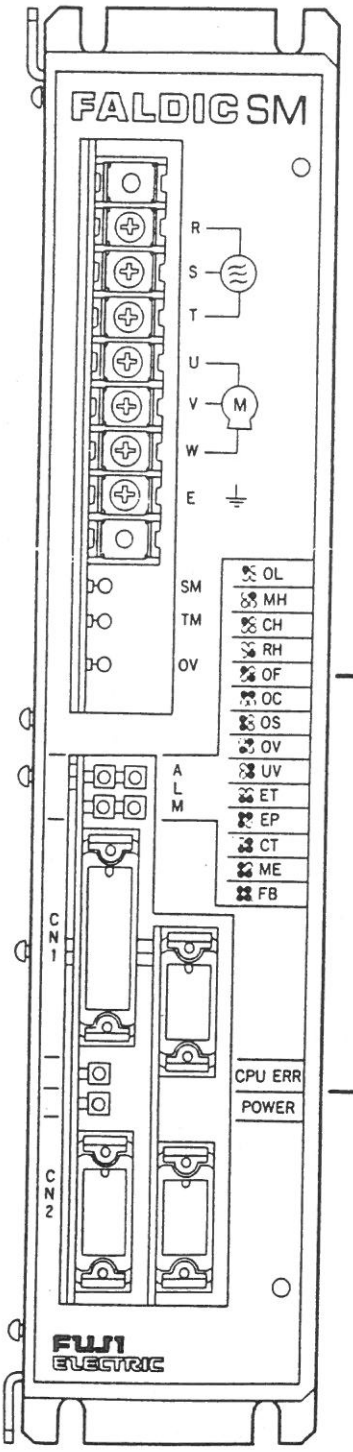




<Display codes and contents of failure>

LU ...Undervoltage
OU ...Overvoltage protection
OC ...Overcurrent protection
OL1 ..Overload
OL2 ..Motor overload
OH1 ..Inverter overheat
OH2 ..External failure
* Refer to the instruction manual of FRENIC 5000M3 for the detail of inverter alarm.

[4] Countermeasures against faulty main turret servo amplifier and remedies



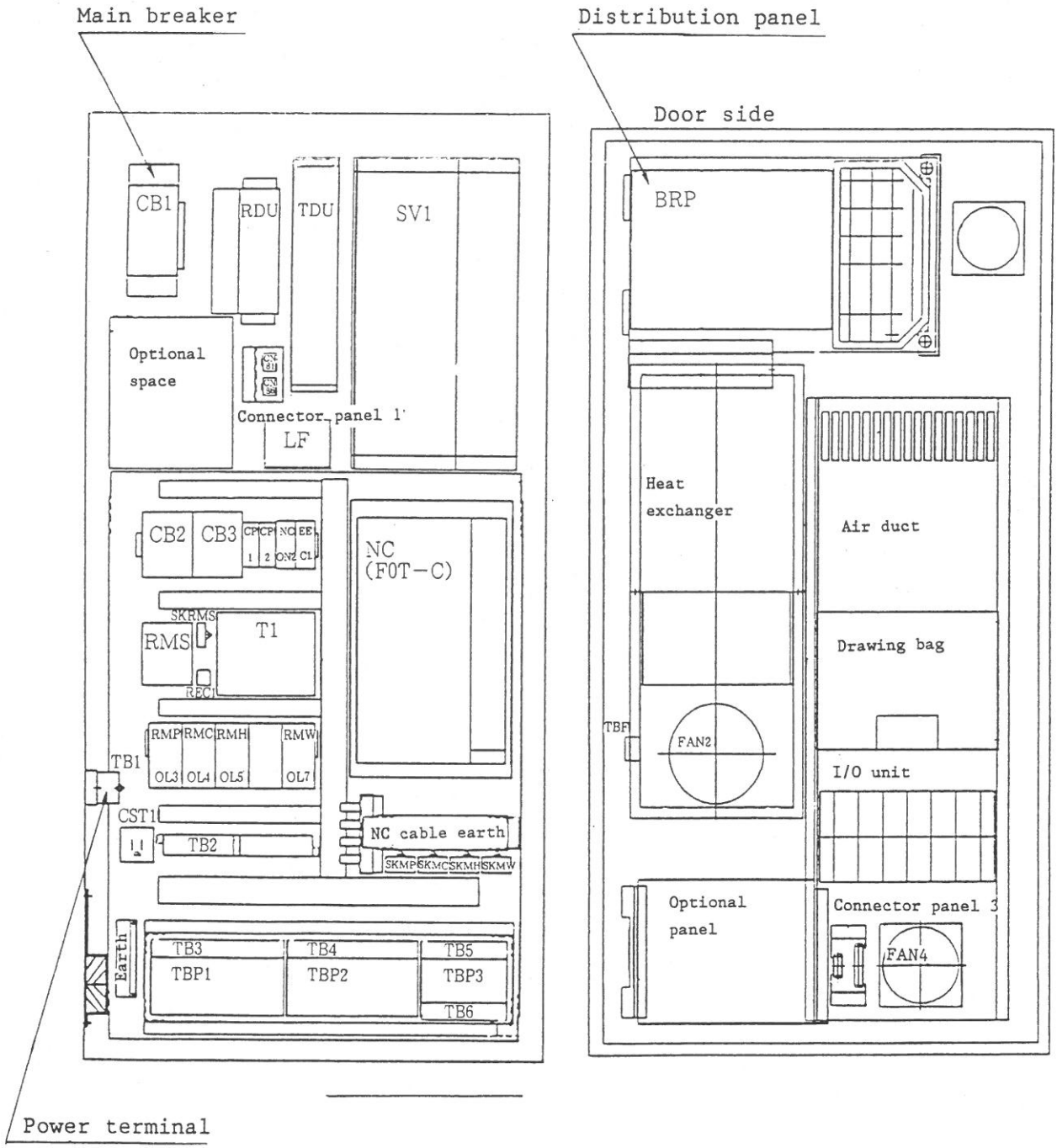
Alarm detection display LED
OL - Motor overload MH - Motor overheat CH - Controller overheat RH - Regenerative resistance overheat OF - Over-deviation OC - Output overcurrent OS - Overspeed OV - Overvoltage UV - Undervoltage ET - Encoder trouble EP - Encoder power trouble CT - Control power trouble ME - Memory error FB - Fuse blowing

Status display LED
POWER (Green) Lighting - Power is present.
ERROR (Red) Lighting - CPU error Flickering - BCD error

[5] Remedies when alarm is not indicated.

When NC alarm lamp or invertor alarm lamp and machine alarm lamp is not lit but the machine stops, the cause of the trouble can be easily found in accordance with this paragraph. If the trouble can not be found or repaired, please contact us.
The trouble can be investigated along the flow chart. Location of equipment appearing in the flow chart is described below.

Layout of equipments in NC box



o Breaker and circuit protector

Application of breaker

CB1: Main breaker
CB2: Power supply for NC device and servo motor
CB3: Power supply for each motor such as hydraulic motor and circuit protector

Application of circuit protector

CP1: AC 100V power supply for machine light, lubrication motor, electromagnetic switch, etc.
CP2: Power supply for solenoid valve

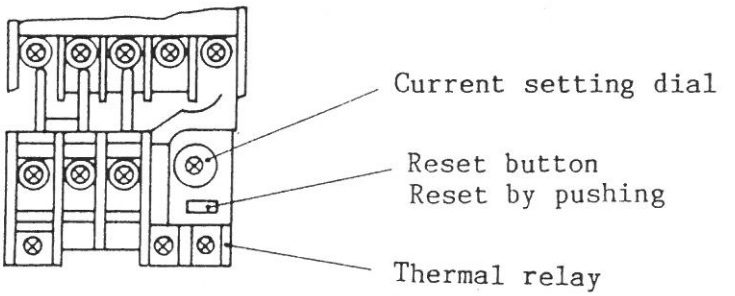
When over current flows, a breaker or circuit protector trips. Remove the cause and turn the lever OFF once, then turn it ON.

o Thermal relay

Application of thermal relay

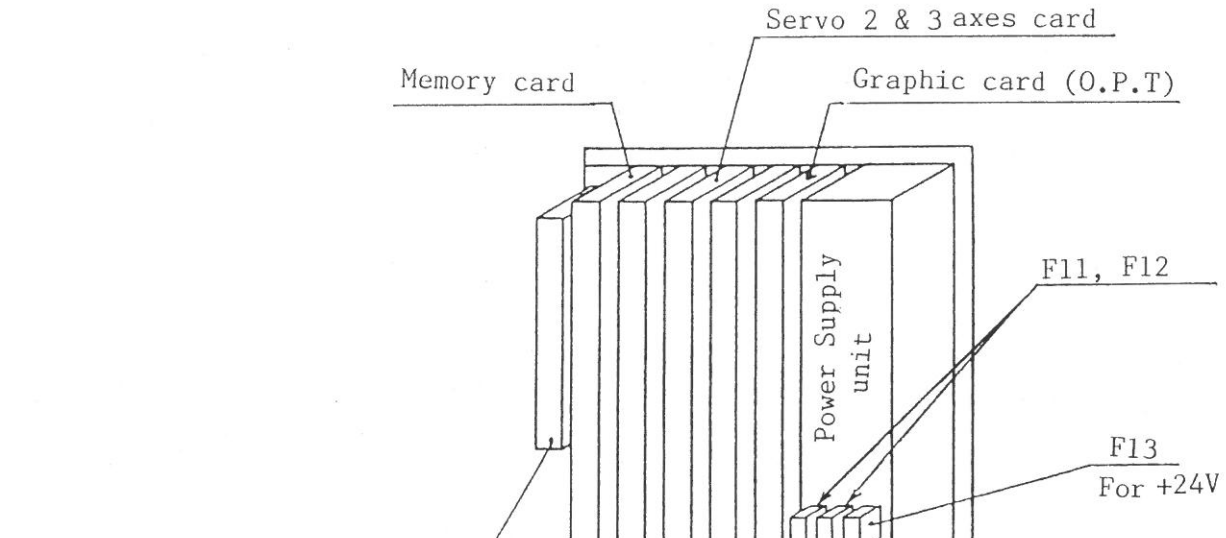
OL3: Hydraulic pump motor
OL4: Coolant pump motor
OL5: High pressure coolant pump motor
OL7: Parts conveyor motor

When a motor is overloaded, a thermal relay trips and machine ready is turned OFF and the machine stops.
For reset, remove the cause and push the reset button as shown below.



o Location of fuses in the NC unit

There are four fuses located in the NC unit as shown below. When any of them melted out, replace it with a spare fuse in the NC box.



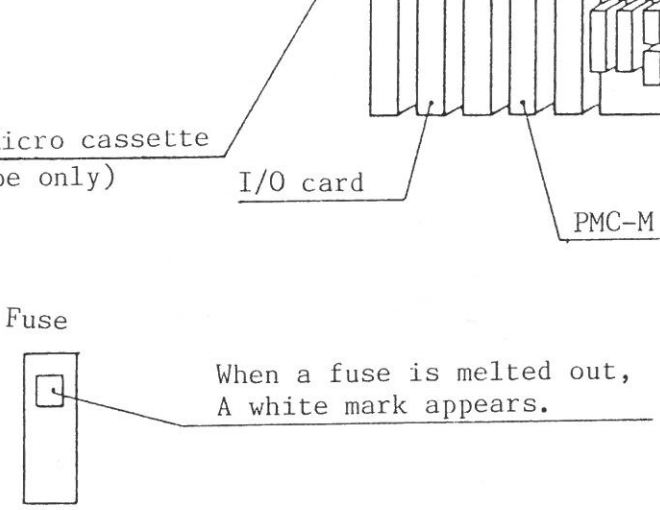
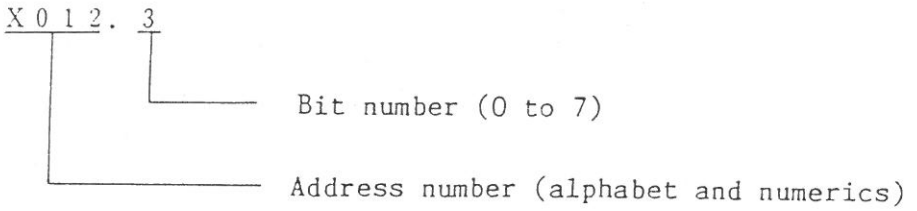


Table of Fuse

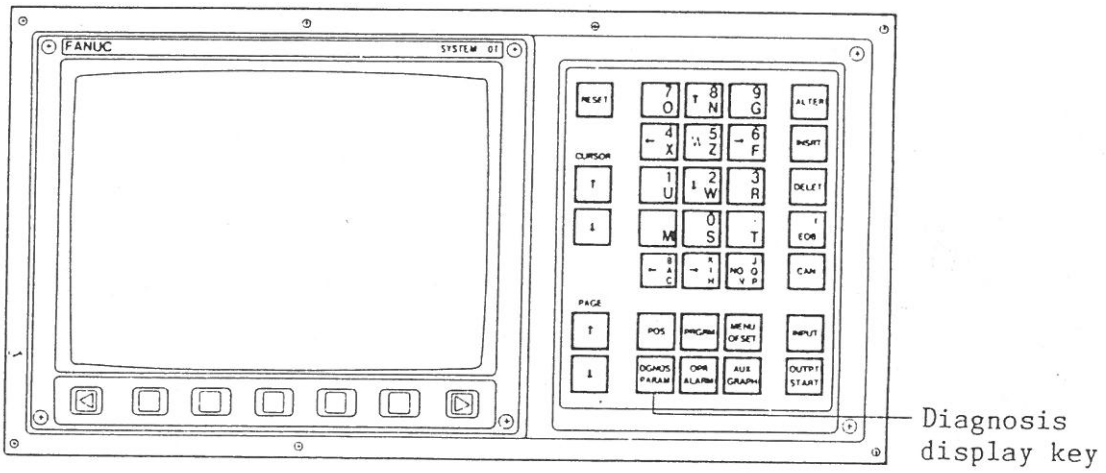
Parts No.	Capacity	Type	Purpose
F11,F12	5A	A60L-0001-0245#GP75	For AC200V power supply
F13	3.2A	A60L-0001-0075#3.2	CRT/MDI. For master printed board +24V
F14	5A	A60L-0001-0046#5.0	For protection against abnormality of machine side +24E line

o PCDGN (PC diagnosis)
The machine is controlled by control device called PC.
Cause of a trouble can be quickly detected by the self-diagnostic function of PC, which is called as PCDGN (PC diagnosis). PC parameter number is consisted of an address number which includes alphabet and numerics and bit number.

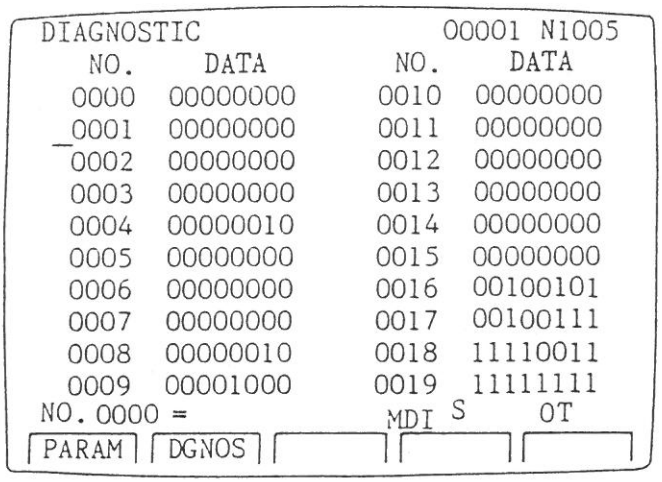


The alphabet of address number is determined as follows.
X: Signal from push button switch and limit switch to PC
Y: Signal from PC to indicator lamp, relay, etc.
F: Signal from NC to PC
G: Signal from PC to NC
R: Internal relay
D: Data of maintaining type memory (PC parameter, timer, etc.)

Refer to the maintenance section for address of input signal of push button switch and limit switch and output signal of lamp, relay, etc.
Refer to the maintenance section for detail of PC parameter. For other addresses, refer to the ladder diagram in the drawing bag of NC box. In this paragraph, leading 0 of address of PCDGN is omitted.
In addition, in actual operation, it can be omitted. For example, X012.3 is represented as X12.3.



Refer to the paragraph 3-[7] Input/output signal display of the maintenance section for display method.
An address and bit number of internal relay can be seen in the ladder diagram, ON or OFF condition of relay can be judged on the screen.



[Example]

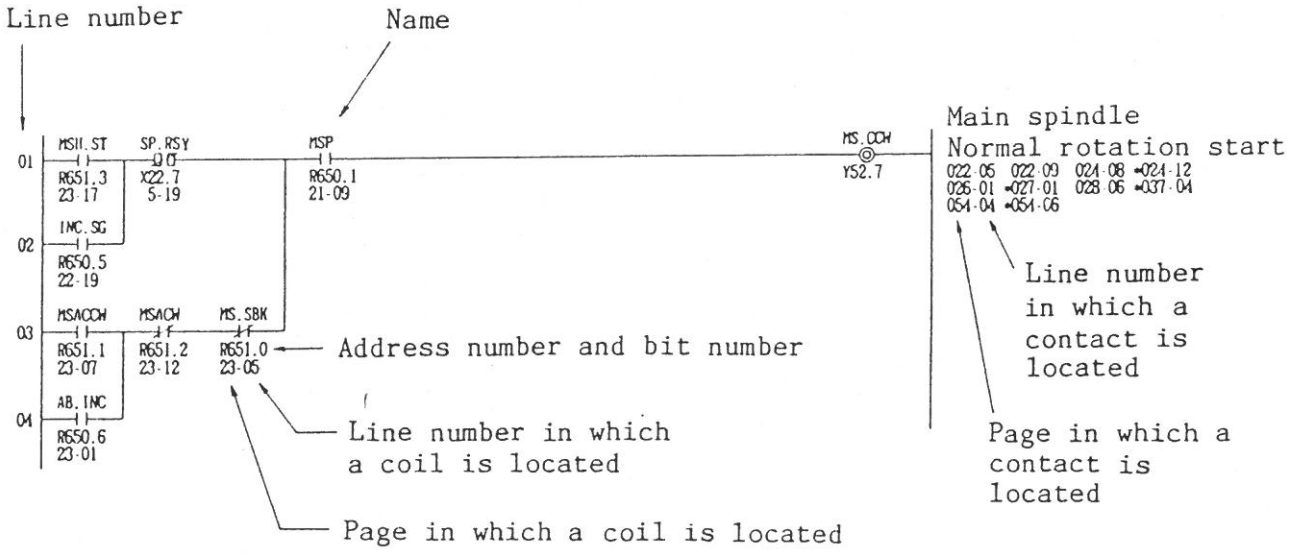
0 0 1 6 0 0 1 0 1 0 0 1

Address number — Bit No. 7 — Bit No. 0

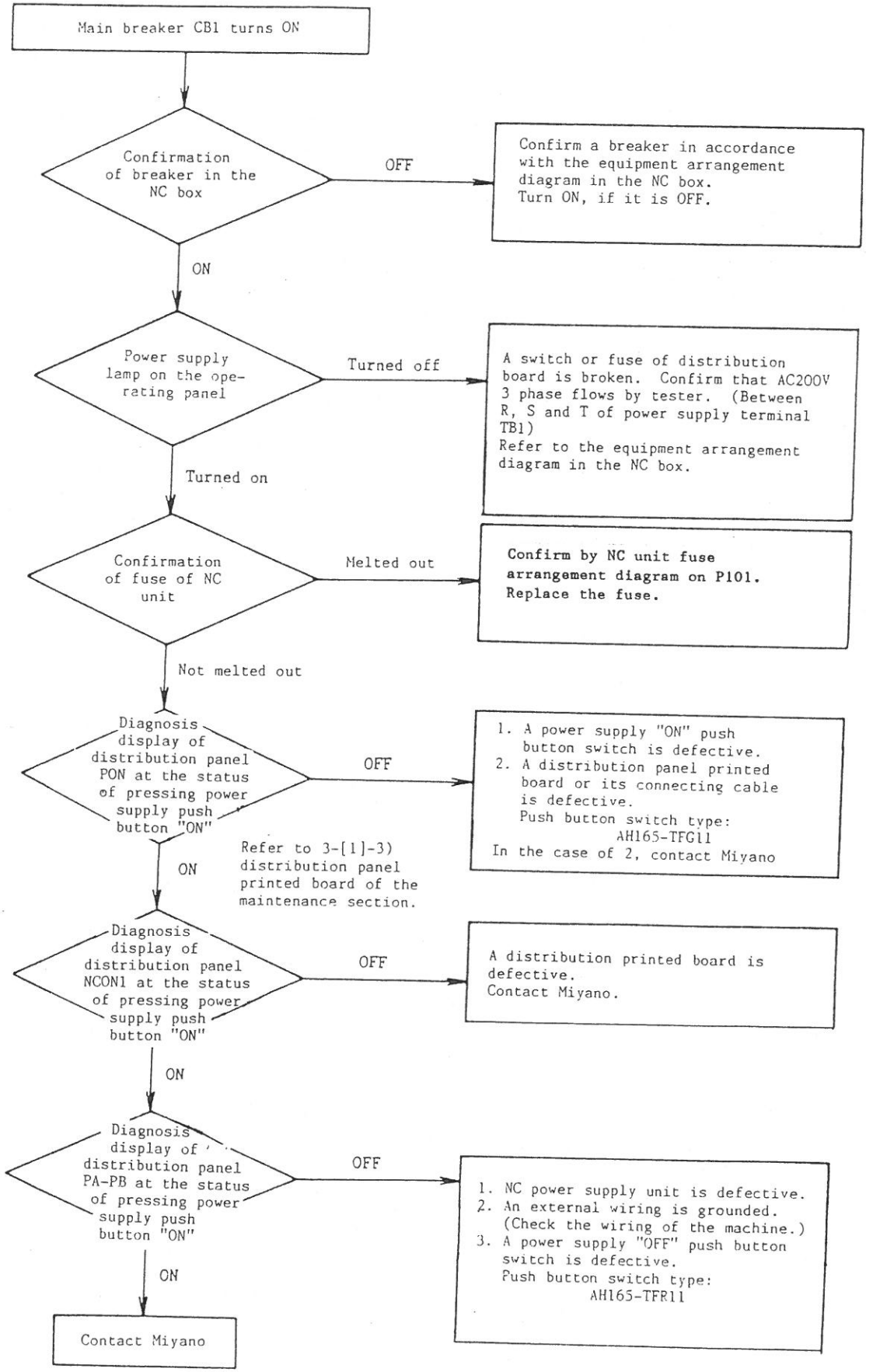
Bit number is counted as 7, 6, ... from the left, and right end is zero.
For display of diagnosis, "0" indicates OFF and "1" indicates ON.

Note) An alphabet of the address number is not displayed on the CRT.

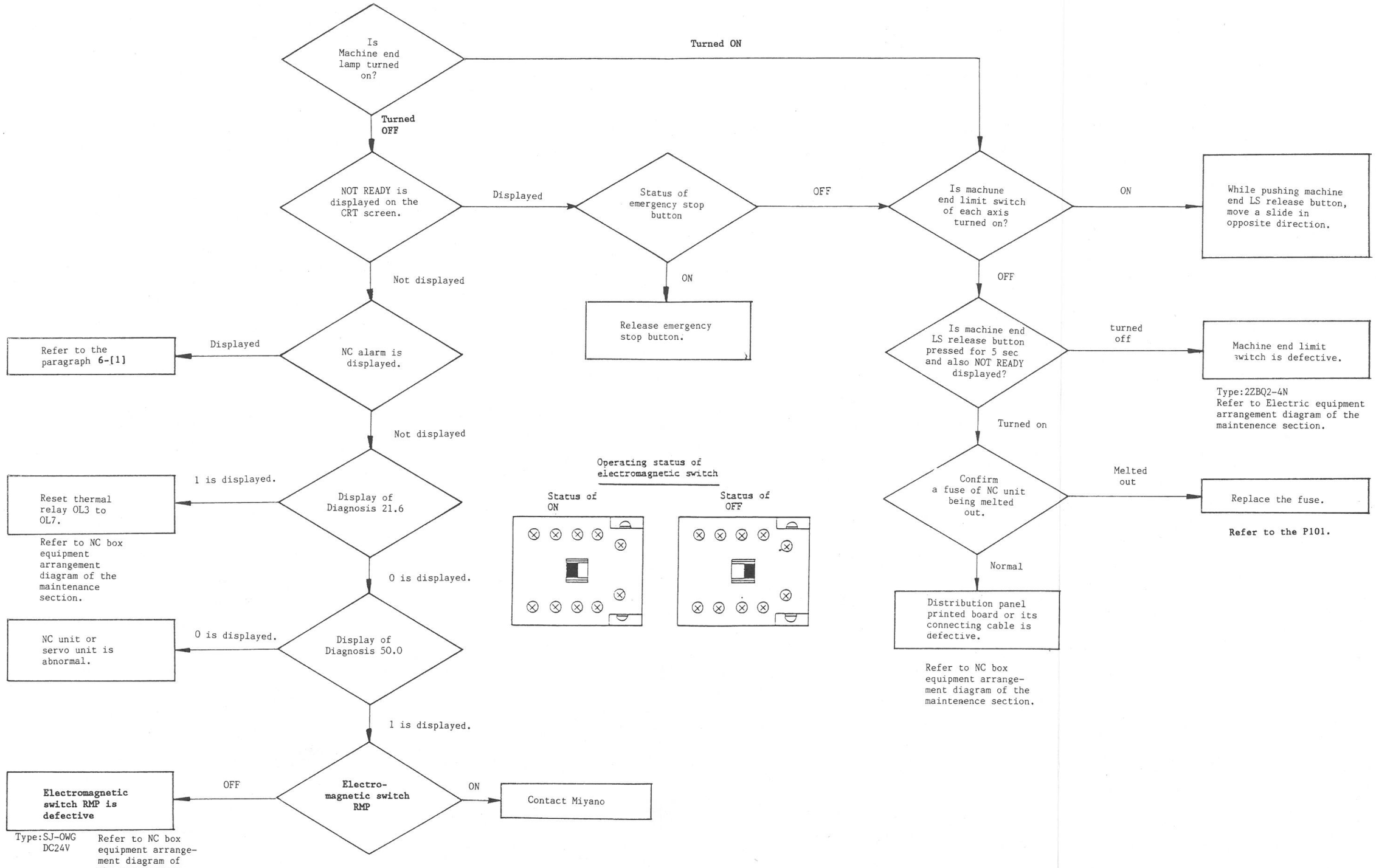
Example of ladder diagram



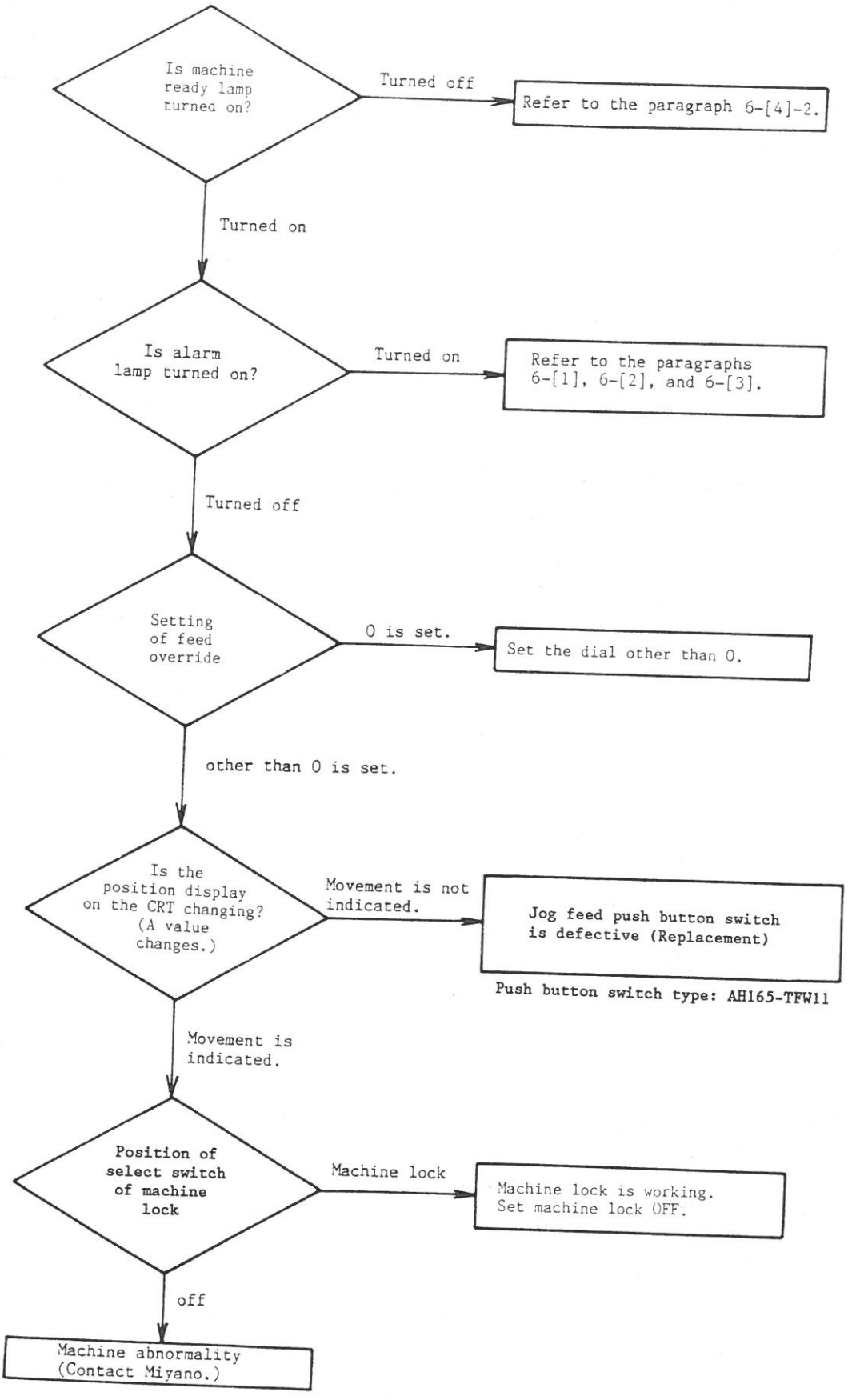
1) Main power can not be turned ON. (CRT screen is not displayed.)



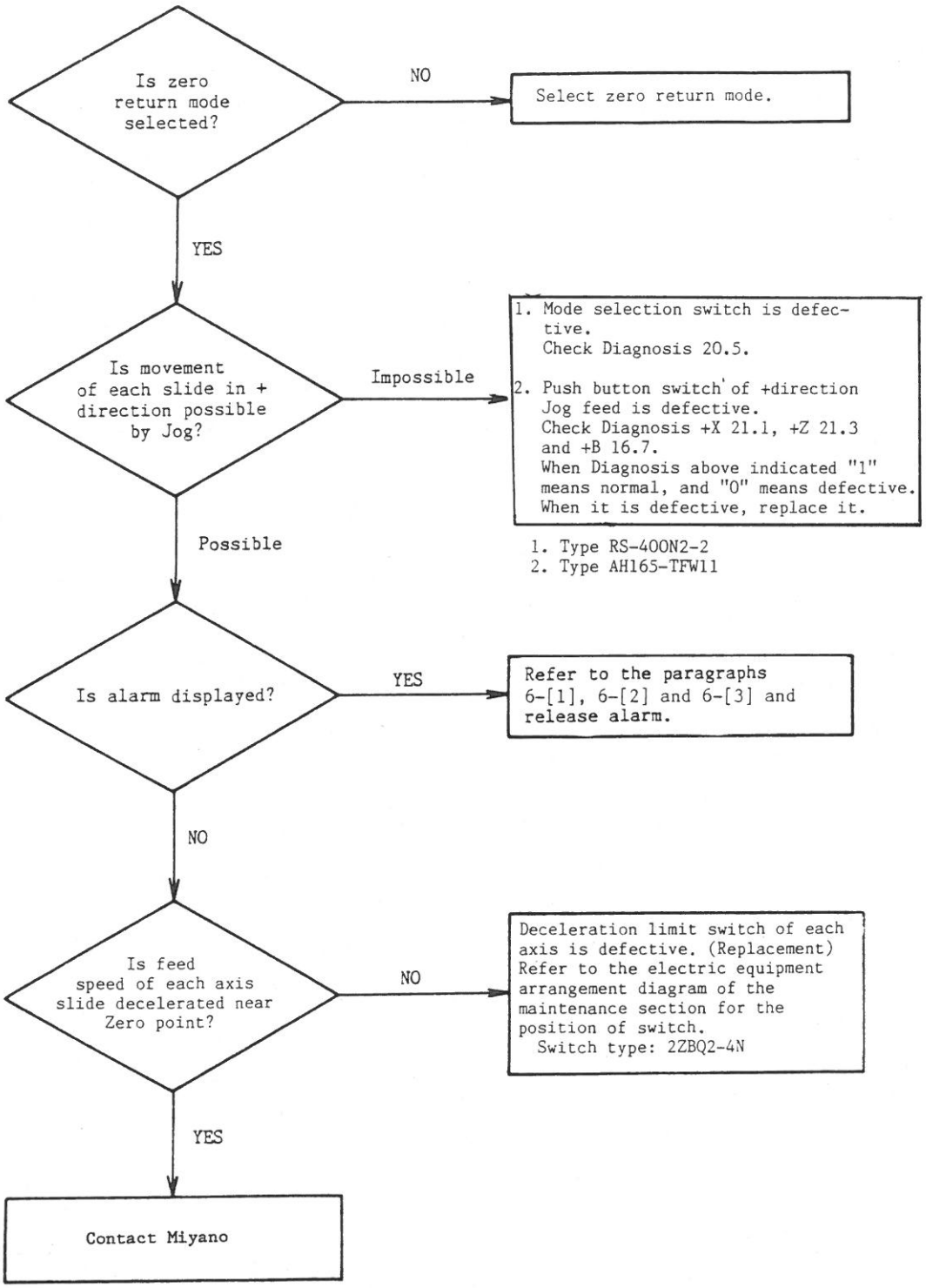
2) Machine ready lamp is not turned on (CRT screen is displayed)



3) Jog feed is impossible

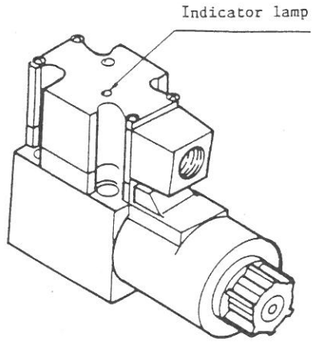


4) Zero return cannot be performed.



5) Turret indexing abnormality

a) Turret does not index.



Is machine alarm lamp turned on?

Turned ON → Refer to the paragraph Machine Alarm

Turned OFF → Unsolved

Is un-clamp SOL-24 lamp turned on?

Turned OFF → Diagnosis 51.4

0 is displayed. → Jog mode By pressing a turret indexing button, diagnosis 21.7

0 is displayed. → Turret indexing button is defective. AH165-TFW11

1 is displayed. → Contact Miyano.

1 is displayed → LED No.18 of TBP1 is displayed

ON → . TBP1 connecting board is defective.
. Connecting cable between connecting board and valve (24S-38) is defective.
. Solenoid valve is defective.

Type of solenoid valve:
LS-G02-2BP-10-N DC24V

Refer to NC box equipment arrangement diagram of maintenance section.

OFF → Printed board BRP, TBP1 or connecting cable CN61 between BRP and PBP1 is defective.

Turned ON

In case of reverse rotation, led in the parentheses is displayes.

Does turret perform unclamping ?

YES → Diagnosis 14.7.

1 is displayed → LS at clamping end is poorly adjusted or limit switch is defective.

Type of LS: PE-B4P3

0 is displayed → Contact Miyano

NO → To next page

From previous page

Is machine ready lamp turned on?

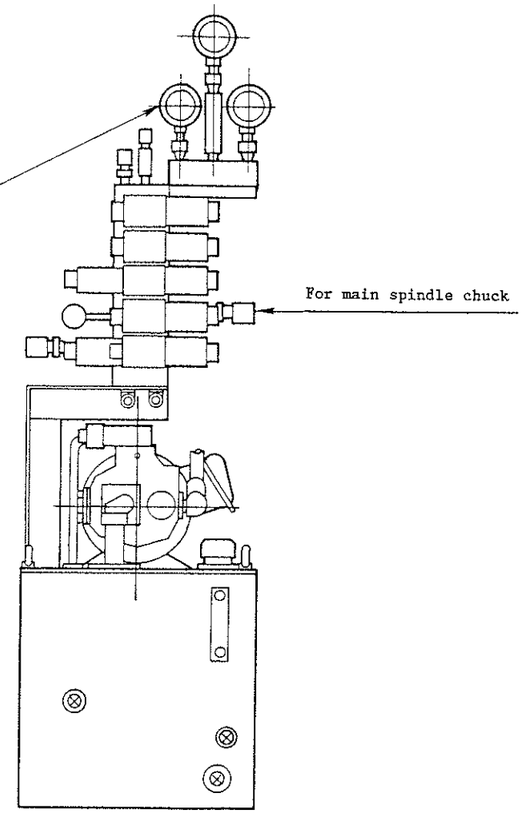
Turned off → Refer to the paragraph 6-[4]-2).

Turned on

Is main spindle chucking pressure raised? Refer to the right figure.

No raised →
1. Hydraulic oil is not enough. (Add hydraulic oil.)
2. Piping is defective.
3. Adjustment of pump pressure is not correct.
4. Adjustment of pump discharge is not correct.
5. Pump is defective.
In case of 2 through 5, contact Miyano.

Main spindle chuck pressure gauge



Raised
Refer to the paragraph for adjustment of chuck clamping force adjustment section.

Is unclamping performed by pressing the manual pin (ϕ 6) of solenoid valve ? (Refer to the right figure.)

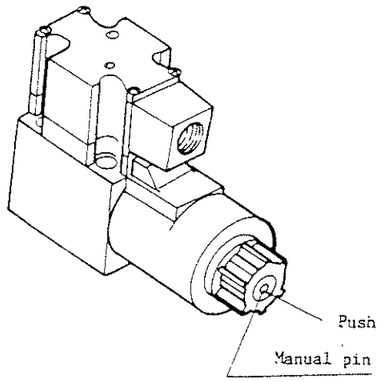
YES → Coil of solenoid valve is defective. Replace the valve.
Type number:
LS-G02-2BP-10-N
Voltage:DC24V

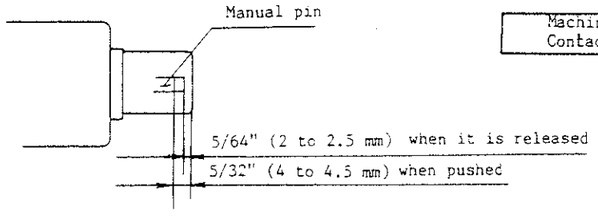
NO

Is it possible to push the manual pin of solenoid valve to the position indicator in the left figure?

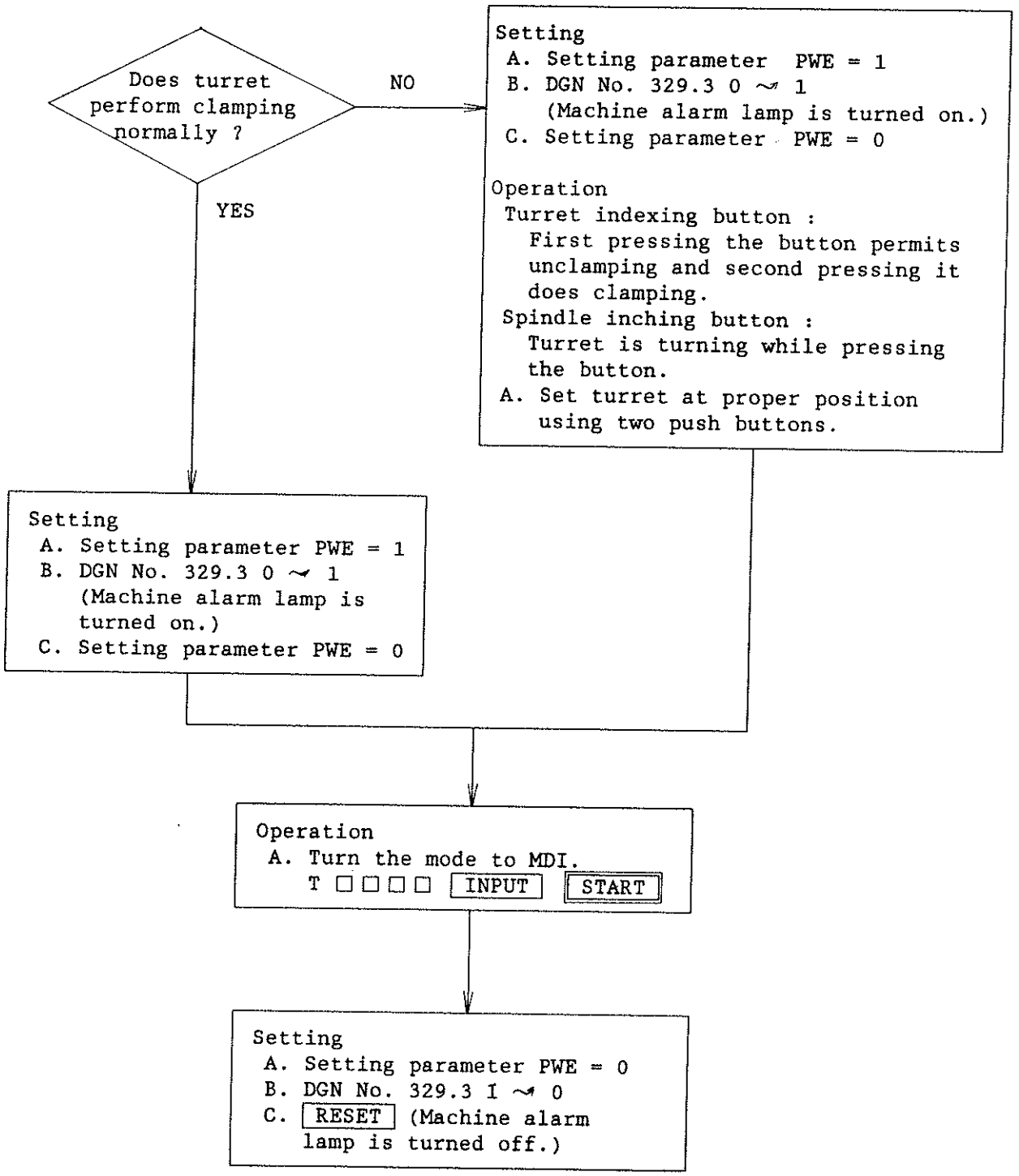
NO → A solenoid valve is defective. Replace it.
Type number:
LS-G02-2BP-10-N DC24V
In this case, since hydraulic oil is spoiled in many cases, replace hydraulic oil.

YES → Machine is abnormal. Contact Miyano.

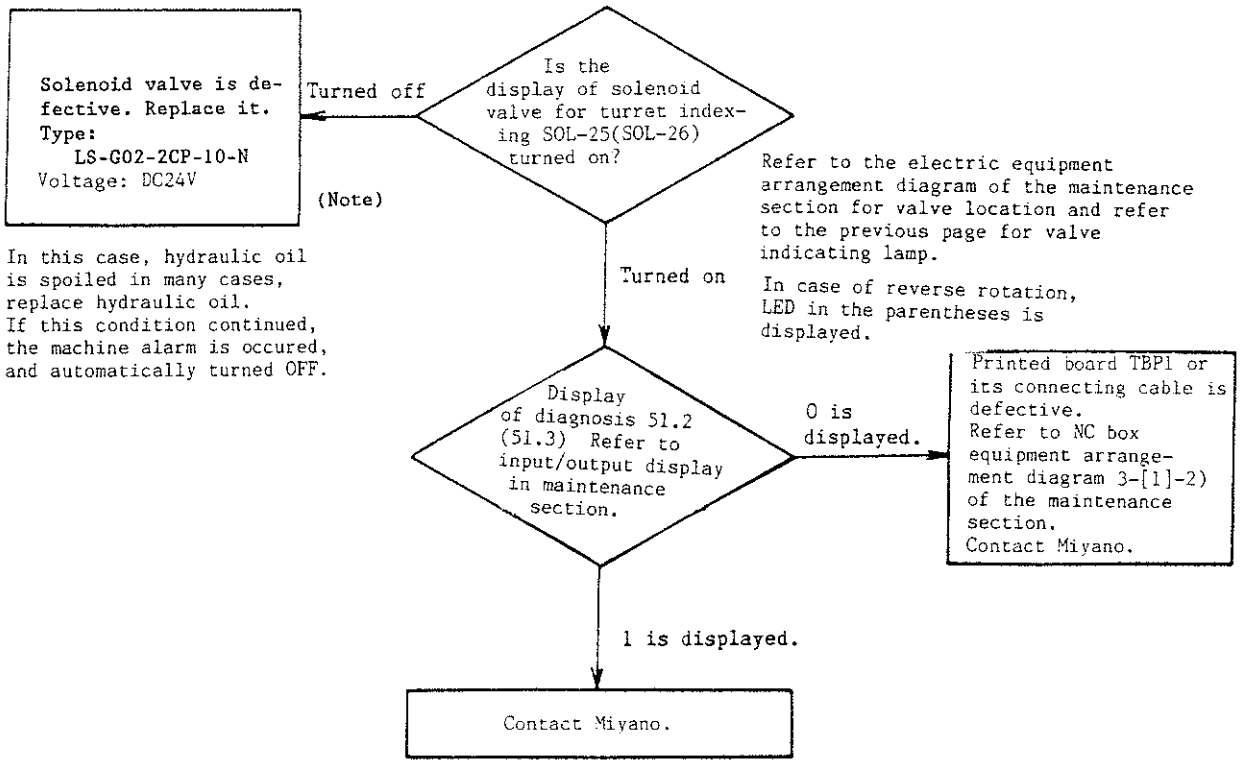




b) When turret is shifted.

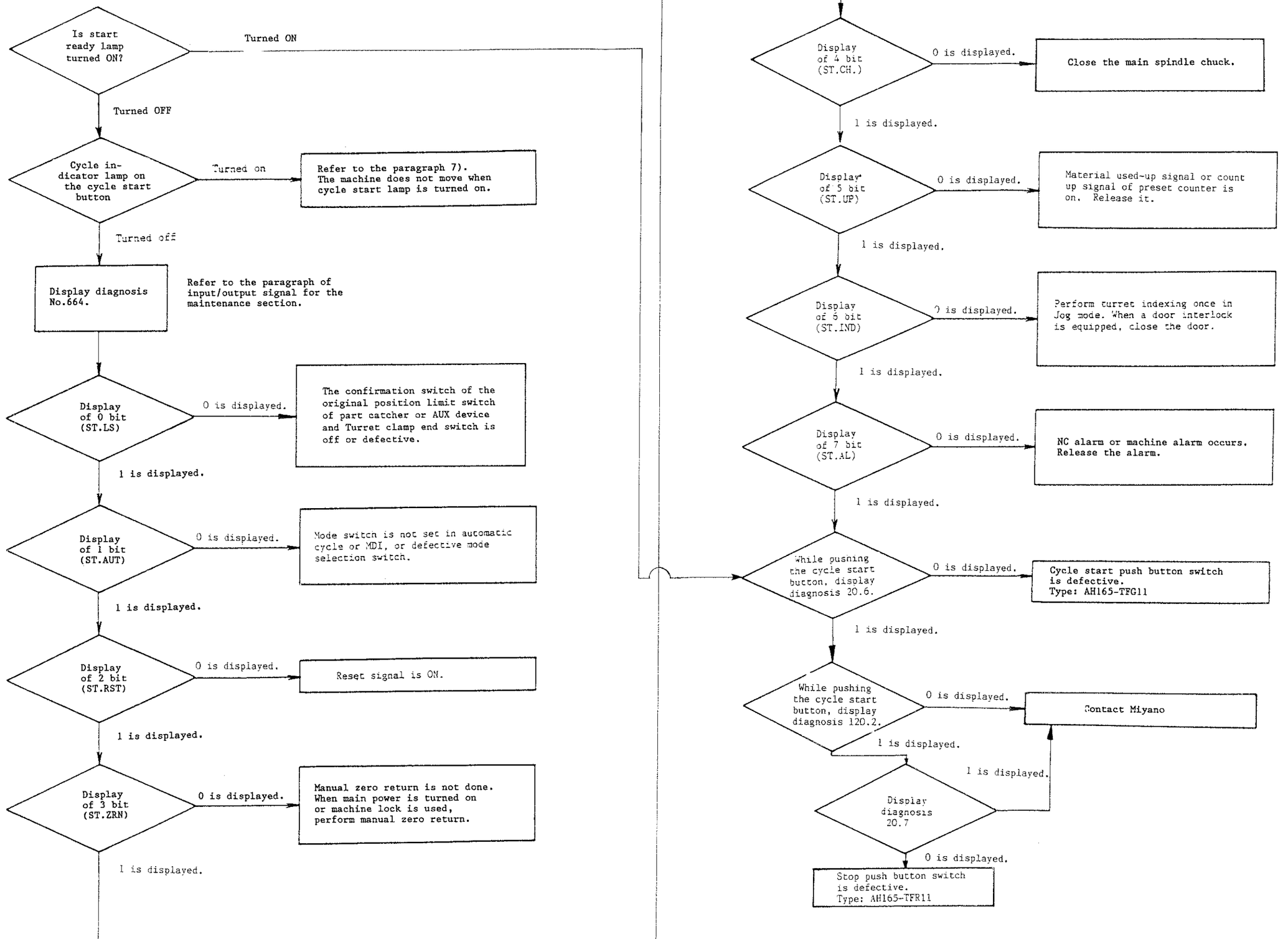


c) Indexing does not stop

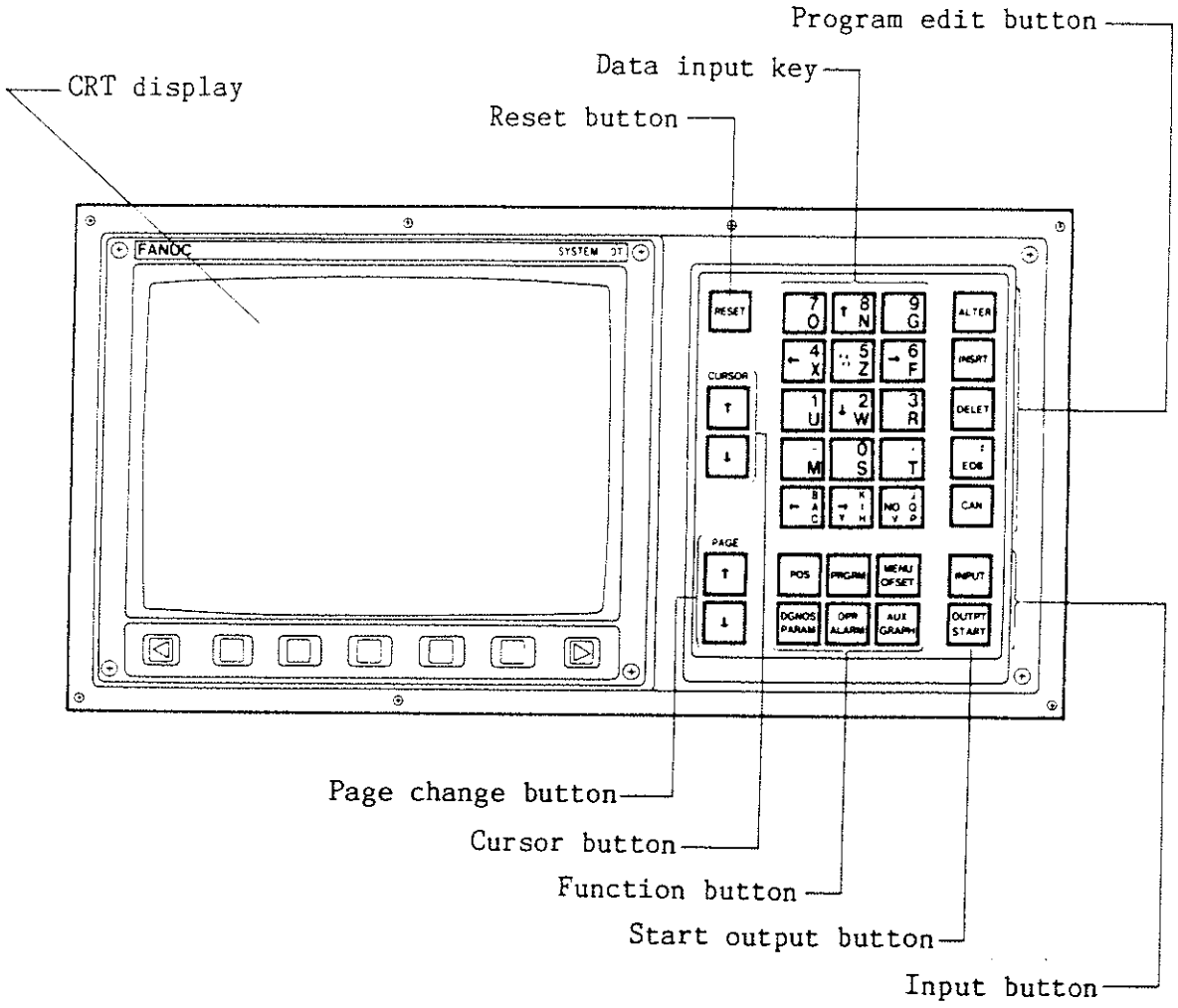


(Note) In hydraulic oil pressure ON condition, only the manual pin of solenoid valve (SOL-24) for turret unclamping is depressed, turret indexing is operated. When hydraulic oil pressure is OFF, solenoid valve SOL-25 (SOL-26) for turret indexing is defective.

6) Automatic cycle does not start even the cycle start button is pushed.



7) Cycle start indicator lamp is lit but slide does not move.



Check diagnosis No. 700, 701, and 712 on the CRT screen.
The cause can be found by the display position of "1".

Diagnosis No.	7	6	5	4	3	2	1	0
7 0 0		CSCT	CITL	COVZ	CINP	CDWL	CMTN	CFIN

When "1" is displayed, the following matter is meant.

CSCT: Waiting for the spindle speed reached signal.
CITL: Interlock is ON.
COVZ: Override setting is 0%.
CINP: In-position check is being performed.
CDWL: Dwell is being executed.
CMTN: Positioning is being executed in automatic cycle.
CFIN: M, S and T functions are being executed.

Diagnosis No.	7	6	5	4	3	2	1	0
7 0 1			CRST				CTRD	CTPU

When "1" is displayed, the following matter is meant.

CRST: A reset button of emergency stop, external reset or MDI panel is ON.

CTRD: The data is being input thru reader/puncher interface.

CTPU: The data is being output thru reader/puncher interface.

Diagnosis No.	7	6	5	4	3	2	1	0
7 1 2	STP	REST	EMS		RSTB			CSU

This is information to indicate the status of automatic operation stop and used for detection of cause when a fault occurs. When "1" is displayed, the following matter is meant.

STP: This is a signal to stop pulse distribution and used in the following case.

(a) External reset is turned ON.
(b) Emergency stop is turned ON.
(c) Feed hold is turned ON.
(d) Reset button of MDI panel is turned ON.
(e) The mode is changed to manual mode (Jog, Handle/Step).
(f) Other alarm occurs. (There is an alarm which is not effective.)

REST: External reset, emergency stop or reset button is turned ON.

EMS: Emergency stop is turned ON.

RSTB: Reset button is turned ON.

CSU: Emergency stop is turned ON or servo alarm occurs.

8) Main spindle chuck can not be opened.

Indicator lamp of main spindle chuck solenoid valve (Refer to the right figure.)

Turned off → Confirm that a machine lock switch is made OFF.

Turned on → Machine ready lamp is turned on.

Turned off → Refer to 6-[4]-2).

Turned on → Is main spindle chuck hydraulic pressure raised? (Refer to the right figure below.)

Not raised →
1. Hydraulic oil is not enough. (Add hydraulic oil.)
2. Piping is defective.
3. Adjustment of pump discnarge is not correct.
4. Adjustment of pump pressure is not correct.
5. A pump is defective.
In case of 2 through 5, contact Miyano.

or

Pressure reducing valve for main spindle chuck is defective.
(Replacement)
Type No.: MGB-02P-03-50-GT-30

Raised → Refer to the paragraph of adjustment of chuck clamping force and adjustment.

Does chuck open by pushing the manual pin of solenoid valve for main spindle chuck? (Refer to the right figure below.)

Opened →
A solenoid valve is defective. Replace it.
Valve type No.:
LS-G02-2BP-10-N DC24V

Not opened → To next page

OFF → Display of diagnosis 52.5. Refer to input/output signal display of the maintenance section.

1 is displayed. → Is display of LED No.1 of printed board TBP1 turned on?

ON →
1. TBP1 connecting board is defective.
2. Connecting cable between connection board and valve (24S to 22) is defective.
3. Solenoid valve is defective.

3. Type: LS-G02-2BP-10-N

OFF → Printed board BRP, TBP1 or connecting cable between BRP and PBP1 is defective.

0 is displayed. → Is it possible to close and open by JOG mode?

YES → PC parameter P.CHJG(D318.5) shows 1. Refer to the PC parameter table.

NO → Is main spindle rotating?

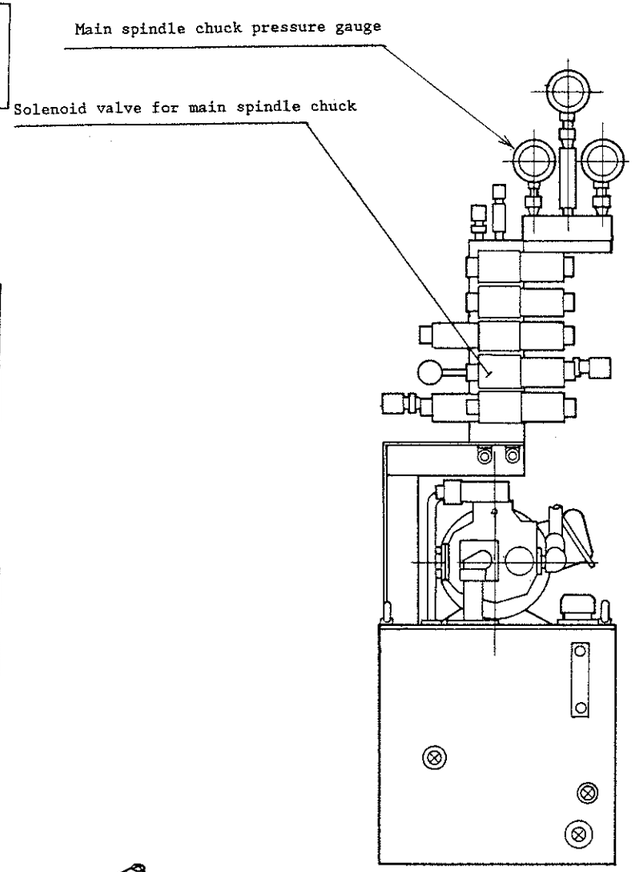
Rotating → Stop the main spindle.

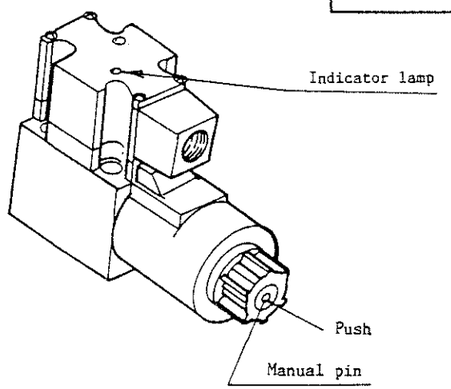
Stop → Display of diagnosis 0.0. Refer to input/output signal display of the maintenance section.

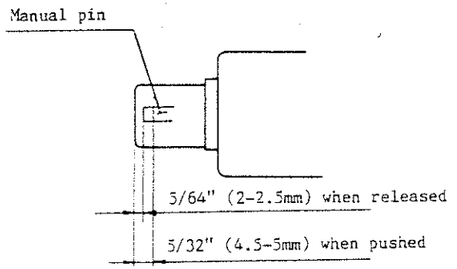
0 is displayed. → Main spindle zero speed signal of invertor is defective. (Contact Miyano.)

1 is displayed. → Main spindle chuck open switch is defective. (Replacement)

Switch type: AH30-H210







From previous page

Close the main spindle chuck. Indicator lamp of solenoid valve for main spindle chuck is turned off.

Is manual pin of solenoid valve for main spindle chuck moved when pushed to the position of upper left figure?

NO

Solenoid valve is defective. Replace it.
Valve type number
LS-G02-2BP-10-N
DC 24V

YES

Open the chuck of main spindle.
Indicator lamp of solenoid valve for main spindle chuck is turned on.
Remove oil guard and chuck cap. Close the main spindle chuck again.

Refer to the paragraph of main spindle chuck system of operation and adjustment section for removing of oil guard and chuck cap.

Is chuck sleeve located correct position ? Refer to the paragraph of main spindle chuck system of operation and adjustment section.

NO

Installation of chuck sleeve is not correct.

YES

Is there cutting chip inside of chuck?

YES

Clean inside of the chuck.

NO

Does chuck sleeve move when chuck of main spindle is closed or opened ?

Move

1. Incorrect size of chuck is used. Replace the chuck.
2. Chuck or chuck sleeve is worn or defective. Replace them.

Does not move

Close the chuck of main spindle.

Is it possible to remove the chuck sleeve? (Chuck sleeve has right hand screw.)

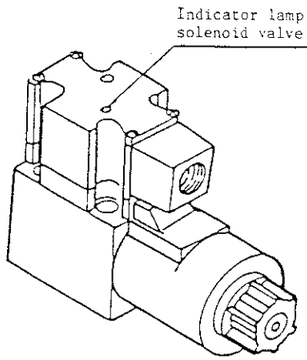
YES

Hydraulic rotary cylinder for main spindle is defective.

NO

Machine is abnormal. Contact Miyano.

9) Main spindle chuck can not be closed.



Is the indicator lamp of solenoid valve for main spindle chuck turned on?

Turned on

Display of diagnosis 52.5. Refer to input/output signal display of the maintenance section.

0 is displayed.

Printed board TBP1, BRP or its connecting cable is defective. Refer to NC box equipment arrangement diagram 3-[1]-2) of the maintenance section. Contact Miyano.

Turned off

1 is displayed.

Is machine ready lamp turned on?

Turned off

Refer to 6-[4]-2

Is it possible to open and close by by JOG mode.

YES

Is automatic bar feeder equipped?

NO

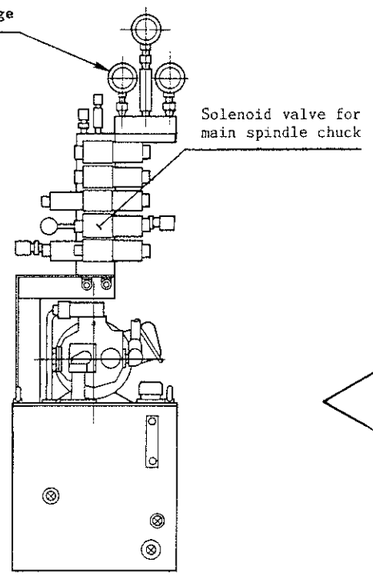
YES

Material feed out signal is not transmitted from automatic bar feeder. Consult with the bar feed maker. Confirm by the diagnosis 2.6

Contact Miyano

Turned on

Main spindle chuck pressure gauge



Is main spindle chuck hydraulic pressure raised? (Refer to the right figure.)

Not raised

1. Hydraulic oil is not enough. (Add hydraulic oil.)
2. Piping is defective.
3. Adjustment of pump pressure is not correct.
4. Adjustment of pump discharge is not correct.
5. A pump is defective. In case of 2 through 5, contact Miyano.

Or

Reducing valve for main spindle chuck is defective. Replace it.

Type No.: MGB-02P-03-50-GT-30

Raised

Refer to the paragraph of adjustment of chuck clamping force for adjustment.

Display of diagnosis 8.6 by chuck switch lever being closed.

1 is displayed.

Chuck close or open switch of main spindle is defective. Replace it.

Switch type: AH30-H210

0 is displayed.

Contact Miyano

Is manual pin of solenoid valve for main spindle chuck returned to the position of the right figure when pushed?

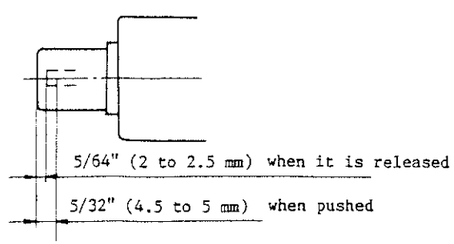
Not returned

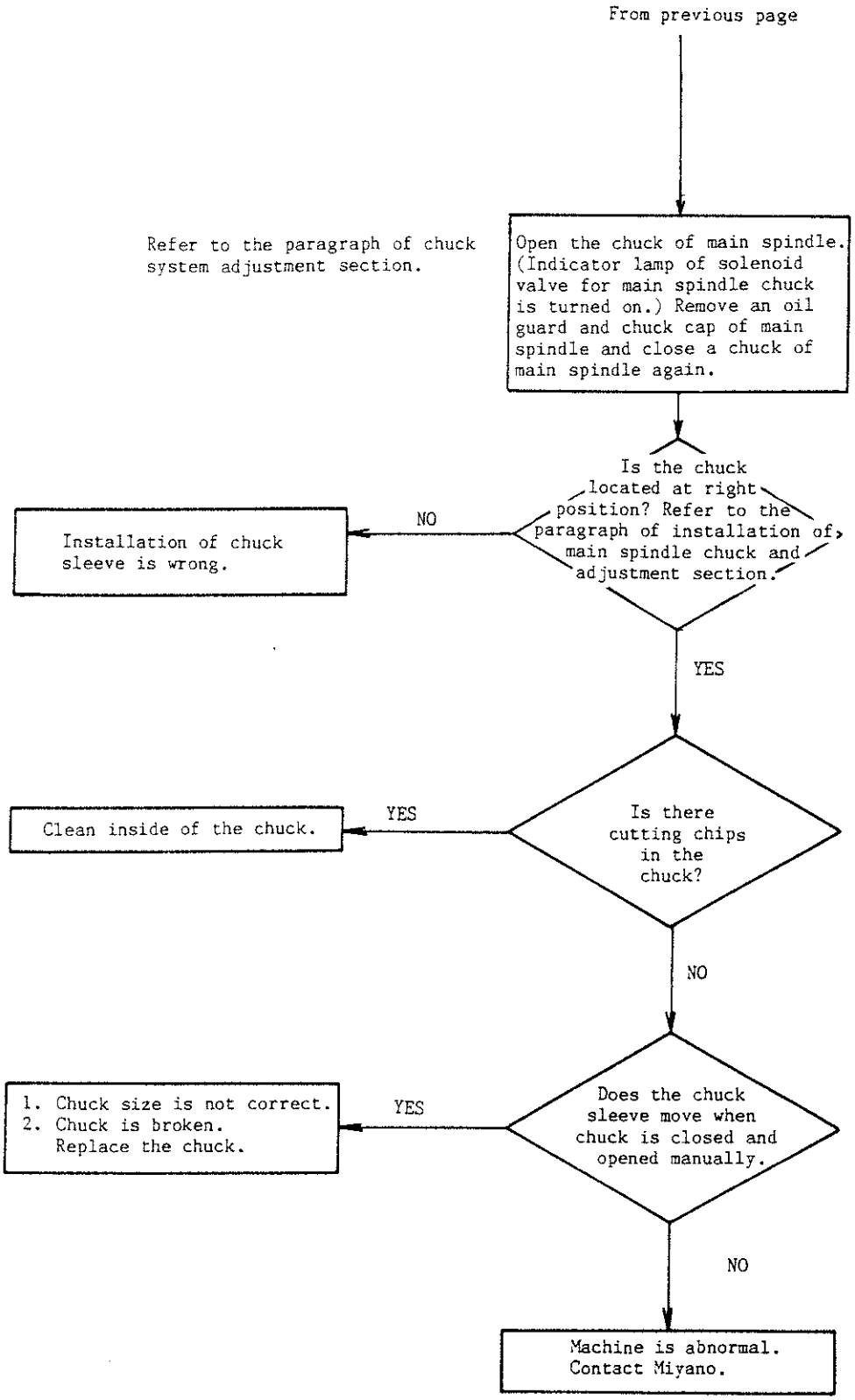
Solenoid valve is defective. Replace it.

Type No.:
LS-G02-2BP-10-N DC24V

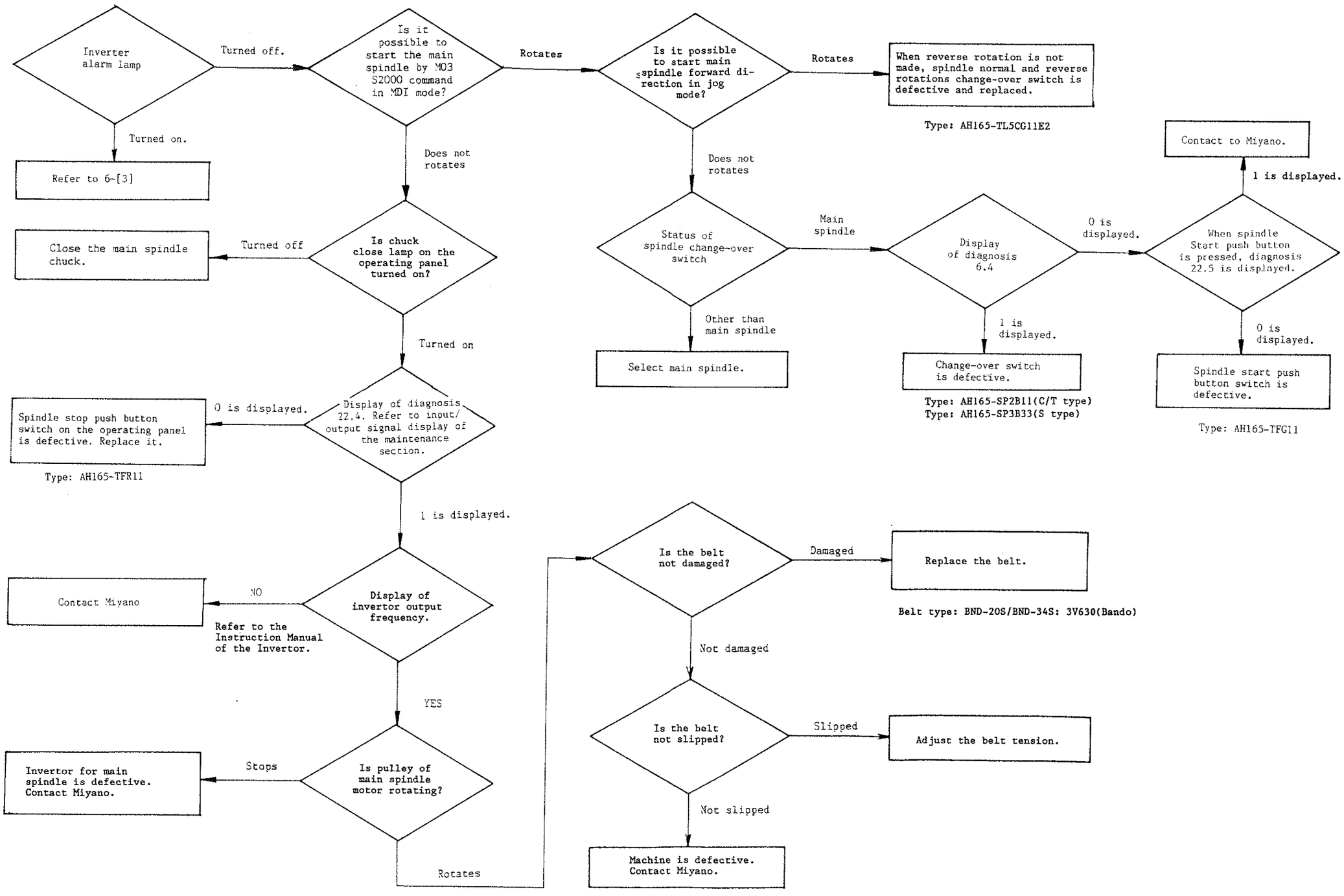
Returned

To next page




From previous page
Refer to the paragraph of chuck system adjustment section.
Open the chuck of main spindle. (Indicator lamp of solenoid valve for main spindle chuck is turned on.) Remove an oil guard and chuck cap of main spindle and close a chuck of main spindle again.
Is the chuck located at right position? Refer to the paragraph of installation of main spindle chuck and adjustment section.
NO
Installation of chuck sleeve is wrong.
YES
Is there cutting chips in the chuck?
YES
Clean inside of the chuck.
NO
Does the chuck sleeve move when chuck is closed and opened manually.
YES
1. Chuck size is not correct.
2. Chuck is broken.
Replace the chuck.
NO
Machine is abnormal.
Contact Miyano.

10) Main spindle can not rotate



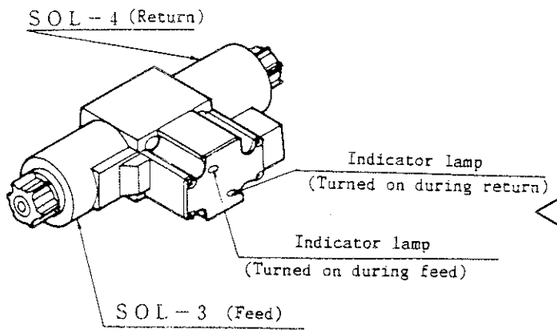
11) MS tube type outside bar feeding abnormality

a) Does not feed.

Is the chuck of main spindle opened?

Closed → Refer to the paragraph 6-[4]-8)

Opened



Indicator lamp of solenoid valve for bar feed (Indicating lamp of SOL-3 feed)

Turned off → Display of diagnosis 53.0. Refer to input/output signal display of the maintenance section.

1 is displayed. → Is display of LED No.1 of printed board TBP1 turned on?

Refer to NC box equipment arrangement diagram of the maintenance section.

Turned ON →
1. TBP1 connecting board is defective.
2. Connecting cable between connecting board and valve(24S to 23) is defective.
3. Solenoid valve is defective.

Turned OFF → Printed board TBP1, BRP or its connecting cable between BRP and TBP1 is defective.

0 is displayed → Is bar materials can be feed by change-over switch in Jog mode?

Possible → Contact to Miyano.

Impossible → Display of diagnosis 6.2 by feeding of change-over switch

1 is displayed. → Contact to Miyano.

0 is displayed → Selector switch for bar feeding is defective. Replace it.

Type: AH30-P1B40

Turned on → Machine ready lamp is turned on.

Turned OFF → Refer to the paragraph 6-[4]-2)

Turned on → Is main spindle chuck pressure raised set-up pressure? (Refer to the right figure.)

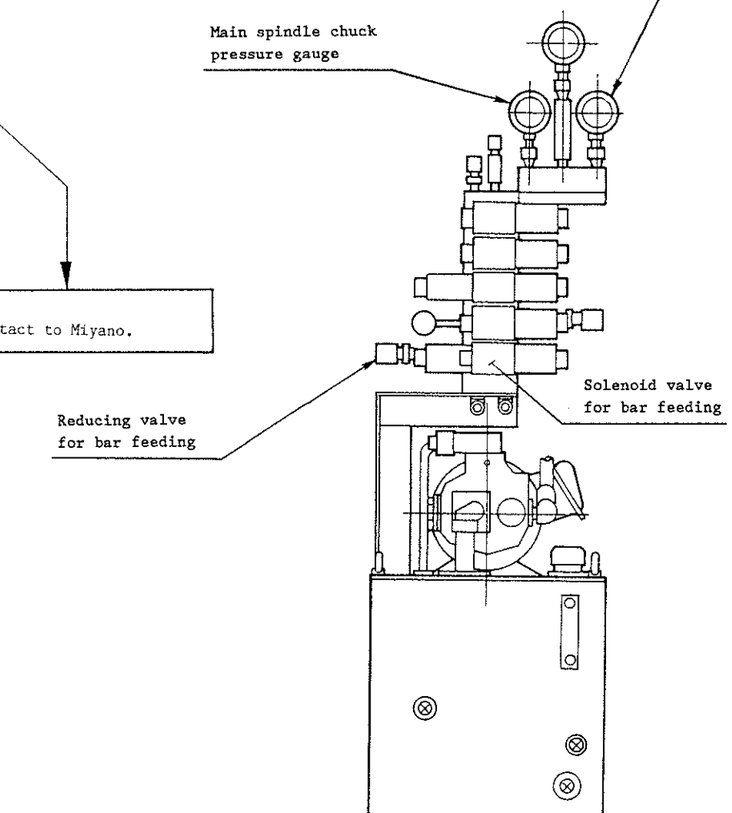
Not raised →
1. Hydraulic oil is not enough. (Add hydraulic oil.)
2. Adjustment of pump discharge pressure is defective.
3. Adjustment of pump discharge is defective.
4. Piping is defective.
5. The pump is defective. In case of 2 through 5, contact Miyano.

Raised → Is bar feeding pressure raised to specified valve? (Refer to the right figure.)

Not raised. →
1. Bar feeding pressure setting is not correct.
2. Reducing valve for bar feeding is defective. Replace it.
Type No.: MG-02P-03-50-PT-32

Raised → To next page

Bar feeding pressure gauge



From previous page

Is feed started when manual pin of solenoid valve SOL-3 for bar feeding (figure below) is pushed?

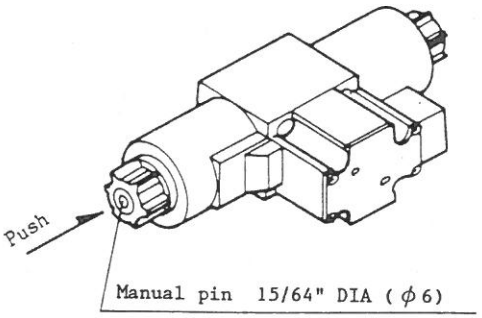
Feeds → A coil of solenoid valve is defective.
Replace the solenoid valve.
Type: LS-G02-9CP-10-N DC24V

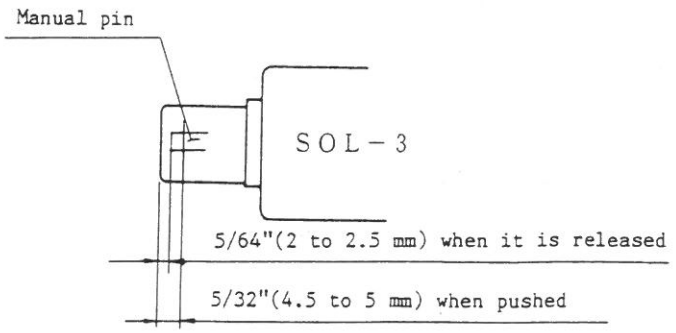
Does not feed

Is it possible to push the manual pin of solenoid valve SOL-3 for bar feeding to the posittion of figure below?

NO → A solenoid valve is defective.
Replace the solenoid valve.
Type : LS-G02-9CP-10-N DC24V

YES → Machine is abnormal.
Contact Miyano.



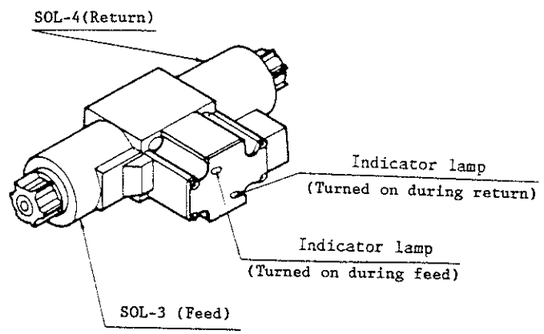


b) Does not retract.

Is the chuck of main spindle opened?

Closed → Refer to the paragraph 6-[4]-8)

Opened



Indicator lamp of solenoid valve for bar feed (Indicating lamp of SOL-4 return)

Turned off → Display of diagnosis 53.1. Refer to input/output signal display of the maintenance section.

1 is displayed. → Display of LED No.4 of TBP1 of printed board

Refer to NC box equipment arrangement diagram of the maintenance section.

Turned ON → 1. TBP1 connecting board is defective.
2. Connecting cable between connecting board and valve(24S to 24) is defective.
3. Solenoid valve is defective.

3. Type: LS-G02-9CP-10-N DC24V

Turned OFF → Printed board TBP1, BRP or its connecting cable between BRP and TBP1 is defective.

Turned on

Machine ready lamp is turned on.

Turned OFF → Refer to the paragraph 6-[4]-2)

Turned on

Is main spindle chuck pressure raised setup pressure? (Refer to the right figure.)

Not raised → 1. Hydraulic oil is not enough. (Add hydraulic oil.)
2. Adjustment of pump discharge pressure is not correct.
3. Adjustment of pump discharge is not correct.
4. Piping is defective.
5. A pump is defective.
In case of 2 through 5, contact Miyano.

Raised

Is bar feeding pressure raised to specified value? (Refer to the right figure.)

Not raised. → 1. Setting of bar feeding pressure is not correct.
2. Reducing valve for bar feeding is defective. Replace it.

Type No.: MG-02P-03-50-PT-32

Raised

To next page

0 is displayed

Is bar materials can be feed by change-over switch in JOG mode?

Possible → Contact Miyano.

Impossible

Display of diagnosis 6.3 by setting change-over switch "Retract"

1 is displayed. → Display of diagnosis 14.6

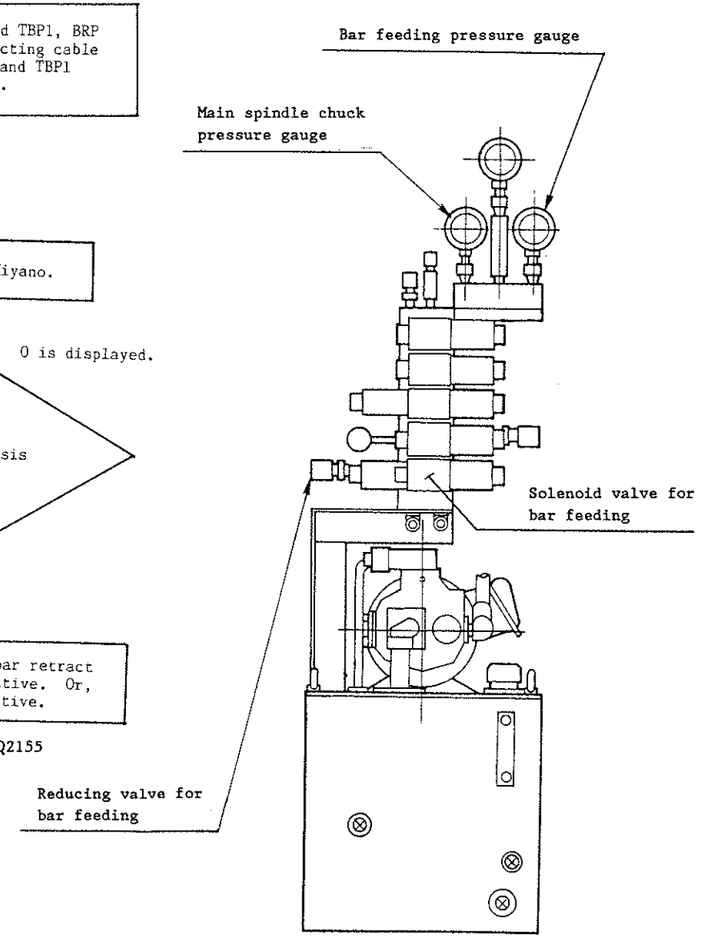
0 is displayed. → Contact Miyano.

0 is displayed. → Selector switch for bar feeding is defective. Replace it.

Type: AH30-P1B40

1 is displayed. → Adjustment of bar retract end LS is defective. Or, switch is defective.

Type: SHL-Q2155



From previous page

Is retract started when manual pin of solenoid valve SOL-4 for bar feeding(figure below) is pushed?

Retract

A coil of solenoid valve is defective.
Replace the solenoid valve.
Type: LS-G02-9CP-10-N DC24V

Does not retract

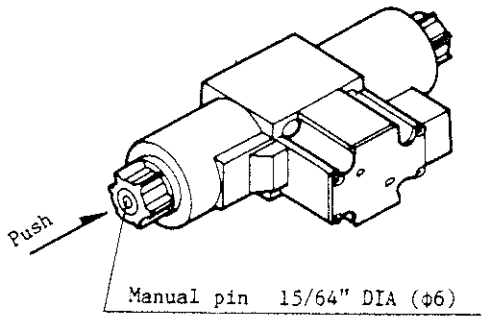
Is it possible to push the manual pin of solenoid valve SOL-4 for bar feeding to the position of figure below?

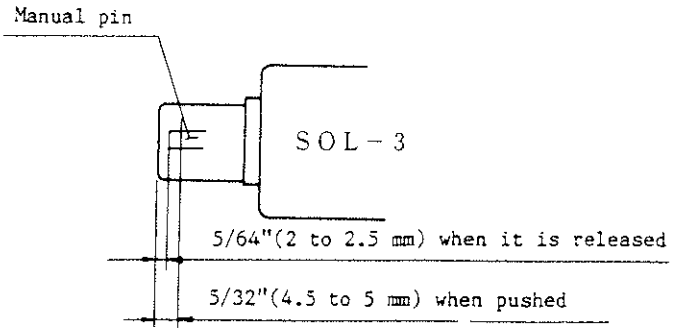
NO

Solenoid valve is defective.
Replace the solenoid valve.
Type: LS-G02-9CP-10-N DC24V

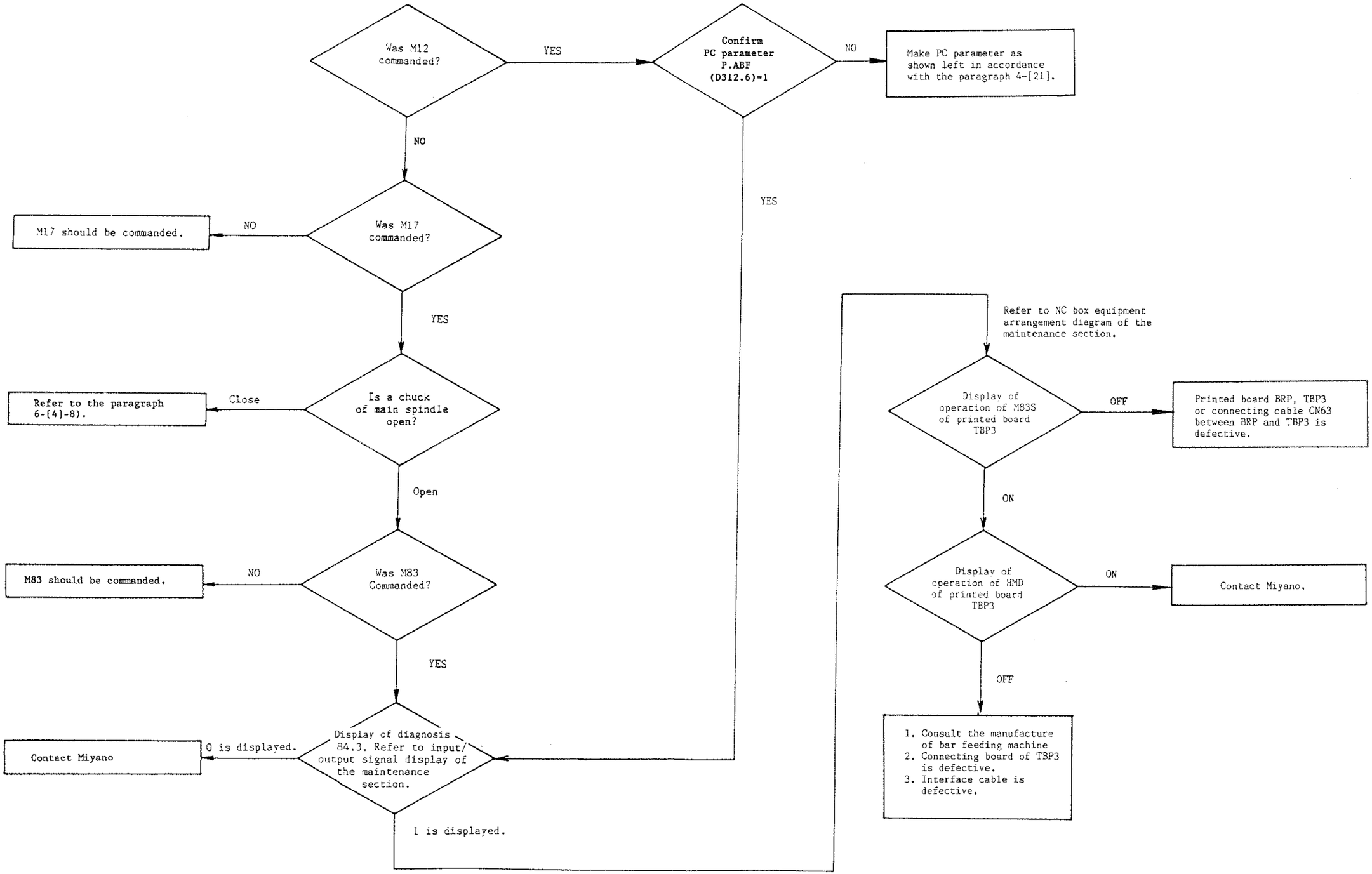
YES

Machine is abnormal.
Contact Miyano.

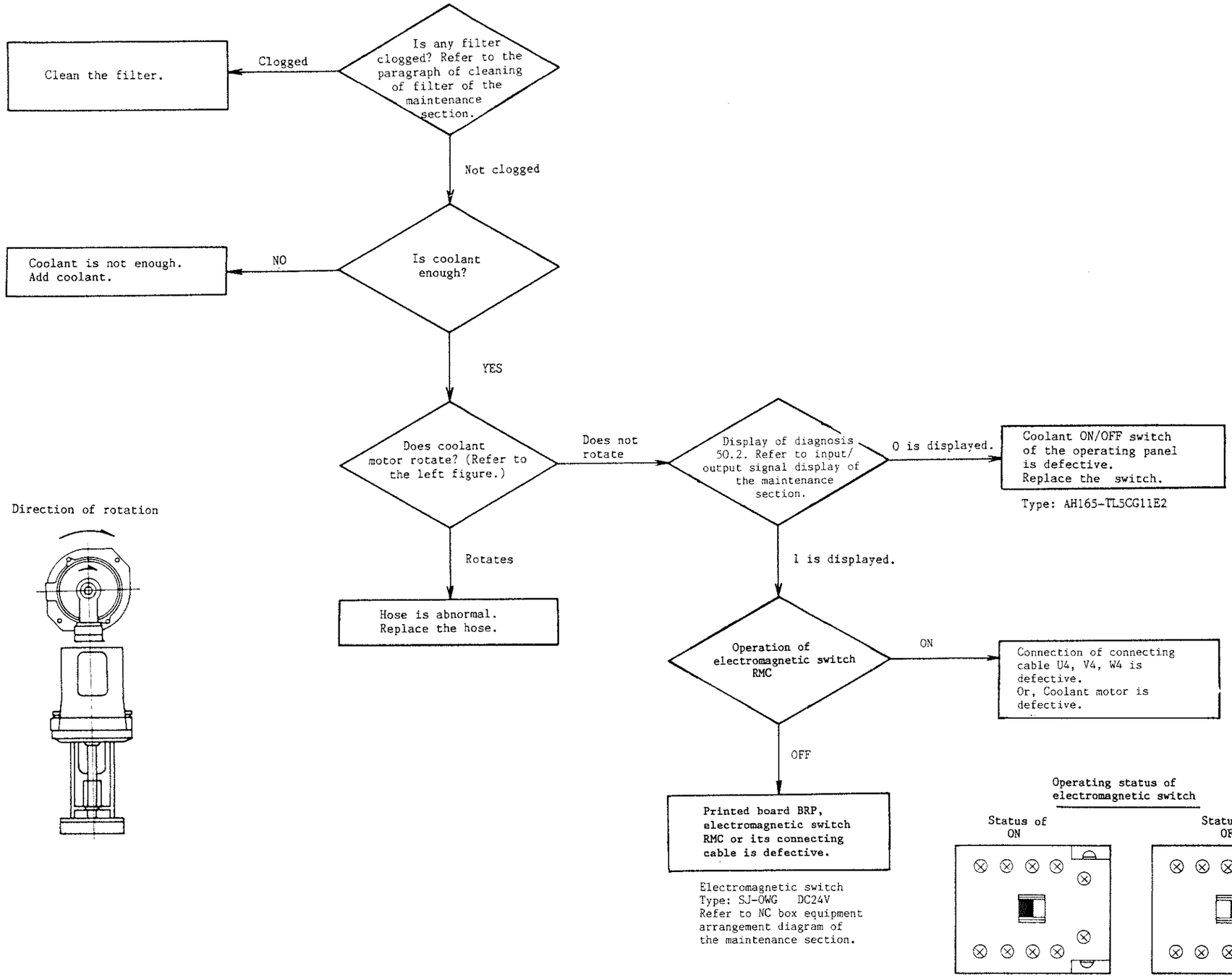




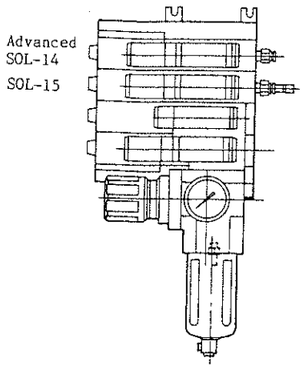
12) The automatic magazine loaded bar feeder does not feed.



13) Coolant does not run.



14) Parts catcher does not move



Parts catcher does not move forward.

Command of M35

NO → Command M35.

YES

Is M35 commanded to NC?

NO → Display of diagnosis 12.6

1 is displayed. → Contact Miyano

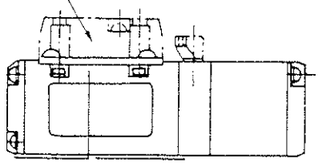
0 is displayed.

. Cylinder is not retracted completely.
. Adjustment of original position switch is defective.
. Switch is defective.

Switch type: D-K79CN

YES

Lamp with surge voltage protection



Indicator lamp of Solenoid valve SOL-14

Turned off → Display of diagnosis 53.2

0 is displayed. → Contact Miyano

1 is displayed

Refer to NC box equipment arrangement diagram of the maintenance section.

Turned on

Is it air leaking from pipe?

YES → Piping is defective.

NO

Solenoid valve is defective. Replace it.
Type: VFS2100-5FZ
DC24V

or

1. There is an obstacle in the pipe. Remove the obstacle.
2. Air cylinder is defective. Replace it.

Display of LED No.14 of printed board TBP1

Turned on

. TBP1 connecting board is defective.
. Connecting cable between connection board and valve (24S to 34) is defective.
. Solenoid valve is defective.

Type of Solenoid valve:
VFS2100-5FZ
DC24V

Turned off

Printed board BRP,TBP1 or connecting cable CN61 between BRP and TBP1 is defective.

Parts catcher Does not move retract.

Command of M36

NO → Command of M36

YES

Is M36 commanded to NC?

NO → Display of diagnosis 12.6

0 is displayed. → Contact Miyano

1 is displayed

. Adjustment of original position is defective.
. Switch is defective.

YES

Turned on

Indicator lamp of solenoid valve SOL-14

Turned off

Is it air leaking from pipe?

YES → Piping is defective.

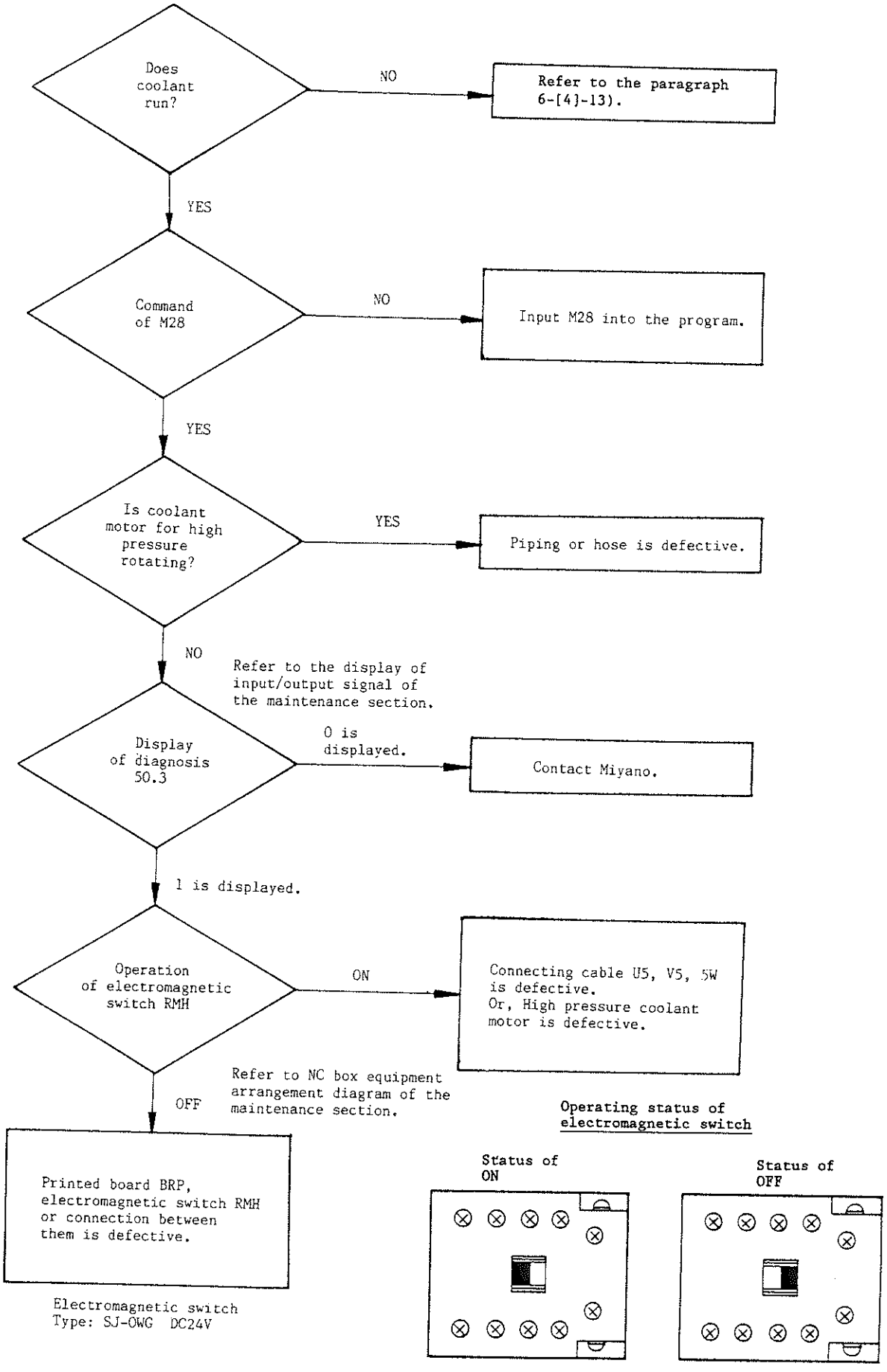
NO

Solenoid valve is defective. Replace it.
Type: VFS2100-5FZ
DC24V

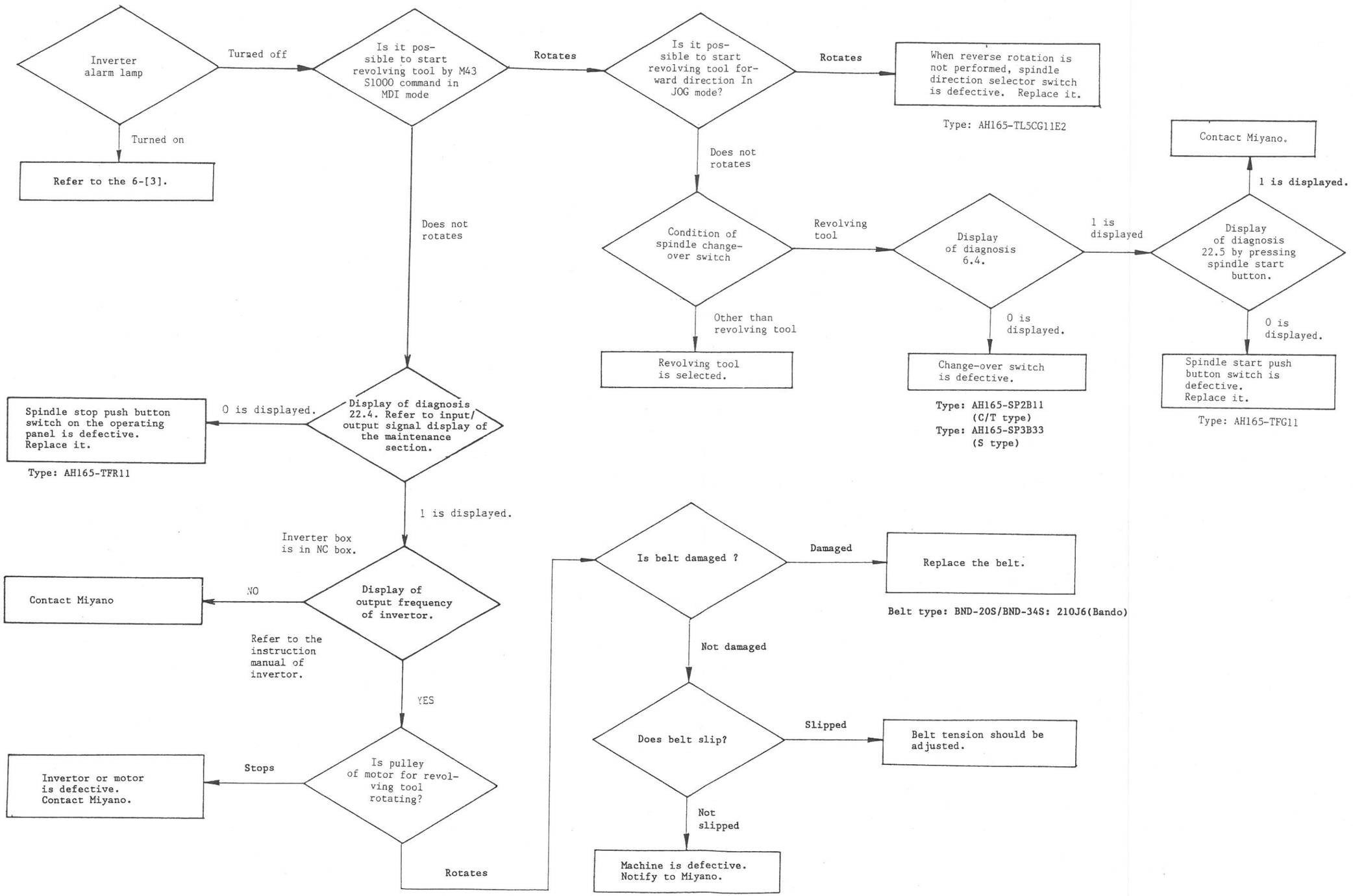
or

1. There is an obstacle in the pipe. Remove the obstacle.
2. Air cylinder is defective. Replace it.

15) High pressure coolant for main turret does not run

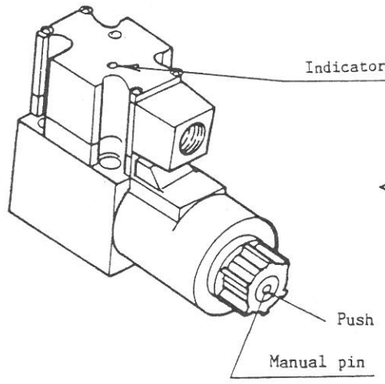


16) Revolving tool does not rotate



17) Main spindle positioning abnormality

a) Lock pin cannot be pushed in



Is machine alarm lamp turned on?

Turned on → Refer to the paragraph alarm.

Turned off / Unsolved

Is indicator lamp of solenoid valve SOL-12 turned on?

Turned off → Display of diagnosis 84.0

1 is displayed. → Is Display of LED No.12 of printed board TBP1 turned on?

Turned on → Refer to NC box equipment arrangement diagram in maintenance section.

- Connection of connecting board of TBP1 is defective.
- Connecting cable between connecting board and valve (24S to 32) is defective.
- Solenoid valve is defective.

Soleniod valve
Type: LS-G02-2BP-10-N
DC24V

Turned off → Printed board BRP, TBP1 or connecting cable between BRP and TBP1 CN61 is defective.

Turned on

Is machine ready lamp turned on?

Turned off → Refer to the paragraph 6-[4]-2).

Turned on

Is hydraulic pressure of main spindle chuck raised?

Not raised →
1. Hydraulic oil is not enough. (Add oil.)
2. Piping is incorrect.
3. Adjustment of pump pressure is incorrect.
4. Adjustment of pump discharge is incorrect.
5. Pump is defective.
In case of 2 to 5, contact Miyano.

Raised → Refer to the paragraph of chuck, gripping force of operation and adjustment section.

Is it possible to operate by pressing manual pin (ϕ6) of solenoid valve?

YES → **Coil of solenoid valve is defective. Replace the valve.**

Type: LS-G02-2BP-10-N DC24V

NO

Is it possible to push the manual pin of solenoid valve to the position indicator in the right figure?

NO → **Solenoid valve is defective. Replace it. Type: LS-G02-2BP-10-N DC24V**

In this case, hydraulic oil often became dirty. Replace the oil.

YES → Contact Miyano

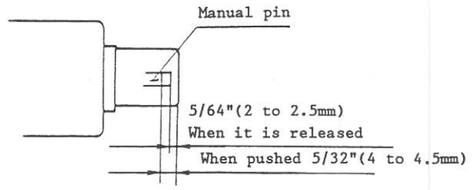
0 is displayed.

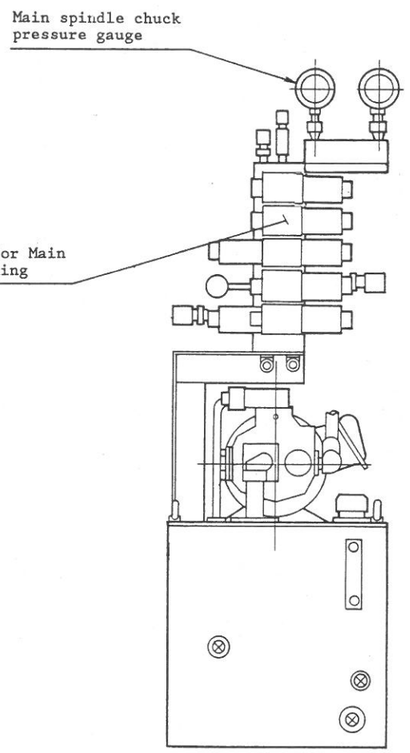
Display of PC parameter P.MPIN(D310.5)

0 is displayed. → Make P.MPIN(D310.5) "1".

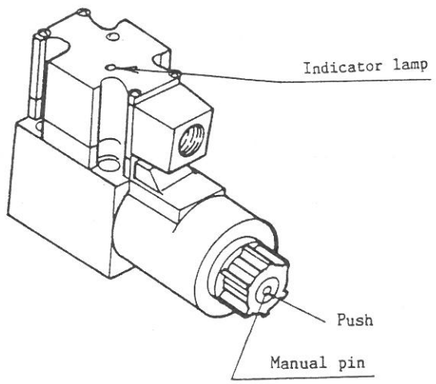
1 is displayed → After confirming the display of diagnosis 18.5, contact Miyano.

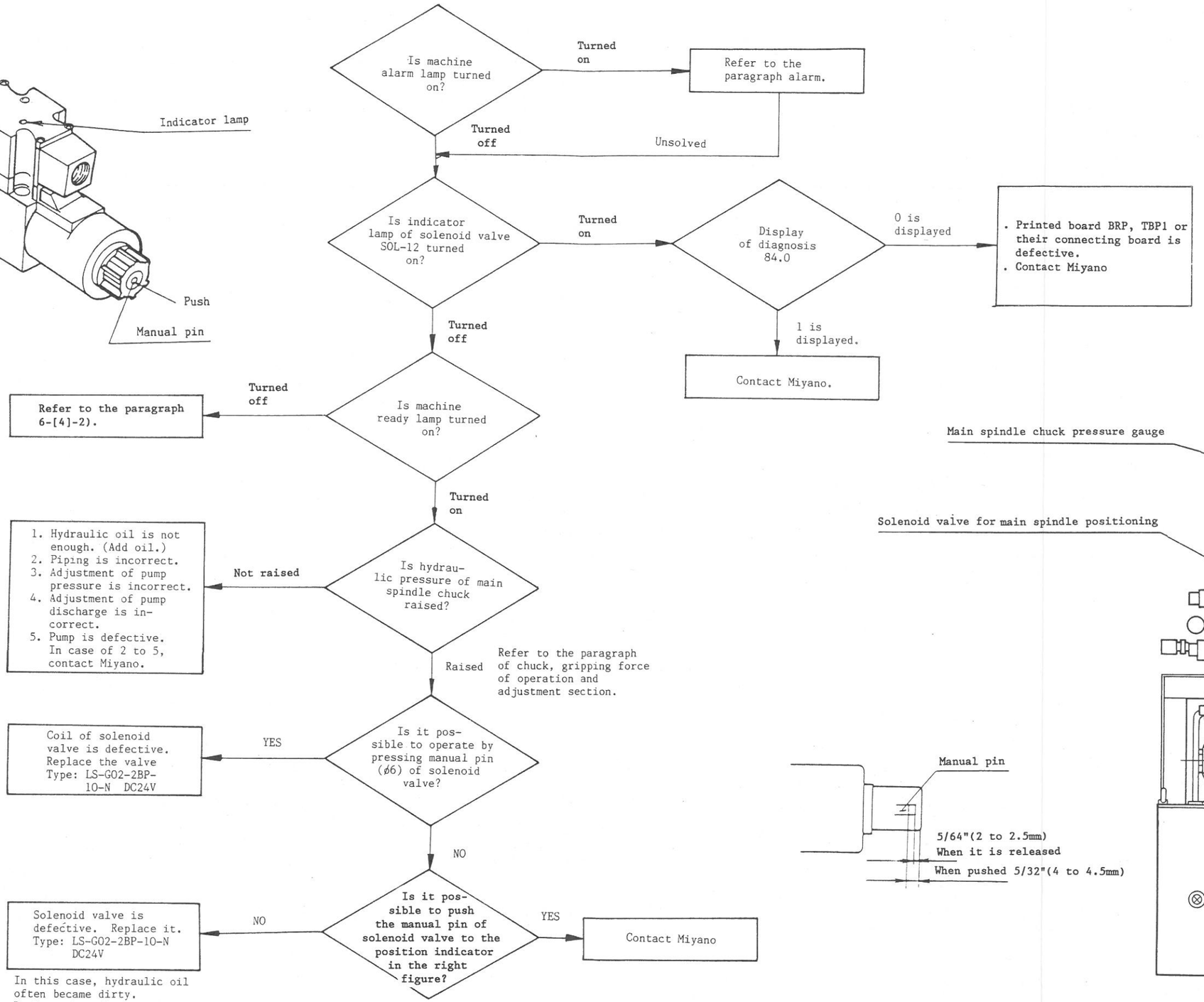
DGN18.5 is the signal of orientation completion.

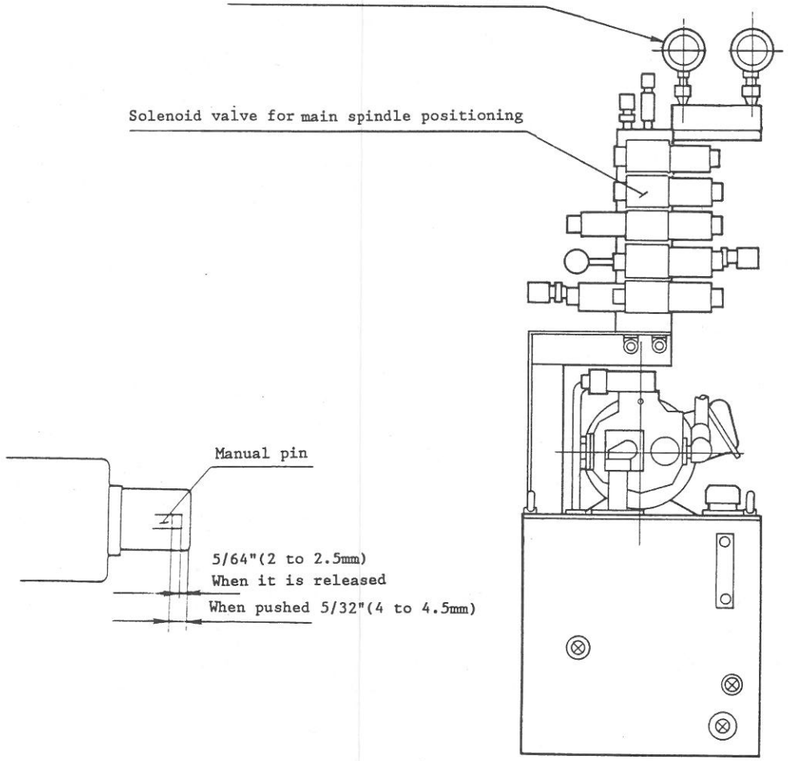




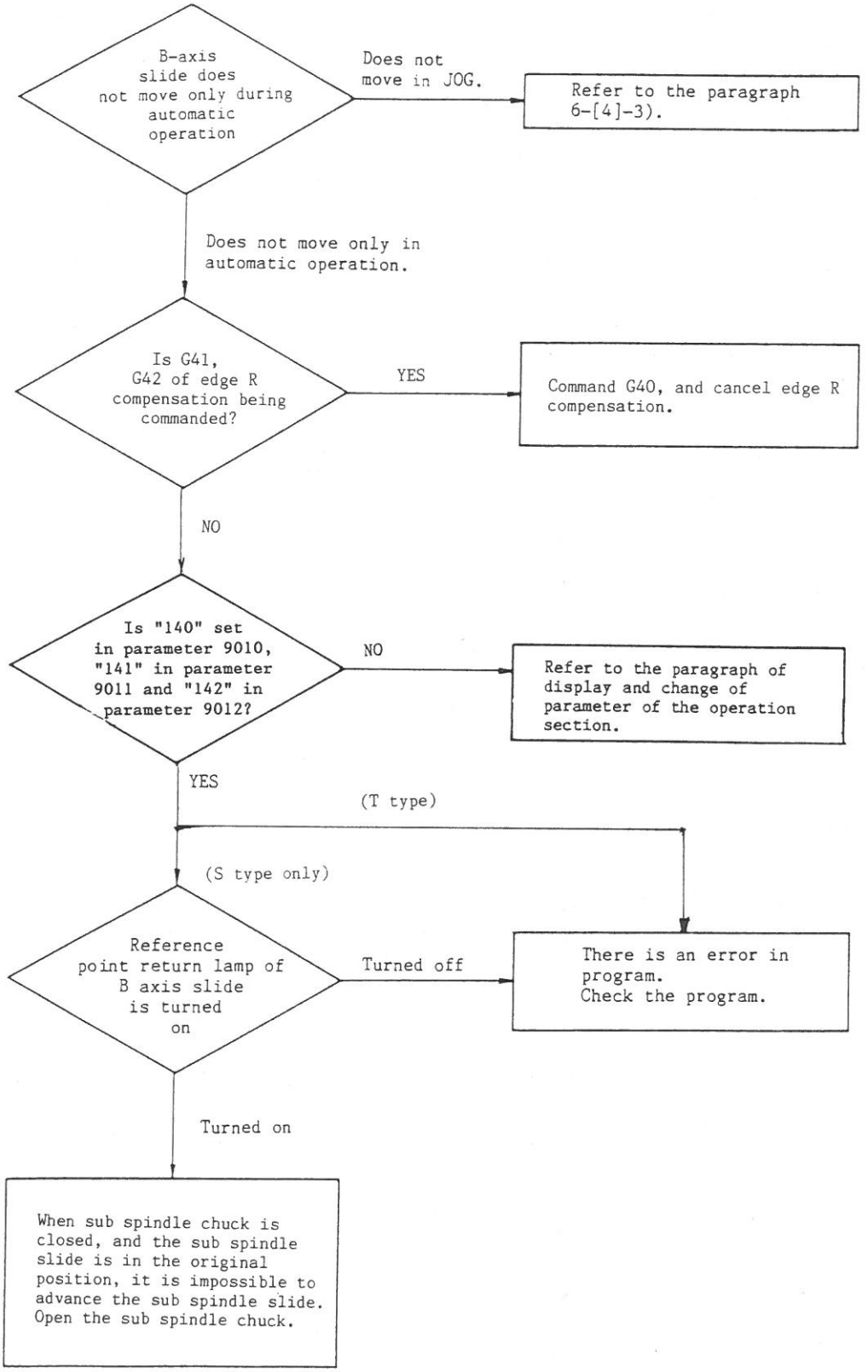
b) Lock pin cannot be pulled out



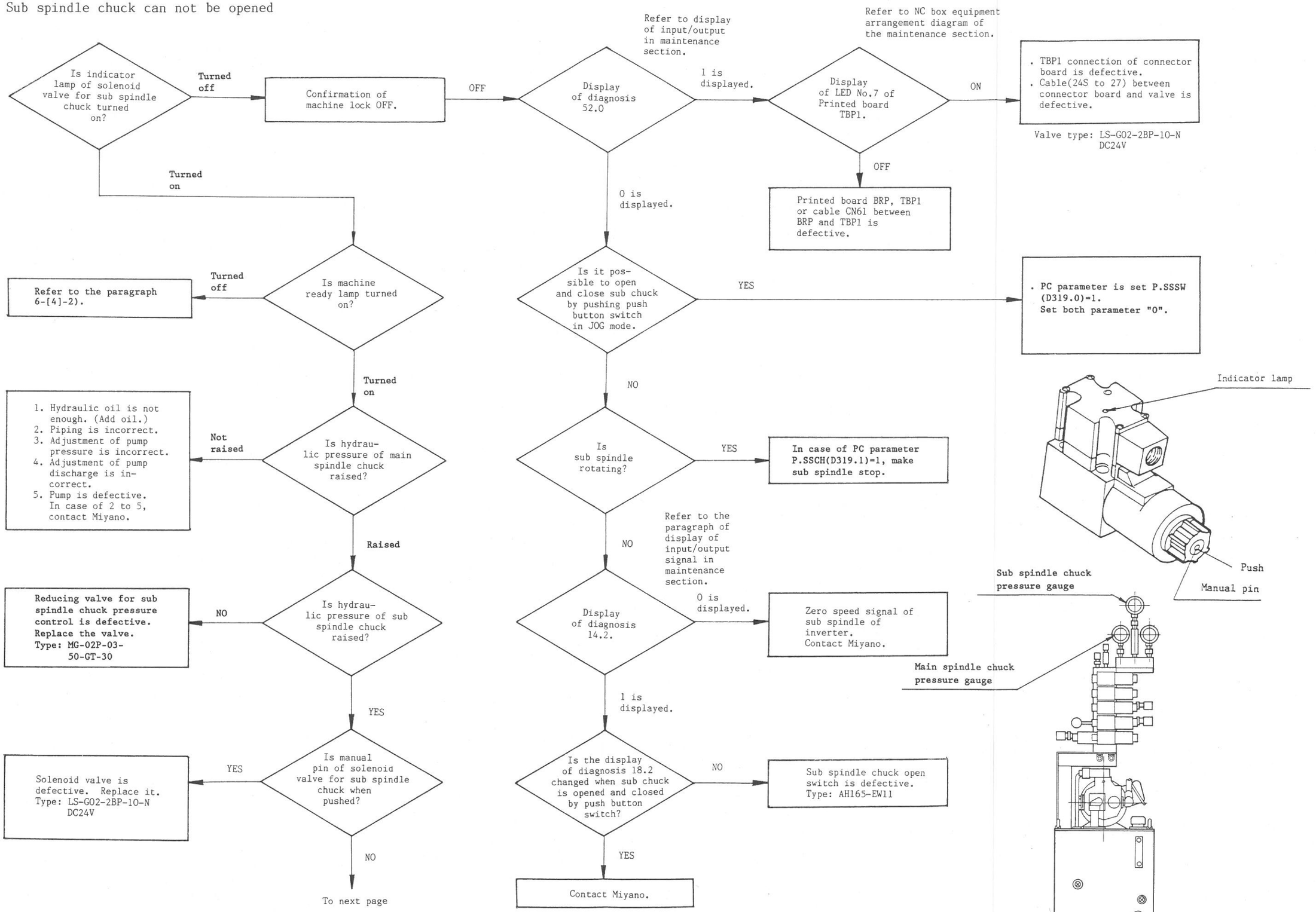


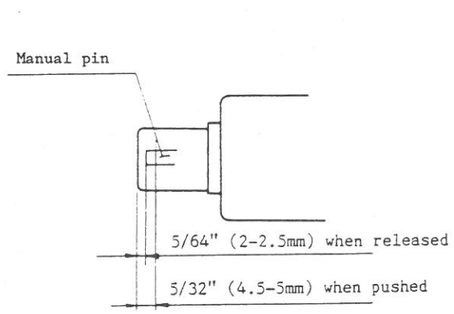


18) B-axis slide does not move



19) Sub spindle chuck can not be opened





From previous page

Close the sub spindle chuck. Indicator lamp of solenoid valve for sub spindle chuck is turned off.

Is manual pin of solenoid valve for sub spindle chuck moved when pushed to the position of upper left figure ?

NO

Solenoid valve is defective. Replace it.
Valve type number
LS-G02-2BP-10-N DC24V

YES

Refer to the paragraph of sub spindle chuck system of operation and adjustment section for removing of oil guard and chuck cap.

Open the chuck of sub spindle.
Indicator lamp of solenoid valve for sub spindle chuck is turned on.
Remove oil guard and chuck cap. Close the sub spindle chuck again.

Is chuck sleeve located correct position ? Refer to the paragraph of sub spindle chuck system of operation and adjustment section.

NO

Installation of chuck sleeve is not correct.

YES

Is there cutting chip inside of chuck?

YES

Clean inside of the chuck.

NO

Does chuck sleeve move when chuck of sub spindle is closed or opened ?

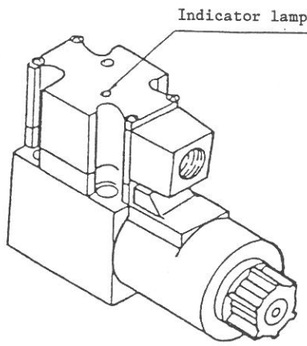
YES

1. Incorrect size of chuck is used. Replace the chuck.
2. Chuck or chuck sleeve is worn or defective. Replace them.

NO

Contact Miyano.

20) Sub spindle chuck can not be closed.



Is the indicator lamp of solenoid valve for sub spindle chuck turned on?

Turned on

Refer to input/output signal display in maintenance section.

Display of diagnosis 52.0

0 is displayed.

Printed board BRP, TBP1 or its cable is defective. Refer to NC box equipment arrangement diagram in maintenance section 3-[1]-2). Contact Miyano.

1 is diaplayed.

Turned off

Is machine ready lamp turned on?

Turned off

Refer to the paragraph 6-[4]-2).

Is display of diagnosis 18.2 changed when sub chuck is opened and closed by push button switch k?

NO

Sub spindle chuck close and open switch is defective. Replace it. Type: AH165-EW11

YES

Contact Miyano

Turned on

Is hydraulic pressure of main spindle chuck raised ? (Refer to right figure.)

Not raised

1. Hydraulic oil is not enough. (Add hydraulic oil.)
2. Piping is incorrect.
3. Adjustment of pump pressure is incorrect.
4. Adjustment of pump discharge is incorrect.
5. Pump is defective. In case of 2 to 5, contact Miyano.

or

Reducing valve for sub spindle chuck is defective. Replace it. Type number MG-02P-03-50-GT-30

Raised

Is chuck pressure of sub spindle raised ? (Refer to right figure.)

Not raised

Raised

Is manual pin of solenoid valve for sub spindle chuck returned to the position of right figure when pushed ?

NO

Solenoid valve is defective. Replace it. Type number LS-G02-2BP-10-N DC24V

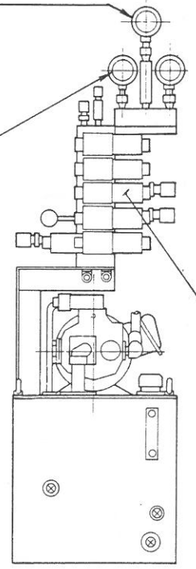
YES

To next page

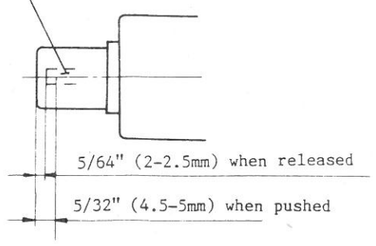
Sub spindle chuck pressure gauge

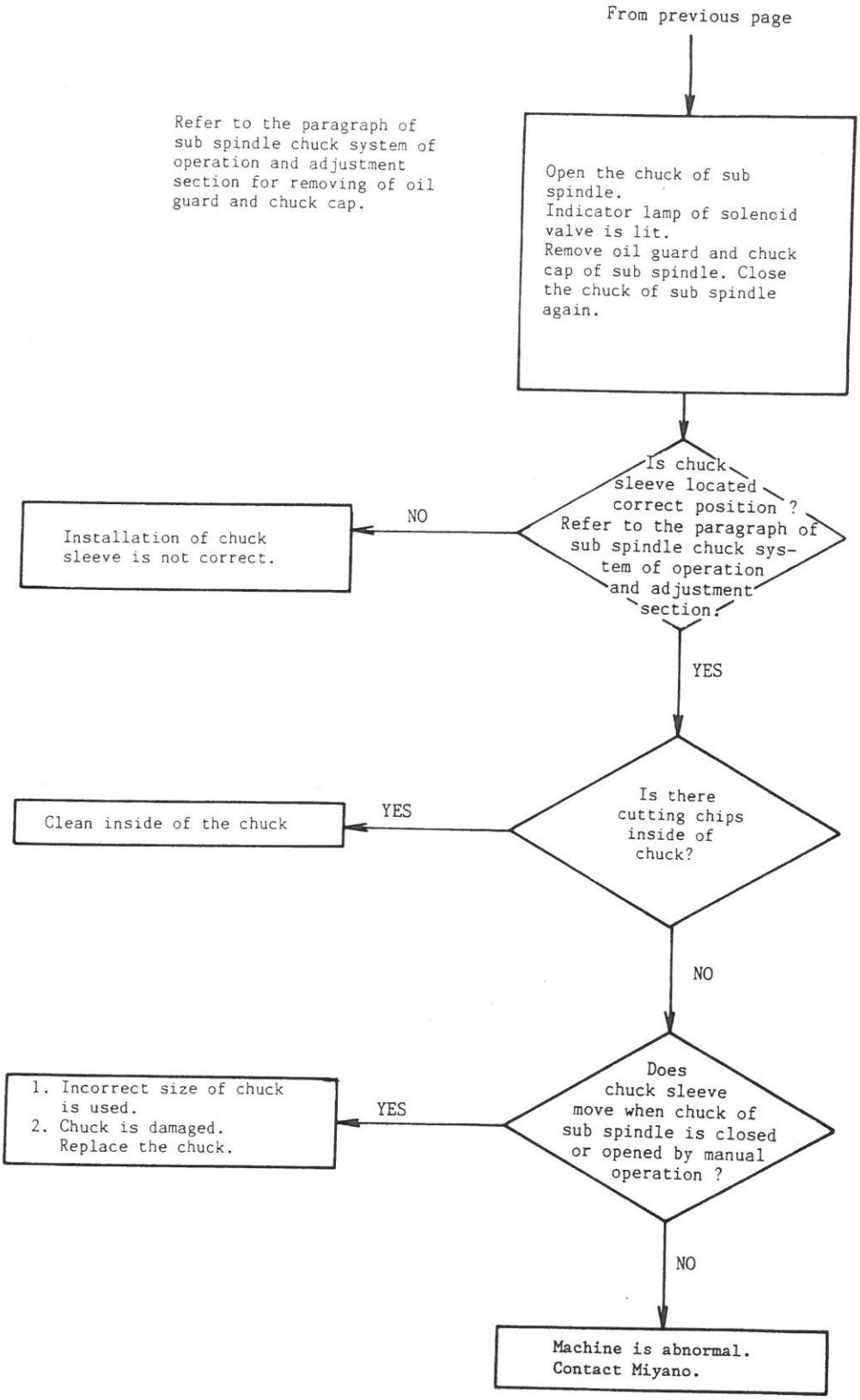
Main spindle chuck pressure gauge

Solenoid valve for sub spindle chuck

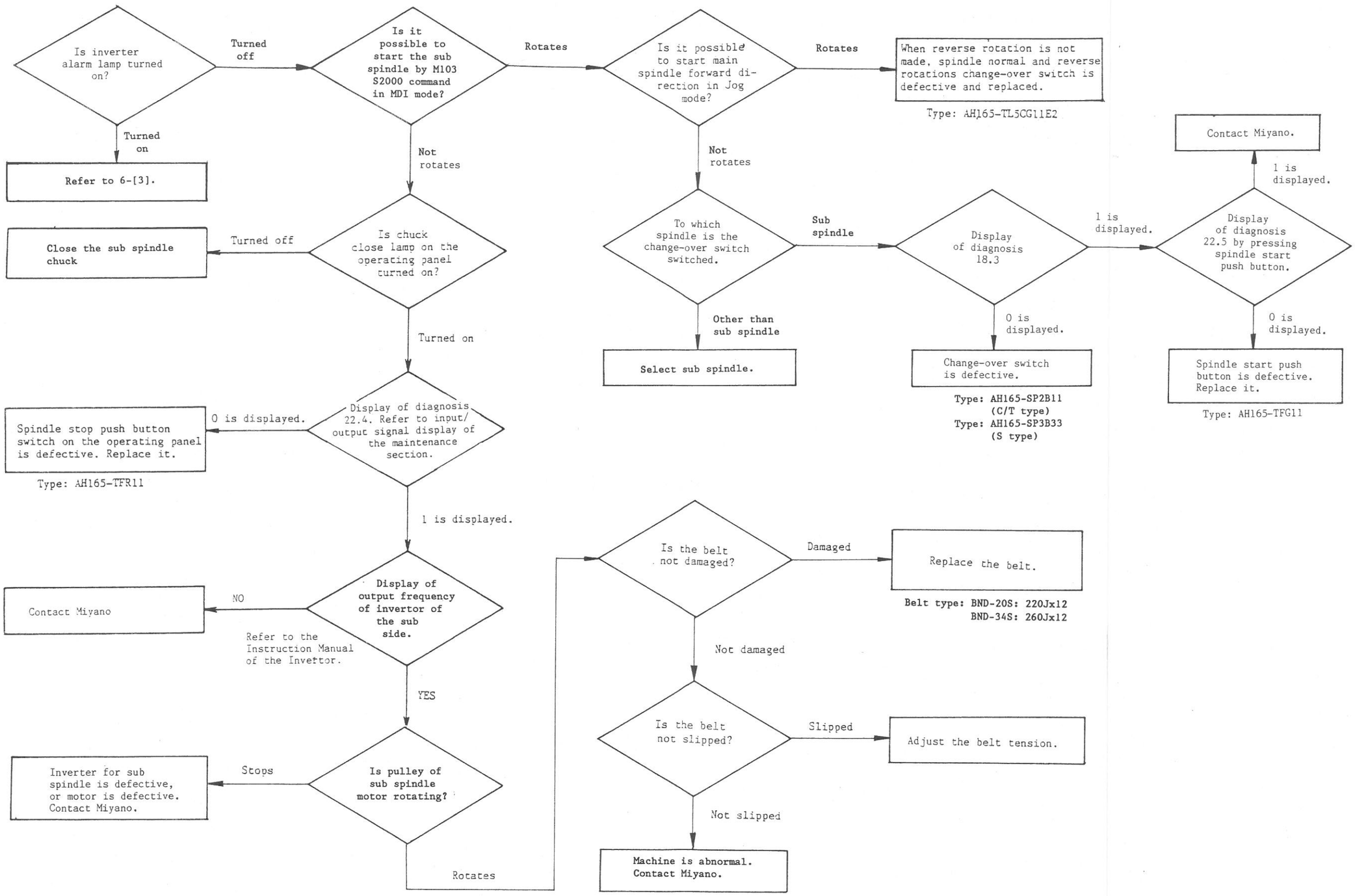


Manual pin

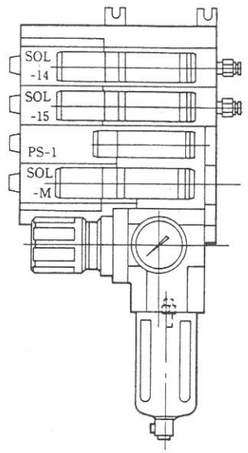



From previous page
Refer to the paragraph of sub spindle chuck system of operation and adjustment section for removing of oil guard and chuck cap.
Open the chuck of sub spindle.
Indicator lamp of solenoid valve is lit.
Remove oil guard and chuck cap of sub spindle. Close the chuck of sub spindle again.
Is chuck sleeve located correct position ? Refer to the paragraph of sub spindle chuck system of operation and adjustment section.
NO
Installation of chuck sleeve is not correct.
YES
Is there cutting chips inside of chuck?
YES
Clean inside of the chuck
NO
Does chuck sleeve move when chuck of sub spindle is closed or opened by manual operation ?
YES
1. Incorrect size of chuck is used.
2. Chuck is damaged.
Replace the chuck.
NO
Machine is abnormal.
Contact Miyano.

21) Sub spindle does not rotate



22) Work ejector does not work (Air cylinder type)

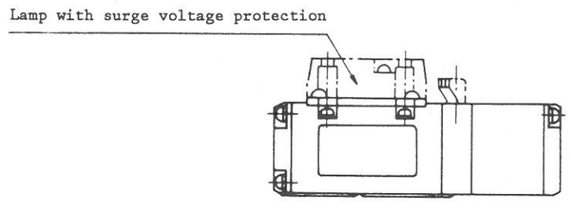


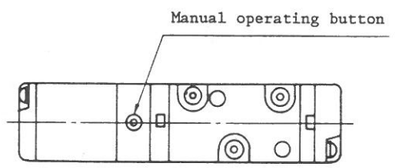
Parts catcher

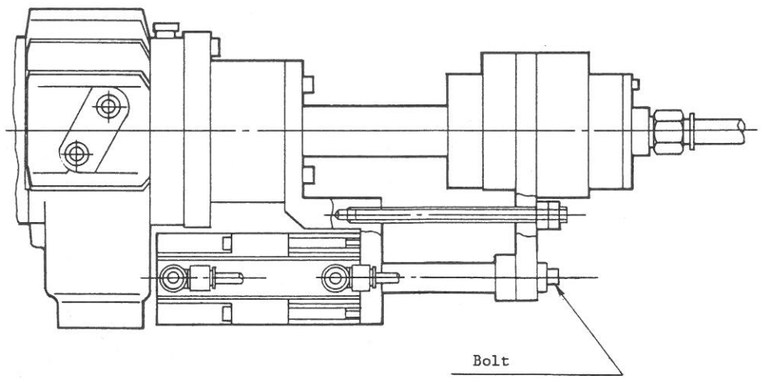
Work ejector

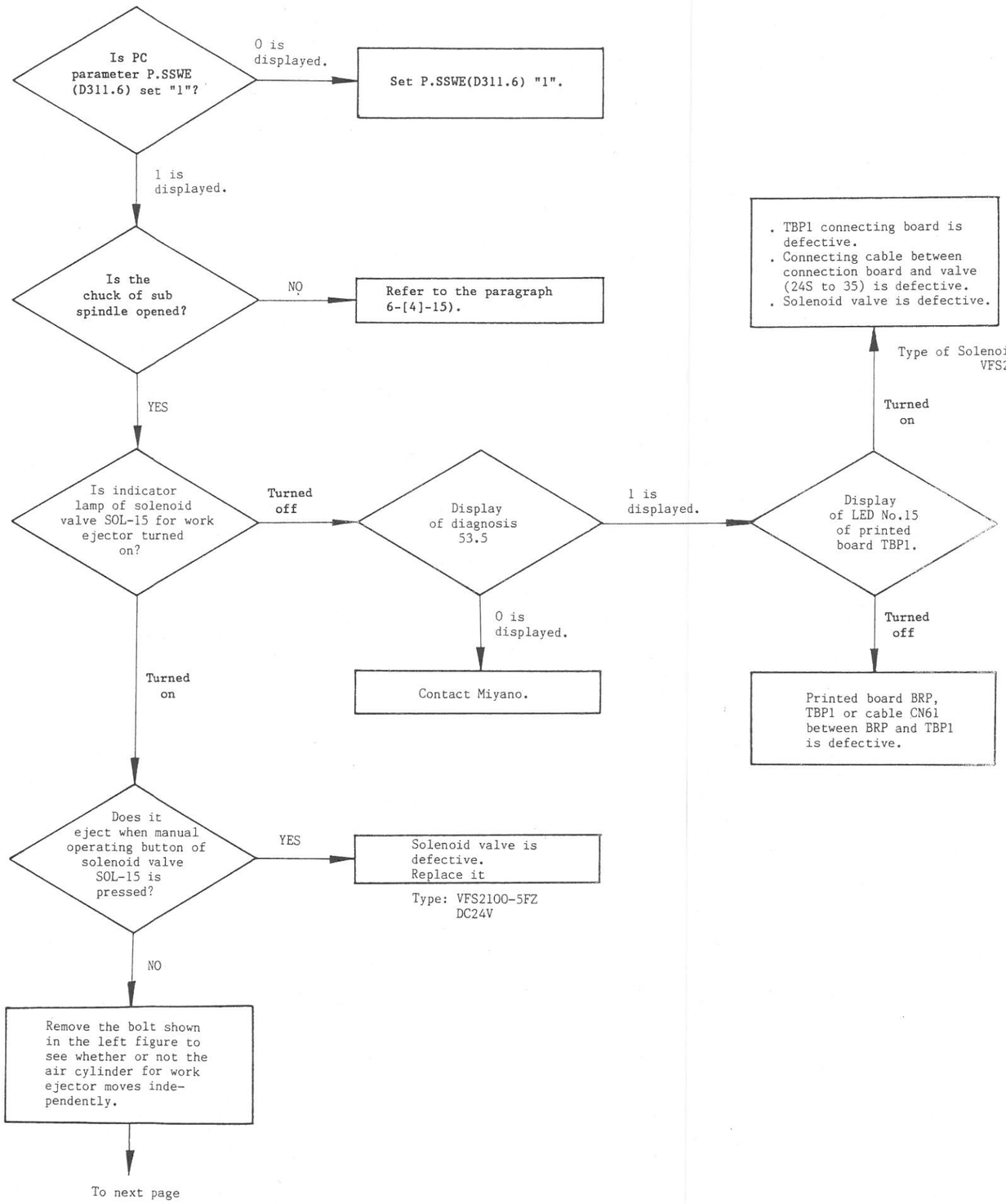
(Pressure switch)

Main valve









From previous page

Is air cylinder for work ejector located at the position of figure below?

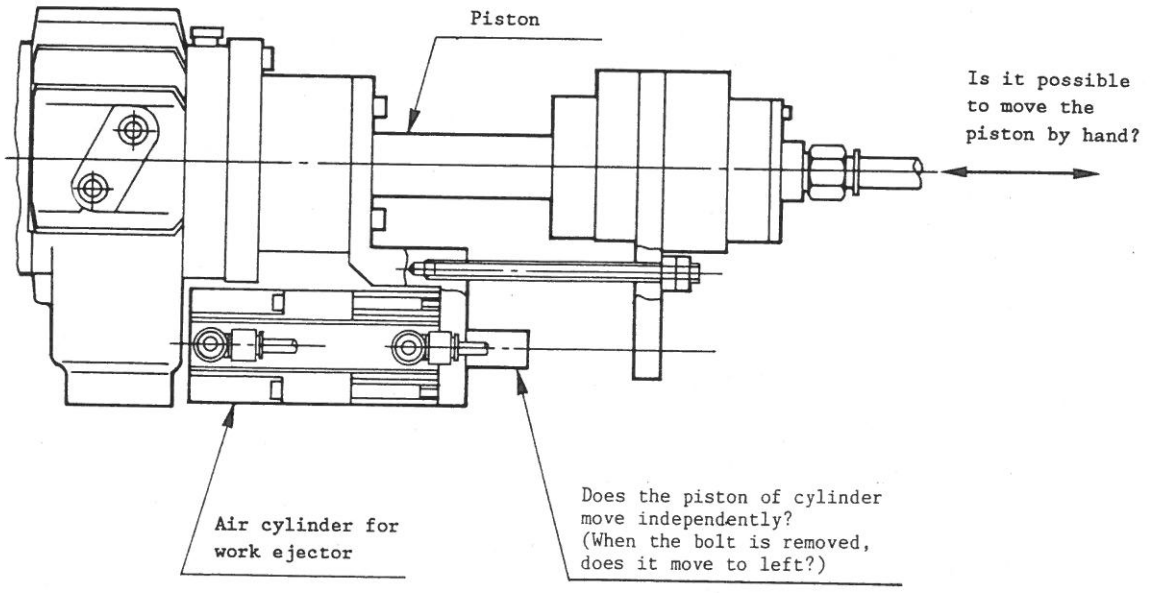
NO → Air cylinder for work ejector is defective. Replace it.

YES

Is it possible to move the piston shown below by hand?

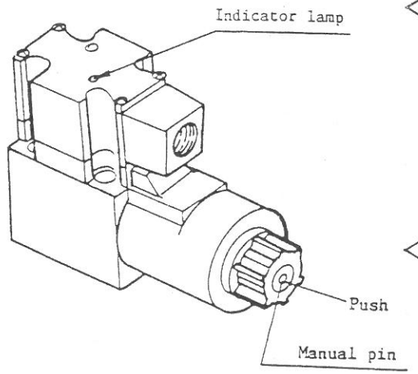
YES → Push rod is damaged. Work ejector is defective.

NO → Machine is abnormal. Contact to Miyano.



23) Sub spindle positioning abnormality

a) Lock pin is not pushed in



Is machine alarm lamp turned on?
- Turned on → Refer to the paragraph alarm.
- Turned off / Unsolved → Is indicator lamp of solenoid valve SOL-27 turned on?

Is indicator lamp of solenoid valve SOL-27 turned on?
- Turned off → Display of diagnosis 52.3
- Turned on → Is machine ready lamp turned on?

Display of diagnosis 52.3
- 1 is displayed. → Is Display of LED No.10 of Printed board TBP1 turned on?
- 0 is displayed. → Display of PC parameter P.SPIN(D311.5)

Is Display of LED No.10 of Printed board TBP1 turned on?
- Turned on → . Connection of connecting board of TBP1 is defective. . Connecting cable between connecting board and valve (24S to 30) is defective. . Solenoid valve is defective.
- Turned off → Printed board BRP, TBP1 or connecting cable between BRP and TBP1 CN61 is defective.

Refer to NC box equipment arrangement diagram in maintenance section.

Soleniod valve
Type: LS-G02-2BP-10-N
DC24V

Is machine ready lamp turned on?
- Turned off → Refer to the paragraph 6-[4]-2)
- Turned on → Is hydraulic pressure of main spindle chuck raised?

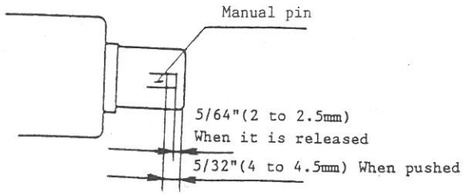
Is hydraulic pressure of main spindle chuck raised?
- Not raised → 1. Hydraulic oil is not enough. (Add oil.) 2. Piping is incorrect. 3. Adjustment of pump pressure is incorrect. 4. Adjustment of pump discharge is incorrect. 5. Pump is defective. In case of 2 to 5, contact Miyano.
- Raised → Refer to the paragraph of chuck, gripping force of operation and adjustment section.

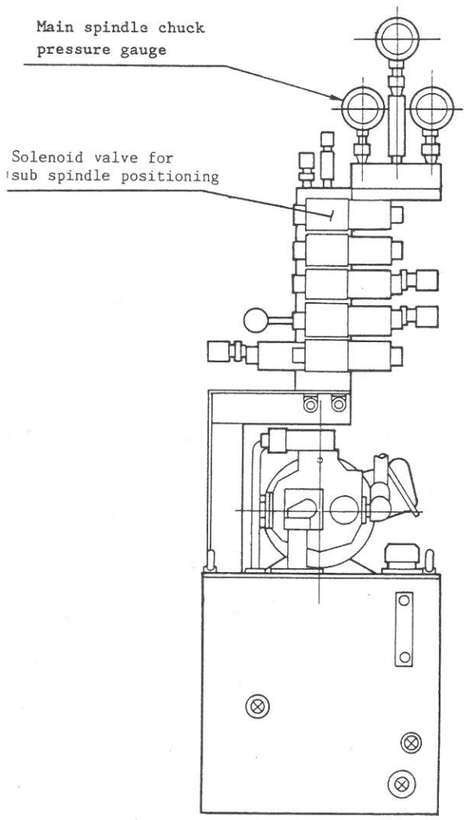
Is it possible to operate by pressing manual pin (ϕ6) of solenoid valve?
- YES → Coil of solenoid valve is defective. Replace the valve
  Type: LS-G02-2BP-10-N DC24V
- NO → Is it possible to push the manual pin of solenoid valve to the position indicator in the right figure?

Is it possible to push the manual pin of solenoid valve to the position indicator in the right figure?
- NO → Solenoid valve is defective. Replace it. Type: LS-G02-2BP-10-N DC24V
  In this case, hydraulic oil often became dirty. Replace the oil.
- YES → Contact Miyano

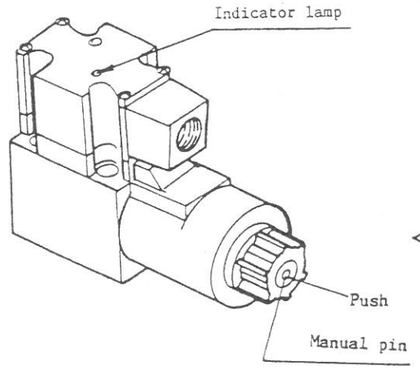
Display of PC parameter P.SPIN(D311.5)
- 0 is displayed. → Make P.SPIN(D311.5) "1".
- 1 is displayed. → After confirming the display of diagnosis 14.5, contact Miyano.

DGN14.5 is the signal of sub orientation completion.





b) Lock pin is not pulled out



Is machine alarm lamp turned on?
- Turned on → Refer to the paragraph alarm.
- Turned off → Is indicator lamp of solenoid valve SOL-27 turned on?
  - Turned on → Display of diagnosis 52.3
    - 0 is displayed → Printed board BRP, TBP1 or their connecting board is defective. Contact Miyano.
    - 1 is displayed. → Contact Miyano.
  - Turned off → Is machine ready lamp turned on?
    - Turned off → Refer to the paragraph 6-[4]-2).
    - Turned on → Is hydraulic pressure of main spindle chuck raised?
      - Not raised → 1. Hydraulic oil is not enough. (Add oil.) 2. Piping is incorrect. 3. Adjustment of pump pressure is incorrect. 4. Adjustment of pump discharge is incorrect. 5. Pump is defective. In case of 2 to 5, contact Miyano.
      - Raised → Refer to the paragraph of chuck, gripping force of operation and adjustment section.
        - YES → Coil of solenoid valve is defective. Replace the valve. Type: LS-G02-2BP-10-N DC24V
        - NO → **Is it possible to push the manual pin of solenoid valve to the position indicator in the right figure?**
          - NO → Solenoid valve is defective. Replace.it. Type: LS-G02-2BP-10-N DC24V. In this case, hydraulic oil often became dirty. Replace the oil.
          - YES → Contact Miyano