

# SHARP

## *OPERATOR'S MANUAL*

### *SV-6030A*

FANUC

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1500-7713-100

edition : A01

## CONTENTS

<b>1 GENERAL</b>	P 1
1 . 1. USE OF THE MACHINE	P 1
1 . 2. GENERAL DESCRIPTION OF THE MACHINE	P 2
1 . 3. DETAILS OF PRINCIPAL COMPONENT	P 3
1 . 4. MACHINE SPECIFICATIONS	P 6
<b>2 TRANSFERRING AND INSTALLATION OF MACHINE</b>	P 8
2 . 1. HANGING OF MACHINE	P 8
2 . 2. FOUNDATION	P 9
2 . 3. INSTALLATION PROCEDURE	P 9
<b>3 PREPARATION FOR TEST RUN</b>	P 11
3 . 1. CLEANING OF MACHINE	P 11
3 . 2. OILING AND GREASING	P 11
3 . 3. REMOVAL OF LOCKING DEVICES	P 11
3 . 4. AIR PIPING	P 12
3 . 5. SWITCHING ON THE POWER SOURCE AND CHECKING	P 13
<b>4 CAUTIONS</b>	P 16
4 . 1. SETTING UP THE MACHINE AND POWER	P 16
4 . 2. WHEN OPERATING	P 16
4 . 3. LUBRICATION AND OIL	P 19
4 . 4. HEALTHY AND SAFETY PROTECTION	P 20
4 . 5. OTHER NOTICES	P 20
<b>5 OPERATION OF MACHINE</b>	P 22
5 . 1. SWITCHING ON THE POWER SOURCE TO MACHINE.	P 22
5 . 2. SWITCHING OFF THE POWER SOURCE	P 22
5 . 3. EXPLANATION FOR USE OF OPERATION PANEL	P 24
5 . 4. OTHER DEVICE	P 33
5 . 5. WHEN TOOL CHANGE MOVEMENT IS INTERRUPTED BY EMERGENCY STOP OR RESET	P 34
5 . 6. WHEN INSTALL OR REMOVE THE TOOL MANUALLY	P 38
5 . 7. WHEN OVERTRAVEL IS DETECTED BY 2ND LIMIT SWITCH.	P 39
5 . 8. MDI KEYBOARD FUNCTIONS	P 41
5 . 9. LIST OF OPERATION	P 43
<b>6 PROGRAMMING</b>	P 46
6 . 1. RESTRICTION	P 46
6 . 2. M FUNCTION, S FUNCTION AND T FUNCTION	P 47
<b>7 CHECKING AND MAINTENANCE OF MACHINE</b>	P 52
7 . 1. DAILY CHECKING	P 52

7 . 2. LUBRICATION OF MACHINE	P 53
7 . 3. LUBRICATION TABLE	P 58
7 . 3. LUBRICATION APPLICABLE	P 58
7 . 3. MAINTENANCE AND ADJUSTMENT OF AIR SOURCE AND PNEUMATIC UNITS	P 59
<b>8 ADJUSTMENT OF SLIDE WAY GIBS</b>	<b>P 64</b>
<b>9 ALARM MESSAGE</b>	<b>P 65</b>
9 . 1. ALARM DISPLAY	P 65
9 . 2. TROUBLESHOOTING	P 65
9 . 3. INPUT / OUTPUT SIGNAL DIAGNOSE	P 67
<b>10 24/32 TOOLS ATC TROUBLESHOOTING</b>	<b>P 70</b>

## MODIFICATION RECORDS

DATE	PAGE	ORIGINAL	MODIFIED	ED	MEMO
2002/8/29	7-5		ADD OIL 2 Tellus oil 68 Teresso 68 DTE26 , SHC626		
2002/6/6	ALL			A01	

## 1 GENERAL

### 1.1 USE OF THE MACHINE

#### 1.1.1 THE ASSIGNED USE OF THE MACHINE

- A. THE PERSON TO USE THIS MACHINE :THE TECHNICIAN WHO HAVE BEEN TRAINED TO USE THE MILLING MACHINE, AND TO USE THE CNC CONTROL SYSTEM AND ELDER THEN 18 YEARS OLD CAN USE THIS MACHINE.
- B. MACHINING MATERIAL : CASTING, CARBON STEEL, STANDLESS STEEL, COPPER, ALUMINUM.
- C. MACHINING METHOD : MACHINING BY PROGRAM :
  - a. MILLING : FACE, OBLIQUE, END, SIDE MILLING, ETC.
  - b. DRILLING : FRONT AND OBLIQUE DRILLINGS.
  - c. BORING : FRONT AND OBLIQUE BORINGS BY CUTTERS INSTALLED.
  - d. MOLDING : PROCESSING OF IRREGULAR CURVES AND MOLD REMOVING ANGLES.
  - e. POLISHING : SURFACE POLISH ON METALLIC PARTS.

#### 1.1.2 THE FORESEEN OTHER REASONABLE USE OF THE MACHINE

- A. THE PERSON TO USE THIS MACHINE : THE PERSON WHO HAVE JUST TRAINED SOME SIMPLE FUNCTIONS ( CYCLE START , FEED HOLD , EMERGENCY STOP ... ) ----- MUST DIRECTED BY TECHNICIAN PERSON DESCRIBED IN 1.1.1.
- B. MACHINING MATERIAL : WOOD ----- THE WOOD DUST MIGHT RUNS INTO BEARING , SIDEWAYS AND CAUSE SOME DAMAGE.
- C. MACHINING METHOD :MACHINING BY MANUAL. ----- SHOULD WEAR THE GOGGLES AND ONLY TECHNICIAN PERSON DESCRIBED IN 1.1.1 CAN OPERATE .

#### 1.1.3 THE FORESEEN UNREASONABLE USE OF THE MACHINE

- A. THE PERSON TO USE THIS MACHINE :THE PERSON WHO HAVE NOT BEEN TRAINED OR UNDER 18 YEARS OLD.

## 1.2 GENERAL DESCRIPTION OF THE MACHINE

1.2.1 THE MODEL MCV1500 IS THE VERTICAL SPINDLE MACHINING CENTER FEATURING ELECTRONIC CONTROL EQUIPMENT BUILT-IN COMPACT DESIGN, PERFORMANCE, ACCURACY AND RELIABILITY.

1.2.2 THE MODEL MCV-1500 BASICALLY CONSISTS OF THE FOLLOWINGS:

- A. MACHINE BODY (INCLUDING SPINDLE HEAD, SPINDLE, COLUMN, BED, SADDLE AND ATC)
- B. OPERATION PANEL
- C. NC SYSTEM
- D. ELECTRIC (POWER SUPPLY) BOX
- E. PNEUMATIC UNIT

1.2.3 THE APPEARANCE AND PRINCIPAL DIMENSIONS OF THE MACHINE AND THE NAME OF EACH

PRINCIPAL COMPONENT ARE AS SHOWN IN FIG. 1-1 AND 1-2.

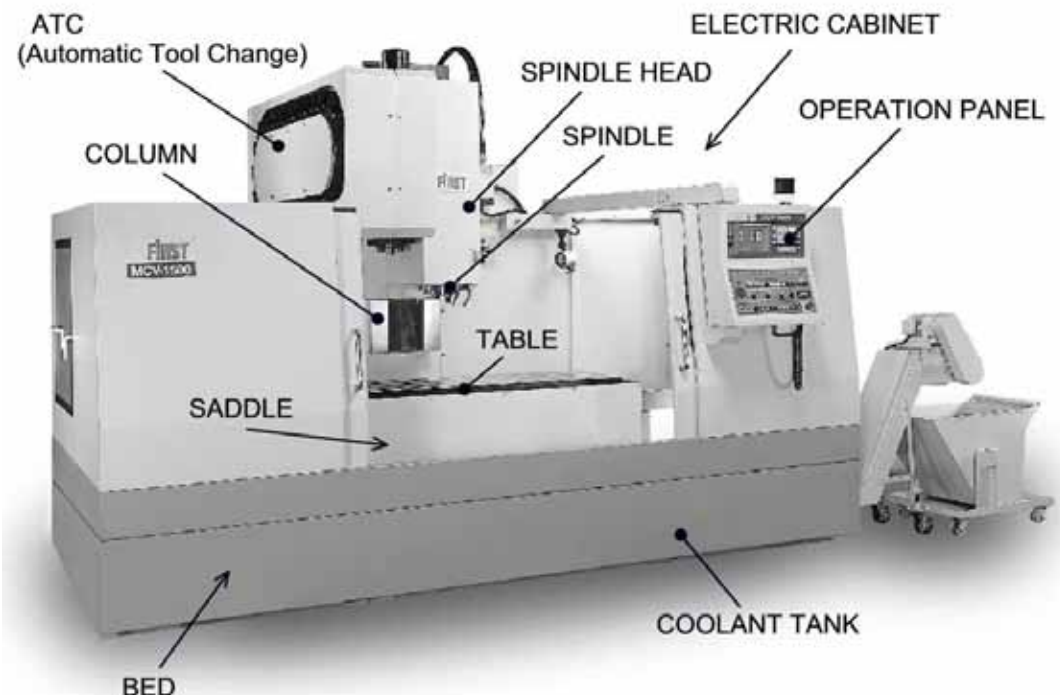


FIG. 1.1 PRINCIPAL COMPONENT NAME

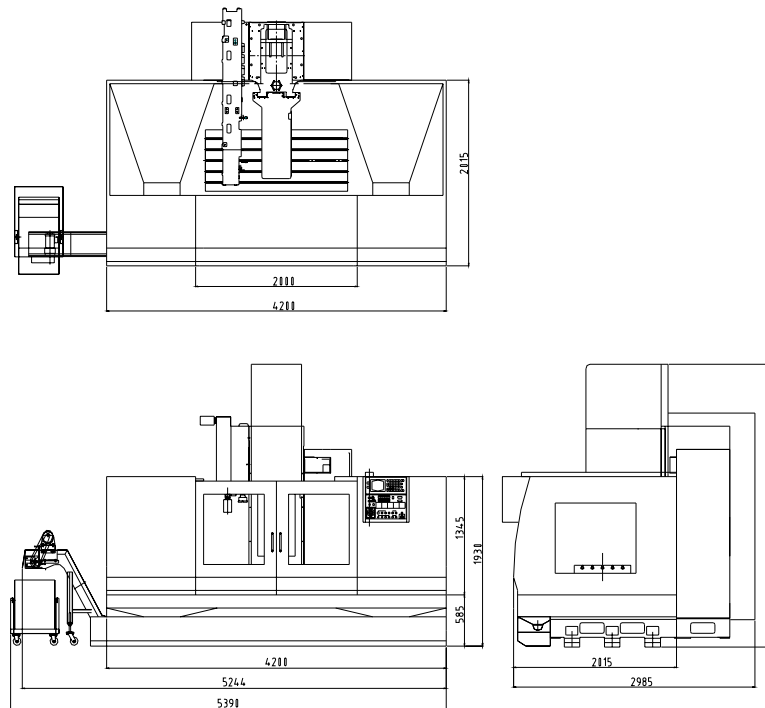


FIG. 1.2 APPEARANCE AND PRINCIPAL DIMENSION OF THE MACHINE

## 1.3 DETAILS OF PRINCIPAL COMPONENT

### 1.3.1 SPINDLE HEAD

- A. THE SPINDLE HEAD IS MOUNTED ON THE SQUARE SLIDE WAYS WHICH IN TURN ARE VERTICALLY INSTALLED ON THE COLUMN FRONT.
- B. THE SPINDLE HEAD IS BALANCED BY COUNTER-WEIGHT, AND VERTICALLY (IN Z AXIS) MOVES ALONG THE SLIDE WAYS.
- C. A PRACTICALLY MAINTENANCE-FREE AC BRUSHLESS MOTOR IS USED TO DRIVE THE SPINDLE ASSURING IN ASSOCIATION WITH LARGE DIAMETER BEARING SYSTEM, EXTREMELY HIGH PERFORMANCE.
- D. CARTRIDGE SPINDLE IS SUPPORTED BY ACCURATE AND GREASED PACKED BEARINGS.
- E. TOOL HOLDER RETAINER AND AIR BLOW THAT REMOVES CHIPS FROM THE SPINDLE AND TOOL TAPER ARE INCORPORATED IN THE SPINDLE.
- F. THE SPINDLE HEAD FEATURES SIMPLE STRUCTURE AND RELIABLE PERFORMANCE.

### 1.3.2 COLUMN

- A. THE COLUMN IS FIRMLY BOLTED TO THE BED, AND DESIGNED TO HAVE PARTICULAR RIGIDITY. THE SLIDE WAYS ALONG WHICH THE SPINDLE HEAD MOVES ARE OF SQUARE TYPE, AND ELABORATELY GROUND AFTER HARDENING. A TURCITE - B SHEET IS APPLIED TO THE SLIDE SURFACE OF THE SPINDLE HEAD, PROVIDING GOOD ACCOMMODATION TO THE SLIDE WAYS.
- B. THE ATC (AUTOMATIC TOOL CHANGER) IS LOCATED AT THE LEFT OF THE COLUMN AND THE PNEUMATIC VALVES IS AT THE BACK OF THE ATC.
- C. THE OPERATION PANEL (OPERATOR'S STATION) IS LOCATED AT THE RIGHT OF THE COLUMN AND THE NC SYSTEM IS AT THE BACK OF THE OPERATION PANEL.
- D. THE SPINDLE HEAD IS BALANCED WITH THE COUNTER-WEIGHT SUSPENDED AT THE BACK OF THE COLUMN TO PROVIDE SMOOTH VERTICAL MOVEMENT OF THE SPINDLE HEAD. THE MOTOR THAT DRIVES THE SPINDLE HEAD IN Z AXIS (VERTICAL MOVEMENT) IS INSTALLED ON THE TOP OF THE COLUMN.

### 1.3.3 BED

- A. THE BED IS PROVIDED WITH LEVELING BOLTS AT ITS FEET, AND HAS THE SECTION WHERE THE COLUMN IS INSTALLED AS WELL AS THE SLIDE WAYS OF SQUARE TYPE ON THE TOP OF THE BED.
- B. THE Y AXIS (CROSSWISE MOVEMENT) FEED MOTOR ARE INSTALLED ON THE BACK WALL OF THE BED.
- C. SINCE THE BED SUSTAINING THE WEIGHT OF THE COLUMN MUST ASSURE RELIABLE Y AXIS MOVEMENT, AND LARGELY AFFECTS CUTTING ACCURACY, IT IS DESIGNED TO HAVE EXTREME RIGIDITY.
- D. IT IS ALSO CONSIDERED IN DESIGNING THE BED THAT CHIPS AND CUTTING OIL CAN BE READILY ELIMINATED AND COLLECTED.

### 1.3.4 TABLE

- A. THE TABLE IS THE ONLY PLACE WHERE YOU CAN LOCKED YOUR WORK PIECE ON IT AND MACHINING , IT MOVES ON THE SADDLE IN LENGTHWISE DIRECTION (X AXIS).



- B. THE TABLE HAS A WORKING AREA MEASURING 1600MM (63 INCH) (X AXIS) BY 520MM (20.4 INCH) (Y AXIS) AND THREE T SLOTS OF 18MM (0.7 INCH) WIDE. 100MM (3.9 INCH) DISTANT FROM EACH TO OTHER. A CHANNEL, OR GROOVE, IS PROVIDE AROUND THE TABLE TO DRAIN CHIPS AND CUTTING OIL. THE OUTLET OF THE DRAIN CHANNEL IS LOCATED AT THE REAR PART OF THE TABLE.

### 1.3.5 ATC (AUTOMATIC TOOL CHANGER)

- A. THE ATC IS INSTALLED ON THE LEFT WALL OF THE COLUMN. THE ATC IS OF MAGAZINE TYPE PERMITTING DIRECT TOOL CHANGE, ANY TOOL CAN BE IMMEDIATELY AND RELIABLY CHANGED AT ALL TIMES. THE FEATURES OF THE ATC INCLUDE PNEUMATICALLY DRIVE SYSTEM, SIMPLE STRUCTURE, FAST MOVEMENT, AND RAPID BI-DIRECTIONAL RANDOM TOOL SELECTION IS DIRECTLY DESIGNATED TOOL NO. WITH T CODE. ( 24 / 32 TOOLS CAM TYPE ATC ARE AVAILABLE AS AN OPTION )

### 1.3.6 OPERATION PANEL

- A. THE OPERATION PANEL IS LOCKED IN THE RIGHT FRONT OF THE MACHINE, AND BASICALLY CONSISTS OF THE NC OPERATION PANEL, IN WHICH PROGRAM LOADING FROM TAPE TO THE MEMORY, PROGRAM EDITION AND MID OPERATION ARE PERFORMED, AND THE OPERATION PANEL (OPERATOR'S STATION) HAVING CONTROL SWITCHES AND PUSH BUTTONS ON THE PANEL AND FUNCTIONAL SWITCHES IN THE PANEL.
- B. ALMOST ALL CONTROL SWITCHES AND PUSH BUTTONS NECESSARY TO OPERATE THE MACHINE ARE INSTALLED ON THE OPERATION PANEL, THUS THE OPERATOR CAN READILY CONTROL THE MACHINE OPERATION AT THE FRONT OF THE OPERATION PANEL.

### 1.3.7 NC SYSTEM

- A. THE NC SYSTEM READS SIGNIFICANT INFORMATION FROM THE PROGRAM, AND PRODUCES COMMAND OR INSTRUCTION TO SEQUENTIALLY CONTROL THE MACHINE MOVEMENT AND OPERATION.

### 1.3.8 ELECTRIC BOX

- A. THE ELECTRIC BOX RECEIVES THE COMMAND SIGNALS FROM THE NC SYSTEM, AND DRIVES THE MACHINE. IN THE ELECTRIC BOX, RELAY CIRCUIT AND POWER SOURCE CIRCUIT ARE INCORPORATED.

## 1.3.9 PNEUMATIC UNIT

- A. THE FUNCTIONS OF THE PNEUMATIC UNIT INCLUDE TOOL UNCLAMPING AT THE SPINDLE, AIR BLOWING FOR CLEANING THE SPINDLE AND TOOL TAPER. ATC CROSSWISE MOVEMENT AND ATC MAGAZINE VERTICAL MOVEMENT. ONLY STRICTLY SELECTED PARTS AND DEVICES ARE USED IN THE PNEUMATIC UNIT, THUS ASSURING STABLE AND RELIABLE OPERATION

## 1.4 MACHINE SPECIFICATIONS

**TABLE ( FIG. 1.3 )**

WORKING SURFACE ( X X Y )	1760 X 700 MM ( 69.3 X 27.6 INCH )
T SLOT ( NO. X WIDTH X PITCH )	5 X 22 X 125 MM ( 5 X 0.9 X 4.3 INCH )
TABLE STROKE ( X X Y )	1500 X 760 MM ( 59 X 29.9 INCH )
CUTTING FEEDRATE	1-5000 MM/MIN ( 0.04-196 INCH/MM )
RAPID TRAVERSE ( X X Y )	12,000 MM/MIN ( 472.4 INCH/MIN ))
X FEED MOTOR ( AC SERVO UNIT )	ALPHA 12 / 2000 2.1 KW AC MOTOR
Y FEED MOTOR ( AC SERVO UNIT )	ALPHA 22 / 2000 3.8 KW AC MOTOR
TABLE LOAD CAPACITY	1500 KG ( 3300 LBS )

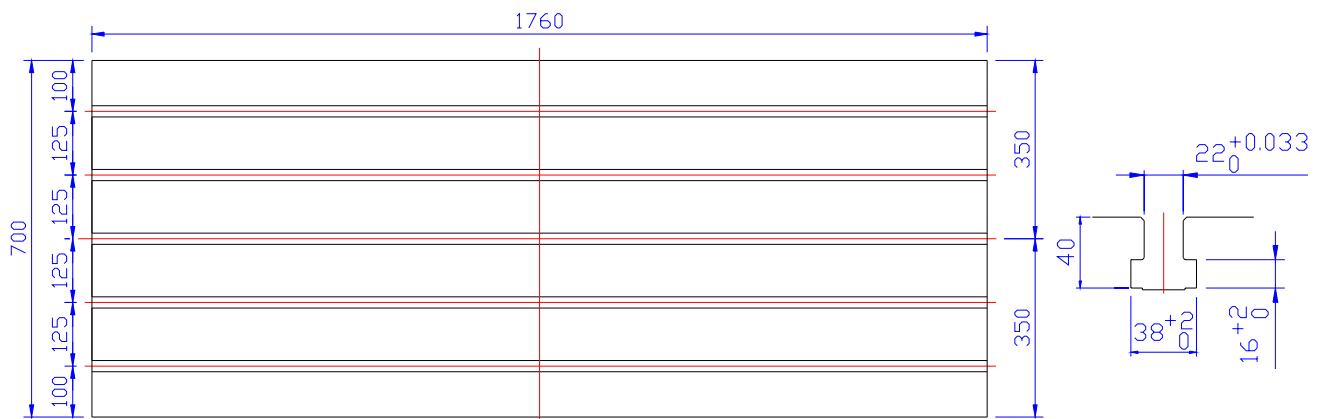


FIG. 1.3 PRINCIPAL DIMENSIONS OF TABLE

### SPINDLE

STROKE ( Z )	680 MM ( 26.8 INCH )	
TABLE TO SPINDLE END (MIN./MAX.)	150 / 830 MM ( 5.9 / 32.7 INCH )	
SPINDLE MOTOR	AC VARIABLE FREQUENCY MOTOR INFINITELY VARIABLE 11 KW CONTINUOUS RATING / 30 MINUTES RATING 15 KW	
SPINDLE RPM RANGE	#50	#40

	40 - 4000 RPM ( STANDARD , HIGH LOW GEAR )	90 – 4000 / 6000 RPM 180 – 10000 RPM
PULL STUD	MAS-P40T-1 45 DEGREE ( ISO 40 ), MAS-P50T-1 45 DEGREE ( ISO 50 )	
TRANSMISION	BT50: 2 STEP GEAR BT40: BELT DRIVEN	

### GENERAL INFORMATION

AIR POWER REQUIRED	6 KGF / CM <sup>2</sup>
SPINDLE CENTER TO COLUMN	760 MM ( 29.9 INCH )
FLOOR TO TABLE	810 MM ( 31.9 INCH ) (WITH LEVLING PADS)
MACHINE HEIGHT	3,200 MM ( 126 INCH )
MACHINE WEIGHT	10,500 KGS ( 23,100 LBS )
FLOOR AREA REQUIRED	3,500 (W) X 3,200 (D) MM ( 138 X 126 INCH ) INCLUDE OPERATION AND MAINTENANCE AREA

## 2. TRANSFERRING AND INSTALLATION OF MACHINE

### 2.1 HANGING OF MACHINE

2.1.1 BEFORE HANGING AND TRANSFERRING THE MACHINE, BE SURE TO CHECK THE TRANSFERRING ROUTE FOR SAFETY. LOCATE THE SADDLE BY THE COLUMN, AND THE TABLE AT THE CENTER OF ITS STROKE TO BALANCE THE MACHINE.

2.1.2 THE MACHINE WAS BALANCED BEFORE SHIPPING BY US.

- A. BEFORE HANGING THE MACHINE , TO PREVENT FROM DAMAGE OF THE MACHINE.
- B. LIFT THE MACHINE ON THE POSITION AS SHOWN IN FIG. 2-1.
- C. THE MACHINE WEIGHS APPROXIMATELY 10,500KG. BE SURE TO USE A SUITABLE FORK LIFT.
- D. DURING HANGING AND TRANSFERRING OF THE MACHINE, USE CARE NOT TO GIVE DETRIMENTAL VIBRATION OR SHOCK TO THE MACHINE, AND TO MAINTAIN THE MACHINE IN BALANCE.

(NOTE THAT THE MACHINE IS LIABLE TO TILT BECAUSE THE ELECTRICAL UNIT EQUIPPED VERTICAL MACHINING CENTER HAS THE CENTER OF GRAVITY RELATIVELY HIGH POSITION.)

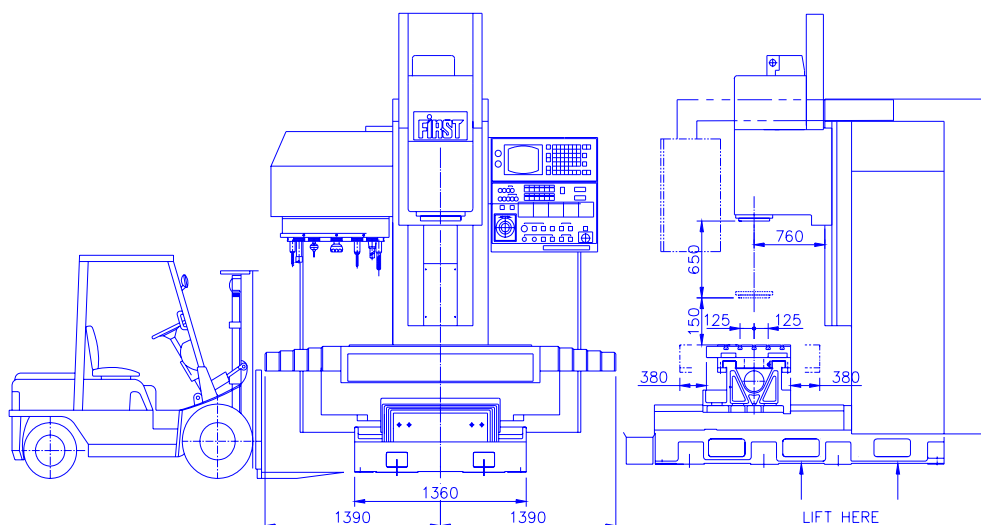
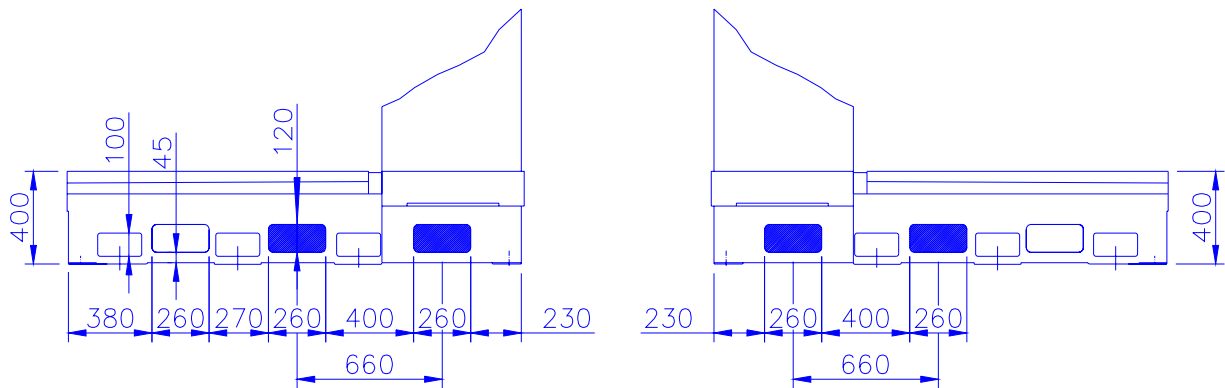


FIG. 2.1 LIFTING THE MACHINE



## 2.2 FOUNDATION

2.2.1 THE FOUNDATION ON WHICH THE MACHINE INSTALLED SHOULD BE RIGIDLY CONSTRUCTED WITH CONCRETE.

2.2.2 SINCE MACHINING ACCURACY IS LARGELY GOVERNED BY THE ADEQUACY OF FOUNDATION AND INSTALLATION, ELABORATELY CONSTRUCT THE FOUNDATION AND INSTALL THE MACHINE ON IT.

2.2.3 THE MACHINE SHOULD BE LOCATED WHERE IS NOT SUBJECTED TO VIBRATION FROM OTHER MACHINERY, AND TO DIRECT SUNBEAM.

2.2.4 THE THICKNESS AND SIZE OF THE CONCRETE FOUNDATION SHOULD BE DETERMINED TAKING THE GROUND CONDITION INTO CONSIDERATION.

2.2.5 SEE FIG. 2.2 .

## 2.3 INSTALLATION PROCEDURE

2.3.1 WHEN FOUNDATION BOLT IS NOT USED, USE LEVELING PADS FURNISHED TO THE MACHINE TO INSTALL THE MACHINE. CLEAN THE REVERSE SURFACE OF THE LEVELING PADS AND THE SUPPORTING PADS. AND PLACE THE LEVELING PADS AND THE SUPPORTING PADS ACCORDING TO THE FLOOR PLAN FIG 2.2

2.3.2 CAREFULLY LOWER THE HUNG MACHINE SO THAT EACH FOOT OF THE MACHINE CAN REST ON THE RECESS OF EACH LEVELING PADS. THEN ADJUST THE LEVEL OF THE MACHINE BY THE LEVELING BOLTS.

2.3.3 WHEN ANCHOR BOLT IS USED, INSTALL THE MACHINE ACCORDING TO THE PLAN FIG 2.3

2.3.4 BECAUSE MORTARED HOLD MAY SINK WITH TIME UNTIL THE MORTAR IS COMPLETELY SET, PERIODICALLY CHECK THE LEVEL OF THE MACHINE FOR 6 TO 8 MONTHS AFTER THE INSTALLATION AND READJUST IF NECESSARY.

2.3.5 FOR CHECKING THE LEVEL, USE A LEVEL VIAL WITH SCALE OF 0.02MM / 1000MM.

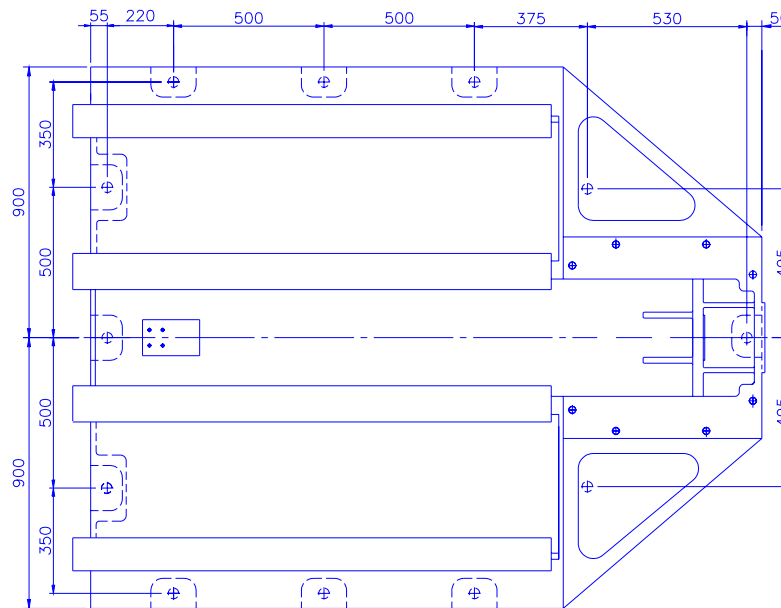


FIG. 2.2 FLOOR PLAN

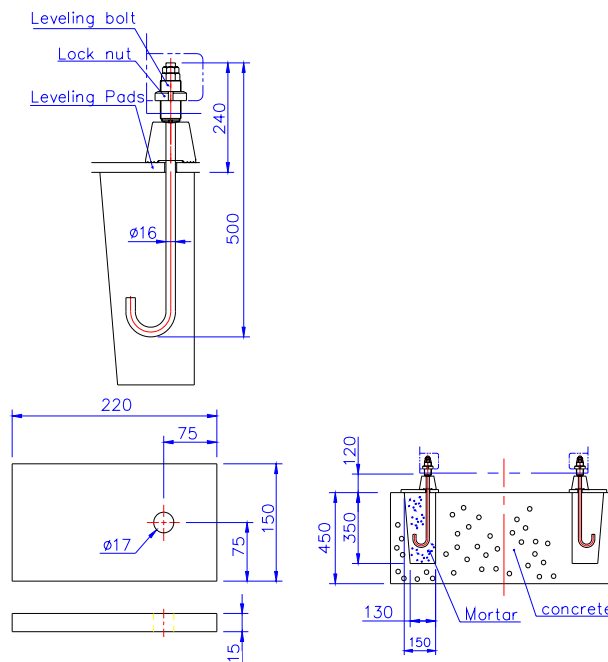


FIG. 2.3 FOUNDATION DRAWING

## **3. PREPARATION FOR TEST RUN**

### **3.1 CLEANING OF MACHINE**

3.1.1 ANTICORROSIVE AGENT HAS BEEN APPLIED ON THE MACHINE TO PREVENT CORROSION.

3.1.2 REMOVE THE ANTICORROSIVE AGENT BEFORE STARTING TEST RUN.

NOTE THAT ANY MOVABLE PART OF THE MACHINE, SUCH AS TABLE, SPINDLE HEAD AND ATC, SHOULD NOT BE MOVED BEFORE THE ANTICORROSIVE AGENT HAS BEEN THOROUGHLY REMOVED.

3.1.3 PARTICULAR CARE SHOULD BE GIVEN TO THOROUGHLY REMOVE THE ANTICORROSIVE AGENT FROM THE SLIDE WAYS, ATC AND SPINDLE TAPER.

### **3.2 OILING AND GREASING**

3.2.1 BEFORE STARTING THE OPERATION, THE MACHINE SHOULD BE PROPERLY OILED.

3.2.2 FOR OILING, REFER TO THE DESCRIPTION ABOUT 7-2 LUBRICATION OF MACHINE.

3.2.3 USE A HIGH QUALITY, PURE OIL SPECIFIED IN THE LUBRICATION TABLE 7-2-2 AND FILL EACH PART. BEFORE STARTING THE TEST RUN, THE FOLLOWING PARTS SHOULD BE OILED.

A. LUBRICATION PUMP OIL TANK.

B. PNEUMATIC UNIT LUBRICATOR

### **3.3 REMOVAL OF LOCKING DEVICES**

3.3.1 ACCORDING TO THE DRAWING FIG. 3.1, REMOVE ALL LOCKING DEVICES USED TO SECURE THE MOVABLE COMPONENTS OF THE MACHINE DURING THE TRANSPORT, SUCH AS Y AXIS LOCKING DEVICES ( 1 AND 2 ), X AXIS LOCKING DEVICES ( 3 AND 4 )

3.3.2 REMOVE THE COUNTER WEIGHT SUPPORTER (6) TO POSITION (9).

3.3.3 HOWEVER, DO NOT REMOVE THE SPINDLE HEAD LOCKING WOOD BLOCK ( 5 ) WHICH SHOULD BE REMOVED AFTER THE POWER SOURCE IS GIVEN TO THE MACHINE. (SHOULD CONTINUE TO READ THIS MANUAL UNTIL 3.5.5 FOR REMOVING ALL LOCKING DEVICES.)

3.3.4 IF THE SURFACE IS FOUND FOUL AFTER THE REMOVAL OF LOCKING DEVICE OR SCREW THOROUGHLY CLEAN.

3.3.5 ONCE REMOVED PACKING MATERIAL. AND LOCKING DEVICES ARE NO LONGER USED.PUT THEM ASIDE FOR SAFE WORK.

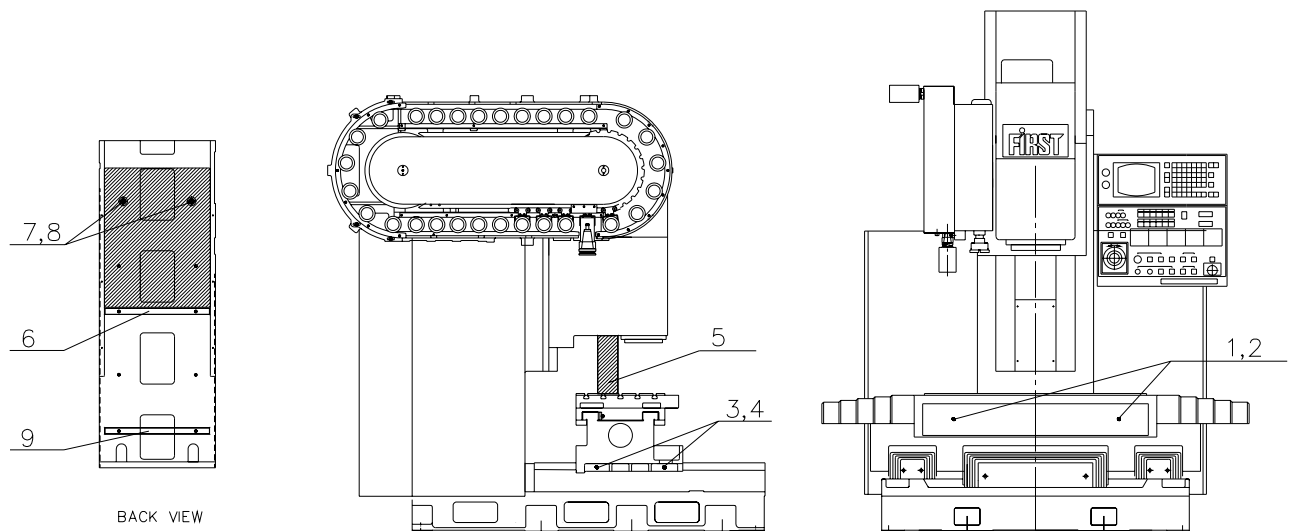


FIG. 3.1 LOCKING DEVICE

### 3.4 AIR PIPING

3.4.1 CONNECT THE PIPES TO THE AIR INLET OF THE PNEUMATIC UNIT.

3.4.2 THE PNEUMATIC DEVICES ARE DESIGNED TO WORK WITH COMPRESSED AIR AT 5.5 KG / CM<sup>2</sup>.

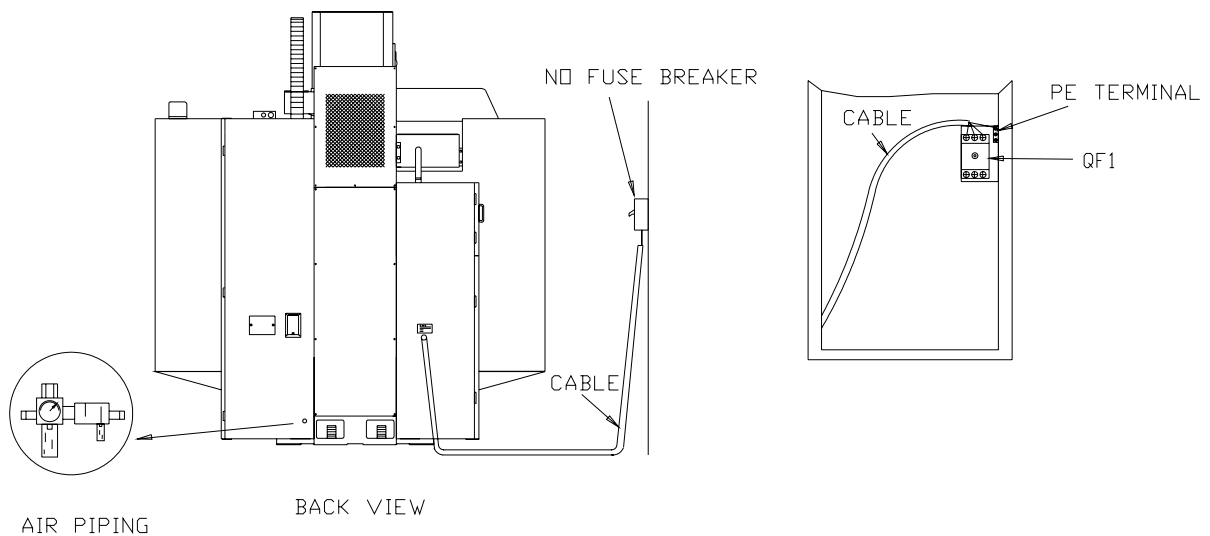
3.4.3 THEREFORE, USE AN AIR SOURCE AT CONSTANT PRESSURE OF AT LEAST 6 KG / CM<sup>2</sup>.

3.4.4 ALTHOUGH AIR FILTER IS PROVIDED TO PROTECT THE PNEUTURE, OIL AND DUST, AND PURIFIED BY AIR FILTER OF 5



MATIC UNIT, THE SUPPLIED AIR SHOULD BE FREE FROM MOISMICRONS.

3.4.5 THE AIR PRESSURE HAVE BEEN PROPERLY SET UP BEFORE SHIPPING OUT THE MACHINE, IF ANY PROBLEM PLEASE CHECK 7.3.1 .



POWER SOURCE

ALIMATION : 3PH 50/60HZ L1,L2,L3+PE

SUPPLY : WIRING VOLTAGE MAY DIFFERENT PLEASE CHECK

CABLE : 70MM<sup>2</sup>X4C MAX : 3M (220V POWER SOURCE)

FIG. 3.2 POWER SOURCE AND PIPING DRAWING

### 3.5 SWITCHING ON THE POWER SOURCE AND CHECKING

SINCE THE ELECTRICAL UNITS ARE BUILT IN THE MACHINE, ONLY CONNECTION OF THE POWER CABLE IS REQUIRED FOR WIRING.

TO WIRE AND CHECK, PROCEEDING AS FOLLOWS:

3.5.1 MAKE SURE THAT CLEANING OF THE MACHINE, OILING AND AIR PIPING HAVE BEEN COMPLETED, AND THAT AIR PRESSURE IS PROPER.

3.5.2 TO CONNECT THE POWER CABLE, INSERT THE POWER CABLE INTO ELECTRIC BOX AS SHOWN IN FIG. 3.2 THEN OPEN THE ELECTRIC BOX DOOR AND PULL THE POWER CABLE , AND CONNECT THE POWER CABLE TO NO FUSE BREAKER TERMINAL QF1 AND PE TERMINAL IN THE ELECTRIC BOX. THE POWER CABLE SHOULD HAVE CRAMP TERMINALS AND THE EACH TERMINALS SHOULD BE FULLY

TIGHTENED WITH PLUS SCREWDRIVER. USE 70 mm<sup>2</sup> OR LARGER CABLE FOR POWER CABLE.

3.5.3 TURN ON THE POWER SWITCH ON THE ELECTRIC BOX, THE LAMP L1 IN FIG. 5.2 WILL LIGHT AND THE COOLING FAN OF THE ELECTRIC BOX AND THE SPINDLE MOTOR COOLING FAN WILL START RUNNING.

3.5.4 HOLD DOWN THE PUSH BUTTON " POWER ON " ON THE NC CONTROL PANEL FOR 2 - 3 SEC. DURING WHICH THE POWER SOURCE WILL BE GIVEN TO THE SERVO SYSTEM, PNEUMATIC UNIT AND OTHER ELECTRIC UNITS AND DEVICES. THEN PERFORM THE FOLLOWING CHECKING:

- A. CHECK IF ALARM MESSAGE APPEARS.
- B. WHEN THE MACHINE IS EQUIPPED WITH COOLANT UNIT, CHECK WHETHER OR NOT THE COOLANT UNIT IS PLUGGED IN, CHECK WHETHER OR NOT THE COOLANT PUMP MOTOR RUNS IN THE DIRECTION INDICATED WITH ARROW.
- C. IF ALARM MESSAGE OCCURS, REFER TO "TROUBLESHOOTING BY USING SELF-DIAGNOSIS" AND ELIMINATE THE CAUSE OF THE ALARM. IF THE COOLANT PUMP MOTOR DOES NOT RUN IN THE DIRECTION INDICATED WITH ARROW PRESS THE PUSH BUTTON "POWER OFF" ON THE NC OPERATION PANEL AND ALSO TURN OFF THE POWER SWITCH OF THE ELECTRIC BOX TO INTERRUPT THE POWER SOURCE AND THEN CHANGE POWER CABLE CONNECTION BETWEEN TWO WIRES OF THREE WIRES OF THE POWER CABLE.
- D. AGAIN CHECK ROTATION OF THE MOTOR.
- E. NOW THE POWER CABLE CONNECTION HAS BEEN COMPLETED.

3.5.5 SET THE MODE SELECT SWITCH ( 17 ) (REFER TO 5.3 EXPLANATION FOR USE OF OPERATION PANEL AND FIG 5.1) ON THE OPERATION PANEL TO " HANDLE X10 POSITION AND THE AXIS SELECT SWITCH TO " Z AXIS " POSITION. GRADUALLY TURN THE MANUAL PULSE GENERATOR CONTROL ( 16 ) IN + DIRECTION TO REMOVE THE SPINDLE HEAD LOCKING WOOD BLOCK.

- A. THE SPINDLE HEAD GRADUALLY DOES UP WHEN THE MANUAL PULSE GENERATOR CONTROL IS TURNED. THEN THE WOOD BLOCK CAN BE REMOVED.

- B. IN SO DOING BE SURE TO HOLD THE WOOD BLOCK BY ONE HAND TO PREVENT ITS FALLING DOWN.
- C. THEN TURN THE MANUAL PULSE GENERATOR COUNTER - DIRECTION TO BRING HEAD DOWN UNTIL STRETCH THE CHAINS AND REMOVE THE COUNTER WEIGHT LOCKING SCREWS ( IF ANY ).
- D. NOW ALL LOCKING DEVICES HAVE BEEN REMOVED FROM THE MACHINE.

### 3.5.6 MOVE SPINDLE HEAD, SADDLE AND TABLE TO THE REFERENCE POINT (COORDINATE ZERO).

TO MOVE THE SPINDLE HEAD TO THE REFERENCE POINT IN Z AXIS, PROCEED AS FOLLOWS:

- A. SET THE MODE SWITCH ( 17 ) TO ZERO RETURN POSITION.
- B. SET THE SWITCH "RAPID OVERRIDE" ( 19 ) TO 25%.
- C. SET THE AXIS SELECT SWITCH 30 TO "Z" ("X" FOR X AXIS AND "Y" FOR Y AXIS).
- D. HOLD DOWN THE PUSH BUTTON "MANUAL FEED + " ( 25 ) UNTIL THE ZERO (REFERENCE POINT) LAMP "Z" ("X" FOR X AXIS AND "Y" FOR Y AXIS) LIGHTS
- E. WHEN THE LAMP LIGHTS, THE SPINDLE HEAD REACHES THE REFERENCE IN Z AXIS. REPEAT THE STEPS 3.5.4 AND 3.5.5 ABOVE TO RETURN THE SADDLE AND TABLE TO THE REFERENCE POINT IN Y AXIS X AXIS RESPECTIVELY.

NOTE: WHEN OPERATION IS RESUMED AFTER THE POWER SOURCE IS ONCE TURNED OFF PERFORM THE OPERATION 3.5.6 TO RETURN THE REFERENCE POINT AND THEN START THE OPERATION AGAIN.

## 4. CAUTIONS

IN ORDER TO MAINTAIN THE INITIAL MACHINING ACCURACY AND PERFORMANCE FOR ANY LENGTH OF TIME, THE MACHINE TOOL MUST BE CORRECTLY USED UNDER THE FAVORABLE ENVIRONMENTAL CONDITIONS.

INADEQUATE OPERATION MAY CAUSE DAMAGES TO THE MACHINE ITSELF AND EXTREME CAUSE ,SERIOUS ACCIDENT TO OPERATOR.

TO PREVENT SUCH TROUBLES, PLEASE READ THIS INSTRUCTION MANUAL CAREFULLY UNTIL YOU REACH COMPLETE UNDERSTANDING AND THEN OPERATE THE MACHINE.

THE FOLLOWING CAUTIONS ARE PARTICULARLY IMPORTANT TO BE OBSERVED FOR SAFE OPERATION.

### 4.1 SETTING UP THE MACHINE AND POWER

#### 4.1.1 THE ENVIRONMENT TO SET UP THE MACHINE

- A. DO NOT EXPOSED THE MACHINE UNDER INCLEMENCY ENVIRONMENT ( SUNNY, RAINING, OR SNOWING ) AND PREVENT FROM SET TOGETHER WITH THE EQUIPMENT WHICH COULD HUMIDIFY THE ENVIRONMENT ( COOLANT TOWER, FILTER TOWER ... ETC. )

#### 4.1.2 CONNECTION AND DISCONNECTION OF POWER CABLE

- A. WHEN THE POWER CABLE IS DISCONNECTED, AND CONNECTED AGAIN, CARE SHOULD BE EXERCISED TO CONNECT EACH TERMINAL IN THE CORRECT PHASE (R,S,T PHASES).
- B. FOR DETAILS OF THE CONNECTION OF THE POWER CABLE, REFER TO THE DESCRIPTION " 3-5 " SWITCHING ON THE POWER SOURCE AND CHECKING."

### 4.2 WHEN OPERATING

4.2.1 WARM THE MACHINE 15 - 30 MIN. DAILY, BEFORE OPERATION.

4.2.2 CHECK IF THE WORKPIECE IS SECURELY LOCKED ON THE TABLE BEFORE MACHINING.

4.2.3 MOVE THE TOOLS AWAY FROM WORKPIECE BEFORE STARTS THE SPINDLE.

4.2.4 MANUAL REFERENCE POINT RETURN AFTER TURNING ON THE POWER SWITCH.

- A. AFTER THE POWER SWITCH IS TURNED ON, DO NOT FORGET TO RETURN THE SPINDLE HEAD, SADDLE AND TABLE TO THE REFERENCE POINT IN MANUAL OPERATION MODE.

4.2.5 INSTALL PULL STUD TIGHTLY

- A. THE PULL STUD SHOULD BE SECURELY INSTALLED TO THE GIVEN TOOL SHANK.
- B. IF THE PULL STUD IS LOOSENED DURING CUTTING, THE TOOL CANNOT BE SECURELY CLAMPED IN THE SPINDLE. SINCE LOOSENED TOOL IS VERY DANGEROUS, BE SURE TO CHECK THE PULL STUD BEFORE STARTING THE OPERATION.

4.2.6 USE OF SPECIFIED PULL STUD

- A. DO NOT USE A PULL STUD NOT SPECIFIED BY US, OTHERWISE THE TOOL CANNOT BE SECURELY CLAMPED IN THE SPINDLE.
- B. THEREFORE, ALWAYS USE ONLY THE PULL STUD CONFORMED TO THE STANDARD MAS-P40T 1....ETC.
- C. DO NOT USE A PULL STUD MADE IN YOUR FACTORY.

4.2.7 INSTALLATION AND REMOVAL OF TOOL TO AND FROM SPINDLE BY HAND

- A. WHEN TOOL IS INSTALLED TO THE SPINDLE, CARE SHOULD BE TAKEN AS FOLLOWS:
  - a. THE TOOL AND SPINDLE BORE TAPERS SHOULD BE CLEAN.
  - b. DO NOT RELEASE HAND FROM THE TOOL UNTIL IT IS ASSURED THAT THE TOOL IS SECURELY CLAMPED IN THE SPINDLE.
  - c. INSTALL THE TOOL UPRIGHT, BUT DO NOT TILT.

NOTE: SINCE AIR FOR CLEANING OF THE SPINDLE BORE AND TOOL TAPER BLOWS FROM THE SPINDLE BORE WHEN THE UNCLAMP SWITCH ON THE OPERATION PANEL IS PRESSED, USE CARE TO SECURELY HOLD THE TOOL BY HAND AND PREVENT DROPPING OF THE TOOL.

B. WHEN THE TOOL IS REMOVED FROM THE SPINDLE BY HAND, CARE SHOULD BE TAKEN AS FOLLOWS:

- a. AT THE SAME TIME AS THE UNCLAMP SWITCH ON THE OPERATION PANEL IS PRESSED, THE PULL STUD IS PRESSED DOWN AND THE TOOL GOES DOWN APPROXIMATELY 0.5MM (0.02 INCH). SINCE AIR BLOW PRESSURE ENHANCES PRESSING DOWN MOVEMENT OF THE TOOL, SECURELY HOLD THE TOOL BY HAND.
- b. AS MENTIONED ABOVE, THE TOOL GOES DOWN WHEN IT IS REMOVED, BE SURE TO RAISE THE SPINDLE HAND AT A POSITION HIGH ENOUGH TO PREVENT CONTACT OF THE TOOL WITH THE WORK OR TABLE.

#### 4.2.8 DO NOT ALLOW HAND TO GAIN ACCESS WITHIN THE MOVABLE RANGE OF ATC UNIT.

A. IT IS VERY DANGEROUS TO ALLOW YOUR HAND TO GAIN ACCESS WITHIN THE MOVABLE RANGE OF THE ATC UNIT OR TO TOUCH THE PERIPHERY OF THE ATC UNIT.

#### 4.2.9 WHEN THE SPINDLE IS UNDER ORIENTATION, DO NOT INSTALL AND REMOVE THE TOOL, WHICH IS PROHIBITED FROM USING A HOLDER IN THE SPINDLE UNDER ORIENTATION, TOGETHER WITH TOOL HOLDER, OTHERWISE THE SPINDLE MIGHT BE DAMAGED.

#### 4.2.10 DO NOT USE A HEAVY TOOL.

A. THE MAXIMUM WEIGHT OF THE TOOLS APPLICABLE TO THE MACHINE IS 6KG ( 18 TOOLS ATC ) AND 18KG ( 24 / 32 TOOLS ATC ).

B. DO NOT USE TOOLS HEAVIER THAN 18KG.

#### 4.2.11 DO NOT USE A LARGE TOOL.

A. FOR 18 TOOLS ATC

- a. THE MAXIMUM DIAMETER OF THE TOOLS APPLICABLE TO THE MACHINE IS 80MM (3.1 INCH)
- b. DO NOT USE TOOLS LARGER THAN THESE DIAMETERS.

B. FOR 24 / 32 TOOLS ATC

- a. THE MAXIMUM DIAMETER OF THE TOOLS APPLICABLE TO THE MACHINE IS 110 MM (4.3 INCH) WHEN TOOLS ARE ADJACENTLY ACCOMMODATED IN THE MAGAZINE.

### 4.2.12 THE FRONT DOOR PROTECTION ( CE ONLY )

- A. NORMALLY WHEN MACHINING IN MEM OR MDI MODE IF YOU OPEN THE FRONT DOOR , THE MACHINE STOPS IN THE SAME CONDITION AS FEED HOLD. TO RESTART, PUSH THE CYCLE START BUTTON ( 22 ) .
- B. WHEN OPEN THE FRONT DOOR AND WORK IN MANUAL MODE THE MACHINE WILL REDUCE THE SPEED OF MOVEMENT, ANYWAY BE WARE TO WARE GOGGLES WHENEVER WORKING IN THE CONDICTION OF OPENING THE FRONT DOOR.
- C. ONLY TECHNICIAN CAN USE THE DOOR SW. RELEASE SWITCH AND WEAR GOGGLES WHEN WORKING.

## 4.3 LUBRICATION AND OIL

### 4.3.1 LUBRICATING OIL SHORTAGE

- A. IF LUBRICATING OIL RUNS SHORT, THE SLIDE WAYS AND BALL SCREWS IN X, Y AND Z AXIS WILL BE RAPIDLY WORN AND THE MACHINE IS DEGRADED.
- B. BE SURE TO CHECK AMOUNT OF LUBRICATING OIL EVERYDAY AND REPLENISH IF NECESSARY.
- C. IF THE LAMP LUBRICATION LEVEL LIGHTS, IMMEDIATELY REPLENISH.

### 4.3.2 AIR SOURCE

- A. SINCE EACH PNEUMATIC UNIT AND DEVICE IS DESIGNED TO WORK ON THE AIR SOURCE AT 5.5 KG / CM<sup>2</sup>, ALWAYS SUPPLY COMPRESSED AIR AT 6KG/CM TO THEM.
- B. THE AIR SOURCE SHOULD BE AT CONSTANT PRESSURE. ALTHOUGH AIR FILTER IS INSTALLED AT THE AIR INTAKE TO PROTECT THE PNEUMATIC UNIT, THE SUPPLIED AIR SHOULD BE FREE FROM MOISTURE, OIL AND DUST, AND PURIFIED BY AIR FILTER OF 5 MICRONS MESH.

### 4.3.3 TOO HIGH OR LOW AIR PRESSURE

- A. THE REQUIRED PRESSURE OF THE AIR SOURCE GIVEN TO THE MACHINE IS 6 KG / CM<sup>2</sup>.

- B. TOO HIGH AIR PRESSURE CAN CAUSE TROUBLE WITH PNEUMATIC UNIT OR DEVICE.
- C. WHILE TOO LOW AIR PRESSURE CAN RESULT IN UNSTABLE OPERATION OF PNEUMATIC UNIT OR DEVICE.
- D. IF AIR PRESSURE GOES DOWN BELOW 4 KG/CM, THE LAMP AIR PRESSURE ON THE OPERATION PANEL LIGHTS, THE ALARM BUZZER SOUNDS AND TOOL CHANGE BECOMES IMPOSSIBLE.
- E. SEE 7.3 FOR MORE INFORMATION.

### 4.3.4 ADJUSTMENT OF AIR FLOW RATE TO EACH CYLINDER

- a. THE AIR FLOW RATE TO EACH CYLINDER SHOULD BE ADJUSTED BY RESPECTIVE SPEED CONTROLLER .

## 4.4 HEALTHY AND SAFETY PROTECTION

### 4.4.1 NOISE OF THE MACHINE

#### A. CONDITIONS :

- a. A.) DOOR CLOSED.
- b. B.) SPINDLE RUNS.
- c. C.) TESTING 1 M FROM THE MACHINE.

B. FOR 4000 RPM. SPINDLE, THE MAXIMUM NOISE IS  $70 \pm 5$  DB.

NOTE : CUTTING WORKPIECE MAY CAUSE LOUDER NOISE . WHEN WORKING LONG TIMES IN CUTTING WORKPIECE BE WARE TO WEAR EARPLUGS.

### 4.4.2 WHEN OPERATE MANUALLY

A. IF OPERATED BY OPENING THE FRONT DOOR AND MACHINING BY MANUAL , BE SURE TO WEAR THE GOGGLES , AND ONLY TECHNICIAN PERSON WHO HAVE BEEN TRAINED CAN OPERATE IN THIS WAY.

4.4.3 MOVE THE TOOLS AWAY FROM WORKPIECE BEFORE MAINTENANCE OR ANY CHECK OF THE MACHINE OR WORKPIECE.

## 4.5 OTHER NOTICES



4.5.1 IN CASE OF MAINTENANCE, SERVICING, AND PARTS CHANGES, PLEASE CONTACT OUR SALES AGENCIES OR BUSINESS DEPARTMENT DIRECTLY.

4.5.2 SUGGESTIONS FOR IMPROVEMENTS OF THE MACHINE STRUCTURE AND / OR INQUIRIES, INCLUDING PLANT VISITATIONS, ARE CORDIALLY WELCOME.

4.5.3 THE MANUFACTURER REVERSES THE RIGHT TO MODIFY THE DESIGN, OPERATIONS, STRUCTURE ETC. ALL OF THE MACHINE WITHOUT ANY PRIOR NOTICE.

## 5. OPERATION OF MACHINE

### 5.1 SWITCHING ON THE POWER SOURCE TO MACHINE.

APPLY THE POWER SOURCE TO THE MACHINE ITSELF AS FOLLOWS:

- 5.1.1 MAKE SURE THAT NO TROUBLE OCCURS WITH THE MACHINE REFERRING TO THE DESCRIPTION OF 7-1 CHECKING BEFORE STARTING THE MACHINE, WRITTEN IN THE DAILY CHECKING SCHEDULE.
- 5.1.2 TURN ON THE POWER SWITCH ON THE ELECTRIC BOX. THE LAMP SOURCE ON THE OPERATION PANEL WILL LIGHT AND SPINDLE MOTOR AND THE COOLING FAN IN THE ELECTRIC BOX WILL START RUNNING.
- 5.1.3 HOLD DOWN THE PUSH BUTTON POWER ON THE NC OPERATION PANEL FOR 2 OR 3 SEC. THE POWER SOURCE WILL BE GIVEN THROUGHOUT THE MACHINE.
- 5.1.4 REFERRING TO THE DESCRIPTION OF CHECKING BEFORE STARTING THE MACHINE IN DAILY CHECKING BEFORE STARTING THE MACHINE IN DAILY CHECKING SCHEDULE 7-1, MAKE SURE NO TROUBLE IS FOUND IN THE MACHINE AND THEN START THE OPERATION.

### 5.2 SWITCHING OFF THE POWER SOURCE

TO TURN OFF, PROCEED AS FOLLOWS:

- 5.2.1 MAKE SURE THAT THE LAMP OF THE CYCLE START ON PUSH BUTTON ON THE OPERATION PANEL DOES NOT LIGHT.
- 5.2.2 MAKE SURE THAT ALL MOVABLE PARTS OF THE MACHINE ARE IN STANDSTILL.
- 5.2.3 WHEN TAPE PUNCH UNIT (ASR33 OR RS-232C) IS USED, TURN OFF THE UNIT.
- 5.2.4 THEN HOLD THE PUSH BUTTON POWER OFF ON THE NC OPERATION PANEL FOR 1 OR 2 SEC.
- 5.2.5 TURN OFF THE POWER SWITCH ON THE ELECTRIC BOX.

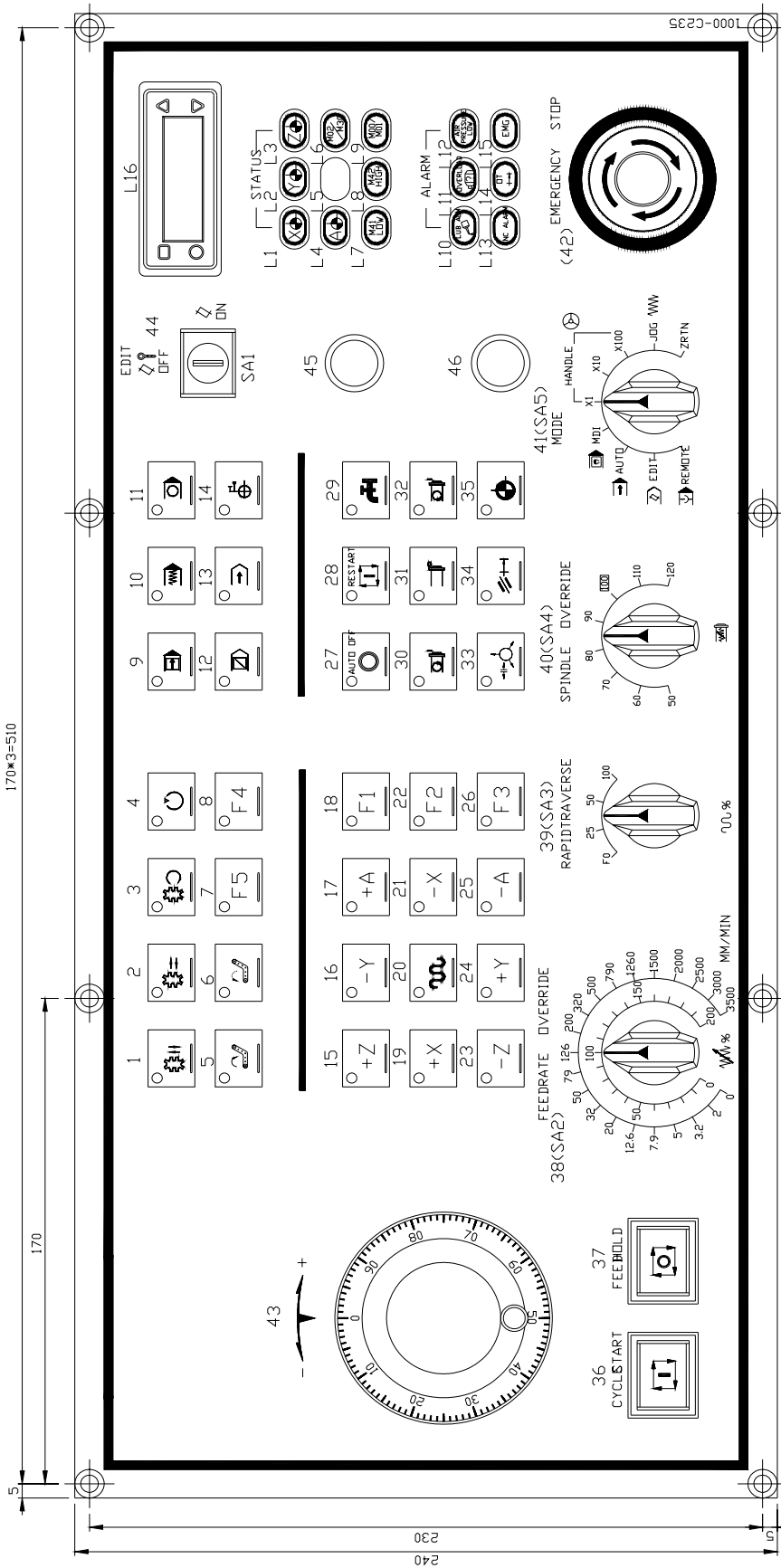
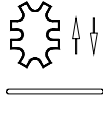
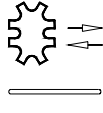
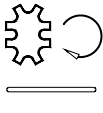
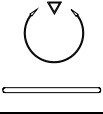
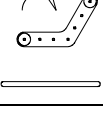
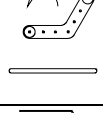
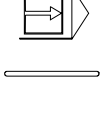
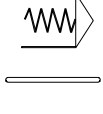
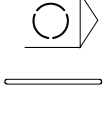
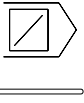
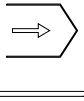
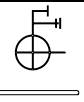
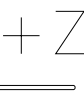
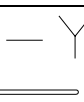



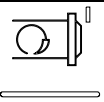
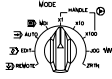
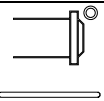
FIG. 5.1 OPERATION PANEL




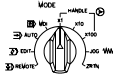







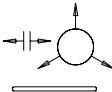
## 5.3 EXPLANATION FOR USE OF OPERATION PANEL

NO	PIC.	NAME	DESCRIPTION
1		TOOL MAGAZINE UP / DOWN	USED ONLY IN 18 TOOLS MAGAZINE PUSH TO MOVE THE MAGAZINE DOWN PUSH AGAIN TO MOVE BACK
2		TOOL MAGAZINE FORWARD / BACKWARD	USED ONLY IN 18 TOOLS MAGAZINE IN THE CONDITION OF "MANUAL MODE" AND M19 STATUS AND WITHOUT TOOL INTERFERENCE PUSH THIS BUTTOM TO MOVE MAGAZINE FORWARD PUSH AGAIN TO MOVE BACK
3		TOOL MAGAZINE TURN CLOCKWISE	PUSH THIS BUTTOM TO ROTATE TOOL MAGAZINE CLOCKWISE RELEASE TO STOP
4		M19 SPINDLE ORIENTATION	PUSH THIS BUTTOM TO ORENTATE SPINDLE (M19) BUT Z AXIS MUST BACK TO ZERO POSITION IN ADVENCE
5		CHIP CONVEYOR ON / OFF	PUSH THIS BUTTOM TO START THE CHIP CONVEYOR PUSH AGAIN TO STOP
6		CHIP CONVEYOR REVERSE ON / OFF	PUSH THIS PUTTOM TO REVERSE THE CHIP CONVEYOR RELEASE TO STOP IT
9		SINGLE BLOCK	THE SWITCH IS APPLIED TO EXECUTE TAPE PROGRAM OR MEMORY PROGRAM STEP BY STEP. WHEN THE PUSH BUTTON IS SET TO ON AND THE PUSH BUTTON CYCLE START $\underline{\quad} \text{---} \overset{\text{A}}{\quad}$ IS PRESSED. THE MACHINE EXECUTES ONE BLOCK OF THE PROGRAM AND STOPS. WHEN THE PUSH BUTTON SINGLE BLOCK IS PRESSED DURING MEM MODE OPERATION, THE MACHINE STOPS AFTER EXECUTED OF THE CURRENT BLOCK.
10		DRY RUN	WHEN THE SWITCH IS SET AT ON, FEED COMMAND (F CODE) IN THE PROGRAM IS IGNORED DURING. MEM, MDI OPERATION MODE AND THE FEED SPEED SELECTED BY THE SELECT SWITCH JOG FEEDRATE $\underline{\quad} \text{---} \times$ BECOMES EFFECTIVE. THE RAPID TRAVERSE SPEED CAN BE ALSO CHANGED BY THE SWITCH DRY RUN.
11		OPTIONAL STOP	BY SETTING THIS SWITCH, THE OPTIONAL STOP FUNCTION OF M 01 IS IGNORED OR NOT IGNORED DURING MEM OPERATION MODE. WHEN THE SWITCH IS SET AT ON, THE BLOCK WITH M 01 IS

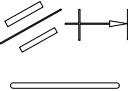




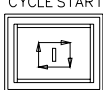





			EXECUTED AND THE OPERATION STOPS AFTER THE EXECUTION OF THE BLOCK.
12		OPTIONAL BLOCK SKIP	<p>BY SETTING THIS SWITCH, THE BLOCK HAVING "/" (SLASH) AT ITS HEAD IS IGNORED OR NOT IGNORED. WHEN THE SWITCH IS AT ON, THE BLOCK HAVING "/" AT ITS HEAD IS IGNORED.</p> <p>THE SWITCH IS NOT EFFECTIVE FOR THE BLOCK IN EXECUTION AND THE BLOCK READ IN THE BUFFER, AND BECOMES EFFECTIVE FROM THE NEWLY READ BLOCK.</p>
13		MACHINE LOCK	<p>WHEN THE SWITCH IS PRESSED THE MACHINE IS LOCKED.</p> <p>REPRESS THE SWITCH TO RELEASE POSITION AND UNLOCKED THE MACHINE</p> <p><b>** MACHINE LOCK</b></p> <p>IN MEM OR MDI OPERATION MODE ( 22 ), THE MACHINE OPERATION CAN BE SIMULATED, THAT IS, THE MACHINE DOES NOT ACTUALLY WORK, BUT THE DISPLAY APPEARS AS IF THE MACHINE ACTUALLY DOES.</p>
14		MANUAL ABSOLUTE	<p>WHEN ( 22 ) MEM OPERATION MODE IS INTERRUPTED BY MANUAL OPERATION, THIS SWITCH IS EFFECTIVE TO THIS MANUAL AXIS MOVEMENT IN MANUAL MODES.</p> <p>SWITCH ON : THE MOVE AMOUNT IS ADDED TO THE ABSOLUTE COORDINATE VALUE.</p> <p>OFF: THE MOVE AMOUNT IS NOT ADDED TO THE ABSOLUTE COORDINATE.</p> <p>FOR DETAILS OF THE SWITCH FUNCTION, REFER TO THE DESCRIPTION OF THE "MANUAL ABSOLUTE" A SEPARATE INSTRUCTION MANUAL "PROGRAMMING" PAGE.</p>
15		MANUAL FEED +/-	<p>THE SWITCH IS USED TO MANUALLY COMMAND COORDINATE DISPLACEMENT. OPERATE THE SWITCH AS FOLLOWS:</p> <p><b>A.</b>SELECT JOG MODE BY THE MODE SELECT SWITCH ( 22 )</p> <p><b>B.</b>SPECIFY THE AXIS TO BE DISPLACED THROUGH THE AXIS SELECT SWITCH ( 18 )</p> <p><b>C.</b>WHEN JOG MODE IS SELECTED AT STEP 1), SET THE JOG FEED SPEED BY OPERATING THE JOG FEEDRATE SELECT SWITCH ALSO WHEN RAPID MODE IS SELECTED AT STEP 1). SET THE RAPID SPEED BY</p>
16			
17			


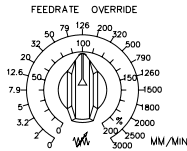
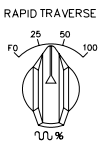
19			<p>OPERATING. THE RAPID OVERRIDE SELECT SWITCH</p> <p></p> <p>D.PRESS THE SWITCH MANUAL FEED + OR MANUAL FEED - WHICHEVER CORRESPONDS TO THE DIRECTION TO BE DISPLACED.</p>
21			
23			
24			
25			
20		RAPID	IN JOG MODE PUSH THIS BUTTOM <b>TOGETHER WITH X+ X- Y+ Y- Z+ Z- A+ A-</b> TO MOVE THE AXIS RAPIDLY.
18		SPARE FUNCTION FOR OPTION	<p>THESE SPARE FUNCTION USED FOR SOME OPTIONS, IT COULD BE AS FOLLOW :</p> <ul style="list-style-type: none"> <li>● DOOR SWITCH NEGLECT</li> </ul> <p>ONLY THE MACHINE WITH (CE) MARK COULD HAVE THIS OPTION.</p> <p>THIS OPTION USED TO LET OPERATORS COULD OPERATE THE MACHINE WITH LESS LIMIT IN THE DOOR OPEN STATUS. <b><u>ONLY AUTHORIZED PERSON CAN USE THIS FUNCTION</u></b></p>
22			
26			
8			
7			
27	AUTO OFF 	AUTO POWER OFF	PUSH THIS BUTTOM AND AFTER PROGRAM READS M30, THE MACHINE WILL SHOOT DOWN THE MAIN POWER AUTOMATICLLY ( OPTION FUNCTION )
28	RESTART 	PROGRAM RESTART	PUSH THIS BUTTON AND WHEN TOOL BROKE DURING RUNS A PROGRAM , YOU DON'T HAVE TO START THE PROGRAM FROM THE BEGINNING. FOR DETAIL OPERATION REFER TO THE CONTROL SYSTEM OPERATOR'S MANUAL. ( FANUC OPERATOR'S MANUAL 4.4 PROGRAM RESTART )
29		COOLANT ON / OFF	<p>THE SWITCH IS USED TO MANUALLY START AND STOP THE CUTTING OIL PUMP.</p> <p>WHEN THE COOLANT ON SWITCH (PUSH BUTTON) IS PRESSED, THE CUTTING OIL PUMP STARTS DELIVERING</p>

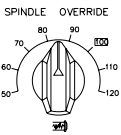
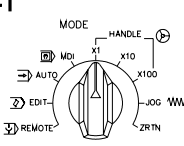




			<p>CUTTING OIL.</p> <p>THE COOLANT ON/OFF SWITCHES ARE APPLICABLE NO MATTER WHAT MODE IS SELECTED.</p> <p>PRIORITY IS GIVEN TO THE SETTING OF THE SWITCHES OVER M FUNCTION SUCH AS M08 (CUTTING OIL START) AND M09 (CUTTING OIL STOP).</p>
30		MO3 SPINDLE ON CLOCKWISE	<p>TO START OR STOP THE SPINDLE IN RAPID, JOG OR HANDLE MANUAL OPERATION MODE, THESE SWITCH ARE USED.</p> <p style="text-align: right;">  </p> <p><b>A. SET THE MODE SELECT SWITCH TO MDI POSITION AND SET SPINDLE SPEED IN MDI OPERATION</b></p>
31		SPINDLE STOP	

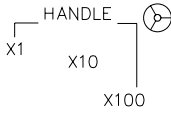




<p>32</p>	 <p>MO4 SPINDLE ON COUNTERCLOCK WISE</p>	<p>I</p>	<p>POSITION AND SET SPINDLE SPEED IN MDI OPERATION AS FOLLOW..</p> <ul style="list-style-type: none"> <li>● IN FANUC 0MD CONTRAL</li> </ul> <ol style="list-style-type: none"> <li>1. KEYIN <b>SXXXX</b> THEN "INPUT"</li> <li>2. PUSH  CYCLE START TO EXECUTE</li> </ol> <ul style="list-style-type: none"> <li>● IN FANUC 18MC CONTROL</li> </ul> <ol style="list-style-type: none"> <li>1. KEYIN <b>SXXXX;</b></li> <li>2. PUSH  CYCLE START TO EXECUTE</li> </ol> <p><b>B. SELECT THE DESIRED MODE AMONG RAPID, JOG AND HANDLE MODES BY THE MODE SELECT SWITCH</b></p>  <p><b>C. PRESS THE PUSH BUTTON SPINDLE CW  OR CCW  ,THE SPINDLE WILL START RUNNING AT THE SET SPEED AT STEP 1.)</b></p> <p><b>D. THE SPINDLE STOPS WHEN THE PUSH BUTTON  SPINDLE OFF  IS PRESSED.</b></p> <p><b>E. TO START AGAIN, PRESS THE PUSH BUTTON SPINDLE ON   THE SPINDLE STARTS RUNNING AT THE SET SPEED AT STEP 1) AGAIN.</b></p> <p>TO CHANGE SPINDLE SPEED REPEAT STEPS A ) - E ) AFTER SETTING PUSH THE CYCLE START BUTTOM  THE SPINDLE WILL RUN AT THE NEWLY SET SPEED.</p>
<p>33</p>	 <p>TOOL CLAMP / UNCLAMP</p>		<p>THE SWITCH IS USED TO MANUALLY INSTALL AND REMOVE TOOL IN RAPID JOG OR HANDLE MODE OPERATION.</p> <p>THIS SWITCH IS LIGHTING AND ALSO SHOWING UNCLAMP CONDITION OF THE SPINDLE WHEN THIS SWITCH IS PRESSED AGAIN, THE LIGHTING GOES OUT AND CLAMP CONDITION OF THE SPINDLE SETS AGAIN.</p> <p>TO MANUALLY INSTALL OR REMOVE THE TOOL REFER TO THE DESCRIPTIONS 5.5 WHEN INSTALL OR REMOVE THE TOOL MANUALLY.</p>


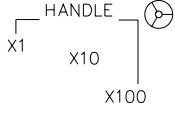
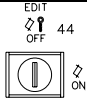



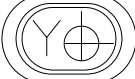













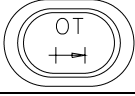

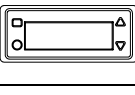
34		2ND LIMIT SWITCH REMOVE	<p>OVER-TRAVEL IN EACH IS DETECTED AT TWO STAGES.</p> <p>UNDER USUAL CONDITION, OVER - TRAVEL CAN BE DETECTED BY THE STORED STROKE LIMIT AT THE FIRST STAGE.</p> <p>ANOTHER OVER TRAVEL LIMIT SWITCH IS PROVIDED AT THE SECOND STAGE TO DETECT OVER - TRAVEL IF IT IS NOT DETECTED AT THE FIRST STAGE.</p> <p>IN SUCH A CASE, ALARM (EMERGENCY STOP) TAKES PLACE, IMMEDIATELY STOPPING THE MACHINE. 2ND LS REMOVE SWITCH IS USED. FOR USE OF THIS 2ND LS REMOVE SWITCH WHEN OVERTRAVEL IS DETECTED BY 2ND LIMIT SWITCH, REFER TO THE DESCRIPTION 5.6. WHEN OVERTRAVEL IS DETECTED BY 2ND LIMIT SWITCH.</p>
35		AUTO ZERO RETURN	<p>THE SWITCH IS USED TO RETURN THE SPINDLE HEAD( Z ), SADDLE( Y ) AND TABLE ( Z )TO THE REFERENCE POINT ( COORDINATE ZERO).</p> <p>THE OPERATION IS AS FOLLOWS:</p> <p><b>A.</b> SET THE MODE SWITCH  TO ZRTN</p> <p><b>B.</b> PUSH THIS BUTTOM </p> <ul style="list-style-type: none"> <li>● THE TRAVEL SPEED WILL REFER TO  RAPID TRAVERSE SWITCH</li> <li>● IF START POSITION FOR REFERENCE POINT RETURN IS LOCATED WITHIN 50MM (2 INCH) FROM THE REFERENCE POINT (DECELERATION RANGE) THE AXIS WILL GOES REVERSE DIRECTION UNTIL PROPER DISTANCE.</li> </ul>
36	<p>CYCLE START</p> 	CYCLE START	<p>THIS IS A LIGHTING PUSH BUTTON, AND USED TO START OPERATION IN  AUTO OR MDI OPERATION MODE. WHEN THE PUSH BUTTON IS PRESSED, THE LAMP IN THE PUSH BUTTON LIGHTS.</p> <p>THE PUSH BUTTON IS PRESSED TO RESTART OPERATION AFTER OPERATION STOP WHEN THE PUSH BUTTON FEED HOLD  OR SINGLE BLOCK  IS OPERATED, OR WHEN OPERATION MODE IS CHANGED.</p>
37	<p>FEED HOLD</p> 	FEED HOLD	<p>THIS PUSH BUTTON IS USED TO STOP OPERATION IN  AUTO OR MDI OPERATION MODE. WHEN THE PUSH BUTTON IS PRESSED, THE LAMP IN THE PUSH BUTTON</p>

			<p style="text-align: center;">CYCLE START </p> <p>CYCLE START GOES OUT. WHEN THE PUSH BUTTON IS PRESSED IN THE COURSE OF COORDINATE DISPLACEMENT, THE MOVEMENT IS DECELERATED AND STOPS. WHILE THE OPERATION DOES NOT IMMEDIATELY STOP, WHEN THE PUSH BUTTON IS DEPRESSED DURING EXECUTION OF M, S OR T FUNCTION, BUT STOPS AFTER THE COMPLETION OF THE FUNCTION. THE PUSH BUTTON IS NOT EFFECTIVE DURING TAPPING CYCLE ( G84 ), ( G74 ) OR DWELL (G04). HOWEVER OPERATION IS STOPPED DURING EXECUTION OF CANNED CYCLE BY OPERATING THE PUSH BUTTON SINGLE BLOCK, THE LAMP IN THE PUSH BUTTON LIGHTS INDICATING THE EXECUTION PUSH BUTTON LIGHTS INDICATING THE EXECUTION OF THE CANNED CYCLE.</p>
<p><b>38</b></p> 		<p>OVERRIDE SELECT SWITCH (%)</p> <p>JOG FEEDRATE SELECT SWITCH ( MM / MIN )</p>	<p>A. THE SELECT SWITCH PERMITS OVERRIDING THE FEED SPEED SPECIFIED BY F CODE IN AUTO OR MDI MODE OPERATION WITHIN A RANGE FROM</p> <p>0 TO 200% (18MC)</p> <p>0 TO 150% (0MD)</p> <p>WITH INCREMENT OF 10%.</p> <p>HOWEVER, THE OVERRIDE SELECTION REMAINS INEFFECTIVE WHEN SWITCH LOCATED OVER THE OVERRIDE SELECT SWITCH IS SET AT CANCEL POSITION. THE OVERRIDE SELECT SWITCH DOES NOT EFFECT THE TAPPING FEED SPEED IN TAPPING CYCLE (G84).</p> <p>B. THE JOG FEED SPEED CAN BE PRESET BY THIS SELECT SWITCH IN AUTO OR MDI OPERATION MODE WHEN JOG MODE IS SELECTED BY THE MODE SELECT SWITCH AND THE SWITCH DRY RUN IS SET AT ON.</p> <p>THE SPEED IS SELECTABLE WITHIN A RANGE FROM</p> <p>0 TO 3,000 MM / MIN (18MC)</p> <p>0 TO 1,260 MM / MIN (0MD)</p>
<p><b>39</b></p> 		<p>RAPID OVERRIDE SELECT SWITCH</p>	<p>RAPID SPEED CAN BE OVERRIDDEN BY 100%, 50% 25% FO.</p> <p>WHEN THE RAPID TRAVERSE SPEED IS AT 12M/MIN, AND OVERRIDDEN BY 50%, FOR EXAMPLE, THE SPEED IS REDUCED TO 6 M / MIN.</p> <p>F0 IS SET TO 100 MM / MIN. THE OVERRIDE FUNCTION IS APPLICABLE TO THE FOLLOWING RAPID TRAVERSE.</p> <p><b>A.</b>RAPID TRAVERSE IN GOO.</p> <p><b>B.</b>RAPID TRAVERSE DURING EXECUTION OF CANNED CYCLE.</p> <p><b>C.</b>RAPID TRAVERSE IN G27,28,29.</p>

		D.MANUAL RAPID TRAVERSE IN RAPID MODE OPERATION.
<p><b>40</b></p>  <p>SPINDLE SPEED OVERRIDE SELECT SWITCH</p>		THIS SWITCH CAN OVERRIDEN THE SPINDLE SPEED FROM 50 % TO 120 % , 10 % PER STEP.
<p><b>41</b></p> 	<p>DNC (REMOTE) MODE</p>  <p>REMOTE</p>	USE THIS MODE TO RUNS THE PROGRAM ( MACHINING ) FROM YOUR CONNECTED PERSONAL COMPUTER, AND THE OPERATION DEPENDS ON THE DNC SOFTWARE IN YOUR COMPUTER .
	<p>EDIT MODE</p>  <p>EDIT</p>	THIS MODE IS SELECTED TO STORE PROGRAM IN THE MEMORY AND TO EDIT THE PROGRAM STORED IN THE MEMORY.
	<p>AUTO (MEMORY) MODE</p>  <p>AUTO</p>	THIS MODE IS SELECTED TO EXECUTE THE PROGRAM STORED IN THE MEMORY, OR TO SEARCH THE SEQUENCE NO. OF PROGRAM STORED IN THE MEMORY.
	<p>MDI MODE</p>  <p>MDI</p>	THIS MODE IS SELECTED WHEN DATA IS MANUALLY ENTERED (KEY IN).

	<p>HANDLE MODE</p> 	<p>THIS MODE IS SELECTED WHEN USING PULSE GENERATOR HANDWHEEL  TO MOVE AXIS MANUALLY</p> <p><b>THE AXIS SELECTED BY THE AXIS SELECT BUTTOM</b></p> <p><u>+X</u> , <u>+Y</u> , <u>-Z</u> , <u>+A</u></p> <p>AFTER SELECTED THE LAMP OF THE BUTTOM WILL BLINK</p> <p>X1 = 0.001 MM ( OR 0.0001 INCH IN INCH SYSTEM).</p> <p>X10 = 0.01 MM (OR 0.001 INCH IN INCH SYSTEM).</p> <p>X100 = 0.1 MM (OR 0.01 INCH IN INCH SYSTEM).</p>
	<p>JOG MODE</p> <p>JOG </p>	<p>THIS MODE IS SELECTED TO MANUALLY DISPLACE COORDINATE IN THE AXIS SELECTED BY THE AXIS SELECT BUTTOM X+ X- Y+ Y- Z+ Z- A+ A- FOR JOG OPERATION.</p>
	<p>ZERO RETURN</p> <p>ZRTN</p>	<p>SELECT THIS MODE THEN KEEP PUSHING</p> <p><b>X+</b> TO MOVE X TO ZERO POINT</p> <p><b>Y+</b> TO MOVE Y TO ZERO POINT</p> <p><b>Z+</b> TO MOVE Z TO ZERO POINT</p> <p><b>A+</b> TO MOVE A TO ZERO POINT</p> <p>YOU CAN PUSH 2 OR 3 AXIS TOGETHER</p> <p>OR IN THIS MODE PUSH "  AUTO ZERO RETURN" BUTTOM TO MOVE THREE AXIS TOGRTHHER TO ZERO POINT.</p>
<p>42</p> 	<p>EMERGENCY STOP</p>	<p>THE PUSH BUTTON IS USED IMMEDIATELY STOP THE MACHINE OPERATION IN CASE OF EMERGENCY. AT THE SAME TIME AS THE PUSH BUTTON IS PRESSED, THE SERVO SYSTEM OF THE MACHINE IS SHUT OFF THE POWER SOURCE AND THE NC EQUIPMENT IS RESET.</p> <p>TO START THE MACHINE AGAIN AFTER THE EMERGENCY STOP, PROCEED AS FOLLOWS:</p> <ol style="list-style-type: none"> <li><b>A.</b> ELIMINATE THE CAUSE OF EMERGENCY STOP AND SET UP THE MACHINE TO BE READY FOR OPERATION.</li> <li><b>B.</b> WHEN THE EMERGENCY STOP PUSH BUTTON IS PRESSED, THE PUSH BUTTON IS LOCKED. TO RELEASE THE PUSH BUTTON FROM LOCKING, ROTATE OR PULL IT .</li> <li><b>C.</b> PRESS RESET BUTTON ON THE NC OPERATION PANEL.</li> <li><b>D.</b> AFTER RESETING FROM THE EMERGENCY STOP, BE SURE TO PERFORM ZERO RETURN OF ALL AXIS IN</li> </ol>

			MANUAL OPERATION.
43		PULSE GENERATOR HANDWHEEL	USED ON MODE 
44		PROGRAM PROTECT	THE SWITCH IS FOR PROTECTION OF THE PROGRAM STORED IN THE MEMORY FROM ERRONEOUS OPERATION. SINCE THE SWITCH IS EFFECTIVE WHEN IT IS SET AT OFF POSITION, MAINTAIN THE SWITCH SET AT OFF FOR USUAL OPERATION. WHEN THE SWITCH IS SET AT ON, THE FOLLOWING FUNCTIONS ARE AVAILABLE. 1. STORING AND EDITION OF PROGRAM. 2. RESETTING OF COORDINATE SYSTEM WHEN THE SWITCH ZERO RETURN IS PRESSED WITH X, Y OR Z AXIS SPECIFIED, THE ABSOLUTE VALUE OF THE CORRESPONDING AXIS TURN TO "0". 3. SETTING OF TOOL POSITION OFFSET, TOOL DIAMETER OFFSET AND TOOL SETTING UP.
45		OPTIONAL FUNCTION	EX : Z AXIS CANCEL.WHEN PUSH WILL CANCEL Z AXIS COMMAND.
46		OPTIONAL FUNCTION	
L1		LAMP X	THE LAMP INDICATES THAT THE TABLE (X AXIS). SADDLE (Y AXIS) AND SPINDLE HEAD (Z AXIS) ARE AT THE REFERENCE POINT (COORDINATE ZERO). THE LAMP LIGHTS WHEN REFERENCE POINT IS COMPLETED BY MANUAL OPERATION, OR RETURN TO REFERENCE POINT (G28). OR REFERENCE POINT RETURN CHECK (G27). THE LAMP GOES OUT WHEN THE TABLE, SADDLE OR SPINDLE OR SPINDLE HEAD LEAVES THE REFERENCE POINT.
L2		LAMP Y	
L3		LAMP Z	
L4		LAMP 4TH AXIS ZERO POSITION	
L5		OPTION	BLANK FOR OPTION
L6		PROGRAM FINISH	WHEN PROGRAM EXECUTE M02 OR M30 THIS LAMP LIGHTS
L7		LAMP LOW GEAR	INDICATES THE LOW GEAR OF THE SPINDLE ( NOT USED ON MCV-600/800/1000 )
L8		LAMP HIGH GEAR	INDICATES THE HIGH GEAR OF THE SPINDLE ( NOT USED ON MCV-600/800/1000 )

L9		LAMP OPTIONAL STOP	THE LAMP LIGHTS WHEN THE PROGRAM RUNS TO THE OPTIONAL STOP ( M01 ) OR THE PROGRAM RUNS TO THE END ( M00 ) , .
L10		LAMP LUBRICATIO N LEVEL (FAILURE)	IF AMOUNT OF LUBRICATING OIL DECREASES TO ABOUT ONE FOURTH OF THE LUBRICATING OIL TANK CAPACITY, THE LAMP LIGHTS.  SINCE THE MACHINE DOES NOT STOP AUTOMATICALLY WHEN THE LAMP LIGHTS, IMMEDIATELY STOP THE MACHINE AND REPLENISH NECESSARY AMOUNT OF OIL WHEN THE IS FOUND LIGHTING.  WHEN THE OIL TANK IS FILLED. THE LAMP GOES OUT.
L11		LAMP OVERLOAD	THE LAMP LIGHTS IF OVERLOAD OCCURS WITH THE COOLANT PUMP , LUBRICATION PUMP OR ATC MAGAZINE DRIVE MOTOR.  SINCE THE MACHINE DOES NOT STOP AUTOMATICALLY WHEN THE LAMP LIGHTS, STOP THE MACHINE IMMEDIATELY AND EXAMINE THE THERMAL RELAYS FOR CAUSE IF THE LAMP LIGHTS. TO RESUME THE OPERATION, ELIMINATE THE CAUSE OF THE OVERLOAD.
L12		LAMP AIR PRESSURE ( FAILURE)	THE LAMP LIGHTS IF COMPRESSED AIR PRESSURE GOES DOWN BELOW 4 KG/CM <sup>2</sup> .  THE ALARM BUZZER ALSO SOUNDS AND TOOL CHANGE BECOMES IMPOSSIBLE WHEN THIS LAMP LIGHTS.  WHEN THE LAMP LIGHTS, STOP THE MACHINE OPERATION, CHECK AIR PRESSURE IN THE PNEUMATIC UNIT THROUGH PRESSURE GAUGE AND AIR PRESSURE TO 5.5KG/CM <sup>2</sup> .
L13		LAMP NC ALARM	WHEN GENERATE SEQUENCE ERROR, THIS LAMP LIGHTS
L14		OT DETECT	WHEN X, Y, Z OR 4TH AXIS DETECT THE HARDWARE OVERTRAVEL THIS LAMP LIGHTS
L15		EMERGENCY STOP	IN EMERGENCY STOP STATUS, THIS LAMP LIGHTS.
L16		TOOL NO. INDICATOR	INDICATE THE TOOL NUMBER.

## 5.4 OTHER DEVICE FOR SIGNAL

### 5.4.1 BUZZER SIGNAL

THE BUZZER IS ON THE BOTTOM OF THE CONTROL PANEL BOX ,  
WHEN ALARM ACCRUES THE BUZZER SOUNDS. TO CUT OF THE



BUZZER , JUST PUSH

### 5.4.2 PROGRAM END SIGNAL LIGHT (OPTION)

WHEN M30 (END OF PROGRAM CODE) IS READ, THIS LIGHT IS

LIGHTING. TO STOP THE LIGHT, PRESS F3 FEED HOLD SWITCH

## 5.5 WHEN TOOL CHANGE MOVEMENT IS INTERRUPTED BY EMERGENCY STOP OR RESET


### 5.5.1 18 TOOLS ATC

A. THE ATC MAGAZINE AND SPINDLE TAKES FOLLOWING CONDITIONS WHEN TOOL CHANGE MOVEMENT INTERRUPTED BY EMERGENCY STOP OR RESET.


- a. ATC MAGAZINE KEEPS THE POSITION WHEN EACH MOVEMENT OF ATC MAGAZINE HAS COMPLETED.
- b. THE ATC MAGAZINE GOES AND STOPS AT UP POSITION WHEN THE ATC MAGAZINE IS MOVING TO UP POSITION OR ON THE WAY TO DOWN POSITION.
- c. THE ATC MAGAZINE GOES AND STOPS AT BACK POSITION WHEN THE ATC MAGAZINE IS MOVING TO BACK POSITION OR ON THE WAY TO FORWARD POSITION.
- d. THE ATC MAGAZINE ROTATING MOVEMENT JUST STOPS THE POSITION WHEN EMERGENCY STOP OR RESET GENERATES.
- e. THE SPINDLE TAKES CLAMP CONDITION DURING THE ATC MAGAZINE IS MOVING ON FORWARD - BACK SPACE.
- f. THE SPINDLE TAKES UNCLAMP CONDITION DURING THE ATC MAGAZINE IS MOVING ON UP - DOWN SPACE.
- g. THE SPINDLE ORIENTATION MOVEMENT IS JUST STOPPED THE POSITION WHEN EMERGENCY STOP OR RESET GENERATES.

B. HOW TO MAKE RESTART

THE ATC MAGAZINE TAKES ONE OF THE FOLLOWING THREE POSITIONS WHEN THE TOOL CHANGE MOVEMENT IS INTERRUPTED BY EMERGENCY STOP OR RESET.

- a. BACK AND UP POSITION
  - b. FORWARD AND UP POSITION
  - c. FORWARD AND DOWN POSITION
- C. HOW TO MAKE RESTART IN CASE OF ( a ).
- a. ELIMINATE THE CAUSE OF EMERGENCY STOP AND SET UP THE MACHINE TO BE READY FOR OPERATION.
  - b. PRESS POWER OFF BUTTON ON THE NC OPERATION PANEL. THEN, PRESS THE POWER ON BUTTON.
  - c. PERFORM ZERO RETURN OF ALL AXES IN MANUAL OPERATION.
- D. HOW TO MAKE RESTART IN CASE OF ( b ).
- a. ELIMINATE THE CAUSE OF EMERGENCY STOP STATUS OR RESET AND SET UP THE MACHINE TO BE READY FOR OPERATION.
  - b. PRESS UNCLAMP SWITCH  TO MAKE CLAMP CONDITION OF THE SPINDLE. DO NOT FORGET THIS OPERATION, OTHERWISE THE ATC MAGAZINE CANNOT MOVE.
  - c. BACK THE ATC MAGAZINE BY USING FORWARD /BACK SWITCH
  - d. PRESS POWER OFF BUTTON ON THE NC OPERATION PANEL. THEN, PRESS THE POWER ON BUTTON.
  - e. PERFORM REFERENCE POINT RETURN OF ALL AXES IN MANUAL OPERATION.
- E. HOW TO MAKE RESTART IN CASE OF ( c )
- a. ELIMINATE THE CAUSE OF EMERGENCY STOP STATUS OR RESET AND SET UP THE MACHINE TO BE READY FOR OPERATION.
  - b. WHEN THE ATC MAGAZINE DID NOT STOP AT INDEXING POINT, ROTATE TO DESIRED INDEXING POSITION BY USING MAGAZINE TURN SWITCH
  - c. UP THE ATC MAGAZINE BY USING UP/DOWN SWITCH



- d. PRESS THE UNCLAMP SWITCH  TO MAKE CLAMP CONDITION OF THE SPINDLE.
- e. BACK THE ATC MAGAZINE BY USING FORWARD/BACK SWITCH
- f. PRESS POWER OFF BUTTON ON THE NC OPERATION PANEL. THEN, PRESS THE POWER ON BUTTON.
- g. PERFORM REFERENCE POINT RETURN OF ALL AXES IN MANUAL OPERATION.

### 5.5.2 24 / 32 TOOLS ATC

#### A. THE TOOL CHANGER ARM IS IN POSITION

- a. ELIMINATE THE CAUSE OF EMERGENCY STOP AND SET UP THE MACHINE TO BE READY FOR OPERATION.
- b. PRESS POWER OFF BUTTON ON THE NC OPERATION PANEL. THEN, PRESS THE POWER ON BUTTON.
- c. PERFORM ZERO RETURN OF ALL AXES IN MANUAL OPERATION.

#### B. THE TOOL CHANGER ARM IS NOT IN POSITION

- a. ELIMINATE THE CAUSE OF EMERGENCY STOP
- b. ROTATE THE ARM MANUALLY ( USE ALLEN KEY ) FROM THE MOTOR UPON TOOL CHANGER , UNTIL

( FANUC OMC , OMD )

REFER TO PARAMETER LIST "DGN SETTING"

DGN 20.2 = 0 ( ARM 90 TOOL CATCH POS. )

DGN 20.3 = 1 ( ARM 0 HOME POS. )

DGN 20.4 = 1 ( ARM STOP COMD. )

( FANUC 18M )

REFER TO PARAMETER LIST "DGN SETTING"

DGN 1008.2 = 0 ( ARM 90 TOOL CATCH POS. )

DGN X1008.3 = 1 ( ARM 0 HOME POS. )

DGN X1009.4 = 1 ( ARM STOP COMD. )

- **WARNING ! ONLY AUTHORIZED PERSON CAN DO THE OPERATION ABOVE. AND WHEN DOING THE OPERATION BE WARE NOT TO MOVE THE MACHINE. TO PREVENT FROM DANGEROUS PUSH  EMERGENCY STOP BEFORE OPERATION.**

C. SET UP THE MACHINE TO BE READY FOR OPERATION.

D. CHECK IF TOOL POT IN VERTICAL POSITION

SWITCH F2 MODE SELECT SWITCH TO MANUAL

( HANDLE X1 , X10 OR X100 ) MODE

FROM ATC OPERATION PANEL , SELECT " POT. H " THEN PUSH START ( ON ATC OPERATION PANEL ). NOW THE TOOL POT SHOULD BE IN HORIZONTAL POSITION.

SWITCH BACK TO AUTO ( ATC OPERATION PANEL )

E. CHECK IF THE TOOL POT NUMBER AND TOOL NUMBER IS CORRECT.

FANUC 0MC , 0MD

CHECK G.DATA SETTING

PLEASE REFER TO PARAMETER LIST " DGN SETTING" FOR THE CORRECT G.DATA SETTING.

FANUC 18MC

a. CHECK G.DATA SETTING

PLEASE REFER TO PARAMETER LIST " DGN SETTING" FOR THE CORRECT G.DATA SETTING.

b. IF TOOL NUMBER IS NOT CORRECT REFER TO CHAPTER 10 24 / 32 TOOLS TROUBLESHOOTING.

- **WARNING ! PLEASE ALWAYS CHECK THE TOOL TABLE DGN SETTING SHOULD BE CORRECT BEFORE**


**AUTOMATIC MACHINING . WRONG TOOL TABLE MAY CAUSE INCORRECT TOOL CHANGE AND CRUSH THE MACHINE.**


### 5.6 WHEN INSTALL OR REMOVE THE TOOL MANUALLY

TO MANUALLY INSTALL OR REMOVE THE TOOL FROM / TO SPINDLE PROCEED AS FOLLOWS :

#### A. INSTALLATION OF TOOL

a. STOP THE SPINDLE AND COORDINATE DISPLACEMENT IN EACH AXIS.

b. SET THE MODE SELECT SWITCH  TO RAPID JOG OR HANDLE POSITION. MAKE SURE THAT THE SPINDLE TAPER BORE AND THE TOOL TAPER ARE CLEAN.

c. PRESS THE UNCLAMP SWITCH  AND MAKE SURE THE SWITCH IS LIGHTING.

d. INSERT THE TOOL INTO THE SPINDLE TAPER BORE.

e. WHEN THE TOOL IS SECURELY SET UP IN THE SPINDLE, PRESS THE UNCLAMP SWITCH AND MAKE SURE THE LIGHTING GOES OUT. NOW THE SPINDLE HAS BEEN CLAMPED IN THE SPINDLE.

f. AFTER MAKING SURE THE TOOL HAS BEEN SET UP IN THE SPINDLE, RELEASE HAND FROM THE TOOL.

- **NOTE: AT STEP C ), AIR BLOW OUT TO REMOVE FINE METALLIC PARTICLES AND DUST FROM THE TOOL TAPER AND THE SPINDLE TAPER BORE, WHEN THE UNCLAMP SWITCH IS PRESSED.**

CARE SHOULD BE TAKEN TO SECURELY HOLD THE TOOL TO PREVENT BLOWING OFF OF THE TOOL.

#### B. REMOVAL OF TOOL

a. PERFORM STEPS 1) AND 2) INSTRUCTED ABOVE.

b. PRESS THE UNCLAMP SWITCH THE PULL STUD WILL BE PRESSED AND THE TOOL SINKS BY APPROXIMATELY 0.5 MM (0.02 INCH).

- c. REMOVE THE TOOL.
- d. PRESS THE UNCLAMP SWITCH.
- **NOTE: SINCE THE TOOL GOES DOWN AT STEP 2), AND IS SUBJECTED TO THE AIR BLOW PRESSURE, SECURELY HOLD THE TOOL BY HAND.**

WHEN THE TOOL IS REMOVED BE SURE TO REMOTELY LOCATE THE SPINDLE HEAD (Z AXIS)

TO PREVENT CONTACT OF THE TOOL WITH THE WORK OR TABLE.

### 5.7 WHEN OVERTRAVEL IS DETECTED BY 2ND LIMIT SWITCH.

5.7.1 TO RESET FROM THE ALARM STATUS, OPERATE SWITCHES AS FOLLOWS:

- A. STOP THE BUZZER BY OPERATING THE BUZZER STOP SWITCH



- B. PRESS THE 2ND LS REMOVE SWITCH



THE SWITCH (PUSH BUTTON) SHOULD BE HELD DOWN UNTIL THE RESETTING IS COMPLETED. WHEN 2ND LS REMOVE SWITCH IS PRESSED, THE POWER SOURCE IS GIVEN TO THE MACHINE.

- C. SET THE AXIS DIRECTION SWITCH TO THE AXIS IN WHICH OVERTRAVEL OCCURRED AND THEN PRESS THE MANUAL FEED SWITCH OF THE DIRECTION ("+" OR "-") REVERSE TO



THE OVERTRAVEL DIRECTION. THE COORDINATE SHOULD BE DISPLACED AT LEAST 50 MM (2 INCH) FROM STOPPED POSITION.

- D. PRESS RESET BUTTON ON THE NC OPERATION PANEL TO CLEAR THE ALARM CONDITION. NOW THE MACHINE HAS BEEN RELEASED FROM THE ALARM ( EMERGENCY STOP) CONDITION. IF IT IS PRESUMABLE THAT OPERATION MAY BECOME OUT OF CONTROL AGAIN WHEN THE 2ND LS REMOVE SWITCH IS PRESSED AT STEP 2 ), CONSULT, WITH OUR SERVICE ENGINEER.

- **NOTE: BEFORE TURNING ON THE POWER SOURCE, PERFORM REFERENCE POINT RETURN IN MANUAL OPERATION IN ALL AXES.**

IF THE COORDINATE IS DISPLACED TO THE STROKE END IN - DIRECTION WITHOUT PERFORMING REFERENCE POINT RETURN, IT MAY NOT BE DETECTED AT THE STORED STROKE END (1ST STAGE), BUT DETECTED BY THE 2ND LIMIT SWITCH CAUSING STOP TO THE MACHINE. THEREFORE, IF EMERGENCY STOP OCCURS, IDENTIFY THE CAUSE OF EMERGENCY STOP (WHETHER IT IS CAUSED BY FAILURE OF REFERENCE POINT RETURN, OR BY OTHER TROUBLE).

WHEN THE EMERGENCY STOP IS DUE TO FAILURE OF REFERENCE POINT RETURN, OPERATE THE 2ND LS REMOVE SWITCH TO RELEASE THE MACHINE FOR EMERGENCY STOP CONDITION AND THEN RESUME USUAL OPERATION.

## 5.8 MDI KEYBOARD FUNCTIONS ( FIG . 5.3 )

NO.	NAME	FUNCTION
1	RESET KEY	PRESS THIS KEY TO RESET THE CNC, TO CANCEL AN ALARM, ETC.
2	START	PRESS THIS KEY TO START THE MDI COMMENDS, OR TO START THE AUTOMATIC OPERATION CYCLE.
3	ADDRESS AND NUMERICAL KEY	PRESS THIS KEYS TO INPUT ALPHABETIC, NUMERIC, AND OTHER CHARACTER.
4	INPUT KEY	WHEN AN ADDRESS OR A NUMERICAL KEY IS PRESSED, THE ALPHABET OR THE NUMERAL IS INPUT ONCE TO THE KEY INPUT BUFFER, AND IT IS DISPLAYED ON THE CRT SCREEN. TO SET THE DATA INPUT TO THE KEY INPUT BUFFER IN THE OFFSET REGISTER, ETC. , PRESS THE INPUT KEY. THIS KEY IS EQUIVALENT TO THE INPUT KEY OF THE SOFT KEYS, SO THE SAME RESULTS CAN BE OBTAINED BY PRESSING EITHER OF THEM.
5	CANCEL (CAN) KEY	PRESS THIS KEY TO CANCEL CHARACTER OR SIGN. (EXAMPLE) WHEN THE KEY INPUT BUFFER DISPLAY N0001, N0001 IS CANCELED WITH THIS KEY.
6	CURSOR SHIFT KEYS	THERE ARE TWO KINDS OF CURSOR SHIFT KEY DESCRIBED BELOW : : THIS KEY IS USED TO SHIFT THE CURSOR A SHOUT DISTANCE IN THE FORWARD DIRECTION. : THIS KEY IS USED TO SHIFT THE CURSOR A SHOUT DISTANCE IN THE REVERSE DIRECTION.
7	PAGE CHANGEOVER KEY	TWO KINDS OF PAGE CHANGEOVER KEYS ARE DESCRIBED BELOW : : THIS KEY IS USED TO CHANGEOVER THE PAGE ON THE CRT SCREEN IN THE FORWARD DIRECTION. : THIS KEY IS USED TO CHANGEOVER THE PAGE ON THE CRT SCREEN IN THE REVERSE DIRECTION.
8	SOFT KEYS	THE SOFT KEY HAVE VARIOUS FUNCTIONS, ACCORDING TO THE APPLICATIONS. THE SOFT KEY FUNCTIONS ARE DISPLAYED AT THE BOTTOM OF THE CRT SCREEN. LEFT-END SOFT KEY THIS KEY IS USED IN ODDER TO EXIT TO THE INITIAL STATES (CONDITION WHEN THE FUNCTION BUTTON IS DEPRESSED WHEN EACH FEATURE HAS BEEN OPERATED VIA SOFT KEYS) RIGHT-END SOFT KEY THIS KEY IS USED WHEN OPERATE FUNCTIONS WHICH HAVE NOT YET BEEN DISPLAYED.

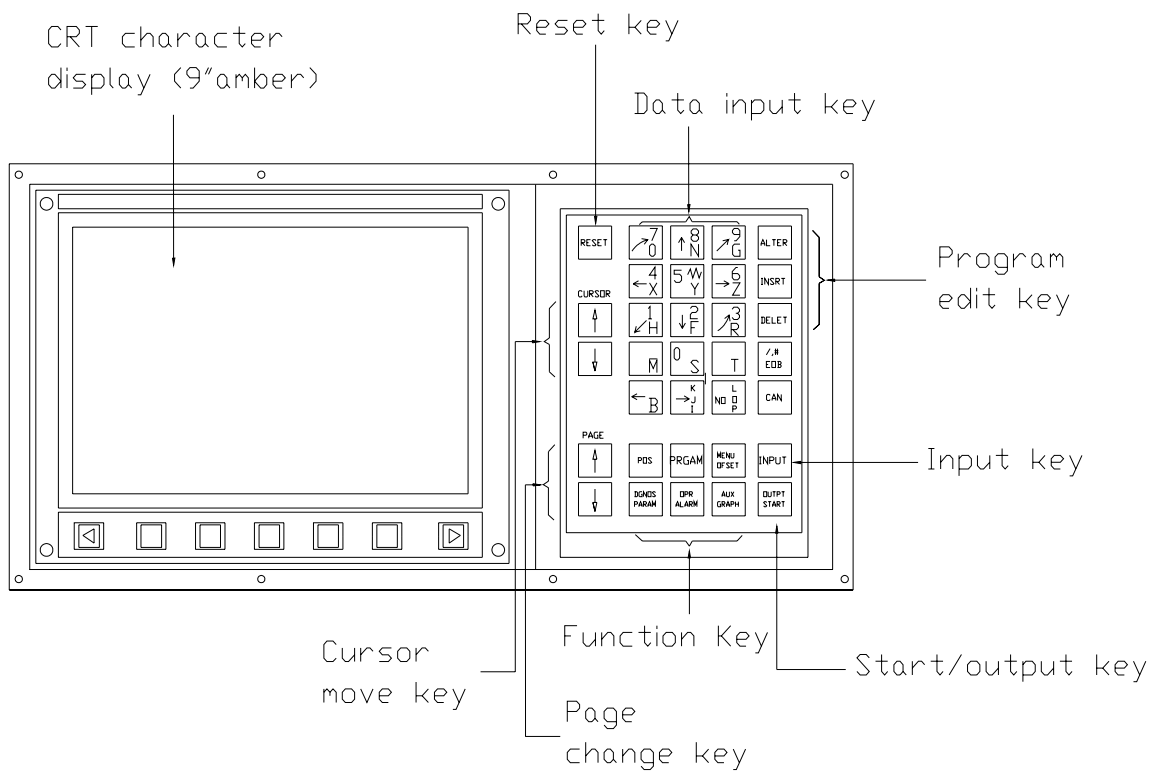


FIG. 5.3 MDI KEYBOARD

**9" Monochrome/Color  
CRT/MDI Panel  
(standard type)**

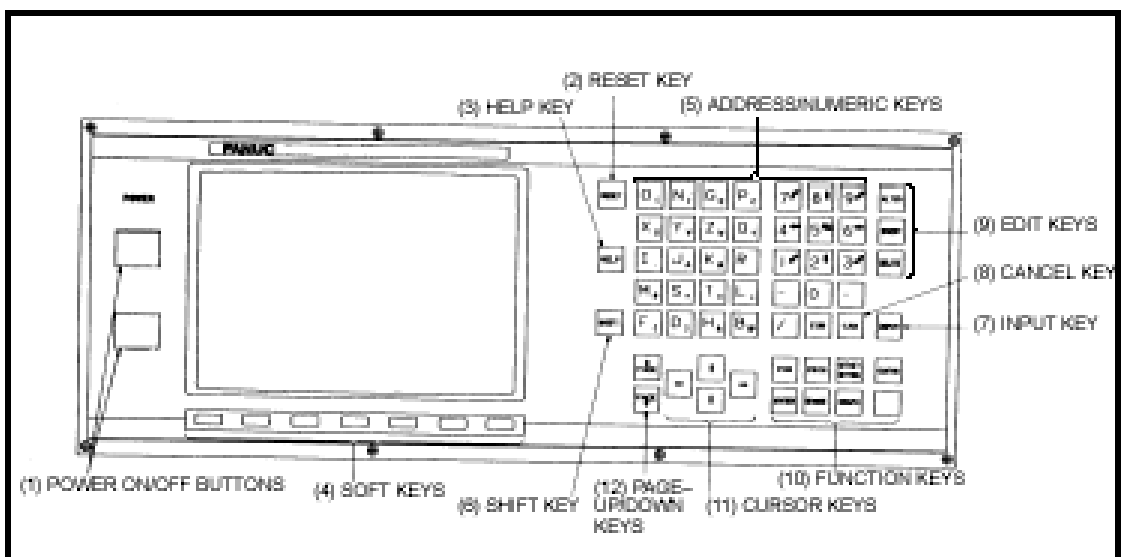


FIG. 5.4 18M MDI KEYBOARD

### 5.9 LIST OF OPERATION

CLASSIFICATION	FUNCTION	KEY SWITCH	SETTING PWE=1	MODE SWITCH BUTTON	FUNCTION BUTTON	OPERATION
CLEAR	MEMORY ALL CLEAR			POWER ON	—	[ RESET ] AND [ DELETE ]
	PARAMETER AND OFFSET		○	POWER ON	—	[ RESET ]
	CLEARING STORED PROGRAM		○	POWER ON	—	[ DELETE ]
RESET	RUN TIME			—	—	[ R/3 ] → [ CAN ]
	PARTS NUMBER			—	—	[ P/Q ] → [ CAN ]
	OT ALARM			POWER ON	—	[ P/Q ] AND [ CAN ]
DATA INPUT FROM MDI	PARAMETER			MDI	PARAM	[ P/Q ] → PARAM. NO. → [ INPUT ] → [ DATA ] → [ INPUT ] → PWE=0 → [ RESET ]
	OFFSET VALUE		○	—	OFFSET	[ P/Q ] → OFFSET NO. → [ INPUT ] → OFFSET DATA → [ INPUT ]
	SETTING DATA			MDI	PARAM	[ P/Q ] → 0 → [ INPUT ] → DATA → [ INPUT ]
	PMC PARAMETER	○			DGNOS	[ P/Q ] → DIAGRAM NO. → [ INPUT ] → DATA → [ INPUT ]
	TOOL LENGTH MEASUREMENT			JOG	POS OFFSET	[ POS ] (RELATIVE) → [ Z ] → [ CAN ] → [ OFFSET ] → MOVE TOOL TO MEASURING POSITION →
						[ P / Q ] → OFFSET NO. → [ EOB ] AND [ Z ] → [ INPUT ]
DATA INPUT FROM TAPE	PARAMETER (TAPE TO MEMORY)		○	EDIT	PARAM	[ INPUT ]
	OFFSET VALUE	○		EDIT	OFFSET	[ INPUT ]
	PROGRAM INPUT			EDIT / AUTO	PRGRM	[ INPUT ]
TAPE PUNCH	PARAMETER			EDIT	PARAM	[ START ]
	OFFSET VALUE			EDIT	OFFSET	[ START ]



	ALL PROGRAM			EDIT	PRGRM	[ 0 ] → -999 → [ START ]
	ONE PROGRAM			EDIT	PRGRM	[ 0 ] → PROGRAM NO. → [ START ]
SEARCH	PROGRAM NO. SEARCH			EDIT / AUTO	PRGRM	→ [ 0 ] PROGRAM NO. → [ ↓ ] (CURSOR)
	SEQUENCE NUMBER SEARCH			AUTO	PRGRM	PROGRAM NO. SEARCH → [ N ] → SEQUENCE NO. → [ ↓ ] (CURSOR)
	ADDRESS WORD SEARCH			EDIT	PRGRM	SEARCHING ADDRESS AND DATA INPUT → [ ↓ ] (CURSOR)
	OFFSET NO.			—	OFSET	[ P/Q ] → OFFSET NO. → [ INPUT ]
PROGRAM EDITING	PROGRAM MEMORY USED			EDIT	PRGRM	[ P ] → [ INPUT ]
	DELETION OF ALL PROGRAM	○		EDIT	PRGRM	[ 0 ] → [ 9999 ] → [ DELETE ]
	DELETION OF A PROGRAM	○		EDIT	PRGRM	[ 0 ] → PROGRAM NO. → [ DELETE ]
	DELETION OF SEVERAL BLOCKS	○		EDIT	PRGRM	[ N ] → SEQUENCE NO. → [ DELETE ]
	DELETION OF A BLOCKS			EDIT	PRGRM	[EOB] → [DELETE]
	DELETION OF A WORD	○		EDIT	PRGRM	SEARCH THE WORD TO BE DELETED → [ DELETE ]
	ALTERNATION OF A WORD	○		EDIT	PRGRM	SEARCH THE WORD TO BE ALTERED → NEW DATA → [ ALTER ]
	INSERTION OF A WORD	○		EDIT / AUTO	PRGRM	SEARCH THE WORD TO BE INSERTED → NEW DATA → [INSERT]
COLLATION	COLLATION IN MEMORY WITH TAPE			EDIT / AUTO	PRGRM	[ INPUT ]
INPUT / OUTPUT WITH FANUC CASSETTE	PROGRAM INPUT	○		EDIT / AUTO	PRGRM	[ N ] → FILE NO. → [ INPUT ] → [ INPUT ]
	OUTPUT ALL PROGRAM			EDIT	PRGRM	[ 0 ] → -9999 → [ START ]

	OUTPUT ONE PROGRAM			EDIT	PRGRM	[ 0 ] → PROGRAM NO. → [ INPUT ]
	SEARCHING FOR A HEAD OF A FILE			EDIT / AUTO	PRGRM	[ N ] → FILE NO. , -9999 OR - 9998 → [ INPUT ]
	DELETION OF FILE	○		EDIT	PRGRM	[ N ] → FILE NO. → [ START ]
	COLLATION OF PROGRAM			EDIT / AUTO	PRGRM	[ N ] → FILE NO. → [ INPUT ] → [ INPUT ]
PLAYBACK				TEACHIN JOG / HANDLE	PRGRM	MOVE MACHINE → [ X ] , [ Y ] OR [ Z ] → [ INSERT ] → NC DATA [ INSERT ] → [ EOB ] → [ INSERT ]

## 6. PROGRAMMING

THIS SECTION DESCRIBES THE RETRACTION THAT SHOULD BE FOLLOWED IN PROGRAMMING, AND THE PROGRAMMING PRACTICE OF M FUNCTION ( AUXILIARY FUNCTION ), S FUNCTION ( SPINDLE FUNCTION ) AND T FUNCTION ( TOOL FUNCTION ).

### 6.1 RESTRICTION

PROGRAMMING IS CONDITIONED AS FOLLOWED :

#### 6.1.1 MAXIMUM STROKE IN EACH AXIS

- A. REFER TO 1.4 FOR STROKE LIMIT
- B. IF COMMAND OF COORDINATE DISPLACEMENT OVER THE ABOVE STROKE IS GIVEN, ALARM OCCURS.

#### 6.1.2 LEAST INCREMENT

0.001 MM

#### 6.1.3 FEED SPEED ( INCLUDE RAPID TRAVELS )

- A. F0 - F1260 ( MAX. 20000 MM/MIN )
- B. EVEN WHEN FEED SPEED FASTER THEN THE MAXIMUM SPEED 5000 MM/MIN IS COMMENDED, SPEED EXCEEDING 5000 MM/MIN IS NOT OBTAINABLE AND ALARM OCCURS.

#### 6.1.4 SPEED FUNCTION

- A. S 90 - S 3000
- B. S 120 - S 6000 ( OPTION )
- C. S 180 - S 10000 ( OPTION )
- D. IF SPEED OUT OF ABOVE RANGE COMMANDED, ALARM ACCRUES.

#### 6.1.5 TOOL FUNCTION

- A. T01 - T18 ( 18 TOOL A.T.C. )
- B. T01 - T24 ( 24 TOOL A.T.C. )

C. T01 - T32 ( 32 TOOL A.T.C. )

D. TOOL FUNCTION OTHER THEN SPECIFIED ABOVE RESULTS IN ALARM.

### 6.1.6 PREPARATORY FUNCTIONS

A. REFER TO THE DESCRIPTION OF THE AUXILIARY FUNCTIONS.

## 6.2 M FUNCTION, S FUNCTION AND T FUNCTION

BY DESIGNATION NUMERIC VALUES AFTER THE ADDRESS M, S OR T , THE CODE SIGNAL AND STROBE SIGNAL ARE OUTPUT TO THE MACHINE SIDE.

ON THE MACHINE SIDE, THE SIGNAL ARE MAINLY USED FOR ON / OFF CONTROL OF VARIOUS FUNCTIONS. EACH ONE OF S, T, M, CODE IS PROGRAMMABLE FOR EACH BLOCK.

THE S CODE IS USED TO CONTROL THE SPINDLE, T CODE IS TO COMMAND TOOL CHANGE, AND M CODE IS FOR ON / OFF CONTROL OF VARIOUS FUNCTIONS ON THE MACHINE SIDE.

WHEN COORDINATE DISPLACEMENT COMMEND IS PROGRAMMED TOGETHER WITH S, T OR M CODE IN THE SAME BLOCK, THE PROGRAM CAN BE EXECUTED IN THE FOLLOWING TWO MANNERS :

6.2.1 THE COORDINATE DISPLACEMENT COMMEND AND THE S, T, OR M FUNCTION ARE EXECUTED AT THE SAME TIME .

6.2.2 AFTER THE COMPLETION OF THE COORDINATE DISPLACEMENT, THE S, T OR M FUNCTION IS EXECUTED.

IN THIS MACHINE, METHOD ( 6.2.2 ) IS EMPLOYED ONLY FOR M05 ( SPINDLE STOP ) AND METHOD ( 6.2.1 ) IS EMPLOYED FOR OTHER S, T AND M FUNCTIONS.

### 6.2.3 M ( AUXILIARY ) FUNCTION

WHEN 2 - DIGIT NUMERIC VALUE FOLLOWING THE ADDRESS M IS DESIGNATED, B C D 2-DIGIT CODE SIGNAL AND STROBE SIGNAL ARE OUTPUT. THE SIGNALS ARE USED FOR ON /OFF CONTROL ON THE MACHINE SIDE.

ONLY ONE M CODE IS PROGRAMMABLE IN ONE BLOCK. IF TWO M CODE ARE PROGRAMMED, ONLY LAST CODE IS EFFECTIVE .

THE DETAILS OF M CODES ARE AS FOLLOWS :

### M CODE LIST

M CODE	FUNCTION	DESCRIPTION	NOTE
M00	PROGRAM STOP	TO STOP THE PROGRAM ( FEED HOLD ). PUSH CYCLE START TO CONTINUE THE PROGRAM	
M01	OPTIONAL STOP	USE TOGETHER WITH THE OPTIONAL STOP BUTTON ON OPERATION PANEL TO HOLD THE PROGRAM ( AS M00 ) PUSH CYCLE START TO CONTINUE THE PROGRAM	
M02	END OF PROGRAM	USED IN THE END OF PROGRAM AS FINISH. (THE CURSOR STAY IN THE END) USE M30 TO END THE PROGRAM AND MOVE THE CURSOR TO THE BEGINNING OF THE PROGRAM	
M03	SPINDLE ON CW	TURN ON THE SPINDLE CLOCKWISE	
M04	SPINDLE ON CCW	TURN ON THE SPINDLE COUNTERCLOCKWISE	
M05	SPINDLE STOP	STOP THE SPINDLE	
M06	TOOL CHANGE	USE TOGETHER WITH Txx TO CHANGE TOOL AUTOMATICALLY	
M07	CLEAN CHIP PUMP ON	TURN ON THE CHIP CLEAN PUMP	(OPTION)
M08	COOLANT PUMP ON	TURN ON THE COOLANT PUMP	
M09	COOLANT PUMP STOP CLEAN CHIP PUMP OFF	TURN OFF THE COOLANT PUMP AND TURN OFF THE CHIP CLEAN PUMP	(OPTION)
M13	SPINDLE ON CW / COOLANT PUMP ON	TURN ON THE SPINDLE CLOCKWISE AND COOLANT PUMP	0MD, OMC, 18M 18T
M14	SPINDLE ON CCW / COOLANT PUMP ON	TURN ON THE SPINDLE COUNTERCLOCKWISE AND COOLANT PUMP	0MD, OMC, 18M 18T
M15	SPINDLE STOP / COOLANT PUMP OFF	STOP SPINDLE AND COOLANT PUMP	0MD, OMC, 18M 18T
M19	SPINDLE ORIENTATION	SPINDLE ORIENTATION FOR TOOL CHANGE	
M20	SPINDLE ORIENTATION RESET	RESET SPINDLE ORIENTATION	
M23	SPINDLE ON CW /	TURN ON THE SPINDLE CLOCKWISE AND	18M 24T

	COOLANT PUMP ON	COOLANT PUMP	
M24	SPINDLE ON CCW / COOLANT PUMP ON	TURN ON THE SPINDLE COUNTERCLOCKWISE AND COOLANT PUMP	18M 24T
M25	SPINDLE STOP / COOLANT PUMP OFF	STOP SPINDLE AND COOLANT PUMP	18M 24T
M29	SPINDLE RIGID TAPPING MODE	RIGID TAPPING MODE	
M30	PROGRAM END	USED IN THE END OF PROGRAM AS FINISH.  (THE CURSOR MOVE TO THE BEGINNING OF THE PROGRAM)  REFER TO M02 TO STAY THE CURSOR IN THE END.	
M33	EXTERNAL BLAST ON	TURN ON THE EXTERNAL BLAST	(OPTION)
M35	EXTERNAL BLAST OFF	TURN OFF THE EXTERNAL BLAST	(OPTION)
M36	CHIP CONVEYOR FORWARD	TURN ON THE CHIP CONVEYOR	(OPTION)
M37	CHIP CONVEYOR STOP	TURN OFF THE CHIP CONVEYOR	(OPTION)
M41	SPINDLE LOW GEAR	CHANGE THE SPINDLE GEAR BOX TO LOW SPEED POSITION	(OPTION)
M42	SPINDLE HIGH GEAR	CHANGE THE SPINDLE GEAR BOX TO HIGH SPEED POSITION	(OPTION)
M48	COOLANT THROUGH SPINDLE ON	TURN ON THE COOLANT THROUGH SPINDLE SYSTEM	(OPTION)
M50	A AXIS CLAMP	CLAMP A AXIS	(OPTION)
M51	A AXIS UNCLAMP	UNCLAMP A AXIS	(OPTION)
M94	MIRROR IMAGE OFF	TURN OFF THE MIRROR IMAGE FUNCTION	
M95	MIRROR IMAGE X AXIS	TURN ON THE X AXIS MIRROR IMAGE FUNCTION	
M96	MIRROR IMAGE Y AXIS	TURN ON THE Y AXIS MIRROR IMAGE FUNCTION	
M98	SUBPROGRAM CALL	SUBPROGRAM CALL	
M99	END OF SUBPROGRAM	END OF SUBPROGRAM	

## M CODES FOR 24/32 ATC ( FANUC OMC , OMD )

USE THE FOLLOWING M CODE TO CHANGE TOOLS STEP BY STEP

BEFORE CHANGE TOOLS:

1. MOVE Z AXIS TO HOME POSITION
2. EXECUTE "M19 SPINDLE ORIENTATION "
3. IN MANUAL MODE ROTATE TOOL MAGAZINE AND CHOOSE THE STANDBY TOOL TO THE ONE YOU NEED

M CODE	FUNCTION	DESCRIPTION	NOTE
M60	TOOL POT V.	MOVE THE TOOL POT TO VERTICAL POSITION	
M61	ARM 90	ROTATE ARM 90 DEGREE TO CLAMP BOTH SPINDLE AND STANDBY TOOLS	THIS OPERATION MUST AFTER " M19 "
M62	TOOL UNCLAMP	UNCLAMP SPINDLE TOOL	
M63	TOOL CHANGE	THE ARM PULL DOWN THE TOOLS AND ROTATE 180 DEGREE TO CHANGE TOOLS	
M64	TOOL CLAMP	CLAMP SPINDLE TOOL	
M65	ARM 90 HOME	ROTATE ARM 90 DEGREE TO HOME POSITION	
M66	TOOL POT H.	MOVE THE TOOL POT TO HORIZONTAL POSITION	

## M CODES FOR 24/32 ATC ( FANUC 18MC )

USE THE FOLLOWING M CODE TO CHANGE TOOLS STEP BY STEP

BEFORE CHANGE TOOLS:

1. MOVE Z AXIS TO HOME POSITION
2. EXECUTE "M19 SPINDLE ORIENTATION "
3. IN MANUAL MODE ROTATE TOOL MAGAZINE AND CHOOSE THE STANDBY TOOL TO THE ONE YOU NEED

M CODE	FUNCTION	DESCRIPTION	NOTE
M1000	TOOL POT V.	MOVE THE TOOL POT TO VERTICAL POSITION	
M1001	ARM 90	ROTATE ARM 90 DEGREE TO CLAMP BOTH SPINDLE AND STANDBY TOOLS	THIS OPERATION MUST AFTER " M19 "
M1002	TOOL UNCLAMP	UNCLAMP SPINDLE TOOL	
M1003	TOOL CHANGE	THE ARM PULL DOWN THE TOOLS AND ROTATE 180 DEGREE TO CHANGE	

		TOOLS	
M1004	TOOL CLAMP	CLAMP SPINDLE TOOL	
M1005	ARM 90 HOME	ROTATE ARM 90 DEGREE TO HOME POSITION	
M1006	TOOL POT H.	MOVE THE TOOL POT TO HORIZONTAL POSITION	

### 6.2.4 S (SPINDLE) FUNCTION

- A. THE S FUNCTION IS USED TO COMMAND SPINDLE SPEED RPM.
- B. THE SPINDLE SPEED CAN BE DIRECTLY COMMANDED WITH ADDRESS S FOLLOWED BY 4-DIGIT NUMERIC VALUE WITHIN A RANGE FROM 90 TO 3000 RPM OR 180 TO 6000 RPM (OPTION) . IF SPEED OUT OF THE RANGE IS COMMENDED, ALARM OCCURS.

EXAMPLE:

FOR SPEED OF 1234 RPM, PROGRAM AS FOLLOW :

S1234 ( EOB )

M03 OR M04 ( EOB )

### 6.2.5 T ( TOOL ) FUNCTION

- A. THE T FUNCTION IS USED TO COMMAND THE NUMBER OF TOOL TO BE CHANGED.
- B. THE DESIRED TOOL CAN BE DIRECTLY COMMENDED WITH ADDRESS T FOLLOWED BY 2-DIGIT NUMERIC VALUE. TOOL FUNCTION IS AVAILABLE WITHIN A RANGE FROM T01 TO T18, AND SHOULD BE PROGRAMMED IN THE BLOCK WITH M06 ( TOOL CHANGE FUNCTION ), OR IN THE BLOCK BEFORE THE BLOCK WITH M06.

EXAMPLE :

WHEN TOOL IS CHANGED TO N0. 2 TOOL, PROGRAM AS FOLLOW :

T02 M06 ( EOB )

NOTE : WHEN TOOL CHANGE Z AXIS MUST IN ZERO POSITION.



## 7. CHECKING AND MAINTENANCE OF MACHINE

### 7.1 DAILY CHECKING

IN ORDER TO GUARANTEE TROUBLE FREE, LONG USE OF THE MACHINE, IT IS VERY IMPORTANT TO ELABORATELY CHECK EACH PART OF THE MACHINE PERIODICALLY . IF ANY TROUBLE OR SIGN IF TROUBLE IS FOUND DURING CHECKING, BE SURE TO IMMEDIATELY REMEDY IT, THE DAILY CHECKING AND MAINTENANCE SCHEDULE THAT SHOULD BE AT LEAST PERFORMED BEFORE STARTING DAILY WORK IS SHOWN BELOW.

#### DAILY CHECKING SCHEDULE

	CHECK UP	FREQUENCY
A . BEFORE STARTING MACHINE		
1	VISUALLY CHECK THE APPEARANCE OF THE MACHINE	DAILY
2	CHECK IF ANY OBJECT IS LOCATED WITHIN THE MOVEABLE RANGE OF THE TABLE, SADDLE AND SPINDLE HEAD.	DAILY
3	CLEAN THE SPINDLE BORE TAPER AND THE CIRCUMFERENCE OF THE SPINDLE	DAILY
4	CHECK THE WIPERS FOR THE SPINDLE HEAD, SADDLE AND SADDLE SIDWAYS.	DAILY, AND FROM TIME TO TIME
5	CHECK THE GIBS USED IN X, Y AND Z AXIS.	FROM TIME TO TIME
6	CHECK THE SIDE WAYS FOR DAMAGE, SCORE OR DEFECTS. IF ANY DAMAGE OR SCORE IS FOUND, FLATTEN USING AN OIL STONE.	DAILY
7	CHECK THE TOOL TAPER FOR CLEANLINESS AND CLEAN IF NECESSARY.	DAILY
8	CHECK THE TOOL PULL STUD FOR LOOSENED. NOTE THAT LOOSENED PULL STUD IS VERY DANGEROUS DAILY	DAILY
9	CHECK LUBRICATION OIL IN THE LUBRICATION PUMP USING THE FURNISHED LEVEL GAUGE AND REPLENISH IF NECESSARY.	DAILY TANK CAPACITY : 4.6 L
10	WHEN COOLANT UNIT ( OPTION ) IS USED, CHECK COOLANT LEVEL USING THE FURNISHED LEVEL GAUGE AND REPLENISH IF NECESSARY.	DAILY
11	CHECK COMPRESSED AIR PRESSURE ( TO BE 5.5 KG/CM2 ) THROUGH PRESSURE GAUGE INCORPORATED IN THE PNEUMATIC UNIT AND ADJUST IF NECESSARY.	DAILY
B. AFTER STARTING MACHINE		
1	CHECK IF UNUSUAL SOUND, VIBRATION OR HEAT RISE OCCURS.	VISUALLY CHECK OR TOUCH

2	CHECK THAT LUBRICATING OIL IS SATISFACTORILY GIVEN TO EACH SIDE WAYS . DEPRESS THE INSTANT PUSH BUTTON OF THE LUBRICATION PUMP TO DELIVER OIL IF NECESSARY.	DAILY
3	BEFORE STARTING THE OPERATION, LET RUN THE SPINDLE AT A LOW SPEED AND MOVE THE SPINDLE HEAD, SADDLE AND TABLE WITHIN THESE FULL STROKES WITHOUT LOAD FOR 10 - 20 MIN.	DAILY
C. WHEN DAILY WORK ENDS		
1	WHEN DAILY WORK ENDS, BE SURE TO THOROUGHLY CLEAN THE MACHINE, PARTICULARLY SIDE WAYS. APPLY MACHINE OIL TO THE SPINDLE TAPER TO PREVENT CORROSION. WHEN DAILY WORK ENDS. DO NOT FAIL TO REMOVE THE OIL BEFORE STARTING THE MACHINE.	DAILY
2	WHEN DAILY WORK ENDS, CHECK IF THE CUTTING CHIPS IS TOO MUCH THAT MAYBE EFFECT THE MOVEMENT OF X AND Y AXIS MOVEMENT, USE A VACUUM TO CLEAN IT FROM THE FRONT DOOR.	WHEN NECESSARY

## 7.2 LUBRICATION OF MACHINE

7.2.1 LUBRICATION IS VERY IMPORTANT AND NOT NEGLIGIBLE TO ASSURE LONG LIFE AND HIGH LEVEL OF ACCURACY OF THE MACHINE.

SINCE THE MACHINE CENTER IS USUALLY OPERATED CONTINUOUSLY FOR LONG HOURS UNDER HEAVY DUTY AND THERE ARE MANY PARTS THAT REQUIRES LUBRICATION, THE MACHINE EMPLOYS THE LUBRICATION SYSTEM BEST SUITED FOR SUCH APPLICATION , REQUIRING ONLY MINIMUM CARE OF LUBRICATION TO OPERATOR.

LUBRICATION TO EACH PART OF MACHINE IS AS FOLLOWS :

A. GREASE SEALED LUBRICATION IS EMPLOYED FOR SPINDLE BEARINGS.

( GREASE : KLUBER ISOFLEX NBU 15 (PA0040 - A26) )

B. X,Y AND Z AXIS BALL SCREW AND SIDE WAYS ARE FORCIBLY OILED BY LUBRICATION PUMP.

C. GREASE IS APPLIED TO THE COUNTERWEIGHT CHAINS,.

D. FOR ALL OTHER BEARINGS, GREASE SEALED LUBRICATION IS EMPLOYED.

### 7.2.2 REOILING

IT IS MANDATORY TO MAINTAIN A SUITABLE AMOUNT OF OIL OR GREASE WHERE LUBRICATION IS REQUIRED TO ASSURE TROUBLE-FREE, LONG OPERATION OF THE MACHINE.

BE SURE TO REPLENISH THE HIGH QUALITY, PURE OIL OR GREASE SPECIFIED IN THE LUBRICATION TABLE, AS INSTRUCTED IN THE TABLE.

REOILING TO EACH PART : (REFER TO LUBRICATION TABLE AND LUBRICATION APPLICABLE )

- A. REOILING TO LUBRICATION PUMP TANK FOR DETAILS ABOUT LUBRICATION PUMP REFER 7.4.2 MAINTENANCE AND ADJUSTMENT OF LUBRICATION PUMP. THE LUBRICATION PUMP TANK ( A ) AS SHOWN IN FIG. 7.1 HAS A CAPACITY OF 4.6 L. WHEN THE POWER SOURCE IS TURNED ON, THE PUMP AUTOMATICALLY STARTS AND DELIVERS OIL TO THE SPEED REDUCTION GEARINGS. THE PUMP IS ADJUSTED BY US AT SHIPPING TO DELIVER OIL AT A RATE OF 6 CC FOR EVERY 10 MIN.

AS NECESSARY, ADJUST THE RATE IN ACCORDANCE WITH 7.4.2 MAINTENANCE AND ADJUSTMENT OF LUBRICATION PUMP.

WHEN THE PUMP IS LEFT OUT OF OPERATION FOR ANY LENGTH OF TIME, OIL LEVEL GO DOWN IN THE PIPING. THEREFOR, HOLD DOWN THE INSTANT PUSH BUTTON ( B ) OF THE PUMP BEFORE STARTING THE MACHINE OPERATION, UNTIL SUFFICIENT AMOUNT OF OIL IS DISTRIBUTED TO EACH SIDE WAY.

REPLENISH OIL IN THE TANK TO THE SPECIFIED LEVEL THROUGH THE OIL FILLER HOLE ( C ) AT THE TOP OF THE TANK WITH A SUITABLE FREQUENCY (USUALLY ONCE TWO WEEKS) THAT DEPENDS ON THE SERVICE CONDITION.

IF THE OIL LEVEL GOES DOWN TO ONE FOURTH OF THE SPECIFIED LEVEL, THE LAMP "LUBRICATION LEVEL" WILL LIGHTS, IMMEDIATELY REPLENISH OIL.

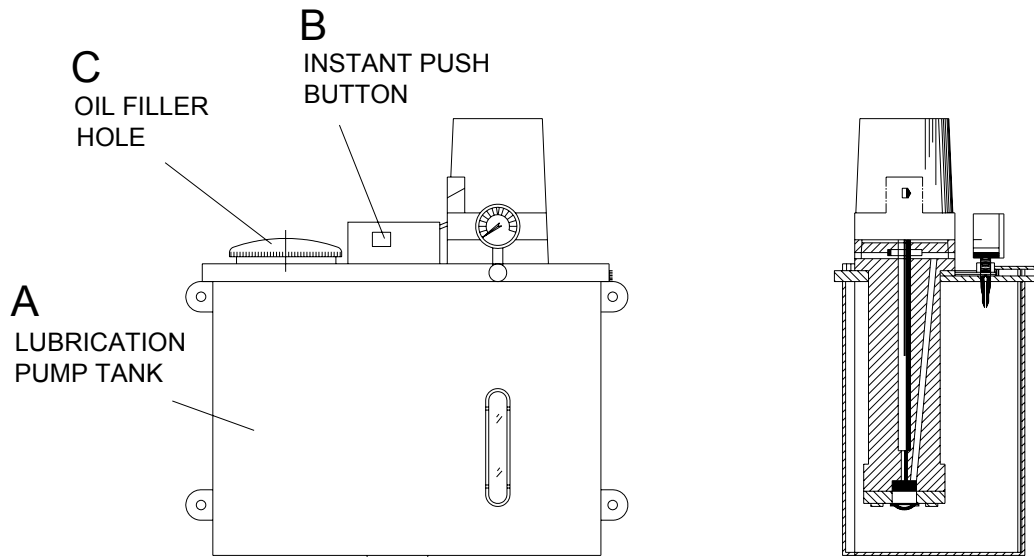


FIG. 7.1 REOILING LUBRICATION PUMP TANK

## B. GREASING TO COUNTERWEIGHT ROLLER CHAIN

THE SPINDLE HEAD IS CONNECTED WITH THE COUNTERWEIGHT THROUGH THE ROLLER CHAIN AS SHOWN IN FIG 7.2 . ALTHOUGH SELECTED ROLLER CHAIN CAPABLE OF WITHSTANDING THE REQUIRED LOAD IS USED, BE SURE TO GREASE THE CHAIN ONCE EVERY 6 MONTHS. TO GREASE, REMOVE THE UPPER COVER OF COLUMN.

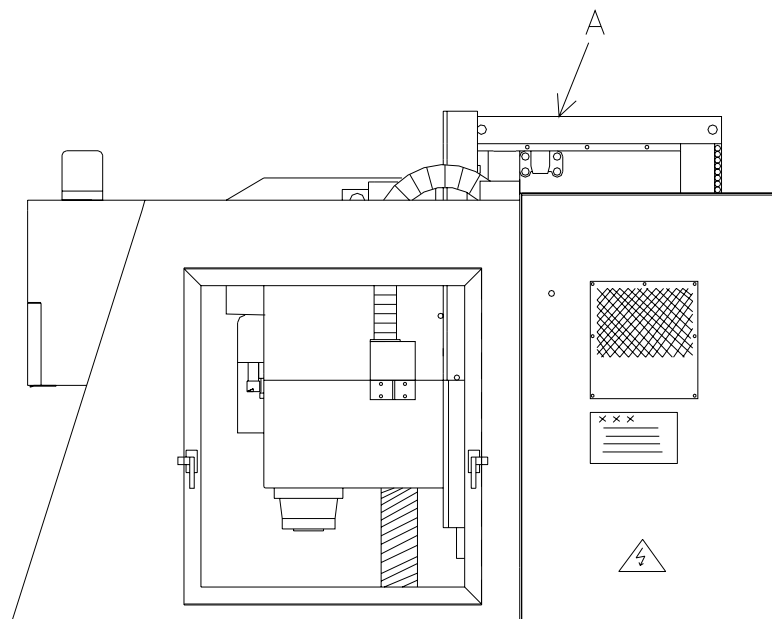


FIG. 7.2 GREASING TO COUNTERWEIGHT ROLLER CHAIN

### C. REOILING TO LUBRICATOR OF PNEUMATIC UNIT

REMOVE THE BOWL GUARD AS SHOWN IN FIG 7.6 TO REPLENISH OIL IN THE LUBRICATOR OF PNEUMATIC UNIT. THE LUBRICATION SHOULD BE FILLED WITH OIL UP TO THE UPPER LIMIT OF THE LEVEL GAUGE ( ABOUT 80 % OF LUBRICATOR CAPACITY ).

NOTE : THAT TO MUCH OIL MAY CAUSE STANDSTILL TO THE LUBRICATOR. CHECK OIL LEVEL WEEKLY AND REPLENISH OIL IF NECESSARY.

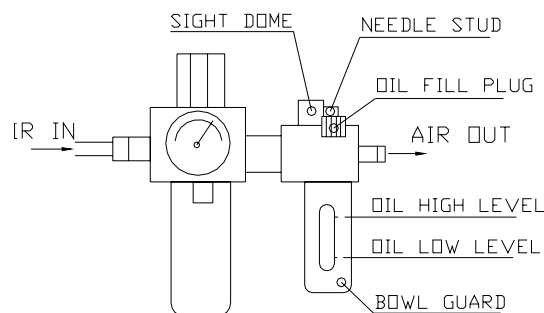


FIG. 7.3 REOILING TO LUBRICATOR OF PNEUMATIC UNIT

### D. ATC GEAR OIL

CHECK THE GEAR OIL FROM GAUGE (A) REFILL FROM (B) AND FLOW THE OIL OUT FROM (C) (FIG.7.4)

IMMEDIATELY REPLENISH IF OIL LEVEL IS FOUND BELOW THE SPECIFIED LEVEL. RELENISH EVERY YEAR FOR LONG LASTING USE OF THE PARTS.

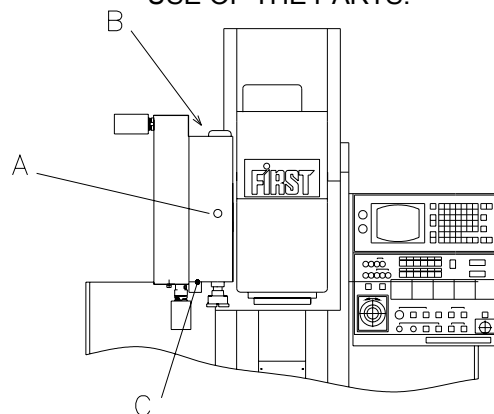


FIG. 7.4 ATC GEAR OIL

### E. GREASING TO TOOL MAGAZINE

GREASING TO THE RELATED PARTS FOR TOOL POT VERTICAL AND HORIZONTAL CHANGE (FIG. 7.5).

TAKE OFF COVER (B). ACCORDING TO DIFFERENT TYPE OF TOOL MAGAZINE GREASING TO THE RELATED MOVING PARTS.

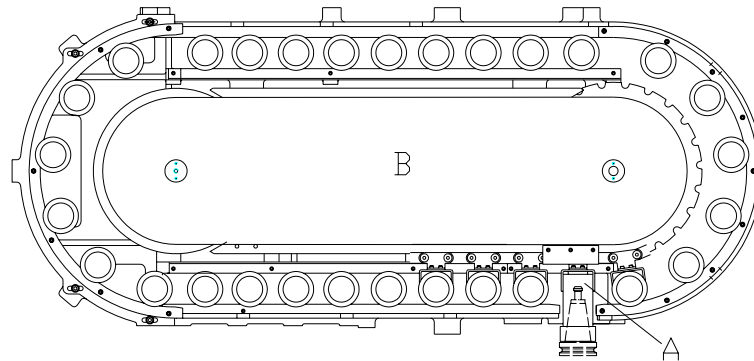


FIG. 7.5 TOOL MAGAZINE

### F. SPINDLE GEAR BOX

LOOK FROM WINDOW ON COVER (A) TO CHECK GEAR BOX OIL (FIG. 7.6) .

TO REFILL THE OIL , TAKE OFF (B) LOSS THE SCREW AND REFILL FROM THE TOP , TAKE OFF (C), WHEN OIL FULL IT WILL FLOW OUT FROM THE HOLE IN (C).

TO FOLW THE OIL OUT , TAKE OFF (C) AND LOSS THE SCREW.

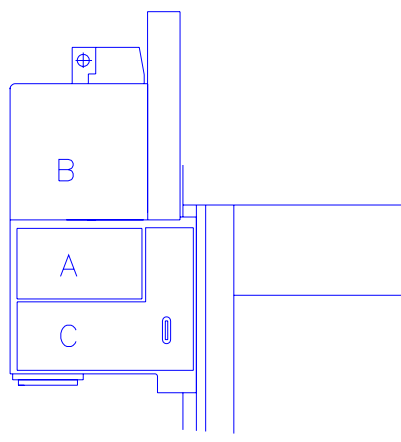


FIG. 7.6 SPINDLE HEAD (GEAR SWIFT TYPE)

### 7.3 LUBRICATION TABLE

	PART TO BE OILED	FREQUENCY	Q'TY	LUBRICANT	REMARKS
A	LUBRICATION PUMP	1-2 WEEKS	4.6L	1	CHECK OIL LEVEL IN THE TANK AND REPLENISH IF NECESSARY.
B	COUNTERWEIGHT ROLLER CHAIN	6 MONTHS		3	BRUSH LUBRICANT.
C	LUBRICATOR OF PNEUMATIC	WEEKLY	0.17L	4	IMMEDIATELY REPLENISH IF OIL LEVEL IS FOUND BELOW THE SPECIFIED LEVEL
D	ATC GEAR OIL	EVERY YEAR	5.5 L	2	IMMEDIATELY REPLENISH IF OIL LEVEL IS FOUND BELOW THE SPECIFIED LEVEL
E	TOOL MAGAZINE	6 MONTHS		3	BRUSH LUBRICANT
F	SPINDLE GEAR BOX	6 MONTHS	5 L	2	IMMEDIATELY REPLENISH IF OIL LEVEL IS FOUND BELOW THE SPECIFIED LEVEL

### 7.4 LUBRICANTS APPLICABLE

LUBRICANT	SHELL	ESSO	MOBIL
1	SHELL TONNA 32	FEBIS K32 (K46)	MOBIL VACTRA 1
2	SHELL TONNA T68 Tellus oil 68	FEBIS K68 Teresso 68	MOBIL VACTRA 2 DTE26 , SHC626
3	SHELL ALVANIA GREASE 2	TENPCEX N2	MOBIL UX 2
4	SHELL TURBIN OIL T32	TERESSO 32	MOBIL DTE OIL LIGHT

#### 7.4.1 CAUTIONS ON OILING

THE FOLLOWING CAUTIONS ARE VERY IMPORTANT TO BE FOLLOWED WHEN OILING.

A. USE ONLY SPECIFIED OIL OR GREASE WITH SPECIFIED QUANTITY.

THE USE OF OIL OR GREASE OTHER THEN SPECIFIED AND TO MUCH AMOUNT OF OIL OR GREASE MAY ADVERSELY AFFECT THE PERFORMANCE OF THE MACHINE.

B. CLEAN THE SIDE WAYS, OIL FILLER HOLES, OIL TANK, ETC. BEFORE POURING OIL AND USE CARE NOT TO POLLUTE OIL WHEN POURING OIL.

- C. WHEN POURING OIL, PLACE A FILTER OVER OIL FILLER HOLE TO ELIMINATE DUST AND CONTAMINATOR. IF FILTER IS NOT AVAILABLE, USE A WIRE NET OF 150 MESH OR FINER.
- D. SUCCESSIVELY USE THE IDENTICAL OIL OR GREASE. NOTE THAT THE USE OF OIL HAVING DIFFERENT PROPERTIES MIGHT DEGRADE THE OIL.
- E. EVEN WHEN NEW OIL IS DRAINED, AND USED AGAIN FOR REASSEMBLING, REPLACEMENT OF PART OR ANY OTHER REASON, BE SURE TO FILTER THE OIL WHEN POURING THE OIL AGAIN.
- F. DO NOT FULLY USE OIL OF OIL CAN, BUT LEAVE A SMALL QUANTITY OF OIL IN THE CAN. THIS CAUTIONS SHOULD BE FOLLOWED TO ELIMINATE MOISTURE AND SEDIMENT FROM OIL.

### 7.4.2 MAINTENANCE AND ADJUSTMENT OF LUBRICATION PUMP

- A. LUBRICATION PUMP WITH A PRESSURE GAUGE AND MANUAL SWITCH FOR MANUAL DISCHARGE. WHEN NECESSARY, THIS PUMP ARE CONTROL BY PLC 30 SECONDS OF RUNNING TIME AND 1000 SECOND OF INTERMITTENT TIME. THIS TIMER WAS BE PRESENTED INSIDE OF CNC PLC. PLEASE REFER TO YOUR LADDER DIAGRAM FOR DETAIL.
- B. AS A FLOAT SWITCH WAS EQUIPPED WHEN OIL LEVEL DROOPS. THE YELLOW LAMP ( L8 ) WILL BE LIGHTED AND BUZZER SOUND AND SWITCH TO SINGLE BLOCK AUTOMATICALLY. PLEASE REPLENISH THE OIL FOR CONTINUE OPERATIONS.

## 7.5 MAINTENANCE AND ADJUSTMENT OF AIR SOURCE AND PNEUMATIC UNITS

THE FOLLOWING MOVEMENT AND FUNCTIONS ARE DRIVEN BY COMPRESSED AIR.

- A. \* SPINDLE TOOL UNCLAMP.
- B. \* SPINDLE AIR BLOW.
- C. \*TOOL POT HORIZONTAL AND VERTICAL.
- D. \* SPINDLE GEAR CHANGE.

### 7.5.2 AIR SOURCE

- A. THE PNEUMATIC AIR SOURCE.



THE PNEUMATIC ARE DESIGNED TO WORK WITH COMPRESSED AIR AT LEAST 5.5 KG / CM<sup>2</sup> .

THEREFOR, USE AN AIR SOURCE AT CONSTANT PRESSURE OF AT LEAST 6 KG / CM<sup>2</sup>.

THE PNEUMATIC AIR SOURCE HAVE BEEN SET UP BEFORE SHIPPING OUT THE MACHINE.

TO ADJUST THE AIR PRESSURE ( SEE FIG. 7.7 ) TAKE OFF THE COVER A FROM THE PNEUMATIC SOURCE , ADJUST THE POINTER TO 6 KG / CM<sup>2</sup> , CONNECT THE AIR SOURCE ( AIR IN ) , IF THE AIR PRESSURE IS UNDER 6 KG / CM<sup>2</sup> , PULL THE STUD B ADJUST IT TO 6 KG / CM<sup>2</sup> . IF THE AIR PRESSURE STILL NOT ENOUGH, CHECK THE AIR SOURCE.

ALTHOUGH AIR FILTER IS PROVIDED TO PROTECT THE PNEUMATIC LINE, THE AIR FREE FROM MOISTER OIL AND DUST SHOULD BE SUPPLIED, AND PURIFIED BY AIR FILTER OF 5 MICRONS.

### B. THE SPINDLE NOSE CLEANING AIR SOURCE

THE SPINDLE NOSE CLEANING AIR SOURCE HAVE BEEN SET UP BEFORE SHIPPING OUT THE MACHINE.

TO ADJUST THE SPINDLE NOSE CLEANING AIR SOURCE ( SEE FIG. 7.7 ) TAKE OFF THE COVER ( C ) FROM THE SPINDLE NOSE CLEANING AIR SOURCE , ADJUST THE POINTER TO 2 KG / CM<sup>2</sup> , IF THE AIR PRESSURE IS UNDER 2 KG / CM<sup>2</sup> , PULL THE STUD D ADJUST IT TO 2 KG / CM<sup>2</sup> .

### C. THE AIR PRESSURE DETECTOR

IF THE AIR PRESSURE IS UNDER 6 KG / CM<sup>2</sup> , IT MAY CAUSE THE ERROR MOVEMENT OF THE MACHINE, THE AIR PRESSURE DETECTOR CAN MAKE SURE THE AIR PRESSURE ALWAYS HIGHER THEN 6 KG / CM<sup>2</sup> . IF THE AIR PRESSURE IS UNDER 4 KG / CM<sup>2</sup> , MACHINE ALARMS AND YOU HAVE TO CHECK THE AIR SOURCE.

THE AIR PRESSURE DETECTOR HAVE BEEN SET UP BEFORE SHIPPING OUT THE MACHINE.

TO ADJUST THE AIR PRESSURE DETECTOR, ( SEE FIG. 7.7 ) ADJUST ( E ) TO 0 ( WITH DRIVE SCREW ) AND ADJUST ( F ) TO 4 .

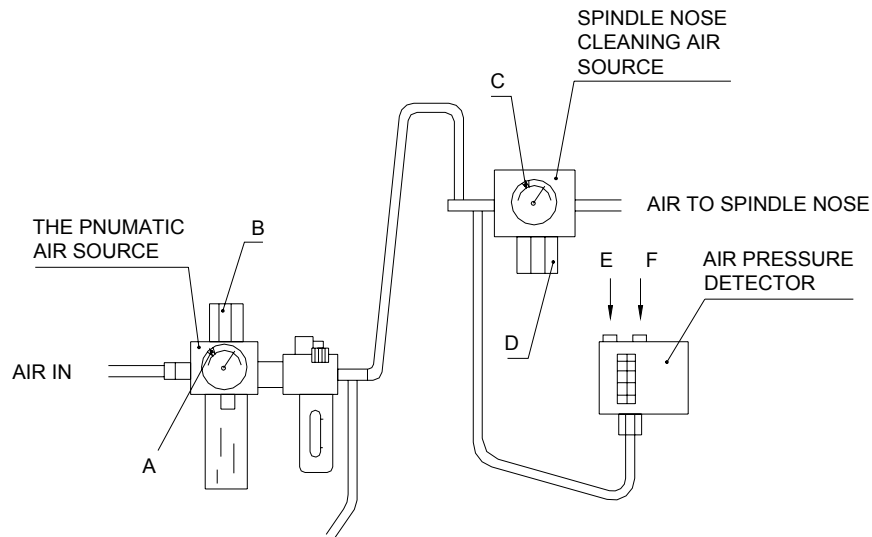


FIG. 7.7 AIR SOURCE ADJUSTMENT

### 7.5.3 AIR LINE LUBRICATOR ( FIG. 7.8 )

THIS DEVICE SUPPLIES LUBRICATING OIL, NECESSARY TO OIL EACH CYLINDER AND CYLINDER VALVE FOR TOOL POT CHANGE, TOOL UNCLAMP FROM THE MIST INVOLVE IN THE COMPRESSED AIR.

#### A. INSTALLATION :

INSTALL LUBRICATOR WITH BOWL VERTICAL IN PIPE LINE SO THAT AIR FLOWS IN THE DIRECTION OF THE ARROW LOCATED ON THE LUBRICATOR BODY. THE LUBRICATOR CAN BE FILLED WHILE UNDER PRESSURE. JUST REMOVE THE OIL FILL PLUG AND FILL THE LUBRICATOR TO OIL LEVEL LIMIT LINE USING CLEAN AND PURE LUBRICANT .

#### OPERATION :

OIL FEED RATE CAN BE ADJUSTED BY THE NEEDLE STUDDED. CLOCKWISE ROTATION OF THE NEEDLE STUD DECREASES OIL FEED RATE.

#### B. MAINTENANCE :

IF OIL DOES NOT FLOW FROM OIL DRIP TUBE .....

- a. MAKE SURE THE AIR INSTALLED IN THE CORRECT DIRECTION. IF NOT, REINSTALL IT .

- b. CHECK THE OIL LEVEL. ADJUST OIL QUANTITY IF THE LEVEL EXCEED THE LIMIT LINE OR DOES NOT REACH THE END OF SIPHON TUBE.

IF OIL LEAKS AROUND THE NEEDLE STUD.....

- c. CHECK IF THE NEEDLE STUD IS OPEN EXCESSIVELY, IF SO, CLOSE IT TO THE RIGHT POSITION.
- d. TAKE OFF BOWL GUARD AND CHECK O RING ( ON THE TOP OF THE BOWL GUARD ), IF THE O RING IS DAMAGED, REPLACE IT.

CAUTION :

DO NOT USE THE LUBRICATOR NEAR OR IN CONTACT WITH SUCH ORGANIC SOLVENTS AS LACQUER THINNERS, ALCOHOL, ETC., AS THE MATERIALS WILL DAMAGE THE PLASTIC BOWL. IF NECESSARY TO CLEAN THE PLASTIC BOWL, USE NEUTRAL CLEANSER ONLY.

TEMPERATURE AND OPERATING PRESSURE SHOULD NOT EXCEED THE MAXIMUM LIMITS MARKED ON THE LUBRICATOR BOWL.

### 7.5.4 JOINT AND HOSE

#### A. AIR HOSE

MARKER : U - KHAN

MODEL : POLYURETHANE 5 X 8

O.D. X I.D. : 8 X 5 MM

MINIMUM BENDING DIAMETER : 55 R MM

TEMP. : - 40 ° C - 100 ° C

HIGHTEST PRESSURE : 7 KG / CM<sup>2</sup>

#### B. QUICK-FIT JOINT

MARKER : NIHON LEGRIS

MODEL : CONNECTOR 31750813

ELBOW 31090813

EACH PNEUMATIC DEVICE IS CONNECTED WITH NYLON RESIN HOSE AND QUICK-FIT TYPE JOINT IS USED. THE QUICK-FIT TYPE JOINT PERMITS HOSE TO BE IMMEDIATELY CONNECTED ONLY BY INSERTING THE HOSE IN THE JOINT.

AFTER THE CONNECTION, MAKE SURE THE CONNECTOR IS SECURELY HELD IN THE COUPLING AND NO LEAKAGE OCCURS.

FOR DISCONNECTION OF HOSE, PRESS DOWN THE RING-LIKE PART AND PULL THE HOSE AS FIG. 7.9 .

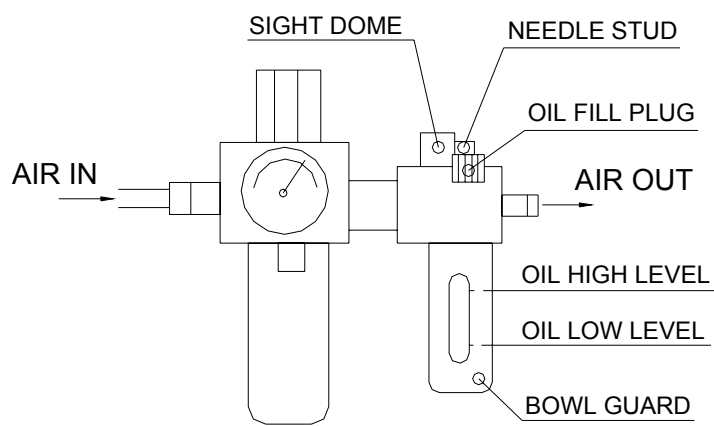


FIG. 7.8 AIR LINE LUBRICATOR

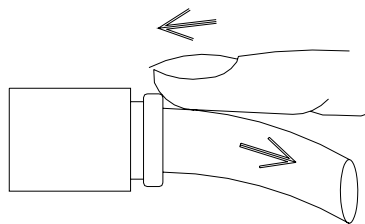


FIG. 7.9 DISCONNECTING OF HOSE

## 8. ADJUSTMENT OF SLIDEWAY GIBS

WITH TIME, THE SLIDE WAY WEAR AND THEREFORE MUST BE ADJUSTED THROUGH THE GIBS.

THE GIB ADJUSTING SCREW FOR X AXIS IS FOUND AT THE LEFT OF THE TABLE VIEWED FROM THE MACHINE FRONT, THE GIB ADJUSTING SCREW FOR Y AXIS AT THE FRONT OF THE SADDLE, AND THE GIB ADJUSTING SCREW FOR Z AXIS ON THE TOP OF THE COLUMN .

IN GENERAL PRACTICE, THE ADJUSTMENT SHOULD BE MADE IN 3 MONTHS AND 6 MONTHS AFTER INSTALLATION. AFTER THAT, CHECK SLIDE WAY LEVEL YEARLY AND ADJUST IT IF NECESSARY.

TO ADJUST SLIDE WAY LEVEL, PROCEED AS FOLLOWS : ( AS SHOWN IN FIG. 8.1 )

- A. LOOSEN 3 - 4 TURNS GIB LOCK SCREW.
  - B. FULLY TIGHTEN GIB ADJUSTING SCREW.
  - C. LOOSEN ONE TURN THE GIB ADJUSTING SCREW.
  - D. TIGHTEN THE GIB LOCK SCREW.
- **NOTE THAT TOO TIGHTLY CLAMPED GIB MAY HINDER SMOOTH MOVEMENT, ACCELERATE WEAR AND, IN EXTREME CASE, RESULT IN SEIZURE. WHEN ADJUSTING SLIDE WAY GIBS. PLEASE INFORM OUR SERVICEMAN.**

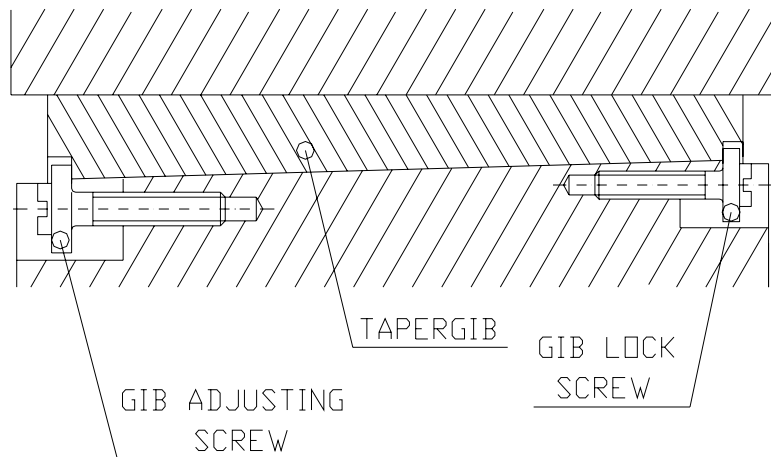


FIG.8.1 ADJUSTMENT OF SLIDE WAY GIBS

## 9. ALARM MESSAGE

### 9.1 ALARM DISPLAY (FANUC 0MD)

WHEN ALARM OCCURS, USUALLY THE CONTENTS OF THE ALARM ARE AUTOMATICALLY DISPLAYED.

#### A. FOR THE ALARM WITH NUMBERS

PLEASE REFER TO YOUR FANUC OPERATOR'S MANUAL APPENDIX 9.

#### B. FOR THE ALARM WITH DESCRIPTIONS

- a. TO STOP THE BUZZER, PRESS THE BUZZER STOP SWITCH



ON THE CONTROL PANEL.

- b. REFER TO 9.2 TROUBLESHOOTING.

- c. EACH DESCRIPTION CORRESPOND TO A DGN NUMBER (REFER TO 9.2) SEARCH FOR THE DGN NUMBER ON THE LADDER DIAGRAM AND FIND THE COURSE OF THE PROBLEM .

### 9.2 ALARM DISPLAY (FANUC 0MD)

#### 9.2.1 24/32 TOOLS ATC

#### A. BATTERY ALARM (DGN R654.0 MES01)

CHANGE THE SYSTEM BATTERY WHILE POWER ON.

#### B. SPINDLE ALARM (DGN R654.1 MES02)

WHEN THIS ALARM DETECTED, THE MACHINE STOPS IMMEDIATELY.

WHEN THIS ALARM IS OCCURRED THE LUMINOUS DIODES WHICH IS IN AC SPINDLE UNIT SHOW ERROR POINT SINCE, OPEN THE ELECTRIC BOX TO INSPECT WHERE ERROR POSITION IS GENERATING AND TO ELIMINATE THE ERROR, REFER TO THE DESCRIPTIONS OF AC SPINDLE UNIT MAINTENANCE MANUAL. THEN, PRESS THE RESET BUTTON.

- **NOTE: WHEN THIS ALARM IS DETECTED DO NOT PRESS THE RESET BUTTON FIRST, SINCE, THE LUMINOUS DIODES WHICH SHOWS ERROR POINT OF AC SPINDLE UNIT GOES OUT.**

C. COOLANT PUMP OVERLOAD (DGN R654.2 MES03 ).

WHEN THIS ERROR OCCUR MACHINE SWITCH TO SINGLE BLOCK AUTOMATICALLY.

ELIMINATE THE ERROR AND RESET THE MOTOR CIRCUIT BREAKER IN THE ELECTRIC CABINET.

D. LUBRICATION OVERLOAD (DGN R654.3 MES04 ).

THE SAME PROCEDURE AS C ).

E. MAGAZINE OVERLOAD (DGN R654.4 MES05 ).

THE SAME PROCEDURE AS C ).

F. MAGAZINE ARM OVERLOAD (DGN R654.4 MES06 ).

THE SAME PROCEDURE AS C ).

G. CABINETE OVER HEAT (DGN R654.6 MES07)(OPTION).

COOL DOWN THE CABINET.

H. T CODE = SPD TOOL DISPLAY (DGN R654.7 MES08)

CHANGE ANOTHER TOOL NUMBER.

I. X AXIS OVERTRAVEL (DGN R655.0 MES09)

SWITCH TO HANDWHEEL MODE MOVE BACK THE AXIS TO SAFE POSITION . (NOTIC THE DIRECTION + / - ).

J. Y AXIS OVERTRAVEL (DGN R655.1 MES10).

THE SAME PROCEDURE AS J.

K. Z AXIS OVERTRAVEL (DGN R655.2 MES11).

THE SAME PROCEDURE AS J.

L. AIR LOW PRESSURE (DGN R655.3 MES12).

CHECK THE SOURCE OF THE AIR OR IF THE AIR PIPE IS BROKEN.

M. LUBRICATION LOW LEVEL (DGN R655.4 MES13).

WHEN THIS ERROR OCCUR MACHINE SWITCH TO SINGLE BLOCK  
AUTO MATICALLY . REFILL THE LUBRICATION.

N. LIMIT SWITCH ERROR DISP . (DGN R655.5 MES14)

CHECK TOOL CLAMP AND UNCLAMP POSTION AND LIMIT  
SWITCH.

O. SPD START ERROR (T UNCLAMP) (DGN R655.6 MES15).

BEFORE TURNNING THE SPINDLE, TOOL MUST IN CLAMP  
POSITION.

P. MAGAZINE POS. ALARM (DGN R655.7 MES16).

CHECK IF MAGAZINE IS IN POSITION OR IF THE POSITION  
SENSOR GOT THE SIGNAL.

### 9.3 INPUT / OUTPUT SIGNAL DIAGNOSE (FANUC 0MD)

IF ANY TROUBLE WITH I / O SECTION IS PRESUMABLE FROM  
ALARM CODE AND STATUS CODE DISPLAY, THE CURRENT  
STATUS OF I / O SIGNAL CAN BE DISPLAYED FOR CHECKING  
PRESS DGNOS, NO. , ( ON CONTROL PANEL ) AND I / O SECTION  
NUMBER WHICH IS ASSUMED GENERATING TROUBLE. ERROR  
CONTENTS (MESSAGE) ARE DISPLAYED WITH " 1 " OR " 0 " .

A. IN CASE OF MAKE CONTACT

" 1 " = OPEN CONTACT

" 0 " = CLOSED CONTACT

B. IN CASE OF BREAK CONTACT

" 1 " = CLOSED CONTACT

" 0 " = OPEN CONTACT

(REFER TO THE ELECTRIC CIRCUIT DIAGRAM ABOUT THE KIND  
OF CONTACTS)

FOR THE DETAIL OF OPERATING METHOD PLEASE REFER TO  
FANUC MAINTENANCE MANUAL STATUS DISPLAY BY SELF-  
DIAGNOSTIC FUNCTION



## FANUC 18MC 24/32 TOOLS

NO.	ADDRESS	MESSAGE
001	A10.0	1000 X AXIS OVER TRAVEL
002	A10.1	1010 Y AXIS OVER TRAVEL
003	A10.2	1020 Z AXIS OVER TRAVEL
004	A10.3	1030 LUBRICATION PUMP OVER LOAD
005	A10.4	1040 COOLANT PUMP OVER LOAD
006	A10.5	1050 MAGAZINE ARM MOTOR OVER LOAD
007	A10.6	1060 MAGAZINE RUN MOTOR OVER LOAD
008	A10.7	1070 SPINDLE COOLANT PUMP OVER LOAD
009	A11.0	1100 CHIP CONVEYER OVER LOAD
010	A11.1	1110 TAPPING OIL PUMP OVER LOAD
011	A11.2	1120 SPINDLE COOLANT PUMP OVER LOAD
012	A11.4	1140 RECYCLE PUMP OVER LOAD
013	A11.5	1150 CHIP CLEAN PUMP OVER LOAD
014	A12.0	2000 M-CODE OCCUPIED (MF1)
015	A12.3	2030 M30 PROGRAM END
016	A12.4	2040 M02 PROGRAM END
017	A12.5	2050 M01 PROGRAM OPTIONAL STOP
018	A12.6	2060 M00 PROGRAM STOP
019	A13.0	1300 LUBRICATION OIL LOW LEVEL
020	A13.1	1310 AIR LOW PRESSURE
021	A13.2	1320 FANUC BATTERY LOW LEVEL
022	A13.4	1340 COOLANT TANK LOW LEVEL
023	A13.5	1350 COOLANT TANK HIGH LEVEL
024	A14.0	1400 SPINDLE ALARM
025	A14.2	1420 SPINDLE RUN NOT S CODE
026	A14.3	1430 SPINDLE ORIENTATION ALARM
027	A14.4	1440 SP. RIGID TAP MADE REST

028	A15.0	1500 TOOL CLAMP LIMIT ERROR
029	A15.1	1510 TOOL UNCLAMP LIMIT ERROR
030	A15.3	1530 TOOL UNCLAMP SOL ERROR
031	A17.0	1700 MAGAZINE DOWN LIMIT ERROR
032	A17.1	1710 MAGAZINE UP LIMIT ERROR
033	A17.2	1720 MAGAZINE DOWN SOL ERROR
034	A17.3	1730 MAG. FORWARD LIMIT ERROR
035	A17.4	1740 MAG. BACKWARD SOL ERROR
036	A17.5	1750 MAG. FORWARD SOL ERROR
037	A18.0	1800 MAGAZINE ARM NOT AT HOME POSITION
038	A18.1	1810 MAGAZINE NOT IN POS
039	A18.2	1820 Z AXIS NOT HOME POS
040	A19.0	2100 RETURN TO ALL AXES REF POS
041	A19.1	1910 AUTO POWER OFF ALARM
042	A19.3	1930 FLOW CIRCULATION ERROR
043	A20.2	2020 LUBRICATION SYSTEM ERROR (LUB OIL PRESSURE LOW)

## 10. 24/32 TOOLS ATC TROUBLESHOOTING

### 10.1 FANUC OMC , OMD

- A. DIFFERENT LADDER EDITION MIGHT HAVE DIFFERENT DGN SETTING. PLEASE REFER TO PARAMETER LIST "DGN SETTING" FOR DGN NUMBER INFORMATION.
- B. CHECK TOOL POT NUMBER DGN. THE NUMBER SHOULD BE THE SAME AS THE TOOL POT NUMBER ON THE MAGAZINE .
- C. IF THE TWO NUMBER IS DIFFERENT ...
  - a. CHANGE DGN TO THE CORRECT NUMBER .
  - b. SWITCH TO MANUAL MODE AND ROTATE THE TOOL
  - c. CHECK THE TOOL NUMBER ON THE TOOL POT .
  - d. CHECK SPINDLE TOOL DGN.
  - e. CHANGE DGN TO THE CORRECT TOOL NUMBER . ( OR CHANGE THE TOOLS TO FIT DGN NUMBER )

### 10.2 FANUC 18M

- A. PROCEDURE AS ABOVE
- B. REFER TO PARAMETER LIST "DGN SETTING" FOR DGN NUMBER INFORMATION.