

Partner 2C

Electrical and Mechanical Manual

Milltronics Manufacturing Company

1400 Mill Lane
Waconia, MN USA 55387

952-442-1410

DRIVE BUSS TRANSFORMERS SETTINGS

CUSTOMER INPUT VOLTAGE	TRANSFORMER	PRIMARY INPUT BUSS VOLTAGE	SECONDARY OUTPUT BUSS VOLTAGE
110 VAC	3356 1KVA	H1-H2 110	X1-X2 68 X1-X3 72 X1-X4 79
220 VAC (NOTE NEED TO JUMP H1 TO H3 & H2 TO H4)	3357 1KVA	H1-H2 220	X1-X2 68 X1-X3 72 X1-X4 79
440 VAC (NOTE NEED TO JUMP H2 TO H3 & H1 TO H4)	3357 1KVA	H2-H4 220	X1-X2 68 X1-X3 72 X1-X4 79
208 VAC	3358 1.5KVA	H1-H2 208	X1-X2 110
240 VAC	3358 1.5KVA	H1-H3 240	X1-X2 110
480 VAC	3358 1.5KVA	H1-H4 480	X1-X2 110

SYSTEM 110 TRANSFORMER SETTING

CUSTOMER INPUT VOLTAGE	TRANSFORMER	PRIMARY INPUT BUSS VOLTAGE	SECONDARY OUTPUT BUSS VOLTAGE
208 VAC	3263 .5KVA	H1-H2 208	X1-X2 110
240 VAC	3263 .5KVA	H1-H3 240	X1-X2 110
480 VAC	3263 .5KVA	H1-H4 480	X1-X2 110

MEASURING POWER SUPPLY AND BUSS VOLTAGE USING A DC VOLT METER

- 1) CONNECT COMMON LEAD OF THE DC VOLT METER TO TERMINAL BLOCK BLOCK 22 (DC GROUND) AND THE OTHER LEAD TO TERMINAL BLOCK BEING CHECKED SEE TABLE (1.1)

TABLE 1.1 POWER SUPPLY TERMINAL BLOCK

TERMINAL BLOCK	VOLTAGE
12	24 VDC
23	5.1 VDC
26	14.9 VDC
27	-14.9 VDC

- 2) TO CHECK BUSS VOLTAGE SET DC VOLT METER TO ABOUT THE 200 VOLT RANGE. CONNECT THE COMMON LEAD TO THE NEGATIVE TERMINAL OF THE CAPACITOR ON DRIVE PLATE THE OTHER LEAD TO THE POSITIVE TERMINAL. USE TABLE (1.2) FOR CORRECT BUSS VOLTAGE READINGS.

TABLE 1.2 BUSS VOLTAGE FOR MILLS

MILL	BUSS VOLTAGE
2, 3, 4	95 - 105
5	150 - 160

- 3) TO CORRECT BUSS VOLTAGE MOVE THE SECONDARY TAP TO ADJUST VOLTAGE HIGHER OR LOWER ACCORDING TO DRIVE BUSS TRANSFORMER SETTINGS ON PAGE 1.

UNCRATING:

Carefully remove protective crating so that machine and parts are not marred or damaged. In the event of damage in transit, IMMEDIATELY notify the distributor from whom the machine was purchased, as well as the transportation company making delivery.

SHORTAGES:

Check shipment carefully against the itemized packing list. In case of shortages, report them IMMEDIATELY to the distributor from whom the machine was purchased.

CLEANING:

Thoroughly clean protective coating from the machine with a suitable cleaning solution.

WARNING

IT IS NOT RECOMMENDED THAT GASOLINE OR ANY OTHER HIGHLY INFLAMMABLE CLEANING AGENT BE USED.

Do not move the table, knee, saddle or ram until all ways have been well cleaned and lubricated. Then move table, saddle, and knee to limit stop in one direction. Clean and lubricate the exposed ways and then move each unit to the opposite limit stop and similarly clean and lubricate the exposed ways.

RECOMMENDATIONS

Use 2, 3, or 4 flute end mills. Eight flute end mills are usually not as satisfactory for general milling. When using shell mills, face mills, or any other tooling, proper machining practice should be observed.

CAUTION

DO NOT TRY TO CHANGE SPINDLE SPEED ON VARI-DRIVE HEAD UNTIL MOTOR IS RUNNING. THIS COULD CAUSE PARTS BREAKAGE.

Spindle Feeds are adjusted by turning speed change handwheel on the front of the belt housing. There are two ranges shown: 60 to 500, and 500 to 4200.

60 - 500 RPM is obtained through the back-gear drive and is referred to as low range. To engage the back-gears, use the lever marked Hi-Neutral-Lo on the right side of the head. Move this lever to the "LO" position and use low range on the variable speed dial.

When shifting to "LO," DO NOT FORCE THE LEVER if the back gears do not mesh. Hold the lever so that the gears are clear of one another, rotate the spindle nose by hand until the gears line up, and then put the unit in "LO" (back gear).

500 - 4200 RPM is direct drive and is the high range. The same procedure as previously described is used to select this range except the Hi-Neutral lever is set in the Hi position.

Wear on the vari-drive belt will cause a slight change in the speeds to that shown in windows on the dial. This can be corrected as follows. Crank the speed change handwheel snugly against the high speed stop. (This will be near the 4200 reading on the dial.) Use a tachometer to determine the spindle speed, then turn the pivot stud, after loosening the jam nut, until the spindle speed registers 4200 on the tachometer; tighten the jam nut.

Now reposition the speed dial plate to match the tachometer reading. This is done by loosening the Hex nut until the spindle speed registers 4200 on the tachometer; tighten the jam nut.

DO NOT LOOSEN THE 3 HEX NUTS on the upper part of the Quill Housing. These are set at the factory and are used only for alignment.

REMOVING THE MOTOR

Run the head to the lowest speed of either range and shut off the motor. This puts the Vari-Drive belt in the best position for disassembly.

1. DISCONNECT THE POWER.
2. Remove the cover (B, Figure 3) at the lower end of the motor shaft. Use two cover screws (A) to fasten the spring (C) on the lower end of the motor shaft to the lower motor vari-drive pulley. This will reduce the hazard of personal injury that is always present when a heavy spring is under compression. When the pulley, spring retainer, and spring are securely fastened as a single unit, crank the speed change handwheel to the top speed position.
3. Now remove the screws (D) that fasten the motor to the belt housing. The motor should be lifted slightly and pulled firmly away from the spindle and toward the rear of the belt housing. This will pull the vari-drive belt deeply into the spindle pulley providing the slack needed to slip the belt over the motor pulley.
4. Now lift the motor high enough to rest the motor base GENTLY on the adjusting screw (E) seen directly in front of the motor flange. The belt can now be slipped over the lower pulley and the motor removed from the housing.

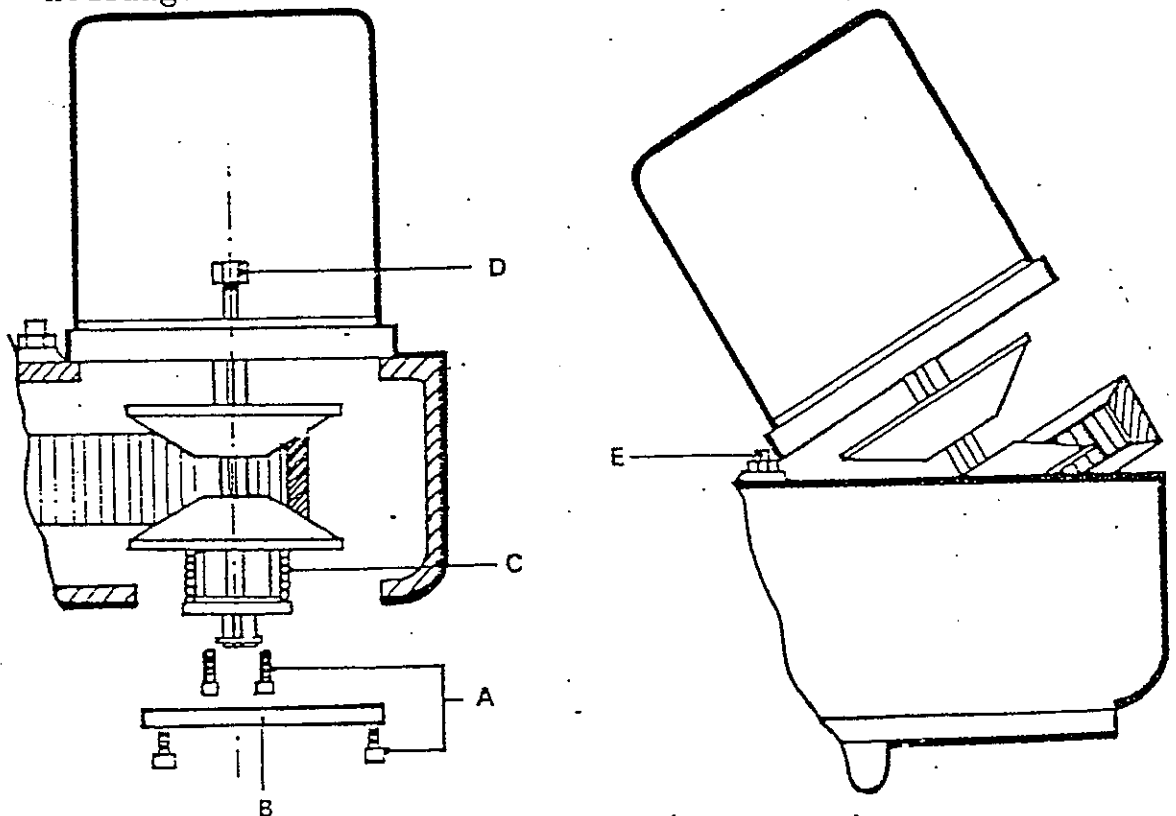


Figure 3. Removing the Motor (Side View)

CHANGING VARI-DRIVE BELT

Complete the previous procedures for removing the motor, then remove the three screws (A, Fig 4) and lift out the top bearing cap (B). Looking down inside of the housing, locate and remove two socket head cap screws and sleeves (C). Next, remove the six screws (D) then holding the belt housing (E) to the base.

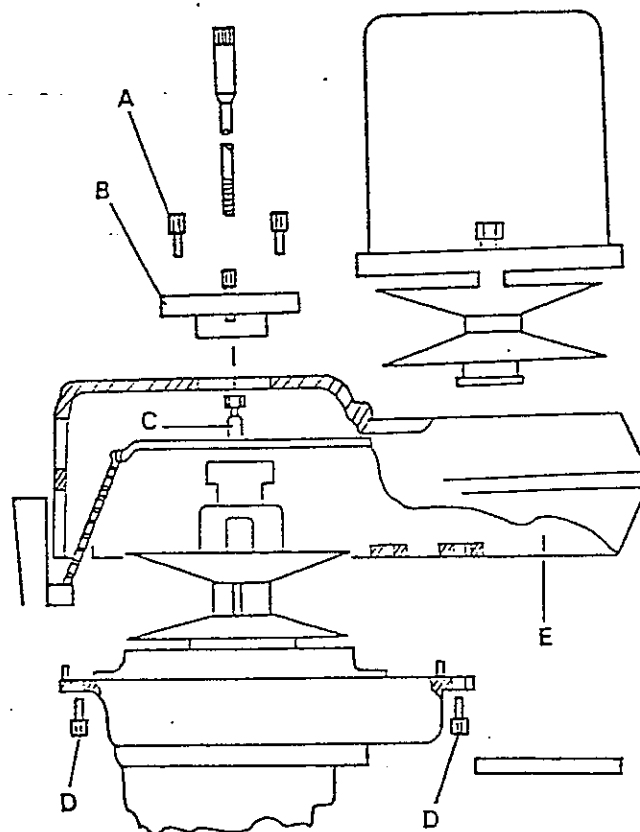


Figure 4. Removing the Vari-Drive Belt

Remove the old belt and replace it with a new belt. Do not use a substitute belt purchased from other than a # 383032B-13 of Bando V/S Belt. Vibration and heat could result from the use of the wrong belt.

WARNING
USE ONLY
MOBIL VACTRA no.2
AMOCO WAYTAC no.68
SUNOCO SUNWAYLUBE no.1180
OR EQUIVALENT

CHANGING THE TIMING BELT (Figure 5)

Complete the operation for removing the motor. Then put the Hi-Neutral-Lo lever in the Lo position, remove the drawbar (A, Figure 5), and lower the spindle.

Remove screws (B) holding the upper and lower housing together, including the two lower screws (C) in speed changer bracket just below the speed dial.

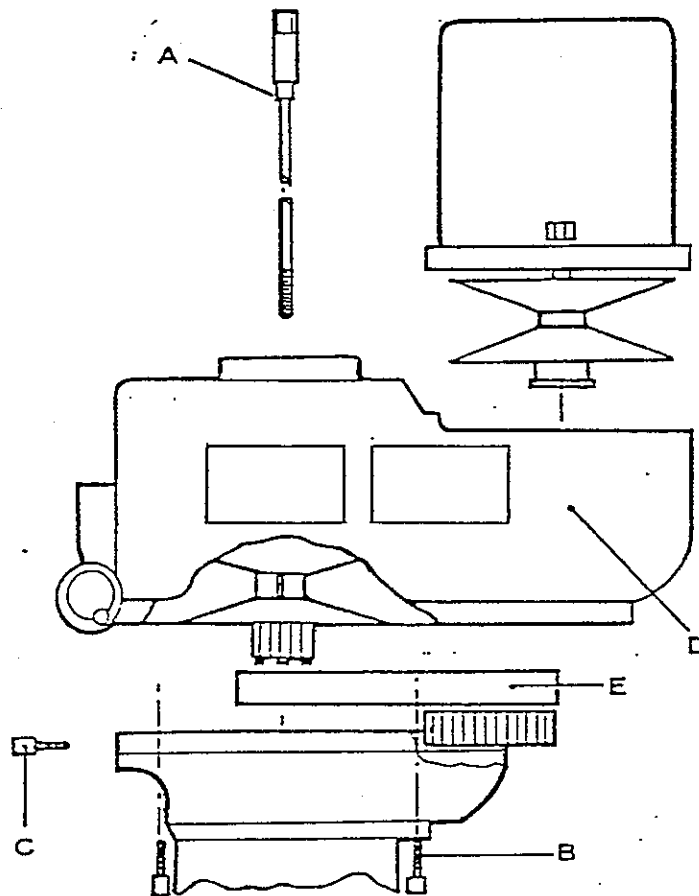
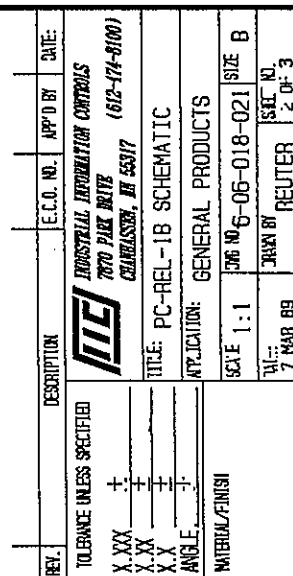


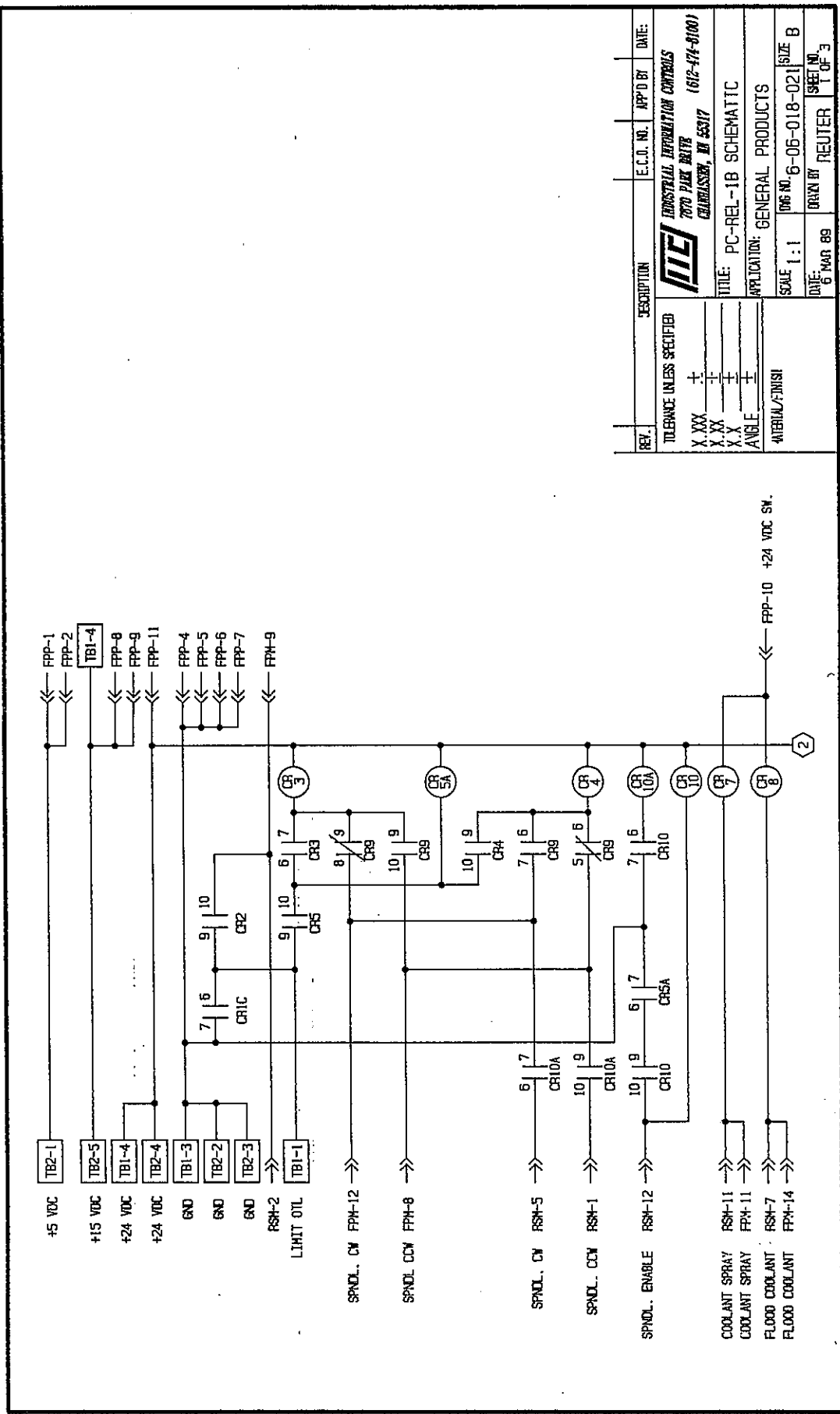
Figure 5. Removing Timing Belt

A slight blow under the speed changer bracket may be needed to separate the upper housing (D) from its base.

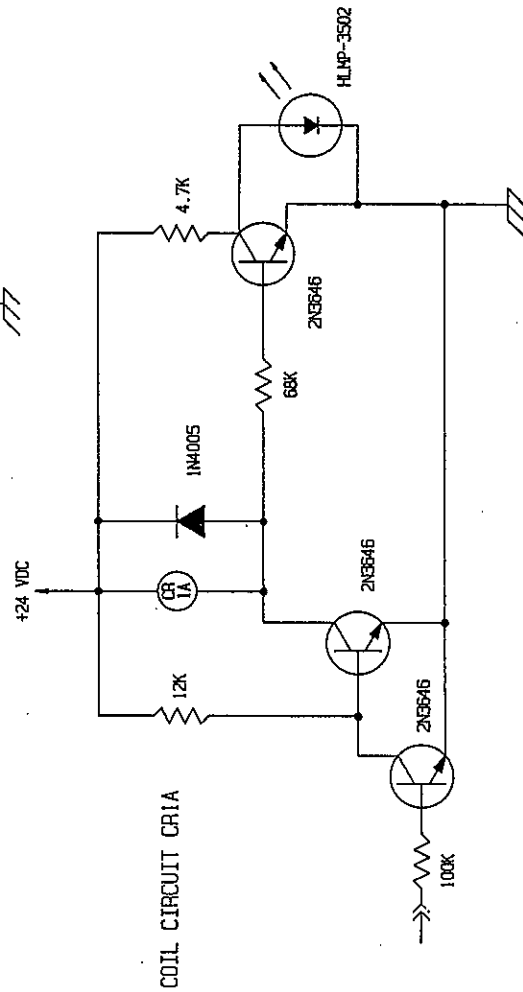
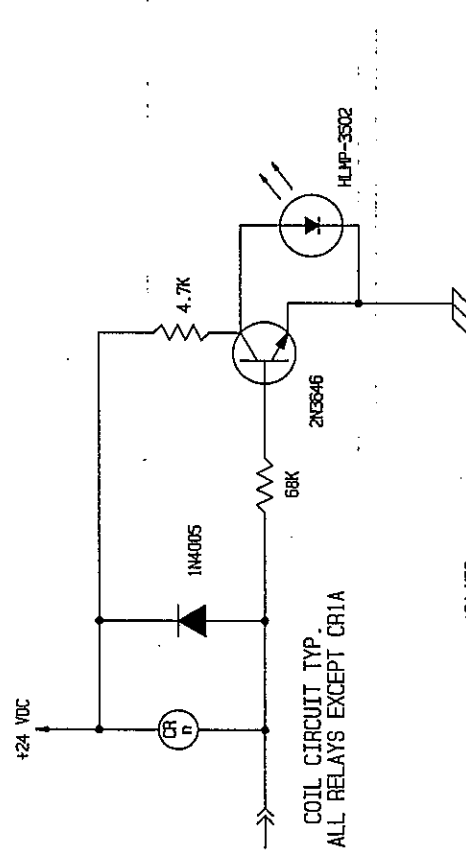
As the housings are being separated, the HTD belt (E) still connects them, resisting the separating movement. The separation can be assisted by gently pushing the belt off the large pulley as the upper housing is being raised.

Remove the old belt and replace with a new belt.

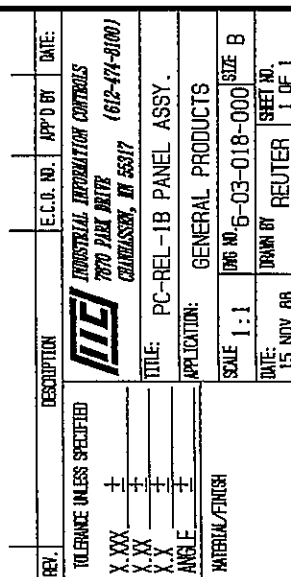




REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
	TOLERANCE UNLESS SPECIFIED			
	X.XXX ±			
	X.XX ±			
	X.X ±			
	ANGLE ±			
	WATER/FINISH			
 INDUSTRIAL INFORMATION CONTROLS 7070 PLUS MILLER CHENNAI, IN 5317				
TITLE: PC-REL-1B SCHEMATIC				
APPLICATION: GENERAL PRODUCTS				
SCALE 1:1				
DATE: 6 MAR 89				
DRAWN BY: REUTER				
SHEET NO. 1 OF 3				

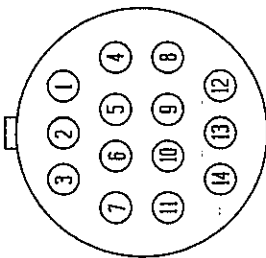


REV.	DESCRIPTION	E.C.D. NO.	APP'D BY	DATE:
TOLERANCE UNLESS SPECIFIED				
X.XXX	+			
X.XX	+			
X.X	+			
ANGLE	+			
MATERIAL/FINISH				
 INDUSTRIAL INFORMATION CONTROLS 7070 PARK DRIVE CLEVELAND, OH 44137 (612-474-8000)				
TITLE: PC-REL-1B SCHEMATIC				
APPLICATION: GENERAL PRODUCTS				
SCALE 1:1 JWG N° 6-06-018-021 SIZE G				
DATE: MAR 89 REW BY: NEUTER ISS NO. 3 OF 3				



REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE:
	TO FINISH: UNLESS SPECIFIED X. XXX ± X. XX ± X. X ± ANG. F ±	INDUSTRIAL INFORMATION CONTROLS 7070 PEEK DRIVE CHICAGO, IL 60637		
TITLE: PC-REL-1B PANEL ASSY.				
APPLICATION: GENERAL PRODUCTS				
MATERIAL/FINISH		SIZE B DWG NO. 6-03-018-000		
DATE: 15 NOV 68		DRWN BY REUTER SHEET NO. 1 OF 1		

FEMALE AMP PLUG



TERMINAL BLOCK

1	2	3	4	5	6	7	8
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NOTES:
1. TABLES REFERENCE
TO PC REL. 1B 1/0
BOARD ONLY

RSM (CNC)

PIN No.	FUNCTION	INT. DEST.
1	SPINDLE COV	CR10A-10
2	TOOL CHG RESET	CR-8
3	SPINDLE STOP	PPM-10
4	SPINDLE ANALOG	TB2-7
5	SPINDLE CV	CR10A-6
6	RESET ALLOW	PPM-13
7	COOLANT FLOOD	CR8
8	S-WORD DISABLE	CR11
9	EXCESS ERROR	TB2-6
10	UP TO SPEED	TB2-8
11	COOLANT SPRAY	CR7
12	SPINDLE ENABLE	CR-8
13	LUBE FAULT	TB1-6
14	WAIT CHANNEL	TB1-14

MISC.

PIN No.	FUNCTION
1	CR 12-10
2	CR 12-8
3	CR 12-9
4	W/A
5	CR 12-7
6	CR 12-6
7	CR 12-5
8	SPARE
9	CR 11-8
10	CR 11-9
11	CR 11-10
12	CR 12 COIL
13	KEY
14	KEY

F.P.P.

PIN No.	FUNCTION
1	+500C
2	+5V
3	KEY
4	GND
5	GND
6	GND
7	GND
8	+15V
9	+15V
10	SWITCHED 24V
11	24V
12	SPARE
13	SPARE
14	SPARE

F.P.M.

PIN No.	FUNCTION	INT. DEST.
1	KEY	
2	RESET	CR1A-5
3	E STOP	PPM-2
4	E STOP	CR1C
5	SPINDLE STOP	CR2-6
6	TOOL CHANGE	CR2
7	KEY	
8	SPINDLE COV	CR-8, 9
9	TOOL CHG RESET	RSM-2
10	SPINDLE STOP	RSM-3
11	COOLANT SPRAY	CR-7
12	SPINDLE CV	CR-8, 9
13	RESET	RSM-6
14	COOLANT FLOOD	CR8

T.B. 1

T.B. No.	FUNCTION	INT. DEST.
1 (6)	OVER TRAVEL LIMITS	CR-8
2 (9)	OVER TRAVEL LIMITS	CR1A
3 (22)	GND	
4 (76)	+15V	
5 (86)	SPINDLE HI/LON	
6 (78)	CNC AUTO LUBE	CR9
7 (79)	CNC WAIT CHANNEL	RSM-13
8 (12)	+24V	RSM-14

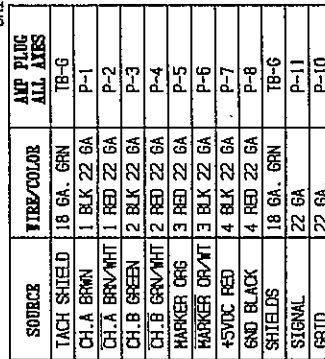
T.B. 2

T.B. No.	FUNCTION	INT. DEST.
1 (23)	+5V	
2 (22)	GND	
3 (22)	GND	
4 (12)	+24V	
5 (26)	+15V	
6 (21)	EXCESS ERROR	CR1A
7 (97)	SPINDLE ANALOG	RSM-4
8 (90)	AUTO SPEED	RSM-10

T.B. 3

T.B. No.	FUNCTION	INT. DEST.
1 (56)	AC MAGNETICS	CR-5
2 (57)	AC MAGNETICS	CR5-7
3 (61)	AC MAGNETICS	CR7-9
4 (1)	AC MAGNETICS	CR1C-9
5 (A)	AC MAGNETICS	CR3-10
6 (8)	AC MAGNETICS	CRM-7
7 (C)	AC MAGNETICS	CR8-7
8 (D)	AC MAGNETICS	CR1C-10
9 (B2)	AC MAGNETICS	CR11-5

REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE:
	TOLERANCE UNLESS SPECIFIED			
	X.XXX ±			
	X.XX ±			
	X.X ±			
	ANGLE ±			
	MATERIAL/FINISH			
INDUSTRIAL INFORMATION CONTROLS 7070 PINE BLVD CHARLESTON, WY 83017 TEL: 612-474-8100				
TITLE: PC REL. 1B 1/0 PLUG DEF.				
APPLICATION: GENERAL PRODUCTS				
SCALE 1:1	DWG NO. 6-04-018-005	SIZE B		
DATE: 11 AUG 88	DRAWN BY REITER	SHEET NO. 1 OF 1		



TACH WIRES:
CUT OFF SHIELD ON MOTOR END AND
SECURE WITH HEAT-SHRINK. PULL 4 IN. WIRE
THRU SHIELD AND SECURE WITH HEAT-SHRINK.
LARGE SHIELD AS '6'.

END OF WIRE:

CUT OFF SHIELD ON MOTOR ENDS AND SECURE WITH HEAT-SHRINK. LABEL AS 1,2,3,4. PULL 4 IN. WIRE THRU SHIELDS. PLACE MALE AMP PINS ON WIRES. LABEL WIRES 1 THRU 8. INSTALL PINS TO PLUG

GRID WIRE:

CUT OFF SHIELD AND RED WIRE ON MOTOR END. SECURE WITH HEAT-SHRINK. LABEL AS '10'. CUT OFF RED WIRE AND COVER SHIELD WITH HEAT SHRINK. PLACE MALE AMP PIN ON BLACK WIRE AND INSTALL INTO PLUG.

SIGNAL WIRE:-

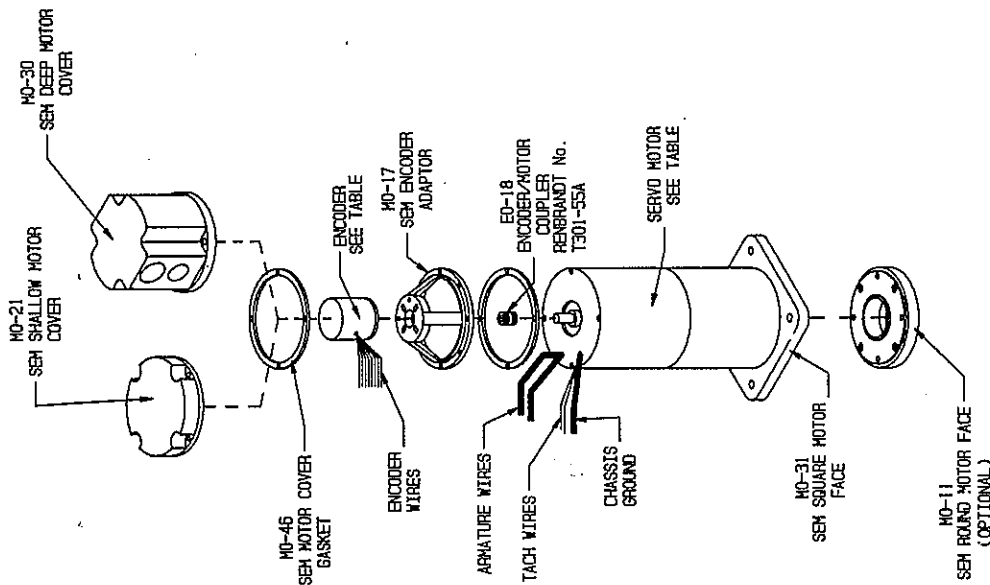
SIGNAL WIRE:
CUT OFF SHIELD AND BLACK WIRE ON MOTOR END, SECURE WITH HEAT-SHRINK. LABEL AS '1'. CUT OFF BLACK WIRE AND COVER SHIELD WITH HEAT-SHRINK. PLACE MALE AMP PIN ON RED WIRE AND INSTALL INTO PLUG.

ARMATURE WIGGS (PARTNER V)

ARMATURE WIRES (PARINER V)
12 GA. RED/BLACK TWISTED PAIR

SOURCE	COLOR/TIRE	X	Y	DESTINATION Z
MOTOR +	RED 14 GA	TB-35	TB-44	TB-53
MOTOR -	BLK 14 GA	TB-36	TB-45	TB-54
TACH +	RED 22 GA	TB-29	TB-38	TB-47
TACH -	RED 22 GA	TB-30	TB-39	TB-48
SIGNAL	RED 22 GA	TB-28	TB-37	TB-46
GRN	PK 22 GA	TB-34	TB-43	TB-52

REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE:
	TO EXHIBIT UNLESS SPECIFIED  INDUSTRIAL INFORMATION CONTROLS 7870 PARK DRIVE CHAMLISSEEN, MI 55317 (612-474-9100)			
	X XXX ±			
	X XX ±			
	X X ±			
	ANGLE ±			
	TITLE: X, Y, Z MOTOR CABLES/ASSY.			
	APPLICATION: GENERAL PRODUCTS			
	MATERIAL FINISH			
	SCALE 1:1			
	DATE DEC 88			
	DRAWN BY REUTER			
	SHEET NO. 1 OF 2			
	DWG NO. 6-04-018-005			
	SIZE B			



MOTOR TABLE		
IIC No.	MANUFACTURER'S No.	TORQUE LB/IN
MO-1	MT30F4-25	13
MO-2	MT30H4-38	26
MO-3	MT30M4-36	40
MO-8	MT40ZD4-90-744	97 (W/O BRAKE)
MO-9	MT40ZD4-90-746	97 (WITH BRAKE)
MO-22	MT30U4-57	40

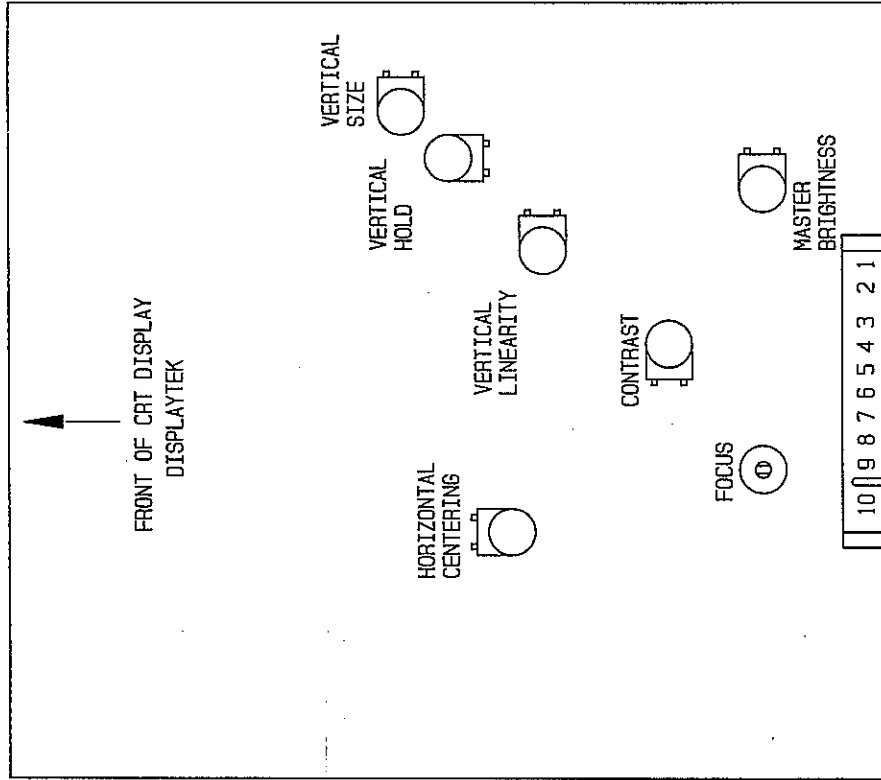
ENCODER TABLE		
IIC No.	MANUFACTURER'S No.	COUNT
EO-4	152-021-500-18UAS	DRC-500
EO-5	152-021-1000-18UAS	DRC-1000

FACEPLATE TABLE		
IIC No.	MANUFACTURER'S No.	DESCRIPTION
MO-11	S081-1-43S47	SEM ROUND
MO-31	3 IN RABBIT	SEM SQUARE
N/A	4.5 IN RABBIT	SEM SQUARE

MOTOR COVER TABLE		
IIC No.	MANUFACTURER'S No.	DESCRIPTION
MO-21	330CHT1477	SHALLOW COVER
MO-30	N/A	DEEP COVER

COMPONENT ASSIGNMENTS						
PART	PARTNER MILLING MACHINE (IIC No. GIVEN)					
	II	III	IV	V	VII	
MOTOR	MO-1	MO-2	MO-2	MO-22	MO-6,9	
ENCODER	EO-4	EO-4	EO-4	EO-4	EO-5	
COVER	MO-30	MO-30	MO-30	MO-30	MO-30	
FACEPLATE	MO-31	MO-31	MO-31	N/A	N/A	

REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE:
	TOLERANCE UNLESS SPECIFIED			
X .XX	±			
X .XX	±			
X .XX	±			
ANGLE	±			
 INDUSTRIAL INFORMATION CONTROLS 7070 PARK DRIVE CHILMARK, MA 01937 (612-474-8100)				
TITLE: SERVO MOTOR ASSY				
APPLICATION: GENERAL PRODUCTS				
SCALE	5:1	DATE	6-02-018-013	SIZE B
DRAWN BY	30 NOV 88	REVIEWED	REUTER	SHEET NO. 1 OF 1



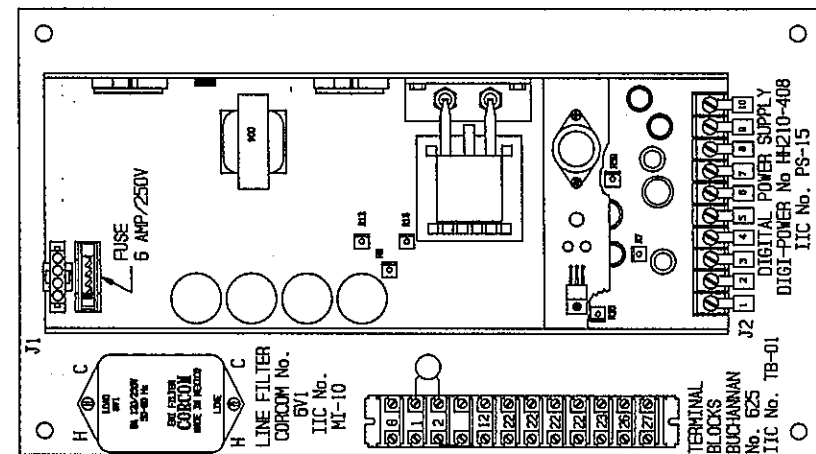
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X.XX	±			
X.XX	±			
X.X	±			
X.X	±			
ANGLE	±			
MATERIAL/FINISH				
 INDUSTRIAL INFORMATION CONTROLS 7070 PARK DRIVE CHARLLESTON, NH 05517				
TITLE: CRT PC TRIMPOT LOCATOR				
APPLICATION: GENERAL PRODUCTS				
SCALE 1:1		DWG NO. 6-02-018-101		SIDE B
DATE: 20 SEP 88		DRAWN BY: REUTER		SHEET NO. 1 OF 1

POWER SUPPLY DATA

- J1-1 115VAC HOT OUTPUT
 J1-2 NOT USED
 J1-3 CHASSIS GROUND
 J1-4 115VAC COMMON INPUT
 J2-1 NOT USED (POWER FAIL)
 J2-2 GND. (POWER FAIL RET.)
 J2-3 -15VDC • 1.5A OUTPUT
 J2-4 GROUND
 J2-5 +24VDC • 2.0A OUTPUT
 J2-6 +15VDC • 4.0A OUTPUT
 J2-7 GROUND
 J2-8 GROUND
 J2-9 +5VDC • 20A OUTPUT
 J2-10 +5VDC • 20A OUTPUT
 J1 CONNECTOR - AMP P/N 350779-1
 J1 SOCKET - AMP P/N 350689-1
 R9-11LM ADJ.: PRESET TO 120% TOTAL
 POWER OUTPUT
 R13-0VP ADJ.: PRESET TO 140% (ALL OUTPUTS)
 R15-0H ADJ.: PRESET (INTERNAL VOLTAGE)

NOTES:

1. 'P' DESIGNATES MALE
 AMP PLUG, CD-17
 2. USE 14 GA. BLUE WIRE
 (WC-06) FOR P-PLUG
 ALL LENGTHS: 36 IN.
 3. BEND 12 WIRES TO RIGHT FOR STAND
 ALONE MODELS. BEND 12 WIRES TO LEFT FOR
 ALL OTHER APPLICATIONS.
 3. ADD MOV TO TB 1 & 2



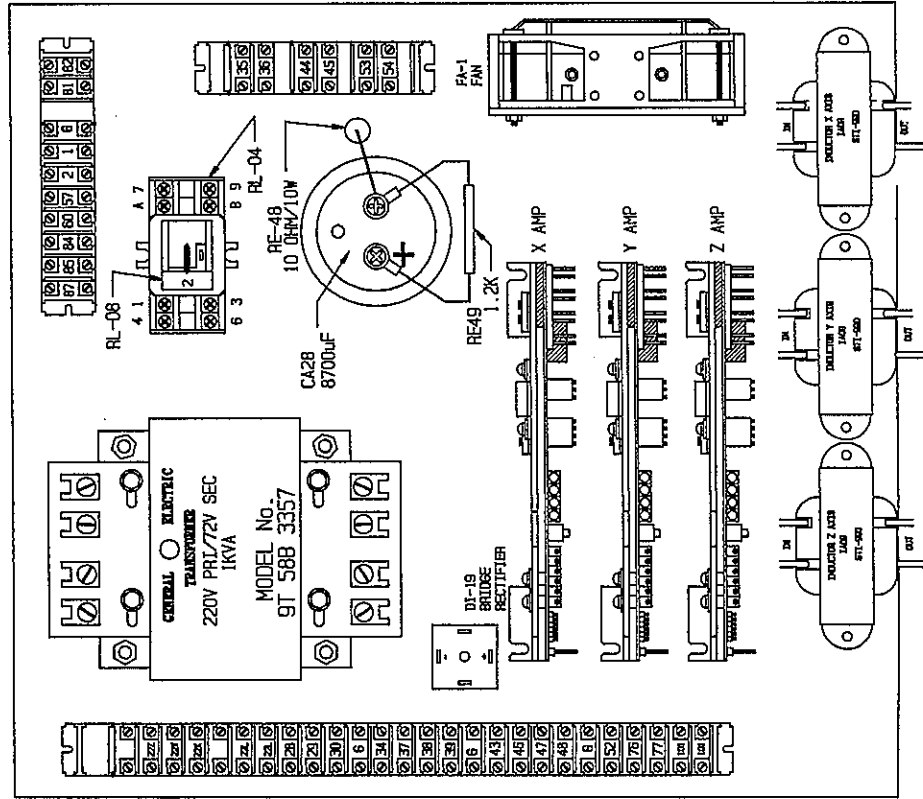
ASSEMBLY WIRING (ALL 14 GA.)

FROM	TO	FROM	TO
J1-3	TB-6	J2-5	P-4
LF-GND	TB-6	J2-6	TB-26
LF-LINE-C	TB-1	J2-6	P-6
J1-4	LF-LOAD-H	J2-7	TB-22
LF-LINE-H	TB-2	J2-7	P-13
J1-1	LF-LOAD-C	J2-8	TB-22
J2-2	TB-22	J2-8	P-11
J2-3	P-10	J2-8	P-12
J2-3	TB-27	J2-9	P-1
J2-3	P-7	J2-9	P-2
J2-4	TB-22	J2-10	TB-23
J2-4	P-14	J2-10	P-3
J2-5	TB-12		

TRIM POT DEFINITIONS

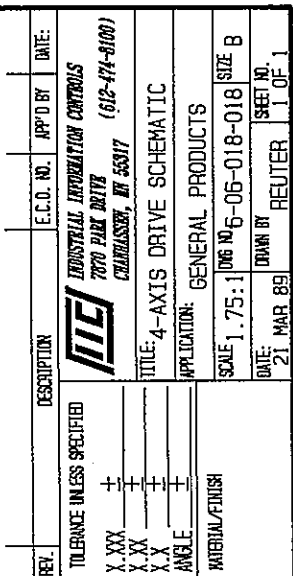
- R 9 11LM ADJUST R35 +5V ADJUST
 R13 0VP ADJUST R57 -15V ADJUST
 R15 +3V ADJUST R58 +15V ADJUST

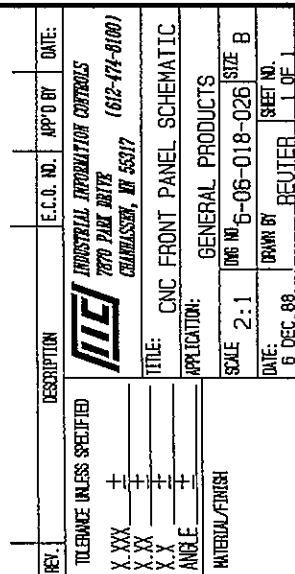
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
A	ADD MOV	19	M.F.	15/89
INDUSTRIAL INFORMATION CONTROLS 7070 PINE BLVD CHICAGO, IL 60637 TEL: (312) 474-8100				
TITLE: DIGITAL PWR. PANEL ASSY. APPLICATION: GENERAL PRODUCTS SCALE: 2.5:1 DWG NO.: 6-03-018-001 SIZE: B DATE: 17 NOV 88 DRN BY: REUTER SHEET NO.: 1 OF 1				

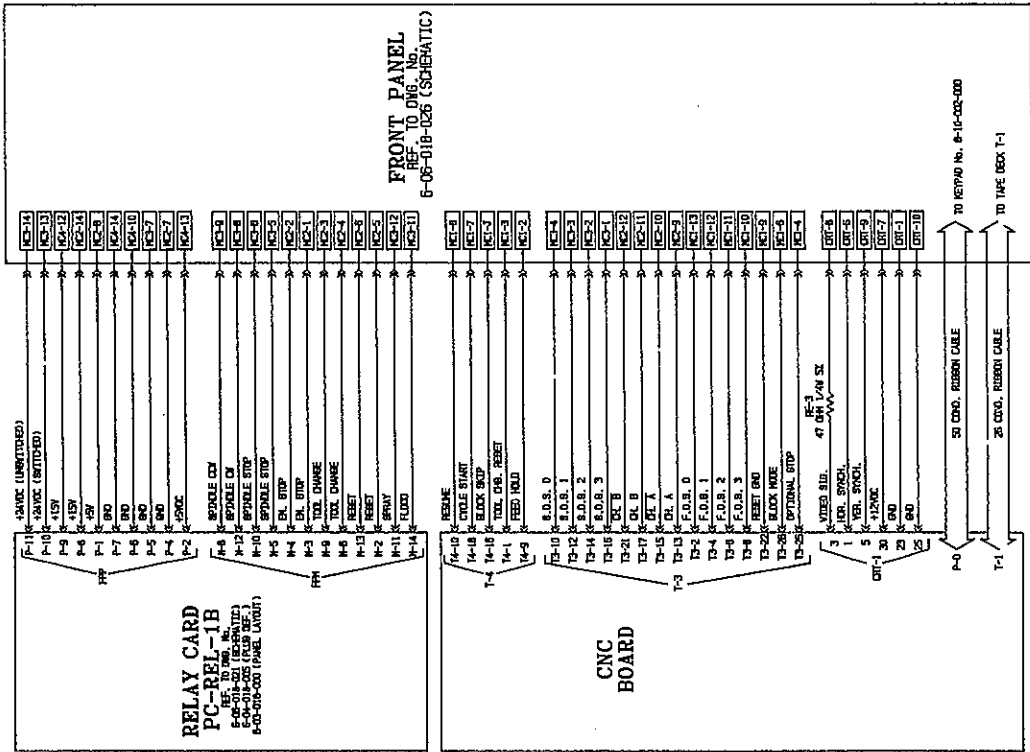


A	REF. TO E.C.O.	48	M.F.	8/89
REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
MATERIAL/FINISH				
STOCK NO.				
UNLESS SPECIFIED				
X.X.I	+			
X.X.X	+			
X.X.X	+			
AWG. F.	+			
TITLE 3 AXIS DRIVER AMP BOARD				
APPLICATION GENERAL PRODUCTS				
SCALE 2.5:1				
DATE 18 NOV 88				
DRAWN BY REUTER				
SHEET NO. OF 1				

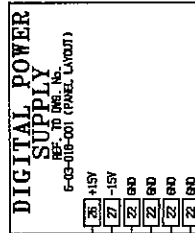
MILLITRONICS MANUFACTURING
7870 PARK DRIVE (612) 474-8100
CHANEASSEN, MN 55317



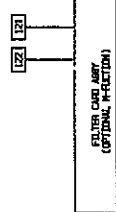




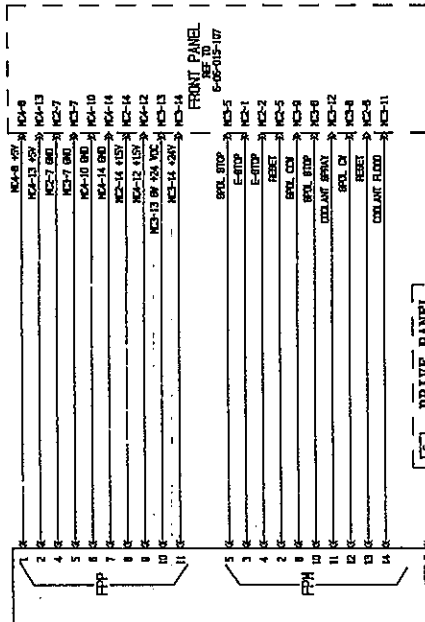
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	ANGLE			
	MATERIAL/FINISH			
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TITLE: CNC/FRONT PANEL INTERFACE				
APPLICATION: GENERAL PRODUCTS				
SCALE: 2.5:1 (SEE NO. 6-06-018-027) SIZE B				
DATE: 27 MAR 89 DRAWN BY: REUTER SHEET NO. 1 OF 1				



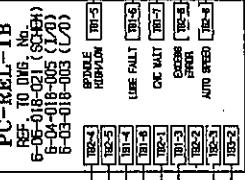
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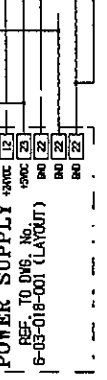
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6-05-018-015 (REVISION)



RELAY CARD
PC-REL-1B
REF. TO Dwg. No.
6-05-018-021 (SCHED)
6-05-018-022 (L/O)
6-05-018-023 (L/O)



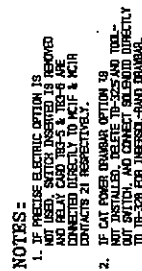
DIGITAL
POWER SUPPLY
REF. TO Dwg. No.
6-05-018-001 (LAYOUT)



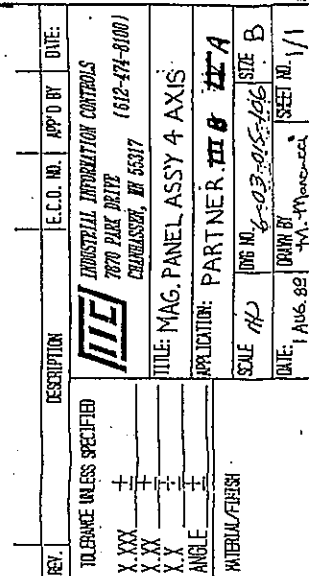
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	7070 PUMP DRIVE			
	CHAMBERS, MI 55317			
	TITLE: SYSTEM INTERCONNECT/DC			
	APPLICATION: GENERAL PRODUCTS			
	SCALE: 2.25:1			
	DWG NO: 6-05-018-023			
	SIZE: B			
	DATE: 27 MAR 89			
	DRAWN BY: REUTER			
	SHEET NO: 1 OF 1			

INDUSTRIAL INFORMATION CONTROLS
7070 PUMP DRIVE
CHAMBERS, MI 55317

TITLE: SYSTEM INTERCONNECT/DC
APPLICATION: GENERAL PRODUCTS
SCALE: 2.25:1
DWG NO: 6-05-018-023
SIZE: B
DATE: 27 MAR 89
DRAWN BY: REUTER
SHEET NO: 1 OF 1



REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
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	X .XXX ±	INDUSTRIAL INFORMATION CONTROLS 7870 PARK DRIVE CHLAUSEN, MI 48017		
	X .XX ±			
	X .X ±			
	ANGLE ±			
TITLE: MAG PANEL WIRING/AC				
APPLICATION: GENERAL PRODUCTS				
MATERIAL/FINISH				
SCALE 2:1		DWG NO. 6-05-018-022 SIZE B		
DATE: 27 MAR 89		DRAWN BY SHEET NO. 1		
		REITER		



TERMINAL BLOCK DESIGNATORS

1.	115 VAC HOT.	129.	A-MOTOR TACH +
2.	115 VAC COMMON	130.	A-MOTOR TACH -
6.	X OTL SW. OUT.	134.	A-GRID SWITCH
7.	Y OTL SW. OUT/X OTL SW. IN	135.	A-MOTOR +
8.	Z OTL SW. OUT/Y OTL SW. IN	136.	A-MOTOR -
9.	Z OTL SW. IN	328.	POWER DRAWBAR
12.	+24 VDC FROM PWR. SUPPLY	F1.	SW. 115 VAC TO FLOOD COOLANT
22.	GROUND FROM PWR. SUPPLY	G.	CHASSIS GROUND
23.	+5 VDC FROM PWR. SUPPLY	22L.	MACHINE SW. GROUND
26.	+15 VDC FROM PWR. SUPPLY	22X.	X-AMP GROUND
27.	+15 VDC FROM PWR. SUPPLY	22Y.	Y-AMP GROUND
28.	X-AMP ANALOG SIGNAL	22Z.	Z-AMP GROUND
29.	X-MOTOR TACH +	22A.	A-AMP GROUND
30.	X-MOTOR TACH -		
34.	X-GRID SWITCH		
35.	X-MOTOR +		
36.	X-MOTOR -		
37.	Y-AMP ANALOG SIGNAL		
38.	Y-MOTOR TACH +		
39.	Y-MOTOR TACH -		
43.	Y-GRID SWITCH		
44.	Y-MOTOR +		
45.	Y-MOTOR -		
46.	Z-AMP ANALOG SIGNAL		
47.	Z-MOTOR TACH. +		
48.	Z-MOTOR TACH. -		
52.	Z-GRID SWITCH		
53.	Z-MOTOR +		
54.	Z-MOTOR -		
56.	115 VAC FOR FLOOD/SPRAY		
57.	SW. 115 VAC HOT		
60.	SW. 115 VAC COMMON		
61.	115 VAC FOR SPRAY		
65.	SW. 220 VAC FOR AUTOLUBE		
66.	220 VAC FOR AUTOLUBE		
74.	SW. 115 VAC FOR A-AXIS BRAKE		
76.	+15 VDC FOR AMPS		
77.	-15 VDC FOR AMPS		
78.	LUBE FAULT SWITCH		
79.	WAIT CHANNEL SWITCH		
81.	220 VAC FOR DRIVE TRANSFORMER		
82.	220 VAC FOR DRIVE TRANSFORMER		
84.	SW. 72 VAC TO RECTIFIER		
85.	SW. 72 VAC TO DRIVE TRANSFORMER		
86.	SPINDLE HI/LO PROX. SWITCH		
87.	72 VAC TO RECTIFIER		
101.	DRIVE AMPS DISABLE		
119.	S-WORD PROX. SWITCH		
120.	CR-11 COIL S-WORD DISABLE		
121.	CR-12 COIL		
128.	A-AMP ANALOG SIGNAL		

RELAYS

CR1.	RESET
CR1A.	EXCESS ERROR
CR1B.	DRIVE DISABLE
CR1C.	DRIVE RESET
CR2.	TOOL CHANGE RESET
CR3.	SPINDLE CLOCKWISE
CR4.	SPINDLE COUNTERCLOCKWISE
CR5.	SPINDLE STOP
CR5A.	SPINDLE SAFETY
CR7.	SPRAY MIST
CR8.	FLOOD COOLANT
CR9.	SPINDLE HI/LO
CR10.	SPINDLE ENABLE
CR10A.	SPINDLE SAFETY
CR11.	DISABLE S-WORD
CR12.	AUXILIARY RELAY
MC1F.	SPINDLE CW (AC)
MC1R.	SPINDLE CCW (AC)
MC2.	FLOOD COOLANT (AC)
UR1.	UP SPINDLE SPEED (S-WORD)
DR1.	DOWN SPINDLE SPEED (S-WORD)
UR2.	UP SPINDLE SPEED (AC)
DR2.	DOWN SPINDLE SPEED (AC)

REV.	DESCRIPTION	E.C.O. NO.	APP'D BY	DATE
 INDUSTRIAL INFORMATION CONTROLS 7070 PARK DRIVE CHICAGO, IL 60631				
TITLE: TERMINAL BLOCK N/2 APPLICATION: PARTNER III				
SCALE: N-A				
DATE: 13 NOV 88				
DRAWN BY: REUTER				
SHEET NO. B				

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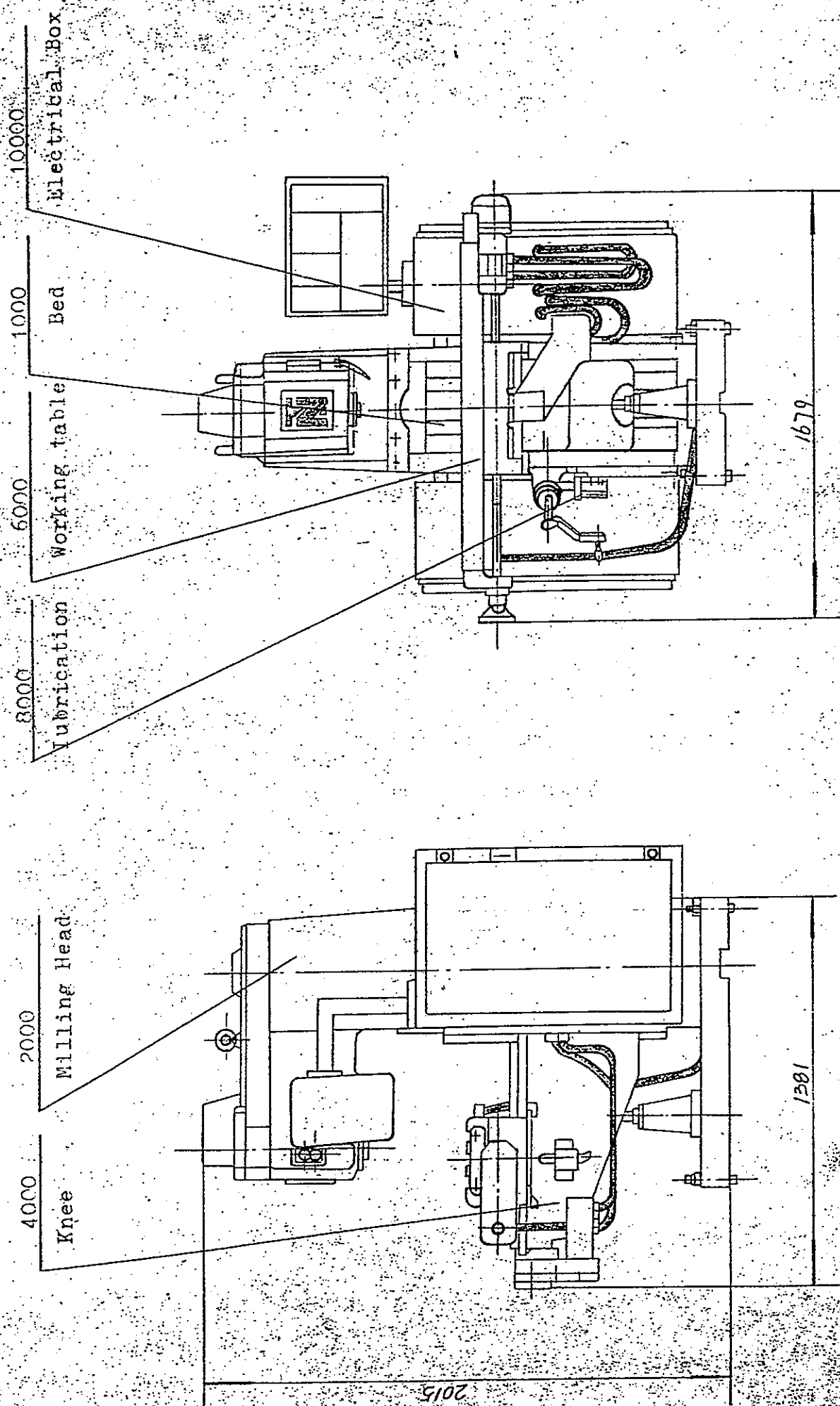


Fig. 1 The outline of XK5030A CNC milling machine

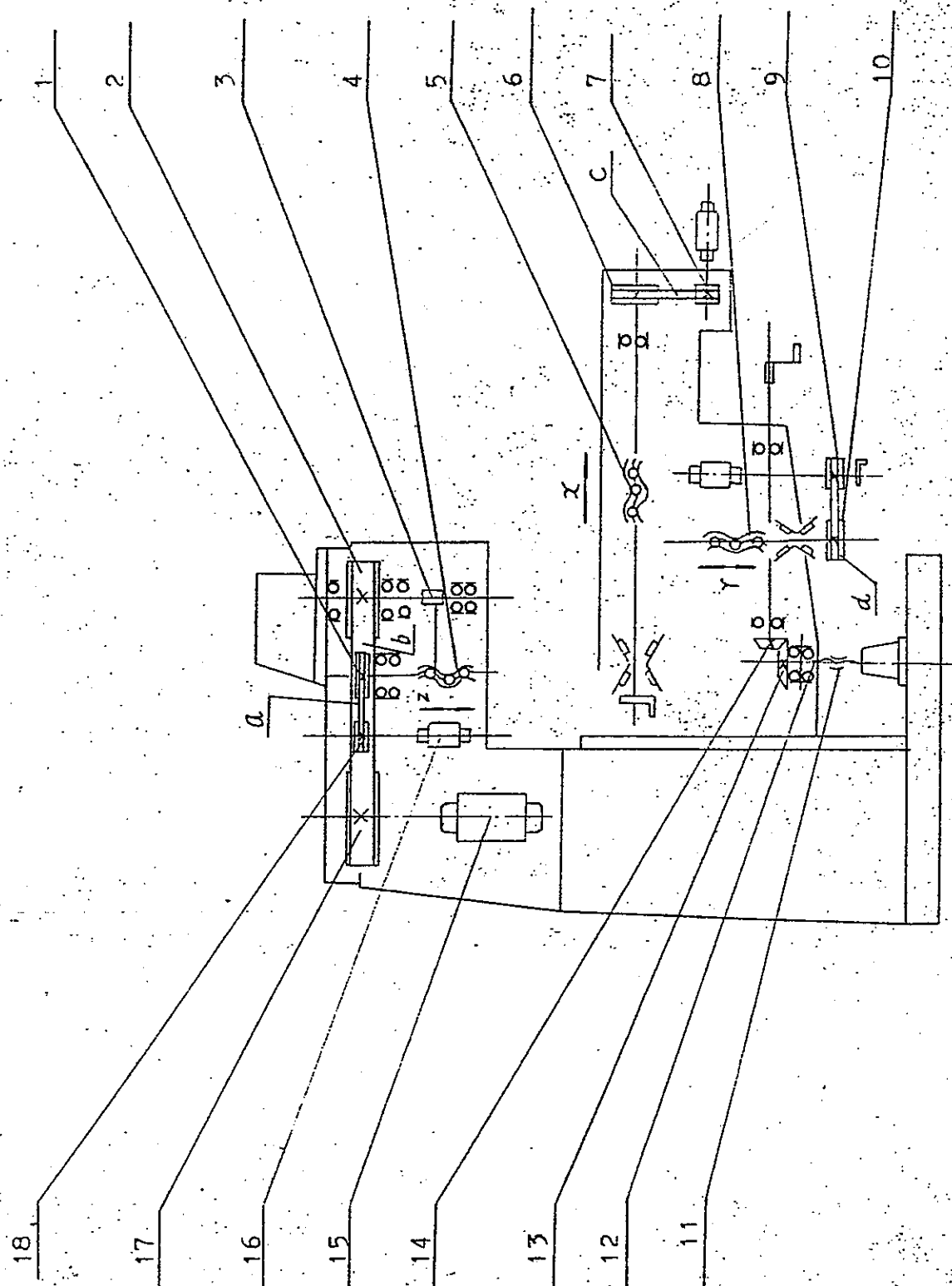


Fig. 2 The transmission system diagram.

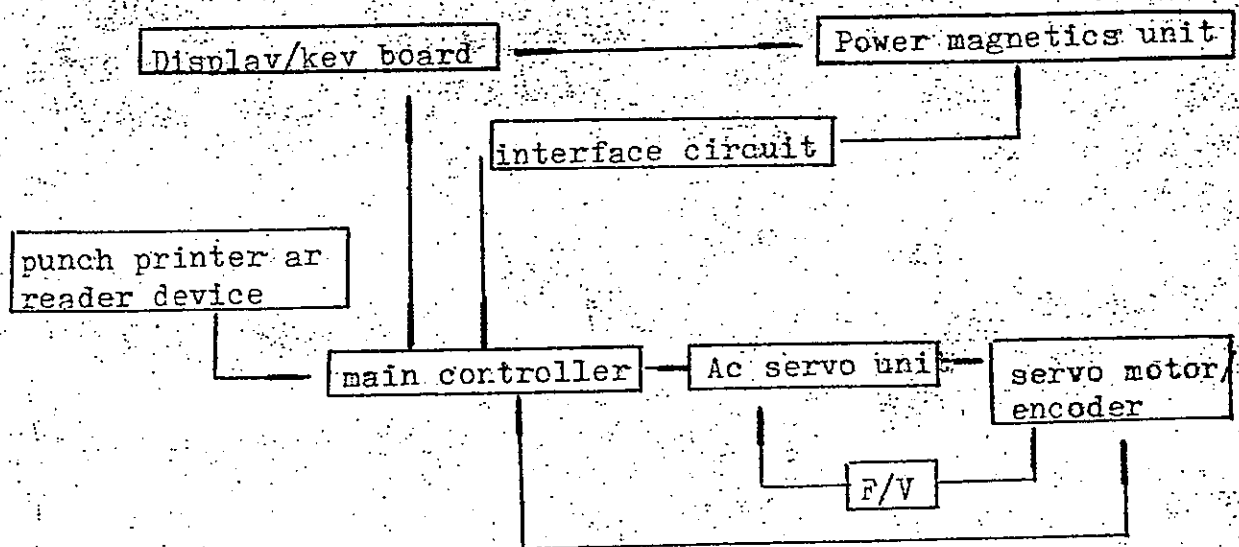
I. Introduction

XK5030A is a three dimensional NC milling machine fitted with FANUC-CMA system. Its control system permits automatic cycles of over 90% of basic milling, boring, drilling and tapping. The high accuracies of positioning and repositioning ensure workpieces to be machined precisely without profiling attachments. With complete functions and high accuracies, this machine is adaptable to process various complicated parts in especial such as cams, patterns, models etc.

II. Performances and Feature

XK5030A is a 3-dimensional NC vertical milling machine with knee. The controller is adopted CMA CNC micro-computer system produced by FANUC company in Japan. The working table saddle and spindle quill are driven independently by AC motor. Its feeding rigidity and positioning are improved via a pair of timing gear and belt in conjunction with a ball lead screw. A semi-closed loop control system is formed by a servo motor included a pulse encoder from which the feedback information about position and speed can be obtained.

The constitution and correlation of the control system is shown in the block diagram as following:



The operation of this system are substantially effectuated by push-buttons on key board at the front panel. A display is used to display the contents of the input program. Coordinates and various stored information, When the function of graphic display is used, CRP may display the programing cutter center's moving trace for check program.

The processing programs may be inputted by MDI or via peripheral equipment through RS-232C Series interface, such as tape reader.

The spindle speeds are changed by AC spindle servo unit and the cutting area is cooled down by liquid coolant. Set the spindle to start or stop, to be cooled or uncooled as well as its rpm by corresponding commands or via manual operation.

The main control function of FANUC OMA system are as follows:

1. Simultaneous 3-axies control
2. Linear interpolation and multi-quadrant circular interpolation.
3. Tangential constant speed control.
4. Automatic acceleration/deceleration.
5. Rapid traverse: 24M/m
Max programing feedrate: 15M/m
(XK5030A has set the rapid speed 5M/m and Max program feedrate 2.5M/m)
6. Various canned cycles, subroutines and costum Macro.
7. The tape storage leagth can be extended to 120m.
8. Absolute/incremental programing, inch/metric conversion.
9. Cutter length compensation. Cutter C compensation.
10. Full editing and self-diagnosis.
11. M. S. T function.
12. Backlash compensation and stored pitch-error compensation.
13. Main-program.
14. Batteries are backup for program storage in cass of power failure.
15. Graphic display. (Option).

III. Main specifications and Accuracies

3.1 Working table

Working table areas (width X length).....12"x48"
Table longitudinal travel.....30"
Saddle transverse.....15½"
Knee vertical travel.....15¾"
Number and width of T-slots.....3x5/8"
Space between T-slots.....2 9/16"
Allowable loaded JOB weight Max.....500 LBS

3.2 Spindle

Quill diameter.....4"
Spindle hole taper.....ISO 40#(7:24)
Spindle quill travel.....6"
Range of spindle speed (speed charged by AC)
 high speed (using 3.8"/5" belt).....80-4500 RPM
 Low speed (using 2.8"/6.4" belt).....45-2600 RPM
Distance from spindle center
 to column guide way surface.....16"
Distance from spindle nose
 to working table surface.....4.9"-20.6"

3.3 Feeding speed

Milling feeding range.....98"/min
Rapid movement speed.....197"/min

3.4 Motor capacity

Spindle motor.....FANUC 3# 3HP/7HP AC
Feeding motor.....FANUC 0# 0.3kg M AC
Cooling pump motor.....40W AC
Lubricant motor.....
Machine power.....220V AC 3φ

3.5	Controller type.....	FANUC OMA
3.6	Overall dimension (LxWxH).....	55"x66"x80"
3.7	Machine net weight.....	4600 LBS
3.8	Accuracies	
	Resolution.....	0.0001"
	Positioning accuracy.....	$\pm 0.0005"/ft$
	Repositioning accuracy.....	$\pm 0.0002"$

IV Construction

This machine is basically consisted of six components. that is column milling head, working table, knee, cooling lubricating and pneumatic and electric box.

The machine outline is shown as Fig. 1 and transmission system principle diagram shown as Fig.2

4.1 Column

The column with properly reinforced ribs offers high rigidity. There are four adjusting bolts on the base to facilitate machine level. And the liquid coolant tank is mounted on the machine base inner.

4.2 Milling head

Milling head is a whole with rigid construction. The main drive is stepless variable driven by a special spindle motor. There are two grades of spindle speed, high or low speed. Its change may be obtained by replacing pulleys when spindle motor driving a couple of 6.4" and 2.8" pulleys, spindle speed is in the range of 45-2600 rpm. When driving a couple of 5" and 3.8" pulleys, its speed is in the range of 80-4500rpm

The spindle speed may be set by correspondent commands, or by manual operations. The spindle speed can be read out via the rotating meter mounted at the front operation panel.

The spindle quill vertical feeding is accomplished as follows: An AC servo motor in the milling head enables ball lead screw to rotate. Via a timing belt and a pair of pulleys the ball lead screw nut to move up and down and carries the bracket on the spindle quill into action.

4.3 Working table

The working table and saddle are supported on the wider horizontal guide way of inee. See Fig. 3

The longitudinal feeding of table is accomplished by AC servo motor on the right of the table. The motor drives the preloaded ball lead screw assembly 4 via the pair of timing belt wheels 7 and 6, so as to get longitudinal feeding.

On the left of the table handle 1 and dial 2 are mounted for manual operation.

The guideways for longitudinal and horizontal movements of the saddle are respectively paved with TURCITEB plastic.

In addition to improving their wearlessness, smoothness of movement, and accuracy repeatability, this measure eliminates the crawling phenomenon in lower speeds.

4.4 Knee

The knee is located in the front of the column and matched with dovetail guideway. See Fig. 4

An AC servo motor mounted in the front of inee, drives saddle to perform horizontally feeding and its principle of transmission is same as longitudinal feeding of the table.

On the left of knee, a lock handle is mounted continuous. A long handle is mounted on the end of shaft 5 to rotate the lead screw 2 via taper gears 3, 4, and to drive knee movement up or down.

4.5 Cooling, Lubricating and pneumatic system

4.5.1 Cooling system

This system is consisted of cooling pump, outlet pipe inlet pipe. Valve and nozzle. The pump is mounted on the machine base inner. By pumping coolant from a tank under the machine to inlet pipe and via the nozzle the cutting area is cooled.

4.5.2 Lubricating system

This system is consisted of auto lubricating pump, oil distributor, restrictor and oil pipes.

(1) Lubricating method

There are two methods of lubrication, auto lubricating and periodical lubricating.

Using a centralized lubrication system, this machine may be longed service lifetime and avoid the crawling pgebinebib ub kiw feedubg soeed.

The lubricant flow may be controlled by adjusting the scale on the lubrication.

The location of auto lubrication points shown as Fig. 5

The other lubricated positions use periodical lubrication. The points of periodical lubricating shown as Fig. 6

(2) Lubricant

According to machine's property serveral lybricants

Lubricate	Lubricant	Moving viscosity
auto lubricating pump	precise machine guideway oil 40#	37-43
Main guideway of column	precise machine guideway oil 40#	37-43
Others	precise machine spindle bearing grease	265-295

4.5.3 Pneumatic system

This system is consisted of air source assembly unit, 2-position 3-way magnetic valve, air cylinder. The working pressure is 5-6kg. Pneumatic system principle is shown as Fig. 7 Loading/unloading cutter is shown as Fig. 8

The cutter loading is controlled via a NC 2-position 3-way magnetic valve

If cutter will be replaced push the button first, the magnetic valve may be conducted. Then the compress air enters the air cylinder through upper spindle quill and move down the piston 7 and cam ring 5. The oblique groove on the cam ring releases 3 pieces of pin 4.. and pushes the cutter handle down down aparting from spindle taper hole.

Notice: In order to avoid parts or table surface damaged when unloading cutter. It is important that the cutter handle must be damped tightly first by hand, then push the button of magnetic valve

When loading cutter the magnetic valve must be start first then align the notch on the handle to the key on spindle nose, insert the cutter into spindle taper hole until touch the pin. After that turn off the magnetic valve, the cam ring 5 will be move up by resuming force of spring 8 and three lock pins will stick into the concave groove of the pulling nail 9. The cutter handle will be lock.

Brode spindle

To avoid spindle follow turning when loading or unloading, another magnetic valve is used for control spindle brake. In case of brake spindle it may start the valve first, then turn the spindle slowly until the cylinder piston rod insert into the special hole on the spindle belt wheel. Then the spindle will be braked.

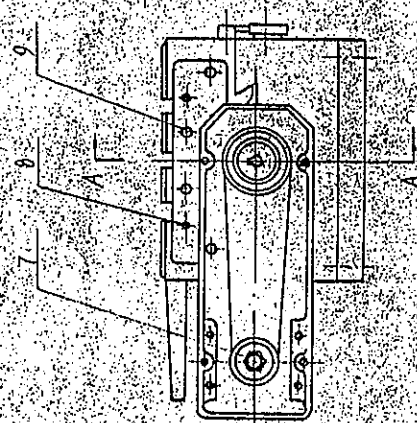
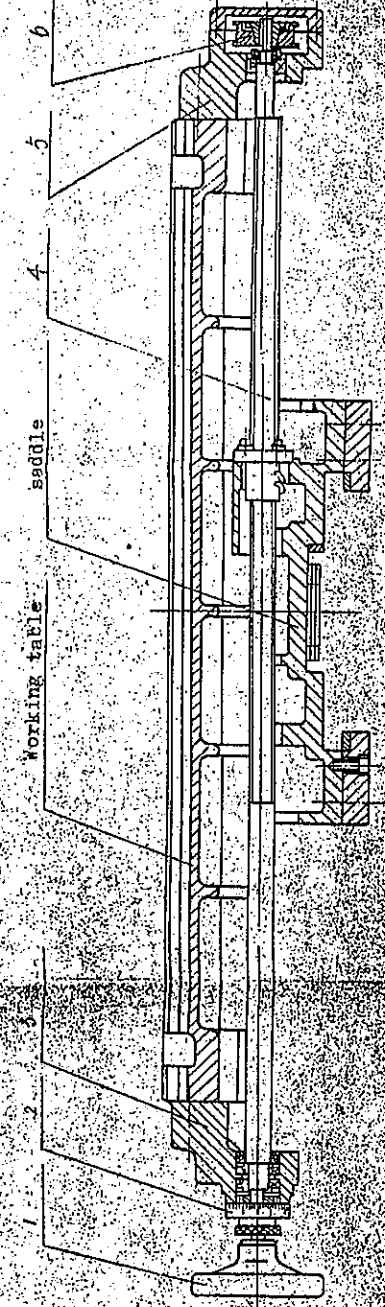
Notice: Only the spindle stop rotate the two buttons for brake magnetic valve may be pushed.

4.6 Electric box

The X.Y.Z. Servo amplifier system and CNC main controller are mounted in the control box installed on the right of the machine. A operation box with CRY is connected to control box with ram and turret which can turn free.

The power magnetic system and the spindle servo unit are mounted in the power box installed on the left of machine.

A → A



AC several motor

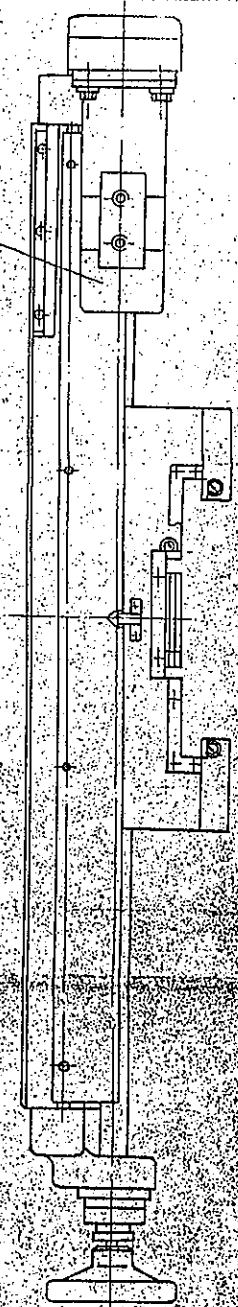


FIG. 1. The working table assembly drawing

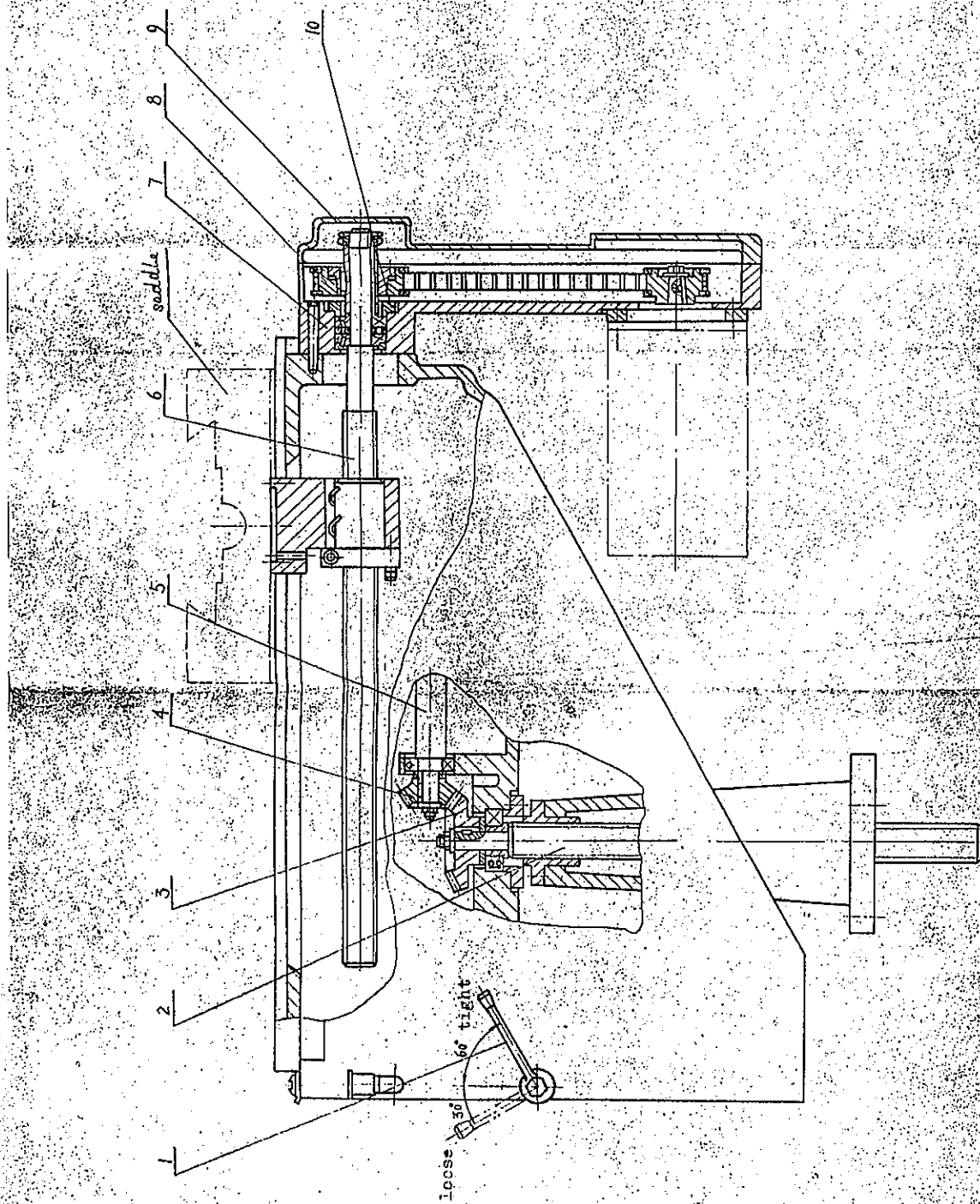


FIG. 1. The free assembly drawing

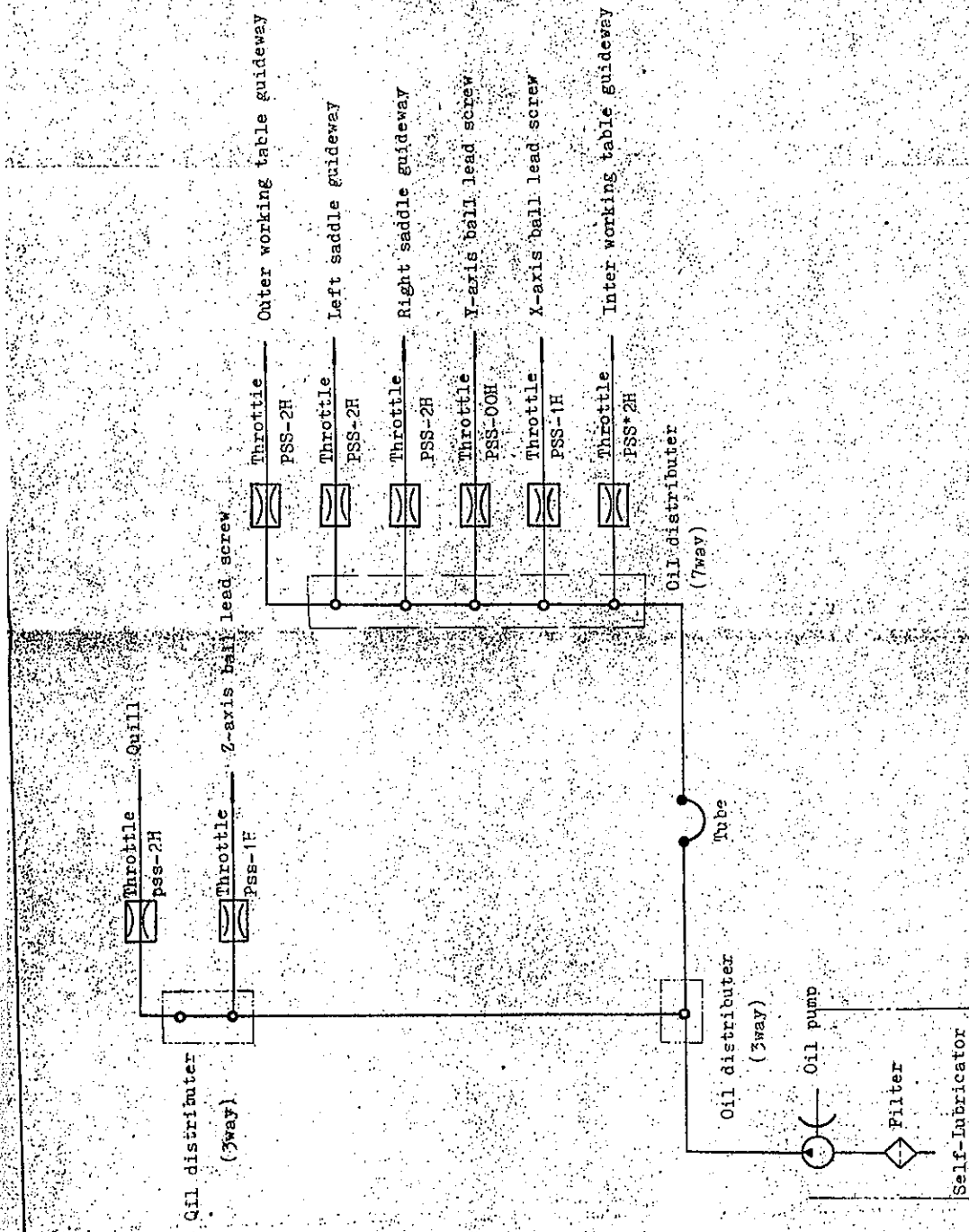


Fig. 5. Oil lubrication points diagram

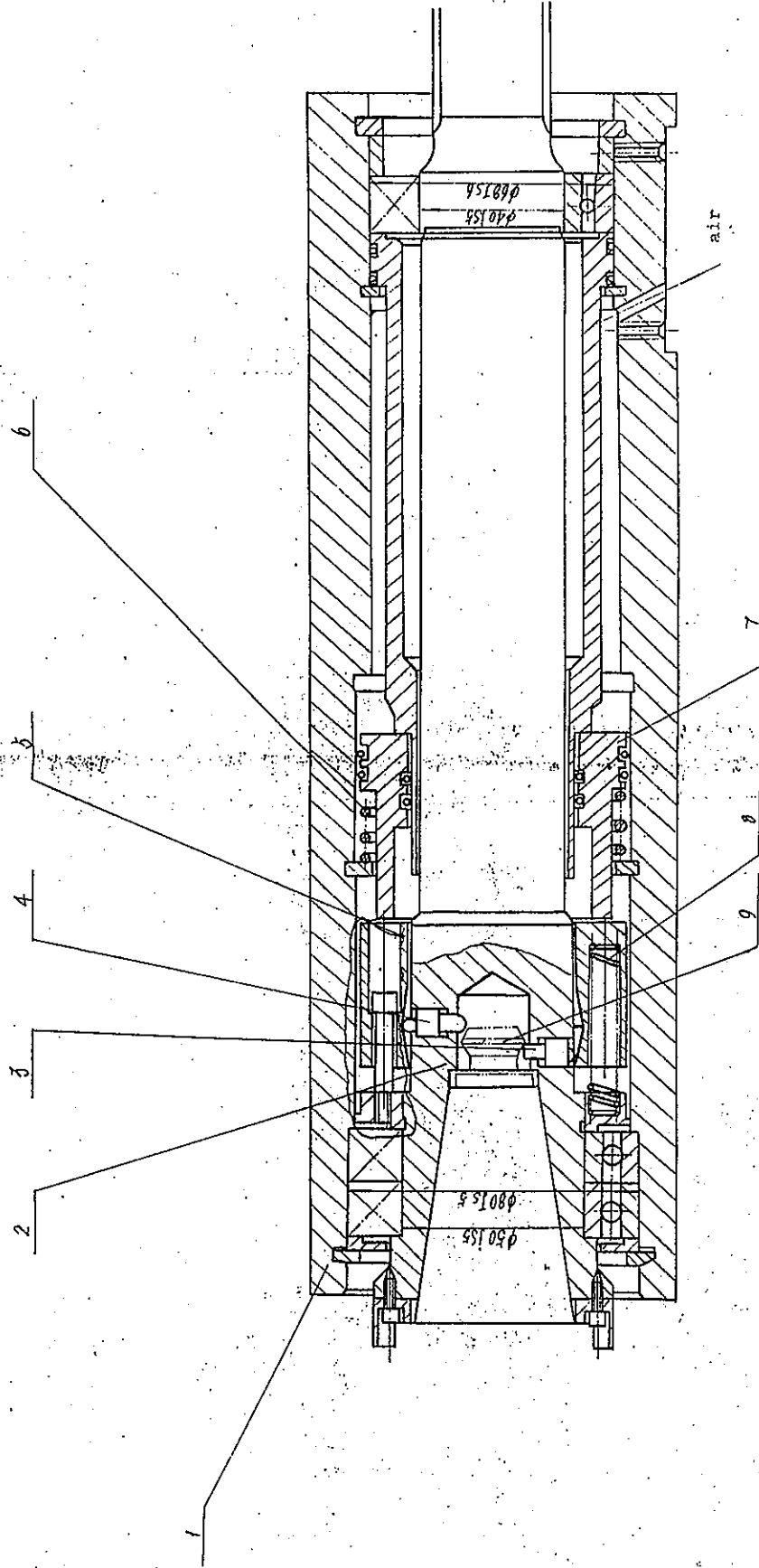


Fig. 8 Spindle assembly diagram

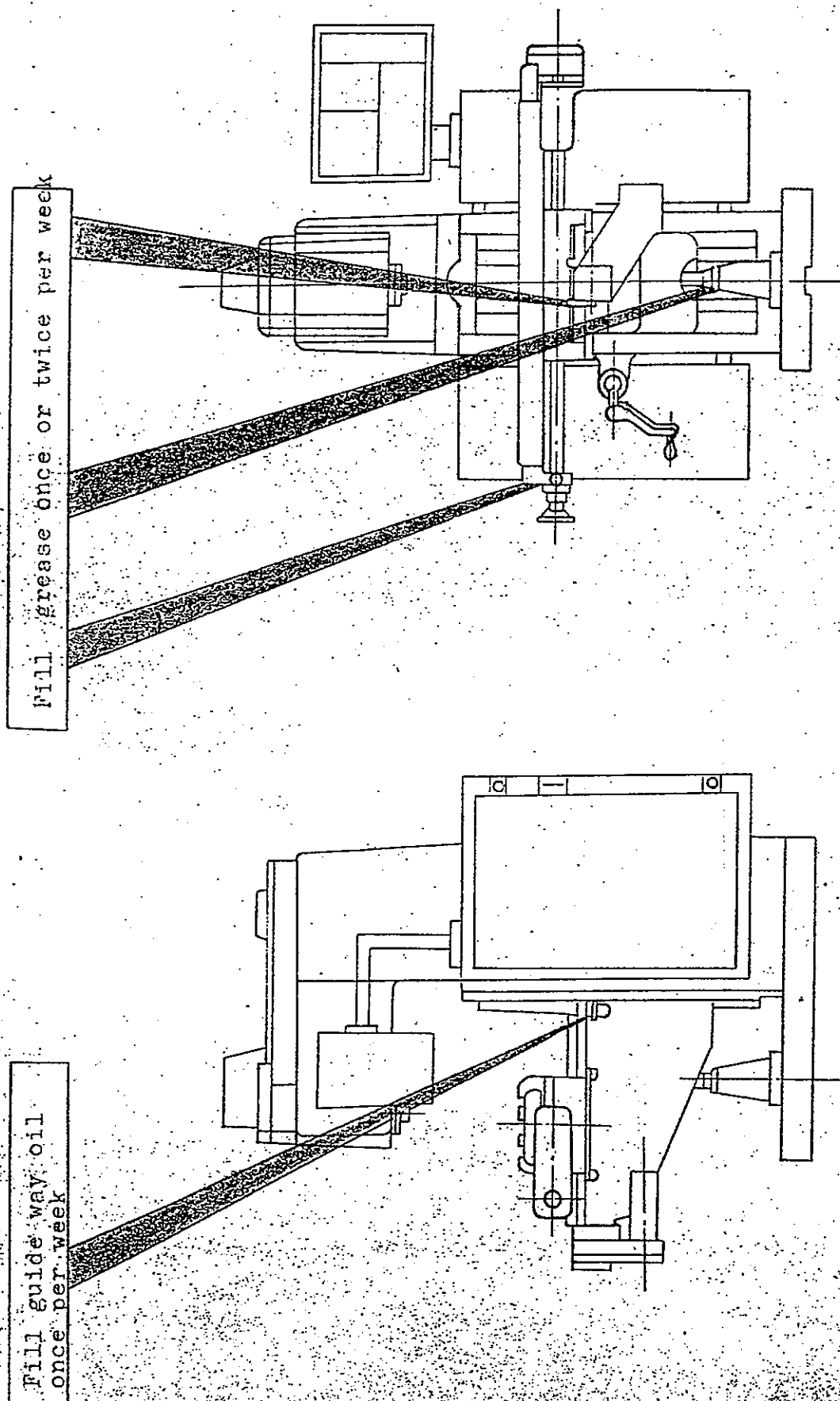


Fig. 6 The periodical lubrication points diagram

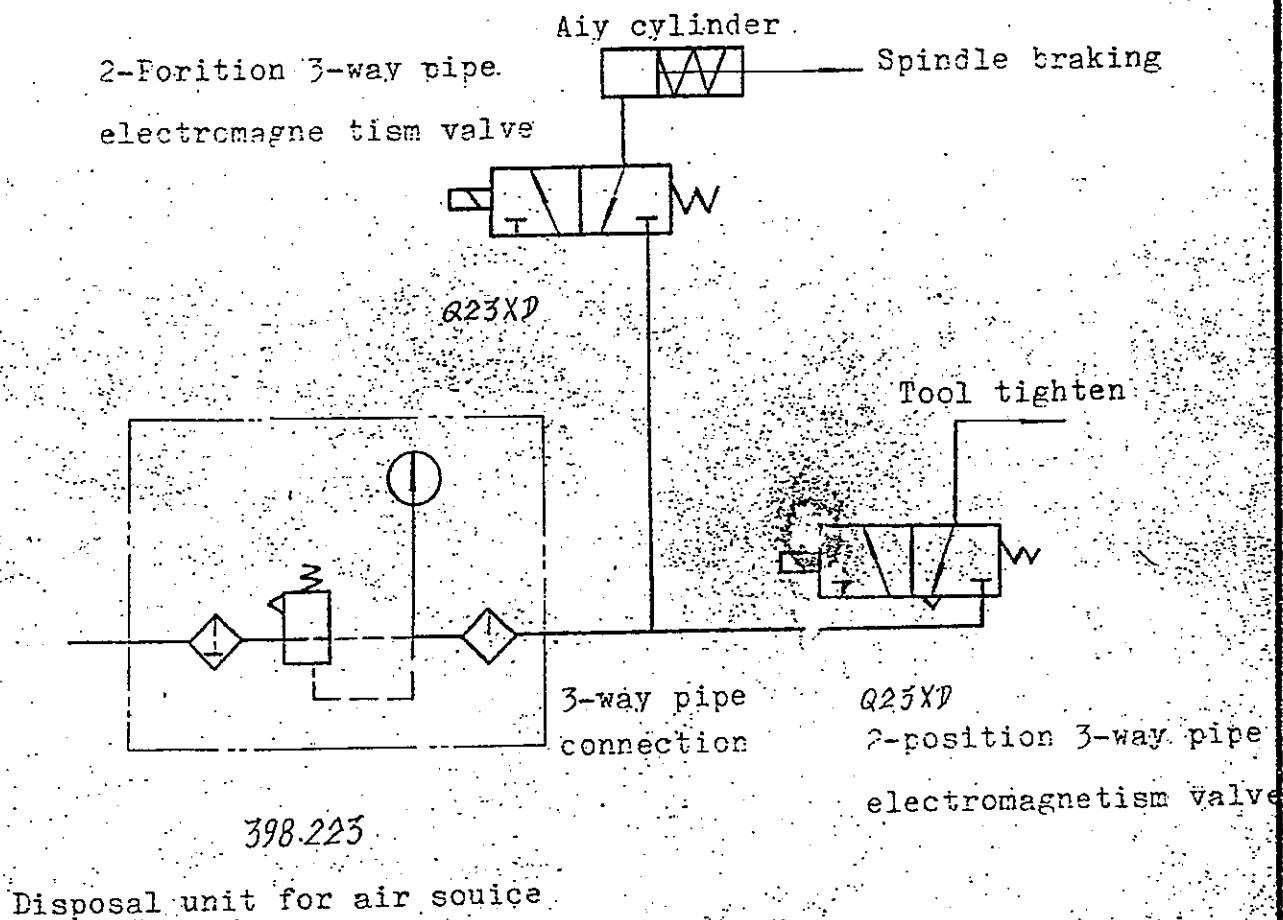


Fig. 7 Pneumatic system principle diagram

V. Operation and Maintenance

1. Precautions

- A). Since ~~it~~ is NC milling machine, the operator should carefully study the operation manual and the properties of NC system first. Then be acquainted with the structure and principle of driving system before operation (The programming and operation of NC system, reference to programming and operation manual). The machine has been adjusted and tested strictly in the manufacturing factory. Therefore no adjustment is needed when putting into operation.
- B). The machine should be lubricated periodically according to the lubrication specification.
- C). In order to prevent the working table from partial wearing, It is recommended that workpieces on the table should be clamped at clamped at locations as different as possible to obtain an evenly worn surface.
- D). When the knee is locked, no movement is allowed for preventing parts from damage.
- E). When using pneumatic system, please close its air source after the machine stops running everyday, pour out the water of the filter cup, full fill the lubricating-tank with prescribed gear-oil. The prescribed pressure should be attained before operation.
- F). For operation safety the power supply must be cut off before disassembly reassembly and maintenance.
- G). Caution! Do not press the two buttons of electro-magnetism valve when the psindle of machine is running.

2. Maintenance of the machine

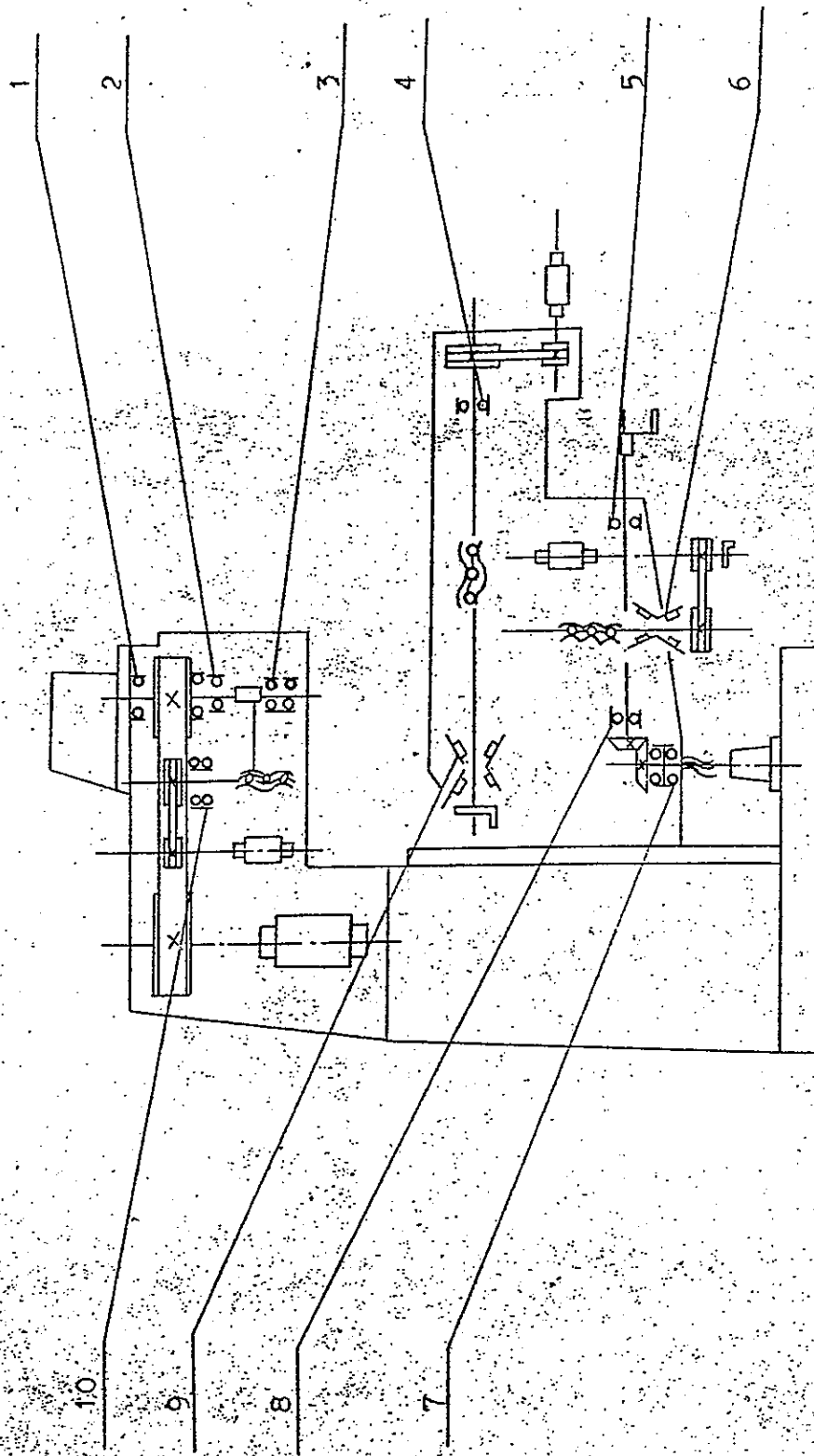


Fig. 9 Locations of rolling bearings

Rolling Bearing Detailed List

Item	Type	Name	Spec	Qty	Remark
1	80110	Single Row Radial Ball Bearing with dust cover	50x80x16	2	GB278-82
2	6008-2ps1/p6	Single Row Radial Ball Bearing with dust cover	40x68x15	1	U.S.A
3	QCL40	Matched couple Radial Ball Bearing	50x80x32	1pair	U.S.A
4	80205	Single Row radial ball bearing with dust cover	25x52x15	1	GB278-82
5	204	Single row radial ball bearing	20x47x14	1	GB276-64
6	05185/05079	Single row taper roller bearing	30x47x14.5	2	U.S.A
7	206	Single row radial ball bearing	30x62x16	1	GB276-64
8	204	Single row radial ball bearing	20x47x14	2	GB276-64
9	D7205	Single row taper roller bearing	25x52x15	2	GB297-64
10	17244/17118	Single row taper roller bearing	30x62x32	1	U.S.A

Transmission parts List

Item	Drawing No.	Name	Material	Qty	Remark
1	NT-J320A-2121	Timing belt pulley Z=30	Assembly	1	
2.	J325-2016b	Main pulley 6.4"	HT20-40	1	Match with J325-2106-2
	J325-2016B-1	Main pulley 5"	HT20-40	1	Match with J325-2106-3
3.	J325-2103	Quill	20Cr	1	
4.	GS287-C	Z-axis ball screw pair $\pm 0.2"$		1	
6.	XK5025-6115	Timing belt pulley Z=26	Assembly	1	
7.	XK5025-6116	Timing belt pulley Z=13	Assembly	1	
8.	XK5025-7002E	Y-axis ball screw pair $\pm 0.2"$		1	
9.	XK5025-7104	Timing belt pulley Z=15	Assembly	1	
10.	NT-J320A-2121	Timing belt pulley Z=30	Assembly	1	
11	J325-4301	Nut	ZQSn6-6-3	1	
12	X6325-4103-2	Lead Screw	45	1	
13	X6325-4102	Curve teeth bevel gear m=2.5 z=40	45	1	
14.	X6325-4104	Curve teeth bevel gear m=2.5 z=20	45	1	
15.		Main motor 3HP/5HP		1	U.S.A
16.		Servo motor 0.74HP		3	one per X.Y.Z. U.S.A

Item	Drawing No.	Name	Material	Qty	Remark
17.	J325-2106-2	Pulley of main motor 2.8"	45	1	
	J325-2106-3	Pulley of main motor 3.8"	HT20-40	1	
18.	J325-2125A	Timing belt pulley Z=42	45	1	
a.		Timing belt 225L075		1	U.S.A
b.		Teeth belt 615LB		1	U.S.A
c.		Timing belt 270L075		1	U.S.A
d.		Timing belt 322L075		1	U.S.A

(1) In generally machine head does not need to disassemble. If necessary, please operate removal according to following sequence:

- a. Remove shutter cover over head
- b. Remove 4 connected screws from main motor mounted plate to head, then take out the plate with motor.
- c. Loose 6 screws connected with column at bottom of head and 2 taper pins, lift head up slowly.
- d. Caution: Before loose the 6 connected screws, the head should be pre-lifting via 2 hangers at top of head to avoid smashing workers or machine.

(2) Removal of table

- a. Remove 8 screws (9) and 4 taper pins (8) at racks on sides of table turn the left rack 180° counter clockwise.
- b. Loose table gib.
- c. Remove table carefully to left direction.

(3) Removal of saddle

- a. Put table at middle of knee. Remove transmission box cover (9) and timing belt (8) (See Fig. 4)
- b. Remove flange (10), rotate ball screw (6), move bearing out from box, then remove it. (See Fig. 4)
- c. Remove 3 screws and 2 taper pins connected transmission box with knee, and fetch out the box.
- d. Remove saddle carefully with ball screw from knee.

(4) All axes of ball screws and nuts assemblies are coux parts for machine precision. So it must be carefully to disassemble them without clash.

(5) Location of ball screws of machine is shown as Fig. 9 and List 1.

(6) The principle drawing of machine transmission and location of transmission parts is shown as Fig. 2 and List List 2.

(7) Electric part

The electric part of machine is rather complex. It is detailed in Electric part Manual about electric components adjusting and attendance.

VI. Transportation Unpacking Installation & Trail Run

1. Transportation

When hoisting the packed machine be sure to lift it with the wire ropes at the marks on the package and place it down slowly and carefully. Neither shocks nor shaks is permitted. The unpacked machine may be lifted with the two eyebolts fixed on the top of the machine for hoisting. See Fig. 10

2. Unpacking.

Carefully unpack the machine so that it may be prevented from any damage. After unpacking, check the accessories against the itemized packing list which is included in the package, and the machine whether it is sound. In case of shortages or defects, connect with the supplies at once.

3. Installation

Since this is a precision NC milling machine, its accuracies are quite affect by the foundation and ambient temperature. Therefore, the machine must be mounted on a mass concrete foundation and little temperature variation is allowed.

The machine may be either mounted directly on four steel pads, which are placed under four foundation bolts seperately, or fixed to the concrete foundation by bolts M14. See Fig. 12 When fixing machine, neccessary safe space around it should be left.

Machine foundation diagram. See Fig. 11

It is leveled by the four adjusting bolts and nuts, During

leveling, the knee must be locked. The table should be set in the center position while the right and left surfaces of the table are leveled. The saddle must be set at center of the knee while the front and rear surfaces are leveled. After leveling accurately, the levelness along X-axis, Y-axis is of 0.025/300mm as less.

4. Trail Run.

A). Before trail run, the slush all over the machine should be carefully cleaned away and the exposed metal surfaces should be applied with some engine oil. The tank should be filled and the lubricating points should be filled by manually pushing the plunger pump in the self-lubricating system several times.

B). The movable parts should be displaced manually to check whether they are free to motion.

C). The trial operation should be made under low speed over 30 minutes, and then the speed is gradually increased.

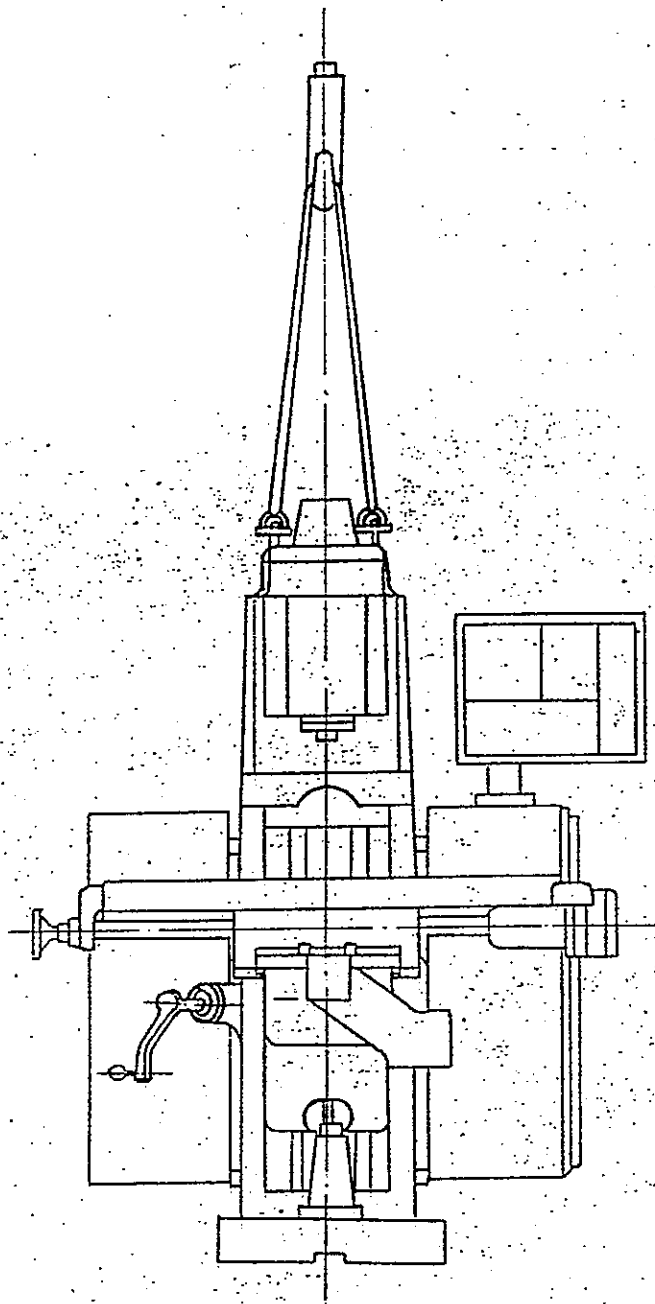


Fig. 10 Lifting transport

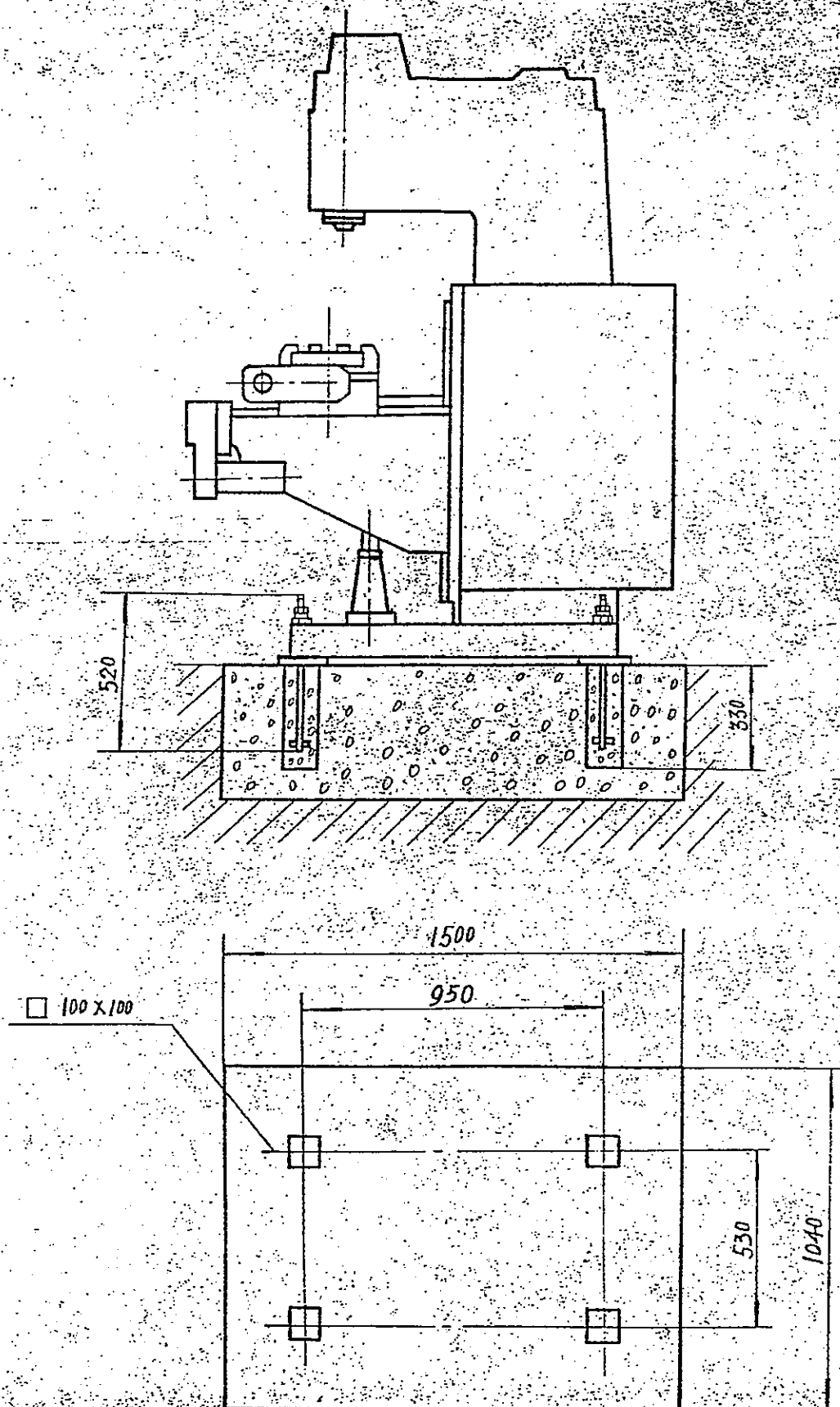


Fig. 11 The foundation drawing