



RT-150 Rotary Table



Operator's Manual

Serial # _____

Rev. 082704

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1. PREFACE

Centroid INC. is dedicated to providing precision CNC Rotary Tables. Our products provide customers with quality machine tools that speed up production through less downtime.

The CNC Rotary Table is assembled using quality parts and precision servo motors. We hope Centroid Rotary Tables increase your production and sales volume.

The CNC Rotary Table provides easy programming and operation. The special Multi-Point spindle brake offers superior clamp torque on a uniformly dispersed clamp disc, and ensures precision machining without deflection under a heavy load. Also, indexing accuracy will not change with rotating machining.

We appreciate your loyalty in Centroid products. They increase part accuracy and profitability by reducing part handling during operations. Please study the user's guide before you install and operate the rotary table to ensure long life and reliable indexing accuracy. Please keep the user's guide in your files for future reference.

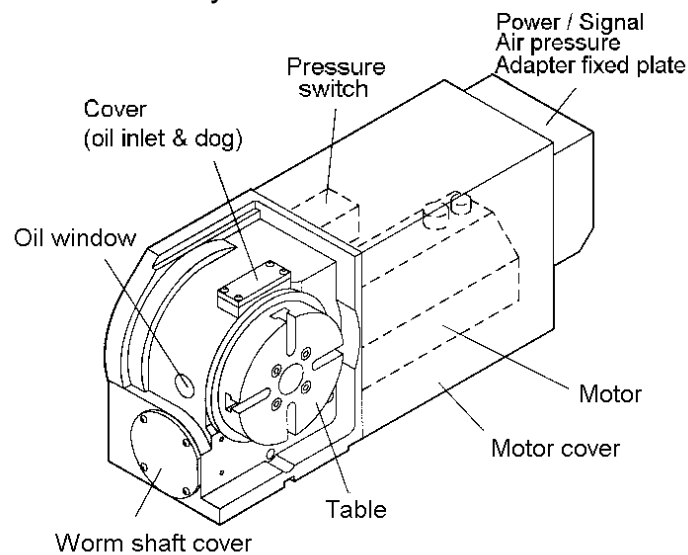


2. TECHNICAL DATA

2.1. Specifications

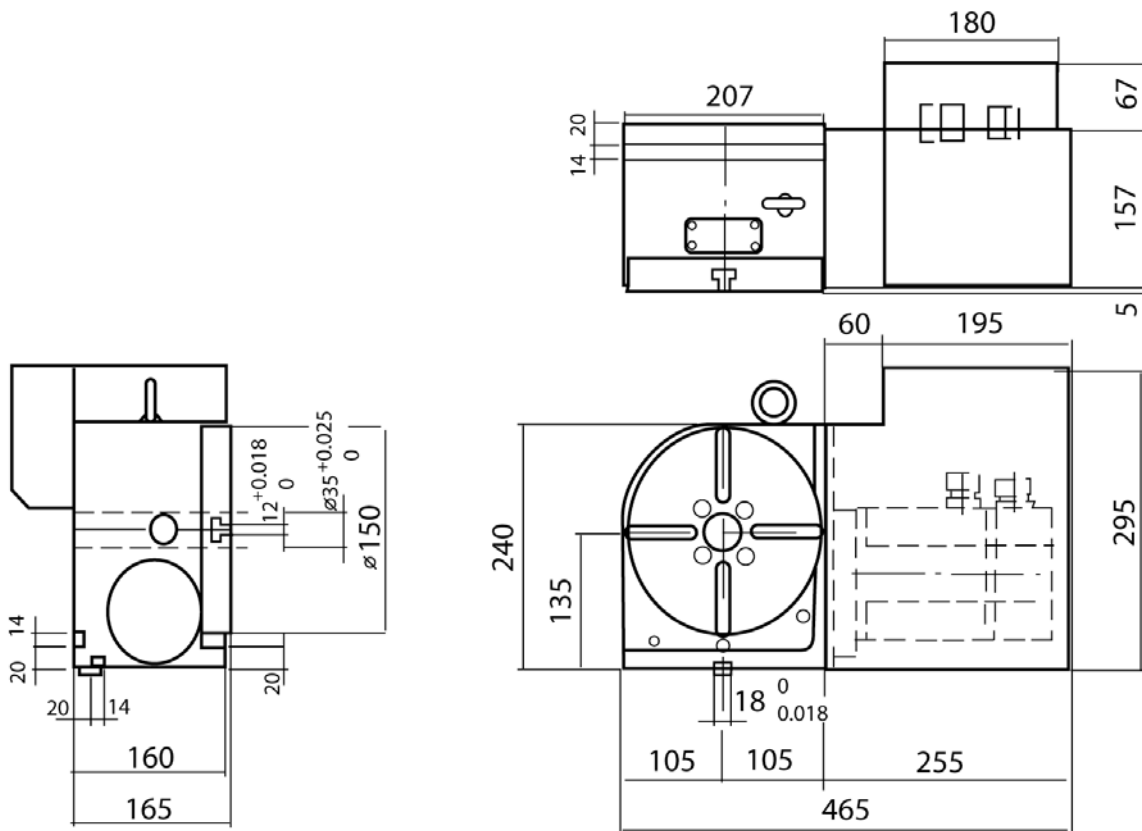
Model		RT-150		
Table diameter	(mm)	Ø150		
Over all height in vertical (without motor cover)	(mm)	240		
Center height in vertical	(mm)	135		
Table height in horizontal	(mm)	165		
Thru-hole diameter	(mm)	35		
Width of T-slot	(mm)	12		
Width of guide block	(mm)	18		
Servo motor type		MODEL	MAX. R.P.M	GEAR RATIO
	Centroid	17 in/lb DC	22.2	90:1
	Centroid	35 in/lb AC	35.8	90:1
Min. increment	(degree)	0.001°		
Clamp pressure resource	(kg/cm ²)	Pneumatic 5 kg/cm ²		
Clamp torque	(kgf·m)	25		
Load capacity horizontal	(kgs)	150		
Load capacity vertical	(kgs)	75		
Max. machining force	(kgf·m)	23		
Repeatability	(sec.)	± 2 "		
Indexing accuracy	(sec.)	A	25 "	
N.W.	(kgs)	70		

2.1.1. Outside Features of Rotary Table





2.2. Outside dimensions





2.3.Optional components

Standard accessories:

<u>Item</u>	<u>Dimensions</u>	<u>Quantity</u>
Block	RT-150	2 pcs
Screw	M16 x 40L	2 pcs
T-slot nut	M16	2 pcs
Nut	M12	2pcs
Air pipe	∅6 x ∅8 x 2M	1 pc
Eye Bolts	M10	1 pc

Optional accessories:

<u>Item</u>	<u>Dimensions</u>	<u>Quantity</u>	<u>Order</u>
3 Jaw Chuck	6 " 3-jaw-chuck	1 pc	SC-6
Chuck interface	6 " chuck interface	1 pc	AP-1
T-slot nut	M10	4 pcs	w/ AP-1
Tailstock (manual)	TSA-530	1 pc	TSA-530
Tailstock (pneumatic)	TSA-530-P	1 pc	Special Order
Tailstock (hydraulic)	TSA-530-H	1 pc	Special Order

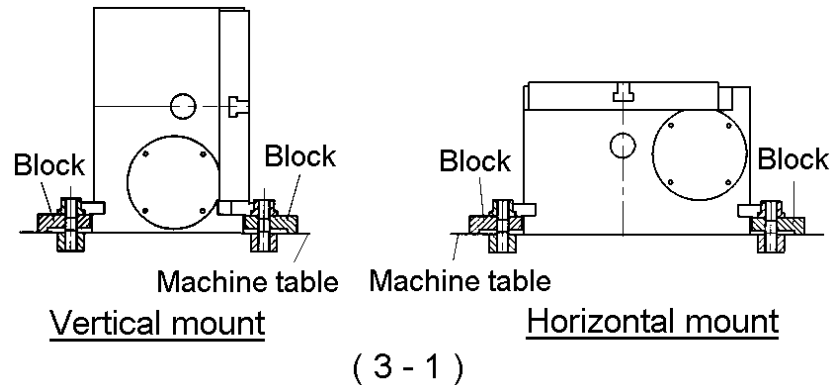


3. INSTALLATION

3.1. Installation steps

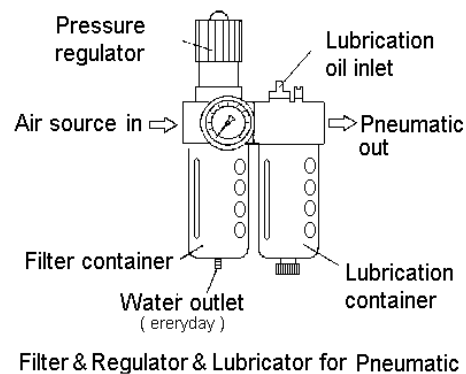
[Installation method]

1. Remove rust-preventing grease, then put rotary table on the machine table.
2. Connect MS connector and conduit and air line.
3. Align the table to the machine.
4. Clamp the rotary table on the machine table.
5. Make sure the 4th axis is turned on.



3.2. Notice

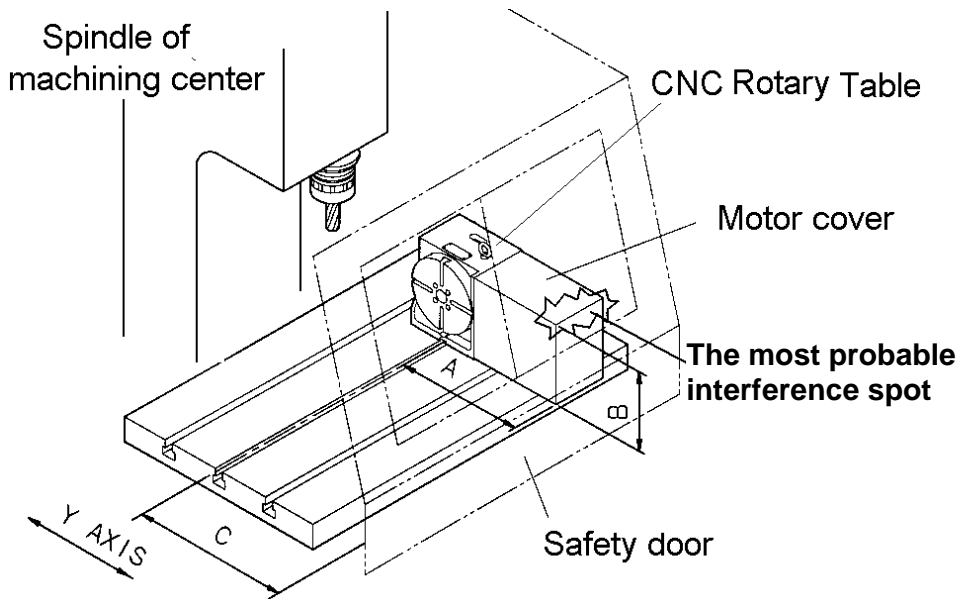
Clamping force is driven by air, it is very important to install filter, regulator, and lubrication as close as possible to the pneumatic equipment for which they are used.



- A. To protect all components from rust it is necessary to install filter, regulator & lubricator for pneumatic supply.
- B. The pneumatic pressure should be set between 57-85psi. When pressure is under 57psi, the mechanism's clamping accuracy will be reduced.
- C. Drain the water inside filter container everyday before operation.



3.3.How to avoid interference between Rotary table and M/C



A → Width from center of guide-block on the CNC rotary table to the end of motor cover.

B → Height of motor cover.

C → M/C moving to end of the Y axis, the distance between locking center of CNC rotary table to the safety door.

[Attention]

Before you purchase or install the rotary table, check the width of 'A'. It should be smaller than the dimension of 'C'. Also consider the height of the table 'B', so it doesn't interfere with the machine surround.



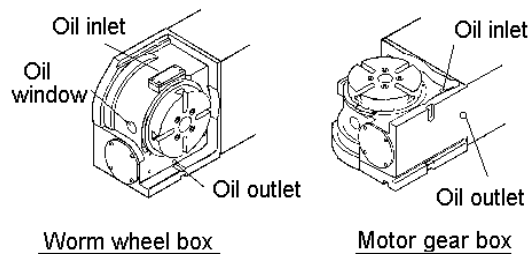
4. MAINTENANCE & LUBRICATION

4.1. Lubrication replacement time and condition

1. Normal operation : Change lubricant every six months.
2. Continuous operation : Change lubricant every three months.
3. If machine is idle over six months, change lubricant oil before use.

4.2. Steps to change lubricant

- A. Drain oil by unscrewing oil outlet screw.
- B. Make sure oil reservoir is clean.
- C. Open oil inlet cover.
- D. Refill with recommended lubricant into oil reservoir.
- E. Put back oil inlet cover.
- F. Be sure the lubricant is over center of oil window.



4.3. Recommended lubricants:

CPC-HD	HD150
Texaco-Meropa	150
Shell-Omela	100
Mobil-Mobilgear	629

Characteristics of recommended lubricants:

AGMA grade	4-EP
Flash point	400° F
ISO Grade	100-150
SUS Viscosity	At 100° F, 72.5 At 210° F, 75.5

4.4. Note:

- (1) Be sure no chips fall into table body during refilling oil.
- (2) Fill oil up to middle of the scale window.
- (3) Clean chips and coolant off of Rotary Table every day.



5. MAINTENANCE

5.1. Trouble shooting

(1) Check following items when motor fails to turn. If the problem cannot be solved, contact your local dealer for further help.

	Phenomenon	Possible reason	Check	Solution	Reference
1	Table no rotating				
	<ul style="list-style-type: none"> ◆ No Motor rotation ◆ Motor rotate 	<ul style="list-style-type: none"> ◆ Motor failed, coolant soaked cable or electrical short ◆ Gear loosened 	<ul style="list-style-type: none"> ◆ Cable connection ◆ Gear box 	<ul style="list-style-type: none"> ◆ Reassembling 	<ul style="list-style-type: none"> ◆ Electrical drawing ◆ Gear backlash adjustment
2	Rotation is not smooth or there is excessive noise	<ul style="list-style-type: none"> ◆ Overload ◆ Fixture position incorrect ◆ Gear failed ◆ Motor parameter set ◆ Lubrication ◆ Worm shaft or driving gear ◆ Incorrect parameter 	<ul style="list-style-type: none"> ◆ Weight of fixture and work piece ◆ Motor loading ◆ Motor low speed ◆ Gear assembling ◆ Gear backlash ◆ Motor rotating conduction ◆ Lubricant level ◆ Pipe and brake switch 	<ul style="list-style-type: none"> ◆ Reduce loading ◆ Remount fixture ◆ Reassembling ◆ Replace oil ◆ Replace gear 	<ul style="list-style-type: none"> ◆ Load capacity and torque data ◆ Gear backlash adjustment ◆ Gear backlash adjustment ◆ Control system manual ◆ Maintenance & Lubrication
3	High current	<ul style="list-style-type: none"> ◆ Brake or release ◆ Overload ◆ Incorrect parameter ◆ Over-filled oil 	<ul style="list-style-type: none"> ◆ Air pipe ◆ Solenoid fail ◆ Check solenoid function ◆ Weight of fixture and work piece ◆ Parameter setting 	<ul style="list-style-type: none"> ◆ Reduce loading ◆ Modify parameter ◆ Reduce oil 	<ul style="list-style-type: none"> ◆ Load capacity and torque data ◆ Parameter list ◆ Maintenance & Lubrication
4	Incorrect index position				
	<ul style="list-style-type: none"> ◆ Position inaccurate ◆ Min or damage of body 	<ul style="list-style-type: none"> ◆ Wore worm wheel ◆ Surface damaged by crash 	<ul style="list-style-type: none"> ◆ Worm gear backlash 	<ul style="list-style-type: none"> ◆ Adjust backlash ◆ Remove edge 	<ul style="list-style-type: none"> ◆ Worm gear backlash adjustment
5	Table shakes				
	<ul style="list-style-type: none"> ◆ When clamp-on cutting ◆ When helix cutting 	<ul style="list-style-type: none"> ◆ Out side force ◆ Brake loosened ◆ Low pressure ◆ Loose worm gear backlash ◆ Loose gear backlash ◆ Loose worm gear bearing 	<ul style="list-style-type: none"> ◆ Cutting condition ◆ Clamp device & clamp sensor ◆ Backlash of worm gear ◆ Backlash of motor gear ◆ Worm gear nut 	<ul style="list-style-type: none"> ◆ Correct cutting condition ◆ Reduce cutting load ◆ Adjust pressure ◆ Adjust backlash ◆ Adjust backlash ◆ Tight worm gear nut 	<ul style="list-style-type: none"> ◆ CNC Rotary Table cutting speed chart ◆ Specification ◆ Worm gear backlash adjustment ◆ Gear backlash adjustment ◆ Worm gear backlash adjustment



	Phenomenon	Possible reason	Check	Solution	Reference
6	Brake function fail				
	<ul style="list-style-type: none"> ◆ Clamp fail ◆ No brake signal ◆ Signal delay 	<ul style="list-style-type: none"> ◆ Low pressure ◆ O-ring worn out ◆ Seal worn out ◆ Pressure switch ◆ Piston jammed ◆ Brake cable ◆ Delay time too long ◆ Air line jammed ◆ Piston jammed ◆ Rust cylinder ◆ Air leak 	<ul style="list-style-type: none"> ◆ Air pressure regulator ◆ O-ring ◆ Piston seal ◆ Pressure function ◆ Pressure less than 71 psi ◆ O-ring and seal ◆ Signal cable ◆ Parameter ◆ Air line ◆ Piston and cylinder ◆ Air filter and regulator ◆ Check air line 	<ul style="list-style-type: none"> ◆ Replace O-ring ◆ Replace seal ◆ Replace pressure switch ◆ Adjust pressure ◆ Replace O-ring or seal ◆ Reconnection ◆ Reset parameter ◆ Clean air line ◆ Clean piston and cylinder ◆ Refill oil ◆ Replace line or joint 	
7	Zero return				
	<ul style="list-style-type: none"> ◆ Table no rotation ◆ Non stop rotation ◆ Position error 	<ul style="list-style-type: none"> ◆ Signal fail ◆ Signal fail ◆ Limit switch fail ◆ Dog fail ◆ Signal fail ◆ Dog fail 	<ul style="list-style-type: none"> ◆ Signal cable ◆ Signal cable ◆ Limit switch ◆ Zero return dog ◆ Signal cable ◆ Zero return dog 	<ul style="list-style-type: none"> ◆ Reconnection ◆ Reconnection ◆ Replace limit switch ◆ Adjusting zero return dog ◆ Reconnection ◆ Adjusting zero return dog 	

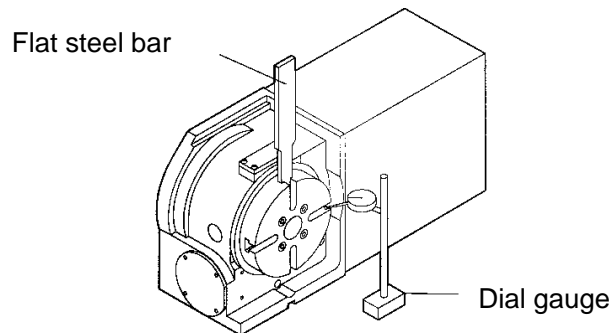
(2) There are some things that can hamper machining. Please, take precautions to prevent the following possible problems to protect your machine and table.

Wrong method	Precaution
Rotary isn't secured	Please refer to installation chapter for securing rotary table on machine.
Cutting method	<ol style="list-style-type: none"> 1. Check cutting tools for sharpness before use. 2. Avoid interference of tools and work piece. 3. Make sure the part is held securely to rotary table. 4. The height tolerance between table and tailstock is less than 0.03 5. Avoid cutting force greater than suggested value. 6. Return to zero point before working. 7. Backlash parameter should be set to the proper value, if needed.
Crashed	Crashed machine may cause parts damage, inaccurate index or noise during indexing. We recommend that you send the table back to Centroid for repair if crashed



5.2. Checking the backlash

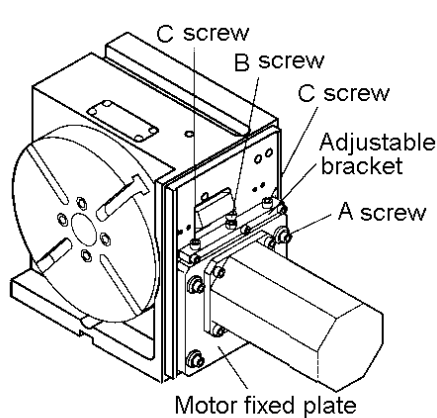
1. Turn off power and remove air supply.
2. The backlash can be measured with a dial indicator by inserting a flat steel bar into a T-slot of the rotary table and applying force to the bar CW to CCW.
3. Measure the backlash again and make sure the backlash is between 0.0004 - 0.0008in. Adjustment is required when a backlash of above 0.002in is observed.
4. The measurement is to be done on eight spots of the table by rotating it every 45°.



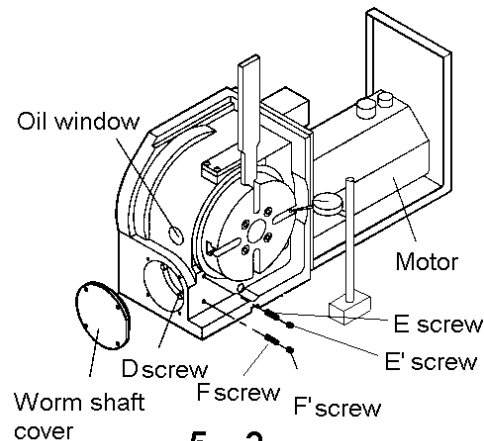
5-1 (RT-150)

5.2.1. Worm gear and worm wheel backlash adjustment

- A. Take off the motor cover (5-2), and loosen the 4 A screws then loosen screw B and tighten screw C to lift up motor.



5 - 2



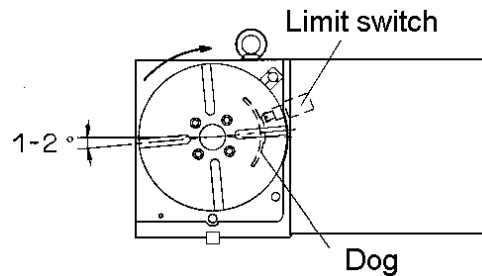
5 - 3

- B. Take off the worm shaft cover (5-3), loosen the 4 D screws, align the $\varnothing 8\text{mm}$ hole to T-slot to screw E position.
- C. Take out screw E' and screw F'. Loosen screw F to free the eccentric shaft and tighten screw E to turn the eccentric shaft closer to the worm wheel. Check the backlash again and make sure the backlash is between 0.0004in ~ 0.0008in by adjusting screw E and F.
- D. Make sure the 4 screws D are tight and use screw E' and screw F' with tape seal to lock the adjusting screws.
- E. Loosen two C screws and tighten screw B (5-2) to adjust motor gear backlash, secure the motor by tightening A screws.
- F. Connect the power then test the motor load and gear noise. Readjust the gear if the gear is noisy or motor load is too high.

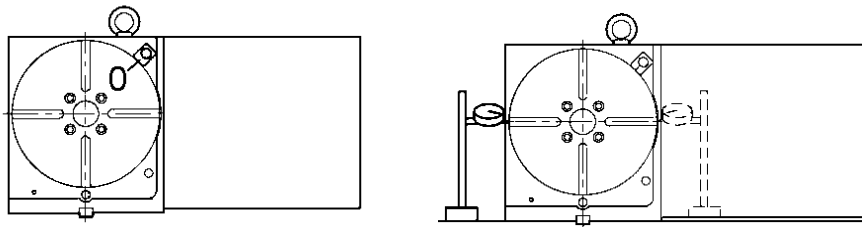


5.3.Origin mechanism

- A. A limit switch is used for origin or home as shown in Fig. (5 - 4)
- B. Origin dog attached internally to the rotary table, actuates the limit switch to have it output a signal $1^{\circ}\sim 2^{\circ}$ before home position.



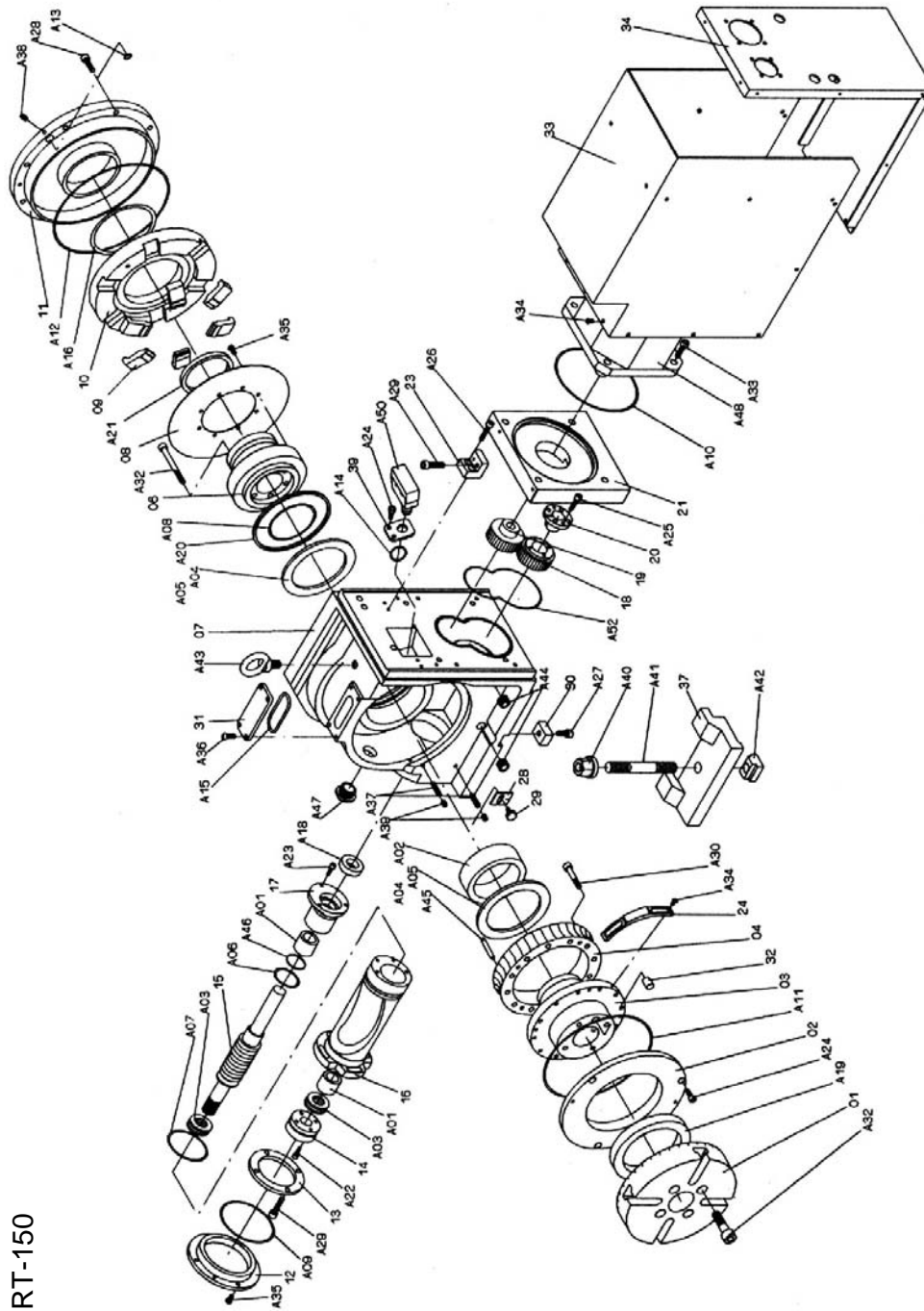
- C. To adjust the dog position, bring the dog, under jog mode to the position of the oil inlet (Cover No.31), where the adjustment can be done easily.
- D. Loosen the cap-screws of dog. Move the dog to a proper position. The dog has slots for about ± 0.3 in of movement.



- E. **CAUTION** : When you loosen the cap-screws, don't loosen them completely – this will prevent them from dropping into the interior of the machine.



5.4. System drawing



RT-150



5.5.Part list

RT-150

Part No.	Description	Q'ty	Material	Drawing No.	Remark
1	Top cover	1	FC30	CNC150-001	
2	Top cover	1	SS41	CNC150-002	
3	Spindle	1	SCM4	CNC150-003	
4	Worm wheel	1	ALBC2	CNC150-004	
6	Compression ring	1	S45C	CNC150-043	
7	Base	1	FC30	CNC200R-007	
8	Brake piece	1	SUS304	CNC150-008	
9	Brake plate	6	S45C	CNC150-010	
10	Piston	1	S45C	CNC150-011	
11	Base cover	1	FC30	CNC150-012	
12	Worm shaft back cover	1	S45C	CNC150-013	
13	Packing	1	S45C	CNC150-014	
14	Nut	1	S45C	CNC150-015	
15	Worm shaft	1	SNM21	CNC150-016	
16	Eccentric tube	1	FCD55	CNC150-017	
17	Worm shaft back cover	1	S45C	CNC150-018	
18	Gear	1	SCM21	CNC150-019	
19	Gear	1	SCM21	CNC150-020	Centroid DC
19	Gear	1	SCM21	CNC150-020-1	Centroid AC
19	Gear	1	SCM21	CNC150-020-2	
19	Gear	1	SCM21	CNC150-020-3	
19	Gear	1	SCM21	CNC150-020-4	
20	Taper sleeve	1	S45C	CNC150-021	
21	Adjustable plate	1	FCD55	CNC150-022	Centroid
22	Packing	4	S45C	CNC150-023	
23	Adjustable bracket	1	SS41	CNC150-024	Centroid
24	Zero point	1	S45C	CNC150-025	
28	Indicator	1	SS41	CNC150-029-1	
29	Screw	1	S45C	CNC150-030	
30	key	1	S45C	CNC251-048	
31	cover	1	S45C	CNC150-032	
32	key	1	SK2	CNC150-033	
33	Motor cover	1	SS41	CNC150-034-4	Centroid
34	Cover	1	SS41	CNC150-035-2	Centroid DC
34	Cover	1	SS41	CNC150-035-3	Centroid AC
35	Protecting cover for adapter	1	SS41	CNC150-037	Centroid
36	Fixed plate for adapter	1	SS41	CNC150-038-4	Centroid DC
36	Fixed plate for adapter	1	SS41	CNC150-038-5	Centroid AC
37	Block	2	S45C	CNC150-041-1	
38	Fixed plate	1	S45C	CNCT201-022	



RT-150

Part No.	Description	Specification	Q'ty	Brand	Remark
A1	Needle bearing	NK17/20	2	IKO	
A2	Needle bearing	RNA4911	1	IKO	
A3	Thrust bearing	AZ17309	2	IKO	
A4	Thrust bearing	AXK75100	2	IKO	
A5	Thrust bearing plate	AS75100	4	IKO	
A6	O-ring	G30	1	NOK	
A7	O-ring	G50	1	NOK	
A8	O-ring	G60	1	NOK	
A9	O-ring	G70	1	NOK	Centroid
A10	O-ring	G80	1	NOK	
A11	O-ring	G145	1	NOK	
A12	O-ring	G155	1	NOK	
A13	O-ring	P8	1	NOK	
A14	O-ring	P18	1	NOK	
A15	O-ring	P41	1	NOK	
A16	O-ring	P80	1	NOK	
A17	Oil seal	TC1/2"x1"x1/4"	1	NOK	CMC ME3528
A18	Oil seal	TC17x30x8	1	NOK	
A19	Oil seal	TC80x105x13	1	NOK	
A20	O-ring	G100	1	NOK	
A21	Oil seal	UHS60A	1	NOK	
A22	Screw	M4x12L (CAP)	4	YM	
A23	Screw	M4x14L (CAP)	3	YM	
A24	Screw	M5x12L (CAP)	3	YM	
A25	Screw	M5x20L (CAP)	4	YM	
A26	Screw	M5x25L (CAP)	3	YM	Centroid
A27	Screw	M6x12L (CAP)	2	YM	
A28	Screw	M6x20L (CAP)	8	YM	Centroid
A29	Screw	M6x25L (CAP)	2	YM	Centroid
A30	Screw	M6x30L (CAP)	4	YM	Centroid
A31	Screw	M6x60L (CAP)	6	YM	
A32	Screw	M8x35L (CAP)	4	YM	
A33	Screw	M8x40L (CAP)	4	YM	Centroid
A34	Screw	M4x8L (BH)	25	YM	Centroid
A35	Screw	M5x10L (BH)	12	YM	
A36	Screw	M5x14L (BH)	4	YM	
A37	Screw	M6x6L (SET)	2	YM	
A38	Screw	M6x8L (SET)	1	YM	
A39	Screw	M6x20L (SET)	2	YM	



RT-150

Part No.	Description	Specification	Q'ty	Brand	Remark
A40	Nut	M16	2	YM	
A41	Screw	M16x75L	2	YM	
A42	T-key	M16	2	YM	
A43	Eye bolts	M10	1	TG	
A44	Stopper	PT1/4	3		
A45	Pin	NO.4x32L	4	Yoeng Feng	
A46	C ring	φ 25	1	Yoeng Feng	
A47	Oil window	PF1/2	1	Nok	
A48	Motor		1	Centroid	
A48	Motor	35 in/lb AC	1	Centroid	
A49	Pressure switch	PSA-SD	1	Nisshingauge	
A50	Limit switch	SHL-Q2155	1	Omron	
A51	Solenoid	TZ511T-S9-WA	1	Nok Tec	
A52	PU-belt	φ 2x300L	1		



6. RECYCLING AND DISPOSAL

- A. Drain all lubricant oil from CNC Rotary Table.
- B. Disassemble the plastic and rubber form CNC Rotary Table (refer the system drawing)
- C. Sort all parts according to material.

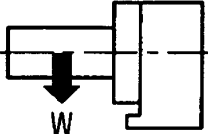
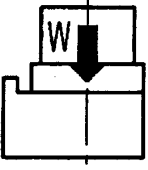
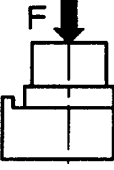
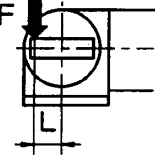
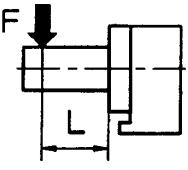
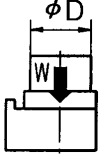
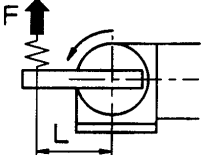
[Note] : Please refer to local recycle laws for recycling and disposal.



7. APPENDIX

7.1. Load capacity and torque data

RT-150

Item	Example	Allowable value
Max. Load	 <p>Vertical</p>	W = 165 lbs / 75 kg
	 <p>Horizontal</p>	W = 330 lbs / 150 kg
Max. Radial Load		F = 1,763 lbs / 800 kg
		$F \times L = 11.2 \text{ kg}\cdot\text{m}$ 22.5 lbs x 3ft
		$F \times L = 40 \text{ kg}\cdot\text{m}$ 80.6 lbs x 3ft
Max. Working Inertia	$J = \frac{WD^2}{(8 \times 980)}$ 	$4.08 \text{ kg}\cdot\text{cm}\cdot\text{sec}^2$ 22.8 lbs x in x sec ²
Spindle Drive Torque		$9 \text{ kg}\cdot\text{m}$ 18.1 lbs x 3 ft

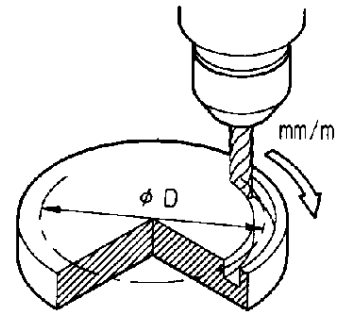


7.2. CNC Rotary Table cutting speed chart

The direct instruction system under F code is employed for giving instructions of CNC Rotary Table feeding speed (movements of degree per minute).such as [example : F100 = 100 °/min. = 0.28 R.P.M.] Relation between a feed of tool and a circular arc dia. D at a time of cutting is listed in the following chart.

How to use chart :

When an outer periphery of work D = Ø 160 mm is to be cut by end milling at a speed of 110 mm / min. F value obtained as f = 80 from 111 mm / min. corresponding to D = Ø 160 mm at the topmost line.



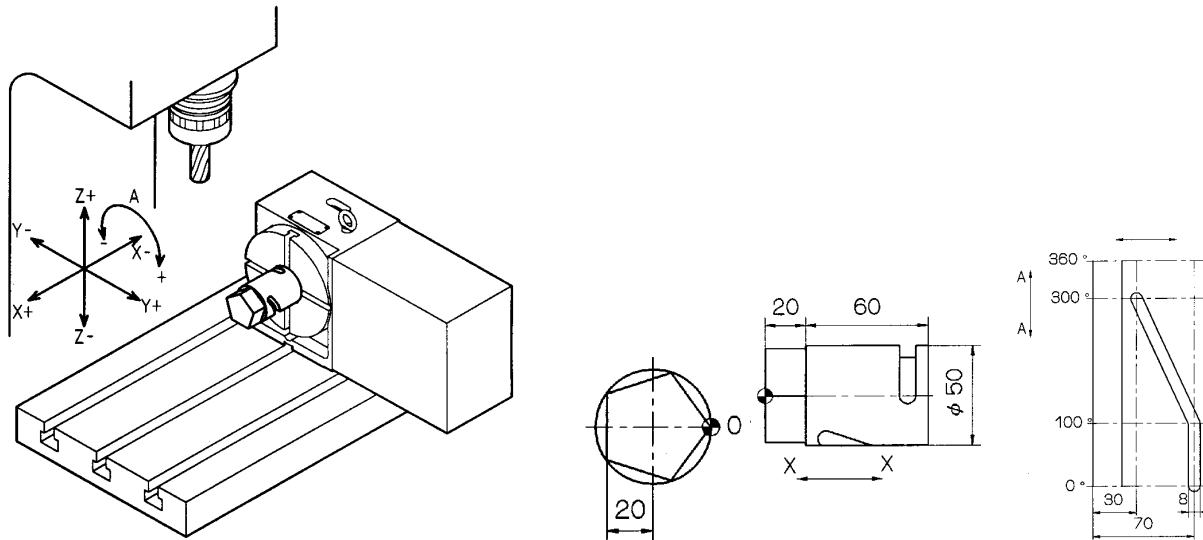
F	R.P.M.	30	40	50	60	80	100	120	140	160	180	200	230	250	300	400	500	ØD	F
F 10	0.03	3	4	5	6	8	9	11	13	15	17	19	22	24	28	38	47	F 10	
F 20	0.06	6	8	9	11	15	19	23	26	30	34	38	43	47	57	75	94	F 20	
F 30	0.08	8	10	13	15	20	25	30	35	40	45	50	58	63	75	100	125	F 30	
F 40	0.11	10	14	17	21	28	35	42	48	55	62	69	80	87	104	138	173	F 40	
F 50	0.14	13	18	22	26	35	44	53	62	70	79	88	101	110	132	176	220	F 50	
F 60	0.16	15	20	25	30	40	50	60	70	80	91	101	116	126	151	201	252	F 60	
F 70	0.19	18	24	30	36	48	60	72	84	96	107	119	137	149	179	239	299	F 70	
F 80	0.22	21	28	35	41	55	69	83	97	111	124	138	159	173	207	276	346	F 80	
F 90	0.25	24	31	39	47	63	79	94	110	126	141	157	181	196	236	314	393	F 90	
F100	0.28	26	35	44	53	70	88	106	123	141	158	176	202	220	264	352	440	F100	
F110	0.31	29	39	49	58	78	97	117	136	156	175	195	224	244	292	390	487	F110	
F120	0.33	31	41	52	62	83	104	124	145	166	187	207	239	259	311	415	519	F120	
F130	0.36	34	45	57	68	90	113	136	158	181	204	226	260	283	339	452	566	F130	
F140	0.39	37	49	61	74	98	123	147	172	196	221	245	282	306	368	490	613	F140	
F150	0.42	40	53	66	79	106	132	158	185	211	237	264	303	330	396	528	660	F150	
F160	0.44	41	55	69	83	111	138	166	193	221	249	276	318	346	415	553	691	F160	
F170	0.47	44	59	74	89	118	148	177	207	236	266	295	340	369	443	591	739	F170	
F180	0.50	47	63	79	94	126	157	189	220	251	283	314	361	393	471	628	786	F180	
F190	0.53	50	67	83	100	133	167	200	233	266	300	333	383	416	500	666	833	F190	
F200	0.55	52	69	86	104	138	173	207	242	276	311	346	397	432	518	691	864	F200	
F210	0.58	55	73	91	109	146	182	219	255	292	328	364	419	456	547	729	911	F210	
F220	0.61	57	77	96	115	153	192	230	268	307	345	383	441	479	575	766	958	F220	
F230	0.64	60	80	101	121	161	201	241	282	322	362	402	463	503	603	804	1006	F230	
F240	0.67	63	84	105	126	168	211	253	295	337	379	421	484	526	632	842	1053	F240	
F250	0.69	65	87	108	130	173	217	260	304	347	390	434	499	542	650	867	1084	F250	
F260	0.72	68	90	113	136	181	226	271	317	362	407	452	520	566	679	905	1131	F260	
F270	0.75	71	94	118	141	188	236	283	330	377	424	471	542	589	707	942	1178	F270	
F280	0.77	73	97	121	145	194	242	290	339	387	435	484	556	605	726	968	1210	F280	
F290	0.81	76	102	127	153	204	255	305	356	407	458	509	585	636	764	1018	1273	F290	
F300	0.83	78	104	130	156	209	261	313	365	417	469	522	600	652	782	1043	1304	F300	
F310	0.86	81	108	135	162	216	270	324	378	432	486	540	624	676	811	1081	1351	F310	
F320	0.90	85	113	141	170	226	283	339	396	452	509	565	650	707	848	1131	1414	F320	
F330	0.92	87	116	145	173	231	289	347	405	462	520	578	665	723	867	1156	1445	F330	
F340	0.94	89	118	148	177	236	295	354	413	472	531	591	679	738	886	1181	1476	F340	
F350	0.97	91	122	152	183	244	305	366	427	488	548	609	701	762	914	1219	1524	F350	
F360	1.00	94	126	157	189	251	314	377	440	503	566	628	723	786	943	1257	1571	F360	
F370	1.03	97	129	162	194	259	324	388	458	518	582	647	744	809	971	1294	1618	F370	
F380	1.06	100	133	167	200	266	333	400	466	533	599	666	766	833	999	1332	1665	F380	
F390	1.08	102	136	170	204	271	339	407	475	543	611	679	780	848	1018	1357	1697	F390	
F400	1.11	105	139	174	209	279	349	418	488	558	628	697	802	872	1046	1395	1744	F400	
F410	1.14	107	143	179	215	286	358	430	501	573	645	716	824	895	1074	1432	1791	F410	
F420	1.17	110	147	184	221	294	368	441	515	588	662	735	845	919	1103	1470	1838	F420	
F430	1.19	112	150	187	224	299	374	449	523	598	673	743	860	935	1121	1495	1869	F430	
F440	1.22	115	153	192	230	307	383	460	537	613	690	767	882	958	1150	1533	1917	F440	
F450	1.25	118	157	196	236	314	398	471	550	628	707	785	908	982	1178	1571	1964	F450	
F460	1.28	121	161	201	241	322	402	483	563	643	724	804	925	1005	1206	1608	2011	F460	
F470	1.31	123	165	206	247	329	412	494	576	658	741	823	946	1029	1235	1646	2058	F470	
F480	1.33	125	167	209	251	334	418	501	585	668	752	836	961	1045	1253	1671	2089	F480	
F490	1.36	128	171	214	256	342	427	513	598	684	769	855	983	1068	1282	1709	2187	F490	
F500	1.39	131	175	218	262	349	437	524	611	699	786	873	1004	1092	1310	1747	2184	F500	
		30	40	50	60	80	100	120	140	160	180	200	230	250	300	400	500		



7.3.Example of programming

The workpiece is 50 mm in diameter

1. Cutting 5 face by 20 mm at end of the workpiece.
2. Helix cutting.

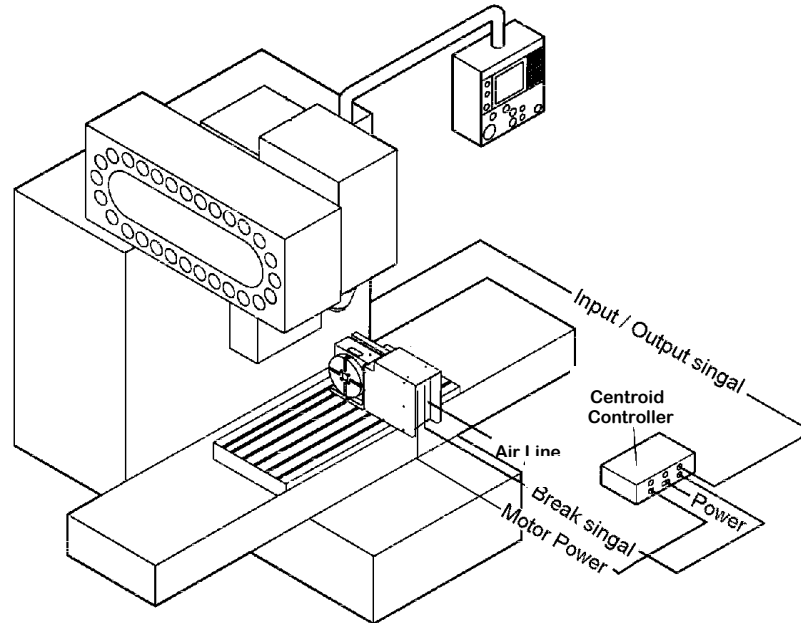


NC program	Specification	NC program	Specification
N1 T1 M06 M11 G90 G00 A36. M10 G90 G45 G00 X7.5 Y25 G43 Z100. S500 H1 M03 Z5 G01 Z-5. F100 M08 Y-12. Y-25. F2000 M11 G00 A108. M10 G01 Y12. F100 Y25. F2000 M11 G100 A180. M10 G01 Y-12. F100 Y-25. F2000 M11 G00 A252. M10 G01 Y12. F100 Y25. F2000 G00 A324.	\varnothing 25mm End Mill Rotary table unclamp Rotary +36° Rotary table clamp	M10 G01 Y-12. F100 Y-25. F2000 Z5. M09 M11 G00 A0. G90 G00 Z100. M05 G91 G28 Z0. G49 N2 T2 M06 G90 G54 G00 X70. Y0. G43 Z100. S3000 H2 M03 G01 Z-6. F100 M08 A100. X30. A300. G90 G00 Z5. M05 M09 M10 G91 G28 Z0. G49 M30	Coolant off Spindle stop \varnothing 8mm End Mill

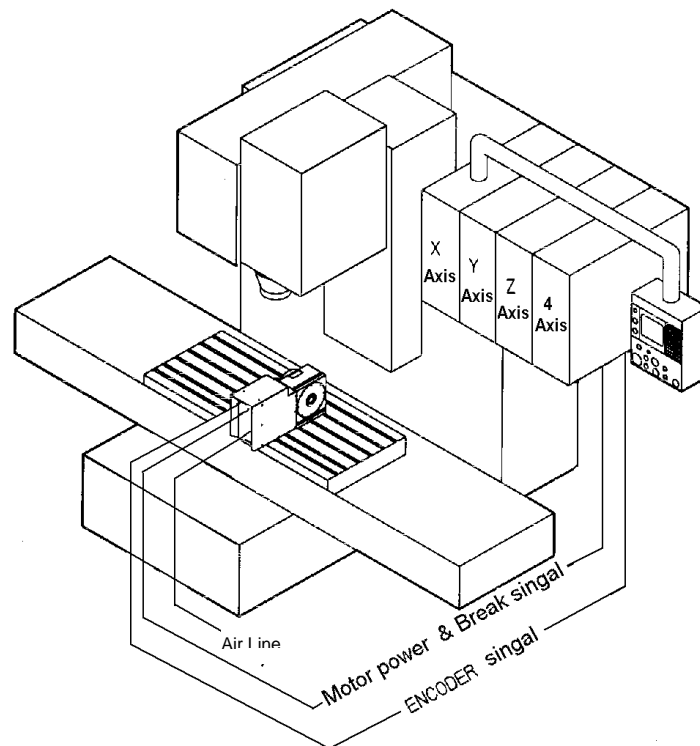


7.4. Machine computer and rotary table control connection

7.4.1. Machine with 3 axes



7.4.2. Machine with 4 axes

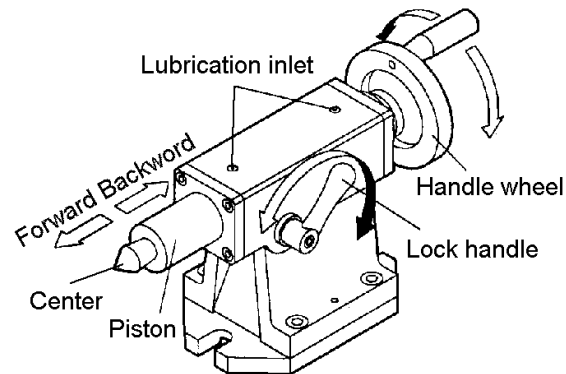




7.5.How to use tailstock

7.5.1.Manual tailstock

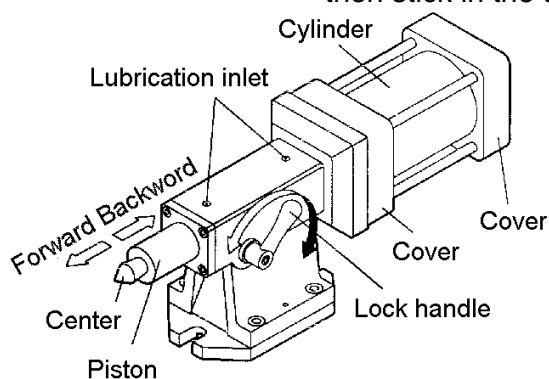
1. To lock piston: Turn locking handle CCW to release piston or CW to lock the piston (7-1).
2. To move forward and backward: Turn handwheel CW to move piston forward and CCW for backward.
3. To remove the center: Move the piston backward CCW to the end, this will release the center.



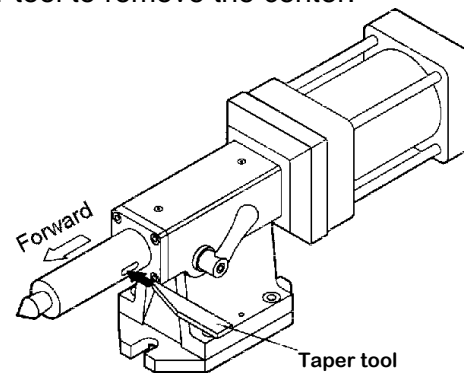
(7 - 1)

7.5.2.Power tailstock (pneumatic or hydraulic)

1. To lock piston: Turn locking handle CCW to release piston or CW to lock the piston (7-2).
2. To move forward and backward: Operating the pneumatic (hydraulic) solenoid will move the piston forward or backward (7-3).
3. To replace the center: Move the piston forward until the oval hole is complete out of body then stick in the taper tool to remove the center.



(7 - 2)



(7 - 3)

7.5.3.Maintenance:

It is recommended to add grease to the lubricant holes every six months for maintenance.



7.6.Parameter Setting for Rotary Tables

See also the following **TECH NEWS Documents**:

- 1.TB012 Removing and installing Servo Drives.
- 2.TB013 3 axis to 4 axis upgrade with an RTK1 PLC.
- 3.TB022 Modifying CNC7.hom file for homing program.

W		+ 0.0000			Press CYCLE START
Machine Configuration					
Axis	Slow Jog (in/min)	Fast Jog (in/min)	Max Rate (in/min)	Deadstart (in/min)	
1	0.0001	0.0001	0.0001	0.0001	
2	0.0001	0.0001	0.0001	0.0001	
3	0.0001	0.0001	0.0001	0.0001	
4	360.0000	720.0000	1200.0000	3.0000	
Axis Label	Motor	Encoder	Lash Comp.	Limit	Home

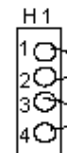
Steps

*Set the Machine Configuration as below for the **4th axis only.**

*DO NOT CHANGE THE VALUES FOR 1, 2, 3 AXIS!

1. Place jumpers on the RTK2-B H1 between pins 1 and 2, and pins 3 and 4.

See Diagram



Go to the proper screens as follows: F1<Setup>, F3<Config>, Password= 137 <Enter>; then F3<Params> or F2<Machine> as instructed below. Always be sure to use F10 <Save> before exiting.

2. In the F2<Machine> configuration, set the #4 Axis label to W and edit this same line as indicated below to replicate the proper configuration for the proper rotary table.



Rotary Table Parameters:

<i>Rotary Table</i>	Mtr/T bl Ratio	Slow Jog	Fast Jog	Max Rate	Rev/ degree	Encod e counts	Limit		Home		Dir
							+	-	+	-	
<i>Troyke</i>	180:1	360	720	1,200	0.5	8,000	0	0	*	*	N
<i>Yuasa SUDX 220 w/5.27</i>	90:1	2,000	3,937	3,937	0.25	8,000	0	0	*	*	N
<i>Yuasa SUDX 220 w/6.00</i>	90:1	2,000	12,000	12,000	0.25	8,000	0	0	*	*	N
<i>Yuasa SUDX 140 w/5.27</i>	70:1	2,000	3,937	3,937	0.2	8,000	0	0	*	*	N
<i>Yuasa SUDX 140 w/6.00</i>	70:1	2,000	12,000	12,000	0.2	8,000	0	0	*	*	N
<i>Centroid RT-200</i>	DC 90:1	2,000	9,000	9,000	.25	8,000	0	0	*	*	N
	AC 90:1	5,000	11,500	11,500	.25	8192	0	0	*	*	N
<i>Centroid RT-150</i>	DC 90:1	2,000	9,000	9,000	.25	8,000	0	0	*	*	N
	AC 90:1	5,000	11,500	11,500	.25	8192	0	0	*	*	N

* Determined by PLC

TABLE 1

- To figure your Revs/degree you need to divide the Motor Revs./ Table Revs. ratio by 360. See table 1.
- In the **F3<Params>** screen, change parameter 94 to 1.0 (this will flag that axis as rotary). The conversational software will then display degrees, minutes, and seconds for that axis in linear moves. Also change parameter 98 to 45.0 (the autotune move distance).

*To find feedrate for a rotary axis in degrees/min, you must do the following:
 (Surface Velocity/Part Diameter) * (114.591559) = Deg/Min

The degree per minute is the input required for the feedrate.

- From the main screen of CNC7, press F6<Edit> and open the file *c:\cnc7\cnc7.hom*. Add these lines at the end of the file for homing the rotary axis.
 If you have a home/limit switch add these lines - M92/W M26/W
 If you don't have a home/limit switch just add this line - M26/W
- Some earlier Centroid Controls may require an updated RTK2 assembly if you find that H1 is not installed on the circuit board and/or a PLC Program modification in order to use the "Clamp" feature. Call Tech Support if this applies.



Special Note For Rotary Table with DC brush motor:

The Kd parameter will need to be adjusted for the 17 lb/in motor that is installed in the table. Follow the instructions below.

Go to the proper screens as follows: F1<Setup>, F3<Config>, Password= 137 <Enter>; then F4<PID>, F1<PID> Use the right arrow key to move over to the Kd column then the down arrow key to get to the correct row and axis, in this case W. Change the value in this field to 5.000. Always be sure to use F10 <Save> before exiting.

Testing

- Check the clamp. With proper air supply, press <F3> for MDI then M10<enter>(clamp on). Verify that the table is clamped, or locked, into position so that it cannot rotate. Issue an M11<enter>(clamp off) to unclamp the table.
- Jog the 4th axis in both directions to verify proper motor wiring. (Note: If the motor power leads are reversed, an axis will move the same direction a small amount no matter which jog key is pressed. If this is the case call Tech Support)
- Verify proper homing. During homing sequence, the table will turn at the slow jog rate to the switch and then come off the switch at 24 deg/min a short amount before setting home. (Note: If the input is not connected, the table will turn at 24deg/min indefinitely.)
- Go into MDI. If the rotary table is labeled W, enter the following commands: W0<cycle start> W360 <cycle start>. Verify that the table completes one revolution.
- If the table is the 4th axis, set parameter 98 to 45. This will cause autotune to move 45 degrees on the rotary table. See chapter 10 in the manual. Run Autotune.

Field upgrade checklist:

- a new PLC program for 4 axis system
- a new wiring diagram
- a 4th axis drive similar to the one in the machine (i.e.. is the 3 axis 12,12,15 brake? or a 12,12,12? etc.)
- a new limit switch cable that goes from the PLC to the drive.
- a wiring harness for the inside of the magnetics cabinet and tools to install the connector in the bottom of the magnetics cabinet. (If applicable)



7.7. Using 4th Axis on Offline Mill Intercon

In order to enable 4th axis support using Off-line Intercon, the control parameter and configuration files must be set correctly. Follow the steps below to enable 4th axis in off-line programming.

Setting correct parameters on the control

(1) At the control, be sure that parameter 94 = 1.0, which is a signal to Intercon that the 4th axis is rotary. To access the parameters screen starting from the main screen, use <F1> Setup, <F3> Config, enter the password of 137, and then <F3> Params. Remember to press <F10> to save changes.

(2) The 4th axis should be labeled in the Machine Configuration with a letter other than N, typically B or W. To access the Machine Configuration screen starting from the main screen, use <F1> Setup, <F3> Config, enter the password of 137, and then <F2> Machine, followed by <F2> Motor. Remember to press <F10> to save changes.

(3) Another good idea is to set the Console type in the Control Configuration to be Offline, so that the function keys will also be labeled, as the off-line keyboard function keys obviously will not line up with the off-line computer monitor. To access the Control Configuration screen starting from the main screen, use <F1> Setup, <F3> Config, enter the password of 137, and then <F1> Control. Remember to press <F10> to save changes. The console type should be changed back to the original setting after the files have been copied to a floppy disk.

Copying the information from the control to a floppy disk

(4) Insert a blank, formatted floppy disk into the floppy drive.

(5) From the main screen, exit to DOS by pressing <CTRL + ALT + X>, i.e., all three keys at the same time.

(6) Execute the following commands:

```
copy cnc7.prm a:\ <ENTER>
copy cnc7.cfg a:\ <ENTER>
```

Copying the information from the floppy disk to the off-line system

There are several ways to accomplish this task, especially when the off-line computer operating system is Windows. What needs to be done is that the two files on the floppy disk (cnc7.prm and cnc7.cfg) must be copied into the \CNC7 directory of the off-line computer system, replacing the ones that are there.

Assuming the off-line system is DOS based, here would be the commands to type at the command line. Using a Windows 9x operating system, the same commands could be typed into the Run dialog box accessible via the Start Menu.

```
copy a:\.* c:\cnc7 <ENTER>
```

Try using the offline Intercon and verify that 4th axis is enabled.



7.8. Converting inches(mm)/minute to degrees/minute

Overview

This document gives the formulas for calculating the feed for a rotary axis. The feed rate for rotary axis on a Centroid Control is in degrees per minute.

Formulas for Converting inches (millimeters) per minute to degrees per minute.

Degrees per minute = Inches per minute / Diameter * 114.5916

Degrees per minute = Millimeters per minute / Diameter * 114.5916

Example #1: 20 inches per minute, Cutting 3 inch diameter

Degrees per minute = $20/3 * 114.5916$

Degrees per minute = $6.6667 * 114.5916$

Degrees per minute = 763.9478

Example #2: 508 millimeters per minute, Cutting 76.2 millimeter diameter

Degrees per minute = $508/76.2 * 114.5916$

Degrees per minute = $6.6667 * 114.5916$

Degrees per minute = 763.9478

Formulas for Converting Degrees per minute to inches (millimeters) per minute.

Inches per minute = Degrees per minute * Diameter / 114.5916

Millimeters per minute = Degrees per minute * Diameter / 114.5916

Example #3: 4000 Degrees per minute, Cutting 2 Inch Diameter

Inches per minute = $2000 * 2 / 114.5916$

Inches per minute = $4000 / 114.5916$

Inches per minute = 34.907

Example #4: 4000 Degrees per minute, Cutting 50 millimeter diameter

Millimeter per minute = $4000 * 50 / 114.5916$

Millimeter per minute = $200000 / 114.5916$

Millimeter per minute = 1745.329



7.9.110 Volt Rotary Table MS Connectors

Problem Description:

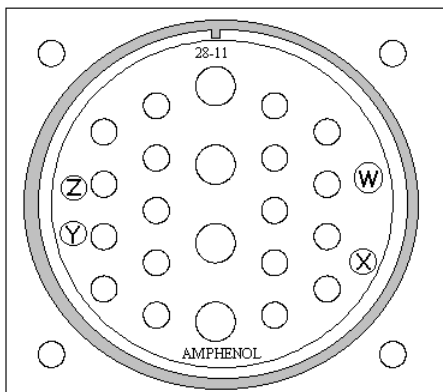
This Tech Bulletin is about the 4th Axis Rotary table connectors on Centroid Controls configured for 110 Volt rotary tables.

Before the week ending April 26th 2002 Centroid shipped every Control setup for 4th axis in the same way, regardless of whether it was setup for 24V or 110V operation. This has been known to cause problems if someone would try and connect the Rotary table setup for 24V operation to a Control set for 110V.

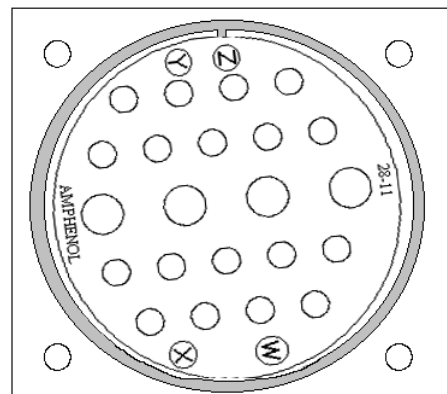
Solution:

To combat this problem Centroid will begin shipping Controls setup for 110V Rotary operation with the MS connector in a different configuration. The new configuration for the MS connector is what is called the 'Z' position. The cables shipped for 110V operation will also be set to the 'Z' position. You can clearly see the difference between the 'Z' position and the normal position in the diagrams below. All diagrams show the connectors when looking from the front.

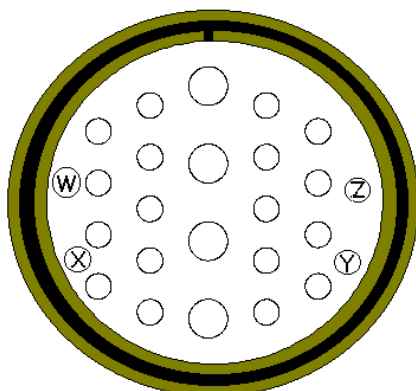
Female MS Connector Set For 24V:



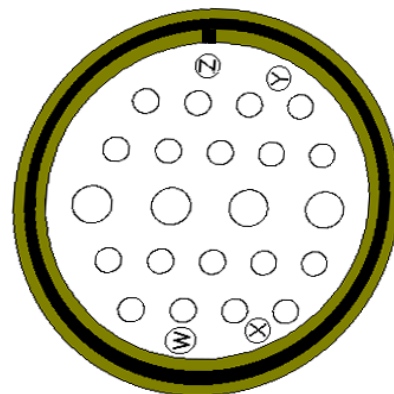
Female MS Connector in 'Z' For 110V:



Male MS Connector Set For 24V:



Male MS Connector in 'Z' For 110V:





It is recommended that all Controls in the field have the connectors changed to the 'Z' position if they are set for 110V operation. This ensures that there will be no confusion in the future with these machines and the cables. Note. It is still just as important to have the correct cable for the rotary table in use.

Instructions for changing connector configuration:

To set up the connectors to the 'Z' position you need to follow the simple steps below:

Female:

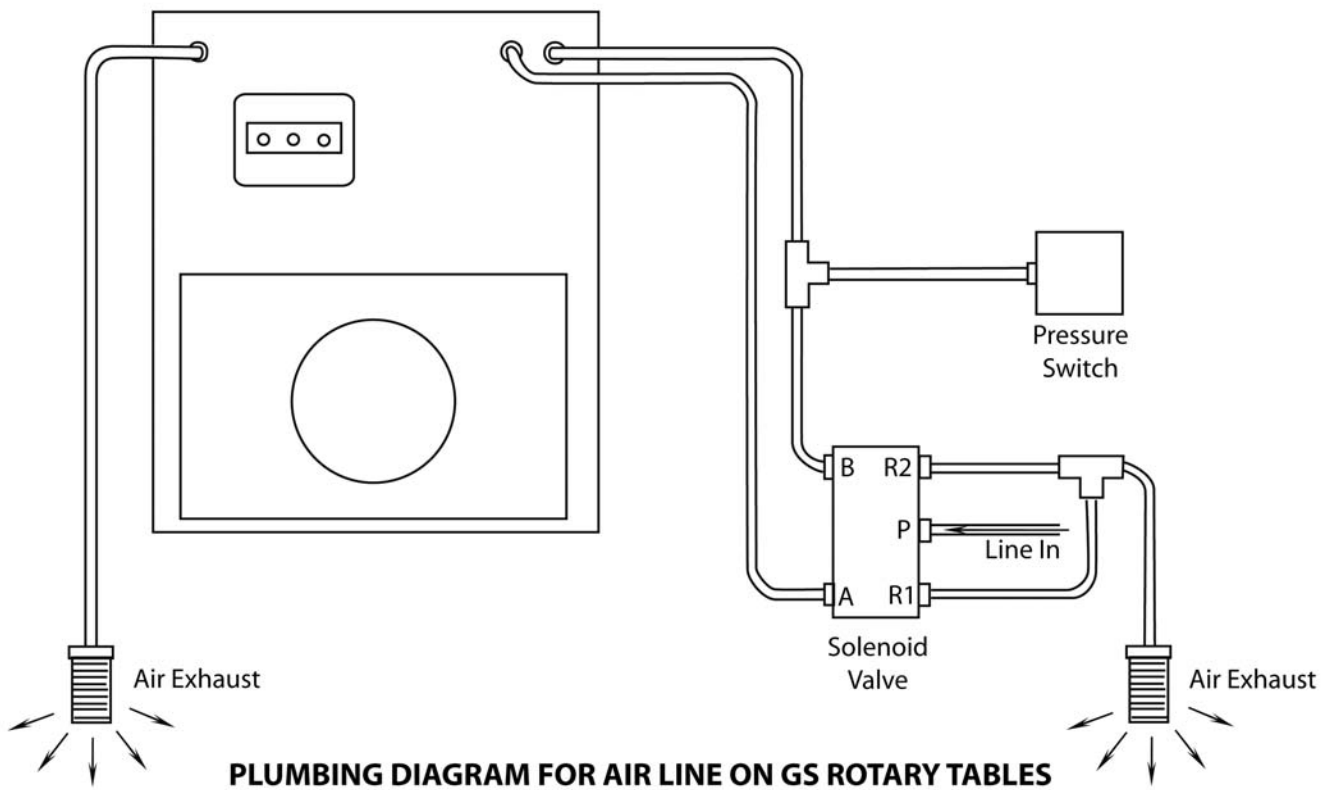
1. Remove socket from cabinet
2. Remove snap ring on back of socket holding connector together
3. Slide out center of connector
4. Rotate to 'Z' position. **Note:** You may have to remove some material from the center section in order for it to slide into the 'Z' position. To do this simply use a Dremel or an exacto-knife to remove the material as needed
5. Slide center back into connector body
6. Replace snap ring
7. Replace socket back in cabinet

Male:

1. Unscrew back of connector
2. Remove snap ring in back of connector
3. Slide out center section of connector
4. Rotate center section to the 'Z' position. **Note:** You may have to remove some material from the center section in order for it to slide into the 'Z' position. To do this simply use a Dremel or an exacto-knife to remove the material as needed
5. Slide center section back into socket
6. Replace snap ring
7. Screw back of connector back into place

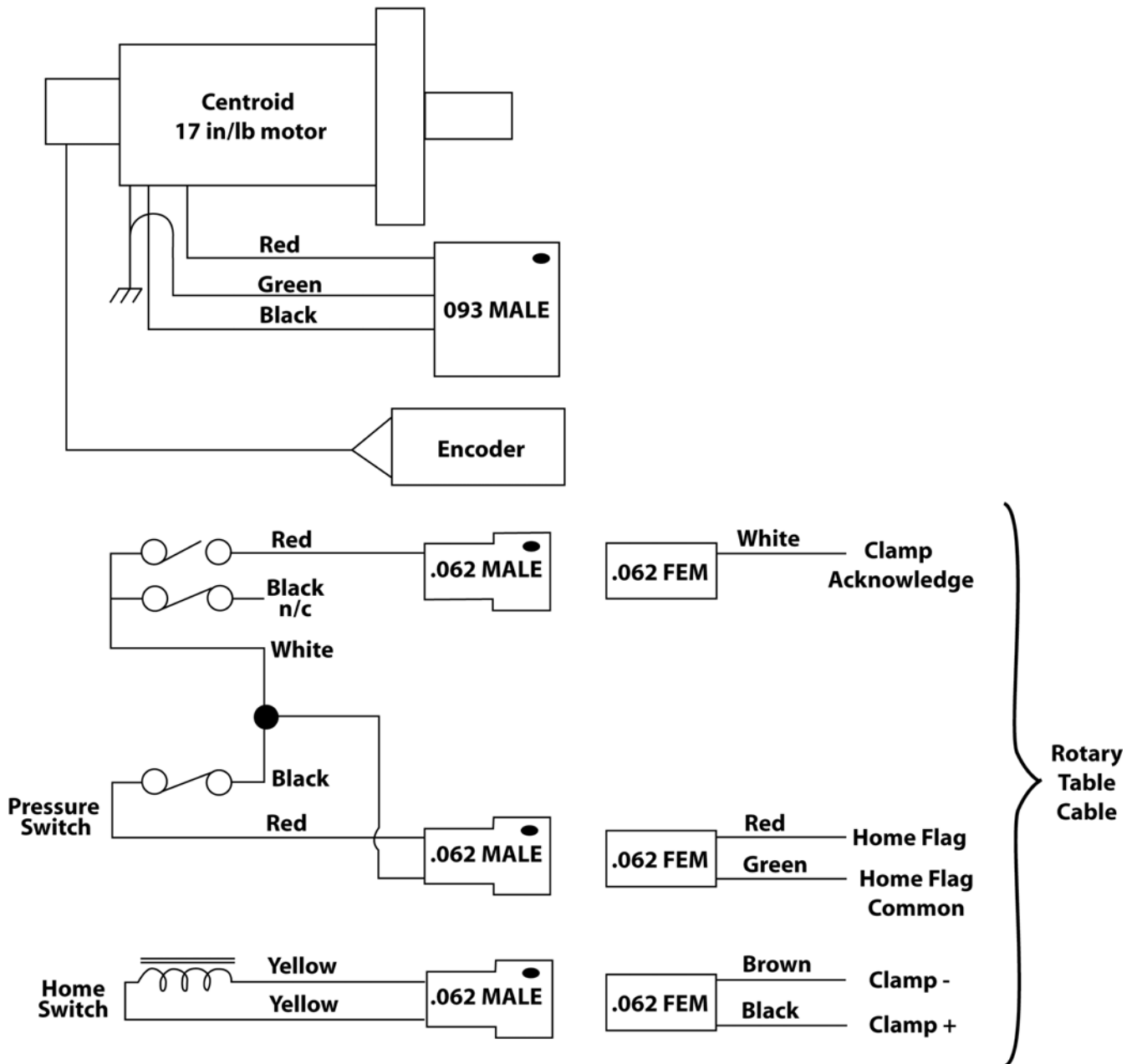


7.10.Plumbing Diagram for Air Line on Centroid Rotary Tables



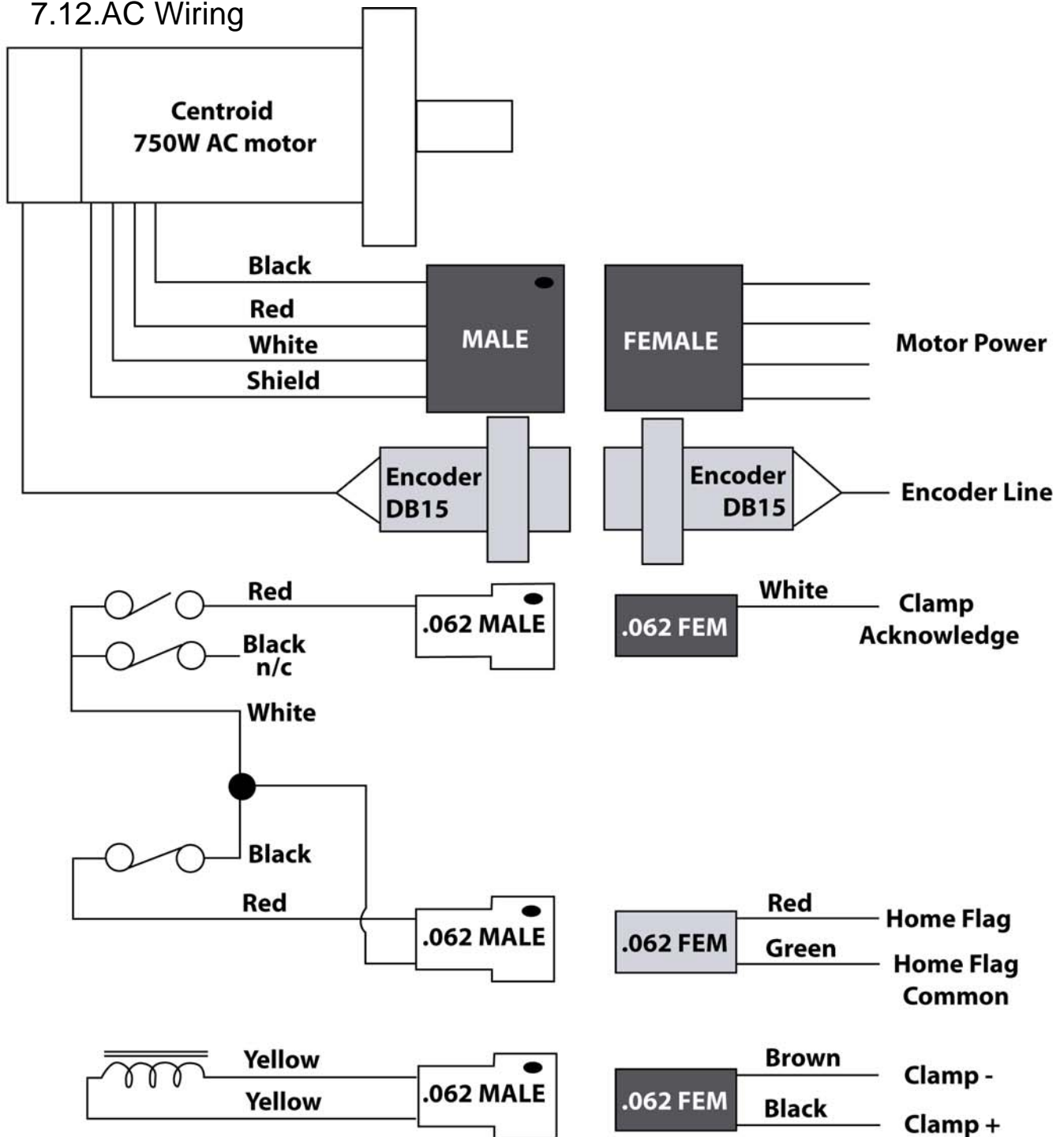


7.11.DC Wiring





7.12.AC Wiring



AC Rotary Table cable uses two 1/2" conduit lines

All wires and connectors indicated in light gray go through encoder conduit

All wires and connectors indicated in dark gray go through power conduit



7.13.DC Rotary Table Connections

