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Magnum Straighteners

Models: SS300, SS500, SS650, SS800, SS1000, SS1300

Table of Contents

Thank you for selecting our product for your coil handling needs. This manual will provide you with all the information necessary to install, operate, apply and maintain your machine. Safety is always a priority so please follow all the caution and warning stickers labeled on our machines.

1 Introduction

Please read this manual thoroughly before installing, operating, applying and maintaining this machinery. Failure to do so may result in serious injury to yourself and/or others.

1.1 General Safety program

Accident free operation will result from a well developed, management sponsored and enforced safety program. Of vital importance to any successful program is the proper selection of guards and devices. However, there is no safety device that will bring “automatic” safety to your operation.

Of equal importance to this proper selection of the guard and the device is the training of your personnel. Each person must be trained as to the operation of the guard or safety device, highlighting why they have been provided on the equipment. Rules for safe operating should be written and enforced at all times. A final major concern of an effective safety program is regularly scheduled inspection and maintenance of all of the equipment.

To ensure continued safety at all times, top management, line supervision, safety engineers and all employees must assume their proper share of the responsibility in the program. Only as a group, one that knows your own operation and its problems, can you carry out an effective safety program.

To assist you in the development of and continued use of safety programs, many safety minded groups have made guidelines available to you. However, you must know when and how to apply these guidelines. The manufacturer provides information to assist you in properly adjusting and maintaining your equipment. There is no short cut to proper safety; therefore, it is recommended that you comply with their recommendations at all times.

1.2 Warning

This equipment offers various means of operating or controlling machines. The operator must not be in or near the point-of-operation of the machine, or the operating parts of any equipment installed on the machine, or bodily injury could result. The EMPLOYER must post adequate warning signs onto the machine with proper warnings for his machine and the specific application to which the machine and equipment are being applied. Occupational Safety and Health Act (OSHA) Sections 1910.211, 1910.212, and 1910.217 contain installation information on the distance between danger points and point-of-operation guards and devices. No specific references have been made to which paragraph of OSHA 1910.211, 1910.212, 1910.217 or any other applicable sections because the paragraphs may change with each edition of the publication of OSHA provisions. All equipment manufactured by us is designed to meet the construction standards of OSHA in effect at the time of sale, but the EMPLOYER installs the equipment so the EMPLOYER is responsible for installation, use, application, training, and maintenance, as well as adequate signs on the machine onto which this equipment will be installed. Remember, OSHA says that the EMPLOYER must use operating methods designed to control or eliminate hazards to operating personnel. It shall be the responsibility of the EMPLOYER to establish and follow a program of periodic and regular inspections of his machine to insure that all their parts, auxiliary equipment, and safeguards are in a safe operating condition and adjustment. Each machine

should be inspected and tested no less than weekly to determine the condition of the machine. Necessary maintenance or repair of both shall be performed and completed before the machine is operated. The EMPLOYER shall maintain records of these inspections and the maintenance work performed.
Our Company is not responsible to notify the user of this equipment of future changes in State or Federal laws, or construction standards.

1.3 Warranty Program

We warrant our new parts against defects under normal use and service for a period of 12 months after date of shipment. Our obligation under this warranty is limited to replacing or repairing (at our option) the defective part without charge, F.O.B. our plant in Bloomfield, Connecticut. The defective part must be forwarded to our plant, freight prepaid, for our inspection prior to replacement or repair**. EXCEPT AS EXPRESSLY PROVIDED HEREIN, THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING A WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**
Furthermore, the seller does not warrant or represent that the equipment complies with the provisions of any law, particularly including the Occupational Safety and Health Act of 1970, and regulations promulgated there under. In no event shall we be liable for special, indirect incidental or consequential damages, however rising.

1.4 Receiving and Inspection

SPECIAL NOTE: P/A INDUSTREIS INC. ASSUMES NO RESPONSIBILTIY IN CONNECTION HEREWITH, NOR CAN IT BE ASSUMED THAT ALL ACCEPTABLE SAFETY MEASURES ARE CONTAINED IN THIS PUBLICATION, OR THAT OTHER ADDITIONAL MEASURES MAY NOT BE REQUIRED UNDER PARTICULAR OR EXCEPTIONAL CIRCUMSTANCES OR CONDITIONS.

RECEIVING INSPECTION

Before removing the unit from its packaging, check for visual damage, especially if crate, skid, or carton had been damaged in transit. Any damage caused by shipping should be immediately reported to the carrier. If the unit appears in satisfactory condition, remove all the packaging. Read these instructions. They are provided to answer questions regarding the Operation and use of this equipment.

2 Installation and Assembly

2.1 Mechanical

Machinery should be placed in line with any other machinery that is being adjoined (uncoiler, powered straightener, press and die, etc.) See line layout drawing for distance measurements between the machines.

- All equipment should be leveled and squared before continuing with operation.
- Leveling should be executed by both parallel and perpendicular to stock direction.
- Proper positioning should factor in both material requirements and minimal angles of entry from the supporting equipment to the feed (feeder-straightener).
- If running a conventional coil handling systems line (uncoiler, powered straightener, feeder), please reference this manual proper loop storage section.
- Only after the following steps have been followed and reviewed should the equipment be permanently affixed in place.
- For the air supply, make sure the supply line is 1/6th larger than the air inlet on the valve.
- Do not use quick disconnect fittings as their capacity is insufficient.
- Air supply to straightener should be 1/2" line.
- An air filter, regulator and lubricator must be included in hook up of air supply.
- After air is hooked up, adjust the feed roll pressure.

2.2 Electrical

Reference the schematic attached for proper voltage and tie in location.

3 Operation

Main Power On/ Reset: This button engages the main contactor within the control box and resets any tight loop or faults.

Main Power Off: Disengages the main contactor, shutting off power to the drive.

Power Light: When live power is connected to the control and the main switches are open, this light will be on.

Drive Fault: If any issues arise with the drive, please record what the error code is on the main LCD panel on the blue drive inside the control box. Please call PA Industries (860-243-8306) for assistance.

Auto Cycle On: This button puts the drive into auto mode.

Auto Cycle Off: Shuts the auto mode off.

E-Stop: This button cuts power to the main power and puts the drive in a state of fault. Also see the second to last page in the schematic for information in tying in the E-stop with the press stop circuit.

Exit/Entrance Roll Open: Right above the pressure regulator you will find a black handle that will be used to open and close the entrance guide rolls. On the same side at about the same height, on the exit end of the straightener you will also find the exit roll open handle.

Jog Pendant: Attached to the control box you will find a yellow jog pendant with arrows indicating the direction you would like the straightener to feed. You will not be able to use this pendant when the auto cycle is on.

4 Roll Straightener Settings

COIL CURVATURE O.D. vs I.D.

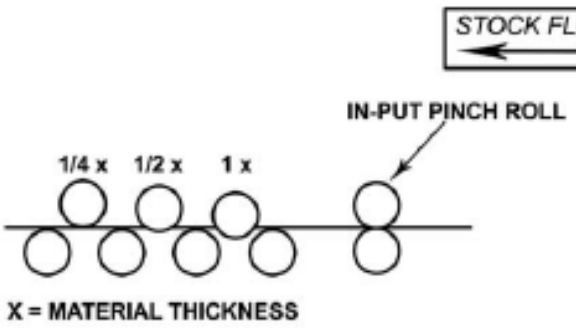
1- Variance in coil curvature may require straightener adjustments during coil run to achieve desired flatness.

2- Lighter gauge materials require more straightener rolls to minimize the number of adjustments.

RECOMMENDED ROLLER SETTINGS

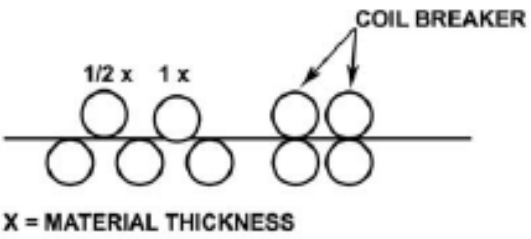
SEVEN ROLL STRAIGHTENER

LIGHTER OR WIDER RANGE OF MATERIAL



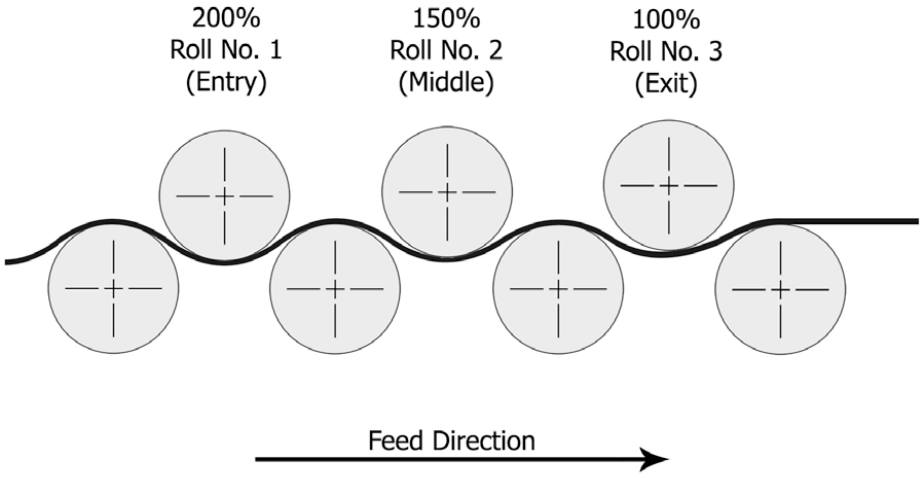
FIVE ROLL STRAIGHTENER

HEAVY GAUGE MATERIAL



* This is a general rule recommended for removing coil curvature of mild steel. Actual roller settings are dependant on stock thickness, tensile, roll diameter and O.D.

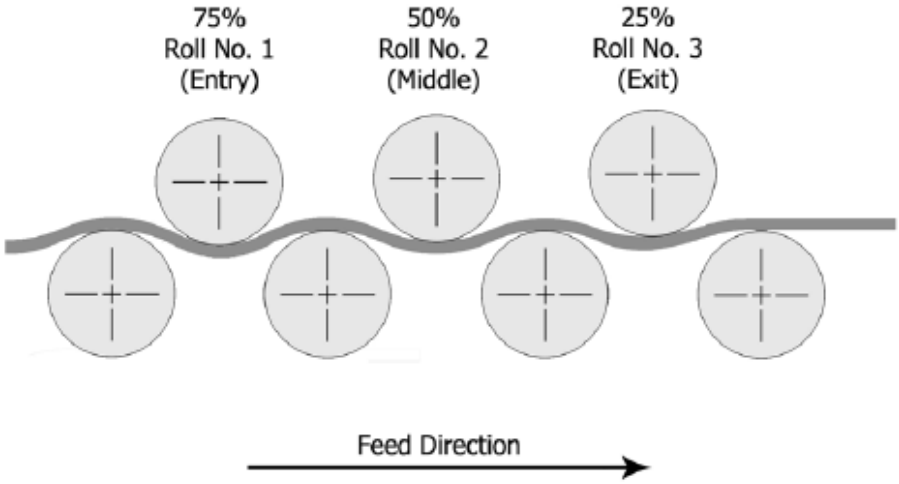
LIGHT GAUGE MATERIAL: PERCENT PENETRATION



Light Gauge Material: (.020" - .080")

Entry Work Roll_____200% Penetration
Middle Work Roll_____150% Penetration
Exit Work Roll_____100% Penetration

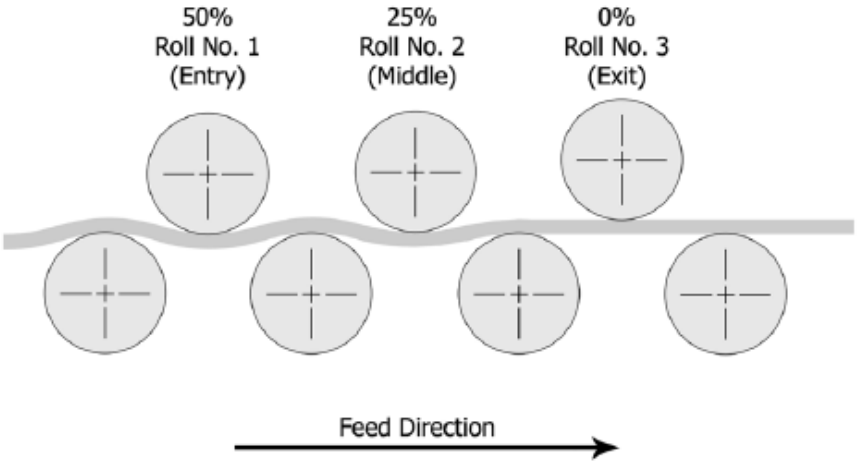
MEDIUM GAUGE MATERIAL: PERCENT PENETRATION



Medium Gauge Material: (.090" - .156")

Entry Work Roll_____75% Penetration
Middle Work Roll_____50% Penetration
Exit Work Roll_____25% Penetration

HEAVY GAUGE MATERIAL: PERCENT PENETRATION



Heavy Gauge Material: (.187" - .250")

Entry Work Roll_____50% Penetration
Middle Work Roll_____25% Penetration
Exit Work Roll_____0% Penetration

Straightener Roll Settings
(Inches of Penetration Into Material)

		Mild Steel			HSLA Steel		
	Material Thickness (In)	Entry Roll	Center Roll	Exit Roll	Entry Roll	Center Roll	Exit Roll
Light Gauge Material	0.010	0.0200	0.0150	0.0100	0.0300	0.0225	0.0150
	0.020	0.0400	0.0300	0.0200	0.0600	0.0450	0.0300
	0.030	0.0600	0.0450	0.0300	0.0900	0.0675	0.0450
	0.040	0.0800	0.0600	0.0400	0.1200	0.0900	0.0600
	0.050	0.1000	0.0750	0.0500	0.1500	0.1125	0.0750
	0.060	0.1200	0.0900	0.0600	0.1800	0.1350	0.0900
	0.070	0.1400	0.1050	0.0700	0.2100	0.1575	0.1050
	0.080	0.1600	0.1200	0.0800	0.2400	0.1800	0.1200
Medium Gauge Material	0.090	0.0675	0.0450	0.0225	0.1013	0.0675	0.0338
	0.100	0.0750	0.0500	0.0250	0.1125	0.0750	0.0375
	0.110	0.0825	0.0550	0.0275	0.1238	0.0825	0.0413
	0.120	0.0900	0.0600	0.0300	0.1350	0.0900	0.0450
	0.130	0.0975	0.0650	0.0325	0.1463	0.0975	0.0488
	0.140	0.1050	0.0700	0.0350	0.1575	0.1050	0.0525
	0.150	0.1125	0.0750	0.0375	0.1688	0.1125	0.0563
	0.160	0.1200	0.0800	0.0400	0.1800	0.1200	0.0600
Heavy Gauge material	0.170	0.0850	0.0425	0.0000	0.1275	0.0638	0.0000
	0.180	0.0900	0.0450	0.0000	0.1350	0.0675	0.0000
	0.190	0.0950	0.0475	0.0000	0.1425	0.0713	0.0000
	0.200	0.1000	0.0500	0.0000	0.1500	0.0750	0.0000
	0.210	0.1050	0.0525	0.0000	0.1575	0.0788	0.0000
	0.220	0.1100	0.0550	0.0000	0.1650	0.0825	0.0000
	0.230	0.1150	0.0575	0.0000	0.1725	0.0863	0.0000
	0.240	0.1200	0.0600	0.0000	0.1800	0.0900	0.0000
	0.250	0.1250	0.0625	0.0000	0.1875	0.0938	0.0000

NOTE: This chart is only a guide to setting your straightening rolls for the first time. Please fine tune and document the roll settings per job for maximum results.

5 Maintenance

DAILY REQUIREMENTS
1. CHECK ALL SYSTEMS FOR PROPER PRESSURE.
2. CHECK ALL AIRLINES AND FITTINGS FOR LEAKS.
7. CHECK FOR ANY SAFETY HAZARDS.

WEEKLY REQUIREMENTS
1. INSPECT AND CLEAN, IF NECESSARY, ALL AIRLINE FILTER BOWLS.
2. FILL AIRLINE LUBRICATOR BOWL TO INDICATED LEVEL WITH PROPER OIL.
3. CHECK ALL AIR VALVES FOR LEAKS. DRY RUN ALL FUNCTIONS TO INSURE PROPER OPERATION.
4. GREASE ALL POINTS AS INDICATED ON TAGS.

MONTHLY REQUIREMENTS
1. CHECK DRIVE BELTS AND DRIVE CHAIN LOCATED INSIDE THE STRAIGHTENER CABINET, TIGHTEN OR REPLACE WHERE NECESSARY.
2. CHECK THE DRIVE BELT ON THE ELECTRONIC FEED, TIGHTEN OR REPLACE WHERE NECESSARY.
4. CHECK THE OIL IN THE GEAR REDUCERS.
5. CLEAN COOLING FANS ON ALL MOTORS.
6. CHECK THE DRIVE CHAINS. TIGHTEN OR REPLACE WHERE NECESSARY.

SIX MONTH REQUIREMENTS
1. CHECK CALIBRATIONS ON THE FOLLOWING READOUTS: EDGE GUIDES—FEED AND STRAIGHTENER; ROLL ADJUSTMENT OF UPPER STRAIGHTENER ROLLS; AND PASS LINE HEIGHT ON FEED.
2. INSPECT FEED ROLLS AND PINCH ROLLS. REPLACE IF FINISH IS WORN OR FLAT SPOTS ARE VISIBLE.
3. GREASE ALL POINTS AS INDICATED ON TAGS.

YEARLY REQUIREMENTS
1. ELECTRICAL – CHECK AND TIGHTEN ALL CONNECTIONS, TERMINAL STRIPS, RELAYS, FUSES, ETC.
2. RECORD AMP READING ON ALL MOTORS.
3. CHECK MOUNTING BOLTS ON ALL MOTORS.
4. CHECK ALL BEARINGS AND WEAR SURFACES—REFER TO ASSEMBLY DRAWING FOR LOCATIONS. REPLACE OR REPAIR WHERE NECESSARY.

Note:
Grease Daily. Do not grease with extreme pressure additives. Such additives may cause the over running clutches to malfunction. Recommended lubricant BP Energrease LS-EP2.

Dial Indicator:
Replace battery every 2 years.

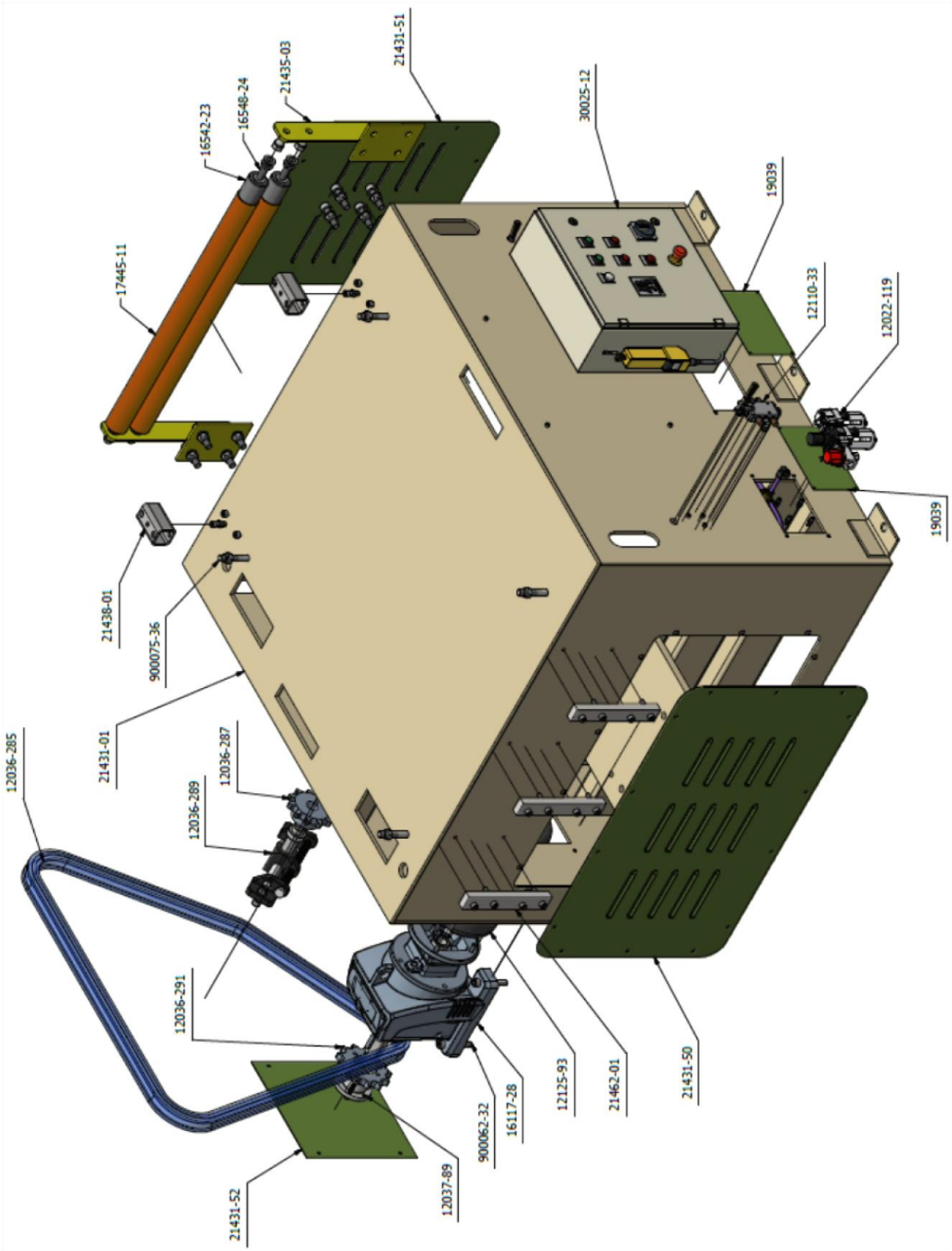
Gearbox:
Oil should be changed at least every 2,500 operating hours or every 6 months, whichever comes first. Recommended lubricants include MOBIL Gear 632, SHELL Omala 320, MOBIL Mobilube HD80W-90, SHELL Spriax E.P 90. Never mix oils.

6 Troubleshooting

For any service related questions please call PA Industries at 860-243-8306.

7 Parts and Specifications

Model	Max. Stock Width (in)	Stock Thickness Range (in)	Straightening Rolls		Pinch Rolls		Speed Range (IPM)	AC Drive Motor (HP)	Input Power VAC/Phase/HZ
			Qty	Dia. (in)	Qty	Dia. (in)			
SS300-7	12	.040-.276	7	3.75	4	3.75	0-900	10	460/3/60
SS500-7	20	.040-.236							
SS650-7	25	.040-.196							
SS800-7	30	.040-.165							
SS1000-7	40	.040-.133							
SS1300-7	50	.040-.118							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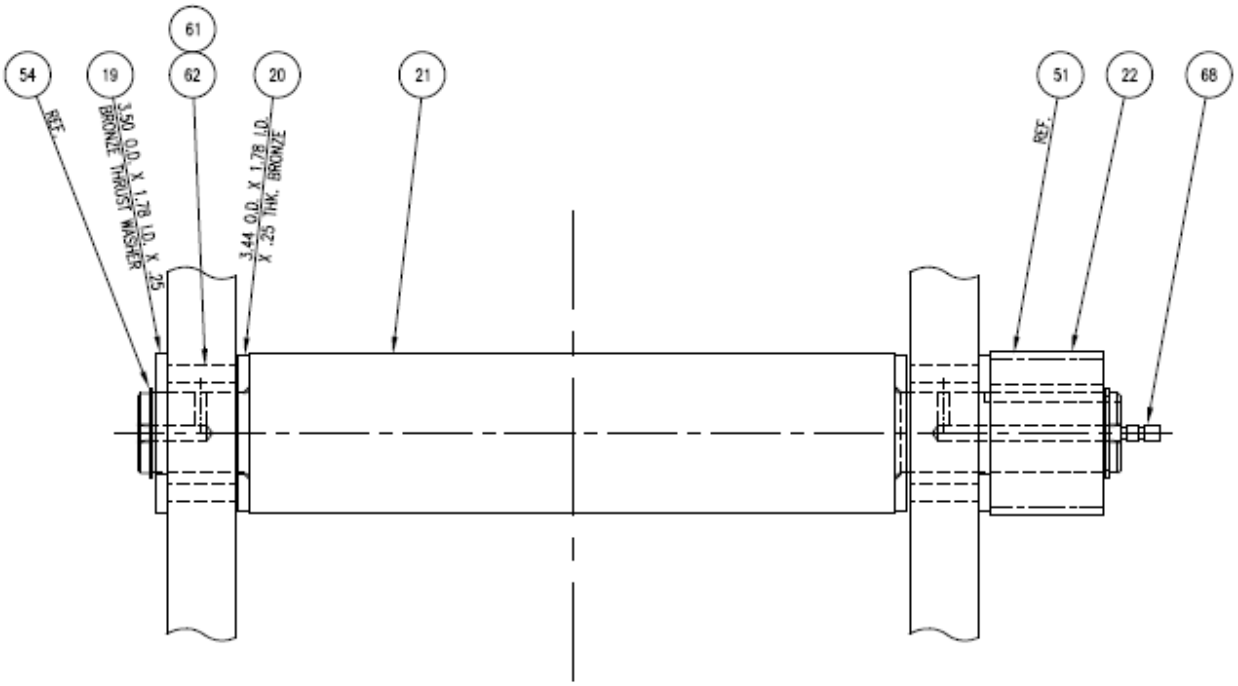
21435-03
16548-24
16542-23
30025-12
19039
17445-11
12110-33
12022-119
19039
21438-01
900075-36
21431-01
12036-285
12036-287
12036-289
12036-291
12037-89
21431-52
900062-32
16117-28
12125-93
21462-01
21431-50

7.1 Straightener Body Parts List

Item #	Part #	Description	Qty
1	21431-52	COVER, DRIVE SPROCKET	1
2	12036-291	SPROCKET, #120 CHAIN, 13T, QD SF	1
3	12036-289	CHAIN TENSIONER, HD	1
4	12036-287	SPROCKET, IDLER, #120, 11T, 1.5 ID	1
5	21431-01	CABINET, SS350-900	1
6	12036-285	CHAIN, #120, ROLLER	1
7	900075-36	3/4-10x4 1/2 LG, SHCS, BLACK	4
8	21438-01	SPACER, INLET GUIDE	2
9	17445-11	COVER, ROLLER, 2.50 ID x 38.08 LONG	2
10	16542-23	ROLLER, 2.5 DIA x 38.50 LG, 20mm BEARING	2
11	16548-24	ROD, THREADED, M20 x 42.32 LONG	2
12	21435-03	BRACKET, ENTRANCE GUIDE	2
13	21431-51	COVER, REAR, SS350-900	1
14	30025-12	CONTROL SS 460V 3PH 10 HP	1
15	19039	COVER PLATE, SIDE, SRH-10K	2
16	12110-33	VALVE, 5 WAY, 2 POS, LEVER, 3/8 NPT	2
17	12022-119	FILTER REG LUBRICATOR 1/2 NPT W/SHUT OFF	1
18	21431-50	COVER, FRONT, SS350-900	1
19	21462-01	SPACER, EXIT CASCADE, SS350	3
20	12125-93	MOTOR, 230/460 VAC, 10HP, 1725RPM,215TC	1
21	16117-28	REDUCER HELICAL GEAR, 24:1, 11 HP, 215TC	1
22	900062-32	5/8-11X4.0 LG, SHCS, BLACK	4
23	12037-89	BUSHING, QD, TYPE SF 2.125 BORE	1



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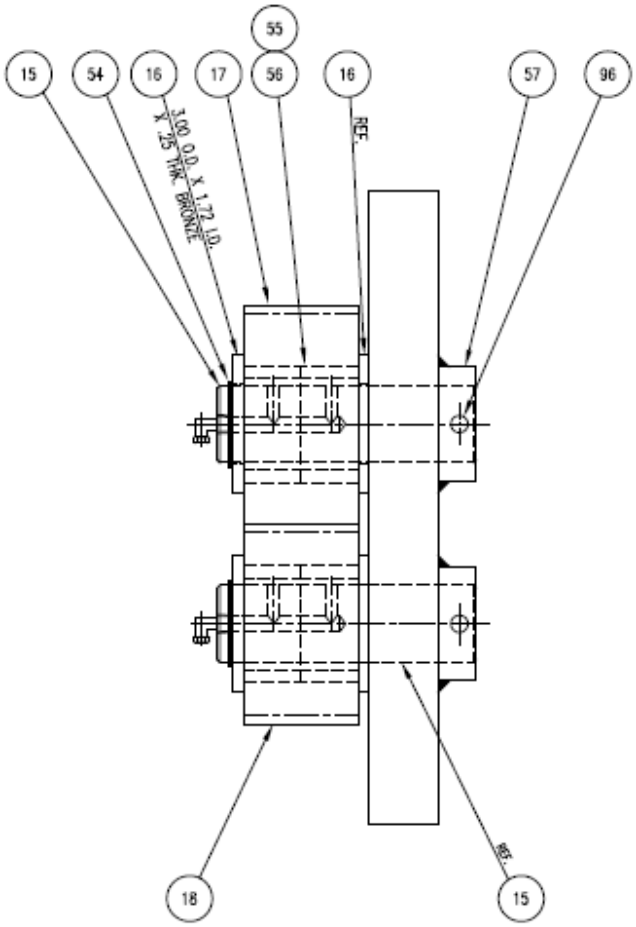

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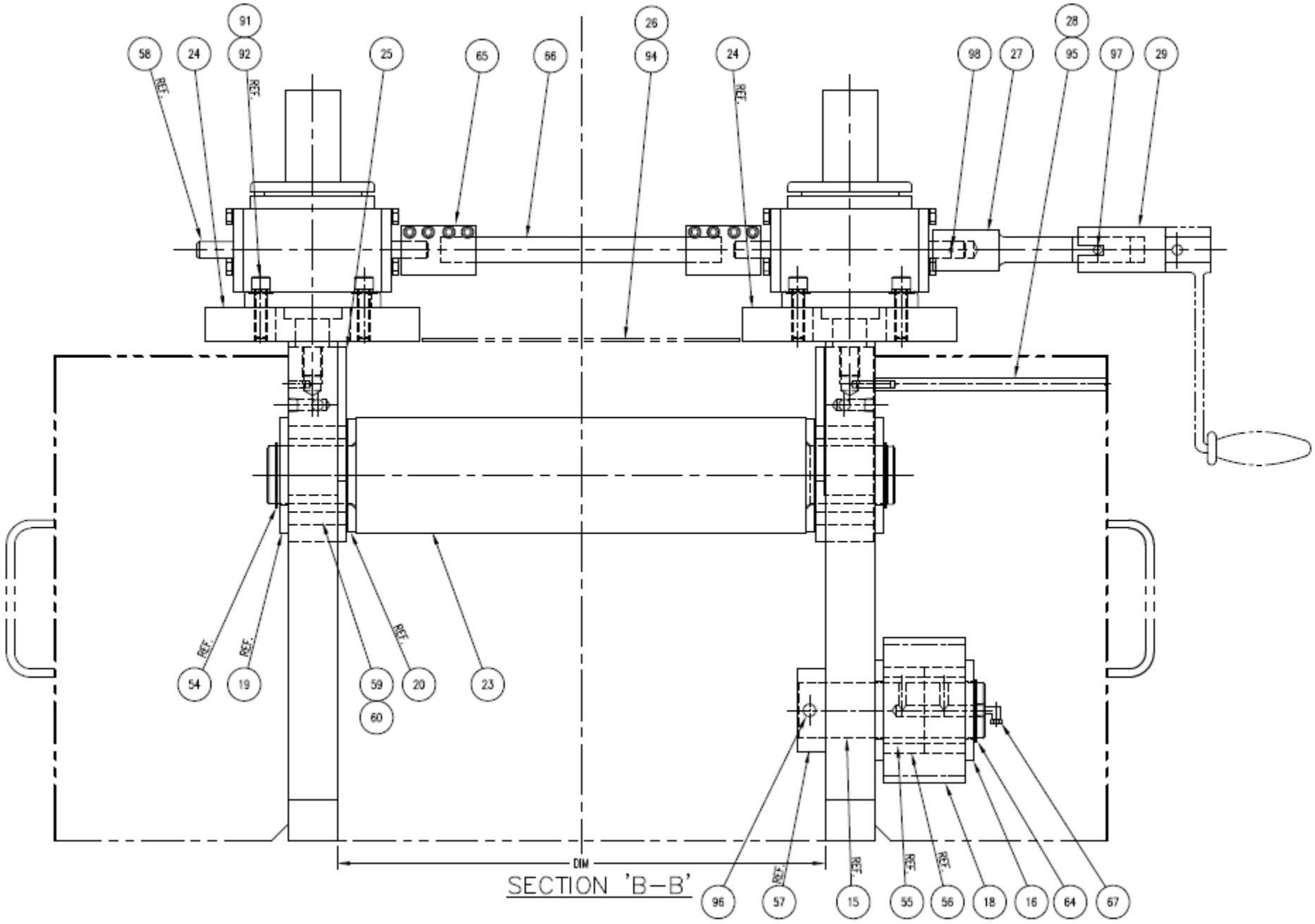
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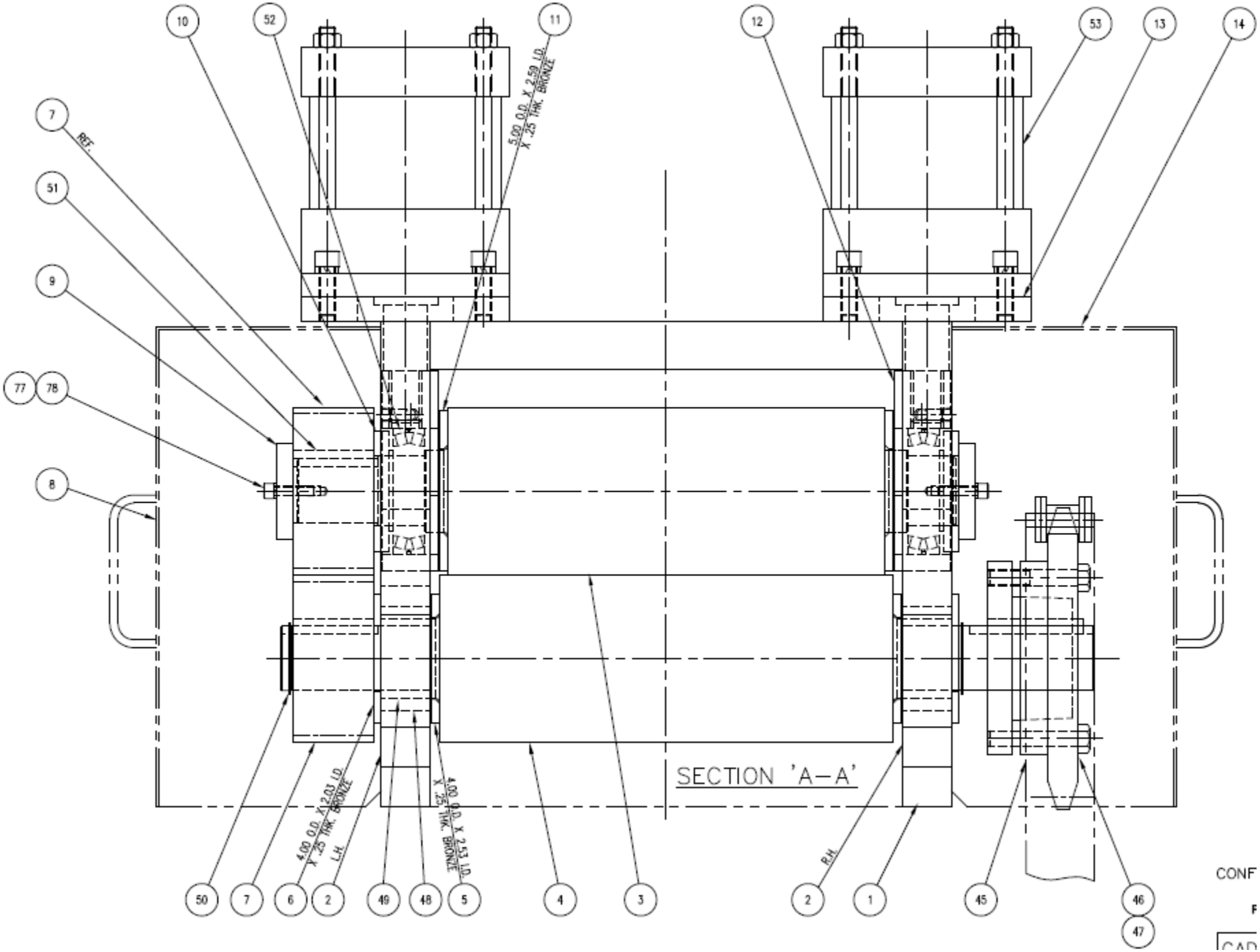
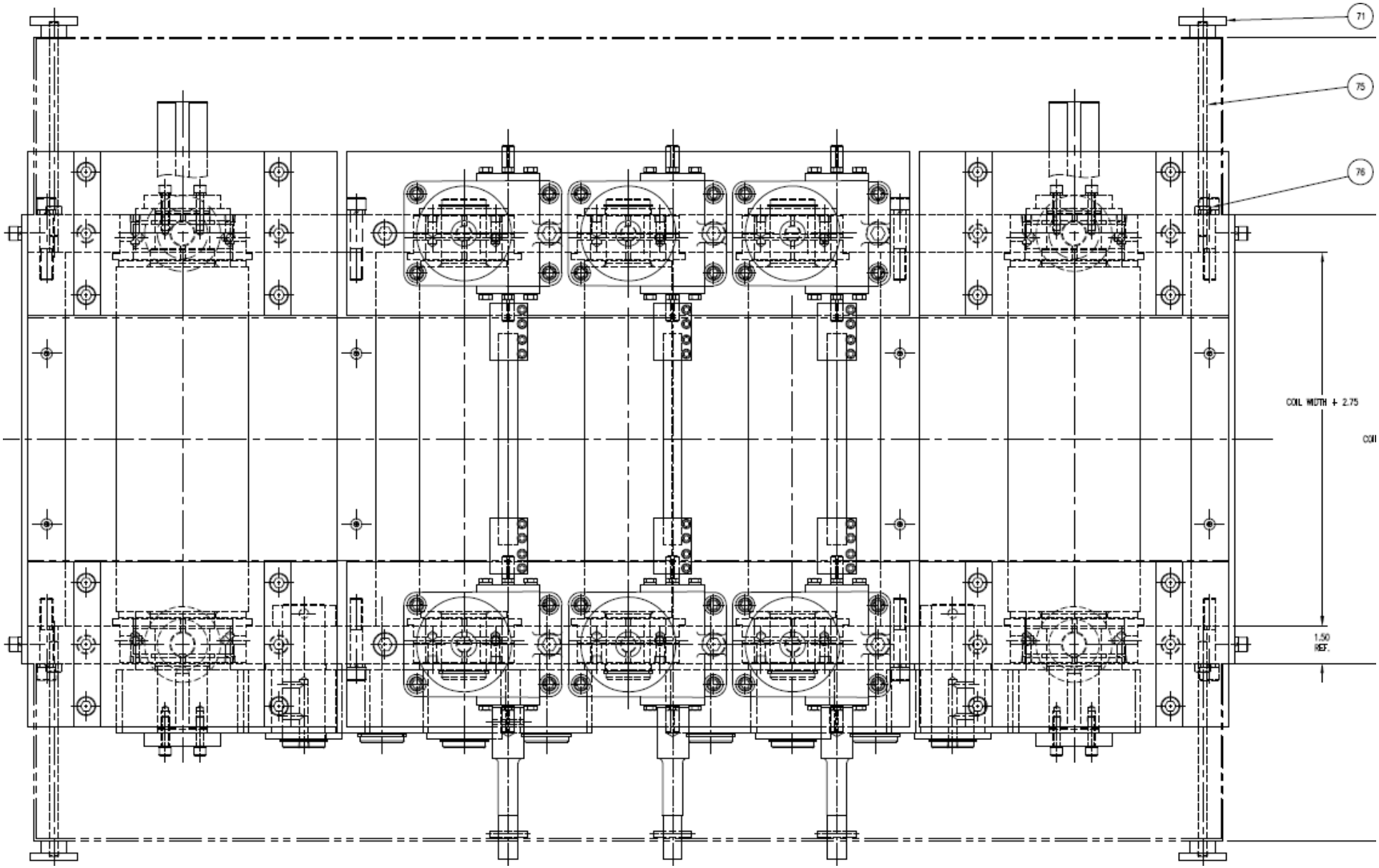

SECTION 'A–A'
5.00 O.D. X 2.59 I.D. X .25 THK. BRONZE
4.00 O.D. X 2.03 I.D. X .25 THK. BRONZE
LH
4.00 O.D. X 2.53 I.D. X .25 THK. BRONZE
RH
REF.
CONF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COIL WIDTH + 2.75
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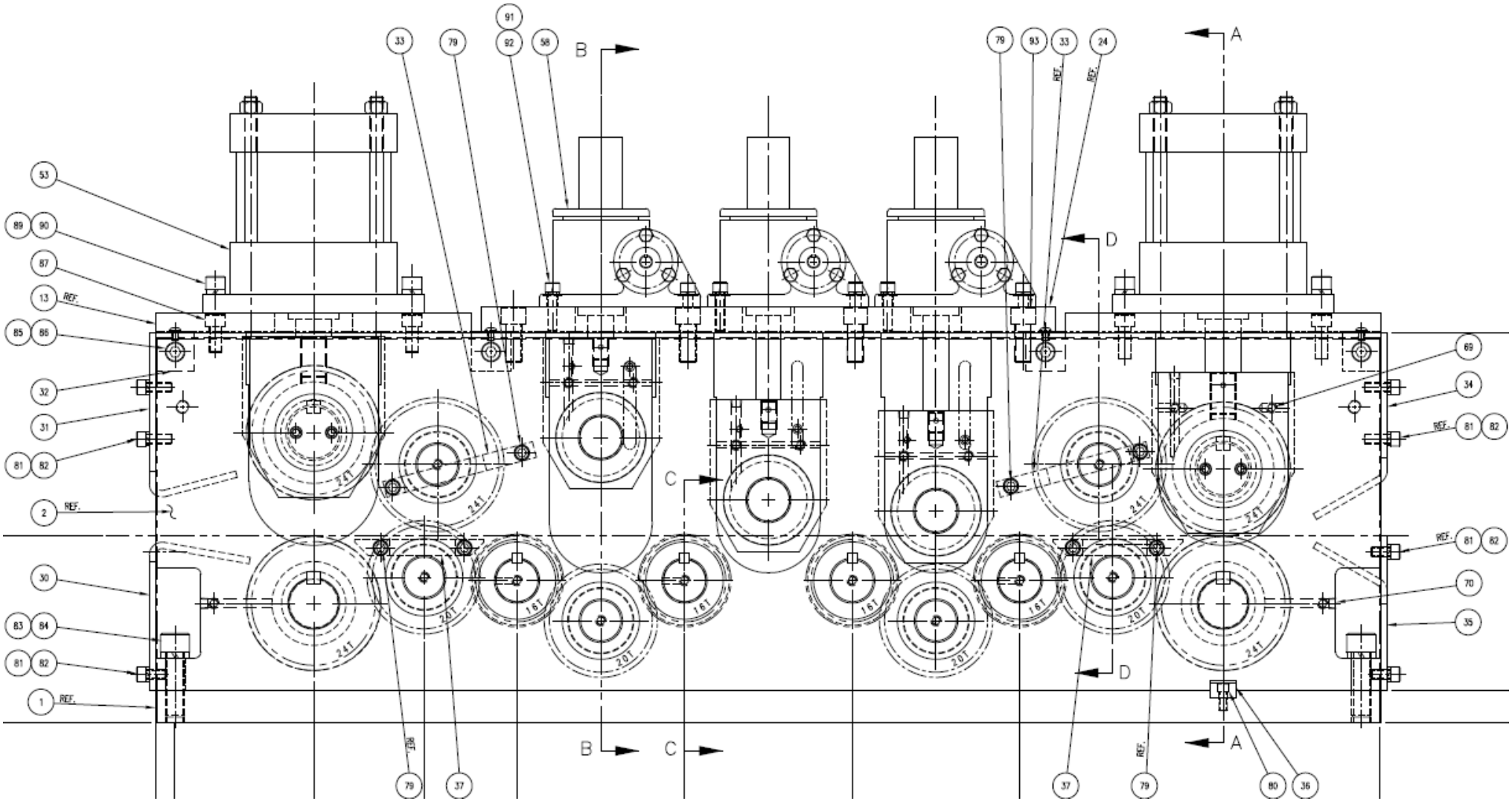

A
B
C
D
REF.
24T
16T
20T

7.2 Straightener Head Parts List

Item#	Description	QTY
1	Mounting Rail 3-1/2" Dai. 7 Roll	2
2	Side Plate R.H. and L.H.	1
3	Pinch Roll Upper	1
4	Pinch Roll Lower	2
5	Thrust Bearing Lower Pinch Roll	2
6	Thrust Bearing Lower Pinch Roll	4
7	Gear Pinch Roll	4
8	Side Cover Gear side (w/Slots)	1
9	Retainer Pinch Roll	4
10	Spacer Bearing Upper Pinch Roll	4
11	Thrust Bearing Upper Pinch Roll	4
12	Slide Block Pinch Roll	4
13	Cylinder Mounting Plate 6" Bore	4
14	Side Cover Drive Side	1
15	Idler Shaft	6
16	Thrust Bearing Idler	12
17	Gear-Idler (Pinch Roll) Upper	2
18	Gear-Idler (Pinch Roll) Lower	4
19	Thrust Bearing-Break Roll (Outer)	14
20	Thrust Bearing-Break Roll (Inner)	14
21	Break Roll-Lower	4
22	Gear-Break Roll	4
23	Break Roll-Upper	3
24	Top Plate-Joyce 3 Ton Jacks (W63)	2
25	Slide Block-Break Roll (Joyce WJ63)	6
26	Top Cover-W/o MTR. Jacks &BKups	1
27	Adaptor-Joyce WJ63 W/siko DE-09	3
28	Indicator Rod	3
29	Crank Handle, 3-1/2" & 4" PWR. STR.	1
30	Deflector –Lower Exit	1
31	Deflector-Upper Exit	1
32	Support Bar	4
33	Inner Deflector –Upper Exit	2
34	Deflector-Upper Entrance	1
35	Deflector-Lower Entrance	1
36	Key	2
37	Inner Deflector-Lower Entrance	2
45	Chain	1
46	Single Sprocket w/QD Bushing	2
47	QD Bushing, Style E, 2" Bore W/Keyway	2
48	Heavy Duty Needle Roller Bearing	4
49	Inner Ring H.D. Needle Roller Bearing	4
50	Retaining Ring H.D. Needle Roller Bearing	4
51	Key – ½"x ½" x 2-1/2" LG. –C.R.S.	4

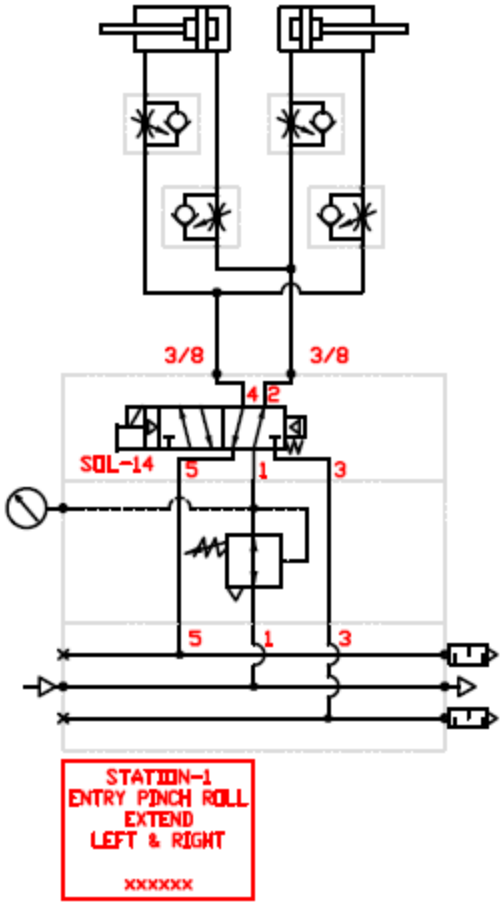
52	Spherical Roller Bearing	4
53	Air Cylinder -6” Bore -2” Stroke	4
54	Retaining Ring	6
55	Inner Ring –H.D. Needle Roller Bearing	12
56	Heavy Duty Needle Roller Bearing	12
57	Set Collar	6
58	Machine Screw Actuator	6
59	Inner Ring H.D. Needle Roller Bearing	6
60	HEAVY Duty Needle Roller Bearing	6
61	Inner Ring H.D. Needle Roller Bearing	8
62	Heavy Duty Needle Roller Bearing	8
65	Coupling	6
66	3/4" Dia. X (C.W. -3.50) LG C.R.S.	3
67	90 deg Lube Fitting	4
68	90 deg Swivel Fitting	8
69	Lube Fitting	20
70	Pipe Plug, 1/8 NPT	8
71	Knurled Steel Knob	4
75	1/2-13 x 8-1/2” LG. Threaded Rod	4
76	1/2-13 Hex Nut	4
77	5/16-18 x 1-1/4” LG S.H.C.S.	8
78	5/16 NOM. Dia. H.C.L.W.	8
79	3/8-16 X 1-3/4” LG S.H.C.S.	16
80	5/16-18 X 3/4” LG S.H.C.S.	2
81	3/8-16 X 3/4" LG S.H.C.S.	16
82	3/8 NOM. DIA. H.C.L.W.	16
83	3/4-10 X 2-1/4” LG S.H.C.S.	4
84	3/4 NOM. DIA. H.C.L.W.	4
85	1/2-13 X 2-1/2” LG S.H.C.S.	8
86	1/2 NOM. DIA. H.C.L.W.	8
87	1/2-13 X 1” LG S.H.C.S.	8
89	1/2-13 X 1-1/22” LG S.H.C.S.	16
90	1/2 NOM. DIA. H.C.L.W.	16
91	3/8-16 X 1-1/2 LG S.H.C.S.	16
92	3/8 NOM. DIA. H.C.L.W.	16
93	5/8-11 X 1-1/4” LG S.H.C.S.	8
94	1/4-20 X 1/2” LG. B.H.C.S.	8
95	1/4-20 X 1/2" LG S.H.S.S.	3
96	3/8” DIA. X 2-1/2” LG ROLL PIN	6
97	1/4” DIA. X 1-1/2” LG. ROLL PIN	3
98	1/8” DIA. X 1-1/4” LG ROLL PIN	3

7.3 Electrical Schematic

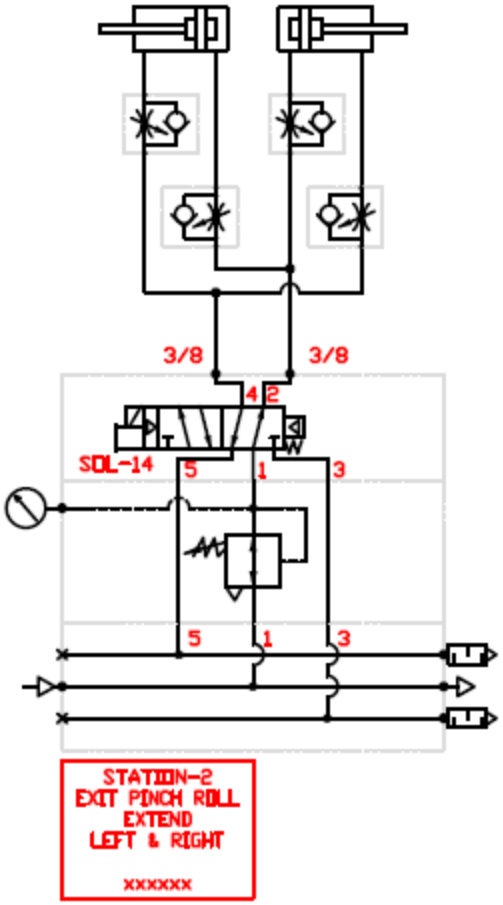
See attached.

7.4 Pneumatic Schematic

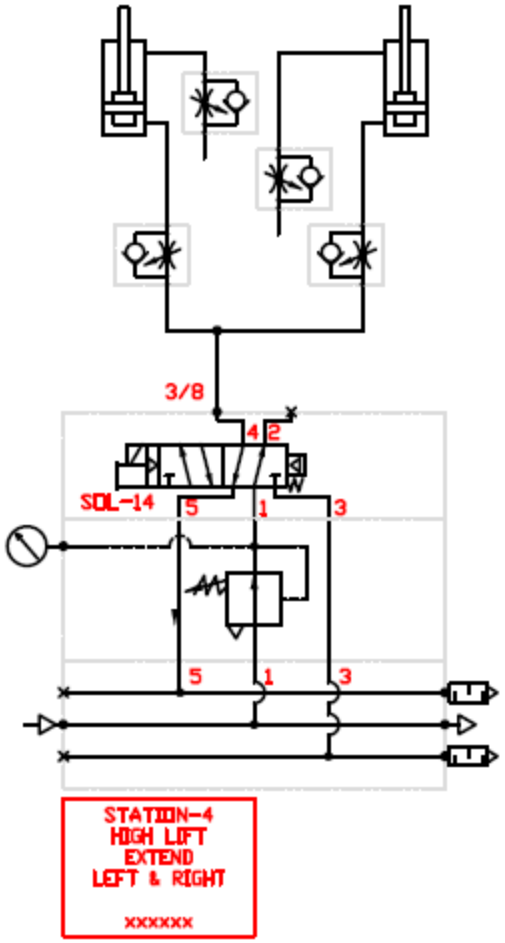
ENTRY PINCH ROLL



EXIT PINCH ROLL



HIGH LIFT



7.5 Status / Warning Messages

	Status / Warning	Cause	Solution
bF	Drive ID Warning	The Drive ID (P502) stored on the EPM does not match the drive model	Verify motor data (P302-306) and perform Auto Calibration, Set drive mode (P300) to 0 or 1, Reset the drive (P199 to 3 or 4)and reprogram
CAL	Motor Auto Calibration	Refer to P300, 399	Motor Auto-Calibration is being performed
cE	An EPM that contains valid data from a previous software version has been installed	An attempt was made to change parameter settings	Parameter settings can only be changed after the EPM data is converted to the current version (P199 = 5)
CL	Current Limit (P171) reached	Motor Overload	Increase P171, Verify drive/motor are proper size for application
dEC	Decel Override	The drive has stopped decelerating to avoid tripping into HF fault, due to excessive motor regen (2 seconds max)	If the drive trips to HF fault: Increase P105, P126, Install Dynamic Braking option
Err	Error	Invalid data was entered, or an invalid command was attempted	
FCL	Fast Current Limit	Overload	Verify drive/motor are proper size for application
GE	OEM Settings Operation Warning	An attempt was made to change parameter settings while the drive is operating in OEM settings mode	In OEM Settings mode (P199 = 1), making changes to parameters is not permitted
GF	OEM Defaults Data Warning	An attempt was made to use (or reset to) the OEM default settings (P199 = 1 or 2) using an EPM without valid OEM data	Install EPM containing valid OEM Defaults data
LC	Fault Lockout	The drive attempted 5 starts after a fault but all attempts we unsuccessful (P110 = 3-6)	Drive requires manual reset, Check fault history (P500) and correct the fault condition
	Fault	Cause	Solution
F_AF	High Temperature fault	Drive is too hot inside	Reduce drive load, Improve cooling
F_AL	Assertion Level fault	Assertion Level switch is changed during operation, P120 is changed during operation, P100 or P121-P124 are set to a value other than 0 and P120 does not match the Assertion Level switch	Make sure the Assertion Level switch and P120 are both se for the type of input devices being used prior to setting P100 or P121-P124. Refer to 3.2.3 and P120
F_bF	Personality fault	Drive Hardware	Cycle Power, Power down and install EPM with valid data, Reset the drive back to defaults (P199 = 3 or 4) and then re-
F_CF	Control fault	An EPM has been installed that is either blank or corrupted	

F_cF	Incompatible EPM fault	An EPM has been installed that contains data from an incompatible parameter version	program, If the problem persists, contact factory technical support
F_cFt	Forced Translation fault	An EPM from an old drive put into a new drive	Press [M] (mode button) twice to reset
F_dbF	Dynamic Braking fault	Dynamic braking resistors are overheating	Increase active decel time (P105, P126, P127), Check main voltage and P107
F_EF	External fault	P121-P124 = 21 and that digital input has been opened, P121-P124 = 22 and that digital input has been closed	Correct the external fault condition, Make sure digital input is set properly for NC or NO circuit
F_F1	EPM fault	EPM missing or defective	Power down and replace EPM
F_Fnr	Control Configuration fault	The drive is setup for REMOTE KEYPAD control (P100 = 2 or 5) but is not set up for network communication	Set P400 = 1 or P600 = 1
		4-20mA signal (at TB-25) drops below the value set in P164	Set P400 or P600 to a valid network communications protocol selection
F_GF	OEM Defaults data fault	Drive is powered up with P199 = 1 and OEM settings in the EPM are not valid	Install an EPM containing valid OEM defaults data or change P199 to 0
F_HF	High DC Bus Voltage fault	Mains voltage is too high	Check main voltage and P107
		Decel time is too short, or too much regen from the motor	Increase decel time (P105, P126, P127) or install Dynamic Braking option
F_IL	Digital Input Configuration fault (P121-P124)	More than one digital input set for the same function	Each setting can only be used once (except setting 0 and 3)
		Only one digital input configured for MOP function (up, Down)	One input must be set to MOP up, another must be set to MOP down
		PID mode is entered with set point reference and feedback source set to the same analog signal	Change PID set point reference (P121-P124 or feedback source (P201)
		One of the digital inputs (P121-P124) is set to 10 and another is set to 11-14	Reconfigure digital inputs
		One of the digital inputs (P121-P124) is set to 11 or 12 and another is set to 13-14	
		PID enabled in Vector Torque mode (P200 = 1 or 2 and P300 = 5)	PID cannot be used in Vector Torque mode
F_LF	Low DC Bus Voltage fault	Main voltage is too low	Check main voltage
F_nId	No Motor ID fault	An attempt was made to start the drive in Vector or Enhanced V/Hz mode prior to performing the Motor Auto-Calibration	Refer to parameters P300-P399 for Drive Mode setup and calibration
F_OF	Output fault: Transistor	Output short circuit	Check motor/motor cable

	fault	Acceleration time too short	Increase P104, P125
		Severe motor overload due to: Mechanical problem, Drive/motor too small for application	Check machine/system, Verify drive/motor are proper size for application
		Boost values too high	Decrease P168, P169
		Excessive capacitive charging current of the motor cable	Use shorter motor cables with lower charging current, Use low capacitance motor cables, Install reactor between motor and drive
		Failed output transistor	Contact factory for technical support
F_OF1	Output fault: Ground fault	Grounded motor phase	Check motor cable
		Excessive capacitive charging current of the motor cable	Use shorter motor cables with lover charging current
F_PF	Motor Overload fault	Excessive motor load for too long	Verify proper setting of P108, Verify drive and motor are proper size for application
F_rF	Flying Restart fault	Controller was unable to synchronize with the motor during restart attempt; (P110 = 5 or 6)	Check motor/load
F_SF	Single-Phase fault	A line phase has been lost	Check line phases / voltage
F_UF	Start fault	Start command was present when power was applied (P110 = 0 or 2)	Must wait at least 2 seconds after power-up to apply Start command, Consider alternate starting method (P110)
F_FAU	TB5 (0-10V signal) Threshold fault	0-10V signal (at TB5)drops below the value set in P158	Check signal/signal wire, Refer to parameter P157 and P158