Rapid-Air

Operating Instructions

MiniServo Feed

INCLUDES MS2, MS4 & MS8

Control Version ‘C’
Serial Number 131826 and higher

4601 Kishwaukee Street, Rockford, IL 61109
815.397.2578
www.rapidair.com

The MiniServo product line is a precision, servo driven roll feed that has been designed for compactness, ease of setup and ease of installation. A 120VAC receptacle and a press actuated signal to cycle is all that is required of the customer. The electrical control is housed in a small box that can be mounted on the press or if purchased, on a post that can be positioned close to the press. Two 20’ cables are supplied to connect the control to the MiniServo roll feed motor.

Programming is equally simple. Enter a job number and then input a feed length, press speed in SPM and a feed arc in degrees. The MiniServo control then computes the acceleration and deceleration rates and speed needed to keep up to the press strokes per minute. Once a job has been defined it is available for recall on other projects.

TABLE OF CONTENTS

SPECIFICATIONS

Mechanical

Max Material Width:	
MS2	2” (51mm)
MS4	4” (102mm)
MS8	8” (204mm)
Roll Position Repeatability	±0.0025”
Pass Line Height:	2.16” (55mm)
Max Thickness Capacity at Full Width:	0.040” (1.02mm)
Max Feed Roll Opening:	0.060” (1.52mm)
Roll Type:	Hardened & Ground 8620 C.R.S.
Entrance Guide Assembly:	Standard
Max Speed:	See Fig. #1
Dimensions:	See Fig. #2A or 2B
Options:	Pneumatic Operated Pilot Release Mechanical Operated Pilot Release Adjustable Mounting Bracket Special Rolls – Contact Factory Entry Cascade Rollers Exit Cascade Rollers Adjustable Exit Guides

SPECIFICATIONS cont'd

Electrical

Line Voltage:	120 VAC, 1 ph, 50/60 Hz
Rated Input Current:	5 Amps
Max Inrush Current:	10 Amps
Max Operating Temperature:	30˚ C Ambient
AC Servo Drive:	Servotronix CDHD-003
Display:	Two Technology PSMT
Enclosure	
Rating:	IP30
Dimensions:	12" x 9" x 9" (305mm x 229mm x 229mm)
Inputs:	Opto-isolated, sinking Use NPN sensor or isolated contact Max input current - 10 mA Propagation delay time - 1µs
Outputs:	<u>END OF FEED</u> Sinking: 24VDC @ 250 mA max. <u>FAULT</u> Dry relay contact – rated 1 amp @ 24VDC N.C.H.O. – closes on fault condition

Mechanical Setup

Installation

The MiniServo is designed to feed the stock from right to left. Proper mounting of the standard configuration will place the Roll Release handle on the side of the feed away from the operator. If your application would benefit from feeding left to right it is possible to reverse the normal feed direction. Please contact the factory for instructions on how to do this. If a mounting bracket was purchased then mount it first. Be sure to align the centerline of the bracket with the centerline of the die area. The servo feed can then be mounted on the bracket. A print of the bracket can be found on the last page of this manual. If an adjustable mounting bracket was not purchased then the servo feed will have to be mounted on the press bed or a customer provided bracket. Be sure the rolls are centered and perpendicular to the centerline of the die area. See Figure #2 (page 18) for the mounting hole dimensions.

Gear Drive

The gear drive is located on the same side as the roll release handle. It is a non-lubricated gear train so it is essentially maintenance free.

Roll Release Handle

The roll release handle is located on the side of the servo feed. If the PILOT RELEASE STOP has not been set then the handle can travel ‘full stroke’ and lock in the fully open position. This is the max feed roll opening of 0.060”. If the pilot release stop has been set then the handle will only travel enough to open the rolls to the amount set by the pilot release stop. The handle will not lock in this position, do not force beyond this point.

Pilot Release Stop

Higher speed applications may benefit from adjusting the pilot release stop. By limiting the amount the rolls can open, time is not wasted by the rolls traveling full open and close. The pilot release stop adjustment is mounted next to the roll pressure knob and should be set to let the rolls open about 0.005/.010” to free the material during piloting.

Roll Pressure

The roll pressure knob is located on the entrance side of the servo feed and is a knurled knob with a locking nut located right behind it. It is positioned parallel to the inlet face and uses a compression spring for adjusting roll pressure. Adjust so there is only enough pressure applied to properly feed the stock. Exerting too much pressure can result in ‘fluting’ of the edges or cause camber.

Entrance Guide

The entrance guide’s adjustable rollers should be adjusted to maintain the incoming stock centered on the feed rolls. Similar guides are available as an option for the exit side of the feed rolls. By having a set of guides on each side of the servo feed the setup time for aligning the material in the feed is decreased considerably as you will know that the material is straight through the feed before entering the die.

Mechanical Setup cont'd

Roll Parallelism

The MiniServo feed has an eccentric shaft to allow adjustment of the upper roll to ensure it is parallel with the fixed position lower roll. It has an adjustment of 0.005" and the adjusting mechanism is located on the side of the feed by the Roll Release handle. The eccentric is locked in position by two ¼-20 button head screws. The shaft has 5/8" wrench flats which allow CW or CCW rotation to move the position of the upper roll end.

The parallel adjustment is factory set at assembly. If material tracking is a problem first inspect the alignment of the feed to the die as well as the payoff equipment setup. Also confirm the material itself is not the issue. Check the material camber by cutting a 3' to 5' length of stock from the payoff. Lay the material next to a straight edge and observe if there is camber. If there is not obvious camber turn the sample strip upside down from the way it is normally being fed and run it through the MiniServo. If the material now tracks in the other direction it could be indicative of a material issue rather than a MiniServo feed problem.

Only after confirming these items are not the cause should you attempt to adjust the roll parallelism.

Roll Parallelism Adjustment

- Remove both the entrance and exit roll covers.
- With the upper roll down, shine a light on the contact point between the upper and lower rollers. Observe from the opposite side. If the amount of light showing between the rollers is the same for the entire length of the rolls then the parallelism is good. If one end or the other has more light showing (i.e. more gap) then adjustment is indicated.
- To adjust:
    - Loosen the two ¼-20 button head eccentric lock screws.
    - Rotate the eccentric while viewing the amount of light showing between the rollers. Rotate until the rolls appear parallel.
    - Tighten the two ¼-20 button head eccentric lock screws. Check the opening with a feeler gage
- Replace both the entrance and exit roll covers.

INTERFACING SERVO FEED WITH PRESS

The servo feed is a slave to the press and therefore requires a command from the press to operate in the automatic mode. This command can be in the form of a normally open contact, a normally open NPN prox switch, cam switch, or other electronic feed interface device that can be programmed. This device is wired between the terminals labeled “FEED” and “COM”

The servo feed cycles upon receipt of the leading edge of the Initiate Feed input. The signal does not need to be maintained during the entire feed move. Once a move is started the remainder of the Initiate Feed signal is ignored. The input should be activated during the press upstroke when the tooling is clear of the material. The input should be turned off before 350^{o} of the press stroke so that the switch is not actuated during a top stop.

In addition there is an enable input available to the user. It is labeled “IN 1” on the terminal board and a closed circuit between it and the “COM” terminal is required before the MiniServo will cycle. As shipped there is a yellow jumper installed, enabling the servo feed. This jumper may be removed and replaced with a signal from downstream components to insure the entire system is ready before the MiniServo will cycle. **NOTE: This is not a safety rated input. Do not depend on this for personnel or machine safety!**

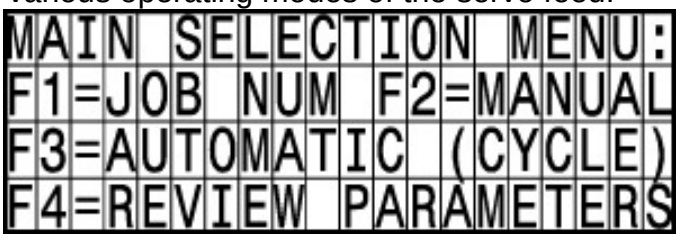
If the servo feed is equipped with an air operated pilot release then a second interfacing signal is required between the servo feed and the press. This signal is wired into directly to the coil of the air valve used to operate the pilot release. There is no control of the pilot release by the MiniServo control. The pilot release signal should be set to turn on at the point of when the pilot is entering the hole. When energized the air valve will open the servo feed rollers releasing the material and allow the pilot pins to position the material as required. The pilot release signal should be turned off at approximately 180^{o} of the press stroke letting the rollers return to a holding position, ready for the next feed move.

The amount of roller opening is controlled by the pilot release stop adjustment screw, located at the entrance of the feed. As the rate of production increases it may be necessary to limit the amount the rollers can open for the purpose of pilot release. At higher SPM rates time is lost by fully opening the rollers. Adjustment may be required when the timing of deactivating the pilot release is in close proximity to the initiating of a feed cycle. If the rolls have to close from full open there may be insufficient time for that to happen before the feed starts to feed the next length. If the rolls are not completely closed slippage and inaccurate feeding will occur.

To adjust insert material into the feed, lower the rolls and using a 3/16 hex wrench adjust the screw fully CW. Release the rolls and adjust the screw so the material is free to be moved by the pilot pin. The adjustment is now complete. **NOTE:** This adjustment does also limit the manual roll release travel. If this causes a problem back off the adjustment a little.

OPERATION

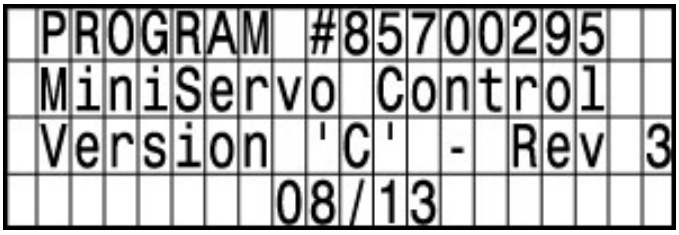
When the MiniServo is turned on the MAIN SELECTION MENU screen is displayed. It is from this screen you can go to the various operating modes of the servo feed.



A typical scenario may be:

- F1 to select an existing job or enter a new job's parameters.
- F2 to go to the manual mode to test feed length or to jog for setup purposes.
- F3 to go into the automatic mode.
- F4 to review the current job's parameters.

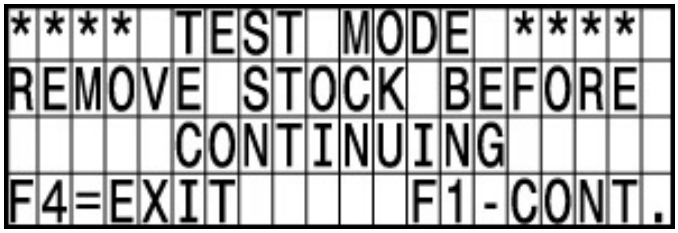
Each of these options are explained in more detail below. Two other functions are available from this screen. In the event you need to contact Rapid-Air for assistance with the MiniServo we may ask you for the program number in your control. To find this information press the 'SPACE' key while on the MAIN SELECTION MENU screen. A screen similar to the following will display.



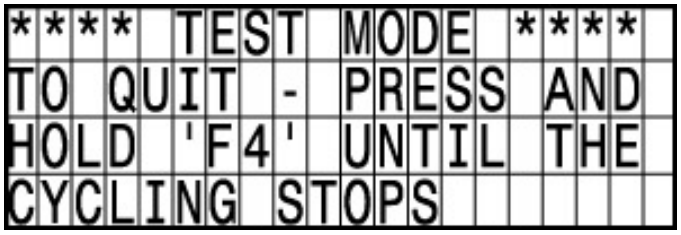
Press the 'BKSP' to return to the main menu.

OPERATION cont’d

Also available from the MAIN SELECTION MENU is a test mode. To access the test mode press the ‘NO’ key. The test mode will repeat indefinitely a feed length of 3.1730”, the circumference of the feed rolls. The feed rate is about 120 SPM. Among other purposes you may use this test to confirm the rolls are positioning properly, repeatedly. Unless you want to measure actual stock feed length results, *remove the stock before initiating test mode*. If you accidentally select the test mode don’t worry, to actually start the feed rolls moving requires a second keystroke.



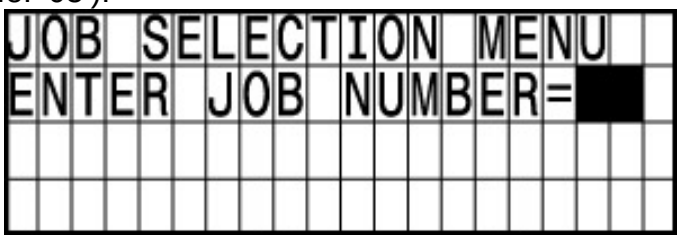
F1 starts the testing.



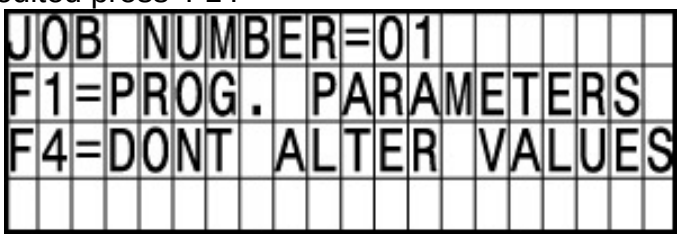
OPERATION cont'd

F1 – JOB NUM

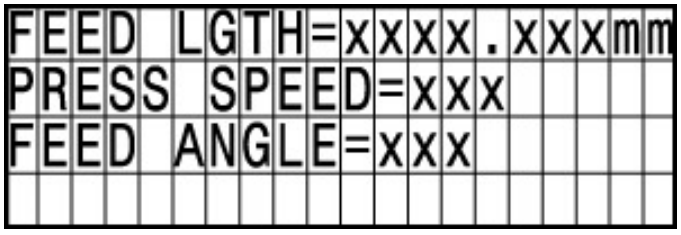
Enter either an existing job's number or enter a new job number to be defined. Leading zero is required for jobs 1 – 9, (i.e. '05').



If you entered an existing job number and the job's parameter don't need to be changed press 'F4' to return to the MAIN MENU SELECTION. If you entered a new job number or the existing job number needs to be edited press 'F1'.



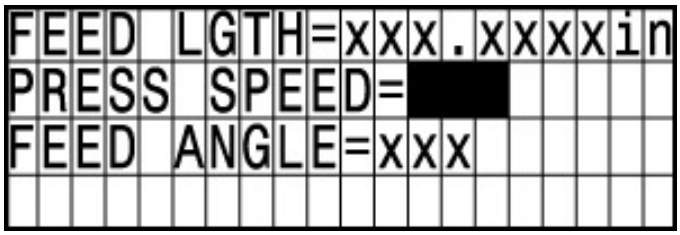
Key in the feed length, the decimal point is automatically inserted so don't use the '.' key. Enter both leading and trailing zeros. When all 7 digits are entered the cursor returns to the first digit. Press 'ENTER' to accept or re-enter to correct the value. Depending on how your servo feed was ordered the length will be in either inches or millimeters.



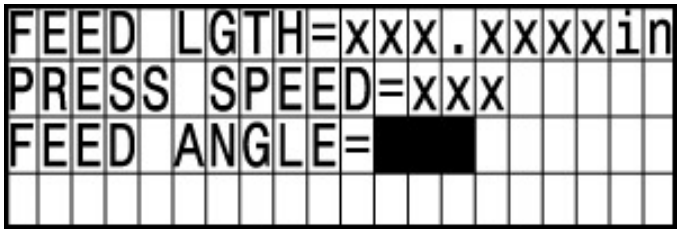
OPERATION cont'd

F1 – JOB NUM cont'd

Enter in the press speed in SPM. Leading zeros are required. Press 'ENTER' when the value is correct.



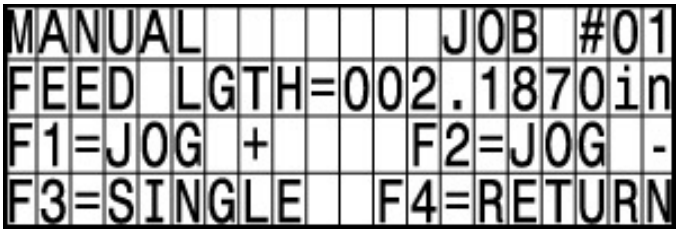
Enter in the amount of press rotation, in degrees, that the MiniServo will have to feed the stock. If you are entering in a value of less than 100 again leading zeros are required but good luck in trying to get the MiniServo to feed in that short of a time period. Press 'ENTER' when the value is correct.



After the FEED ANGLE value is entered the screen returns to MAIN MENU SELECTION.

OPERATION cont'd

F2 – MANUAL

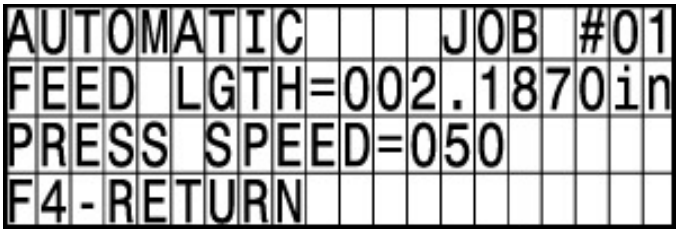


When in the MANUAL mode the display will indicate the currently selected job and the programmed feed length. 'F1' will jog the stock forward for as long as the key is held depressed. This may be helpful for the startup/thread up process. Likewise, holding the 'F2' key depressed will cause the feed to run continuously in the reverse direction. Only one key will function at a time. The jog speed is fixed at a slow speed in the servo feed programming and is not alterable.

Pressing the 'F3' key will cause the servo feed to feed the active job's programmed length at the speed required to meet the job's defined press speed.

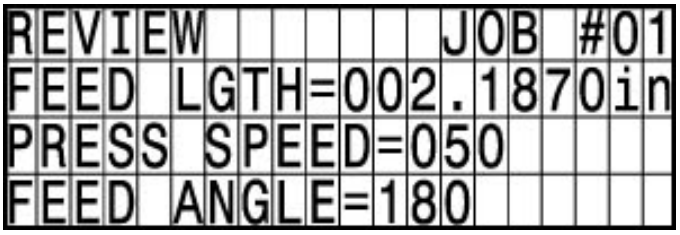
OPERATION cont'd

F3 - AUTOMATIC



The AUTOMATIC mode screen is a static display. Its purpose is to acknowledge the MiniServo feed is in the automatic mode and that it will feed stock upon receipt of the FEED INTIATE input. To exit the automatic mode press the 'F4' key.

F4 – REVIEW PARAMETERS

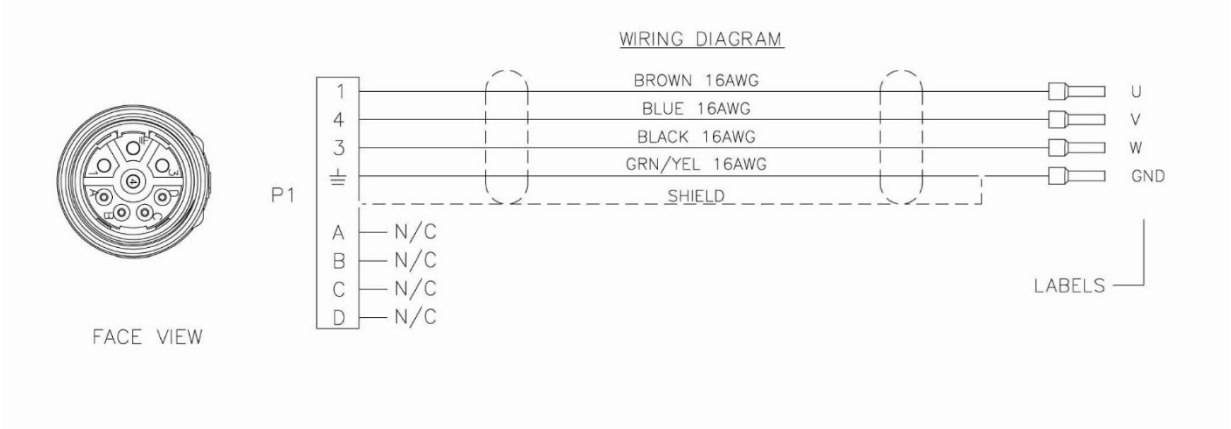


The REVIEW PARAMETERS screen allows you check a job's parameters without going into the editing mode. Useful as a way to check the settings of those seldom used job numbers. Although not displayed, the 'F4' key will return the control to the MAIN MENU SELECTION screen.

TROUBLESHOOTING

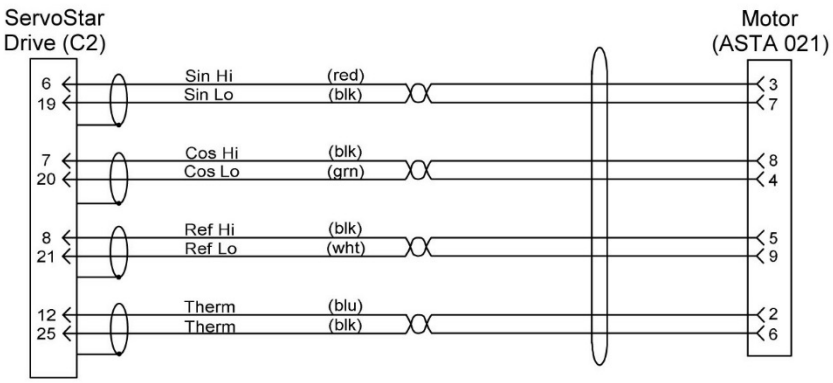
When the MiniServo feed fails to operate it may be necessary to open the control enclosure and inspect the servo drive for a fault code. The normal code is either an ‘8’ or a ‘0’. If the status LED displays other characters the drive is faulted and corrective action is required. There are relatively few error codes the user can correct. Most of the fault codes you may encounter are related to the 2 cables connecting the drive to the servo motor. The following error codes are related to the drive-motor power cable. If one of the following errors occurs inspect the power cable, if possible by checking continuity while flexing the cable (the problem may be intermittent).

Error Code	Description	Notes
F1	Average current exceeds drive rating	Particularly check for electrical shorts
F2	Average current exceeds motor rating	Also check for material binding in the die
P	‘Catch-all’ over current	See above (both)
r27	Motor phases disconnected	Particularly check for open connections



Faults commonly related to resolver feedback cable issues are the results of broken wires or failed connectors.

Error Code	Description	Notes
H	Motor overtemp	Check ‘Therm’ wires
r20	Feedback Communication error	
r28	Resolver Initialization Failed	
r4	A/B Line Break	



TROUBLESHOOTING cont'd

Other faults you may encounter.

Error Code	Description	Notes
e	Drive programming is corrupted	Contact Rapid-Air Corp.
u	Under-Voltage	Check that the nominal 120VAC is good

No error codes?

- Check for 12VDC between the VDC and COM terminals. If the voltage is not present then the Rapid-Air power supply (p/n 69100014) may be bad or have a blown fuse.
- Check that the enable circuit is closed.
- Confirm proper operation of the FEED initiate switch.

To order a new power cable order Rapid-Air p/n 69300041.
To order a new feedback cable order Rapid-Air p/n 69300046

WARRANTY

Warranty Terms & Conditions

ALL SALES BY THE COMPANY ARE MADE SUBJECT TO THE FOLLOWING TERMS AND CONDITIONS. PLEASE READ.

Warranty – The Company warrants for a period of one year from the date of shipment by the Company that the product shipped is free from defects in material and workmanship.
THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL IMPLIED WARRANTIES IN LAW, INCLUDING MERCHANTABILITY. The Company obligation under this warranty is limited to repairing or replacing, F.O.B. Rockford, IL, any part or parts proved to have been defective when shipped. In no event shall the Company be liable for special or consequential damages. Provisions set forth in specifications are descriptive and subject to change and are not intended as warranties.

Customer License Agreement

Rapid-Air reserves the rights in its software. The software program is licensed by Rapid-Air to the original purchaser of the equipment which contains the software for use only on the terms set forth in this license.

You may use the program only on the programmable servo controller furnished with the system and only in conjunction with the servo feed supplied with the system.

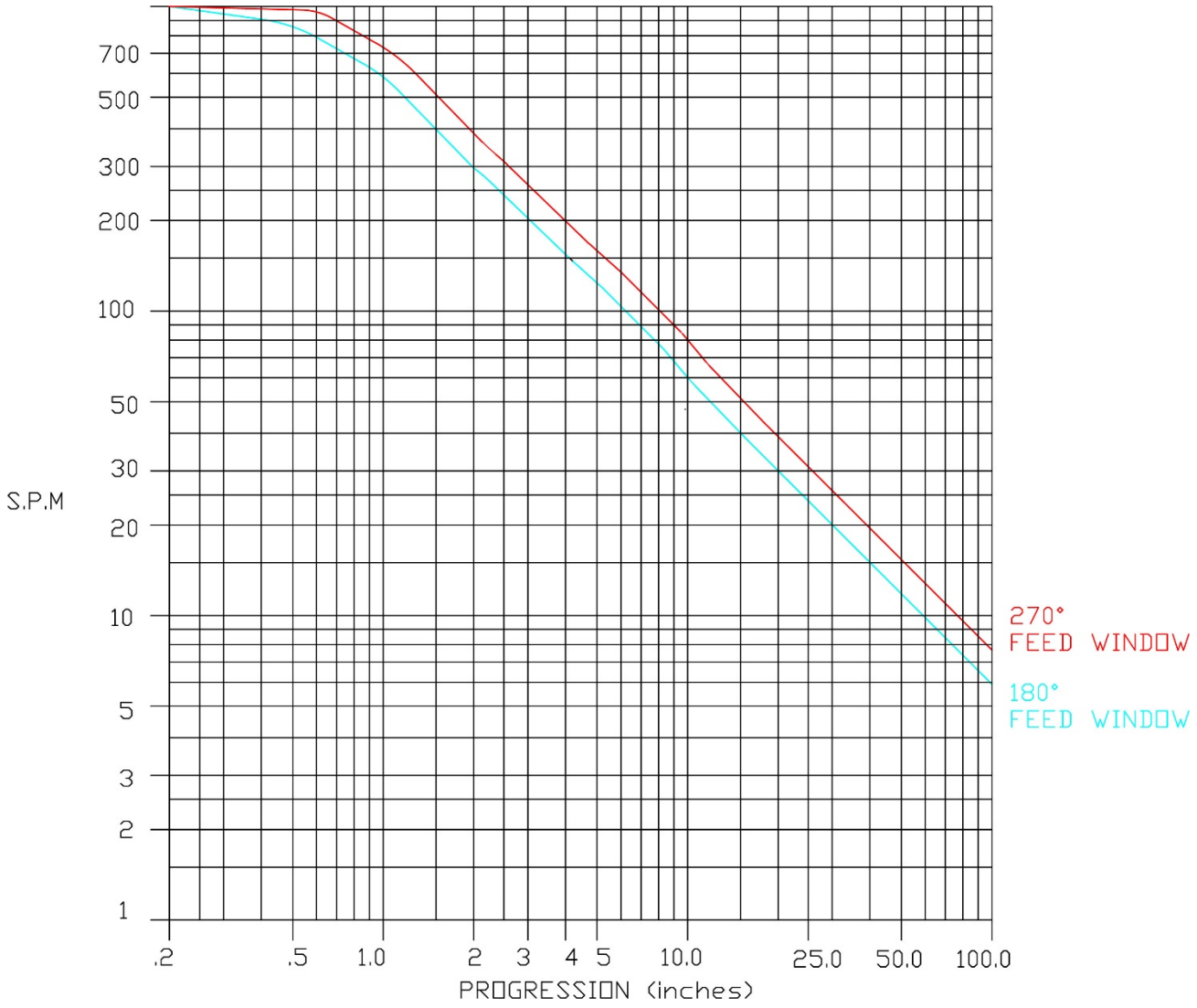
You may not without expressed permission from Rapid-Air:

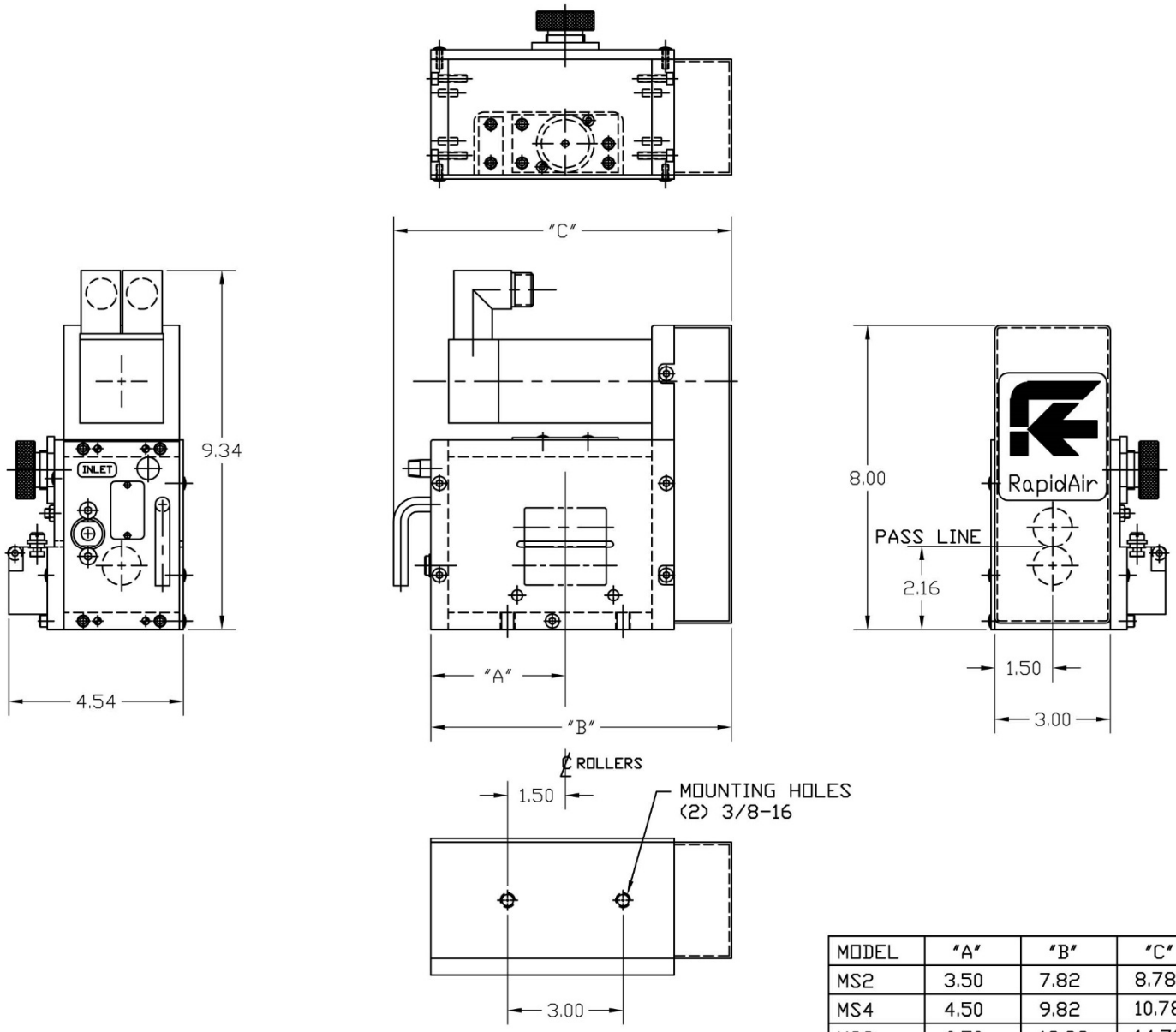
A. Copy, distribute, or document the program for others.
B. Modify or merge any portion of the program for use on non-compatible hardware.
C. Make alterations to the program.

ADDENDUMS

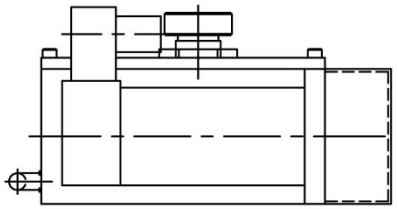
NO ADDENDUMS

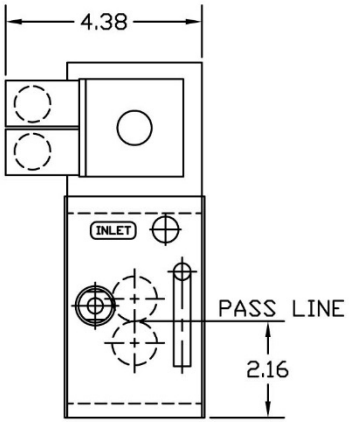
Figure #1 – Speed vs. Progression

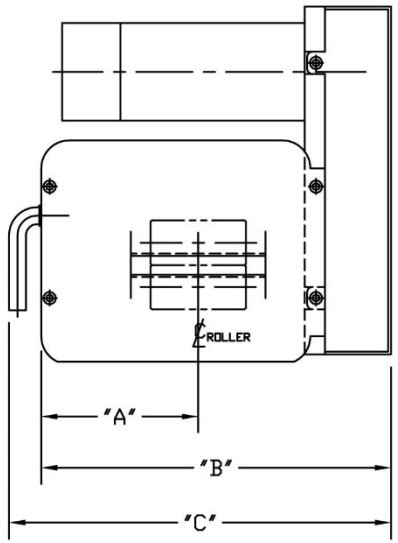


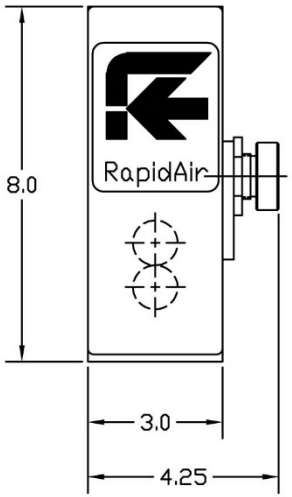


MODEL	"A"	"B"	"C"
MS2	3.50	7.82	8.78
MS4	4.50	9.82	10.78
MS8	6.50	13.82	14.78

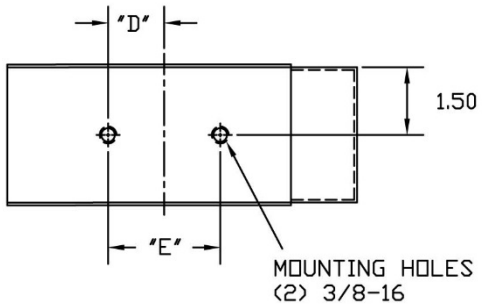


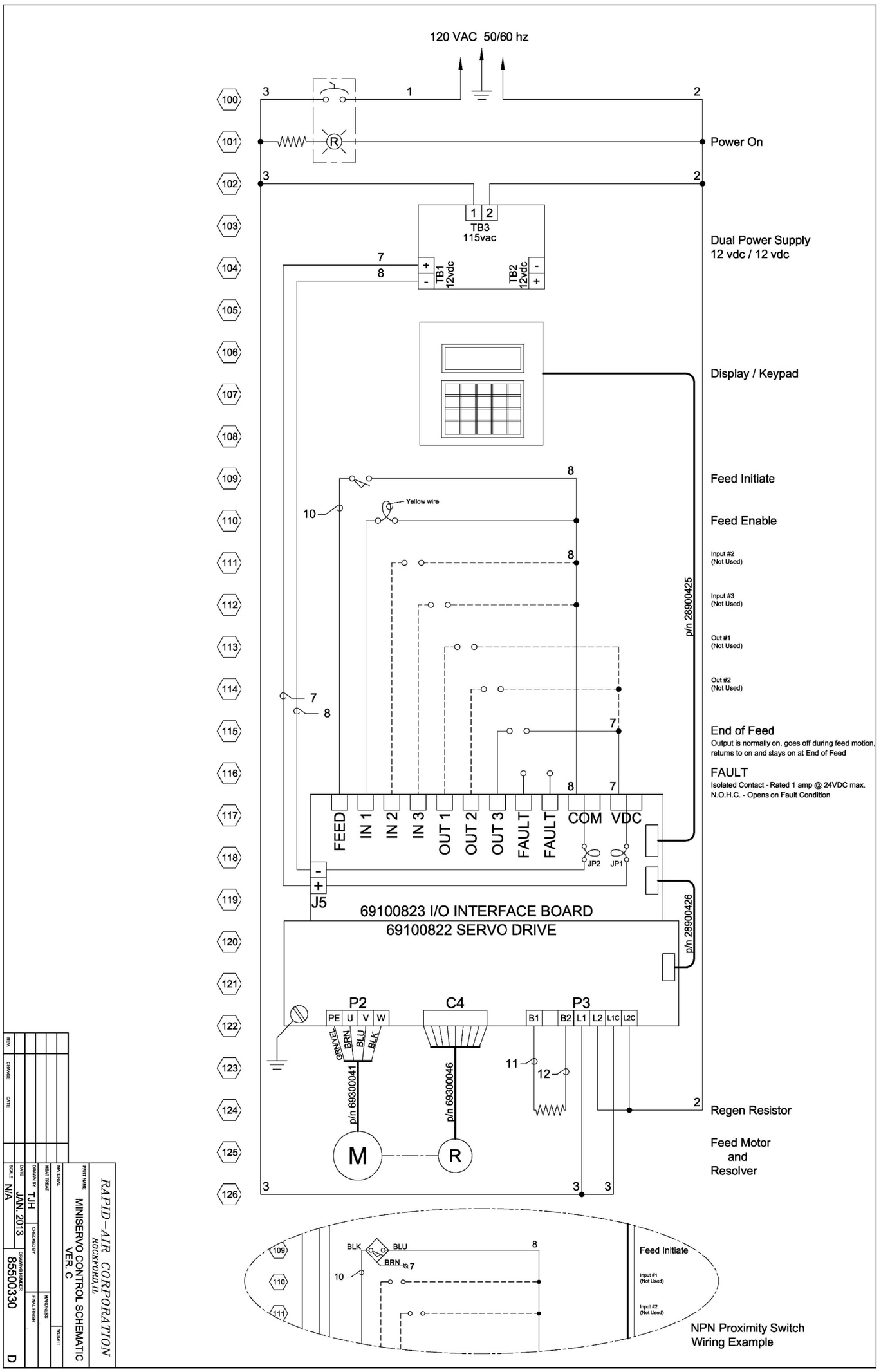






MODEL	"A"	"B"	"C"	"D"	"E"
MS2	3.50	7.80	8.50	1.50	3.00
MS4	4.50	9.80	10.50	1.50	3.00
MS8	6.50	13.80	14.50	1.50	3.00



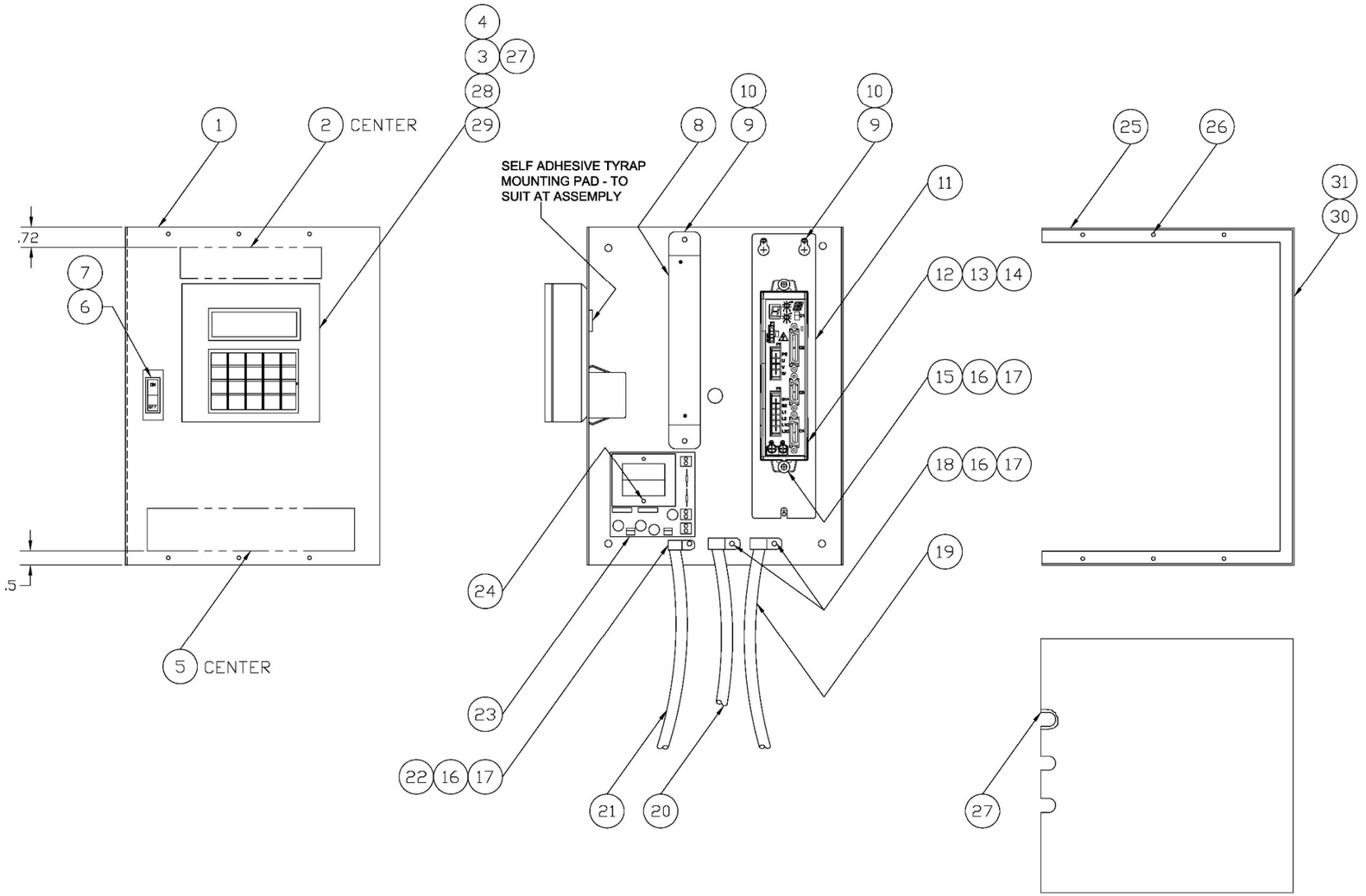


REV.							
CHANGE							
DATE							
DATE	JAN. 2013	CHECKED BY					
DRAWN BY	TJH						
SCALE	N/A	DRAWING NUMBER	85500330				D

RAPID–AIR CORPORATION
ROCKFORD,IL

PART NAME
MINISERVO CONTROL SCHEMATIC
VER. C

MATERIAL
HEAT TREAT
FINISH/SURF.
WEIGHT



Reference:
MiniServo Cntrl Assy (Ver. A) p/n 28900386 - original
MiniServo Cntrl Assy (Ver. B) p/n 28900407 - motor changed
MiniServo Cntrl Assy (Ver. C) p/n 28900417 - drive changed

		85500330	SCHEMATIC
N/S	1	69340033	CONNECTOR
N/S	1	69340035	CONNECTOR
N/S	6	69340038	FERRULE
N/S	2	69280085	FEMALE SPADE TERMINAL
N/S	6	69280210	RING TERMINAL
N/S	2	69340007	FEMALE SPADE TERMINAL
N/S	2	69330004	WIRE-NUT
31	1	39900073	SERIAL NUMBER TAG
30	1	39901009	CAUTION LABEL
29	4	65100632	NUT, 6-32
28	2	66700204	PAN HEAD SCREW 6-32 x 3/4"
27	4	69100762	RUBBER GROMMET
26	4	66408038	SCREW, #8 x3/8"
25	1	31400463	CJ ENCLOSURE - COVER
24	2	69280235	STANDOFF, 6-32 x 3/4"
23	1	69100031	DUAL 12VDC POWERSUPPLY
22	1	69280236	CLAMP, 1/4"
21	1	69300001	120VAC LINE CORD
20	1	69300041	MOTOR POWER CABLE
19	1	69300046	RESOLVER FEEDBACK CABLE
18	2	69280237	CLAMP, 5/16"
17	5	61200010	WASHER, #8
16	5	65100832	NUT, 8-32
15	2	66508050	SFHCS 8-32 x 0.50"
14	1	28900426	I/O BOARD TO DRIVE INTERFACE CABLE
13	1	69100823	I/O INTERFACE BOARD
12	1	69100822	SERVO DRIVE
11	1	31702346	MOUNTING PLATE
10	5	61200013	WASHER, #10
9	5	65101032	NUT, 10-32
8	1	69100297	REGEN RESISTOR
7	1	69100508	RESISTOR, 33K-5W
6	1	69100527	CIRCUIT BREAKER
5	1	39900299	MINISERVO LABEL
4	1	28900425	KEYPAD TO DRIVE INTERFACE CABLE
3	1	69100801	KEYPAD (PROG. #85700295)
2	1	39900275	RAPID-AIR LABEL
1	1	31400464	CJ ENCLOSURE - BACK
ITEM	QTY.	PART NO.	DESCRIPTION

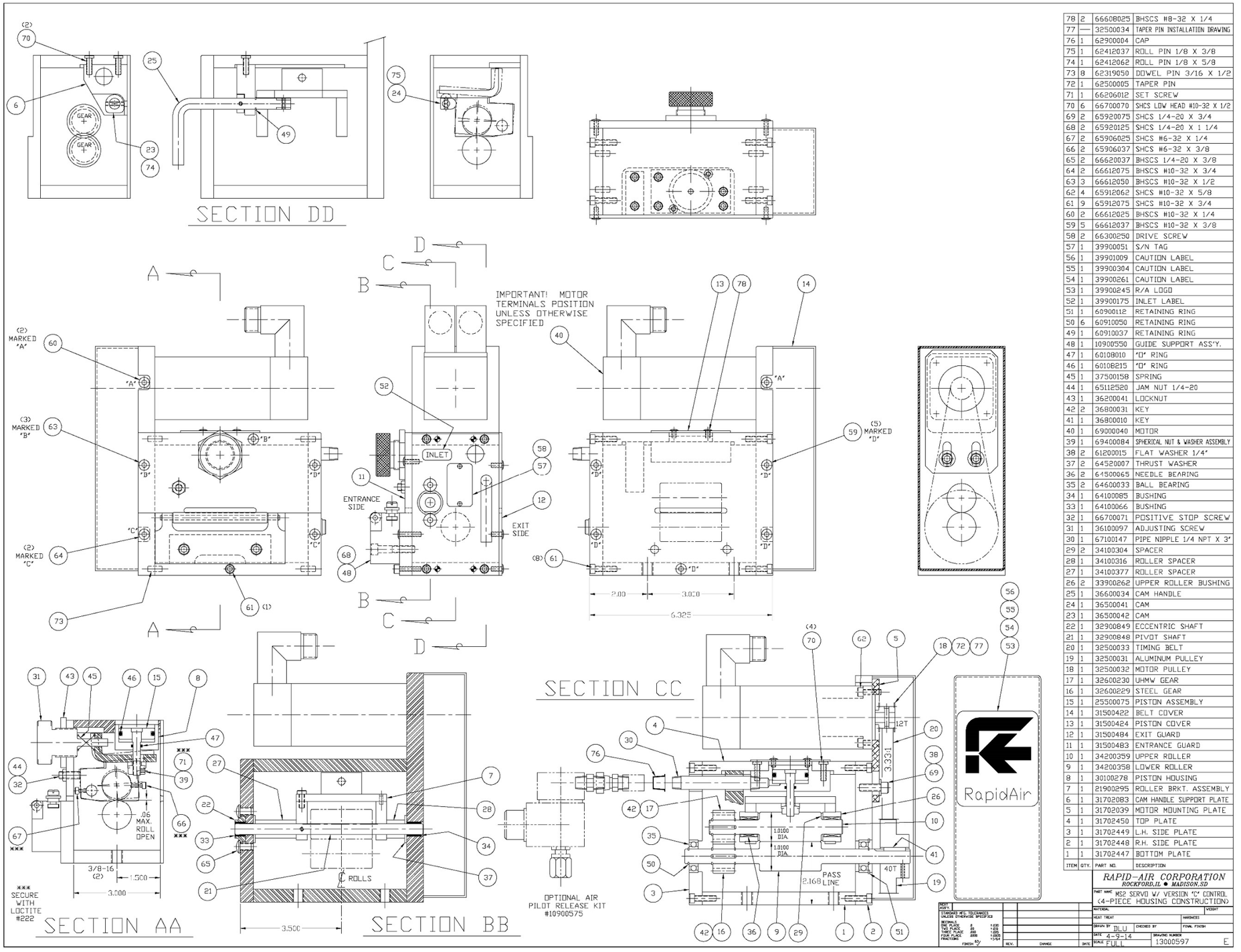
NEXT ASSY.

STANDARD MFG. TOLERANCES
UNLESS OTHERWISE SPECIFIED
DECIMALS
ONE PLACE .0 ±.030
TWO PLACE .00 ±.010
THREE PLACE .000 ±.005
FOUR PLACE .0000 ±.0005
FRACTIONS ±1/64
FINISH 63

REV.	CHANGE	DATE

RAPID–AIR CORPORATION
ROCKFORD,IL

PART NAME: MINISERVO CONTROL ASSEMBLY VER. C
MATERIAL | WEIGHT
HEAT TREAT | HARDNESS
DRAWN BY TJH | CHECKED BY | FINAL FINISH
DATE JAN. 2013 | DRAWING NUMBER 28900417 D
SCALE FULL

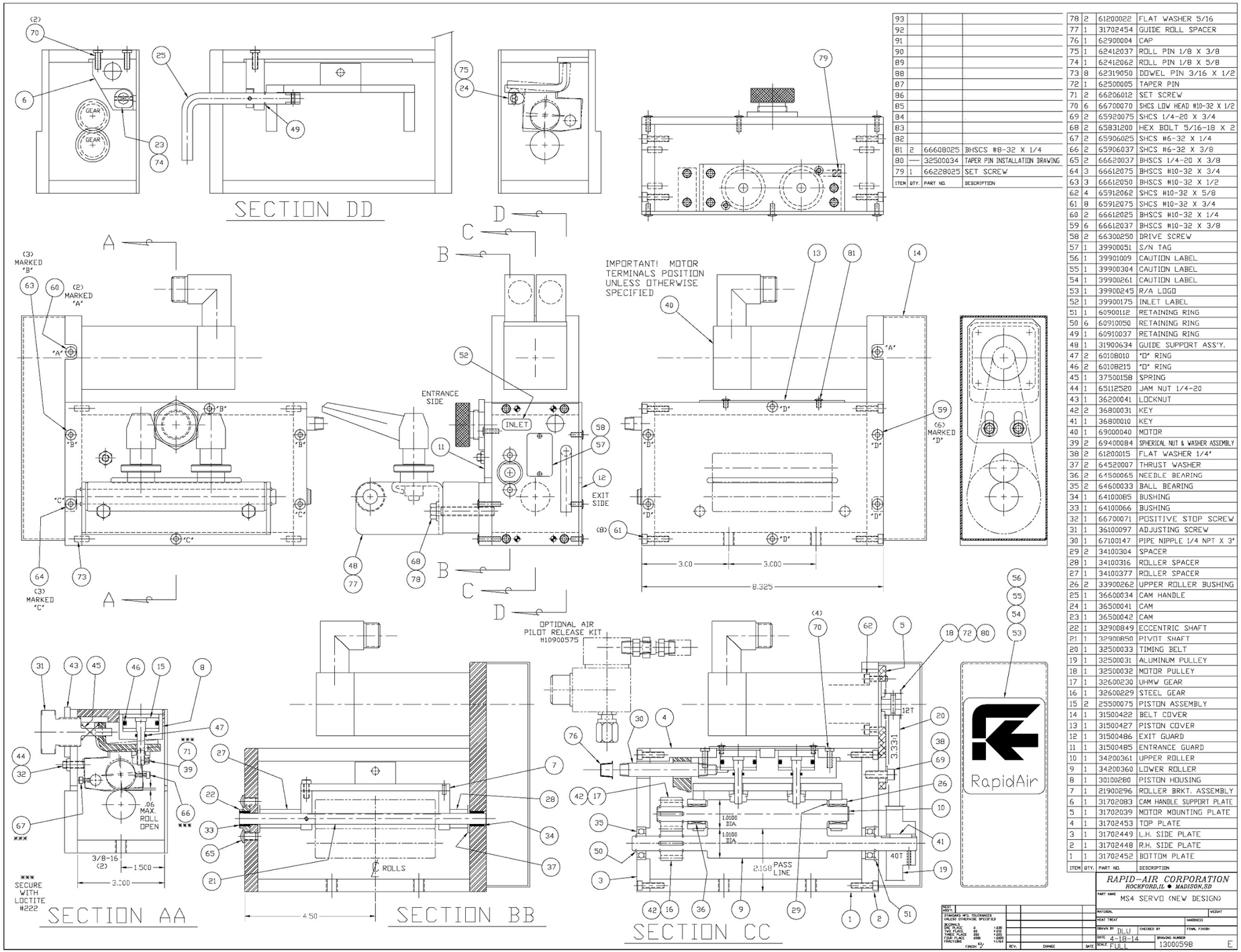


ITEM	QTY.	PART NO.	DESCRIPTION
78	2	66608025	BHSCS #8-32 X 1/4
77	—	32500034	TAPER PIN INSTALLATION DRAWING
76	1	62900004	CAP
75	1	62412037	ROLL PIN 1/8 X 3/8
74	1	62412062	ROLL PIN 1/8 X 5/8
73	8	62319050	DOWEL PIN 3/16 X 1/2
72	1	62500005	TAPER PIN
71	1	66206012	SET SCREW
70	6	66700070	SHCS LOW HEAD #10-32 X 1/2
69	2	65920075	SHCS 1/4-20 X 3/4
68	2	65920125	SHCS 1/4-20 X 1 1/4
67	2	65906025	SHCS #6-32 X 1/4
66	2	65906037	SHCS #6-32 X 3/8
65	2	66620037	BHSCS 1/4-20 X 3/8
64	2	66612075	BHSCS #10-32 X 3/4
63	3	66612050	BHSCS #10-32 X 1/2
62	4	65912062	SHCS #10-32 X 5/8
61	9	65912075	SHCS #10-32 X 3/4
60	2	66612025	BHSCS #10-32 X 1/4
59	5	66612037	BHSCS #10-32 X 3/8
58	2	66300250	DRIVE SCREW
57	1	39900051	S/N TAG
56	1	39901009	CAUTION LABEL
55	1	39900304	CAUTION LABEL
54	1	39900261	CAUTION LABEL
53	1	39900245	R/A LOGO
52	1	39900175	INLET LABEL
51	1	60900112	RETAINING RING
50	6	60910050	RETAINING RING
49	1	60910037	RETAINING RING
48	1	10900550	GUIDE SUPPORT ASS'Y,
47	1	60108010	"O" RING
46	1	60108215	"O" RING
45	1	37500158	SPRING
44	1	65112520	JAM NUT 1/4-20
43	1	36200041	LOCKNUT
42	2	36800031	KEY
41	1	36800010	KEY
40	1	69000040	MOTOR
39	1	69400084	SPHERICAL NUT & WASHER ASSEMBLY
38	2	61200015	FLAT WASHER 1/4"
37	2	64520007	THRUST WASHER
36	2	64500065	NEEDLE BEARING
35	2	64600033	BALL BEARING
34	1	64100085	BUSHING
33	1	64100066	BUSHING
32	1	66700071	POSITIVE STOP SCREW
31	1	36100097	ADJUSTING SCREW
30	1	67100147	PIPE NIPPLE 1/4 NPT X 3"
29	2	34100304	SPACER
28	1	34100316	ROLLER SPACER
27	1	34100377	ROLLER SPACER
26	2	33900262	UPPER ROLLER BUSHING
25	1	36600034	CAM HANDLE
24	1	36500041	CAM
23	1	36500042	CAM
22	1	32900849	ECCENTRIC SHAFT
21	1	32900848	PIVOT SHAFT
20	1	32500033	TIMING BELT
19	1	32500031	ALUMINUM PULLEY
18	1	32500032	MOTOR PULLEY
17	1	32600230	UHMW GEAR
16	1	32600229	STEEL GEAR
15	1	25500075	PISTON ASSEMBLY
14	1	31500422	BELT COVER
13	1	31500424	PISTON COVER
12	1	31500484	EXIT GUARD
11	1	31500483	ENTRANCE GUARD
10	1	34200359	UPPER ROLLER
9	1	34200358	LOWER ROLLER
8	1	30100278	PISTON HOUSING
7	1	21900295	ROLLER BRKT. ASSEMBLY
6	1	31702083	CAM HANDLE SUPPORT PLATE
5	1	31702039	MOTOR MOUNTING PLATE
4	1	31702450	TOP PLATE
3	1	31702449	L.H. SIDE PLATE
2	1	31702448	R.H. SIDE PLATE
1	1	31702447	BOTTOM PLATE

RAPID-AIR CORPORATION
ROCKFORD,IL ● MADISON,SD

PART NAME: MS2 SERVO W/ VERSION "C" CONTROL (4-PIECE HOUSING CONSTRUCTION)

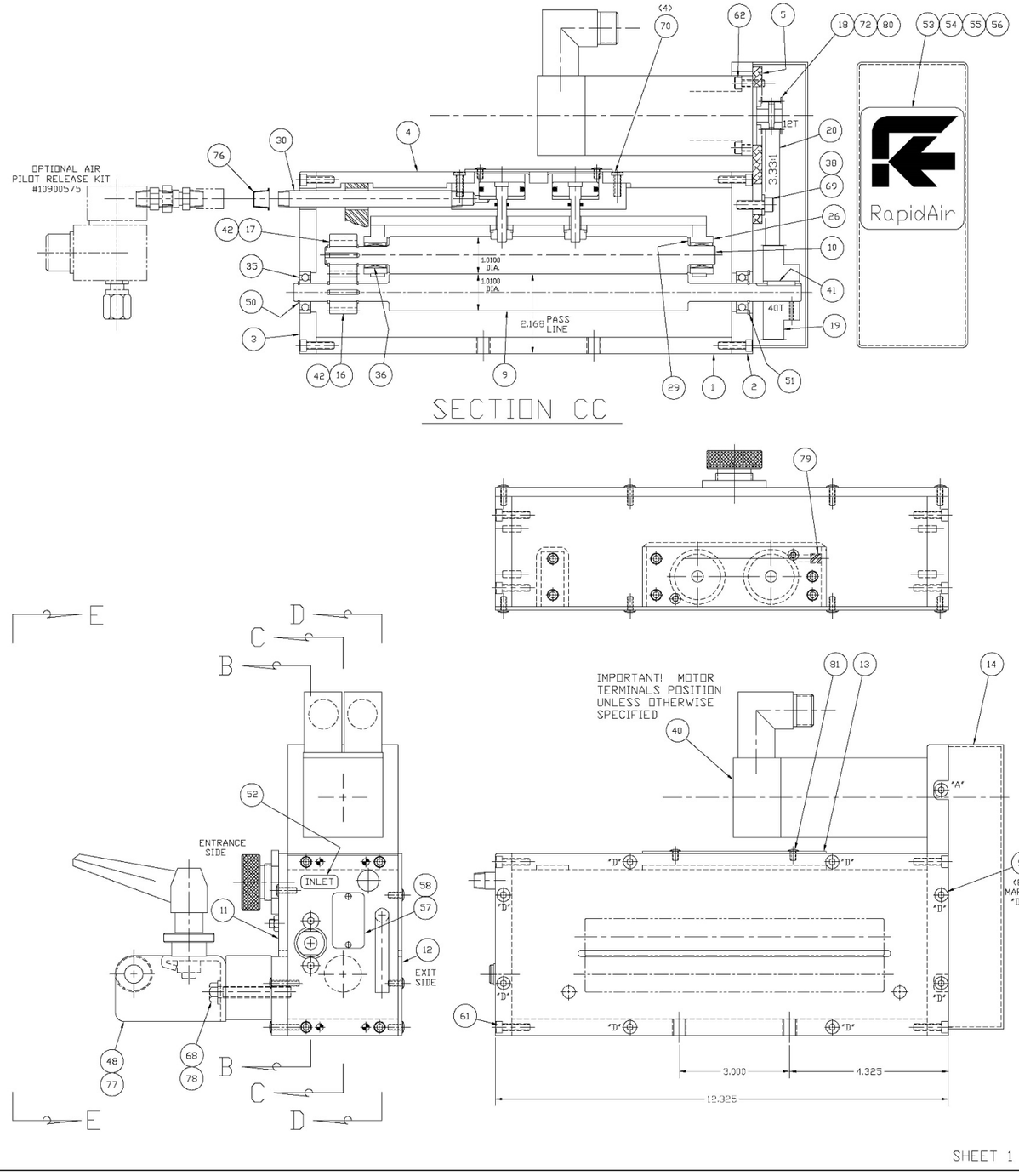
MATERIAL | WEIGHT
HEAT TREAT | HARDNESS
DRAWN BY: DLU | CHECKED BY | FINAL FINISH
DATE: 4-9-14 | DRAWING NUMBER: 13000597 | E
SCALE: FULL



ITEM	QTY.	PART NO.	DESCRIPTION
93			
92			
91			
90			
89			
88			
87			
86			
85			
84			
83			
82			
81	2	66608025	BHSCS #8-32 X 1/4
80	—	32500034	TAPER PIN INSTALLATION DRAWING
79	1	66228025	SET SCREW
78	2	61200022	FLAT WASHER 5/16
77	1	31702454	GUIDE ROLL SPACER
76	1	62900004	CAP
75	1	62412037	ROLL PIN 1/8 X 3/8
74	1	62412062	ROLL PIN 1/8 X 5/8
73	8	62319050	DOWEL PIN 3/16 X 1/2
72	1	62500005	TAPER PIN
71	2	66206012	SET SCREW
70	6	66700070	SHCS LOW HEAD #10-32 X 1/2
69	2	65920075	SHCS 1/4-20 X 3/4
68	2	65831200	HEX BOLT 5/16-18 X 2
67	2	65906025	SHCS #6-32 X 1/4
66	2	65906037	SHCS #6-32 X 3/8
65	2	66620037	BHSCS 1/4-20 X 3/8
64	3	66612075	BHSCS #10-32 X 3/4
63	3	66612050	BHSCS #10-32 X 1/2
62	4	65912062	SHCS #10-32 X 5/8
61	8	65912075	SHCS #10-32 X 3/4
60	2	66612025	BHSCS #10-32 X 1/4
59	6	66612037	BHSCS #10-32 X 3/8
58	2	66300250	DRIVE SCREW
57	1	39900051	S/N TAG
56	1	39901009	CAUTION LABEL
55	1	39900304	CAUTION LABEL
54	1	39900261	CAUTION LABEL
53	1	39900245	R/A LOGO
52	1	39900175	INLET LABEL
51	1	60900112	RETAINING RING
50	6	60910050	RETAINING RING
49	1	60910037	RETAINING RING
48	1	31900634	GUIDE SUPPORT ASS'Y,
47	2	6010B010	"O" RING
46	2	6010B215	"O" RING
45	1	37500158	SPRING
44	1	65112520	JAM NUT 1/4-20
43	1	36200041	LOCKNUT
42	2	36800031	KEY
41	1	36800010	KEY
40	1	69000040	MOTOR
39	2	69400084	SPHERICAL NUT & WASHER ASSEMBLY
38	2	61200015	FLAT WASHER 1/4"
37	2	64520007	THRUST WASHER
36	2	64500065	NEEDLE BEARING
35	2	64600033	BALL BEARING
34	1	64100085	BUSHING
33	1	64100066	BUSHING
32	1	66700071	POSITIVE STOP SCREW
31	1	36100097	ADJUSTING SCREW
30	1	67100147	PIPE NIPPLE 1/4 NPT X 3"
29	2	34100304	SPACER
28	1	34100316	ROLLER SPACER
27	1	34100377	ROLLER SPACER
26	2	33900262	UPPER ROLLER BUSHING
25	1	36600034	CAM HANDLE
24	1	36500041	CAM
23	1	36500042	CAM
22	1	32900849	ECCENTRIC SHAFT
21	1	32900850	PIVOT SHAFT
20	1	32500033	TIMING BELT
19	1	32500031	ALUMINUM PULLEY
18	1	32500032	MOTOR PULLEY
17	1	32600230	UHMW GEAR
16	1	32600229	STEEL GEAR
15	2	25500075	PISTON ASSEMBLY
14	1	31500422	BELT COVER
13	1	31500427	PISTON COVER
12	1	31500486	EXIT GUARD
11	1	31500485	ENTRANCE GUARD
10	1	34200361	UPPER ROLLER
9	1	34200360	LOWER ROLLER
8	1	30100280	PISTON HOUSING
7	1	21900296	ROLLER BRKT. ASSEMBLY
6	1	31702083	CAM HANDLE SUPPORT PLATE
5	1	31702039	MOTOR MOUNTING PLATE
4	1	31702453	TOP PLATE
3	1	31702449	L.H. SIDE PLATE
2	1	31702448	R.H. SIDE PLATE
1	1	31702452	BOTTOM PLATE

RAPID-AIR CORPORATION
ROCKFORD,IL ● MADISON,SD

PART NAME: MS4 SERVO (NEW DESIGN)
MATERIAL | WEIGHT
HEAT TREAT | HARDNESS
DRAWN BY: DLU | CHECKED BY | FINAL FINISH
DATE: 4-18-14 | DRAWING NUMBER
SCALE: FULL | 13000598 | E

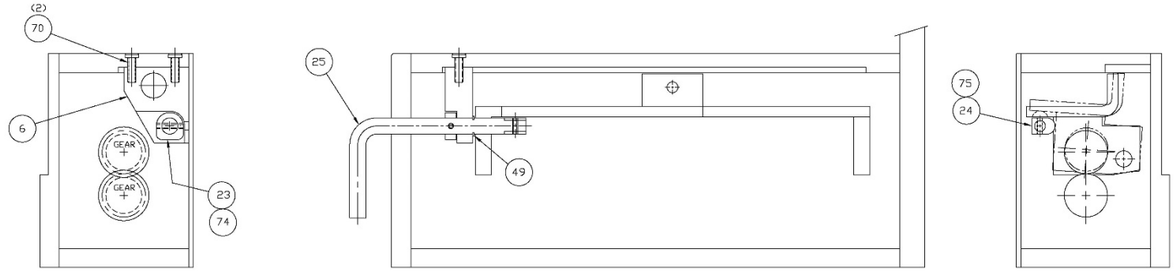


ITEM	QTY.	PART NO.	DESCRIPTION
93			
92			
91			
90			
89			
88			
87			
86			
85			
84			
83			
82			
81	2	66608025	BHSCS #8-32 X 1/4
80	—	32500034	TAPER PIN INSTALLATION DRAWING
79	1	66228025	SET SCREW
78	2	61200022	FLAT WASHER 5/16
77	1	31702457	GUIDE ROLL SPACER
76	1	62900004	CAP
75	1	62412037	ROLL PIN 1/8 X 3/8
74	1	62412062	ROLL PIN 1/8 X 5/8
73	8	62319050	DOWEL PIN 3/16 X 1/2
72	1	62500005	TAPER PIN
71	2	66206012	SET SCREW
70	6	66700070	SHCS LOW HEAD #10-32 X 1/2
69	2	65920075	SHCS 1/4-20 X 3/4
68	2	65831200	HEX BOLT 5/16-18 X 2
67	2	65906025	SHCS #6-32 X 1/4
66	2	65906037	SHCS #6-32 X 3/8
65	2	66620037	BHSCS 1/4-20 X 3/8
64	4	66612075	BHSCS #10-32 X 3/4
63	4	66612050	BHSCS #10-32 X 1/2
62	4	65912062	SHCS #10-32 X 5/8
61	8	65912075	SHCS #10-32 X 3/4
60	2	66612025	BHSCS #10-32 X 1/4
59	8	66612037	BHSCS #10-32 X 3/8
58	2	66300250	DRIVE SCREW
57	1	39900051	S/N TAG
56	1	39901009	CAUTION LABEL
55	1	39900304	CAUTION LABEL
54	1	39900261	CAUTION LABEL
53	1	39900245	R/A LOGO
52	1	39900175	INLET LABEL
51	1	60900112	RETAINING RING
50	6	60910050	RETAINING RING
49	1	60910037	RETAINING RING
48	1	31900635	GUIDE SUPPORT ASS'Y,
47	2	60108010	"O" RING
46	2	60108215	"O" RING
45	1	37500158	SPRING
44	1	65112520	JAM NUT 1/4-20
43	1	36200041	LOCKNUT
42	2	36800031	KEY
41	1	36800010	KEY
40	1	69000040	MOTOR
39	2	69400084	SPHERICAL NUT & WASHER ASSEMBLY
38	2	61200015	FLAT WASHER 1/4"
37	2	64520007	THRUST WASHER
36	2	64500065	NEEDLE BEARING
35	2	64600033	BALL BEARING
34	1	64100085	BUSHING
33	1	64100066	BUSHING
32	1	66700071	POSITIVE STOP SCREW
31	1	36100097	ADJUSTING SCREW
30	1	67100148	PIPE NIPPLE 1/4 NPT X 5"
29	2	34100304	SPACER
28	1	34100316	ROLLER SPACER
27	1	34100377	ROLLER SPACER
26	2	33900262	UPPER ROLLER BUSHING
25	1	36600034	CAM HANDLE
24	1	36500041	CAM
23	1	36500042	CAM
22	1	32900849	ECCENTRIC SHAFT
21	1	32900851	PIVOT SHAFT
20	1	32500033	TIMING BELT
19	1	32500031	ALUMINUM PULLEY
18	1	32500032	MOTOR PULLEY
17	1	32600230	UHMW GEAR
16	1	32600229	STEEL GEAR
15	2	25500075	PISTON ASSEMBLY
14	1	31500422	BELT COVER
13	1	31500427	PISTON COVER
12	1	31500488	EXIT GUARD
11	1	31500487	ENTRANCE GUARD
10	1	34200363	UPPER ROLLER
9	1	34200362	LOWER ROLLER
8	1	30100280	PISTON HOUSING
7	1	21900297	ROLLER BRKT. ASSEMBLY
6	1	31702083	CAM HANDLE SUPPORT PLATE
5	1	31702039	MOTOR MOUNTING PLATE
4	1	31702456	TOP PLATE
3	1	31702449	L.H. SIDE PLATE
2	1	31702448	R.H. SIDE PLATE
1	1	31702455	BOTTOM PLATE

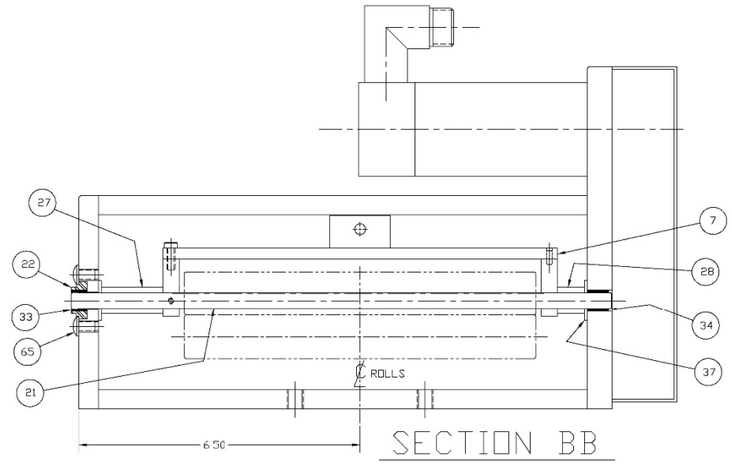
RAPID-AIR CORPORATION
ROCKFORD,IL ● MADISON,SD

PART NAME: MSB SERVO (NEW DESIGN)

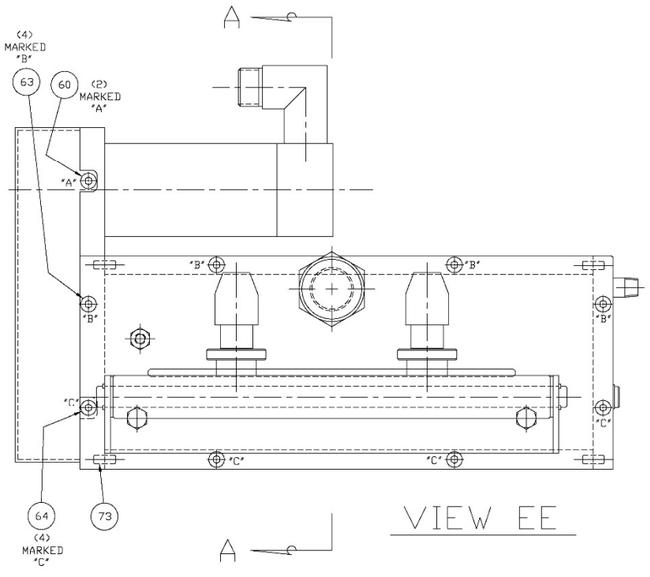
MATERIAL | WEIGHT
HEAT TREAT | HARDNESS
DRAWN BY: DLU | CHECKED BY | FINAL FINISH
DATE: 4-22-14 | DRAWING NUMBER: 13000599 E
SCALE: FULL



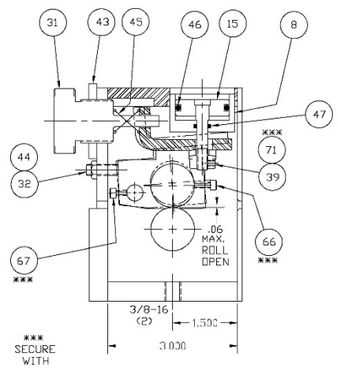
SECTION DD



SECTION BB



VIEW EE



*** SECURE WITH LOCTITE #222

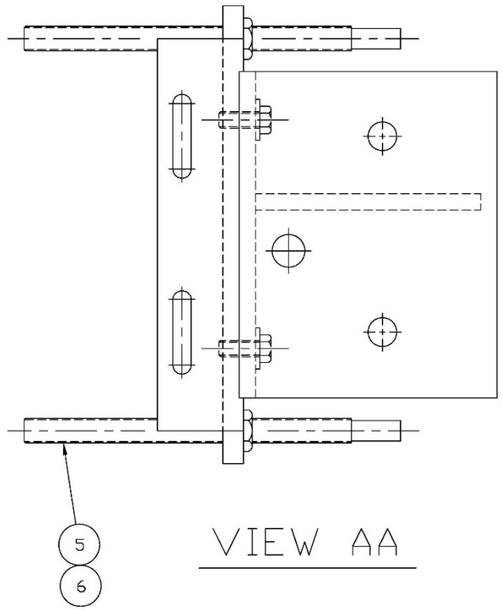
SECTION AA

SHEET 2 OF 2

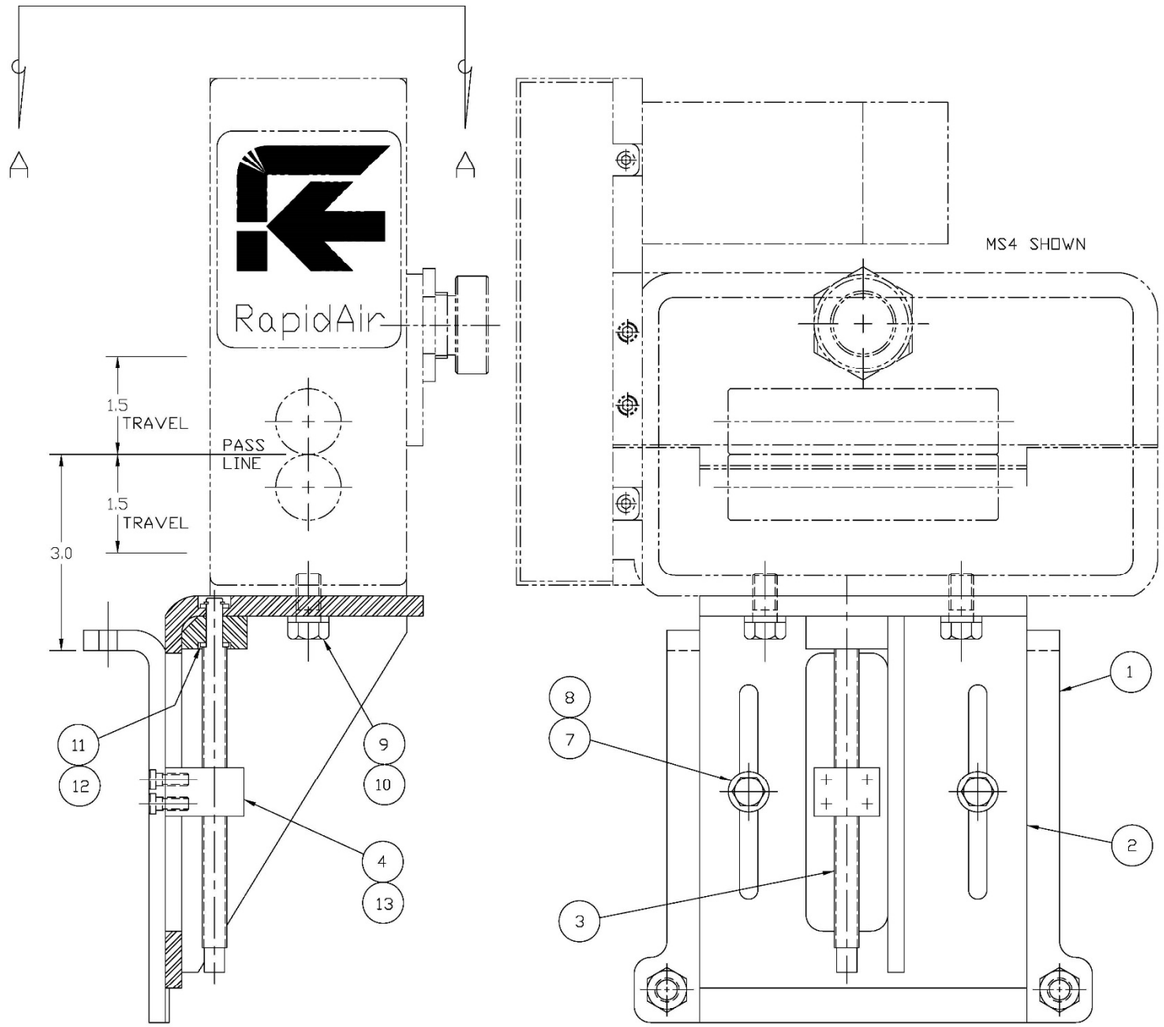
RAPID-AIR CORPORATION
ROCKFORD,IL ● MADISON,SD

PART NAME: MSB SERVO (NEW DESIGN)

MATERIAL	WEIGHT
HEAT TREAT	HARDNESS
DRAWN BY DLU	CHECKED BY / FINAL FINISH
DATE 4-22-14	DRAWING NUMBER 13000599 E
SCALE FULL	



VIEW AA



ITEM	QTY.	PART NO.	DESCRIPTION
15			
14			
13	4	66700070	LOW HEAD #10-32 X 1/2
12	1	60910025	RETAINING RING
11	2	34700119	WASHER
10	2	61300037	LOCKWASHER 3/8
9	2	65836075	HEX BOLT 3/8-16 X 3/4
8	2	65820062	HEX BOLT 1/4-20 X 5/8
7	2	61200019	FLAT WASHER 1/4"
6	2	65113716	JAM NUT 3/8-16
5	2	36100087	ADJUSTING SCREW
4	1	31702270	ADJUSTING SCREW PLATE
3	1	36100109	ADJUSTING SCREW
2	1	31900651	FEED SUPPORT BRACKET
1	1	31900650	MOUNTING BRACKET

NEXT ASS'Y.

STANDARD MFG. TOLERANCES UNLESS OTHERWISE SPECIFIED

DECIMALS		
ONE PLACE	.0	±.030
TWO PLACE	.00	±.010
THREE PLACE	.000	±.005
FOUR PLACE	.0000	±.0005
FRACTIONS		±1/64

FINISH 63/

REV.	CHANGE	DATE
	WAS F4276-1	

RAPID-AIR CORPORATION
ROCKFORD,IL ● MADISON,SD

PART NAME: ADJUSTABLE MOUNTING BRKT. (MS2 , MS4 , MS8)

MATERIAL | WEIGHT

HEAT TREAT | HARDNESS

DRAWN BY: DLU | CHECKED BY | FINAL FINISH

DATE: 8-11-09 | DRAWING NUMBER: 10900598 D

SCALE: FULL