



SERVO FEED OPERATING INSTRUCTIONS

MODELS

KBX SERIES

RAPID-AIR START UP SECTION (100-200-300 S SERIES)

Congratulations on purchasing a Rapid-Air Servo. Not only did you receive a complete servo unit but also telephone support by one of our engineering staff to guide you on using the new servo to it's maximum capability.

In order to maximize your learning time and trouble shoot any interface problems. We would like to request that the following items be complete before calling us.

1. Servo unit should be completely installed and aligned to a die on the press.
2. 220 VAC electrical wiring should be in place and unit turned on.
3. All interface switches should be wired and tested.
4. Air if needed should be connected and ready to be used.
5. All servo interface questions should be directed to your distributor first then to Rapid-Air. Please call 815-397-2578 and ask to have these questions directed to the proper personnel.

TABLE OF CONTENTS

CHARTS AND DRAWINGS DIRECTORY	pg. 3
INTRODUCTION	pg. 4
INSTALLATION AND MECHANICAL SETUP	pg. 5
INSTALLATION OF MOUNTING BRACKET	pg. 6
ELECTRICAL CABLES AND AIR LINE	pg. 7
INTERFACING FEED WITH PRESS	pg. 8
PRETEST WRITE UP	pg. 9
LOADING MATERIAL	pg. 10
SERVO INTERFACING EXPLANATION	pg. 11-12
RESET JOB PARAMETERS	pg. 13
PROGRAM NUMBER DISPLAY	pg. 13
PROGRAMMING PROCEDURE	pg. 16
DRIVE ROLL PARALLELISM ADJ.	pg. 23
TROUBLESHOOTING	pg. 24-25
FAULT DISPLAY - FAULT CODE	pg. 26-27
OPERATIONAL MAINTENANCE PROCEDURES	pg. 28
PRECAUTIONS AND SAFETY	pg. 30
WARRANTY	pg. 31
STRAIGHTENING INSTRUCTIONS	pg. 34

CHARTS AND DRAWINGS

104KBX

108KBX

MOUNTING BRACKET

KBX STRAIGHTENER LAYOUT

ELECTRICAL PANEL LAYOUT

OPERATORS TERMINAL LAYOUT

PRESS-FEED AND PILOT SWITCH SETTINGS

ELECTRICAL & INTERFACE SCHEMATICS - 953

SERVO PARTS BREAKDOWN

WIRING DIAGRAM

INTRODUCTION

The Rapid-Air servo feed carries with it the quality and reliability you have grown to expect from a Rapid-Air product. The motion control system is a programmable industrial computer and this advanced technology combined with a highly engineered precision roll feed coupled with a straightener is an unchallenged combination in the press industry.

The compact mechanical package, direct coupled with a brushless servo drive motor, offers response and feed speed accuracy unparalleled in any other powered roll feed. Operator interface is so simplified, a typical setup person can have the servo feed programmed and running in a matter of minutes. A step by step prompt on the four line 80 character display asks simple questions of the operator. Entry of feed length, strokes per minute, % maximum speed and pilot are all that is required for a new setup. Routine jobs can be stored, recalled, changed and saved or run with a simple 2 digit job number entry. Up to 99 jobs may be stored and recalled at will.

Operator programmed feed length, up to 999.999 inches and % max speed selection along with a jog feature allowing the operator to thread the material and inch it into position. The inch feature enables the operator to jog the servo feed forward at a slow rate. The operator can select jog to length or jog continuous to aid in threading up material.

The precision mechanical roll feed unit has been designed for compactness, ease of setup and installation. A 230 volt, 3 phase supply and an air line are all that is required of the customer. Two cables with twist lock plugs and one or two cables for the air valve control are supplied with the control and need only be connected to the proper locations. The electrical controls are housed in a small cabinet which should be mounted close to the press working area. The operator keypad and display are mounted on top of the control area

INSTALLATION AND MECHANICAL SETUP OF SERVO FEED

The shipping container should contain:

- 1 Mechanical Servo Feed/Straightener -Standard
- 1 Console Complete -Standard
- 1 Cascade Assembly -Optional (100 Series) (Standard 200-300 Series)
- 1 Servo Mounting Bracket -Optional
- 1 Guide Support Assy. -Optional

If a mounting bracket was purchased then it should be installed at this time. There are mounting bracket prints in the back of the manual for hole location dimensions and a bracket mounting instruction section can be found later in this section.

If a mounting bracket was not purchased then the feed should be positioned with the centerline of the drive roller in line with the centerline of the die entrance and at the proper pass line height to the die. Aligning the feed to the die (Parallelism) is very important to the accuracy of the feed. Drag due to misalignment can cause short feeds and servo faults.

If the feed is positioned as such that the material has to move unsupported from the exit side of the feed to the die and the material being moved is allowed to droop or buckle during a move, a short feed can occur. A guide should then be built between the feed and the die to solve this problem.

The following chart lists the servo size with the proper bolt size.

SERVO	BOLT	QUANTITY
Series KBX	3/8-16	4

The servo mounting bolts should not penetrate into the servo body by more than .625".

INSTALLATION AND MECHANICAL SETUP OF MOUNTING BRACKET

The cast mounting bracket is available for mounting the KBX feed directly to the bolster plate of the press. Mounting holes are located on the top and front for securing the bracket firmly. It is very important that the servo bracket and the KBX feed be secured and not allowed to float or vibrate.

Note: It is very important that the end of the bolster plate where the servo feed is to be mounted, be perpendicular to the top surface of the bolster plate within $\pm .005$ to assure the KBX feed will be aligned for proper feeding.

Align the KBX feed bracket with the center line of the bolster plate and transfer the mounting holes on the top face. There are two 1/2" holes on the smaller bracket and 3 1/2" holes on the large bracket.

Once the bracket has been aligned and secured to the bolster plate, the KBX feed can now be put in place. The slotted holes in the mounting bracket allow for accurate alignment of the servo feed in the x-y axis. There is an elevating screw to position the servo feed to the proper tooling pass line height.

When the KBX feed has been aligned and mounted to the bracket, loosen the elevator locking screws and position the servo to match the tooling pass line height. This is accomplished by turning the adjusting screw provided. When the servo is correctly positioned, tighten the elevator locking screws to prevent the unit from moving. There are 2 locking screws on the small bracket and 3 locking screws on the large bracket.

The unit is now assembled and the next step will be to attach the electrical and air to the servo feed unit.

Material alignment is critical. The KBX feed rolls are so precise that they will move the material in whatever direction that they are presented to the die. The feed and die must be in line and square to one another. The servo feed does not have the power of a press driven roll feed so the feed will fault out if misaligned. This is a good warning and if corrected could result in better tool life.

ELECTRICAL CABLES AND AIR LINE

230 VAC INPUT

The required input voltage to the control is 230 Vac, 3 Ph, 60 Hz. The amperage needed is 10 amps for 953 control. If unsure of the amperage needed, the name plate on the side of the Pacific Scientific drive will give the number of the control or check the disconnect fuses for the correct fuse size.

460 VAC INPUT

If your plant has only 460 Vac power then a step down transformer is needed in order to run the servo feed. If you purchased the transformer from Rapid-Air then all that is needed is to connect and wire the 460 volt line to the transformer. If you did not purchase a transformer from Rapid-Air then a transformer, 3 KVA for the control is needed. 460/230 VAC 3PH, 60HZ step down transformer is needed before proceeding with the electrical portion of the installation.

The electrical control enclosure is shipped completely ready to be connected to the mechanical feed. Connected to the bottom of the enclosure are (2) cables with keyed screw type connectors for connection to the motor.

Position the electrical enclosure at a convenient location near the mechanical feed and attach the cables. The motor cables are easily identifiable by the amount of pins in the plugs. The solenoid cables if any can now be attached and checked for proper location when the feed is up and running.

INTERFACING SERVO FEED WITH A PRESS

The KBX unit is a slave to the press therefore it needs a command from the press to operate in the automatic mode.

The command is in the form of a normally open contact from a limit switch, cam switch or an electronic feed interface device that can be programmed.

The contact should be commanded or activated at 270 degrees of the press stroke or when the tooling is clear of the material and released and turned off at around 350 degrees of the press stroke. The significance of the release position is to insure that the feed switch is released with the press top stopped. Once the program senses a closure of the feed input, it will command a move and will complete the move regardless of the switch position.

The schematic in the back of this manual points out the switch or contact connections for wiring the interface. Locate the feed signal input and wire per print. The feed input number is (J52)TBI-1).

This completes the initial setup of the servo feed to the press or other device. The KBX is now ready to run as intended.

If more complete interfacing is needed, please refer to the section (interfacing) in this manual for an explanation of inputs and outputs available.

PRETEST FOR KBX FEED AND PRESS WITHOUT MATERIAL

Now that your KBX feed unit has been mounted and the cables have been attached, you can proceed with testing the unit. The first step is to turn on the main disconnect switch on the electrical enclosure. Next, at the operator's console, pull the power on-off button to the on position. The button should illuminate to indicate that there is power to the system.

The Pacific Scientific drive performs an initial sequence to check its internal program. At this time the display should show the Rapid-Air screen for 5 seconds before starting the main setup program. If you are comfortable with programming a job then continue, if not, please refer to the "Programming Procedure" located in this manual.

Follow the programming sequence for the operators terminal to input parameters into job storage. Your servo feed has been fully tested before it was shipped to your facility and this procedure is merely a test to insure that all functions are still functional and the cables are properly seated.

Select the "inch" function (F2 on keypad) on the manual mode screen. Visually check that the rolls rotate forward when pressing the inch forward key. The speed is preset to creep the rolls at a slow speed for manual positioning of the material.

CAUTION: Do not attempt to place your fingers or any foreign material into the rolls. Injury to the operator or damage to the servo rolls could result.

After you have verified that the rolls are operational, you can experiment with the single cycle moves. The procedure is outlined in the programming section of this manual.

Now, you can cycle the press and watch the rolls to verify that the signal from the press window switch signal is functional and actuating at the proper time.

After all the checks have been made and you feel comfortable with the programming of the servo controller, place the controller in automatic mode. Now cycle the press in either the inch, single stroke or continuous run, the servo feed should react upon the closure of the press window and signal and simulate a feed progression of material.

LOADING MATERIAL INTO THE SERVO FEED

Upon the satisfactory completion of all the tests, you should be ready to load a strip of material into the servo feed.

Step number one is to select the manual mode of operation on the operators console. Open the rolls manually by lifting the lever mounted on the side of the servo feed then open the straightener cover. Position the leading edge of the material with the center of the material near the center of the entry rolls. Adjust the edge guides on the cascade rolls to the proper width. Hand feed the material into the KBX unit until it protrudes out of the feed rolls and starts into the guide on the press. Close the straightener rolls to capture the material, then close the feed rolls.

Check the roller force pressure to be sure that there is enough pressure to prevent slippage but not too much to induce camber into the material. The pressure setting is the amount of force necessary to move the material into the press at the speed and feed programmed. You may find it necessary to readjust the force as you finalize the setup procedure. The amount of force needed will vary depending on the width and type of material being fed. Make a note of the final setting to aid in the setup of the servo feed the next time the same material is run.

You are now ready to begin testing the complete system under power. To check the progression, cycle the press in the single cycle mode with the servo feed in the automatic mode. If the progression is correct, no further adjustments are necessary. If the progression is either short or long, go to the troubleshooting chart and perform the sequences described there for inaccurate feeding, once the feed progression has been accurately set and the repeatability is satisfactory, you are ready for full automatic mode.

SERVO INTERFACING EXPLANATION

A. TAUT STOCK INPUT (J52)TBI-3)

This is a normally open contact from a switch or device that monitors the loop of material prior to the servo feed. When the material reaches a point that it trips the switch, a taut stock has been reached. This input, when received, immediately drops the automatic which stops the feed in progress. The material should be repositioned in the die before restarting the automatic sequence, as the progression was lost when the taut stock occurred.

This input also could be used as a "No Stock" switch that would monitor whether or not there is material available to feed.

B. ENABLE INPUT (J4-Pin 5 & 6))

The enable input is shipped from the factory, jumpered, so that the Pac-Sci unit is ready to work after the initialization procedure is complete.

If it is desired that the servo controls are not functional until other equipment or safety source is activated then a normally open contact can be interfaced to this input. If at any time during the feed cycle the input changes state then the feed will stop at this position. If feeding stock, the reference will be lost and the stock will have to be manually repositioned to the correct location. The automatic cycle will be dropped and have to be restarted.

C. ENABLE OUTPUT (J52)TB2-22)

This output must be tied to a solid state relay to interface to the outside world. The solid state relay must have a D.C. coil and should have a rating of 3-30 VDC. The Rapid-Air #69100165 is recommended for this application. This output is high whenever the enabled input is activated.

D. END OF FEED OUTPUT (J52)TB2-21)

This output must be tied to a solid state relay to interface to the outside world. The solid state relay must have a D.C. coil and should have a rating of 3-30 VDC. The Rapid-Air #69100165 is recommended for this application. This output goes high at the end of every feed and stays high for programmed amount of time before going low. To program the time, with the main screen menu displayed, push the period on the keypad - follow the instructions and enter the time in milli-seconds. The time entered will add to the total feed cycle time and if programmed to last longer than the time from the actual end of feed and the actual tripping of the feed switch then the program will not see the feed switch being tripped. You will then get two hits per feed.

E. AUTOMATIC OUTPUT (J52)TB2-20)

This output must be tied to a solid state relay to interface to the outside world. The solid state relay must have a D.C. coil and should have a rating of 3-30 VDC. The Rapid-Air #69100165 is recommended for this application. This output goes high whenever automatic is selected on the program panel. Any faults will cause the automatic output to go low.

F. STANDARD PROGRAM- DATA INSTRUMENTS INTERFACE (J52)TB1-7)

With the jumper in place, the standard program is active. Remove jumper, recycle power and the Data Instruments program is active. Only the manual mode will work with the keys at this time.

G. KEYPAD AND DISPLAY INTERFACE (RS232 PORT)

The keypad/display is the interface between the operator and the resident program. The Pacific Scientific drive is purchased with a great many capabilities, none of which can be used unless a program is written to utilize these capabilities. Rapid-Air put a great deal of time making a program that is user friendly and yet gets the job done efficiently. We took all the questions and constructive criticism and came up with a program that would cover all the applications, yet be easy to interface and program by a customer.

If an operator reads the programming procedure in this manual and then reads the screen parameters listed as they are displayed and acts on them by inputting data as needed, the servo can be up and running in a very short time.

1. Select a job number.
2. Input or review parameter for that job number.
3. Thread up material in manual mode.
4. If properly interfaced, go into automatic mode.

RESET JOB PARAMETERS

The reset job parameters routing should be used with special caution. We incorporated it as a user function for two reasons.

The first reason is if a problem caused the displayed parameters to be garbled because of a program glitch, then by resetting the job parameters the problem could be cleared.

The second reason is if there were a number of different jobs in memory that were no longer required, then by resetting the job parameters, all the job numbers would be reset to their default values, which includes putting all zeros in the feed length and strokes per minute area of the program.

CAUTION!! CAUTION!! CAUTION!!

Keep a hard copy record of program numbers and data associated with them for reference if needed. If this function is used in a way other than what it was designed for then all previous data is lost and cannot be recovered.

To enter this function, turn off the program by depressing the master stop button. Turn on the program again and push and hold the “clear entry” key, once the program has started the following screen will be displayed.

**DEFAULT VALUE SETUP
PRESS F1 TO RESET TO
DEFAULT VALUES, PRESS
F4 TO IGNORE CHANGES

**Once F1 has been pressed then all data that had been entered will be reset.

PROGRAM NUMBER DISPLAY

Each servo unit that is shipped has a program number assigned to it. If a problem occurs and cannot be solved by reloading the program then you will be asked the program number associated with this servo.

To view the program number, press and hold the “back space” key during the power up sequence. The program number will be displayed for about 30 seconds. Please find and write down the program number in case it is needed in the future.

SERVO

To help you to enter a job from the keypad, let's create an example.

We will use a feed length of three inches and want to run at 100 strokes per minute. We have a pilot pin on the die, so pilots will have to be used. The max feed arc will be 180 degrees.

The main menu is currently displayed. First we select the job number and we will use job #1.

1. Press F1 to select the job number.
2. Enter job number "01" - press the F4 key when finished.
3. The job number screen shows two choices:
 - A. F1 = program parameters. This choice is used if a job has already been programmed and you would like to adjust the parameters that were preset for the job.
 - B. F2 = feed-advisor-calc. This should be used when entering a new job number. The two main inputs are the feed length and strokes per minute. The third input is to enter a "1" or a "0" for pilots. We will put in a "1" for "yes for pilots". The fourth input is the feed arc. This is preprogrammed as 180 degrees and need not be changed to set up a job unless specific move parameters in relation to press stroke position is required. To move around in this screen, press the "enter" key in the lower right corner of the key pad. Once the feed length and strokes per minute are entered, then the F4 key to exit the screen. The program now calculates the accel/decel and speed for the parameters entered. At this time the "F4 key" review parameter should be used to check to be sure that you entered the correct parameters.
4. Press "F2" to select the manual mode.
 - A. Press F1 to select the "inch" or jog mode. This mode will move the material slowly forward or reverse to position the material at it's proper location. F2 being used for forward and F3 for reverse movement. Press F4 to leave the "inch" mode.
 - B. Press F2 to select the "single feed" mode. At this time each press on the F1 key will rotate the rolls to move the material three inches, the feed length that was entered, at the same feed rate as the feed would move the material in the automatic mode. Press the F4 key {exit} to leave this screen.
5. Press "F3" to select automatic cycle. In this mode the servo can be run in the batch or continuous mode.
 - A. Press F1 to select the batch mode. In the batch mode, the servo will feed each time it is commanded until the batch count reaches "0", then the automatic cycle drops out.
 - B. Press F2 to select the continuous mode. In the continuous mode, the servo will feed each time it is commanded until the command stops or the operator presses the "F4" return key.

FEED ARC

To explain how the “feed arc” is related to the servo feed calculation, we must first explain what the feed arc is in relation to a press.

The press has a die that has two halves. The lower half is stationary and the top half is moveable in an up and down motion which is one cycle from the full open to the full closed to the full open again. The component that makes all of this happen is named “crankshaft”. The crankshaft makes a 360 degree revolution for one cycle of the die from open to close to open again. When the die is fully open, the crankshaft would be at “0” degree position. When the die is fully closed the crankshaft is at 180 degrees or one-half of a revolution.

We ask that a switch be set at 270 degrees to activate the feed because at this position, the die is completely clear of the material. This is also a good starting point to explain the “feed arc” portion of the auto calculation in the Rapid Air program.

If the feed input switch was tripped at 270 degrees of the total revolution of the crankshaft and the arc calculation was 180 degrees then the servo feed would complete it’s feed by 90 degrees of the press cycle or 180 degrees past the 270 degree mark.

The feed arc could be set at 90 degrees so the feed cycle would be complete by 360 degrees or when the press was at the top of the stroke.

The feed arc could be set at 270 degrees so the feed cycle would be complete when the press was at 180 degrees. This example would not work if the feed cycle started at 270 degrees as the feed would still be trying to move the material when the die was closed or together. To use a 270 degree feed arc the feed would have to start at 230 degrees or 240 degrees to be finished moving the material before the die was closed or together. This example could not be possible if the die had pilot pins installed in it for precise locating of the stamped part. The cam switch drawing in the back of the manual will help you visualize the above feed arc explanation.

In essence, the larger the feed arc number up to 270 degrees, the lower the acceleration/ deceleration rate. The smaller the feed arc the higher the acceleration/deceleration rate and the fewer strokes per minute for a given feed length.

OPERATOR INPUT TERMINAL - PROGRAMMING PROCEDURE-STANDARD SOFTWARE

The intent of this section is to familiarize the operator with the program flow and what to expect with every keypress. Each screen on the display will be reviewed with special comments to help clarify what is being asked on the screen. The program flow is broken down into 5 sections with the main menu being the home position. Reviewing the flow chart in the back of this manual will help in understanding the sections.

SECTION 1 — F1=JOB ENTRY

SECTION 2 — F2=MANUAL MODE

SECTION 3 — F3=AUTOMATIC

SECTION 4 — F4=REVIEW JOB PARAMETERS

SECTION 5 — RAMP=ADJUST ACCELERATION AND DECELERATION

The first screen to be displayed on the operator terminal will look like this

```
RAPID-AIR CORPORATION
4601 KISHWAUKEE STREET
ROCKFORD, IL 61109
815-397-2578
```

After a few seconds, the display will clear and the following display will appear:

```
MAIN MENU
F1=JOB      F2=MANUAL
F3=AUTOMATIC CYCLE
F4=REVIEW PARAMETERS
```

SELECT F1=JOB #

The first step in programming the servo feed is to select a job number which will be used to store the parameters the operator inputs or recall the parameters which have been previously loaded into the servo controller program. When the operator selects F1 on the keypad, the screen will change to:

```
JOB SELECTION MENU
ENTER JOB NUMBER=XXX
PRESS F4 KEY AFTER
CORRECT # IS ENTERED
```

The operator must enter a 2 digit number before proceeding to any other function. If the job number the operator has entered has been previously stored in memory, or entering a new job, the following display will appear:

```
JOB NUMBER= XXX
F1=PROGRAM PARAMETERS
F2=FEED ADVISOR-CACL
F4=DON'T ALTER VALUES
```

* If entering in a new job then select (F2) "feed advisor" first as RapidAir can preset the Accel/Decel & Max speeds according to the feed length, feed arc and spm entered.

The job number screen displays (3) choices for the operator. In the first choice, F1=Program parameters, the operator can enter or change the feed length, strokes per minute that the press is running and speed of the material movement. In the second choice, F2=Feed Advisor-Calc, the operator can enter or change the feed length, strokes per minute that the press is running and feed arc (free travel of the press in which the feed can move material without a problem) this then calculates the optimum speed of the material movement. The third choice, F4=Exit, puts the job number entered in memory for running at this time, If F1 or F2 was selected one of the following displays will appear:

MANUAL PROG--JOB #=XX
LGTH=XXX.XXX SPM=XXX
%SPEED=XXX
ACC/DEC=XXX% F4=EXIT
Input or change data at
curser. When complete press
F4 to exit. Fault window
will appear if feed length
is too long for SPM

FEED ADVISOR JOB#=XX
LGTH=XXX.XXX SPM=XXX
FEED ARC=XXX
F4=EXIT FEED ADVISOR
Input or change data at
curser. When complete press
F4 to exit, fault window
will appear if feed length
is too long for SPM. Feed
arc is press free travel for
feeding material. Minimum
arc=10, max=300 degrees.
The % of speed is the auto-
matically calculated.

Use the manual program parameters to massage the parameters or to check what the actual feed speed & accel/decel percents are.

This is the fault window that is displayed if the feed length and strokes per minute are not within minimum parameters.

FEED PARAMETER OUT
OF RANGE. THE LENGTH
IS TOO LONG FOR FEED
ARC OR SPM F4=NEXT

F4=Next this command returns to the previous screen so that the new parameters can be entered.

Pressing the F4 key at any time returns you to the main menu.

MAIN MENU
F1=JOB # F2=MANUAL
F3=AUTOMATIC CYCLE
F4=REVIEW PARAMETERS

SELECT F2=MANUAL

In order to advance material into the die, using the servo feed, the operator has to be in the manual mode. Pressing F2 on the keypad will cause the screen to change to the manual mode screen.

MANUAL MODE F1=INCH
F2=SINGLE FEED MODE
F4=EXIT MANUAL MODE

F1=INCH MODE

Pressing the F1 key will allow the operator to change the current “jog to length” to “continuous”. Pressing and holding the F2 and F3 button will command the servo to move the material one programmed feed length. You may press and release the jog button as many times as you wish to get to the feed length. Pressing F1 will display the following screen.

JOG: TYPE=JOG-LENGTH
F1=ALTER TYPE OF JOG
F2=FWD
F4=EXIT (MANUAL MODE)

F1=ALTER TYPE OF JOG

Pressing the F1=alter type of jog will allow the operator to change the current “jog to length” to “continuous”. See below. Pressing and holding the F2 key will command the servo to move the material at a slow rate of speed for as long as the key is pressed.

JOG: TYPE=CONTINUOUS
F1=ALTER TYPE OF JOG
F2=FWD
F4=EXIT (MANUAL MODE)

Pressing the F4 key once will reset the program to the manual mode screen.

MANUAL MODE F1=INCH
F2=SINGLE FEED MODE
F4=EXIT MANUAL MODE
CYCLE ROLL WITH KEYS

F2-SINGLE FEED

If the operator presses F2 then the following screen is displayed. The single feed mode is active and every time the F1 key is pressed then the feed will cycle and move the distance indicated on the feed length line.

```
SINGLE FEED MODE
FEED LENGTH=XXX.XXX
F1=FEED SINGLE LNGTH
F4=EXIT (MANUAL MODE)
```

Pressing F4 once resets the program to the manual mode display. Pressing the F4 key twice resets the program to the main menu display. If the F4 key was pressed twice the following screen is displayed.

```
MAIN MENU
F1=JOB # F2=MANUAL
F3=AUTOMATIC CYCLE
F4=REVIEW PARAMETERS
```

F3=AUTOMATIC CYCLE

If the feed has been properly set up and tested in manual and the press has been electrically interlocked with the feed, feed switch is wired to the correct terminals. Then pressing the F3 key will display the following screen.

```
SELECT CONTINUOUS OR
BATCH CYCLE F1=BATCH
F2=CONTINUOUS CYCLE
F4=EXIT TO MAIN MENU
```

F2=CONTINUOUS

If the F2 key was pressed then the servo will be in the auto total mode and the following screen appears.

```
AUTOMATIC TOTAL=000000
JOB #=XX
LGTH=XXX.XXX SPM=XXX
SPEED=XXX% F4=RETURN
```

Pressing the F4 key, stops the automatic cycle and the main menu screen appears.

```
MAIN MENU
F1=JOB # F2=MANUAL
F3=AUTOMATIC CYCLE
F4=REVIEW PARAMETERS
```

F3=AUTOMATIC CYCLE

If the feed has been properly set up and tested in manual and the press has been electrically interlocked with the feed, feed switch is wired to the correct terminals, then pressing the F3 key will display the following screen.

```
SELECT CONTINUOUS OR
BATCH CYCLE F1=BATCH
F2-CONTINUOUS CYCLE
F4=EXIT TO MAIN MENU
```

F1=BATCH

If the F1 key was pressed then the servo will be in the auto batch mode and the following screen appears.

```
BATCH SETTING=000000
BATCH COUNTER=000000
F1=RESET BATCH COUNT
F4=CONTINUE WITH COUNT
```

If the F1, reset batch count, is pressed then the batch count will be reset to preset or if the F4, continue with count is pressed then either way the following screen appears.

```
AUTOMATIC BATCH=000000
JOB #=XX
LGTH=XXX.XXX SPM=XXX
SPEED=XXX% F4=RETURN
```

Pressing the F4 key, stops the automatic cycle and the main menu screen appears. When the automatic screen is displayed, all keys except the F4 key are inactive. Every time the press cycles and trips the feed switch, the feed will cycle once per the parameters displayed on the screen. If the feed encounters excessive material drag while feeding or the material being moved encounters a restriction that stops the material forward movement then a servo fault can occur. If this happens then the following screen is displayed.

```
A DRIVE FAULT HAS OCCURED
NOTE TYPE OF FAULT —
(           )
```

* Example of fault
#2 Motor over temperature

Look up fault code printout listed in this manual.

If this screen is displayed then the control cabinet has to be opened and the Pac-Sci drive has to be checked. To reset the fault, the master on-off switch has to be cycled which will reset the controller. The material path should be checked for obstruction and parrallelism to the die. If all this seems to be satisfactory and another fault occurs the factory should be consulted.

```
MAIN MENU
F1=JOB # F2=MANUAL
F3=AUTOMATIC CYCLE
F4=REVIEW PARAMETERS
```

The last section to be covered is the ramp/counters section. To get into this mode, press the ramp pushbutton and the following screen appears.

```
SELECT RAMP/COUNTERS
F1=BATCH/TOTAL COUNT
F2=ACCEL/DECEL RAMPS
F4=EXIT TO MAIN MENU
```

F1=BATCH/TOTAL COUNTS

Pressing the F1 key will bring up the batch/total screen, which is used for presetting the batch count or resetting the total count. The following screen appears.

```
BATCH COUNTER=000000
TOTAL COUNTER=000000
SET:F1=BATCH F2=TOTAL
F4=RETURN TO RAMP COUNT
```

Pressing the F1-batch counter key allows the operator to preset a batch count. Pressing the F2-total counter key resets the total count to zero. This cannot be undone so be sure that the counter should be reset to zero before pressing F2 key. Pressing the F4 key brings up the following screen.

```
SELECT RAMP/COUNTERS
F1=BATCH/TOTAL COUNT
F2=ACCEL/DECEL RAMPS
F4=EXIT TO MAIN MENU
```

The only section that has not been covered in this write-up is the ramp adjust mode. The ramp adjusts how fast the servo motor gets up to speed and how fast it stops. This feature is an asset that is seldom adjusted but can be a sure cure if material slippage seems to be a problem. With the main menu screen displayed the key labeled ramp is active. Pressing the ramp key produces this display.

```
RAMP PARAMETER MODE
F1=ACCEL% F2=DECEL%
F3=PERCENT MAX SPEED
F4=RETURN RAMP/COUNT
```

PRESS F1 OR F2

Pressing the F1 or F2 keys will produce one of the following displays. The lower the number entered, the longer the ramp cycle. Press F1 or F2 now.

```
ENTER IN %ACCEL RATE
MAX%=75000 RPM/SEC
MAX ACCEL%=XXX%
F4=EXIT %ACCEL MENU
```

```
ENTER IN %DECEL RATE
MAX%=75000 RPM/SEC
MAX DECEL% = XXX%
F4=EXIT %DECEL MENU
```

The ramp usually is factory set at .015 on the series 100 drives and .035 on the series 200 & 300 drives. There is some deviation to this when the factory runs the unit, but this is a basic starting point.

DRIVE ROLL PARALLELISM ADJUSTMENT

Every KBX feed has an eccentric adjustment screw to adjust the upper roller to be in parallel to the lower roller. The maximum adjustment is .008" on the eccentric.

The adjustment screw is located behind the belt cover and is held fast by a 10-32 socket head cap screw. The actual adjustment screw is a slotted eccentric pin which is turned clockwise or counter-clockwise to raise or lower one end of the upper roll.

The parallel adjustment is factory set when the unit is manufactured but if material tracking seems to be a problem then this could be a way of solving the problem. To test if the rolls need adjustment, do the following.

1. Remove the exit roll cover.
2. Raise the straightener cover.
3. Shine a light from the entrance of the feed toward the main rollers.
4. Inspect from the main rolls side to see if the rollers are parallel. If they are then the material could be the cause of the material walking. If they are not parallel then an adjustment has to be made.
5. To make the adjustment:
 - a. Remove manual roll release arm by removing roll pin.
 - b. Remove belt cover.
 - c. Locate eccentric screw and loosen 10-32 screw.
 - d. Turn slotted eccentric screw while viewing rolls until the rolls are parallel.
 - e. Tighten 10-32 screw and reassemble parts, then retry running material.

For a more accurate adjustment use a feeler gage to check the parallelism. This completes the eccentric adjustment write-up, if there are further questions, please call the factory.

* Before attempting to solve a possible roll parallelism problem by readjusting the rolls or calling the factory, perform the following test.

Step 1) A 3 to 5 foot length of material should be cut from the storage loop preceding the servo feed.

Step 2) Lay the material next to a straight line to see if the material is cambered. If it is then this could be the reason that the material is walking. If not, then turn the material upside down from the way it was being fed and insert into the feed. If the material walks in the opposite direction then the material could be to blame.

TROUBLESHOOTING CHART

<u>PROBLEM</u>	<u>CAUSE</u>	<u>REMEDY</u>
No power indication	Disconnect off Blown fuse Master button in	Turn disconnect on Check/replace fuse Pull button out
No display on operators console	Program fault Faulty wiring	Check lights on P.C. Check plug on console
Power on-no motion	Program fault Drive fault Program error	Check lights on drive Check lights on servo drive readout Check parameters
No roll action	No air Low air pressure	Check air line Check air regulator
Material will not Enter rolls	Feed roll adjusting mechanism too close Material too thick	Open adjustment mechanism Check servo parameters
Material will not feed	Straightener rolls too tight Low roller force Oily material Program fault Obstruction in die	Check rolls Raise roller pressure Clean material Check parameters Check die
Material feeds short	Accel to fast Low roller force Oily material Obstruction in die	Lower accel speed Raise roller pressure Clean material Check die
Material feeds long	High % max speed Material slippery Decell set too high	Lower % max feed speed Lower % Decell Lower % Decell
Material camber	High roller force Bad stock	Lower roller pressure Check stock at input for camber

TROUBLESHOOTING CHART (cont.)

<u>PROBLEM</u>	<u>CAUSE</u>	<u>REMEDY</u>
Material feeds off center	Edge guides not set properly	Set edge guides
	Material not centered to feed	Center material
	Bad Material	Try new roll of material
No automatic cycle	No press signal	Check limit switch input to servo control
	Controller fault	Check lights on drive
	Servo fault	Check lights on drive
	Program error	Check parameters on display
Servo squeals while	Servo velocity gain too high	Consult factory
	Belt too loose or tight	Readjust belt tension
Fault signal on Pac-Sci is displayed	Servo fault	Recycle power
	Material jam	Check die
	Power surge/failure	Check/recycle power
Cannot program unit from display	Program fault	Check Pac-Sci & call factory.
	Data Instruments interface jumper loose	Check Data Instruments connection

SERVO FAULT DISPLAY

The Pacific Scientific drive has a list of internal faults and displays the number of that fault on it's readout located on the front of the drive. Rapid Air now displays the fault on the keypad display. If a fault occurs the screen will display the number and the name of the fault, but there will not be an explanation accompanying the fault. This is a tool to help you to trouble shoot if the servo fails to perform when commanded.

If a fault was displayed the servo controller will have to be turned off and restarted to clear the fault. If the fault is still present when the Pacific Scientific unit is restarted, the fault may not be displayed on the keypad screen as the fault will not let the internal program restart. The control panel will have to be opened to view the fault again.

A list of probable faults and some explanation is included in this section. If more help is required, then Rapid Air will have to be contacted.

FAULT CODE

(Predefined Variable, Integer, Status Variable, Read-Only)

Guidelines - 0 means the drive is not faulted and not enabled, while 8 means the drive is not faulted and enabled. Alternating 8.> means actively inhibiting CW motion and alternating 8.< means actively inhibiting CCW motion

STATUS LED	VALUE	FAULT MEANING
(Blinking) 1	1	Velocity feedback (VelFB) over speed
(Blinking) 2	2	Motor Over-Temp
(Blinking) 3	3	Drive Over-Temp
(Blinking) 4	4	Drive I*t
(Blinking) 5	5	1-n Fault (9x3)
(Blinking) 6	6	Control ±12 V supply under voltage
(Blinking) 7	7	Output over current or bus over voltage
(Blinking) 9	9	Not Assigned
(Blinking) A	10	Bus OV detected by DSP
(Blinking) b	11	Auxiliary +5V Low
(Blinking) C	12	Not assigned
(Blinking) D	13	Not assigned
(Solid) E*	14	Processor throughput fault
(Blinking) E*	14	Power Up Self Test Failure
(Alternating) E1	225	Bus UV, Bus Voltage VBUSTHRESH
(Alternating) E2	226	Ambient Temp Too Low
(Alternating) E3	227	Encoder commutation align failed (Only CommSrc=1)
(Alternating) E4	228	Drive software incompatible with NV memory version
(Alternating) E5*	229	Control Card hardware not compatible with drive software version
(Alternating) E6	230	Drive transition from unconfigured to configured while enabled
(Alternating) E7	231	Two AInNull events too close together
(Alternating) F1	241	Excessive Position Following Error
(Alternating) F3	243	Parameter Checksum Error (Memory Error)

*FaultReset cannot reset these faults.

See ExtFault for further information on Blinking E, Blinking 1 and Alternating F3.

MOTOR SERVICE

The servo motor is flanged mounted and secured with four socket head cap screws. The motor removal has to be done in a sequence as described below.

1. The manual roll release handle has to be removed. The inner roll pin holds the handle to the shaft. Once this is removed the handle should slide off the shaft.
2. The belt guard has to be removed. It is fastened with four 1/4-20 socket head cap screws on the 100 & 200 servos and five 5/16-18 socket head capscrews on the 300B.
3. Remove the belt tension then remove the motor.
4. Install new motor and reassemble in reverse order of the previous instructions.
5. When reinstalling the belt, the tension on the belt should be 1/64" deflection per inch distance between the center lines of the pulleys using 1.5 to 2 lbs. force to cause the deflection. The best way is to tension the belt and try running the servo for a few cycles. If you get a high vibration on the belt when the feed stops then you have to readjust the belt tension. It will have to have more or less tension to stop the vibration of the belt.

MANIFOLD ASSEMBLY

The manifold assembly was designed to give the customer easy access to the components. The valve for the electric roll release and if supplied, the anti-backup valve is mounted on the side of the feed. The air regulator and pressure gauge is mounted on the input side of the feed. All can be easily replaced if needed.

ROLLER AND GEAR BOX ASSEMBLY

At this stage of disassembly, all field maintenance components are exposed and easily accessible. No further field service should be necessary on the roller and gear box assembly unless the gear train is suspected of a malfunction. The drive rolls should be checked for erroneous wear pattern while they are exposed and cleaned before reassembly.

MAINTENANCE PROCEDURES

DAILY

Wipe off feed rolls

Clean any dirt from
servo unit

Clean any dirt from
operators pendant

WEEKLY

Check wear pattern of rolls

MONTHLY

Check oil level

Check cables for cuts
or wear

REASSEMBLY OF UNIT

Prior to assembly, attention must be given to three points of contact that require an application of Moly-Cote, Lubriplate or other suitable heavy grease.

The three points are:

1. The antibackup piston which is located at the feed entrance.
2. The main roll piston and the spiral pins in the main roller tie plate which can be seen by viewing straight down through the center of the feed at approximately half way from the inlet to the exit roller. The piston is positioned horizontally at the base of the feed and approximately in the center of the feed if viewing from the gear box to the belt cover.
3. The mechanical roll release shaft located at the exit side of the feed. Three screws have to be removed and then the keeper plate can be removed. The inner shaft should be thoroughly greased to prevent sticking.

Do not apply excessive grease as it may fall onto the drive rollers and cause misfeeding due to material slippage. All bearings are sealed and need no additional lubrication.

LUBRICATION

The gear box oil must be kept up to sight gauge level and changed after every 2000 hours of use. Recommended oil is Mobil #SHC630 or equivalent. The oil reservoir capacity is 3.5 oz. The oil can be drained by removal of the drain plug located near the base of the gear housing cover, just below the sight gauge. The oil reservoir is filled through the pipe thread port occupied by the air breather plug near the upper edge of the gear housing cover.

NOTE: THE ORIGINAL BREAK-IN OIL IN THE GEAR BOX SHOULD BE CHANGED AFTER 100 HOURS OF CYCLE TIME AND EXAMINED FOR CHIPS OR FOREIGN MATTER. REPLACE THE GEAR BOX OIL PER INSTRUCTIONS.

The anti-backup rollers have been lubricated at the factory and should need no further attention. If they are found to slip in the reverse direction, consult the factory for further assistance.

PINCH ROLL & ANTI-BACK UP ACTUATING PISTONS

Periodically grease with lubriplate or equivalent grease to anti-backup & pinch roll actuating piston nose where it contacts the pressure plate.

PRECAUTIONS & SAFETY

NEVER - Put screwdrivers or foreign materials in feed rolls

NEVER - Hold onto material as it is being fed through the servo

NEVER - Wear neckties around the servo feed rolls

NEVER - Force the rolls open by prying on them

NEVER - Modify the mechanical aspects of the servo feed

CAUTION - Contact the factory before drilling any holes in the unit

CAUTION - Wear proper eye protection when working around the servo

CAUTION - Do not wear loose clothing around the servo feed rolls

WARRANTY

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 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 MERCHANT - ABILITY. The Company obligation under this warranty is limited to repairing or replacing, F.O.B. Madison, SD, 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

The RAPID-AIR CORPORATION reserves the rights in it's 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 computer 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.

KBX Servo Straightener

OPERATION

For set up only, place a short length of stock about four feet on bottom rolls, between the pinch rolls. Set the entrance guide rolls before lowering the cover. Make sure the top rolls are retracted to prevent stock deformation. Apply light pinch roll force on the stock to insure adequate assisting pulling force on the stock and to prevent slippage of the stock over the straightener rolls. Never overload the pinch rolls. This could damage the stock by extrusion causing permanent deformation.

With the cover down and the stock in place, position the idler rolls such that they are mid way between the drive rolls. The windows in the side of the cover are visual indicators of the idler rolls relative position to the drive rolls.

Do not lock the cover down at this time. With the cover held down firmly by hand, lower the vertical entrance knob until the first idler roll contacts the stock with only slight deformation (crease) at that station. Observe the degree of deformation at this first station by lifting the cover and noting the pattern of light reflecting off the stock surface. Rotate the vertical entrance knob 1/4 turn down and lock in place.

Close the cover, hand hold in place while lowering the exit knob. Continuously observe the changing deformation pattern until all but the last station reflects a change. The stock should reflect a diminishing deformation pattern until the final set of exit rolls afford no deformation. Lock the exit knob. Close the cover and latch.

CAUTION

Lateral adjustment, generally, requires no more than two or three turns either side of center. Never force idler rolls against the powered rolls. This will deform the stock.

CAPACITY

KBX104S 4" wide x .004 to .090 thick
KBX108S 8" wide x .004 to .080 thick
KBX112S 12" wide x .004 to .070 thick

Max thickness increases by same percentage as stock width decreases—up to max. of 150%.

LUBRICATION

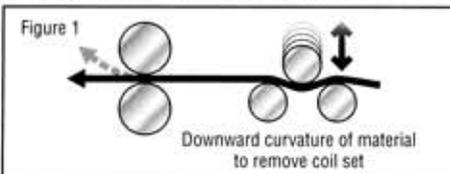
GEAR TRANSMISSION: Use Mobil 600W cylinder oil or equivalent. Reservoir is 4 oz. Oil should be changed every 2000 hours. Fill to oil level plug.

GREASE FITTINGS: Use Mobilux No. 2 or equivalent.

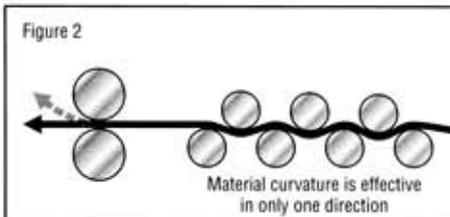
Adjustable Platen Stock Straighteners vs. Straighteners with Traditional Vertical Roll Adjustment

CONCEPT: The concept behind a movable platen containing the upper bank of rolls for straighteners can be somewhat difficult to grasp, but once the principles are understood the superiority of this system becomes obvious. To explain the differences between the adjustable platen system and one that uses traditional single-point vertical roll adjustment, we are describing both types of systems here.

VERTICALLY ADJUSTABLE UPPER ROLLS: For centuries the bending of materials has been done by variations of a three-roll arrangement as illustrated in **Figure 1**.

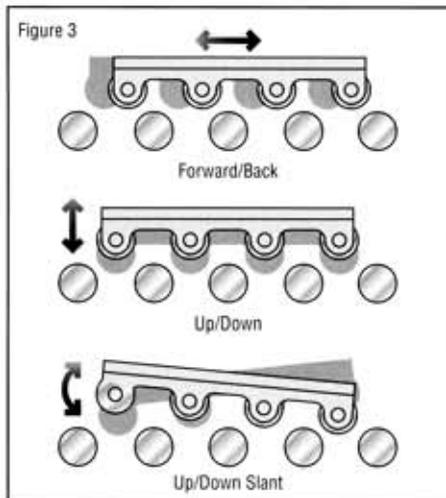


Bending occurs when one roll is forced into the space between the other two rolls for downward curvature of the material to remove coil set. Pressroom straighteners add multiple three-roll combinations in order to level the material in small increments at each stage. This method can provide acceptable results for some materials, but is limited because correction of material curvature is effective in only one direction as illustrated in **Figure 2**.

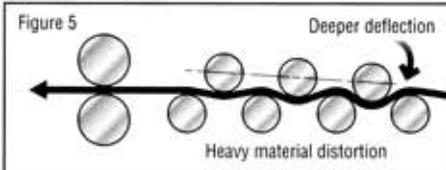
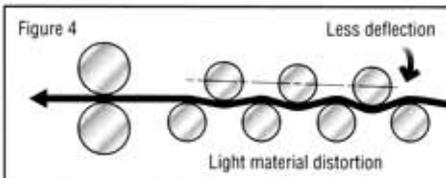


If the straightener is made to correct a clockwise curvature, it is often impossible to correct a counterclockwise curvature. The only available adjustment is the variation of the degree of bend at each station. This is true even for straighteners that have banked upper rolls that pivot for two-point adjustment.

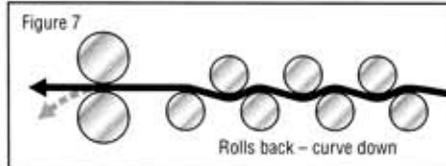
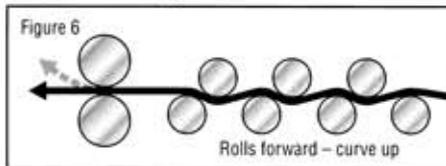
SIX-WAY UPPER ROLL ADJUSTMENT: After manufacturing straighteners with vertically adjustable rolls for many years, RapidAir developed and patented the adjustable platen type straightener as illustrated in **Figure 3**.



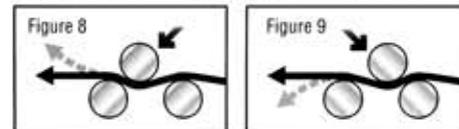
This design mounts the upper rolls in a platen which can be adjusted for *degree of bend* as illustrated in **Figure 4** and **Figure 5**



and for *curvature direction* as shown in **Figure 6** and **Figure 7**.



To more easily explain the concept, **Figure 8** shows a three-roll combination with the upper roll forward and **Figure 9** shows a three-roll combination with the upper roll to the rear.



Notice that the sharpest bend occurs where two rolls are in close proximity. When the upper roll is forward, the curvature will be up and when the forward roll is adjusted to the rear, the bend will be down. The degree of bend can be adjusted by a combination of vertical and horizontal adjustments.

ADVANTAGES: The high degree of flexibility afforded by the adjustable platen design provides a predictable straightening method for a wide variety of materials and takes a lot of the "Black Magic" out of pressroom straightener setup. The reduction in the flexing and distortion of the strip of material and the reduction of the straightening power required allows effectiveness with heavy materials. Additionally, the ability to place rolls in a proper close proximity allows effective straightening with very thin materials.

ROLL DIAMETER: The smaller the roll diameter in a straightener the better it is able to remove distortions in the strip of material, but this factor is compromised by the requirement of larger rolls in wider models of straighteners in order to prevent deflection of the rolls themselves. RapidAir straighteners are designed to optimize all factors (including number of rolls, diameter and position) within the published material capacities and specifications for each model.

SWING-OPEN TOP: RapidAir developed and introduced the swing-open top for straighteners in order to facilitate the cleaning of rolls and the threading of a new strip of material through the straightening rolls. For convenience and safety, each top is counter-balanced and held in the open position until it is clamped for operation. Roll adjustment settings are maintained when the top is closed and locked.

AVAILABILITY: All models of RapidAir straighteners are presently available with the adjustable platen design with an expanded range of models being introduced in the coming months.

