XII.   Crush Grinding

A.   Explanation of Crush Grinding

The distance between the stones is set to the desired ground length of the springs and is held there during the entire process. The carrier moves slowly between the grinding wheels, and the springs pass between the stones only once and then drop out the open trap door. Upon entering the grinder interior, the springs are compressed and then gradually relax as their excess length is ground away. The advantages of crush grinding are that production is higher in most cases, there's less wear on the sub plate and hold downs, and automatic loading is easier. Crush grinding is limited, however, by the thickness and hardness of wire that can be reliably ground in only one pass under the stones.

B. Crush Screen Controls and Explanation of Display (Figure 43 on page 34)

Figure 43 Crush Grind Menu

THE FOLLOWING COMMANDS ARE MADE PUSHING THE ENTER BUTTON

1. **Close**   - Moves both stones equally closer together to make the springs shorter.

2. **Open**   - Moves both stones farther apart to make the springs longer

3. **UP**   - Moves both stones equally upwards without changing the gap between them so that the length of the springs is not changed.

4. **Down**   - Moves both stones down wards equally without changing the gap between the stones and the length of the springs. The UP and Down commands are useful to move both stones up if the springs coming out of the grinder are snagging on the sub plate.

5. **Top Up**   - Moves the top stone up while leaving the bottom stone stationary.

6. **Top Down** - Moves the top stone down while leaving the bottom stone stationary.

7. **Dial Jog**   - Pushing the enter button toggles between jogging the carrier and
   Dial Run   running the carrier.

8. **Jam Test**   - Pushing the enter button turns on and off a sensor to stop the carrier if
   Off/ON   the automation jams up. Screen will say Jam On Norm. or Jam On Special.

   See Page 36 for more information on Jam Test

9. **Af-Off/ON -**   Pushing the enter button turns on and off the add feed function of the measuring gage when installed on the machine. When turned on the add feed moves the stones a tiny bit closer at the end of every ground length reading the gage makes on each spring that passes under the exit probe. This feature is to assist the gage keeping up with wheel wear. However, the gage will override the add feed if the wheels close up too much or too little. The amount of add feed is selected in the Set UP Menu for the gaging system (Reference page 36 for set up of the gage)

10. **Gage**   - Pushing the enter button turn the gage on or off. The gage continuously
    ON/Off   measures the length of springs passing under the exit probe. The length readings are sent to the computer. The program determines how much to adjust for wheel wear.

    Keep the gage turned off until production is running and the ground length is exactly the length needed.

11.   - The information on the left side of the screen keeps the operator informed of the status of the grinding operation.

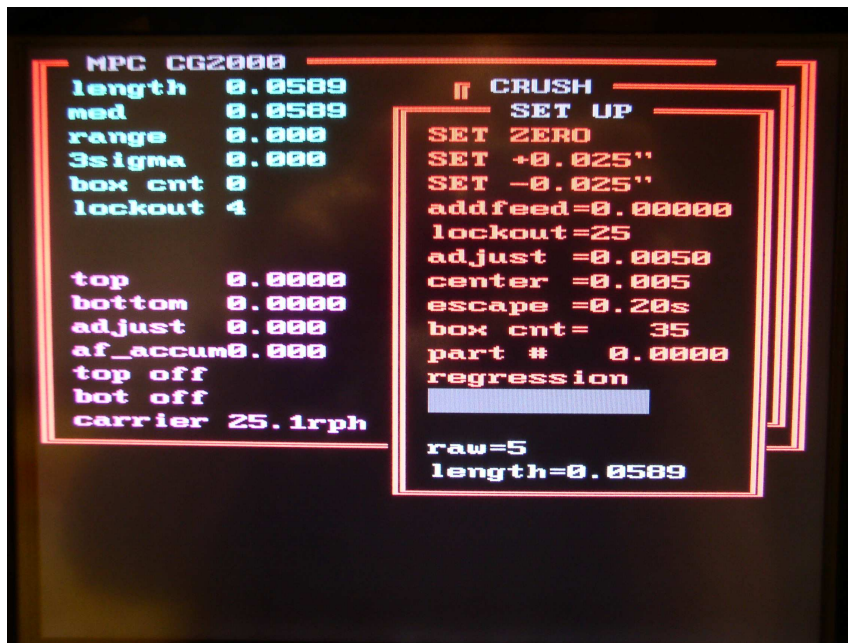   a.   **Length, Med, Range and 3 Sigma** - These are statistical numbers shown if the Exit Probe is turned on.

b. **Box Count / Count- Count** is the production of one row of springs being measured if the read switch is mounted. **Box Count** is the approximate number that is desired in a box as set by the operator. If Box Count is turned on in the set up screen, Box Count will be displayed on the screen instead of **Count**

c. **Lockout** - This is the number of holes that must pass beneath the Exit Probe before another adjustment is made to the grinding wheels for wear.

d. **Top, Bottom and AF Accum.** - These numbers displays the amount of adjustment made to the wheels.

e. **Top Amp, Bot. Amp -** The amperage of the top and bottom motors.

f. **Carrier** - The revolutions per hour that the carrier is rotating.

The following is a more detailed explanation of Jam Test. (Reference pages 34 and 35) The Jam function is turned on and off in the set-up menu in the crush grind screen. An additional jam control has been added. The original Jam is now called **Jam On Norm.** The additional jam is called **Jam On Special.** The operator can select using the cursor and the enter button **Jam Off, Jam On Norm** and **Jam On Special**. The differences between the two jams features are:

Jam On Norm - When automatically loading the grinder, the carrier/dial needs to be stopped if a spring jams between a hole in the carrier and the insertion nozzle. When a jam occurs, the nozzle moves forward and a sensor sends a signal to stop the carrier. The **Dial Run** on the screen will change **to Dial Jog.** When the operator clears the jam, the carrier is restarted by pushing the enter button to toggle to **Dial Run.** A second sensor can be added. This sensor shuts off the carrier if a spring does not go completely down in a hole. This is sold separately from the automation system.

Jam On Special - Jam On Special can be use with or with automation. A read switch that is part of an automation package must be used as a minimum. The read switch is used for sending signals to release springs from the mechanical escapements as part of the automation system. If the read switch has not seen an empty hole go past it for 10 seconds, the carrier will be shut off, and **Dial Run** will change **to Dial Jog.** This is used to ensure that if a spring jams between a hole in the carrier and the drop out or the entrance to the subplate that the carrier stops. The operator uses the Dial Job to clear the jam. After the jam is cleared, the operator selects **Dial Run.**

Figure 44 Set Up Screen

C.   **Set up Menu for Crush Grinding** (Figure 44 on page 36)

Use the arrows keys to move the cursor to highlight **"Set UP"** and push enter. The Set Up screen for crush grinding will be displayed.

1.   *Set Zero, Set +0.025, Set -0.025"* - If the Exit Probe is installed, it must be calibrated. The following calibrates the exit probe. Refer to page 50 Section XIV. for instructions on mounting the Exit Probe. Drop a ground spring with a known length into one of the holes in the carrier. Use the **"Dial/Job Switch"** on the console to move the spring under the target of the Exit Probe. After the spring is directly and completely under the target, turn the micrometer until the target rest on the spring. Make sure that the target is parallel with the sub plate.
Select **"Set Zero"** from the Set UP Menu. Turn the micrometer one complete turn or .025" counter-clockwise and select **"Set +.025"**. Then turn the micrometer two turns or .050" clockwise and select **"-.025"**. Turn the micrometer one turn or 0.25" counter-clockwise to return to the beginning position.

.

2. *Addfeed-* This value is entered as a fixed amount of adjustment for stone wear for each spring that passes underneath the target on the exit probe. This amount is a trial and error selection. If you determine how many holes are in the carrier and how much the wheels wear for one carrier, the proper add-feed can be calculated. For instance if the carrier contained 100 holes and the stones wore .001" for one carrier, the correct add feed is .00001" .001/100.

3. *Lockout -* After the computer has made an adjustment to the head position, it will take some time for the result to show up in the ground springs. The lockout value specifies how many spring readings to ignore before making additional adjustments to the grinding wheels. As a starting point, put in approximately the number of holes under the grinding wheel from the center of the grinding wheel to the exit point.

4. *Adjust -* The Crush Menu options "*close", "open", "top up" and "top down*" move the heads. The value entered here is how much movement is made at a time. The default value is 0.001". For the open and close options, this amount is equally split between the two heads. If the adjust value is set at .002", the top head will move .001" and the bottom head will also move .001"

5. *Center -* This value is similar to "adjust" but applies to the menu options "up" and "down" which moves both heads without changing the gap between them. The default value is 0.005".

6. *Escape -* This is a timer for automation. It tells the fingers on the automation how fast or slow to cycle. If the fingers that hold a spring and drop a spring cycle too fast or too slow, the automation will not escape the springs into the insertion nozzles at the correct time. If the escapement system is feeding every other hole, the time delay is set tool long. If no springs are being released by the fingers, the escapement delay is set too short. To change the timing, go to set up screen and use the cursor to select *Escape*. Using the enter button change the time either up or down. When you push the enter button the time will flash on the time. Type in the new time.

7. *Box Count -* This feature allows the operator to set how many ground springs he wants in a container, Box Count is turned on by typing in a production count like 2,000. When 2,000 spring holes pass under the read switch, a warning light or horn will notify the operator to change the container. Box Count will show on the run screen. If the operator wants to know the production count ground in one row without a warning, the operator types in all zeros. The run screen will show Count or total production of one row since the gage was turned on. The warning light/horn will begin at 20 springs away from the box count number and will flash or blow for six seconds. At 10 springs away from the box count number, the warning will be activated for 10 seconds. At the box count number, the warning light will last for 20 seconds then turn off. The carrier will continue to run.

8. *Regression/Barrier* - This selects which philosophy for the computer to use when making judgments about how much to adjust head positions for wheel wear. This is only used when the Exit Probe is used to measure the springs coming out of the grinder. The control should work best in "*Regression".* If the springs coming into the grinder vary more than usual on free length, the "*Barrier"* mode will work best.

"*Barrier Avoidance"* - Adjusts for stone wear based on measuring deviation of the last 7 springs.
"*Regression"* - The more sophisticated method that tries to predict future stone wear by patterns in the measurements of the last 77 springs.

D. Setting The Position Of The Top Wheel For Crush Grinding

The position of the carrier and bottom stone should have been set as detailed in Section X. "Basic Set Up Procedure" on page 32. The position of the top stone most likely was set after the last dress of the wheels. Reference Section IX. Subsection G on page 31. "Setting Grinding Stones For Grind Height (Grinding Height Stored In Memory)

From the "Main Menu" select "Crush Grind"

Place a ground sample spring or gage block onto the bottom stone, and use a combination of the head movement options such **as close, open, up, down, top up and top down** in the crush menu. In this screen, the heads move an amount set in the setup screen when the enter button is pushed. Keep moving the spring as you are doing this, and stop the head when you feel friction from both stones. When it's positioned right, exit the menus until you get to the Main Menu, and select "Crush Grind." At this instant the current position of the top stone is stored as the "grind line." Remember to set the hold down for crush grinding.

If you have to move the top head a long distance, a faster method is to select "Utilities" from the Main Menu then select "Button Moves" You can use the top head down switch to get close to the desired height.

E. Carrier Speed

Carrier speed is adjusted from 0 to 60 Revolutions-per-hour by a knob on the lower center of the console. The speed in RPH is displayed on the bottom line of the console screen, and is highlighted in white when the carrier is actually running.

F. Running Springs

At first, grind only a few springs, check their length, and make any adjustments to head position by using the "Top Up" and "Top Down" options on the Crush menu. Then you can go into full production.

If the Moyer Exit-Mounted Probe is installed, adjustments for wheel wear will be made for you, and stats will be displayed on the upper left of the console screen.

If you are taking measurements and adjusting manually, you should take five springs every ten minutes or so and note the average length and range of readings.

If these stats look good, you may want to increase the carrier speed 10% and sample some more springs soon. You could keep slightly increasing carrier speed while the measurements are looking good and find a more productive speed to run these springs.

XIII. Down feed Grinding

A.   Explanation of Four-stage Down feed Grinding

At the start of down feed grinding, the stones are apart a distance equal to or slightly less than the UNGROUND length of the spring. During grinding, the top stone gradually moves closer to the bottom stone, until the distance between them is equal to the length you wish your finished springs to be. The distance the top stone moves should be about equal to one wire diameter. I'll call this its "travel".

"Four-stage profile" means this travel is accomplished at different rates. In Stage 1, the top stone moves down fast to one-half the travel. As the first stage removes mostly the end tangs, 50% of the travel can be done very quickly. In Stage 2, the top stone moves down 33% of the travel. The top stone moves down the last 17% of the travel in stage 3. The last (fourth) stage is called "sparkout" and the top stone does not move down anymore, since the travel is complete. The springs are taken   thru the grinding stones for many passes to equalize the lengths, clean up any burning and to give a nice finish.

B.   Set Up And Running Springs In The Down feed Grinding Mode

1. From the "Main Menu" select "Down feed Grind

C.   Setting Heads To Final Grind Length Position

This position is usually set immediately after dressing. Reference Section IX. on pages 24 thru 31. You now need to set the final, ending position at the end of the down feed cycle of the top stone. One method is: from the "Main Menu", select "Utilities", then "Button Moves." Place a ground sample spring or gage block onto the bottom stone, and use the up/down top toggle switch on the console to lower the top stone onto this spring. Keep moving the spring as you are doing this, and stop the head when you feel friction from both stones. When it's positioned right, exit the menus until you get to the Main Menu, and select "Down feed Grind." At this instant the current position of the top stone is stored as the "final position". This final position may also be set using a combination of the head-movement options close, open, up, and down in the "Down feed Menu."

D.   Setting Initial Position Of The Top Stone For An Unground Spring

As the wheels have been set for a finished ground spring and as we want to down feed grind, the top stone must be raised up for an unground spring. The following explains two separate methods for setting the up position of the top head prior to the head coming down to the finished ground length position.

E.   Setting Beginning Position Of the Top Stone With An Unground Spring. Remember the top head will move down from this position to the final ground length position. (Reference Figure 45 on page 40)

Figure 45 Set Beginning Position

1.   From the downfeed screen select "Set UP". The DF Set UP screen will pop up. Move the cursor down to "Set Position" and push the enter button. A small screen will appear called fixed button moves.

2.   Select a large value of head movement than use the top head up/down toggle switch to raise the top stone until you can place an unground spring upright between the stones with a little friction.

(To get the maximum amount of production, part of the tang can be removed during the loading process of the carrier prior to the down feed cycle beginning. To remove part of the tang during the loading, the initial position of the top head needs to be slightly lower than the height of an unground spring. A good rule is to move the top head down from the length of an unground spring about 10% of the wire size.) REMEMBER TO SET THE HOLD DOWN A LITTLE ABOVE THE TOP STONE'S INITIAL POSITION.

3. Select "EXIT" when you are satisfied with your initial position. The head automatically retracts to this height after the end of a down feed cycle, in preparation for the next cycle. When you exit, the initial position will be put in memory.

4. The screen will change form "Fixed Button Moves" to the "Set UP" screen and the cursor will be at travel. THE AMOUNT OF TRAVEL MUST BE ENTERED. THIS FIGURE SHOULD BE CLOSE TO THE DIAMETER OF THE WIRE IN THE SPRING THAT IS GOING TO BE GROUND.

F. Setting The Beginning Position Of The Top Stone Using The Amount Of "Travel"

1. An alternate method of setting initial position is to directly enter a figure into the "Travel" Menu Item and not use an unground spring. The computer remembers the beginning position of the top head from the downfeed job just finished. When you enter the down feed screen, the top head will move up whatever the amount of travel was set for the last job. The first step is to erase the previous amount of travel then set the new travel.

2. From the down feed screen select "Set UP". Look at the amount listed under travel and remember this amount. Move the cusor to "Set Position" and push the enter button. The screen will change to "Fixed Button Move" screen.

3. Select a large head move. Use the Top Head Up/Down toggle switch to move the head up an amount needed for the travel required in the new down feed job. Then move the top head back down the amount of travel set for the previous down feed job. The step of moving down the amount of travel set for the previous down feed job can be eliminated by calculating the difference between the old travel and the new travel required.

4. Select exit which will store in the computer's memory the new beginning position. The fixed button move screen will change to the down feed Set Up screen and the cursor will be at the "Travel". Enter the new travel amount.

G.   Down Feed Screen Controls And Explanation of Display (Figure 46 on page 42)


```
MPC DF2000 (C)1992          DF MENU
stage1                      Stand By
stage2                      Load
stage3                      Grind
spark                       Empty
                            Regrind

emptying                    close0.0010
                            open 0.0010
G_watch   0.6m              up    0.005
G time    0.0m              down 0.005
T_watch 36.3m               Set Up
T_time   49.9m              AddFeed off
                            Gage Off
top 0.0000    0.0000        MAIN MENU
bot 0.0000    0.0000


  load@ 1.1rpm
top spindle off med    0.0000
bot spindle off range 0.000
```

Figure 46 Down feed Screen

1. **Standby**

   The very top option on the "DF menu" is "Stand by" which stops the carrier. This is recommended for safety if you walk away from the machine for a brief period and don't want to power down the spindles or the entire machine.

2. **Load, Grind, Empty And Regrind**

   These are command that the operator uses to perform the down feed cycle. These will be explained later in the manual.

3. **Close**
   This command moves each stone equally closer together to make the springs
    shorter.

4. **Open**
   This command moves each stone farther apart to make the springs longer.

5. **UP**
   This command moves both stones equally upwards without changing the gap
    between them and does not change the length of the springs.

6. **Down**
    This command moves both stones downwards without changing the gap between them and does not change the length of the spring.

7. **Toggle Setting** (Toggle means changing from on and off)

    a.   Addfeed - Off/On This value is how much each stone wears in one down feed cycle. If "AF off" in the Down feed Menu is toggled ON, this value is added to each stone's position at the end of every cycle. If we specified the add feed to be .001". the top head would move up to be ready for the next down feed cycle .001" less than the time before. The gaging system determines this value automatically, if installed. If not, you can estimate this value from your manual sampling data.

    b.   FB-Off/On This turn on and off the Exit Probe. This device will measure the length of the springs at the end of a down feed cycle. The software will then adjust the stones to compensate for wear using statistics.

8. **The display to the left of the screen provides information to the operator as to the status of the grinding operation.**

    a. *Stage 1,2,etc.*

    Progress of the down feed cycle is displayed by the spinning stars in each stage.

    b. *E-Stop*

    Displays when the grinder is in a standby mode or has been shut down by an Emergency Stop.

    c. *Below the stars, the screen will display, the step that the operator is doing such as loading.*

    d. *G Watch* - Grinding time from start of grind thru spark out including pause*.*

        G Time - G Watch Time for the previous load so a comparison can be made to the current load*.*
        T Watch - Total time for loading, grinding and unloading.
        T Time - T-Watch time for previous load so a comparison can be made to the current load.

    e. *Loads* - Displays the loading speed of the carrier that is adjusted by the pot on the console.

    f. *Top and Bottom Spindle* - Displays the motor amperage of each spindle.

H. Changing Down Feed Controls Using the Down feed Set Up Screen (Figure 47 on page 44)

Figure 47 Down feed Set Up Screen

Select "Set UP" From The Down Feed Screen And The Down Feed Set UP Screen Will Appear. Some of the items on this screen will be discussed when we go to Section XIII. "Making A Profile" on page 47

1.   *Adjust*

The Down feed Menu options "close" and "open" change the gap between the stones by the amount entered at *Adjust*. Each stone moves half this amount. The default value is 0.001".

2. *Add Feed*

This value is entered by the operator and is based upon how much wheel is worn in one cycle of the down feed. If *Add Feed* is toggled on, the *Add Feed* value is made after each cycle of the down feed grind. The value selected is much larger than the value selected when using the *Add Feed* in "Crush " grinding. If the stones wear in one cycle, the value to enter is .001"

3. *Feedback*

This value is adjusted by the operator to fine tune the Exit Probe measuring system. If the measuring system is not keeping up with the wheel wear, increase the percentage figure. If the measuring system is over adjusting, decrease the percentage value.

4. *Job Menu* (Figure 48 on page 45)

The operator can type in a part number for saving the profile of a particular job. The job number is typed in the "Down Feed Set Up" menu. The job number is kept in the "Job Menu" The first job number entered will save the information to job number 1 of 1 in the "*Job Menu*". This menu will show this part number along with job 1 of 1. If the second part number is typed in this place, the first job number profile will be replaced by the second job number profile when the operator exits the "Down Feed Set Up" menu. To save the 2nd, 3rd, etc. profiles, the operator goes to the Job Menu FIRST. Copy the first job to 2 of 2. When the profile for the second job is entered and when the job number for the second job is entered, the second profile will be saved a job number xxxxx 2 of 2. Refer to page 51, Section XV for further information on savings jobs.
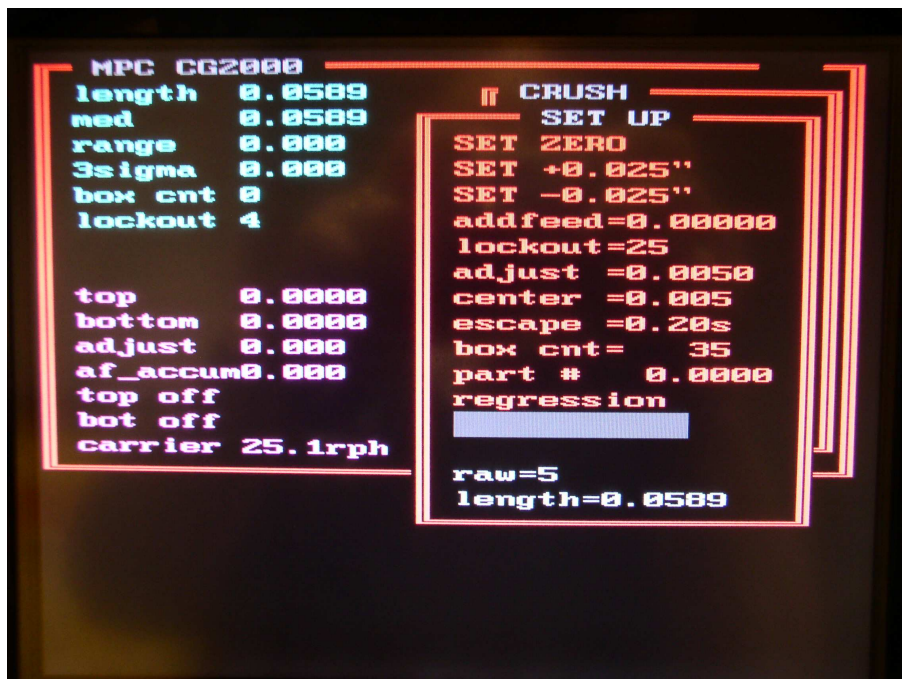

Figure 48 Jobs Menu

5. Gage Set UP

Set Zero, Set +0.025, Set -0.025" - If the Exit Probe is installed, it must be calibrated. The following calibrates the exit probe. Refer to page Section   for instructions on mounting the Exit Probe. Drop a ground spring with a know length into one of the holes in the carrier. Use the "**Dial/Job Switch"** on the console to move the spring under the target of the Exit Probe. After the spring is directly and completely under the target, turn the micrometer until the target rest on the spring. Make sure that the target is parallel with the sub plate.

Select "**Set Zero**" from the Set UP Menu. Turn the micrometer one complete turn or .025" counter-clockwise and select "**Set +.025**". Then turn the micrometer two turns or .050" clockwise and select "**-.025**". Turn the micrometer one turn or 0.25" counter-clockwise to return to the beginning position. (Reference page 46 Figure 46 For Gage Set Up Screen. Refer to page 50 Section XIV "Gage Set UP" for further information on gage set up)

Figure 49 Set Up Screen Gage

I.   Making a Profile

1. *Setup Menu* (Reference Figure 47 on page 44)

     From the "DF MENU" select "setup." A "SET UP" window will pop up allowing you to adjust the parameters affecting down feed grinding. The top half lists time and spindle for each of four stages. The top stone will move 50% of the downfeed travel in Stage 1, another 33% in Stage 2, the last 17% in Stage 3, and remain stationary in Sparkout. These percentages of travel are built into the software and are NOT adjustable. What you can adjust is the TOTAL travel (as in the next two sections), the TIME in minutes for the head to take to travel each stage, and the maximum POWER permitted to the spindle motors.

2. *Time*

     If you specify longer times, the top head will move down slower, removing metal more gradually, and slowing production. This is needed for springs made of thick wire (over 1/8" diameter.) Specifying shorter times will remove metal quickly, allow faster production, but may decrease quality. It will be okay for springs made of thinner or softer wire.

     For new jobs, you'll have to experiment with adjusting these times, grinding only a few springs at a time until you are satisfied with the results. Keep in mind that the thickest part of the wire is ground in Stages 2 and 3, these are the ones to be more careful of.

3. *Power*

     You also notice a % below each time. This % puts a maximum limit on the spindle power, which is monitored constantly by the computer. During down feed grinding, if the spindle motor exceeds this percentage of its maximum rated power, the down feed movement of the top stone will be automatically paused to prevent burning the springs or stone. If a pause occurs, the screen will note, "Pause".

4. *Carrier Speed*

     The standard carrier speed during the down feed grinding cycle is 17 revolutions per minute. If the springs are pulling out of the holes in the carrier or if grinding a large O.D. to the length, slow the carrier speed. This is done by entering a new revolution number to the right of "Grind"

     When you have programmed the profile and are done with the "Setup" menu, select "DONE." This will return you to the "DF MENU" to let you initiate grinding.

5. *Maximize Production*

     This step is critical in obtaining the maximum amount of production. It is always a trial and error step as the time used in each stage in the down feed grinding stages must be set based upon wire size and type, O.D. and rate of the spring. When setting up a job not previously run, set the times fairly short and the amps fairly low. Grind a few loads and observe if the max amp settings cause the down feed cycle to enter pause

in the first three stages. If the heads are pausing in a particular stage and if the springs are turning color in a particular stage and the heads are not pausing decrease the amps. The amps and the times are set best if the heads pause a few times at the end of stage 1 and several times in stage 2 and 3 and the springs turn a slight yellow in these stages. If the grinder is constantly going into pause, increase the time in the stage. If the grinder is seldom going into pause, decrease the time in that stage. The fourth stage should not be making the springs any shorter but should be just equalizing the lengths. Hence, set the time and amps fairly low.

J.   Running the Grind Cycle

1. *Loading the Carrier*

You should be in the "DF MENU" and have already set your initial and final positions and down feed profile. We will now be using the top half of the DF menu to take the grinder through a typical down feed cycle.

From the menu, activate "Load". The powered trapdoor will then shut and you can either load springs into the carrier holes by hand, or turn on the Moyer Automation to load them for you. The load speed is adjusted by the dial speed knob on the console.

2. *Initiating Down feed Grind*

When the carrier is full (or you may only be grinding a few test springs) select "Grind" from   the DF menu. KEEP YOUR HANDS AWAY FROM THE CARRIER! The carrier will speed   up, and the top head will commence its downward movement. On the console screen, please   note the window on the upper left. It displays the progress of the grind as a series of stars, and   will completely fill as the cycle nears the end.

3. *Unloading the Carrier*

At the end of down feeding, the top head will come back up fast and the carrier will slow back down to its original speed. Then, select "Empty" from the menu. The carrier will stop for a brief instant while the trapdoor opens, allowing the springs to fall free into the bin that should be placed underneath.

For the first few cycles you run, watch the springs fall to ensure that they all fall FREELY. If the carrier holes had not been bored with adequate clearance, the hot expanded springs may not fall. DO NOT PUSH THE SPRINGS OUT WITH YOUR HANDS. PUSH THE PANIC BUTTTON AND ADVISE YOUR SUPERVISOR FOR CORRECTING THE PROBLEM.

IMPORTANT NOTE!! - Keep your fingers away from the dropout area, as they may be injured by the powered trapdoor, or pinched between the carrier and side of the dropout.

The down feed cycle is now complete, and the carrier is ready to be loaded again with new springs. You can load past the dropout while the carrier is emptying. Then select "Load" to close the trapdoor when all the ground springs have dropped out, finish loading, and repeat the cycle by selecting "Grind".

4. *Regrind*

If the springs are too long, they can be reground. Prior to emptying the carrier, measure the springs. If too long, move the cursor to "Regrind" and push enter. The down feed cycle will begin again but the first two stages will be done very fast. The last two stages will be done as set up in the profile.

K.   Checking the results

You will want to examine the ground springs for burn, correct length, and squareness. The flat ends should be silver with very fine scratches. A yellow color indicates heat treatment at only 300 to 350 degrees F (150 to 180 degrees C) and is usually okay. Burnt ends are colored deep red, blue, or black, getting darker towards the tang. This indicates that in the down feed profile, you need to increase the time for Stages 2 and/or 3. You may also want to power down the spindles and examine the stones for burning or glazing. A quick dress will restore them.

XIV. Gage Set Up

A. Installing the Exit-Mounted Probe

The probe is mounted to the sub plate between the grinder exit and dropout area using the holes on the underside of the sub plate. Air lines must also be connected to allow the probe to retract up while down feed grinding. The pivoting read switch assembly should be mounted over the carrier holes just past the dropout area, since it must measure empty holes. The cables from both these units plug into a box near the dropout on the machine.

B. Calibrating the Exit Probe

The selections at the top of the "Set UP" window allow calibration of the Moyer Exit-Mounted Probe. To calibrate the probe, drop a spring ground to known length, or the length you wish to hold, into the carrier. Use the "Dial Jog" console button to run the carrier until the spring is directly and completely under the pivoting foot of the Exit-Mounted Probe. Then turn the micrometer until the foot rests FLAT on the spring. In this condition, we want the probe to measure zero deviation.

Select "SET ZERO" from the gage "Set Up" window. Then, turn the micrometer one complete turn (0.025") counter-clockwise and select "SET +0.025"." Then turn the mic two turns clockwise and select "SET -0.025"." Then turn the mic one turn counter-clockwise again to return it to its original zero position in preparation for use.

At the bottom of this window are two readings. "Raw" gives the internal binary value returned by the gage electronics, and is of diagnostic use to Moyer engineers. If the exit probe is set up properly, this value should be between 1848 and 2248.

C. Setting Read Switch

The read switch set the timing for taking a reading of the ground length of the spring. It must be set to take a reading when the spring being measure is directly underneath the target of the Exit Probe. With the spring directly under the Exit Probe, Slide the read switch across the empty hole until the LED just lights. This is the correct position for the read switch to be on when a spring is centered flat under the probe foot.

D. Adjusting The Exit Mounted Probe To Match Ground Lengths

1. Run parts without the gage on and measure to see if good. Adjust the ground length until the springs are at the correct length.
2. If springs are good, the med (Medium) on the screen should be 0.0000" or close to 0.001"
3. If springs are measuring long and the med reads 0.0000" or close, move micrometer counter-clockwise
4. If springs are measuring long and the med reads long but the springs are within specification do nothing and let the gage center.
5. If springs are measuring long and the med reads short, move the micrometer counter-clockwise.
6. If springs are measuring short and the med reads 0.0000" or close move micrometer clockwise.
7. If the springs are measuring short and the med reads short but the springs are within print do nothing and let the gage center.
8. If springs are measuring short and the med reads long, move the micrometer clockwise.

XIV. Saving Set UP Data For Future Runs

A. Overview: Many of the grinder's aspects are stored for you in a battery-backed static memory chip (or NVSRAM). Actually, this chip will let you store data for as many as seven different jobs! The "Change Jobs" main menu option lets you manipulate this feature. When you select the "Change Job" menu option, the "JOB MENU" menu appears.

B. Job X1 of X2: Lets you switch over to the next job in memory. The first number X1 is the current job number the grinder is using, and X2 is the total number of jobs you currently have defined in the SRAM. Selecting this menu option merely increments X1 and loads its setup into the grinder's main memory for it to use from now on. If you increment past X2, it will start over at job #1.

C. Copy Job: Is the method used for easily adding a brand new job. If you have blank room in the SRAM (less than 7 jobs) this option will copy all of the current job's information into the next available job number, increase the total number of jobs by 1, and make this new job the current job. For example, you have 4 jobs stored now. You wish to make a new job similar to job #2. You would change the current job to 2, if it isn't already, then Copy Job. Now, the current job is 5, which consists of all the information in 2. You would then use the Down Feed or Crush Grind routines to fine tune your new sequence.

D. Delete Job: This option erases the information in the current job, and moves all the higher jobs down one. If you have 4 jobs and delete #2, then #3 becomes #2, and #4 becomes #3. You will then have 3 jobs total, and your current job will be set at #2. You will be prompted by the computer before all this happens, in case you select this option by mistake.

XV. Maintenance

A.   Material Required

Bearings   - Kendall Super Blue **(Prior to greasing wipe off grease zerks)**

Air Regulator Oil   - Marvel Air Tool Oil

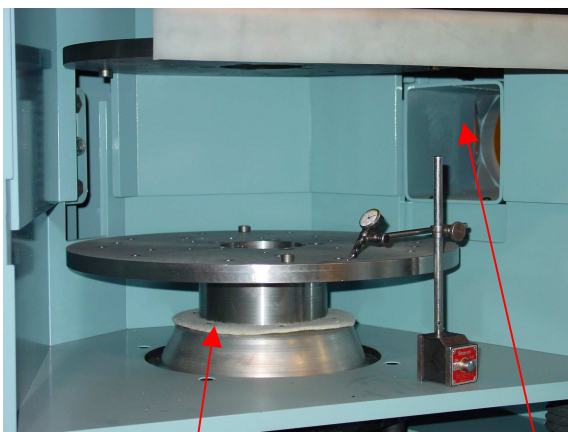Cone Drive Oil   - Mobil SHC 634

Cleaning and Lubrication
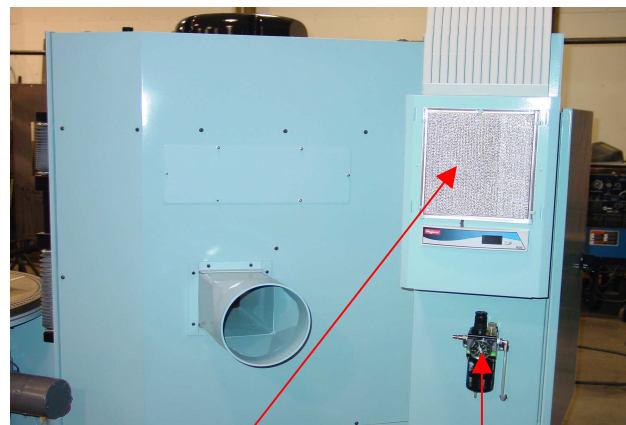

Figure 50

Keep grit below spun aluminum
Conditioner

Figure 51

Filter For Air   Air Regulator

Remove Grinding Build UP

1. **Daily**

   General - clean off the machine each day to remove grit. If using air, maintain a low pressure so that grit is not forced into working components of the machine or your eyes.

   Air Regulators/Oilers - should be filled with oil suitable for pneumatic devices and their seals. Commonly available "Marvel Mystery Oil" is good for this. Push in the pin at the bottom of the regulator to drain away all accumulated water, and change the filter if it's getting dirty. Figure 51

2. **Weekly**

   Cleaning - Every time that grinding wheels are changed. It is very important to clean under the bottom stone mounting plate. KEEP THE DUST BELOW THE SPUN ALUMINUM HOUSING AROUND THE STONE MOUNTING HUB. Also check the exhaust opening for build up of hard grinding swarth and remove. Figure 50

   Filter Air Conditioner - Remove filter from air conditioner and blow off and replace. (Figure 51)
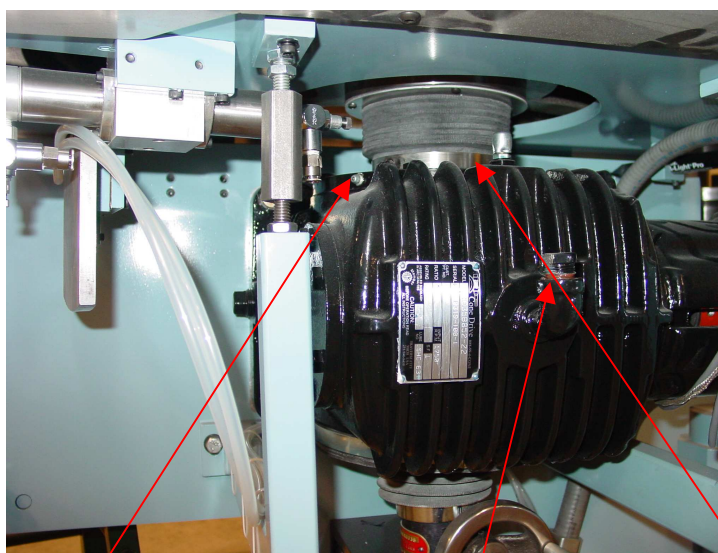
   Blower If Purchased- Check filter and replace if dirty. This blower pumps air thru the spindles. The blower can be damaged if any large particles get into the blower.

   NEVER FORCE THE CARRIER UP OR DOWN. If the carrier moves hard, the Cone drive shaft must be removed. Loosen the set screw holding the Cone drive shaft to allow lifting the Cone shaft up and out of the bore in the Cone Drive. Some models have a bellows attached to the Cone Shaft. Remove the hose clamp on the bellows prior to pulling the shaft out. Clean the shaft very good as the slightest amount of grit can make the Cone shaft move up and down hard.

4.   Every 3 Months

Cone Drive - A zerk is provided to grease the top bearing of the Cone Drive. The zerk is located under the sub plate on the hold down side of the machine. Also clean around the boot where the drive shaft for the carrier goes into the hollow bore of the cone. Replace the boot if it is torn. This is important. If grit gets onto the drive shaft, the drive shaft will become stuck in the hollow bore and will not adjust the carrier up and down easily. (Refer Figure 52 on page 54)

Figure 52

Zerk For Greasing   Oil Level

Top Bearing   Keep Clean

5.   Semi-annually

General Cleaning & Inspection - The outer guards may be removed to clean around the bellows, exhaust, and dresser area. Check all bellows for any holes and replace as needed.

Flange Bearings - Grease the six ball screw flange bearings (3) top and (3) bottom with two pumps of grease

Cone Drive Seals - Clean the top of the Cone Drive so that any grit laying on the top seal will be removed.

6.   Annually

Carrier Gearbox - check oil level in the elbow provided and add Mobil SHC synthetic bearing and gear oil.

Ball Screws and Nuts - Remove the hose clamps around the top and bottom bellows covering the three top and three bottom ballscrews. Using an oiler put a mixture of 50% STP and 50% Kendall Super Blue Grease at the top of each ball screw. Prior to reinstalling the bellows, clean off any oil off the surfaces of the bellows mount. This is important for reassembling the hose clamps around the bellows. (Refer To Figure 53 on page 55)

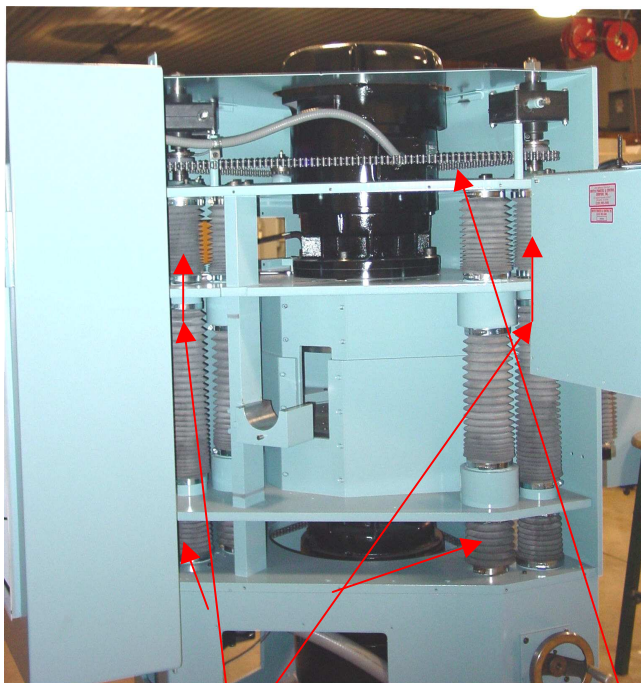**Roller chains** - should receive brushing to remove any grit.

Figure 53

Roller Chain Top Head

Two of the Ball Screws For Top & Bottom Heads

XVI. Utilities Menu

Selecting the last item on the "Main Menu" presents you with a list of "Utilities." The two you will use most often are presented below, followed by the ones you will use rarely, if at all: Button moves - you will use often. Selecting this item presents you with the "Fixed Button Moves" menu allowing you to use the rotary toggle switches on the lower left of the console to raise and lower the top and bottom heads. For details on this, see the "Menu-driven Head Position" topic in the "Controls and Adjustments" chapter early in this manual. Sometimes this option may cause loss of stored dress position. Return (CONTINUE) - exits from the "Utilities" menu and returns you to the "Main Menu. "The other "Utility" selections are pretty arcane and used mainly for diagnostic purposes. They are explained as follows:

Remove drive power - removes power and control from all CNC drives. This frees them for manual manipulation or maintenance.

Return drive power - restores power and control to all CNC drives, making computer control possible again.

Data port dumb term - the computer in the console is equipped with two RS-232 serial communication ports. One of these ports transmits length deviation readings from a Moyer Probe, in DataMyte format. The port can be connected to a DataMyte device, or to the Moyer Realtime Data Collector.

Selecting this menu function presents you with a clear screen and converts the console computer into a "dumb terminal" allowing you to test communication on this serial port. What you type on the keyboard will be sent to the connected device, and what displays on the screen is feedback from the device. A full size alphanumeric IBM-compatible keyboard is recommended for this, and can be plugged into the back of the computer after opening the console. HIGH VOLTAGES EXIST INSIDE THIS CABINET, SO BE CAREFUL!

To get out of this function, hold down the "Ctrl" key and tap the "Z" key. You will be returned to the "Utilities" menu.

Drive port dumb_term - the other RS-232 serial port of the computer is used to send CNC commands from the computer to all the CNC drives.

Selecting this menu function presents you with a clear screen to send commands to the drives using the industry-standard X-language. This language is presented in Compumotor, Modulynx, and other CNC drive manuals. Be sure you know what you're doing before attempting diagnostics with this function. Again, you will need to plug in a full alphanumeric keyboard for this.
To get out of this function, hold down the "Ctrl" key and tap the "Z" key. You will be returned to the "Utilities" menu.

Return to DOS (QUIT) - completely terminates the CNC software and gives you access to the underlying DRDOS operating system of the console computer. This allows file copying, some diagnostic functions, and other tasks beyond the scope of this manual.

To return to the CNC software, press 1, then ENTER. Or you could use the toggle switch on the lower right of the console to turn the computer OFF, then ON again. You will be presented with the "Main Menu."