4RAP Manual

4 Roll Plate Roll CNC Control

Waldemar Design & Machine L.L.C.

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Contact Page

If you have questions about your machine's capacity, wish to consult about a part you are rolling, need a tech to service your machine, need service parts, or have an emergency repair please contact us.

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Welcome to your new CNC Plate Roll Control!

Waldemar Design and Machine is known for well-designed, robust machines and easy to use, intuitive controls.

The 4R-AP (4 Roll, Automatic Cycle, Programmable) is the latest generation of WDM controls. Up to 1000 programs can be quickly created, stored, and easily retrieved via the drop-down menu.

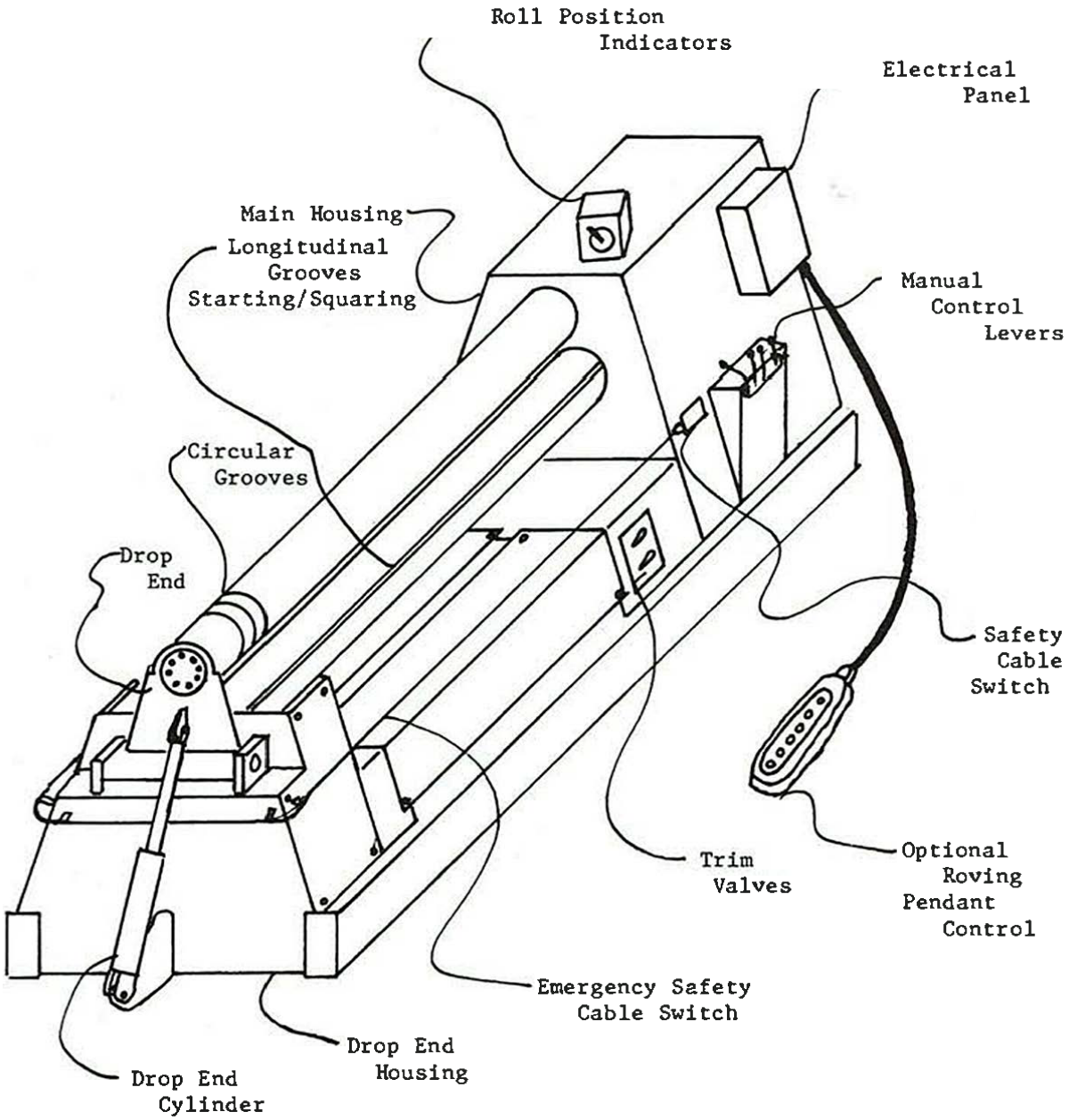
Warning!

Do not use a sharp object to make selections on the touch screen!

This will damage the screen!

Waldemar Design & Machine L.L.C. warrants its products to be free from defects in material and workmanship for a period of one year from the date of manufacture. Waldemar's obligation is to replace, free of charge, any defective part of any product that its inspection shows to be defective, including the lowest priced round-trip transportation to Waldemar from any point in the 48 contiguous states. Waldemar shall not be liable for installation and removal expense, loss of time, manufacturing costs, labor, materials, loss of profits, or consequential damages direct or indirect, because of defective products. There is no other warranty, expressed or implied.

ROLL NOMENCLATURE



Below are the steps needed to roll a standard cylinder in Preset and Auto Mode.

1. Start the machine, lower the pinch roll and both bending rolls, and zero all position readouts (Page 13 [1]). This happens automatically when Auto Mode is selected.
2. Place the Far Roll at Gauge Position using the preset (Page 9 [4] and page 17 [3]).
3. Square the workpiece against the Far Roll (Page 9 [4]).
4. Raise the Pinch Roll to the setpoint so the workpiece is held firmly (Page 14 [24]). In Auto Mode, the plate roll will now proceed through the rolling cycle. In Preset Mode, continue to step 5.
5. Lower the Far Roll out of the way of the workpiece (Page 17 [6]).
6. Reverse the Rotation to the setpoint, so the workpiece is held by the leading edge (Page 18 [13]).
7. Zero the Rotation readout again (Page 13 [13]).
8. Raise the Near Roll to the setpoint, to create the correct radius (Page 13 [11]).
9. Roll the workpiece forward using the Forward Prebend preset (Page 17 [9]).
10. Lower the Near Roll completely.
11. Raise the Far Roll to the setpoint, to create the correct radius (Page 13 [3]).
12. Roll the workpiece forward to the setpoint, until the trailing edge is reached (Page 13 [15]).
13. Lower the Far Roll.
14. Lower the Pinch Roll.
15. Lower the Drop End (Page 9 [1].
16. Remove the workpiece.
17. In Preset Mode, go back to step 2 and start the next cycle. In Auto Mode, tap the footswitch to reset the machine then go to step 3. Note: It is a good idea to make sure all the rolls are lowered completely at some point in the cycle.

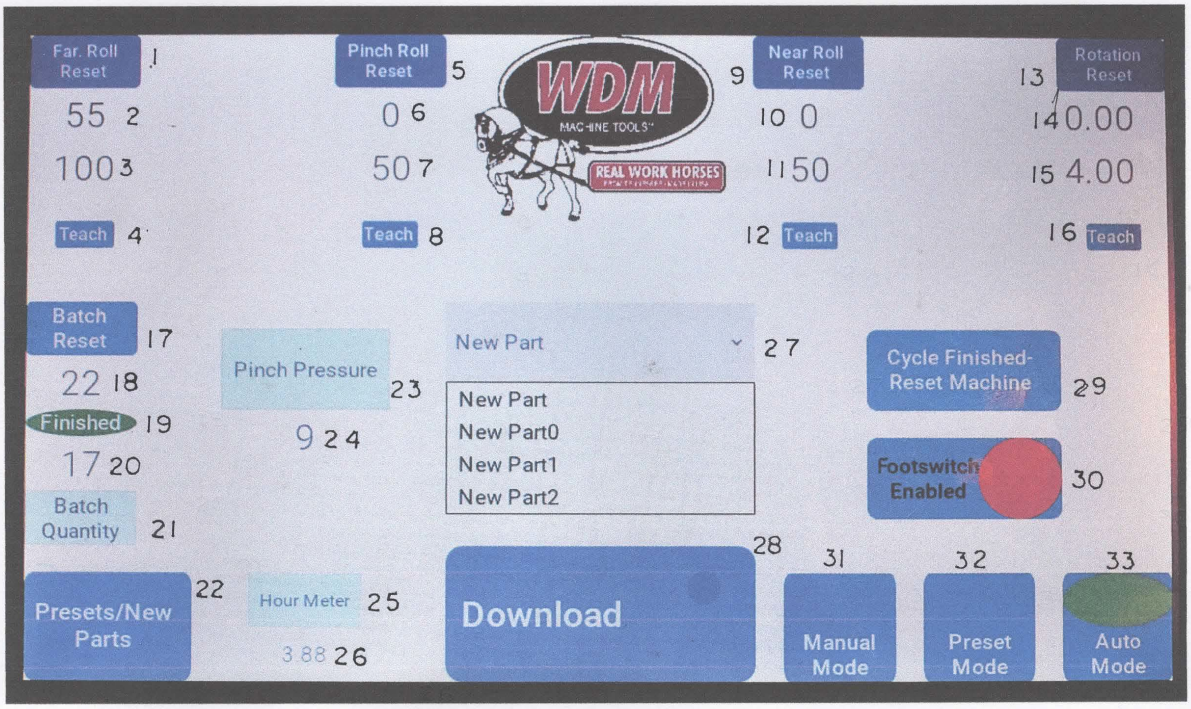

WDM
4R-AUTO PRO
WARNING
STOP
FAR ROLL
4
UP
GUAGE POSITION
DOWN
5
UP
DOWN
NEAR ROLL
6
UP
DOWN
ROLL ROTATION
7
FORWARD
FORWARD PREBEND
REVERSE
8
9
10
11
4RAPCT

On the opposite page you will find a picture of the 4R-AP CNC Control. Each individual control is numbered, and below you will find an explanation of each item.

Note: This control consists of a PLC (**P**rogrammable **L**ogic **C**ontrol) and a touchscreen. The PLC controls the Plate Roll, while the touchscreen stores the programs in its memory. Remembering this will help you understand how the control operates.

1. **Drop End Up/Down:** The Drop End is lowered to allow a complete cylinder to be removed.
   Caution: To prevent damage to the Top Roll, do not open the Drop End when the Pinch/Bending rolls are pushing against the Top Roll. To prevent damage to the Drop End, take care that the Drop End engages the Top Roll without striking the bearing case.
2. **Roll Trim/Normal/Rotation Reroll:**
   a. Roll Trim forces the bending rolls to only move at the drop end of the machine. This allows the operator to tilt the bending rolls, useful when rolling cones. To return the rolls to parallel, place the Trim Control in Normal and fully lower the rolls. Note: Do not try to use the Roll Trim to level the rolls, any adjustment made using the Roll Trim will be lost as soon as the rolls are fully lowered.
   b. Normal: the machine functions normally.
   c. Rotation Reroll: this diverts power from the Pinch Roll and allows the Top Roll to turn faster. This is useful when 'rerolling', which is an operation performed on a part that has been rolled and welded but is not completely round. In rerolling, the Pinch Roll is not used. The Top and Bending rolls are used to press against the part as it is rotated. This can improve the roundness of the workpiece.
3. **Control:** Machine Power On/Power Off.
4. **Far Roll Up/Gauge Position/Down:** This is a three-position joystick that controls the Far Roll. In Manual and Preset Mode (and in the Pause [Page 10 (11)] state of Auto Mode) Up/Down controls the Far Roll. Moving the joystick sideways to 'Gauge Position' moves the Far Roll to a position that allows the operator to square the workpiece against the Far Roll. The Gauge Position setpoint can be changed on the 'Presets' page of the Touchscreen (Page 17 [3]). Starting the workpiece square is very important, if the completed part has 'offset' corners the most likely cause is starting the workpiece out of square.
5. **Pinch Roll Up/Down:** A two-position joystick that controls the Pinch Roll.
6. **Near Roll Up/Down:** A two-position joystick that controls the Near Roll. WDM machines are typically set up so that the workpiece is entered from the right when standing facing the Drop End.

7. **Roll Rotation Forward/Forward Prebend/Reverse:** A three-position joystick that controls the Roll Rotation. Forward Prebend moves the workpiece through the machine far enough to complete the Prebend (Page 17 [9]).
8. **Emergency Stop:** This turns off both the machine and the control.
9. **System Speed:** Controls the speed of machine movements. Slowing the machine down is useful when programming a new part, however, in Auto Mode inconsistent machine speed will result in an inconsistent part.
10. **Cycle Selector Warmup/Drop End Open/Drop End Closed/Tack:** These cycles are for distinct types of parts.
    a. When the control is placed in Auto Mode with the selector in 'Warmup', the machine cycles through the program that is loaded into the PLC. This is used for warming the machine during cold weather because a cold machine, and especially cold hydraulic fluid, will make a significant difference in the part being rolled. Note: be careful when engaging the Warmup cycle, because it will continue cycling until it is stopped. Safety First!
    b. 'Drop End Open' will open the Drop End at the end of every cycle and is for rolling complete cylinders.
    c. 'Drop End Closed' leaves the Drop End closed at the end of the cycle and is for rolling segments.
    d. 'Tack' pauses after completing the part, before releasing the workpiece, allowing the operator to use the overhead support/side supports/bending rolls to manipulate the workpiece. The usual purpose of this cycle is to allow the part to be welded (tacked) on the machine, before removing the part. Care must be taken to ground the workpiece very well when welding a part while it is still in the machine.
11. **Pause/Override:**
    a. Pause pushbutton has no function in Manual Mode (Page 15 [31]).
    b. In Preset Mode (Page 15 [32]) the Pause Pushbutton functions as a setpoint override. Normally, in Preset Mode a roll will not move past the setpoint. If you wish to override the setpoint, press and hold the Pause pushbutton (the light will turn on).
    c. When in Auto Mode (Page 15 [33]) the Pause pushbutton will halt the rolling cycle when it is pressed once. Press it again when you want the cycle to continue. The Amber Light will remain illuminated while the machine is paused. Normally, all controls that would cause the machine to move are disenabled in Auto Mode. However, while the machine is paused, all controls are enabled except for (a) lowering the Drop End and (b) raising the Pinch Roll above the setpoint. To lower the Drop End, place the machine in Manual or Preset Mode. To raise the Pinch Roll higher without taking it out of Auto Mode, increase the Pinch Roll setpoint (Page 13 [7]).


Far. Roll Reset
1
55 2
100 3
Teach 4
Pinch Roll Reset
5
0 6
507
Teach 8
WDM
MACHINE TOOLS
REAL WORK HORSES
9
Near Roll Reset
10 0
1150
12 Teach
13
Rotation Reset
140.00
15 4.00
16 Teach
Batch Reset
17
22 18
Finished 19
17 20
Batch Quantity 21
Pinch Pressure
23
924
New Part
27
New Part
New Part0
New Part1
New Part2
Cycle Finished- Reset Machine
29
Footswitch Enabled
30
28
Download
Presets/New Parts
22
Hour Meter 25
3.88 26
31
Manual Mode
32
Preset Mode
33
Auto Mode

On the opposite page you will find a picture of the Main Screen that appears at start-up. Each feature on the screen is numbered, and below you will find an explanation of each item.

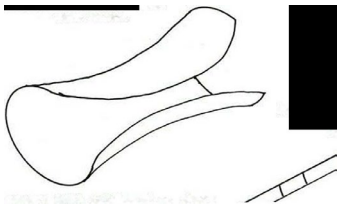
1. **Far Roll Reset:** The reset button for the Far Roll position readout. There are 4 position displays, and each one should be Zeroed before using the machine. In Manual Mode (Page 15 [31]) lower the Near Roll, Pinch Roll, and Far Roll, then use the reset buttons to Zero each position readout including Rotation (13).
2. The Far Roll Position readout. It displays the current position of the Far Roll.
3. The Far Roll Preset. In Preset and Auto Mode (Page 15 [32,33]) this setpoint sets where the Far Roll will stop. Tap on the number and a keypad will appear. Enter the desired setpoint. To hide the keypad without making changes, tap 'Esc'. Tap the 'Return' key to store the preset in the Program that is currently loaded (Page 15 [27]). You must then press Download (Page 15 [28]) to load the change into the PLC, which controls the machine.
4. **Teach:** This is used to save the current position without using the keypad. Pressing the Teach button will write the current Far Roll position into the Program that is currently loaded (Page 15 [27]). Then press Download (Page 15 [28]).
5. **Pinch Roll Reset:** The reset button for the Pinch Roll position. See (1).
6. The Pinch Roll position readout. It shows the position of the Pinch Roll. See (2).
7. The Pinch Roll Preset. This controls how far the Pinch Roll will move. See (3).
8. **Teach:** The Pinch Roll Teach button. See (4).
9. **Near Roll Reset:** See (1).
10. Near Roll position readout. See (2).
11. Near Roll Preset. This controls how far the Near Roll will move. See (3).
12. **Teach:** Near Roll Teach button. See (4).
13. **Rotation Reset**: See (1).
14. Rotation Position in inches. See (2).
15. Rotation Preset. See (3). The Rotation Preset is used to stop the Top Roll movement when the Top Roll reaches the trailing edge of the part.
16. **Teach:** See (4).
17. **Batch Reset:** In Auto Mode (33) the parts being made are counted. The Batch Reset button allows you to Zero the readout before beginning a new batch (18).
18. How many parts have been made (only counts parts in Auto Mode [33].)
19. **Finished:** This lights up when the preset quantity of parts (20) has been reached.
20. Batch Quantity Preset**.** To set the batch quantity, tap on the number. A keypad will appear where you can enter the desired quantity. To hide the keypad without making changes, tap 'Esc'. Tap 'Return' to save the batch quantity.
21. **Batch Quantity:** Label for Batch Quantity preset
22. **Presets/New Parts:** Tap this button to go to the next page, where you can set certain presets and create new programs (Page 19 [26].

23. Pinch Pressure: Label for Pinch Pressure Readout. See (24).

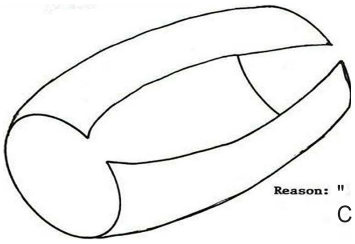
24. Pinch Pressure Readout: This indicates the amount of force that is being exerted on the material when the Pinch Roll is raised. The Pinch Pressure Limit can be set using the adjustment on the side of the drive housing. The Pinch Pressure is important because the amount of force has a significant effect on part quality. Too much force can result in deforming the edges of the material being rolled and possibly a finished part with a diameter that is larger in the center (barrel-shaped). Too little force can result in lengthy flats on the leading and trailing edges and possibly a part that is smaller in diameter in the center (hourglass-shaped). The material should be pinched firmly, avoid it being so loose it can fall out of the machine. 500-1000 PSI is a good place to start. If part quality is not to your satisfaction experiment with raising the pinch pressure/raising the Pinch Roll setpoint (7). When rolling parts in Manual Mode, you can set the Pinch Pressure and then you will be able to pinch each part the same amount, which helps repeatability. Preset (32) and Auto (33) Mode allows you to use the Pinch Roll Setpoint, which stops the Pinch Roll at the same point every time.

    The illustrations below are from the Roll Bending Tips handbook, available from Waldemar Design and Machine in hardcopy or from the WDM website as a PDF download (see the contact page at the beginning of this manual).

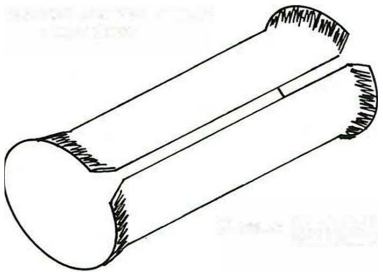
Hourglass shaped workpiece (too much crown/too little pinch pressure).



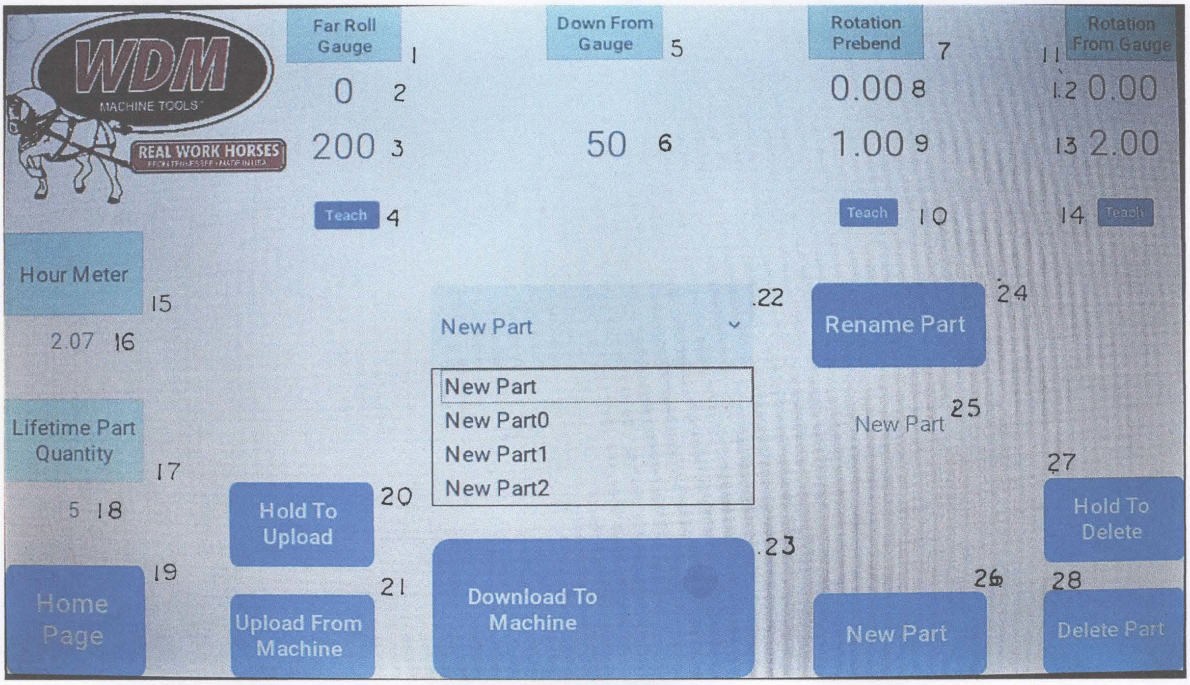
Barrel shaped workpiece (too little crown/too much pinch pressure).



Bell mouth shaped workpiece: Far too much Pinch Pressure!!!



25. **Hour Meter:** (26).
26. This displays total machine runtime over its lifetime. The readout remains blank for 90 seconds after startup.
27. Drop Down Menu. Tap the text box, scroll up/down to find a saved program, then tap the desired program to select it. Then press Download (28) to load the program into the PLC.
28. **Download:** This is used to Download a new program, or any program changes, from the touchscreen into the PLC. After startup you must select the desired program then use the Download button to load it into the PLC. Also, you must press Download before any changes to setpoints will be loaded into the PLC. An orange indicator light shows in the Download button when program changes are made. Note: the displayed program reverts to the first one on the list when the machine is powered off.
29. **Cycle Finished-Reset Machine:** In Auto Mode (33), after a part has been completed, use this button to indicate that the part has been removed from the machine. The roll will then reset itself and go to the starting position, ready for a new part. If the Pause button (Page 10 [11]) is used to move the rolls before starting a new part, this button will reset the machine to home position. Note: This button is only available in Auto Mode and is only active if the Footswitch is disenabled. (30)
30. **Footswitch Enabled:** The 4RAP control comes with a footswitch, but if the footswitch is damaged the control can be operated on its own. For safety, no controls are allowed to be duplicated by the control and the footswitch. In Auto Mode, the footswitch is used to reset the machine at the end of the cycle and raise the pinch roll to clamp the new part. When the footswitch is disenabled, use the Cycle Finished button (29) to reset the machine, and use the Pinch Roll joystick to clamp the new part. This button is only available in Auto Mode.
31. **Manual Mode:** In Manual the machine functions with no presets or automation. The control powers on in Manual Mode, so the machine can be operated in manual without interacting with the touchscreen at all. This can be useful if the touchscreen is damaged.
32. **Preset Mode:** In Preset Mode the control functions as an NC control. All the roll movements will go to the setpoints in the program, and then stop. You can roll a part by going step by step through the cycle. This is useful for programming a new part, or when selecting a program that has not been used recently. Rolling a part one step at a time can help the operator find a problem with the program before it ruins a part.
33. **Auto Mode:** The machine goes through an extended homing procedure the first time that the control is placed in Auto Mode after startup. Thereafter, when Auto Mode is selected the machine goes through an abbreviated homing procedure. This same abbreviated homing procedure takes place when the machine resets before beginning the next cycle. Avoid pausing the machine during a homing process.


WDM
MACHINE TOOLS
REAL WORK HORSES
Far Roll Gauge
1
0
2
200
3
Teach
4
Down From Gauge
5
50
6
Rotation Prebend
7
0.00
8
1.00
9
Teach
10
Rotation From Gauge
11
12 0.00
13 2.00
14 Teach
Hour Meter
15
2.07
16
Lifetime Part Quantity
17
5
18
19
Home Page
20
Hold To Upload
21
Upload From Machine
22
New Part
New Part
New Part0
New Part1
New Part2
23
Download To Machine
24
Rename Part
25
New Part
26
New Part
27
Hold To Delete
28
Delete Part

On the opposite page you will find a picture of the Presets/New Parts Page. Each feature on the screen is numbered, and below you will find an explanation of each item.

1. **Far Roll Gauge:** Label for Far Roll Gauge Position (2).
2. This is the Far Roll Position readout. (Page 13 [2]).
3. Set this position where the operator can easily square the workpiece against the Far Roll. (Page 9 [4]). Once this setpoint is created, it will be the same for most parts. If this setpoint is changed, you will probably also need to change the 'Rotation from Gauge' setpoint (Page 18 [13]).
4. **Teach:** Saves Far Roll position as Far Roll Gauge setpoint. (Page 9 [4]).
5. **Down From Gauge:** Label for the distance that the Far Roll will move out of the way. (6).
6. This is the distance that the Far Roll will move during the cycle. To speed up the cycle, the Far Roll does not travel all the way down after moving from 'Gauge Position' (3). Instead, it moves only far enough to be out of the way of the prebend, before moving to the finish bend position. If you wish the Far Roll to go all the way down after Gauge Position and before Finish Bend Position, just set a number sufficiently large that it will do so. Note: This preset should not be a negative number.
7. **Rotation Prebend:** Label for Prebend length in inches (9).
8. This is the Rotation position, displayed in inches.
9. This is the Prebend length. It is used to measure how far the part moves over the Near Roll. Since you get the best part when 'push' rolling against the Far Roll, the Near Roll is only used to create a bend long enough that the workpiece will engage the Far Roll, then the Near Roll moves down out of the way and the part is finished using the Far Roll. See the explanation of the rolling cycle on Page 5. When setting the Prebend length, start with the pinch roll clamping the workpiece wherever you want the bend to start. At this point zero the Rotation readout, raise the Near Roll high enough to create a bend of the correct radius, then roll the workpiece forward far enough to be past the centerline of the Far Roll when it is raised to finish bend position. At this point use the Teach button to save the Rotation position. Now the Near Roll should be lowered completely, and the part be completed using the Far Roll.
10. **Teach:** This will load the current Rotation position into the Prebend part of the program (9).
11. **Rotation From Gauge:** Label. (Page 18 [13]).
12. This is the Rotation Position in inches.

13. This is the Rotation from Gauge Position.
    a. After squaring the part against the Far Roll, to make a normal cylinder the roll must reverse from Gauge Position until the workpiece is held by the very leading edge. To set this preset, square the workpiece against the Far Roll, zero the Rotation readout, then reverse the Rotation until the workpiece is pinched by the leading edge. If the workpiece falls out of the machine, you went too far! Then use the Teach button (14) to save the Rotation position.
    b. To make a part with a flat on the leading edge, after squaring the part against the Far Roll the Far Roll will lower all the way, then roll forwards until the workpiece reaches the beginning of the prebend (Page 17 [9]).
14. **Teach:** This saves the Rotation position as the Rotation from Gauge preset. After you have set this preset, you will not need to change it unless you change the Gauge Position (Page 17 [3]).
15. **Hour Meter:** Label (16).
16. This is the Hour Meter. It measures total machine runtime over the life of the machine. It starts recording when the start button is pressed, though the readout remains blank for 90 seconds.
17. **Lifetime Part Quantity:** Label for Part Counter.
18. This displays the number of parts that have been rolled in Auto Mode over the life of the machine. It does not record parts rolled in Manual or Preset Mode.
19. **Home Page:** Press this button to return to the Main Page.
20. **Hold To Upload:** Confirm you wish to upload the program that is loaded into the PLC and overwrite the currently selected program. See (21). Press and hold for 3 seconds to upload the program in the PLC and overwrite the currently selected program. To hide this button, tap it once.
21. **Upload From Machine:** Tap this button to bring up the Hold to Upload button (20). Upload is intended to be used when a change has been made to the currently selected program by accident, and said change has not yet been Downloaded to the PLC. If a Teach button is pressed by accident or you change the wrong setpoint, the original setpoint remains in the PLC until you press Download. If you have not yet downloaded the changes, you can upload the original setpoints from the PLC. This will overwrite the changes. Note: Be careful, because if you select a new program without downloading it, then Upload from the PLC, you will overwrite the program you just selected!
22. This is the Dropdown Menu, from which you can select any saved programs. Tap the text box, scroll up/down to find the desired program, then tap the program to select it. Then press Download (23) to load the program into the PLC to start rolling parts.
23. **Download:** You must press Download to load a program into the PLC, or load any changes made to the program. Note: any changes made to the program are saved in memory but are not loaded until you press Download.

24. **Rename Part:** Tap this button to open a text box that displays the currently selected program (See 25). To hide the text box, press and hold for 3 seconds.
25. Use this text box to rename the displayed program. From the Dropdown menu (Page 18 [22]) select the program you wish to rename. This program will appear in the text box. Tap the box and a keypad will appear. Type in the new name and press the Return key. To leave without any changes, press the Escape key (Esc).
26. **New Part:** Press this button to create a new program. Note: When you press New Part, it copies the currently selected program and labels it 'New Part'. So when you need to program a new part, start by selecting a similar part to minimize the changes necessary. (If the currently selected part has all zeros in the setpoints, the new part will also have all zeros.)
27. **Hold To Delete:** Confirm that you wish to delete the currently selected Part. (See 28). Press and hold for 3 seconds to delete the currently selected program. To hide this button, tap it once.
28. Tap this button to bring up the Hold to Delete button (27). Note: When you delete a part, the next part in the list will be automatically selected. When you reach the end of the list, the next part that appears will be the one at the top of the list.