

CPC 12000 Operation and Service Manual

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1.0 Receiving Equipment

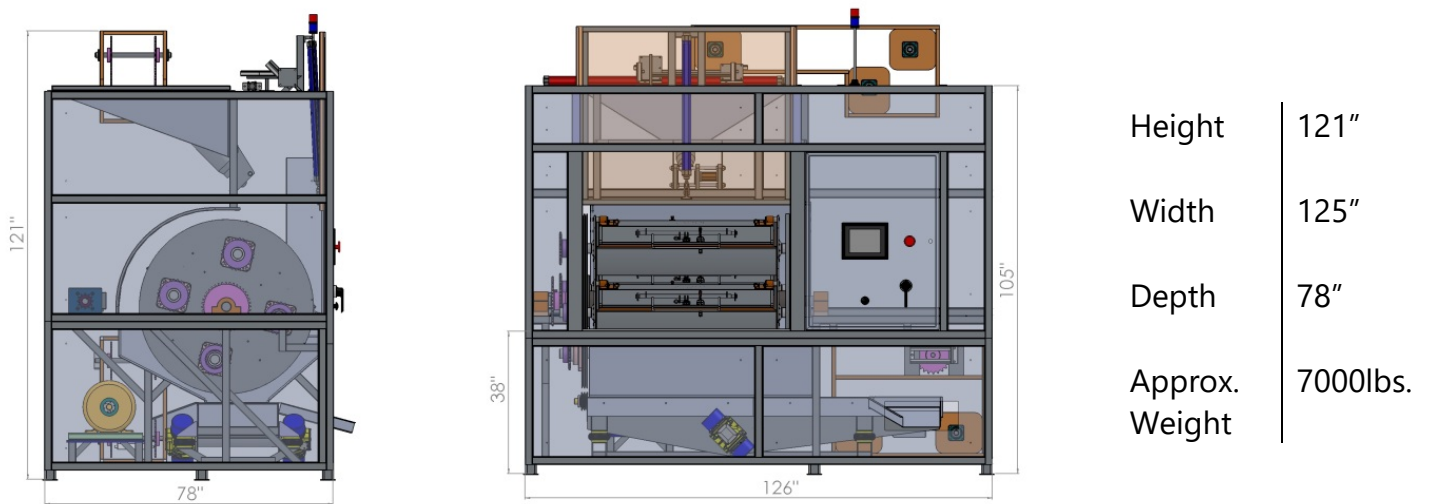
1.1 Inspection

Upon receipt of the Centrifugal Barrel System with integrated Computerized Process Controller (CPC), please perform a thorough inspection of the shipment. Compare what is received to the packing list to be sure all the components, including any ordered supplies are present. Check for any damage to the equipment. If damage is found, notify the delivering freight company and UNITED SURFACE SOLUTIONS, LLC immediately.

1.2 Selecting Equipment Location

The equipment should be conveniently located to the "flow of parts." The CPC System will require the appropriate electrical power, an air-line with a minimum of 100 psi, a water supply with a minimum of 20 psi, and a drain located near the machine. If a sump system and water recycling unit is to be used, separate power must be provided for those units as well. It is suggested to leave at least three (3) feet on each side of the machine for maintenance purposes. Sufficient work and storage space is also required.

2.0 System Dimensions



3.0 Equipment Setup

3.1 Isolation Pads

While setting up the CPC, make certain that high-capacity rubber isolation pads (rated at a min. of 1500 psi) are installed under each leg of the unit. These pads are used to level the equipment and will extend the service life of the machine. The leveling procedures will be explained later in this section.



3.2 Electrical

With the CPC in position, a licensed electrician will be required to connect electrical power. The power requirements for your new equipment are printed on the data plate, which is located on the upper left-hand corner of the machines left side panel. Refer to included schematics for setup details. UNITED SURFACE SOLUTIONS, LLC personnel are not authorized to make connections to your building's electrical system. Likewise, non-UNITED SURFACE SOLUTIONS personnel are not authorized to make any modifications or adjustments to the equipment without written authorization. Doing so may compromise operator safety as well as your warranty.

Caution: Be sure to connect only the specified voltage to the machine. These systems are built with standard voltage 460VAC / 60Hz, but can be ordered in 400VAC / 50Hz configuration. Applying improper voltage will result in severe damage to the system and will void the warranty. Inspect the motor and AC drive to confirm the rated voltage.

3.3 Leveling

Once the electrical connections have been made, it will be necessary to level the unit. Do not skip this step of the setup process. This unit uses a fluid mass of media to finish your parts and if the machine is not level, this fluid mass will favor one side of the barrel, effectively reducing the available working volume of the barrel. This may result in an increase in part-on-part damage. The following instructions will aid you in leveling the CPC:

1. Install High-Capacity Rubber Isolation Pads (rated at 1500 psi) under each leg of the unit. Recommended pad size is 6" X 6" X 1/2".
2. Turn on the power for the CPC at the disconnect the switch located on the right side of the machine. The shutter door should open automatically once the Red Beacon stops flashing and the System Initialization is complete. If the shutter door does not open please check the incoming air supply.
3. Select 'Manual Operation' from the CPC Touch Screen Interface. Using the Jog controls, position the cradles so you have access to the center axle of the turret.
4. Place a magnetic beam level on the center axle of the turret.

5. If adjustment is needed, shim under the isolation pad with varying thicknesses of sheet metal. If large adjustments are necessary use thicker padding, standard sizing is $\frac{3}{4}$ " and 1".

DO NOT BOLT DOWN SYSTEM. The CPC uses a rotating turret that puts stress on the machine. Being on isolation pads, the machine is allowed to "flex" and absorb this stress. If the machine is bolted down and not allowed to flex, additional stress would be placed on the bearings. The added stress on the bearings will cause premature bearing failure. The warranty stands in effect only when the CPC is on the isolation pads. If the CPC is bolted to the floor, the warranty on bearings, barrels and belts will be void.

4.0 Operation

4.1 Component Overview

A brief explanation of the systems major components is necessary for safe and trouble-free operation. Please refer this figure displaying the various components of the CPC.

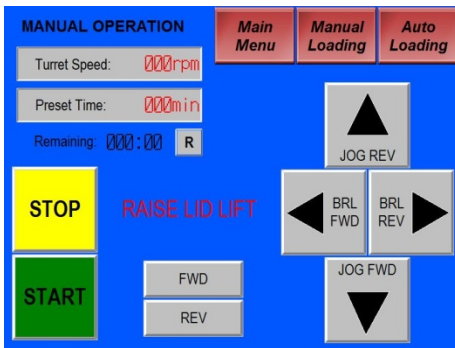
4.2 Applying Power

Before applying power, ensure that the electrical control box is closed and secure, and that there are no obvious exposed electrical conductors. Check that water and air supplies are turned on and are at full pressure.

To apply power to the CPC12000, turn the safety disconnect switch (located on the electrical enclosure on the right side of the machine) to the ON position. The display will show the initialization screen and the red beacon will start flashing. Once initialization is complete, the door will automatically open, the beacon will stop flashing, and the System I.D. Screen will appear. Simply touch the screen to proceed to the main menu.

WARNING: The touch screen is built to NEMA 4 standards and is resistant to water but can be easily damaged by sharp hard objects. DO NOT use any such objects to operate the interface terminal.

4.3 Manual Operation



To begin operating the CPC manually choose **MANUAL OPERATION** from *Main Menu*. This will bring up the *Manual Operation* screen of the CPC. At this level, all necessary functions can be controlled to operate the CPC. Simply press any touch key to operate the related function. Individual functions will be explained throughout this chapter. If at any time the operator needs a brief explanation regarding the function of a touch key they may do so by using the

Help option in the *Main Menu*.

4.3.1 Jog Mode

The CPC has two basic modes of operation: jog mode and run mode. The mode of operation is determined by the position of the shutter door. Once the shutter door is open, the jog and material handling controls will be activated and the operator can safely position the turret for loading and unloading.

4.3.2 Positioning the Turret

When the shutter door is open, the turret may be jogged utilizing the jog button in conjunction with the JOG FWD or JOG REV. The Safety Jog Button is located on the right side of the cabinet below the E-Stop. The JOG FWD and JOG REV are located on the touch screen interface.

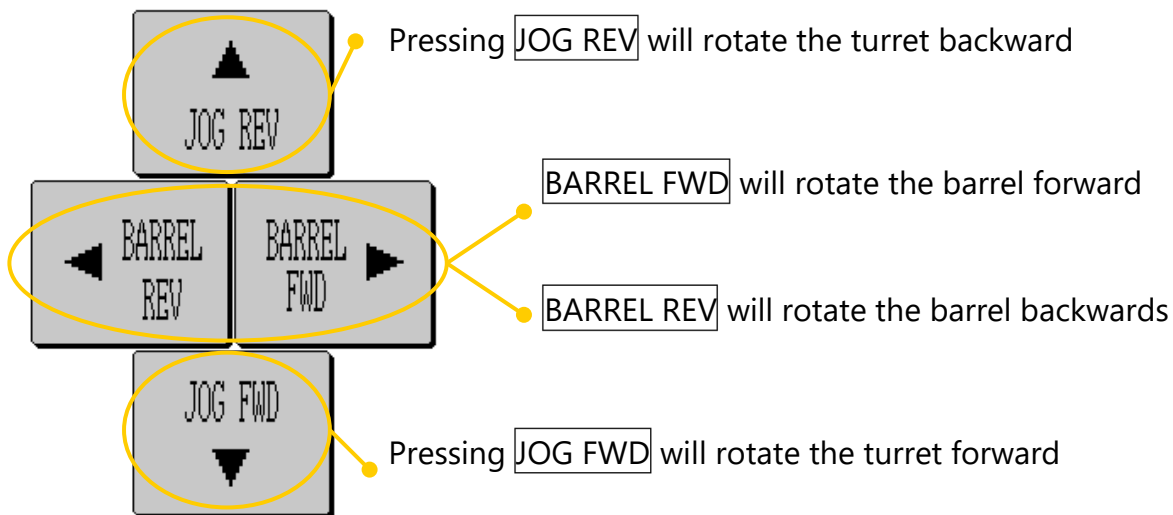


Figure 4.3 Jog Controls

4.3.3 Barrel Rotation

While in Jog Mode the barrels may be rotated to load or unload contents and media by utilizing the hands-free safety jog button in conjunction with the BARREL FWD or BARREL REV touch key (Figure 3.2)

WARNING: Never jog the turret while any body part is in contact with either the barrels or the turret, or is anywhere within the confines of the machine cabinet. Serious injury could occur.

4.3.4 Barrels

The CPC12000 has four barrels held perpendicular to the axle shaft that rotate at a 1:1 ratio relative to the turret. The barrels are constructed of 304-stainless steel with aluminum lids with attached hardened steel and stainless steel hardware and locking assemblies. Within the barrel sits a removable liner of various configurations including compartmental dividers for total part segregation. This barrel and liner assembly holds work pieces, media, compounds, and water during the finishing process.

4.3.5 Opening Barrels

The barrels use an over-centering cam operation to create an airtight seal between the lid and the base of the barrel. A spring and pin locking mechanism is used to hold the cam in the locked position. To open, pull the lock-pin and hold while rotating the cam handle towards the back of the machine using the lid-opening tool provided. Refer to Figure 3.3 for component definition.

WARNING: Barrels may become pressurized. Some processes can generate super-heated steam in as little as 10 minutes. Open slowly, use caution.

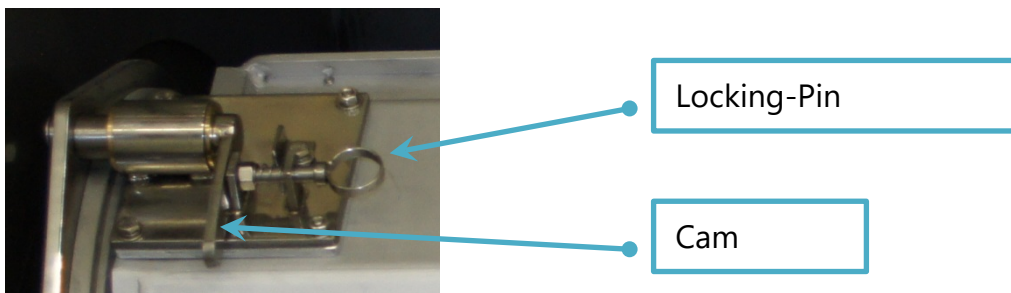


Figure 4.4 Lid Cam Lock

4.3.6 Heat Precaution

The processes used in the CPC may generate a considerable amount of heat. Since the barrel is sealed, some heat is converted to pressure inside the barrel. Use caution when opening the barrel; be prepared for hot, soapy liquid to spray out from between the barrel and the barrel lid. Be sure to position the barrel so that any foam or liquid from the barrels is contained within the turret shrouding. Use the following procedure as a guideline to safely open a heated barrel:

1. Jog the turret so that the barrel is 1 to 2 inches below the lower door frame.
2. Rotate the barrel 15 to 20 degrees so that the front seam between the lid and barrel are facing downward towards the shrouding and the rear seam is facing upward away from the operator.

3. Pull the locking-pin outward and slowly release the cam assembly by rotating the cam handle towards the back of the machine. If pressure begins to release stop until pressure dissipates. Continue until cam is completely relaxed and then proceed to opposite side.
4. Rotate barrel **BARREL REV** until level. Jog turret **JOG REV** 1-2 inches upwards until seam is even with lower door frame. Release center latch. Do Not release prior to dissipating pressure.
5. Slide the cam assemblies in toward each other and remove the lid by sliding the lid across the lower door frame into the lid cradle. Do Not lift the lid injury could result.

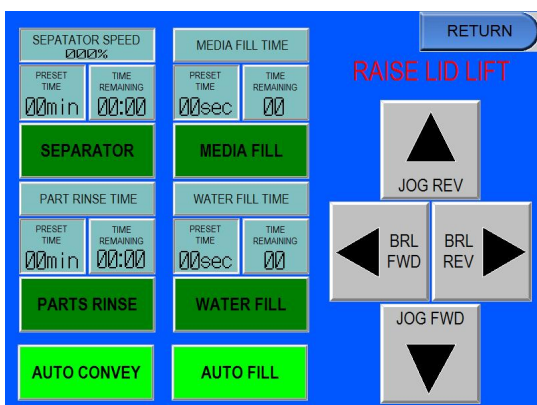
The use of a pressure relief valve: It is not suggested to use any form of pressure relief valve on the barrel assembly due to the nature of the process. The processes used in the CPC typically grind metal, ceramic or plastics in a soapy water mixture. Once this mixture dries it quickly cakes and becomes hard similar to the composition of cement. This would disable any type of pressure relief valve. Consequently, an operator might feel comfortable that the pressure is relieved and open the barrel without taking the precautions required, only finding that the valve had malfunctioned and the barrel was still under pressure. By following the above procedure, the CPC poses little risk to the operator.

If a process must be continually run that generates an excessive amount of heat, raise the water level within the barrel to an inch or more above the media level to help aid in cooling the media. On extremely long cycle times, 60 minutes or more, incorporate what is known as a rinse and recharge into the process. In this manner, half way through the cycle the system would be stopped and the barrels could be flushed with water (without removing any parts or media) and recharged with soap or compound. This helps keep the water temperature from reaching dangerous levels.

NOTE: Excessive heat will reduce the service life of the barrel linings. Highly aggressive processes should have periodic intervals during which the barrels are flushed with cool water to minimize the heat generated within the barrel. A compound recharge will also be added at this time to maintain the cleaning capabilities throughout the remainder of the process.

4.3.7 Loading Barrels

Load the predetermined production part lot into the barrel. Press **MATERIAL HANDLING** in the upper



right hand corner of the *Manual Mode* screen (Figure 4.2). The interface will change to the screen illustrated below. *NOTE: Generally the production parts are loaded into the barrel prior to any media or compound. In some cases such as extremely flat parts water locking or sticking to the barrel lining could occur. If this is the case it maybe necessary to load in reverse order.*

4.3.8 Material Handling

Once in the *Material Handling* screen the operator can load

media and water into the barrel from the hopper via the loading hose. To accomplish this place the hose over the barrel to be loaded and press the **MANUAL** touch key on both the *Media Fill* and *Water Fill*. This will activate the media feed system, to stop once the barrel is to the predetermined capacity simply press both **MANUAL** touch keys again.

It is important to ensure that the sealing surfaces of the barrel and the barrel lid are clean and free from media, compound, and parts that could disrupt the seal. Please follow the guidelines below for closing the barrels.

1. Clean the sealing surfaces of the barrel and lid of all media, compound and/or parts. Rinse the lid using the hose reel provided while it is still in the lid cradle.
2. Slide the lid onto the barrel via lower door frame. Do Not lift the lid; continual lifting could cause strain on the lower back.
3. Secure the cams using the Wrench provided. Be certain that the Locking Pins are in place. Secure the center latch.
4. Visually inspect that all locks are secure and proceed to next barrel. To conserve time, unload and load each barrel independently. Review section on Opening Barrels if necessary.
5. If using only one or two barrels, use opposing barrels. This will balance the turret. Approximate barrel weights should be within ten percent of each other.
6. Operate the machine with all lids in place, even if the barrel is empty. Failure to do so may cause abnormal vibration or damage due to the machine being out of balance.

NOTE: It is usually most efficient to unload and reload one barrel at a time.

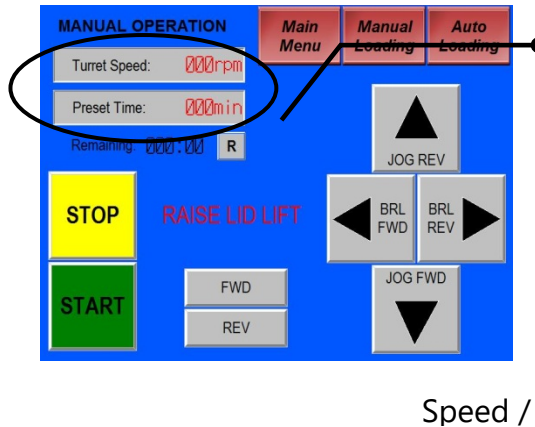
Once all barrels are loaded and safety latches are secure use the **RETURN** touch key to return to the *Manual Operation* screen to set process parameters.

4.3.10 Setting RPM and Cycle Time

To set either the turret RPM or the cycle timer while in the manual mode of operation, touch either command on the display screen. This will activate a pop-up window with a numeric keypad. Once the keypad is displayed, turret RPM and preset time can be adjusted within the system limits (see *System Tools* to adjust limits). Press **CLOSE SCREEN** to hide keypad once the proper adjustments are made.

Turret Direction

To set turret direction simply press the **FORWARD** or **REVERSE** on the *Manual Operation* screen. A green indicator will light one of the directional keys, displaying the current direction of turret rotation. The 'Auto' touch key automatically reverses the turret direction halfway through the cycle by dividing the cycle time in half. When activated, this touch key will flash red.



Press within the boxes to activate keypad



NOTE: Refer to your Process Report for specified time, direction of rotation, and RPM requirements.

4.3.11 Starting Process


It is best to run through a series of safety checks prior to starting the CPC. By organizing the start-up process in a sequential order, an operator can easily remember a set routine. We suggest that the following to be a minimum list of safety checks. Appoint any additional operations as needed.

1. Re-check each barrel to be sure that all barrels are secure and properly locked.
2. Check turret speed.
3. Check preset timer.
4. Check the desired direction of turret rotation. Forward should be used unless specifically stated otherwise on the Process Report.
5. Clear the door area and press **START**. The screen will change to a *Door Closing Warning*. If it becomes necessary to stop the start-up process, use the **OPEN DOOR** touch key to reverse the door operation and return to the *Manual Operation* screen. Once the door is completely closed, the beacon light will turn green indicating that the CPC will begin the processing cycle.

NOTE: When the unit is running, the shutter door will lock shut and will release only after the specified time has elapsed or the stop key is pressed and the turret RPM has decreased to zero. Do not attempt to open the shutter door until the machine is fully stopped.

Once the system starts, the interface will return to the *Manual Operation* screen. The **START** key will be illuminated green and will start counting down. To stop the process use the **STOP** touch key.

Remaining Cycle Time

Below the Preset Time display on the *Manual Operation* screen is a **Remaining 0:00** countdown timer labeled in blue lettering. This timer will display the time remaining until the cycle is complete. If the CPC is stopped during a cycle the Remaining timer will retain the remaining cycle time until the shutter door is opened, at  which time the display will reset to the *preset time*. By pressing the touch key next to the remaining timer the timer can be reset to the PRESET TIME while the system is in operation.

4.3.12 Unloading the System

When the system has completed the process cycle, the turret will automatically decelerate and stop, the **STOP** touch key will be illuminated red, and the shutter door will automatically open. At that time, follow these operations to safely unload the CPC.

1. The system goes into *Jog Mode* once the shutter door is completely open.
2. Use the jog controls (Figure 4.3) in conjunction with the Jog button to bring the first barrel to be unloaded into position. Open the barrels as described in **4.3.5 Opening Barrels**.

WARNING: Refer to the 4.3.6 Heat Precaution for important safety information.

3. Start the Material Handling and Parts/Media Rinse Systems as described in **4.3.8 Material Handling**. The *Rinse Controls* are located in the lower left hand corner of the screen.
4. Empty the barrel by rotating the barrel and dumping the contents onto the forward splash panel. This will allow the parts to lay flat before sliding onto the separator screen.
5. Reload the barrel for the next process or step of operation as described in **4.3.7 Loading Barrels**.
6. Replace the barrel lid and secure the locking pin as described in **4.3.9 Closing Barrels**.
7. Repeat the unloading and reloading sequences for the next barrel.

4.3.13 Operating Tips

Here are a few additional tips for working with your CPC that should make production easier and more consistent:

Always use a soap or detergent in every process. Otherwise the media will soon take on a glazed appearance and will no longer cut properly.

Rinse parts after each step of the process. Do not let the compound dry on the parts.

Do not let parts sit for an extended period after finishing. Some materials, especially aluminum and zinc alloys will develop corrosion spots if left in the machine for as little as 10 minutes after the end of the process. If the parts have sat in the barrel, operate the CPC for a few extra minutes before unloading the barrels. This may help eliminate spotting that may have developed.

Never put compound directly on work pieces. Always load media and water on top of parts before adding compound or compound residue may be found on the parts.

Thoroughly rinse the empty barrels between process steps.

Never use the same scooper for more than one compound. Doing so will contaminate both products and may result in inferior finishing.

Keep finishing media as clean and uncontaminated as possible.

Avoid inadvertently mixing media together.

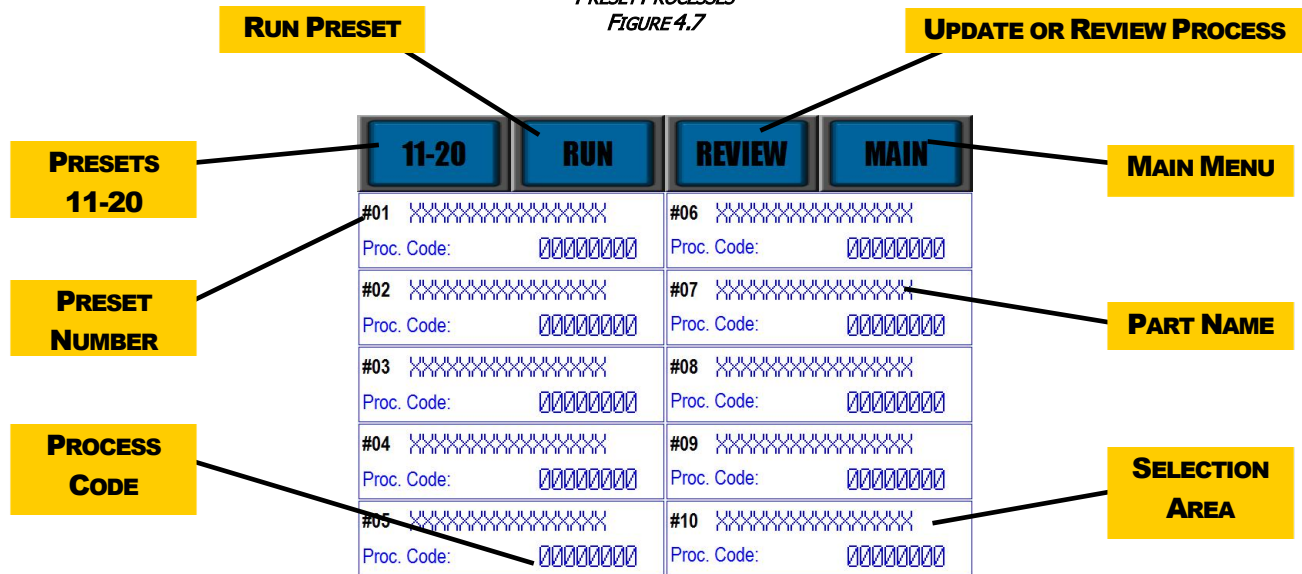
If the work pieces are subject to rust, a rustproof treatment must be used.

4.4 Auto Operation using the CPC Interface

In addition to the MAINTENANCE and SYSTEM HELP this chapter will cover the AUTO mode of operation and recipe storage for the CPC. Please refer to the previous chapter **4.3 Manual Operation** for operation procedures when using the manual mode of operation.

Select AUTO OPERATION to display the *Preset Processes* screen shown in Figure 4.7 on the next page. This control screen allows the operator to store, edit, review or run any of the 30 allowable preset processes.

PRESET PROCESSES
FIGURE 4.7



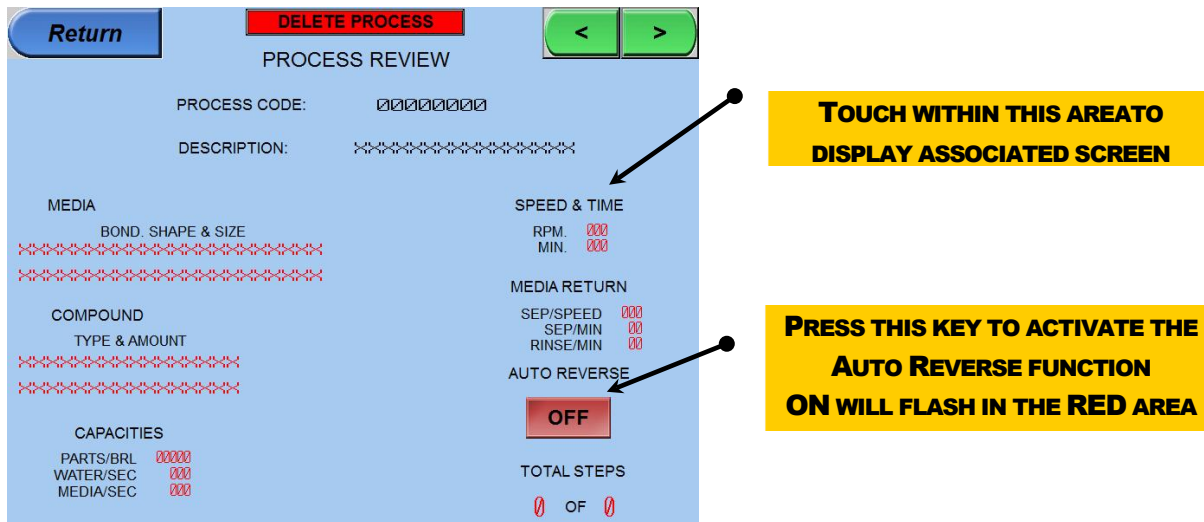
4.4.1 Store or Update Process

To store a new process select any available or unused process by pressing within the Selection Area and selecting **REVIEW**. The *Process Review* screen will appear allowing the operator to both enter a new process or review and edit an existing process. (Figure 4.8)

The *Process Review* screen will allow the operator to edit any process parameter simply by selecting the associated area (outlined with dotted black line). By selecting an area the operator will begin any interview asking basic process parameters.

After entering into any of the process parameter screens, data can be input or edited by using the keypad or keyboard within that screen. Once data is entered **↵ ENTER** must be used to save any changes.

PROCESS REVIEW
FIGURE 4.8

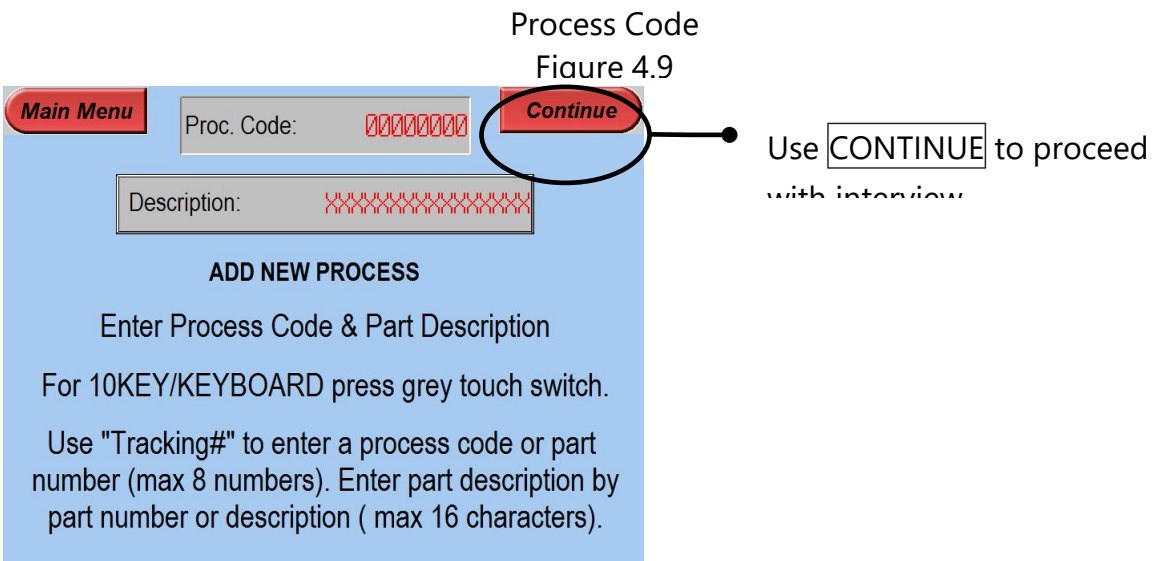


Using the screen illustrated in **Figure 4.8**, the operator can enter a process code generated by United's Lab or insert a tracking number for easy reference.

By pressing **CONTINUE** the operator can enter a program loop that will basically start an interview or allow them to view all parameters for a single process.

The operator can get out of the loop at any time and return to the *Process Review* screen by pressing **RETURN**

Enter a product description using the screen illustrated in Figure 4.10 to identify the part by either a name or a part number. Complete the step by pressing **ENTER**



Utilize *Media Data* screen (**Figure 4.11**) to input media information (shape, type, size and height or level of media within the barrel). Press **CONTINUE** to proceed to the next screen.

MEDIA DATA
FIGURE 4.11

Enter Media "A": [XXXXXXXXXXXXXXXXXXXXXX]

Enter Media "B": [XXXXXXXXXXXXXXXXXXXXXX]

Media Type , Size & Height

For KEYBOARD press Enter Media "A" or "B".

Enter media information and amount. A maximum
of two media types per step is allowed.

Press for Process Review

MEDIA DATA | *COMPOUND* | *CAPACITIES* | *RPM / TIME* | *CONVEYOR*

***NOTE:** To control part on part impingement use a media height of 80 to 95 percent of the total barrel volume. To generate more aggression operate at lower levels approximately 65 percent.*

If the operator has chosen to continue with the interview the following screen (**Figure 4.12**) will be displayed.

COMPOUND DATA
FIGURE 4.12

Compound "A": [XXXXXXXXXXXXXXXXXXXXXX]

Compound "B": [XXXXXXXXXXXXXXXXXXXXXX]

Compound Type & Amount

For KEYBOARD press Compound "A" or "B".

Enter compound type and amount. A maximum
of two compound types per step is allowed.

Press for Process Review

MEDIA DATA | *COMPOUND* | *CAPACITIES* | *RPM / TIME* | *CONVEYOR*

This screen is similar to the *Media Data* screen shown in **Figure 4.8**. It contains information about the compound such as type and amount used. Input the necessary information and press **Enter ↵** to save it. Press **CONTINUE** to proceed to the next screen.

Enter the maximum amount of parts per barrel and desired fill times for the water and media (**Figure 4.13**). These fill times will keep the process consistent by filling each barrel with the exact amount of media every time. The media fill rate is a speed adjustment for the media pan feeder. This adjustment is necessary to insure a steady flow with all media sizes and weights. An adjustment of the media flow rate is needed when switching media and works in conjunction to the media fill time to deliver an exact amount of media to the barrel. Once set, press **Enter ↵** to save. Press **CONTINUE** to proceed to the next screen.

Fill Times and Capacities
Figure 4.13

Parts / Brl: 0000 Water Fill Time: 000sec Media Fill Time: 000sec

Enter Barrel Fill Capacities

For KEYBOARD press grey touch switch.

Enter total parts per barrel and water and media duration to fill barrel to proper levels.

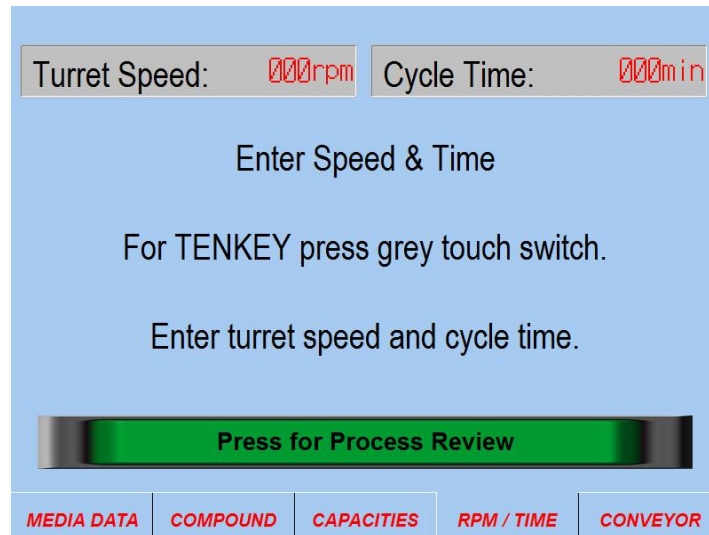
Press for Process Review

MEDIA DATA COMPOUND CAPACITIES RPM / TIME CONVEYOR

NOTE: Standard water level is the height of the media; raise the water level 1 to 2 inches above the media for long or aggressive processes. This will help to cool the contents of the barrel. To reduce part impingement, use a lower water level.

The next step is to set the turret RPM and cycle time. To accomplish this, input the number from the keypad and press **ENTER**. The arrow keys allow scrolling between RPM and time. Pressing **CONTINUE** will display the separator and elevator controls. This is final screen of the interview.

*RPM & TIME
FIGURE 4.14*



4.4.2 Separator Controls

To control the parts/media separator and rinse systems, utilize the screen illustrated below in Figure 4.15. Through this screen, the separator speed and maximum run time can be set. The speed should be adjusted so the parts and media flow evenly across the screen deck without bouncing. The run time sets the amount of time the separator and elevator operate before automatically shutting down. This time should be adjusted to allow the operator time to unload and load all four barrels and clear the separator of any parts and media (approximately 10 to 20 minutes). Once the separator shuts down, the elevator will continue to operate for 20 seconds to empty the buckets completely.

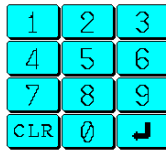
**SEPARATOR & ELEVATOR
CONTROLS
FIGURE 4.15**

REVIEW

CONTINUE

ENTER MATERIAL HANDLING TIMES

↑	SEPARATOR SPEED	⊙ %
↓	SEPARATOR RUN TIME	⊙ MIN.
	PART/MEDIA RINSE	⊙ MIN.



4.4.3 Rinse Timer

The parts/media rinse timer is used to conserve water. This should be set to equal the amount of time it takes for a barrel's contents to exit the separator. The operator should activate the rinse just prior dumping each barrel. In this manner, the rinse system is not spraying water when the separator is empty, such as when the operator is filling the barrel.

Return **DELETE PROCESS**

PROCESS REVIEW

PROCESS CODE: [] [] [] [] [] [] [] []

DESCRIPTION: [X]

MEDIA	SPEED & TIME
BOND, SHAPE & SIZE	RPM. [000]
[X] [X]	MIN. [000]
COMPOUND	MEDIA RETURN
TYPE & AMOUNT	SEP/SPEED [000]
[X] [X]	SEP/MIN [00]
CAPACITIES	RINSE/MIN [00]
PARTS/BRL [00000]	AUTO REVERSE
WATER/SEC [000]	OFF
MEDIA/SEC [000]	TOTAL STEPS
	[0] OF [0]

Return **DELETE PROCESS** **<** **>**

TO NAVIGATE TO ANOTHER STEP USE THE STEP KEY

PRESS RED KEY TO ACTIVATE AUTO REVERSE

*PROCESS REVIEW
FIGURE 4.16*

4.4.4 Auto-Reverse

When using a fixturing device, divided compartments, or holding a part in a stationary position within the barrel, multi-directional turret operation may be required. The **AUTO REVERSE** function will divide the cycle time and change direction automatically, to activate press the touch key.

Some processes require more than a single operational step. The CPC will keep track of the process and prompt the operator at the completion of each step. To create a step or edit information for an existing process step touch the **STEP keys illustrated** in 4-1. The numbers at the bottom right of the screen labeled **TOTAL STEPS** will display the current process step.

4.4.5 Run a Preset Process

To run a process from the Auto Mode simply select the desired process from the *Preset Process* screen, Figure 4.7. A flashing green light will be displayed behind the Preset Number of the selected process. Touch within the Selection Area and press **RUN** to enter the *Loading Instructions* screen.

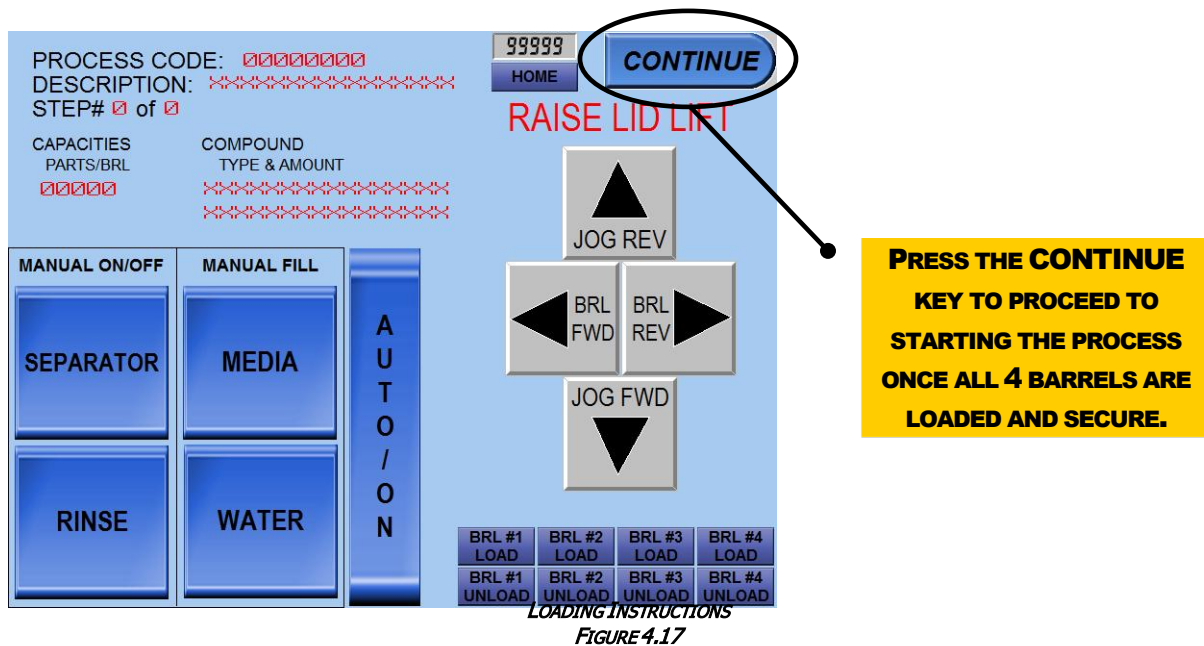
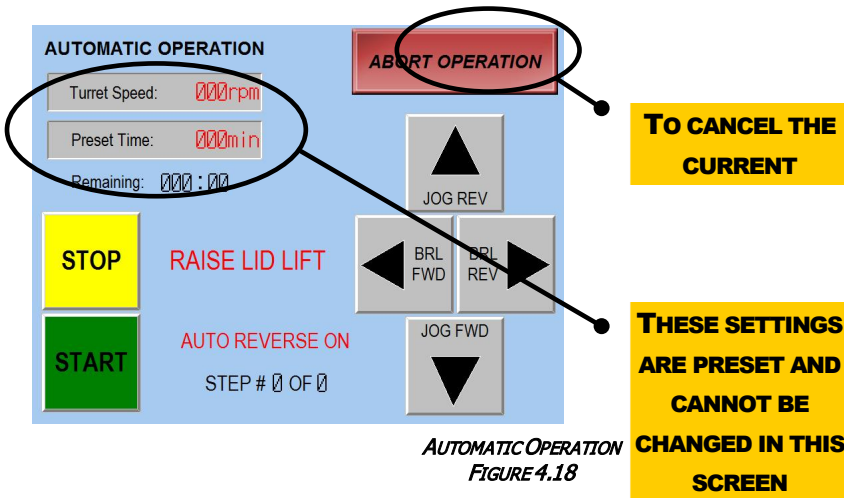


FIGURE 4.17

Figure 4.17 is the *Loading Instruction* screen. This screen appears prior to each process step assisting the operator by displaying the process recipe and material handling control keys. The displayed information are process parameters such as compound types and the required amount of each compound, plus the number of parts per barrel and the status of the media hopper (only if the media level is low).

Once the barrels are loaded according to the process parameters the operator can press **CONTINUE** to proceed to the *Automatic Operation* screen (Figure 4.18.)



This screen is similar to the Manual Operation screen shown in **Figure 4.2** except that the parameters are preset. It is displayed while the process is running.

To exit *Automatic Operation* without beginning the current process or step, use **ABORT OPERATION**. A screen will appear asking if the operator would like to continue with the next step, or abort

the entire process. If **PROCESS** is selected the operator will return to *Preset Processes*.

Once the preset time has elapsed, the CPC will come to a stop. One of two screens will be displayed: *Continue Process* (Figure 4.19) will be displayed if there are additional steps to be completed or *Process Complete* (Figure 4.20) if the total cycle has completed.

*CONTINUE PROCESS
FIGURE 4.19*

*PROCESS COMPLETE
FIGURE 4.20*



Select an option and the operator will be routed to the appropriate instructional screen, either to reload barrels for an additional step or to continue processing with the current parameters. If NEW PROCESS is selected the operator will be returned to the *Preset Process* (**Figure 4.2**).

5.0 Maintenance

5.1 Maintenance in CPC Interface

By pressing **MAINTENANCE** on the *Main Menu*, the operator will be able to view and set basic maintenance functions for the CPC. These functions include:

- Total Operational Hours
- Required Maintenance Alarm
- Maximum System RPM
- Maximum Cycle Time
- PLC Input / Output Utilization
- Serial Number / Model Number
- Reset Password
- Program Version

System critical functions including maximum cycle time, RPM, and maintenance alarm reset can be password protected to keep out unauthorized personnel. Once the maintenance alarm has timed out a message will be flash for one (1) minute on the CPC interface and repeat every fifteen (15) minutes until the reset key activated.

System Maintenance

Figure 5.1

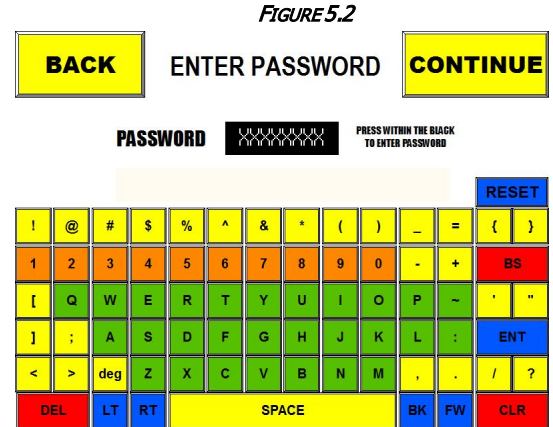


5.1.1 System Information

By pressing **SYSTEM INFORMATION** an information screen will be displayed giving the operator information that may be required by a United Surface Solutions technician troubleshooting the finishing system or when ordering replacement parts.

5.1.2 System Tools Password

The following screen, *Enter Password*, will be displayed when **SYS TOOLS** is pressed. This is to protect from unauthorized personnel tampering with system critical settings. The CPC comes unprotected from the factory and will remain in that state until **ENTER** is pressed. Once pressed, the default password is loaded and a password must be used for future access.



The password status will be shown in the area outlined by the red dashed box. If the status box displays "Invalid Password" or the password has been forgotten, the system can be reset to the default password as follows:

1. Press **CLR**
 2. Press **RESET**
 3. Press **ENTER**
 4. Enter the default password and press **ENTER**
- The status box will display "Password Correct." Press **CONTINUE** to proceed to *System Tools*.

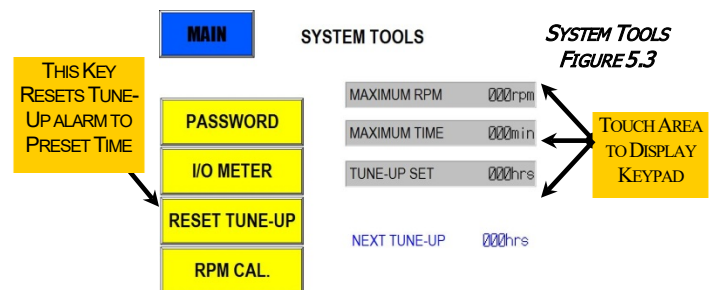
NOTE: For information regarding the default password contact United Surface Solutions Technical Support at (877) 837-4623.

5.1.3 System Tools

The *System Tools* screen controls system critical settings and allows the operator to troubleshoot the system. To change settings simply touch the outlined areas and a keypad will display allowing the operator to input new limits.

5.1.4 Password Reset

By pressing **PASSWORD** the operator is able to reset the default *System Tools* password to any eight (8) character word, number, or alpha-numerical combination.



5.1.5 I/O Meter

By pressing **I/O METER** the operator is able to display a screen displaying the active PLC Inputs and Outputs. This screen is a useful troubleshooting tool in the case of system failure. The screen will display a **green** lamp for any contact, be input or output, which is currently active. Please refer to the CPC *I/O Meter* (**Figure 5.4**)

NOTE: When contacting United Surface Solutions for support, please note active inputs and outputs when speaking with a technician.

5.1.6 Help Menu

The CPC is designed with help functions to assist the operator on the fly. To access the *Help Menu*



HELP MENU

To receive help on system operations touch on an item within any purple HELP MENU. A purple HELP screen will display information in regards to that item. To start choose a touch-key from below.



*HELP MENU
FIGURE 5.5*

press **SYSTEM HELP** on the *Main Menu*. From the *Help Menu* (**Figure 5.5**) the operator can retrieve information on system functions. By pressing any of the purple keys, a non-functional screen will be displayed where the operator can touch on an area to display a help balloon.

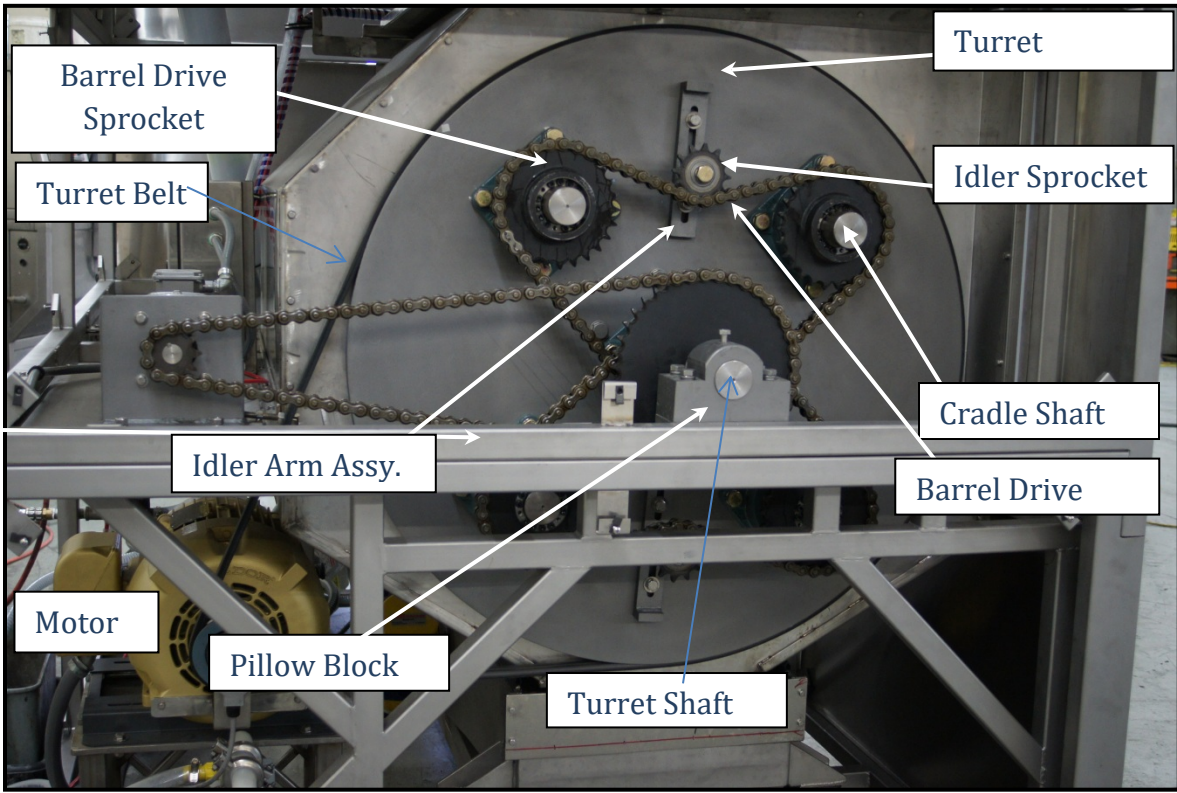
To navigate through the System Help screens use any of the purple function keys.

*I/O METER
FIGURE 5.4*

**ACTIVE
CONTACTS ARE
DISPLAYED IN
GREEN**

RETURN							
INPUTS							
0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07
0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15
1.00	1.01	1.02	1.03	1.04	1.05	1.06	1.07
1.08	1.09	1.10	1.11	1.12	1.13	1.14	1.15
OUTPUTS							
2.00	2.01	2.02	2.03	2.04	2.05	2.06	2.07
3.00	3.01	3.02	3.03	3.04	3.05	3.06	3.07
4.00	4.01	4.02	4.03	4.04	4.05	4.06	4.07
4.08	4.09	4.10	4.11	4.12	4.13	4.14	4.15

5.2 Maintenance and Repair



*MECHANICAL OVERVIEW
FIGURE 5.8*

5.2.1 Preventative Maintenance Schedule

Every Shift

- Inspect cradle over-centering latches.
- Inspect cradle hinges and barrel seats.
- Inspect barrel lock bars and barrel tabs.

First 50 Machine Hours

- Inspect turret double-v belt and tighten as needed
- Inspect barrel chains, lubricate and adjust as needed
- Inspect and tighten set screws on barrel shaft sprockets

First 250 Machine Hours

- Inspect turret double-v belt and tighten as needed
- Inspect barrel chains, lubricate and adjust as needed
- Inspect and tighten set screws on barrel shaft sprockets

Every 500 Machine Hours

- Grease turret bearings
- Grease barrel bearings
- Inspect turret double-v belt and tighten as needed
- Inspect barrel chains, lubricate and adjust as needed
- Inspect and tighten set screws on barrel shaft sprockets
- Inspect barrel & lid linings

Every 1000 Machine Hours

- Inspect electrical connections and tighten as needed.

5.2.2 Turret Drive Assembly

The turret of the CPC is driven using a double a-section v-belt that extends from the pulley on the main motor to the flywheel on the turret. Under most circumstances, this belt will not require any dressing or other conditioning.

Periodically inspect the belt for signs of unusual wear and cracks. Cracks on the top surface of the belt may appear once the belt stretches. This is normal and will not affect the operation of the belt. If cracking appears on the underside or the "V" area of the belt, replacement of the belt is recommended.

WARNING: Always disconnect power and lock the main disconnect switch before doing any maintenance or repair work.

5.3.3 Adjusting Main Drive Belt

As per The Gates Rubber Company the best tension for a V-Belt drive is the lowest tension at which the belts will not slip under the highest load condition.

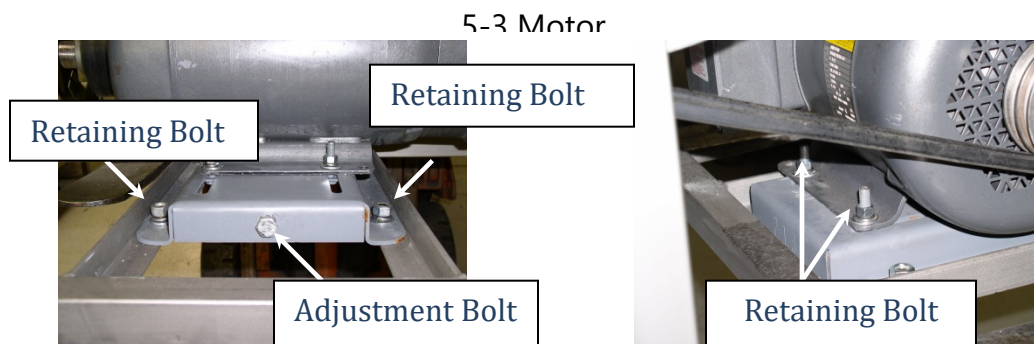
In this manner the method that is used by United's technicians is the twist method. The tension of the turret belt should allow the technician to twist the belt to the halfway point. If the belt can be twisted past the halfway point then the belt must be tightened. If the belt does not twist to the halfway point excess stress is being applied to the belt and bearings and may cause these components to fail prematurely.



For belt adjustment follow the procedures below:

1. Turn OFF the power at the safety disconnect and lock the handle in this position.
2. Loosen the four (4) retaining bolts holding the main drive motor to the motor base.
3. Use the adjustment bolt on the rear of the motor base to move the motor backwards to tighten the belt, or forward to loosen the belt.
4. Recheck the tension on the belt and adjust if necessary.
5. Tighten four (4) retaining bolts holding the main drive motor to the motor base and torque to 30 ft-lbs.

Note: It is important the motor remains parallel to the turret. Before retightening check motor with straight edge or square for alignment with turret.



5.3.4 Replacing Main Drive Belt

1. Empty ALL barrels, insert into the cradles and latch cradle lids.
2. Turn OFF the power at the Safety Disconnect and lock the handle in this position.

3. Release the motor brake by pulling outward on the brake release knob shown in photo 5-4 *Motor Brake*.
4. Loosen the motor adjustment nuts and move motor forwards to loosen the main drive belt. Remove the belt from the motor pulley.
5. Remove the six (6) bolts from the pillow blocks, four (4) on drive side, two (2) on free side.
6. Raise the turret and pillow blocks off the frame and slide the old drive belt out under the pillow block and the new drive belt in.
7. Tighten the six (6) the pillow block bolts, four (4) on drive side, two (2) on free side and torque to 80 ft-lbs.
8. Adjust the main drive belt per the procedure given above as described in Adjusting the Main Drive Belt.
9. Engage the motor brake by pushing in the brake release knob shown in photo 5-4 *Motor Brake*.

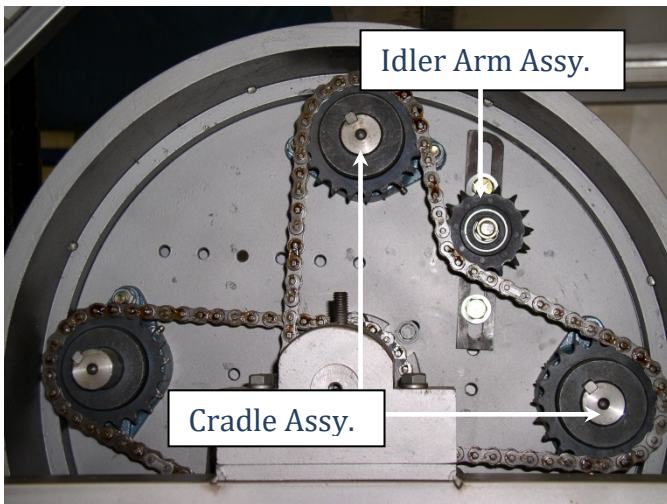


5-4 Motor

5.3.5 Barrel Drive Assembly

The barrels are driven at a 1:1 ration opposite the rotation of the turret by a 50 series sprocket and chain system. The chain type is classified as Diamond Chain and is very resistant to stretching after the brake-in period of 30-40 hours of operation. During this brake-in period some adjustment may be necessary.

5.3.6 Inspection



5-5 Barrel Drive

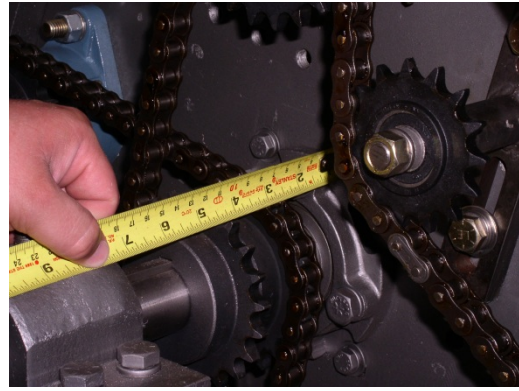
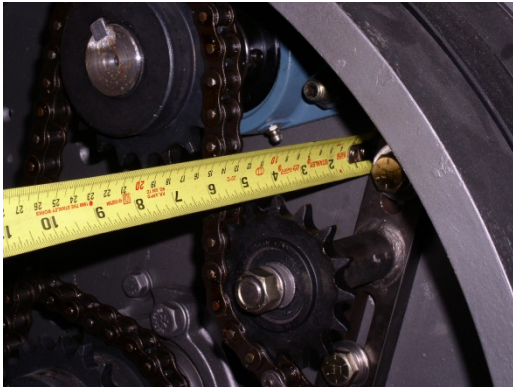
A butterfly configuration is used to drive the cradle assemblies that accommodate the barrels. Each butterfly configuration drives two (2) cradle assemblies and is adjusted by an idler arm assembly. Please refer to the photo 5-5 *Barrel Drive Assembly* on the left for associated components. The operator can check for chain slack and determine if an adjustment is necessary simply by rocking the cradle assembly in a forward and reverse rotation while the CPC is powered OFF and the door is open. If movement is preset then adjustment is necessary.

Visually examine the chains and sprockets for signs of wear or misalignment. If indications of wear are present use the following procedure for further inspection:

5.3.7 Drive Component Removal

To remove and replace barrel drive components follow these procedures:

1. Empty ALL barrels, position into the cradles and latch cradle lids.
2. Turn OFF the power at the safety disconnect and lock the handle in this position.
3. Release the motor brake by pulling outward on the brake release knob shown in photo 5-4 *Motor Brake*.
4. Position the turret so that the drive components to be repaired or replaced are conveniently located and set the motor brake.
5. Remove the two (2) bolts holding the idler arm assembly in place and remove the Idler arm from the turret.
6. Check the Idler Sprocket Bearing for ease of movement and side play and inspect the sprocket for wear. Replace Bearing/Sprocket Assemble if necessary. Torque sprocket retainer nut to 50 ft-lbs.
7. Remove the chain by means of the master link. Clean with mild solvent if necessary and lubricate with penetrating oil such as "Slick 50® One Lube®".
8. Inspect the Barrel Drive Sprockets and keyways for movement. Visually inspect for rust between the sprocket and cradle shaft and physically grasp the sprocket and check for movement on the shaft. If movement is evident remove sprocket and examine keyways for wear. Replace key, shaft or sprocket if wear is excessive.
9. Install Idler Arm Assembly and any sprockets removed and slightly tighten, do not torque.
10. Align Barrel and Turret Sprocket to Idler Sprocket using a measuring device. First measure the distance from the turret disc (disc that the Idler Assy. is mounted on) the center of the Idler Sprocket, record the distance. Next adjust the Barrel and Turret Sprockets so that the centerline of the sprocket equals that of the recorded distance. Refer to photo 5-7 *Align Sprockets* for a demonstration view. Torque Turret and Barrel Sprocket setscrew to 20 ft-lbs.
11. Install the chain and lock the master link using the retainer.

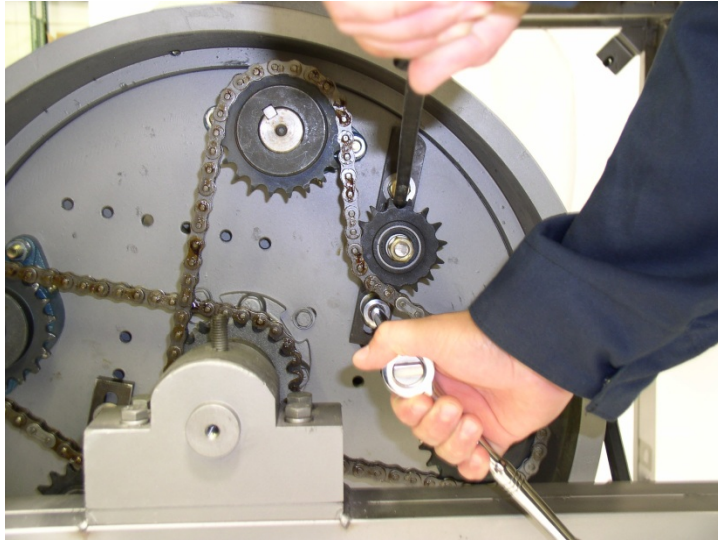


5-7 Align Sprockets

5.3.8 Adjusting Barrel Chain

To adjust the barrel chain, please refer to the following procedure (if continuing from the previous section skip steps 1-5):

1. Empty ALL barrels, position into the cradles and latch cradle lids.
2. Turn OFF the power at the safety disconnect and lock the handle in this position.
3. Release the motor brake by pulling outward on the brake release knob shown in photo 5-4 *Motor Brake*.
4. Position the turret so that the Idler Arm Assembly for the butterfly assembly that needs adjustment is conveniently located and set the motor brake.
5. Slightly loosen the two (2) bolts holding the idler arm assembly in place and remove the Idler arm from the turret.
6. Using a pry bar gently press down (applying 10 to 15 pounds of pressure) on the Idler assembly taking up all slack in the chain. Refer to photo 5-8 *Adjusting Idler Assembly* for tightening method.
7. Retighten the two (2) bolts holding the idler arm assembly and torque to 80 ft-lbs.



5-8 Adjusting Idler Assembly

5.3.9 Bearings

Lubricating

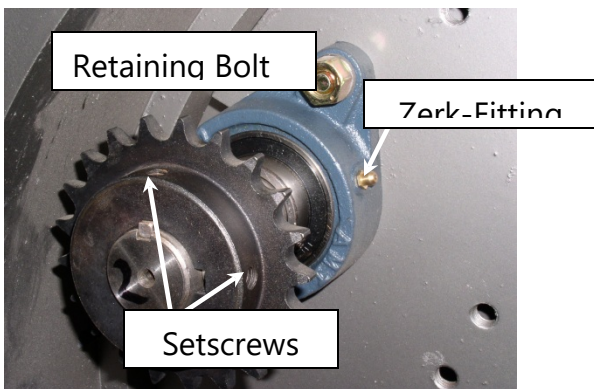
The barrel and turret bearings must be periodically lubricated with water-resistant grease, such as Deoplex Multi-Purpose #2EP, to maintain their service life. Each of the eight (8) barrel bearings (four per side) is equipped with a zerk-fitting for this purpose. Refer to photo 5-9 and 5-10 for zerk-fitting locations.

When lubricating, add only a small amount of grease at any one time, usually only one or two pumps on a grease gun. Adding too much will result in damage to the seal, which will allow water and process chemicals to enter the bearing. If this occurs, the bearing will have to be replaced within a short period of time.

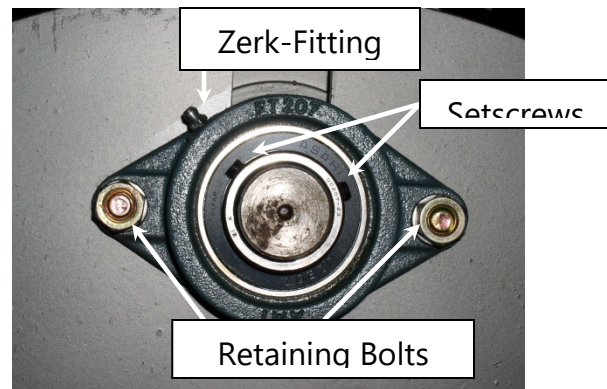
Barrel Bearing - Replacement

1. Empty ALL barrels, position into the cradles and latch cradle lids.
2. Turn OFF the power at the safety disconnect and lock the handle in this position.
3. Release the motor brake by pulling outward on the brake release knob shown in photo 5-4 *Motor Brake*.
4. Position the turret so that the barrel bearing to be replaced is conveniently located and set the motor brake.
5. Remove the two (2) retaining bolts holding the idler arm assembly in place and remove the Idler arm from the turret.
6. Loosen the setscrews holding the sprocket to the shaft, and slide the sprocket off the barrel shaft, using a bearing puller if necessary.
7. Loosen the two (2) setscrews holding the bearing onto the shaft.
8. Remove the two (2) retaining bolts holding the bearing to the turret and slide the bearing off the shaft.
9. Install the new bearing using the method shown in photo 5-11 *Install Barrel Bearing*. Measure the distance from the center shaft to the cradle shaft center point. The distance should equal that of the existing bearings or exactly 8 inches. Torque bearing retaining bolts to 80 ft-lbs.
10. Proceed to line #9 in Drive Component Removal in the previous section for installation instructions.

11. Lubricate the new bearing according to the instructions given in the section Lubricating.



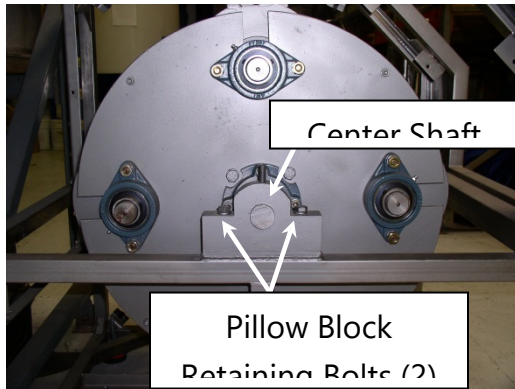
5-9 Bearing



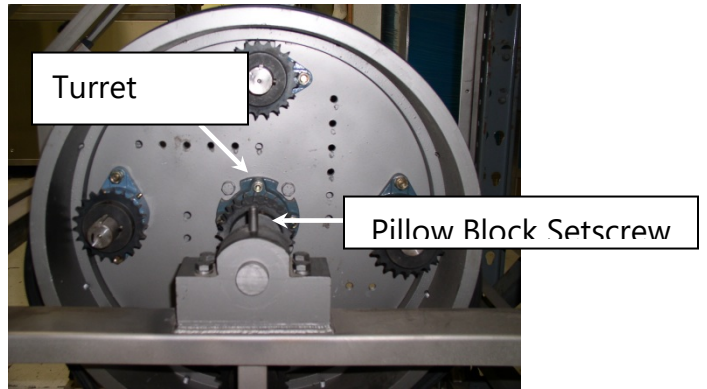
5-10 Bearing

Turret Bearing - Replacement

1. Empty ALL barrels, insert into the cradles and latch cradle lids.
2. Turn OFF the power at the safety disconnect and lock the handle in this position.
3. Release the motor brake by pulling outward on the brake release knob shown in photo 5-4 *Motor Brake*.
4. Loosen the motor adjustment nuts and move motor forwards to loosen the main drive belt. Remove the belt from the motor pulley.
5. If replacing bearing on the Drive Side, remove all Idler Assemblies and both chains.
6. Loosen setscrews on both pillow blocks, Do Not remove the pillow block retaining bolts.
7. Remove the four (4) Turret Bearing Retaining Bolts for the bearing that is being replaced.
8. Loosen the Turret Bearing Setscrews for the bearing on the OPPOSITE side of the turret.
9. Gentle tap the center shaft, OPPOSITE the side of the bearing being replaced, moving it inward about 3/8 of an inch. This will push the bearing that is being replaced out of its centering grove.
10. Remove all six (6) Pillow Block Retaining Bolts; four (4) on drive side and two (2) on free side.
11. Raise the Turret and remove the Pillow Block from the Center Shaft.
12. Loosen the setscrew on the bearing to be removed and slide it off the shaft. If replacing the bearing on the Drive Side, loosen the Sprocket Setscrews and remove both sprockets followed by the bearing.
13. Install the new Turret Bearing into the centering grove and tighten the retaining bolts by hand. Install the Center Shaft Sprockets if replacing the bearing on the Drive Side.
14. Install the Pillow Block and lower the Turret. Torque the Pillow Block Retaining Bolts to 80 ft-lbs.
15. Position the Center Shaft evenly between the Pillow Blocks and torque the setscrews to 20 ft-lbs.
16. Torque the Turret Bearing Retaining Bolts to 60 ft-lbs and torque the setscrews for BOTH Turret Bearings to 15 ft-lbs.
17. Proceed to line #9 in Drive Component Removal in the previous section for installation instructions.
18. Lubricate the new bearing according to the instructions given in the section Lubricating.



5-12 Turret Free Side



5-13 Turret Drive Side

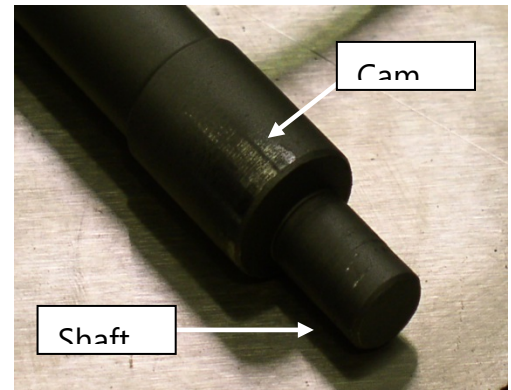
5.3.10 Barrels

Lockbar

The Lockbar is used to apply pressure on the lid and create seal between the lid and barrel. If the barrel lid is not secure, the barrel will leak water during operation.

The Lockbar uses an over-centering cam action to seal the barrel during operation. Periodically, inspect the Lockbar and Barrel Tabs for excessive wear. The cam lobes and shaft ends should be symmetrical and have no flat areas or groves. If the Lockbar is worn then it must be replaced. See photo's *5-10 Profiles and 5-11 Lockbar*.

If repair is needed it is recommended that it be performed by a qualified United technician. For further information please contact UNITED SURFACE SOLUTIONS Product Support Team, Service Department, (877) 8374623.



5-11

Torque Specifications

<i>PART DESCRIPTION</i>	<i>TORQUE</i>
Turret Bearings Retaining Bolts (four per bearing)	60 ft-lbs
Barrel Bearings Retaining Bolts (two per bearing)	80 ft-lbs
Idler Assembly Retaining Bolts (two per idler)	80 ft-lbs
Idler Sprocket Retaining Nut (one per idler)	50 ft-lbs
Pillar Block Retaining Bolts (four - drive side, two - free side)	80 ft-lbs
Motor Adjustment Base to Frame Retaining Bolts (four total)	80 ft-lbs
Motor to Motor Adjustment Base Retaining Nuts (four total)	30 ft-lbs
Setscrews – Sprocket (two per sprocket)	20 ft-lbs
Setscrews – Bearings (two per bearing)	15 ft-lbs
Isolator Pad Retaining Nut (one per pad)	15 ft-lbs
Lid Latch Retaining Bolt (three per latch)	15 ft-lbs

6.0 Troubleshooting

6.1 Interface Not Functioning

Possible Problem	Item to Check	Remarks
Control voltage fuse blown	Check for blown fuses.	If the door interlock has shorted out, it is usually because someone attempted to open the shutter door while in Run Mode. Check the interlock before re-energizing this circuit. Replace as necessary.
No power to the machine	Carefully check the three terminal blocks on the top of the main disconnect for line power.	Consult with your plant electrician to determine the source of the power outage.
PLC Power Supply Blown	Check the lights on the PLC located inside the control box.	The Power Supply on the PLC also powers the Interface, If there is power to the Drive Inverter and not to the PLC first check fuses then replace the Power Supply if needed.
No input voltage	Check that the main disconnect located on the electrical cabinet door is turned to the "On" position	Make sure that the machine is not being serviced before re-energizing the machine.
Main fuses blown	There are three fuses located in the main disconnect. With the power off, check for continuity across each of these fuses.	If a fuse is blown, <u>DO NOT REPLACE IT</u> until the problem that caused the fuse to blow has been corrected.
Loose wire or defective component	Turn the main disconnect to the "Off" position and carefully check and retighten electrical connections beginning at the main disconnect.	If you are certified to work with high voltage AC, re-energize the Disconnect and follow the voltage paths until you find the problem.

6.2 Will Not Begin Cycle

Possible Problem	Item to Check	Remarks
No power to the machine	Verify that the Power Indicator is lit and the CPC screen is operational.	Follow the procedures under "Interface Not Functioning"
Shutter Door is not closed entirely	The Shutter Door must be closed in order in order to place the machine in Run Mode.	Always either completely open or completely close the Shutter Door.
Drive error	Check Drive Keypad for error code.	Refer to the instruction manual for the drive that was supplied with the machine or contact UNITED SURFACE SOLUTIONS for support.
Loose wire or defective component	Turn the main disconnect to the "Off" position and carefully check and retighten electrical connections beginning at the main disconnect.	If you are certified to work with high voltage AC, re-energize the Disconnect and follow the voltage paths until you find the problem.

6.3 Premature System Halt

Possible Problem	Item to Check	Remarks
No power to the machine	Verify that the Power Indicator is lit	Follow the procedures under "Interface Not Functioning"
Drive error or overload	Check Drive Keypad for error code.	Refer to the instruction manual for the drive that was supplied with the machine or contact UNITED SURFACE SOLUTIONS for support.
Human error	<p>Attempting to open the Shutter Door while the machine is running may result in the cycle being canceled.</p> <p>The Stop Button may have been accidentally pressed.</p>	If the cycle timer has reset, human error is likely the problem. If the machine is stopped and the timer is still running, human error must be discounted.
E-Stop activated	Check the CPC Touch Screen to determine if the E-Stop has been activated.	If the E-Stop has been activated the timer will display the remaining time. Proceed to Manual Mode Screen to determine time remaining and finish the current process.
Loose wire or defective component	Turn the main disconnect to the "Off" position and carefully check and retighten electrical connections beginning at the main disconnect.	If you are certified to work with high voltage AC, re-energize the Disconnect and follow the voltage paths until you find the problem.

6.4 Desired RPM Not Reached

Possible Problem	Item to Check	Remarks
Machine overloaded	If the acceleration of the machine slows before the desired RPM is reached, the machine is attempting to avoid an overload condition.	<p>Loading the barrels with <u>more</u> material <u>will not overload</u> the machine. With the CPC, the greatest load condition occurs at approximately 60% fill height.</p> <p>Try running your process with <u>more</u> parts and media to eliminate this condition.</p>
Exceeds Maximum RPM	If in Manual or Auto Mode Screens the "EXCEEDS MAXIMUM RPM" is displayed, check the Maximum RPM setting in the System Tools screen.	Maximum RPM and Cycle Time limits are set to protect the system from operator error. These settings can be password protected.

6.5 Barrels Leak

Possible Problem	Item to Check	Remarks
Contamination on the sealing surface of the barrel and lid	Remove the lid and check for media, compound or other obstructions on the sealing surfaces	Review the section "Closing & Loading Barrels" for procedures to eliminate this problem.
Process too hot	Verify that the process is not building up significant heat and pressure that is causing the seal to fail.	Refer to the section "Opening the Barrels" for information and tips about building up pressure in the barrels.

Worn barrel tabs	Inspect the barrel tabs on each end of each Lock bar and adjust as necessary.	Refer to the section "Lockbar" for detailed instructions.
Worn linings	Inspect the barrel linings	Refer to the section "Inspecting Barrel Lining" instructions.

6.6 Turret Slips During Loading

Possible Problem	Item to Check	Remarks
Loose or broken main drive belt.	Attempt to rotate the turret by hand, if it rotates, then the belt needs servicing.	Refer to the "Main Drive Belt" section for tensioning and replacement instructions.
"Glazed" main brake rotor	Run the machine at 120-180 rpm empty and then remove power from the machine. This will grind a thin layer off the rotor allowing the brake to re-seat.	Due to the requirements of the machine, this "glazing" may become a common occurrence. In which case add this procedure to your preventative maintenance schedule.

7.0 Appendix

The following information for the CPC12000 finishing system is intended to assist personnel with the basic operations of the system. Some or all of the information may not be current. If updated information is required, please contact our technical support team. Thank you for choosing UNITED SURFACE SOLUTIONS, LLC for your finishing solutions.

7.1 Handling Compounds

Compounds are soaps, chemicals and abrasives used in conjunction with a media. Depending on your process, some keep the parts and media clean throughout the process, and some assist the media's cutting properties. Others react to the work piece to remove scale or brighten the surface finish.

In order to perform these tasks, some compounds include harsh chemicals. The pH levels of the compounds that you will be using range from 10 to 2. A pH level of 7 is neutral, like water. It is neither acidic nor base. The farther from neutral a compound becomes (whether up or down from seven), the more harmful the effects.

Each container of compound will have an UNITED SURFACE SOLUTIONS label that shows the "Hazardous Material Identification Guide" (HMIG) rating of the compound. These labels give the level of health risk, degree of flammability and the reactivity of the compound. Also, the protective equipment requirements for handling the compound are shown. This information is furnished in compliance with OSHA Federal Hazard Communication Standard 29 CFR1900.1200, known as the "Right to Know" law.

Another great source of information is the Material Safety Data Sheet. This form can be obtained from your supplier and depicts every hazard or concern related to it. We recommend that these forms be filed for future reference.

It is a good idea to provide a "wash down station" near the work area. At minimum, a manual eye wash bottle should be available. This suggestion, like all others, is deferent to Occupational Safety and Health Administration (OSHA) requirements and local safety code.

UNITED SURFACE SOLUTIONS, LLC

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