Date: 7/27/2012
Revised: 9/10/2012
Job #: E3281

Bimbo Bakeries

Elkhart, IN

Model 2000 Depanner CAD-1-42-C w/Seed Containment & Cyclone Separator Book 1 of 1

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DEPANNER MANUAL

BIMBO BAKERIES
Elkhart, IN
JOB E3281-401
MODEL 2000 DEPANNER CAD-1-42-C w/Seed Containment Unit & Cyclone Separator

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Book 1 of 1

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Section 4. Parts Manual

SYSTEM DATA

MACHINE DATA	
MODEL #:	CAD-1-42-C
SERIAL #:	D2950712
FACTORY ORDER:	E3281-401, -409, -411
CUSTOMER INFORMATION	
COMPANY:	Bimbo Bakeries
LOCATION:	Elkhart, IN
DESCRIPTION	
MODEL 2000 DEPANNER MANUAL	
MODEL 2000 DEPANNER	
YEAR OF PRODUCTION:	2012
SUBJECT TO ALTERATIONS	

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MOTOR/SPROCKET SHEET

CUSTOMER: Bimbo Bakeries | **JOB NUMBER: E3281 – 01 – 401**

MACHINE:Model 2000 Depanner CAD–1–42 W/ Cyclone Sep. | **VOLTS: 480** | **HZ: 60** | **PH: 3** | **PAGE 1 OF 1**

SECTION #	CONVEYOR DESCRIPTION	BELT SPEED (FPM)	MOTOR DESCRIPTION	SPROCKETS	
				MOTOR	CONVEYOR
*	3 1/4" D.T.T. Pan Infeed Conveyor	103.6	Jumper drive from Pan Discharge Conveyor	D.T.T. ∅30 40B19	D.T.T. ∅30 40B22
*	3 1/4" D.T.T. Pan Discharge Conveyor	119.9	1 HP 101 FPM KA37/TDRE80M4/MM07/V M – 2		
*	Intralox 1100 Product Discharge Conveyor	123.4	Jumper drive from Pan Discharge Conveyor	D.T.T. ∅30 40B22	Intralox ∅40 40B18
	Product Discharge Conveyor Tilt		Actuator P-TMD02-2906-4"Stroke 20PPR 24VDC Duff-Norton		
	Vacuum Belt	111.9	1 1/2HP 60 RPM KA37/TDRE90M4/MM11/V M – 4		
*	Vacuum Lift	.40" / Sec.	1/2HP 588 RPM RX67DRS71S4BE05HR/EI7C M – 1	Timing Pulley ∅25 19L100	Timing Pulley ∅25 19L100
	Vacuum Chamber Tilt		Actuator P-TMD02-2906-4"Stroke 20PPR 24VDC Duff-Norton		
	Vacuum Damper Valve		Actuator P-TMD02-2906-4"Stroke 20PPR 24VDC Duff-Norton		
*	Blower		25 HP		
*	Pan Guides		1/3 HP 207 RPM W20DRS71S4/EI7C M – 1		
			* Above Speed At 60 HZ.		
			PRODUCTION RATE		
			120.0 FPM (max.)		
			40.1 FPM (min.)		

DEPANNER PERFORMANCE DATA SHEET

Customer:	**AMF / BBU Elkhart**			**Model No.: 2000 CAD-1-42-C**	
Location:	**Elkhart, TX**			**Serial No.: D2950712**	
Job No.:	**E3281-01-401**				
1. Speed In Feet / Minute					
A. Metering Belt:	**Minimum**	**21.4**		**Maximum**	**152.7**
B. Table Top:	**Minimum**	**24.3**		**Maximum**	**175.3**
C. Vacuum Belt:	**Minimum**	**23.2**		**Maximum**	**161.4**
D. Product Discharge:	**Minimum**	**27.1**		**Maximum**	**183.8**
E. Lid Conveyor:	**Minimum**	**N/A**		**Maximum**	**N/A**
2. Vacuum Measurement @ Maximum Setting 30 kiloPascals					
3. Electrical: 480 Volts, 60 Hertz, 3 Phase					

Amperage Reading:	**Measure Reading:**		**Motor Nameplate:**
A. Pan Conveyor Motor:	**Minimum Speed:**	**0.15**	**1.0 HP 1.9 A**
	Maximum Speed:	**0.58**	
B. Vacuum Belt Drive:	**Minimum Speed:**	**0.32**	**1.5 HP 2.1 A**
	Maximum Speed:	**0.53**	
C. Blower:	**Minimum Vacuum:**	**3 | 11.2 A**	**25 HP 28.4 A**
	Maximum Vacuum:	**30 | 17.3 A**	
D. Chamber Lift:	**Down:**	**0.83**	**0.5 HP SF 1.0 0.92 A**
	Up:	**0.85**	
E. Lid Conveyor:	**Minimum Speed:**	**N/A**	**N/A**
	Maximum Speed:	**N/A**	
F. Delidder Lift:	**Down:**	**N/A**	**N/A**
	Up:	**N/A**	
G. Pan Guide:	**In:**	**0.38**	**0.33 HP 0.57 A**
	Out:	**0.38**	
4. Air Jets Functional:	☐ **N/A**	☒ **Yes**	☐ **NO**
5. Control Side:	☒ **Left hand**	☐ **Right Hand**	
6. Interlocks Functioning	☐ **N/A**	☒ **Yes**	☐ **NO**

Initially Inspected By:	*Adam Gephardt*	
Final Approval of Fit / Form / Function:	**Mech. Eng.**	**Elec. Eng.**

GENERAL DESCRIPTION

The depanner is designed to gently remove product from the baking pans/forms. The depanner transports the baking pans with product on a belt conveyor and a tabletop chain conveyor to the vacuum chamber. An air jet assembly is mounted in front of the vacuum chamber to loosen the product (if needed) from the pan prior to entering the depanning area. As the pans enter the depanning area they are held down by magnets mounted within the pan conveyor. At the same time the product is removed by vacuum cups which are mounted on a vacuum belt. A motorized pulley drives the vacuum belt. A large radius vacuum chamber is used for gentle depanning of the product. The vacuum belt cups can be cleaned by a cup cleaner (optional) using an airline that is mounted on the inside of the belt and located on top of the vacuum chamber. The air flow to the cup cleaner is activated by a solenoid and is turned on or off by the panel view display. A product discharge conveyor mounted within the depanner frame supports the product as it is being released from the cups and conveys the product to the transport conveyor. The empty baking pan moves on the tabletop chain conveyor and is taken over by a discharge conveyor. The height of the product discharge can be adjusted by means of a handwheel or menu driven automatic adjust. The upper and lower limit for the vacuum belt is controlled by proximity sensors that when blocked act as a safety to stop the motor to prevent the belt from over traveling. Depending on the product, the vacuum force in the vacuum chamber can be adjusted with an electric control vacuum valve. The valve, controlled with the panel view display, has an open-to-close time of 15 seconds. The valve is set at the factory.

The delidding conveyor (optional) is contained within the main depanner frame. It is a magnetic double tabletop conveyor that removes the lids from the bread pans and transfers them up over the vacuum chamber and onto the discharge conveyor. The lids are removed prior to the pan entering the vacuum chamber area.

A safety light screen (optional) provides a point-of-operation area access and perimeter safeguarding to protect personnel from injury and equipment from damage.

ATTENTION: The vacuum valve must **NOT** be totally closed.

ADVICE: Note the height of each type of product. Write these heights down on a machine adjustment chart and keep this chart with the depanner. Doing this will save time adjusting the depanner when changing over from one product to another. This chart must be changed depending on the product requirements.

The depanner is provided in a fully operational condition. Any modifications of any type to the equipment must be previously approved by Capway Systems, Inc. Capway Systems, Inc. takes no liability in itself for damage or accidents which are caused by the changing of the mechanical, pneumatic and/or electrical configuration of the equipment without the consultation of Capway Systems, Inc.

Please exercise caution and pay attention to warning stickers and/or labels! These are placed on the equipment for the safety of the personnel around the equipment. Failure to acknowledge the posted warnings can result in serious injury or perhaps death.

The equipment has been specified only suitable for the transporting of the products listed on the order confirmation. Application of other products can lead to equipment damage or failure.

Use of the equipment for other than what is specified can lead to dangerous situations.

The equipment is not suitable for transporting people.

DESCRIPTION OF MODEL 2000 DEPANNER

	APPLICATION	This depanner is suitable to de-pan most types of baked products from the baking pans/forms.
	CONSTRUCTION OF THE DEPANNER	The depanner consists of the following units: 1. Frame 2. Infeed/discharge conveyors 3. Product discharge conveyor with height adjustment 4. Lid conveyor (optional) 5. Vacuum chamber 6. Height adjustment vacuum chamber 7. Vacuum system 8. Drive motors 9. Vacuum valve 10. Electrical controls
	FRAME	Pertains to all units. The frame with precision cage construction is manufactured of tube profiles and stands on six heavy adjustable feet. By moving the adjustable feet in or out, any floor unevenness can be compensated for. The depanner must stand level. The sides of the depanner are completely enclosed by means of removable panels. The casing has been built out of insulated panels to prevent nuisance noise and is easy to clean.
	INFEED/DISCHARGE PAN CONVEYOR	The infeed conveyor can be designed in different combinations: A. As a belt conveyor (buffer conveyor) and/or as a tabletop chain conveyor. B. Driven by the discharge conveyor or by its own motor. The pan discharge conveyor is always designed as a tabletop chain conveyor and driven by the central drive motor. The side guides are adjustable and kept at the required distance from each other by using adjustable handles/handwheels or menu driven automatic adjust. **Belt Conveyor** The belt conveyor is supported by a stainless steel slide plate and driven by a drive pulley. This drive pulley is mounted on the drive shaft. The shaft is supported by bearing blocks with self-aligning ball bearings. A sprocket is mounted on one end of the shaft. This shaft is jumper-driven from the tabletop conveyor. Magnets are mounted under the slider bed. **Tabletop Chain Conveyor, Pan Discharge** The chains are supported by U-profiles which are provided with plastic wear profiles. Magnets are fitted between the chains to ensure a better hold on the pans. This conveyor is jumper-driven from the product discharge conveyor.

	PRODUCT DISCHARGE CONVEYOR	The product discharge conveyor is a belt type. The belt is driven by a drive pulley. The discharge conveyor is driven by its own motor. The infeed side is adjustable in height by means of a handwheel or menu driven automatic adjust.
	LID CONVEYOR (Optional)	A double tabletop conveyor utilizes 3 1/4" stainless steel tabletop chains and is equipped with magnets between the chains. The lid conveyor is driven by its own gearmotor. The infeed height of the lid conveyor can be adjusted with a handwheel or menu driven automatic adjust so that the lids can be picked up easily. **ATTENTION:** If the lid conveyor is not used, place it in the highest position.
	VACUUM CHAMBER	The vacuum chamber can be adjusted by means of a two-way switch located on the panel view display. The upper and lower positions are limited by a proximity switch. The chamber is equipped with a vacuum belt on which the vacuum cups and retainers are mounted. The vacuum belt can be re-tensioned by means of the end drum.
	TILT ADJUSTMENT VACCUM CHAMBER	The tilt of the vacuum chamber can be adjusted manually by means of a handwheel or menu driven automatic adjust.
	VACUUM SYSTEM AND FAN	A high efficiency fan and drive motor are mounted free of vibration on the machine frame. The pressure in the vacuum chamber is generated by the fan. An electrically adjustable vacuum valve controls the vacuum force. The vacuum intake is connected to the filter casing which houses a removable filter. The vacuum force is indicated by a manometer.
	DRIVE MOTORS	All conveyors are driven by their own motors except for the pan conveyor which is jumper driven from the product discharge belt.
	VACUUM VALVE	The vacuum valve is set at the factory. Altering the limit switch settings can cause damage to the blower motor.
	ELECTRICAL	The control box is fitted on the front side (discharge) of the depanner. The control station is pedestal mounted on the side of the infeed direction. The depanner is completely pre-wired.

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GENERAL INFORMATION

a. ESSENTIAL INFORMATION

Dear Customer:

These operating instructions are entrusted to you as the buyer of our equipment. They contain important information and drawings which are only intended for your guidance.

We expect you to treat them confidentially and not to make them accessible to third parties. One copy must be handed over to your operators.

It is essential for the operation and reliability of our products that our operating and maintenance instructions, as well as the accident prevention regulations are adhered to exactly.

Accordingly, the proper use of technical products includes the observation of the operating and maintenance instructions and precautions against foreseeable mistakes.

If we supply accessories later, they are entered in the record. We depend on these details to a large extent when supplying spare parts.

Please give the type of machine or plant with every order, in addition to factory number, the order number and the works number. If you have any inquiries on this manual, please state the section and page number given at the bottom.

In our efforts to give you quicker and better service, following the above procedures will help.

See Order Conformation Sheet & Attachments for terms and conditions of service, warranty, etc.

b. SAFETY REGULATIONS

In order to prevent accidents with this machine, please read the following safety regulations carefully:

- When putting the system into service, operating and maintaining, always avoid any danger to life, limb, health and property.
- Only allow the installation and operation to be performed by fully trained personnel.
- Temporary and unskilled workers must only be allowed to operate the installation while under the supervision of trained personnel.
- Work on a control box, electrical or control component must only be performed by fully trained personnel or the firm's electrician.
- Any work performed after the installation has occurred must satisfy the applicable regulations.

**DANGER SITUATIONS: BEFORE OPENING THE SWITCH BOX,
TURN OFF THE MAIN SWITCH AND REMOVE THE FUSES**

- Before working on the equipment, "LOCK OUT" the electrical and pneumatic energy.
- If a problem arises, **DO NOT** place hands in or interfere in the machine. Switch off the machine and solve the problem.
- Keep hands away from the switches during operation.
- **DO NOT** attempt to climb over or crawl under running conveyors.
- Safety covers and chain guards may only be removed when the equipment is switched off.
- Always ensure that there are no other persons in the danger zone before starting the installation.
- Always switch off the main switch before making any repairs.

There should be an adequate number of medically qualified people present in the facility at all times. This includes normal operation as well as maintenance and cleaning activities.

PERFORM REGULAR MAINTENANCE!

KEY SYMBOLS

Text marked with one of the following symbols must be read carefully. They contain comments which concern your safety.

Tip. Advice and suggestions to the user on how to carry out certain tasks more easily and skilfully.

N.B! A comment giving additional information. A comment to make the user aware of a potential problem.

Warning! The user can (seriously) injure themselves or seriously damage the product. A warning shows that damage to the user or the product will occur if the user does not follow the instructions carefully.

Danger! The user is directly threatened with loss of life.

c. CONVEYOR SAFETY

Conveyor related injuries are common and can be very costly to employers. In recent years the U.S. Department of Labor and Bureau of Labor Statistics reported, on average, 50 conveyor related fatalities per year. These workplace accidents account for approximately 25 percent of all workers' compensation claims and up to 35 percent of all associated costs. Establishing conveyor safety measures and exercising caution around conveyors is absolutely critical in any material handling operation.

There should be an adequate number of medically qualified people present in the facility at all times. This includes normal operation as well as maintenance and cleaning activities.

Keep loose clothing away from the conveyor.

Avoid wearing jewelry while operating the conveyor.

Keep fingers and hair away from the conveyor.

Do not climb, step, stand, sit, or ride on the conveyor at any time.

Be familiar with all emergency stop locations.

Do not remove or alter guards or any other safety features.

Operate the conveyor with trained personnel only.

Report all unsafe practices to your supervisor.

Be aware of any local and federal regulatory requirements for safety.

Potential conveyor hazards include, but are not limited to:

Mechanical hazards:

- **Nip points**
- **Shear points**
- **Pinch points**
- **Crush points**
- **Lacerations**
- **Transfer areas**
- **Power transmissions**

Pneumatic hazards:

- **Nip points**
- **Shear points**
- **Pinch points**
- **Crush points**

Electrical hazards:

- **Electrical shock**
- **Arc flash**

Magnetic hazards:

- **Pacemaker wearers should avoid close contact**

The equipment is provided with safety features which can prevent accidents from occurring. These safety features must be tested often to ensure they are functioning properly.

DO NOT test during production, but in a separate test period. Test at least one time per week.

Table 1: Testing the safety systems. Test each separately!

What to test…	How to test…	What to expect…
Emergency stops	• Press emergency stop button. • Reset the system after activating each button.	• Part of the equipment being tested should stop.
Audible and light signals	• Press emergency stop button. • Reset the system after activating each button.	• Lights should flash and the audible signal can be heard.
Start and reset buttons	• First activate an emergency stop, cancel this and then press the start button. • Press the reset button and then the start button.	• The equipment should not start. • The equipment should start.
Main switches	• Turn main switch to the “OFF” (“O”) position.	• Power should be disconnected from the switch box.
Work switches	• Turn work switch to the “OFF” (“O”) position.	• The related motor should stop.
Instruction and warning labels	• Regularly check that the labels are present and legible.	

THINGS TO REMEMBER

Just as with your personal vehicle, a well maintained conveyor (or system) will benefit your operation for years to come. Here are a few things to remember which should keep your conveyor system and/or equipment running smoothly.

- **DO NOT** exceed the conveyor's capacity. A conveyor has two (2) capacities. The first being "structural" or static capacity which is its skeletal strength (or how much it can support just sitting there). And the second is "live load" which is the weight it can "move". Most conveyors are not made to walk on.
- Don't forget to lubricate those items which require lubrication (check the Maintenance Information section in this manual for specific items).
- Maintain proper oil levels in all reducers with the proper oil. Using the wrong oil can cause premature and sometimes catastrophic gear failure. Reducers with insufficient oil or too much oil can run "hot" which deteriorates seals and bearings.
- Make sure that the employees who work around or maintain the conveyors are familiar with all safety and warning issues. In an effort to "get-r-done" we sometimes forget that people may not be aware of particular safety issues concerning a particular piece of equipment.
- Be certain that the system and/or equipment is "in-line" as originally installed. Through day to day usage things can get moved or bumped out of position. Keeping everything in its proper orientation will assure your product moves smoothly from point A to point B. Another good idea is to make sure that all permanent conveyors and/or equipment are properly lagged to the floor.
- Keep recommended spare parts on hand. Some parts can have extensive lead times to replace and expediting costs can be exorbitant. There should be a recommended spare parts list in this manual, if not contact Capway Systems for a copy which will be specific to your project.
- If operational parameters change, check with Capway Systems to verify if the parameters are within the capability of the conveyor. Just increasing conveyor speed can have a negative effect on your operation. Horsepower requirements need to be checked also. As a rule of thumb it takes twice the horsepower to move an object at 130 fpm than at 65 fpm. Control timing will also be impacted.
- "Doing it" correctly will always have a positive effect on your system capacity and longevity.

d. LOCKOUT/TAGOUT PROCEDURES

PURPOSE

The user is responsible for ensuring that safe procedures are in place for isolation of the equipment and that these procedures are used before any cleaning or maintenance tasks are commenced. All power sources should be locked out and tagged indicating by whom and for what purpose the power has been removed.

This procedure establishes the minimum requirements for the lockout or tagout of energy devices. It should be used to ensure that the machine or equipment is isolated from all potentially hazardous energy sources and locked out or tagged out before employees perform any servicing or maintenance activities where the unexpected movement, start-up or release of stored energy could cause injury. Refer to your company's Lockout/Tagout policy for the recommended procedure.

DEFINITIONS

a. **Affected Employee:** An employee whose job requires him/her to operate or use a machine or equipment on which maintenance or repair is being performed under this lockout/tagout policy or whose job requires him/her to work in an area in which such maintenance or repair is being performed.

b. **Authorized Individual**: A knowledgeable individual to whom the supervisor has given the authority and responsibility to lock or implement a lockout/tagout procedure on machines or equipment to perform maintenance or repair. An authorized individual and an affected employee may be the same person when the affected employee's duties also include performing maintenance or repair of a machine or equipment which must be locked and tagged out.

c. **Knowledgeable Individual:** An individual who is qualified to operate the controls or equipment and is familiar with the effects of operation.

RESPONSIBILITY

Appropriate employees shall be instructed in the safety significance of the lockout (or tagout) procedure as listed above as authorized employees. Each new or transferred affected employee whose operations are or may be in the area shall be instructed in the purpose and use of the lockout procedure.

SEQUENCE OF LOCKOUT OR TAGOUT SYSTEM PROCEDURE (ANSI Z-244.1)

1. **Preparation:** Notify all affected employees that a lockout or tagout system is going to be utilized and the reason therefore. The authorized employee shall know the type and magnitude of the energy that the machine and equipment utilizes and shall understand the hazards thereof.
2. **Machine or Equipment Shutdown:** If the machine or equipment is operating, shut it down by the normal stopping procedures (push stop button, open toggle switch, etc.).
3. **Machine or Equipment Isolation:** Operate the main disconnect switch, valve, or other energy isolating device so that the energy source(s) (electrical, mechanical, pneumatic, etc.) is disconnected or isolated from the equipment. Stored energy such as rotating motors must be allowed to come to a complete rest. Stored energy, such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems and air, gas, steam or water pressure, etc., must also be dissipated or restrained by methods such as grounding, repositioning, blocking, etc.
4. **Application of Lockout/Tagout:** Lockout and/or tagout the main disconnect switch with its assigned individual lock even though someone may have locked the control before you.
5. **Verification of Isolation:** After ensuring that no personnel are exposed and as a check on having disconnected the energy source operate the push button or the normal operating controls to make certain the equipment will not operate.

CAUTION: RETURN OPERATING CONTROLS TO "NEUTRAL" OR "OFF" POSITION AFTER THE TEST

6. The machine is now locked or tagged out.

RESTORING MACHINE OR EQUIPMENT TO NORMAL PRODUCTION OPERATIONS

1. Before lockout or tagout devices are removed and energy is restored to the equipment inspect the work area to ensure that nonessential items, such as tools, have been removed and to ensure that the equipment guards and components are operationally intact.
2. Check work area to ensure that all employees are in the clear.
3. Notify affected employees that lockout/tagout devices have been removed.
4. Each lockout/tagout device shall be removed from the energy isolating device by the employee who applied the device. The energy isolating devices may be opened or closed, i.e., circuit breakers, to restore energy to equipment.

PROCEDURE INVOLVING MORE THAN ONE AUTHORIZED PERSON

In the preceding steps if more than one individual is required to lock out equipment, each person shall place a lock and tag on the group lockout device when that person begins work and shall remove their lock when that person stops working on the equipment.

LOCKOUT PROCEDURE DURING SHIFT CHANGE

Each worker is responsible for removing their own lock and tag device at the completion of the shift **AFTER** the following shifts personnel have placed their lock and tag on the equipment. This ensures continuous lockout/tagout protection during shift or personnel changes. If work is to cease until the next day the supervisor should place his/her personal lock and tag on the equipment and the workers remove their own locks and tags. When work resumes, the workers should place their personal lock and tag to the equipment and the supervisor should remove his/her lock and tag.

EXCEPTION TO SPECIFIC "ENERGY CONTROL PROCEDURE"

Please note that **ALL** of the following criteria must be met for minor servicing to take place without a specific energy control policy. Lockout is still required but a written procedure is not mandatory.

Exception from the requirement to have a specific "Energy Control Procedure" is detailed in OSHA's 29 CFR 1910.147 (c) (4) (i) lockout/tagout regulation. It states:

"The employer need not document the required procedure for a particular machine or equipment, when all the following elements exist:

1. The machine or equipment has no potential for stored or residual energy or re-accumulation of stored energy after shut down which could endanger employees.
2. The machine or equipment has a single energy source which can be readily identified and isolated.
3. The isolation and locking out of that energy source will completely de-energize and de-activate the machine or equipment.
4. The machine or equipment is isolated from that energy source and locked out during servicing or maintenance.
5. A single lockout device will achieve a lockout condition.
6. The lockout device is under the exclusive control of the authorized employee performing the servicing or maintenance.
7. The servicing or maintenance does not create hazards for other employees.
8. The employer in utilizing this exception has had no accidents involving the unexpected activation or re-energization of the machine or equipment during servicing or maintenance."

e. IMPORTANT SAFETY HAZARD LABELS

(Reference OSHA 1910.145/ANSI R545/ISO 3B64)

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations. The color "red" is used to identify "Danger" signs.

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. The color "orange" is used to identify "Warning" signs.

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. The color "yellow" is used to identify "Caution" signs.

NOTICE indicates a message to relay company policy or recommendations that relate directly to personal safety and/or operational issues. The color "blue" is used to identify "Notice" signs.

Whenever possible "pictographs" are also used to provide an "easy to understand" alternative to multi-lingual signs/labels.

DANGER: HIGH VOLTAGE

CAUTION: ELECTRIC SHOCK HAZARD

LOCKOUT ELECTRICAL AND MECHANICAL POWER

CAUTION: HAND CRUSH HAZARD

FALLING HAZARD

PINCH POINT HAZARD

ARC FLASH HAZARD

MAGNETIC FIELDS: NO PACEMAKERS

MACHINE SHUTS DOWN WHEN DOORS ARE OPENED

LIGHT CURTAIN PROTECTED AREA

HAND CRUSH HAZARD

PINCH POINT HAZARD

f. SANITATION AND CLEANING

GENERAL STATEMENT

A good sanitation and cleaning program goes hand-in-hand with your maintenance program. Careful adherence to these programs will greatly enhance the productivity and food safety issues of your facility. Good sanitation doesn't just happen: it takes work, knowledge, and commitment. This section is written with the intent to comply with sanitation standard ANSI/BISSC/Z50.2-2003. Questions and/or suggestions should be sent in writing to:

Capway Systems, Inc.
725 Vogelsong Road
York, PA 17404-1765
Attn: Manual/Compliance

Over the last several decades consumers have come to expect (and demand) a safer food supply. They are more aware of healthier diets and expect consistent quality from their food sources. Media coverage has heightened consumer awareness of food borne illnesses from contamination.

This contamination comes from 4 main sources:

- Chemical
  Cleaning and/or maintenance supplies
- Allergens
  Naturally occurring proteins within a product or ingredient which can potentially cause a severe reaction
- Biological
  Bacteria, mold, pathogens, and pest infestations
- Physical
  Foreign materials such as wood, glass, metal, etc.

Together we (food producer and equipment supplier) can minimize food safety risks. **Food safety is a requirement, not an option.**

It is not the intent of this manual to recommend a specific detailed cleaning procedure or cleaning agent … it is only our intent to recommend basic cleaning procedures and develop recommended schedules for those procedures. As part of this manual you will find charts which specify chemical reactions occurring with various materials used in the manufacture of the equipment. It is the responsibility of the end user (in conjunction with your chemical supplier) to determine if a particular chemical is safe, not only to the cleaning personnel and consumer but also to the equipment.

For your safety and the safety of others, regularly clean the equipment and the direct surroundings.

Cleaning of the equipment must be completed in a safe manner by competent, trained personnel.

Cleaning staff must be informed of and follow all safety instructions and regulations regarding the equipment and surrounding environment.

Understand and follow your company's cleaning and sanitizing procedures.

It is recommended that prior to cleaning, the equipment should be turned "OFF" to prevent any accidental injuries.

At the beginning of each shift use a low-pressure air line to blow any dust or debris off the equipment and carefully blow dust off the photo-eye sensors and reflectors.

Interval	Component (if applicable)	What to do…
A	Machine	Remove dirt particles
B	Conveyor and nibbling belt	Remove sticky dirt. Clean with warm water and soft detergent (soft bristle brush may be used).
B	Photo-eyes and reflectors	Clean with dry cloth
B	Drive chain	Remove remains of product with a brush
C	Motor	Clean cooling fins
C	Oil drip pans	Clean

To prevent corrosion and to maintain free and easy adjustments (where applicable) adjusting screws and other various components will have to be wiped down with a light coating of food grade oil every week.

WET CLEANING

Please check the equipment specifications to determine if the equipment was manufactured for a "wash down" application according to in-place-cleaning (IPC) as defined in this section. This equipment may or may not be designed for use in a wash down application. This information is available in the order confirmation.

Wash Down: Equipment designed to withstand moderate pressure with direct contact of water spray. This does not constitute high pressure wash down. High pressure wash down is when water pressures directed at the surface are greater than 150 psi. If the equipment is not rated for high pressure wash down, it is recommended that nominal pressure of less than 150 psi be used.

DO NOT pressure wash any bearing in a direct hit method of any sort! Nickel plated housing bearings with FHS inserts are a single lip metal shroud seal with a molded Buna N seal to the back side of the shield. This design of enclosure has an exposed seal lip and any direct pressure to this seal lip point will damage the seal and could result in premature failure of the bearing. Stainless steel housings with seal and slinger on stainless steel inserts should not have direct steam and high heat continuously applied to PBT housings. The slingers which protect the seals are pressed on with light press force. If the wash down pressure is sufficient to move the slinger against the inside seal, failure will result. Also, the stake of the seal (which is not completely covered by the slinger) is exposed. Pressure to this area can contaminate the grease. This is why direct pressure should never be put on the bearing face or seals.

The first fundamental step associated with cleaning and sanitation is "**know your process**". Each individual production process may require a much different type of cleaning process and therefore a different cleaner and procedure.

Example:

- Pan handling equipment and product handling equipment may have very different requirements.

The second step is "**know your product**". Each and every facility has its own distinctive soils based on ingredients, overall formulation. Basically you need to know "**what**" you're trying to remove, before you can determine "**how**" to remove it.

If this equipment is designed for a wash down application, please be advised of the following:

1. **Capway Systems recommend using only cleaning solutions approved in the food preparing industry. Some cleaning solutions, however, may be too aggressive to use with the plastics and metals in this equipment.**

2. **Avoid direct spray on the bearing housings and/or bushings. Some of the cleaning solution may penetrate into the bearing housing causing the lubricant inside to break down. This may lead to damage of the equipment and create costly repairs and extensive periods of production downtime.**

If this equipment is not designed for a wash down application, but a wash down will occur in near proximity:

1. **Cover all electrical boxes, photo-eyes and motors with plastic bags. DO NOT remove bags until use of water has ceased.**

WATER QUALITY

Water quality can have a dramatic effect on your cleaning ability with or without cleaning chemicals.

It goes without saying that cleaning water must be of potable quality. In addition, of course, the water must be soft. Hard water greatly reduces the cleaning action of many detergents. Hard water in itself can create a number of surface scale or surface film problems such as rust formations or calcium deposits. An effective cleaning program must have an adequate supply of soft, hot water. Conditioned water reduces the corrosive effects of hard water, and extends the economic life of plumbing systems as well as that of many other pieces of equipment using water. Many efforts have been made to classify water hardness. The U.S. Geological Survey Water Supply Paper number 658 classifies hardness as follows:

- Soft: 0-3.5 grains per gallon
- Moderately hard: 3.5-7.0 grains per gallon
- Hard: 7.0-10.5 grains per gallon
- Very hard: Over 10.5 grains per gallon

WATER TEMPERATURE

There are many opinions about the correct temperature for cleaning water. Whereas there may be an application or two for exceptionally hot water (165°F -200°F), generally speaking, water at 110°F -155°F is more than adequate. In fact, many detergents are most effective in the presence of warm water. Extremely hot water can set or “cook” soil to the surface that is to be cleaned. Be sure to check with your cleaning supplies provider to verify the best temperature for the solution you are using. **Water in excess of 160°F will cause a serious scalding hazard!**

CLEANING CHEMICALS

Selecting the correct chemical for the cleaning job at hand is important. This will result in fewer cleaning hours required and an improvement in the quality of the cleaning job. The following discussion is very general because this topic is covered in much detail in many food sanitation texts. In addition, it is always smart to work closely with the chemical supplier. Their knowledge is invaluable in helping to develop the optimal chemical choices and cleaning parameters for specific applications.

SOILS

There are two types of soils: acid and alkaline. Most food soils are acid soils (fats, proteins, carbohydrates). Alkaline soils include mineral salts and water hardness. Some soils are complex soils composed of a combination of soil types. The type of soil dictates the type of cleaning chemical. In general, acid cleaners are used for alkaline soils and alkaline cleaners are used for acid soils.

CLEANERS

Efficient cleaners will:

- Soften water, suspend hardness
- Emulsify fats and certain proteins
- Saponify fats (turn to soap)
- Penetrate through wetting action
- Disperse particles
- Suspend particles
- Peptize proteins (physical formation of solutions)
- Rinse freely
- Dissolve readily in water
- Not corrode
- Adjust pH to acid cleaning

Be sure that the cleaners used have the capability to do these things. Any chemical supplier will be able to supply a good list of the efficiency attributes that their cleaners exhibit.

DRY CLEANING

A great many of the cleaning jobs around a food plant are dry cleaning jobs which require sweeping, brushing, wiping, blowing (on a minimal basis), and vacuuming. When purchasing brushes and brooms, they should be of high quality to minimize the risk of contamination resulting from lost bristles and the associated hair complaints likely to follow. Cleaning tools should be designated (color coded) “product zone” or “non-product zone” and stored separately to prevent cross-contamination. It is recommended that brushes be cleaned and sanitized after each use.

Vacuuming offers advantages over the other dry cleaning methods: it does not spread dust or pests and it picks up as it goes along. It also removes deeply imbedded dust and dirt. There are two types of industrial vacuum systems available: portable and central. Each has a place in the average food plant and each has desirable features. The efficiency of a sanitation program in an average size food plant will increase noticeably with the use of a vacuum cleaning system. However, these systems must be managed in a manner to prevent pest infestation (neglect = infestation).

CLEANING PLASTICS

Plastic guards are susceptible to scratches and abrasions, as well as to damage by certain solvents. You’ll want to observe some general precautions when cleaning a plastic guard:

- **NEVER** use abrasive cleaners, abrasive pads, or gritty cloths.
- **DO NOT** remove dirt by scraping with a sharp tool, such as a razor blade or putty knife.
- **DO NOT** clean with window cleaning fluids or strong solvents such as gasoline, denatured alcohol, carbon tetrachloride, or acetone. They will cause the plastic to craze with minute cracks.
- To clean a plastic guard, use either a solution of mild soap or detergent and water or a weak solution of household ammonia and water (**DO NOT** use ammonia for polycarbonates). Apply with a soft cloth or cellulose sponge and rinse well with clear water. To prevent water spots, blot dry with a chamois or a damp cellulose sponge.
- Please use an antistatic cleaner and polish (similar to Kleenmaster Brillianize) for plastics and shining surfaces. These products clean and glaze in one operation and the surfaces resist finger marks, dust, and abrasion. Recommended for: plastics, aircraft, boats, mirrors, showcases, sneeze guards, television screens, chandelier crystals, fiberglass, chromium, refrigerators, glazed ceramics, polished marble and granite, and medical and dental equipment.
- **HINT:** Never clean plastic with paper towels – they will scratch!

COMPRESSED AIR

Some cleaning and maintenance operations involve the use of compressed air. Treat compressed air with respect: it can be dangerous if misused. The user is responsible for issuing guidelines for the safe use of compressed air.

Compressed air moves particles that can cause serious eye injuries. Always wear eye protection and **DO NOT** use more than 15 psi (103 kpa) of pressure. Use only an OSHA approved air nozzle.

Limit the use of compressed air when cleaning dusty surfaces (flour, 10X sugar, etc.). Vacuuming will prevent "broadcasting" dust, including difficult to clean overhead areas.

CLEANING AND MAINTENANCE SAFETY PRECAUTIONS

If you have any reason to think that the equipment is operating below its usual standard or abnormally in any way, you must report this to your supervisor as soon as possible.

Continuing to use equipment which you believe is operating below standard could lead to damage to the equipment (or other equipment) and adversely affect the products.

Be especially aware of unusual noises or vibrations.

LOCKOUT/TAGOUT PROCEDURES

Before attempting cleaning or maintenance of the equipment ensure that it is isolated from all power sources:

- Electrical supply
- Pneumatic supply
- Hydraulic supply
- Mechanical blocking
- Hydronic supply

Ensure that the lockout procedures have been applied.

Ensure that any equipment which operates at elevated temperatures has cooled to a safe working temperature before starting work.

NOTE: Failure to carry out these instructions could result in serious injury.

Upon completion of any cleaning or maintenance activities ensure that all components are correctly assembled and the equipment is safe to operate. **DO NOT** operate the equipment unless all guards are securely fitted in their correct position. If parts are not correctly installed, or guards are not fitted properly, serious injury can result. Test any safety systems before putting the equipment back into production.

Lock all electrical enclosures that do not have safety interlocks such that access to them is only by authorized personnel.

CONFINED SPACE

Before attempting cleaning or maintenance of the equipment, ensure that the area to be cleaned is not considered a "confined space". If the area is considered a confined space, then special testing and additional procedures must be followed. Please refer to the Confined Space Program mandates that your employer currently uses.

NOTE: Failure to follow proper confined space regulations and instructions may result in serious or fatal injury.

FREQUENCIES

Food processing equipment should be cleaned frequently enough to prevent microbial/bacteria/pathogenic accumulations and to sufficiently remove soil/dirt/product residues (defined as anything not intended to be in the product) and/or other foreign material contaminants on or around product contact surfaces. Because of varied applications, products produced and regulatory requirements within the food industry, Capway cannot recommend specific cleaning frequencies. Federal, state and/or local guidelines/mandates should be referenced to when considering cleaning frequencies for food processing equipment.

In developing a cleaning and sanitation schedule … your plant must consider **ALL** 4 of the previously mentioned sources of contamination (chemical, allergens, biological and physical). Cross contamination from any single source will require immediate attention and **CANNOT** be postponed until the next "scheduled" cleaning event.

Interval	Frequency	
A	Daily	8-10 hrs
B	Weekly	50-70 hrs
C	Monthly	200 hrs
D	Quarterly	500 hrs
E	6 Months	1000 hrs
F	Yearly	2000 hrs
G	2 Years	4000 hrs

A typical equipment list for cleaning in a food processing application includes (but is not limited to):

1. Air nozzle (OSHA approved 30 psi or less)
2. Air hose
3. Scraper
4. Sanitary wipes or paper towels
5. Broom
6. Shovel
7. Food waste and non-food waste (trash) containers
8. Foam application unit (use only on equipment if equipment is classified as wash down)
9. Water hose and nozzle (use only on equipment if equipment is classified as wash down)
10. Squeegee
11. Mop and bucket
12. "Wet Floor" sign
13. Plastic covering material (for electric components) and strapping tape
14. Scouring pad
15. "Equipment Only" color coded brush
16. Vacuum
17. Ladder
18. Upright power lift (for heights over 8 feet)

A typical personal protective equipment (PPE) list includes (but is not limited to):

1. Chemical resistant (rubber) boots with no-slip soles
2. Rubber apron
3. Rubber gloves
4. Face shield or goggles
5. Dust mask
6. Lockout/Tagout

SAFETY NOTES

NEVER mix non-compatible chemicals such as chlorine and ammonia or acids. Violent reaction and/or noxious gases can occur as a result. Follow label instructions.

Water temperature should never exceed 160°F in manual or semi-manual cleaning operations (scalding hazard).

Working from a ladder: Be certain the ladder is placed in a non-traffic area. **NEVER** step higher than the 2nd step from the top. If possible work with someone to hold the ladder steady.

Be familiar with equipment and surroundings.

YOU ARE RESPONSIBLE FOR THE SAFETY OF YOURSELF AND OTHERS AROUND YOU!

DEFINITIONS

The following definitions are included for your reference to help interpret various subsections of this manual:

Accessible: A surface which is on or can be quickly exposed for inspection and cleaning using simple tools normally used by operating or cleaning personnel, such as screwdrivers or wrenches.

Readily accessible: A surface which is or can be easily and quickly exposed for inspection and cleaning without the use of tools.

Cleanability: Made of such materials, so finished, and so fabricated that soil may be effectively removed by normal cleaning means. (ASME/ANSI F2.1-1986)

Clean in place (CIP): A procedure dependent upon circulating appropriate cleaning solutions at relatively high velocities for a specified time and temperature in a closed system specifically designed for this purpose.

The 3A Accepted Practices for Permanently Installed Sanitary Product Pipelines and Cleaning Systems shall be used as guidelines in determining design criteria for products that are highly perishable.

When specified clean-in-place (CIP) procedures are developed, they shall be included in this definition.

Clean out of place (COP): A method of removing the equipment to an area remote to the operating area that will allow complete cleaning.

Closed: Fitted together tightly with no openings large enough to permit the entry or harborage of vermin, including insects.

Corrosion resistant: A material that maintains its surface characteristics under prolonged influence of the normal components of the environment, such as product, ingredients, ambient conditions, and cleaning material.

Dead end: A place wherein product, ingredients, cleaning agents, or extraneous matter may be trapped, retained or not completely displaced in normal operation or cleaning procedures.

Equipment disassembly procedures: Detailed, written equipment disassembly procedures provided by the manufacturer to allow end-user to adequately clean the machine.

FDA: Federal agency which regulates materials that may come in contact with food products.

In place cleaning (IPC):

Mechanical cleaning: A procedure for using compressed air or vacuum to adequately remove dust, scrap, and residue to provide dry cleaning.

Wash down design: Stationary equipment designed to allow complete washing with a high pressure hose (“high pressure” refers to water pressure supplied to the facility by the local utility and is considered to be less than 100 psi) using water and cleaning agents, with no difference in operating characteristics at end of wash down cycle.

The bakery shall not use water produced by pressurization such as from “pressure washers”. Water pressure in excess of 150 psi can damage equipment components even though these components are considered as “wash down”.

Non-absorbent: A material under ordinary conditions of use that will not retain an amount of the substances with which it normally comes in contact nor be affected adversely or adversely affect the product or ingredients with which it comes in contact or create an unsanitary condition.

The 3A Sanitary Standards Tests for Rubber and Rubber-Like Materials and the 3A Sanitary Standards Tests for Multiple-Use Plastic Materials shall be used as the criteria for determining compliance of such materials with this definition.

When absorbency tests are developed for other materials they shall be included in this definition.

Non-toxic: Materials, which under conditions of their use, conform to the procedures and requirements of U.S. Food and Drug Administration as being non-toxic.

Product zone: All surfaces of the equipment with which product or ingredients may normally come in contact and return to the product or ingredients.

Non-product zone: All surfaces outside the product zone as defined above.

Protective coating: A protective coating shall prevent corrosion of the base material, shall not affect or be affected by the substances in contact with it, shall be non-toxic, non-absorbent, shall not impart an odor or taste to the product, and shall be bonded to the underlying surface so as to be resistant to chipping and peeling. It shall have a durable, smooth surface without breaks exposing the base material, shall resist abrasion in ordinary use, and shall maintain its surface characteristics under prolonged influence of the environment such as the product, and cleaning agents.

Removable: A part which can be quickly separated from the machine or equipment using simple tools normally used by operating or cleaning personnel such as screwdrivers or wrenches.

Readily removable: A part which can be easily and quickly separated from the equipment without the use of tools.

Sealed: The condition resulting from the filling of a crack, crevice, joint or opening, so as to effectively prevent the entry or passage of moisture, liquids, gases, and solids.

Shall: When the verb “shall” is used, the requirements of these standards can be met only by literal compliance.

Should: Use of the verb “should” indicates a preferred condition.

Smooth: A uniform surface free of pits, crevices and scale. Within the product zone surface roughness height shall be no greater than 1.8 micron (70 micro inches) Arithmetic Average.

Special disassembly tools and equipment: The detailed list provided by the manufacturer of tools and/or special equipment that may be required to disassemble the certified machine to insure satisfactory cleaning.

Sufficient clearance: Shall mean designed and installed to permit complete access to all areas for inspection and cleaning.

USDA: Federal agency which regulates equipment that may be employed in meat, dairy, and poultry facilities.

STAINLESS STEEL CORROSION RESISTANCE DATA

Corrosion Resistance Data

The following table presents information as to the relative corrosion resistance of representative types of stainless steels, namely Types 316, 302, 304, 430, 403 and 410. This data is based on laboratory tests and should be considered only as an indication of service life to be anticipated.

Under service operating conditions, many variations are encountered such as fluctuations in temperature, impurities in materials being processed, and local variations in concentrations, etc. Fabrication problems such as welding, brazing and heat treating must also be considered in the selection of the right type of stainless. The design factor must be studied as it, too, enters into the selection. It is important that sufficient access be made to equipment that it might be properly cleaned. Crevices and sharp corners should be avoided and welds should be ground smooth.

In view of the above, it is recommended that, wherever possible, samples of stainless should be subjected to actual operating conditions for evaluation before application to production.

CHART XVI—Corrosion Resistance Data

Chemical Media	Temp. °F.	316	302 304	430	403 410
Acetic Acid					
5 to 20%	70°	■	■	■	■
50%	70°	■	■	■	–
80%	70°	■	■	■	–
100%	70°	■	■	■	■
50%	Boiling	■	■	■	–
80%	Boiling	■	■	■	–
100%	Boiling	■	■	■	–
Acetic Anhydride					
90%	70°	■	■	■	–
90%	Boiling	■	■	■	–
Acetic Vapors					
30%	Hot	■	■	–	–
100%	Hot	■	■	–	–
Acetone					
	70°	■	■	■	–
	Boiling	■	■	■	–
Acetylene	70°	■	■	■	–
Alcohol, Ethyl					
	70°	■	■	■	–
	Boiling	■	■	■	–
Alcohol, Methyl					
	70°	■	■	■	–
	150°	■	■	■	–
Aluminum	Molten	■	■	■	■
Aluminum Acetate					
Saturated	70°	■	■	–	–
Saturated	Boiling	■	■	–	–
Aluminum Chloride					
25%	70°	■	■	■	–
Saturated	70°	–	■	■	–
Aluminum Fluoride	70°	■	■	■	–
Aluminum Hydroxide					
Saturated	70°	■	■	■	–
Aluminum Potassium Sulphate					
2% and 10%	70°	■	■*	■*	–
2% and 10%	Boiling	■	■*	■*	–
Saturated	Boiling	■	■*	■*	–
Aluminum Sulphate					
10%	70°	■	■*	■	–
Saturated	70°	■	■*	■	–
10%	Boiling	■*	■*	■	–
Saturated	Boiling	■*	■*	■	–
Ammonia (Dry or Moist)					
All concentrations	70°-212°	■	■	■	–
Anhydrous	70°	■	■	■	–
Anhydrous	Hot	■	■	■	–
Ammonium Bicarbonate	70° and Hot	■	■	■	–
Ammonium Carbonate					
1% and 5%	70°	■	■	■	■
Aerated or agitated	70°	■	■	■	■
Ammonium Chloride					
1%	70°	■	■*	■	–
10-28-50%	Boiling	■*	■*	–	–
Ammonium Nitrate					
All concentrations	70°	■	■	■	–
Saturated	Boiling	■	■	■	■
Ammonium Oxalate, (5%)	70°	■	■	■	■

Chemical Media	Temp. °F.	316	302 304	430	403 410
Ammonium Persulphate, (5%)	70°	■	■	■	■
Ammonium Perchlorate					
10%	Boiling	■	■	■	–
Ammonium Phosphate					
5%	70°	■	■	■	–
Saturated	70°	■	■	■	–
Ammonium Sulphate					
1% and 5%	70°	■	■	■	–
10%	Boiling	■*	■*	–	–
Saturated	Boiling	■*	■*	–	–
Ammonium Sulphite	70° and Boiling	■	■	–	–
Aniline					
3%	70°	■	■	■	–
Concentrated crude	70°	■	■	■	–
Aniline Hydrochloride	70°	■	■	■	–
Antimony	Molten	■	■	■	–
Antimony Trichloride	70°	■	■	■	■
Amyl Acetate (Conc.)	70°	■	■	■	–
Amyl Chloride	70°	■	■	■	■
Arsenic Acid	150°	■	■	–	–
Barium Carbonate	70°	■	■	■	–
Barium Chloride					
5%	70°	■	■*	■*	–
Saturated	70°	■	■*	■*	–
Aqueous solution	Hot	■*	■*	–	–
Barium Nitrate					
Aqueous solution	Hot	■	■	–	–
Barium Sulphate	70°	■	■	■	–
Barium Sulphide					
Saturated Solution	70°	■	■	■	■
Beer	70°	■	■	■	–
Barley (Malt and Hops)	70°	■	■	■	■
Alcohol (3½ to 4½%)	160°	■	■	–	–
Benzene	70°	■	■	■	■
Benzoic Acid	70°	■	■	■	–
Benzol	70°	■	■	■	–
Blood (Meat Juices)	Cold	■	■*	■*	–
Borax (5%)	Hot	■	■	■	■
Boric Acid					
5%	Hot	■	■	■	■
Saturated solution	Boiling	■*	■*	■*	■*
Bromine	70°	■	■	■	–
Buttermilk	70°	■	■	■	■
Butyric Acid					
5%	70°	■	■	■	■
5%	150°	■	■	■	–
Aqueous Sol. Sp. G. .964	Boiling	■	■	■	–
Calcium Carbonate	70°	■	■	■	–
Calcium Chlorate					
Dilute solution	70°	■	■	–	–
Dilute solution	Hot	■	■	–	–
Calcium Chloride					
Dilute solution	70°	■*	■*	■*	–
Conc. solution	70°	■*	■*	■*	–

Symbols and Colors Indicate Recommendation

- ■ Recommended
- ■ Light attack — use with caution
- ■ Chemically attacked — not recommended
- – Not tested

* Pitting occurs under some conditions.

Chemical Media	Temp. °F.	316	302 304	430	403 410
Calcium Hydroxide					
10%	Boiling	■	■	–	–
20%	Boiling	■	■	–	–
50%	Boiling	■	▪	–	–
Calcium Hypochlorite (2%)	70°	*	*	*	–
Calcium Sulphate					
Saturated	70°	■	■	■	–
Carbolic Acid					
CP	70°	■	■	■	■
CP	Hot	■	■	■	–
Carbonated Water					
(Carbonic Acid)	Cold and Hot	■	■	■	–
Carbon Bisulphide	70°	■	■	■	–
Carbon Monoxide Gas					
	1400°	■	■	■	■
	1600°	■	■	■	–
Carbon Tetrachloride					
CP (Dry)	70°	■	■	■	■
CP (Dry)	Boiling	■	■	■	■
Aqueous solution (10%)	70°	*	*	▪	■
Chinosol					
Antiseptic solution, 1-500	70°	■	■	–	–
Chloracetic Acid	70°	▪	■	■	■
Chlorbenzol					
Pure, Dry	70°	■	■	■	–
Chloric Acid	70°	■	■	■	–
Chlorinated Water					
Saturated	70°	▪	■	■	–
Chlorine Gas					
Dry gas	70°	▪	▪	▪	–
Moist gas	70°	■	■	■	–
Chloroform (Dry)	70°	■	■	■	–
Chromic Acid					
CP 10%	70°	■	■	■	–
CP 10%	Boiling	■	▪	■	–
CP 50%	Boiling	▪	▪	■	–
Chromic Acid					
50% commercial (Cont. SO_3)	70°	■	■	–	–
50% commercial (Cont. SO_3)	Boiling	■	■	■	–
Chromium Plating Bath	70°	■	■	–	–
Cider	70°	■	■	■	–
Citric Acid					
10%	70°	■	■	■	■
25%	70°	■	■	■	–
50%	70°	■	■	–	–
10%	Boiling	■	■	▪	■
25%	Boiling	■	■	–	–
50%	Boiling	■	■	–	–
Coca-Cola Syrup (Pure)	70°	■	■	■	–
Coffee	Boiling	■	■	■	–
Copper Acetate					
Saturated	70°	■	■	■	–
Copper Carbonate					
Sat. sol. in 50% NH_4OH		■	■	■	–
Copper Chloride					
1% aerated	70°	*	*	*	–
5% aerated	70°	*	■	■	–
Copper Cyanide					
Saturated	Boiling	■	■	■	–
Copper Nitrate					
5%	70°	■	■	■	■
50%	Boiling	■	■	–	–

Chemical Media	Temp. °F.	316	302 304	430	403 410
Copper Sulphate					
5% aerated	70°	■	■	■	–
Saturated	Boiling	■	■	–	–
Creosote (Coal Tar)	Hot	■	■	■	–
Cyanogen Gas	70°	■	■	–	–
Dichloroethane	Boiling	■	■	–	–
Dinitrochlorobenzene					
Melted and solidified	70°	■	■	■	–
Dyewood Liquor	70°	■	**	–	–
Epsom Salt					
Magnesium sulphate	Cold and Hot	*	*	■	▪
Ether	70°	■	■	■	–
Ethyl Alcohol, (10% to 100%)	70°	■	■	■	–
Ethyl Chloride (Dry)	70°	■	■	■	–
Ethylene Glycol (Conc.)	70°	■	■	■	–
Ferric Chloride					
All concentrations	70°	▪	▪	▪	–
Ferric Hydroxide	70°	■	■	–	–
Ferric Nitrate					
All concentrations	70°	■	■	■	■
Ferrous Chloride					
Saturated	70°	▪	▪	–	–
Ferrous Sulphate					
10%	70°	■	*	▪	–
10%	Boiling	■	■	–	–
Fluorine (Gas)	70°	▪	▪	▪	▪
Formalin					
(Formaldehyde, 40%)	70°	■	*	*	–
Formic Acid					
5%	70°	■	■	■	▪
10%	70°	■	■	■	–
50%	70°	■	■	–	–
100%	70°	■	■	–	–
10%	Boiling	■	■	▪	–
50%	Boiling	■	■	▪	–
100%	Boiling	■	■	–	–
Fruit Juices	70°	■	■	■	■
Fuel Oil	Hot	■	■	–	–
Furfural	70°	■	■	–	–
Gallic Acid					
5%	70°	■	■	■	–
5%	150°	■	■	■	–
Saturated, 212°F	Boiling	■	■	■	–
Gasoline	70°	■	■	■	■
Gelatine	70°	■	■	■	■
Glue					
Dry	70°	■	*	■	–
Solution acid	70° and 140°	*	*	–	–
Glycerine	70°	■	■	■	■
Hydrobromic Acid		▪	▪	▪	▪
Hydrochloric Acid					
All concentrations	70°	▪	▪	▪	▪
Hydrocyanic Acid		■	■	▪	–
Hydrofluoric Acid					
All concentrations	70° and Hot	▪	▪	▪	–
Hydrofluosilicic Acid	70°	▪	▪	–	–
Hydrogen Peroxide	70°	■	■	■	■
	Boiling	■	■	■	–
Hydrogen Sulphide					
Dry	70°	■	■	■	–
Wet	70°	**	**	**	–
Iodine	70°	▪	▪	▪	–
Iodoform	70°	■	■	–	–
Kerosene	70°	■	■	■	–

Chemical Media	Temp. °F.	316	302 304	430	403 410
Ketchup	70°	■	*	*	–
Lactic Acid					
1%, 5% and 10%	70°	■	■	■	–
1%	Boiling	■	■	■	–
5%	Boiling	■	▪	▪	–
10%	Boiling	■	▪	▪	–
Lard	70°	■	■	■	–
Lead (Molten)	1000°F	▪	▪	▪	–
Lead Acetate (5%)	Boiling	■	■	–	–
Linseed Oil	70°	■	■	■	▪
Lysol	70°	■	■	▪	▪
Magnesium Carbonate					
All concentrations	70°	■	■	■	–
Magnesium Chloride					
1% and 5%	70°	*	*	■	–
	Hot	*	*	▪	–
Magnesium Hydroxide	70°	■	■	■	–
Magnesium Nitrate					
All concentrations	70°	■	■	■	–
Malic Acid	Cold and Hot	■	■	■	–
Mayonnaise	70°	■	*	–	–
Mercuric Chloride (Dil. Sol.)	70°	▪	▪	▪	▪
Mercury		■	■	■	–
Methanol (See Methyl Alcohol)					
Milk					
(Fresh or Sour)	Cold or Hot	■	■	■	–
Mixed Acids					
50% H_2SO_4 + 50% HNO_3	Cold	■	■	–	–
	200°	■	■	–	–
	Boiling	▪	▪	–	–
70% H_2SO_4 + 10% HNO_3 + 20% water	Cold	■	■	–	–
	200°	■	■	–	–
	Boiling	▪	▪	–	–
15% H_2SO_4 + 5% HNO_3 + 80% water	200°	■	■	–	–
	Boiling	■	■	–	–
Molasses		■	■	■	–
Molybdic Acid (5%)	70°	■	■	–	–
Mustard	70°	*	*	*	–
Muriatic Acid	70°	▪	▪	▪	▪
Naphtha (Pure)	70°	■	■	■	–
Naphtha (Crude)	70°	■	■	–	–
Nickel Chloride Solution	70°	*	*	–	–
Nickel Sulphate Solution	70°	*	*	–	–
Niter Cake	Fused	■	■	■	–
Nitric Acid					
All concentrations	70°	■	■	■	■
5%	Boiling	■	■	▪	–
20%, 40% and 65%	Boiling	■	■	■	–
Concentrated	Boiling	■	■	▪	▪
Fuming conc.	70°	■	■	■	–
Fuming conc.	Boiling	▪	▪	▪	–
Nitrous Acid (5%)	70°	■	■	■	–
Oils (Crude)	Cold and Hot	**	**	**	–
Oils (Vegetable and Mineral)	Cold and Hot	**	**	**	–
Oleic Acid	70‡	■	■	■	–
	300°	■	■	▪	–
	400°	■	▪	–	–
Oxalic Acid					
5%	70°	■	■	■	–
10%	70°	■	■	■	–
10%	Boiling	▪	▪	▪	–
25%	Boiling	▪	▪	–	–
50%	Boiling	▪	▪	–	–

* Pitting occurs under some conditions.
** Attack may occur if sulphuric acid is present.

Chemical Media	Temp. °F.	316	302 304	430	403 410
Paraffin	Cold and Hot	■	■	■	■
Petroleum Ether		■	■	■	■
Phenol (See Carbolic Acid)					
Phenolic Resins	Cold and Hot	■	■	–	–
Phosphoric Acid					
1% and 5%	70° and Boiling	■	■	■	–
10% Still	70°	■	■	■	–
10%	Boiling	■	■	■	–
50%	Boiling	■	■	–	–
Picric Acid	70°	■	■	■	–
Pine Tar Oil	Cold and Hot	■	■	–	–
Potassium Bichromate					
25%	70°	■	■	■	–
25%	Boiling	■	■	–	–
Potassium Bromide	70°	*	*	–	–
Potassium Carbonate					
Solution	70° and Boiling	■	■	■	–
Potassium Chlorate					
Saturated	Boiling	■	■	■	■
Potassium Chloride					
1% and 5%	70°	*	*	*	*
1% and 5%	Boiling	*	*	–	–
Potassium Dichromate					
All concentrations	Cold and Hot	■	■	■	–
Potassium Ferricyanide					
5%	70°	■	■	■	–
5% and 25%	Boiling	■	■	–	–
Potassium Ferrocyanide	70°	■	■	■	–
Potassium Hydroxide					
5%	70°	■	■	■	–
27% and 50%	Boiling	■	■	–	–
Potassium Iodide					
All concentrations	Cold and Hot	■	■	–	–
Potassium Nitrate					
50%	70°	■	■	–	–
50%	Boiling	■	■	–	–
Potassium Oxalate		■	■	■	–
Potassium Permanganate					
5%	70°	■	■	■	–
5%	Boiling	■	■	–	–
Potassium Sulphate					
1%	70°	■	■	■	■
5%	70°	■	■	■	■
5%	Hot	■	■	–	–
Potassium Sulphide					
Solution	Hot	■	■	–	–
Pyrogallic Acid		■	■	■	–
Quinine Bisulphate (Dry)		■	■	■	–
Quinine Sulphate (Dry)		■	■	■	–
Rosin	Molten	■	■	■	–
Sauerkraut Brine	70°	■	■	–	–
Sea Water	70°	■	*	*	■
Sewage		**	**	–	–
Silver Bromide		*	*	■	–
Silver Chloride		■	■	■	–
Silver Nitrate					
10%	70°	■	■	■	–
10%	Boiling	■	■	■	–
Soaps	70°	■	■	■	–
Sodium Acetate (Moist)		■	*	■	–
Sodium Bicarbonate					
All concentrations	70°	■	■	■	■
5%	150°	■	■	■	■

Chemical Media	Temp. °F.	316	302 304	430	403 410
Sodium Bichromate		■	■	■	–
Sodium Bisulphate					
10%	70°	■	■	–	–
10%	Boiling	■	■	–	–
Sodium Borate					
All concentrations	Cold and Hot	■	■	■	–
Sodium Carbonate					
5%	Boiling	■	■	■	–
50%	Boiling	■	■	–	–
Molten	1650°	■	■	–	–
Sodium Chlorate					
25%	Cold and Hot	■	■	–	–
Sodium Chloride					
All concentrations	70°	*	*	*	–
Saturated	70° and Boiling	■	*	–	–
Sodium Citrate					
All concentrations	Cold and Hot	■	■	–	–
Sodium Fluoride					
5%		*	*	*	–
Sodium Hydroxide					
20% and 30%	70°	■	■	■	–
20%	Boiling	■	■	–	–
30%	Boiling	■	■	■	–
Molten	650°	■	■	–	–
Sodium Hypochlorite (5%)	70°	*	*	■	■
Sodium Hyposulfite	70°	■	■	*	–
Sodium Nitrate					
All concentrations	Cold and Hot	■	■	■	–
Sodium Nitrite					
All concentrations	Cold and Hot	■	■	–	–
Sodium Perchlorate					
10%	70°	■	■	–	–
10%	Boiling	■	■	–	–
Sodium Peroxide (10%)	70°	■	■	–	–
	Boiling	■	■	–	–
Sodium Phosphate					
5%	Cold and Hot	■	■	–	–
Sodium Sulphate					
5%	70°	■	■	■	■
Saturated	Boiling	■	■	■	–
Sodium Sulphide					
5%	70°	■	*	*	*
50%	Boiling	■	*	*	–
Sodium Sulphite					
5%	70°	■	■	■	–
25% and 50%	Boiling	■	■	■	–
Sodium Thiosulphate					
25%	70°	**	**	–	–
Saturated	70° and Boiling	**	**	■	–
Acid fixing bath (Hypo)	70°	■	■	–	–
Stannic Chloride					
Sp. Gr. 1.21	70°	■	■	–	–
Sp. Gr. 1.21	Boiling	■	■	–	–
Stannous Chloride					
Saturated	120°	■	■	–	–
Saturated	Boiling	–	■	–	–
Steam		■	■	■	■
Stearic Acid	70°	■	■	■	–
Strontium Hydroxide		■	■	–	–
Strontium Nitrate Solution	Hot	■	■	–	–

Chemical Media	Temp. °F.	316	302 304	430	403 410
Sugar Juice	Hot	■	■	■	–
Sulphur					
Fused	265°	■	■	–	–
Boiling	830°	■	■	–	–
Sulphur Chloride	Cold and Hot	■	■	■	–
Sulphur Dioxide Gas					
Dry	575°	■	■	■	–
Moist	70°	■	■	■	–
Sulphur Monochloride	70°	■	■	–	–
Sulphuric Acid					
5%	70°	■	■	■	–
10%	70°	■	■	■	–
50%	70°	■	■	■	–
Concentrated	70°	■	■	■	–
Fuming	70°	■	■	–	–
5%	Boiling	■	■	■	–
10%	Boiling	■	■	■	–
50%	Boiling	■	■	■	–
Concentrated	Boiling	■	■	■	–
Sulphurous Acid					
Saturated	70°	*	*	*	–
150# pressure	375°	*	*	*	–
Tannic Acid					
10%	70°	■	■	■	■
50%	70°	■	■	■	■
10%	Boiling	■	■	■	■
50%	Boiling	■	■	■	■
Tanning Liquor	70°	■	■	–	–
Tar		■	■	–	–
Tartaric Acid					
10%	70°	■	■	■	■
50%	70°	■	■	–	–
10%	Boiling	■	■	■	■
50%	Boiling	■	■	–	–
Tin	Molten	■	■	■	■
Trichloracetic Acid	70°	■	■	■	–
Trichlorethylene (Dry)	70°	*	*	*	–
Tung Oil	Cold and Hot	■	■	–	–
Uric Acid	70°	■	■	–	–
Varnish					
	70°	■	■	■	■
	Hot	■	■	–	–
Vegetable Juices		■	■	■	–
Vinegar					
	70°	■	■	■	–
	Hot	■	■	■	–
Whiskey		■	■	–	–
Wort		■	■	–	–
Zinc	Molten	■	■	■	■
Zinc Chloride					
5%	70°	■	■	*	–
20%	70°	■	■	*	–
70%	70°	■	■	–	–
5%	Boiling	*	*	*	–
20%	Boiling	■	■	■	–
70%	Boiling	■	■	–	–
Zinc Cyanide (Moist)	70°	■	■	–	–
Zinc Nitrate Solution	Hot	■	■	–	–
Zinc Sulphate					
5%	70°	■	■	■	–
Saturated	70°	■	■	■	–
25%	Boiling	■	■	–	–

* Pitting occurs under some conditions.
** Attack may occur if sulphuric acid is present.

PLASTIC CONVEYOR CHEMICAL RESISTANCE GUIDE

The chemical resistance data presented in this table is based on information from polymer manufacturers. The data is indicative only for the conditions under which it was collected and should be considered as a recommendation only, not as a guarantee. This data pertains to chemical resistance only, and the temperatures listed are generally the chemical temperatures. Other design and personal safety concerns were not considered in making recommendations. Prudent application engineering dictates that materials and products should be tested under exact intended service conditions to determine their suitability for a particular purpose.

Chemicals listed without a concentration are for the undiluted chemical. Chemicals listed with a concentration are in solution with water. Descriptions in parenthesis are the active ingredient. In general, as the temperature of an application rises, the chemical resistance of a material decreases.

MATERIAL SUITABILITY CODE

R = Recommended
NR = Not Recommended
Q = Questionable
— = No Available Information

CHEMICAL NAME	STANDARD MATERIALS								SPECIAL APPLICATIONS MATERIALS					
	Polypropylene		Polyethylene		Acetal		EC Acetal		Heat Resistant Nylon		Nylon		Flame Retardant Material	
	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)
Acetic Acid	R	R	R	Q	—	—	—	—	NR	NR	NR	NR	R	R
Acetic Acid - 5%	R	R	R	R	R	—	R	—	R	NR	Q	NR	R	R
Acetone	R	R	R	R	Q	Q	Q	Q	R	R	R	R	R	R
Alcohol - All Types	R	R	R	R	—	—	—	—	R	R	R	R	R	R
Alum - All Types	R	R	R	R	—	—	—	—	Q	—	—	—	—	—
Aluminum Compounds	R	R	R	R	—	—	—	—	Q	R	R	R	R	R
Ammonia	R	R	R	R	—	—	—	—	R	R	R	R	—	—
Ammonium Compounds	R	R	R	R	—	—	R	—	Q	R	R	R	R	R
Amyl Acetate	Q	NR	Q	NR	—	—	—	—	R	N	R	N	—	—
Amyl Chloride	NR	NR	Q	NR	—	—	—	—	—	—	—	—	—	—
Aniline	R	R	R	NR	—	Q	—	Q	Q	—	—	—	NR	NR
Aqua Regia	NR	NR	Q	NR	—	—	—	—	—	NR	NR	NR	NR	NR
Arsenic Acid	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Barium Compounds	R	R	R	R	—	—	—	—	R	R	R	R	R	R
Barium Soap Grease	R	Q	—	—	—	—	—	—	—	—	—	—	—	—
Beer	R	R	R	R	—	—	—	—	R	—	—	—	R	R
Benzene	Q	NR	Q	NR	R	Q	R	Q	R	R	R	R	R	R
Benzenesulfonic Acid - 10%	R	R	R	R	—	—	—	—	R	—	—	—	—	—
Benzoic Acid	R	R	R	R	—	—	—	—	R	Q	Q	Q	—	—
Borax	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Boric Acid	R	R	R	R	—	—	—	—	Q	R	R	R	—	—
Brake Fluid	R	R	—	—	R	R	R	R	R	R	R	R	R	R
Brine - 10%	R	R	R	R	R	R	R	R	—	—	—	—	—	—
Bromic Acid	NR	NR	NR	NR	—	—	—	—	—	NR	NR	NR	—	—
Bromine - Liquid or Fumes	NR	NR	NR	NR	—	—	—	—	NR	NR	NR	NR	NR	NR
Bromine Water	NR	NR	—	—	—	—	—	—	NR	NR	NR	NR	—	—
Butyl Acetate	NR	NR	Q	NR	—	—	—	—	R	R	R	R	R	R
Butyl Acrylate	NR	NR	R	Q	—	—	—	—	—	—	—	—	—	—
Butyric Acid	R	—	R	Q	—	—	—	—	Q	R	R	R	—	—
Calcium Compounds	R	R	R	R	—	—	—	—	Q	—	—	—	R	R
Calcium Soap Grease	R	Q	—	—	—	—	—	—	—	—	—	—	—	—
Calgonite - 0.3%	R	R	—	—	R	R	R	R	—	—	—	—	—	—

(Continued)

CHEMICAL NAME	STANDARD MATERIALS								SPECIAL APPLICATIONS MATERIALS					
	Polypropylene		Polyethylene		Acetal		EC Acetal		Heat Resistant Nylon		Nylon		Flame Retardant Material	
	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)
Carbon Dioxide	R	R	R	R	—	—	—	—	R	R	R	R	R	R
Carbon Disulfide	Q	NR	Q	NR	—	—	—	—	R	R	R	R	—	—
Carbon Tetrachloride	NR	NR	NR	NR	R	Q	R	Q	R	R	R	R	R	R
Cellosolve - TM	R	R	—	—	—	—	—	—	—	—	—	—	—	—
Chloracetic Acid	R	R	—	—	—	—	—	—	—	NR	NR	NR	—	—
Chlorine - Gas	NR	NR	Q	NR	NR	NR	NR	NR	—	NR	NR	NR	NR	NR
Chlorine - Liquid	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Chlorine Water (0.4% Cl)	R	Q	R	Q	NR	NR	NR	NR	—	NR	NR	NR	—	—
Chlorobenzene	NR	NR	Q	NR	—	—	—	—	R	R	R	R	NR	NR
Chloroform	NR	NR	NR	NR	—	—	—	—	Q	—	Q	—	R	R
Chlorosulfonic Acid	NR	NR	NR	NR	—	—	—	—	NR	NR	NR	NR	NR	NR
Chromic Acid - 50%	R	R	R	Q	—	—	—	—	NR	—	Q	—	—	—
Citric Acid	R	R	R	R	—	—	—	—	—	R	R	R	R	R
Citric Acid - 10%	R	R	R	R	R	—	R	—	R	R	R	R	R	R
Citrus Juices	R	R	R	R	—	—	—	—	R	R	R	R	R	R
Clorox - TM	R	Q	—	—	NR	NR	NR	NR	—	NR	NR	NR	—	—
Coconut Oil	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Copper Compounds	R	R	R	R	—	—	—	—	Q	—	Q	—	R	R
Corn Oil	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Cottonseed Oil	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Cresol	R	R	R	Q	—	—	—	—	NR	NR	NR	NR	—	—
Cyclohexane	R	Q	NR	NR	—	—	—	—	—	—	R	—	R	R
Cyclohexanol	R	Q	Q	NR	—	—	—	—	R	—	R	—	—	—
Cyclohexanone	R	Q	NR	NR	—	—	—	—	R	—	R	—	—	—
Detergents	R	R	R	R	R	R	R	R	R	—	—	—	—	—
Dextrin	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Dibutyl Phthalate	R	Q	—	—	—	—	—	—	R	R	R	R	R	R
Diethyl Ether	NR	NR	NR	NR	Q	Q	Q	Q	R	R	R	R	—	—
Diethylamine	R	R	—	NR	—	—	—	—	R	—	—	—	—	—
Diglycolic Acid - 30%	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Diisooctyl Phthalate	R	R	—	—	—	—	—	—	—	—	—	—	—	—
Dimethyl Phthalate	R	R	—	—	—	—	—	—	—	—	—	—	—	—
Dimethylamine	R	—	—	—	—	—	—	—	R	R	R	R	—	—
Dioctyl Phthalate	R	Q	—	—	—	—	—	—	R	R	R	R	R	R
Ethyl Acetate	R	R	Q	Q	Q	NR	Q	NR	R	R	R	R	R	R
Ethyl Ether	Q	Q	—	—	—	—	—	—	—	—	—	—	R	R
Ethylamine	R	R	—	—	—	—	—	—	—	—	—	—	—	—
Ethylene Chloride	NR	NR	—	—	—	—	—	—	—	—	—	—	Q	Q
Ethylene Glycol - 50%	R	R	R	R	R	Q	R	Q	R	Q	R	Q	R	R
Ferric / Ferrous Compounds	R	R	R	R	—	—	—	—	Q	—	—	—	—	—
Formaldehyde - 37%	R	R	R	Q	—	—	—	—	—	—	—	—	R	R
Formic Acid - 85%	R	Q	R	R	—	—	—	—	NR	NR	Q	NR	Q	Q
Freon	—	—	R	R	Q	Q	Q	Q	—	—	—	—	R	R
Fuel Oil #2	R	Q	R	NR	Q	Q	Q	Q	R	R	R	R	—	—
Furfural	NR	NR	Q	NR	—	—	—	—	R	—	R	—	—	—
Gasoline	Q	NR	R	NR	R	R	R	R	R	R	R	R	R	R
Glucose	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Glycerol	R	R	—	—	—	—	—	—	R	R	R	R	—	—
Heptane	NR	NR	Q	NR	R	R	R	R	R	R	R	R	R	R
Hexane	R	Q	NR	NR	—	—	—	—	R	R	R	R	R	R

(Continued)

CHEMICAL NAME	STANDARD MATERIALS								SPECIAL APPLICATIONS MATERIALS					
	Polypropylene		Polyethylene		Acetal		EC Acetal		Heat Resistant Nylon		Nylon		Flame Retardant Material	
	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)
Hydrobromic Acid - 50%	R	R	R	R	—	—	—	—	NR	NR	NR	NR	—	—
Hydrochloric Acid	R	R	R	R	NR	NR	NR	NR	NR	NR	NR	NR	Q	Q
Hydrochloric Acid - 10%	R	R	R	R	NR	NR	NR	NR	NR	NR	NR	NR	Q	Q
Hydrofluoric Acid - 35%	R	R	R	R	NR	NR	NR	NR	NR	NR	NR	NR	—	—
Hydrogen Peroxide - 3%	R	R	R	R	R	R	R	R	Q	Q	Q	Q	R	R
Hydrogen Peroxide - 90%	Q	Q	R	Q	—	—	—	—	NR	NR	NR	NR	R	R
Hydrogen Sulfide	R	R	R	R	—	—	—	—	R	R	R	R	—	—
Hydroiodic Acid	NR	NR	—	—	—	—	—	—	—	—	—	—	—	—
Igepal - 50%	R	R	—	—	R	Q	R	Q	—	—	—	—	—	—
Iodine - Crystals	R	R	Q	Q	—	—	—	—	—	NR	NR	NR	—	—
Isooctane	NR	NR	R	—	—	—	—	—	R	R	R	R	—	—
Jet Fuel	Q	NR	Q	Q	R	R	R	R	R	R	R	R	R	R
Kerosene	Q	NR	Q	Q	R	R	R	R	R	—	—	—	R	R
Lactic Acid	R	R	R	R	—	—	—	—	NR	NR	Q	NR	—	—
Lanolin	R	Q	R	R	—	—	—	—	—	—	—	—	—	—
Lard	—	—	R	R	—	—	—	—	—	R	R	R	—	—
Lauric Acid	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Lead Acetate	R	R	R	R	—	—	—	—	R	R	R	R	—	—
Lemon Oil	Q	NR	Q	NR	—	—	—	—	—	—	—	—	—	—
Ligroin	Q	NR	—	—	—	—	—	—	—	—	—	—	—	—
Lime Sulfur	R	—	—	—	—	—	—	—	—	—	—	—	—	—
Linseed Oil	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Lubricating Oil	R	Q	—	—	R	R	R	R	R	Q	R	Q	R	R
Magnesium Compounds	R	R	R	R	—	—	—	—	Q	—	R	—	—	—
Malic Acid - 50%	R	R	R	R	—	—	—	—	R	R	R	R	—	—
Manganese Sulfate	R	—	R	R	—	—	—	—	Q	Q	Q	Q	—	—
Margarine	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Mercuric Compounds	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Mercury	R	R	R	R	—	—	—	—	R	—	R	—	—	—
Methyl Cellosolve	R	—	—	—	—	—	—	—	—	—	—	—	—	—
Methyl Chloride	NR	NR	—	—	—	—	—	—	—	R	R	R	—	—
Methyl Ethyl Ketone	R	Q	NR	NR	—	—	—	—	R	—	R	—	R	R
Methyl Isobutyl Ketone	R	Q	—	—	—	—	—	—	—	—	—	—	—	—
Methylene Chloride	Q	NR	NR	NR	—	—	—	—	Q	Q	Q	Q	NR	NR
Methylsulfuric Acid	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Mineral Oil	Q	NR	R	NR	R	R	R	R	—	—	—	—	R	R
Mineral Spirits	Q	NR	—	—	—	—	—	—	R	—	—	—	—	—
Molasses	R	R	R	R	—	—	—	—	R	R	R	R	—	—
Motor Oil	R	Q	—	—	R	R	R	R	R	R	R	R	R	R
Naphtha	R	Q	Q	NR	—	—	—	—	R	R	R	R	R	R
Nickel Compounds	R	R	R	R	—	—	—	—	Q	—	Q	—	—	—
Nitric Acid - 30%	R	Q	R	R	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Nitric Acid - 50%	Q	NR	R	Q	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Nitric Acid - Fuming	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Nitrobenzene	R	Q	NR	NR	—	—	—	—	Q	—	Q	—	NR	NR
Nitrous Acid	Q	NR	—	—	—	—	—	—	—	—	—	—	—	—
Nitrous Oxide	R	—	—	—	—	—	—	—	—	—	—	—	—	—
Oleic Acid	R	NR	—	—	R	R	R	R	R	R	R	R	R	R
Olive Oil	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Oxalic Acid	R	R	R	R	—	—	—	—	Q	—	—	—	—	—

(Continued)

CHEMICAL NAME	STANDARD MATERIALS								SPECIAL APPLICATIONS MATERIALS					
	Polypropylene		Polyethylene		Acetal		EC Acetal		Heat Resistant Nylon		Nylon		Flame Retardant Material	
	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)
Oxygen	NR	NR	—	—	—	—	—	—	R	R	R	R	—	—
Ozone	NR	NR	Q	NR	—	—	—	—	Q	Q	Q	Q	—	—
Palmitic Acid - 70%	R	R	R	R	—	—	—	—	R	—	R	—	R	R
Peanut Oil	R	R	—	—	—	—	—	—	—	—	R	—	—	—
Perchloric Acid - 20%	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Perchlorothylene	NR	NR	NR	NR	—	—	—	—	Q	NR	Q	NR	—	—
Phathalic Acid - 50%	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Phenol	R	R	R	R	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Phenol - 5%	R	R	R	R	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Phosphoric Acid - 30%	R	R	R	R	—	—	—	—	NR	NR	NR	NR	Q	Q
Phosphoric Acid - 85%	R	R	R	R	—	—	—	—	NR	NR	NR	NR	Q	Q
Photographic Solutions	R	R	R	R	—	—	—	—	R	—	R	—	—	—
Plating Solutions	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Potassium Compounds	R	R	R	R	—	—	—	—	R	—	—	—	R	R
Potassium Hydroxide	R	R	R	R	—	—	—	—	R	—	Q	—	R	R
Potassium Iodide (3% Iodine)	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Potassium Permanganate	R	Q	R	R	—	—	—	—	NR	NR	NR	NR	—	—
Silver Cyanide	R	R	—	—	—	—	—	—	—	—	—	—	—	—
Silver Nitrate	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Sodium Compounds	R	R	R	R	—	—	R	R	Q	—	—	—	R	R
Sodium Chlorite	R	Q	R	R	—	—	R	R	Q	NR	NR	NR	R	R
Sodium Hydroxide	R	R	R	R	—	—	R	R	R	NR	NR	NR	Q	Q
Sodium Hydroxide - 60%	R	R	R	R	R	R	R	R	R	NR	NR	NR	Q	Q
Sodium Hypochlorite - (5% Cl)	R	Q	—	—	NR	NR	NR	NR	NR	—	Q	—	R	R
Stannic Chloride	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Stannous Chloride	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Stearic Acid	R	Q	R	R	—	—	—	—	R	R	R	R	—	—
Succinic Acid	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Sugar	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Sulfamic Acid - 20%	R	R	—	—	NR	NR	NR	NR	—	—	—	—	—	—
Sulfate Liquors	R	R	—	—	—	—	—	—	—	—	—	—	—	—
Sulfur	R	R	R	R	—	—	—	—	R	R	R	R	—	—
Sulfur Chloride	R	—	—	—	—	—	—	—	—	—	—	—	—	—
Sulfur Dioxide	R	R	R	R	—	—	—	—	R	Q	Q	Q	R	R
Sulfuric Acid - 3%	R	R	R	R	R	R	R	R	NR	NR	NR	NR	Q	Q
Sulfuric Acid - 50%	R	R	R	R	NR	NR	NR	NR	NR	NR	NR	NR	Q	Q
Sulfuric Acid - 70%	R	Q	R	Q	NR	NR	NR	NR	NR	NR	NR	NR	Q	Q
Sulfuric Acid - Fuming	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	Q	Q
Sulfurous Acid	R	—	R	R	—	—	—	—	Q	Q	Q	Q	—	—
Tallow	R	R	R	Q	—	—	—	—	R	R	R	R	—	—
Tannic Acid - 10%	R	R	R	R	—	—	—	—	—	—	—	—	R	R
Tartaric Acid	R	R	R	R	—	—	—	—	Q	Q	R	Q	—	—
Tetrahydrofuran	Q	NR	—	—	—	—	—	—	R	—	R	—	R	R
Toluene	NR	NR	NR	NR	Q	NR	Q	NR	R	R	R	R	R	R
Tomato Juice	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Transformer Oil	R	Q	R	Q	—	—	—	—	R	R	R	R	—	—
Tributyl Phosphate	R	Q	—	—	—	—	—	—	—	—	—	—	—	—
Trichloroacetic Acid	R	R	—	—	—	—	—	—	R	NR	NR	NR	—	—
Trichloroethylene	NR	NR	NR	NR	—	—	—	—	R	NR	Q	NR	—	—
Tricresyl Phosphate	R	Q	—	—	—	—	—	—	—	—	—	—	—	—

(Continued)

CHEMICAL NAME	STANDARD MATERIALS								SPECIAL APPLICATIONS MATERIALS					
	Polypropylene		Polyethylene		Acetal		EC Acetal		Heat Resistant Nylon		Nylon		Flame Retardant Material	
	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)	70 °F (21 °C)	140 °F (60 °C)
Trisodium Phosphate	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Turpentine	Q	NR	Q	NR	—	—	—	—	R	R	R	R	—	—
Urea	R	R	R	R	—	—	—	—	R	R	R	R	—	—
Vinegar	R	R	R	R	—	—	—	—	—	—	—	—	—	—
Wine	R	R	R	R	—	—	—	—	R	R	R	R	—	—
Xylene	NR	NR	NR	NR	—	—	—	—	R	R	R	R	R	R
Zinc Compounds	R	R	R	R	—	—	—	—	Q	—	Q	—	R	R

MATERIAL SUITABILITY CODE
R = Recommended
NR = Not Recommended
Q = Questionable
— = No Available Information

"FABRIC" BELT CONVEYOR CHEMICAL RESISTANCE GUIDE

The chemical resistance data presented in this table is based on information from belting manufacturers. The data is indicative only for the conditions under which it was collected and should be considered as a recommendation only, not as a guarantee. This data pertains to chemical resistance only and the temperatures listed are generally the chemical temperatures. Other design and personal safety concerns were not considered in making recommendations. Prudent application engineering dictates that materials and products should be tested under exact intended service conditions to determine their suitability for a particular purpose.

Chemicals listed without a concentration are for the undiluted chemical. Chemicals listed with a concentration are in solution with water. Descriptions in parenthesis are the active ingredient. In general, as the temperature of an application rises, the chemical resistance of a material decreases.

1 = Excellent 2 = Good 3 = Conditional 4 = Not Recommended

Chemical	PVC		Rubber						Other			
	Std.	Oil Res-istant	Nitrile	SBR	Natural	Neoprene	Butyl	EPDM	Urethane	Silicone	Teflon	Hytrel
Acetaldehyde	4	4	4	4	3	3	2	1	4	3	1	3
Acetic Acid (Glacial)	4	4	3	3	3	3	3	1	3	2	1	1
Acetic Acid - 30%	3	3	3	3	2	4	3	1	3	1	1	1
Acetic Anhydride	3	3	3	4	3	2	2	2	2	3	1	-
Acetone	4	4	4	4	4	2	3	2	4	3	1	2
Alcohols	3	3	1	4	2	1	1	1	4	2	1	1
Aluminum Chloride	1	1	1	1	1	1	1	2	1	1	1	2
Aluminum Nitrate	1	1	1	1	1	1	1	1	1	1	1	1
Ammonium Carbonate	1	1	2	1	1	1	1	1	1	1	1	1
Ammonium Hydroxide	1	1	4	4	4	1	1	1	2	2	1	1
Ammonium Nitrate	1	1	1	1	4	2	1	1	1	1	1	1
Ammonium Phosphate	2	1	1	1	2	1	1	1	1	1	1	1
Ammonium Sulfate	2	1	1	1	1	1	1	2	1	1	1	1
Animal Fats	4	2	2	4	4	2	2	2	3	3	1	1
Asphalt	4	3	2	4	4	4	4	4	2	2	1	2
Barium Chloride	1	1	1	1	1	1	1	1	1	1	1	-
Borax	1	1	2	2	2	1	1	1	1	1	1	1
Boric Acid	1	1	1	1	1	1	1	1	1	1	1	1
Butter	4	2	1	4	4	3	2	4	2	3	1	1
Calcium Chloride	1	1	1	1	1	1	1	1	1	1	1	1
Calcium Hydroxide	1	1	1	1	1	1	1	1	2	2	1	2
Calcium Nitrate	1	1	1	1	1	1	1	1	1	1	1	1
Carbolic Acid	4	4	4	4	4	4	4	4	4	4	2	4
Castor Oil	4	1	1	4	4	1	1	2	1	1	1	1

Chemical	PVC		Rubber						Other			
	Std.	Oil Res-istant	Nitrile	SBR	Natural	Neoprene	Butyl	EPDM	Urethane	Silicone	Teflon	Hytrel
Chlorinated Solvents	4	4	4	4	4	4	4	4	4	3	2	4
Chlorine Solutions	3	3	3	1	1	1	1	1	3	3	1	4
Citric Acid	1	1	1	1	1	1	1	1	1	2	1	1
Coal	3	1	1	3	4	2	4	1	1	1	1	-
Coconut Oil	4	2	1	4	4	2	1	1	1	3	1	1
Copper Sulfate	1	1	1	1	2	1	1	1	1	1	1	1
Corn Oil	4	2	1	3	4	2	2	3	2	2	1	1
Cotton Seed Oil	4	2	1	3	4	2	2	3	2	2	1	1
Denatured Alcohol	3	3	1	3	1	1	1	1	4	2	1	1
Diesel Fuel	4	2	1	4	4	2	4	4	1	3	1	-
Ethyl Alcohol	3	3	1	3	1	1	1	1	4	2	1	1
Ethyl Cellulose	3	2	1	1	1	1	1	1	4	1	1	1
Ethylene Glycol	3	3	1	1	2	1	1	1	2	2	1	1
Fatty Acids	4	3	2	3	4	2	4	4	2	2	1	2
Ferric Chloride	1	1	1	1	1	1	1	1	1	1	1	2
Ferric Sulfate	1	1	1	1	1	1	1	1	1	1	1	1
Formaldehyde	1	1	2	4	4	2	1	1	1	1	1	2
Fuel Oils	4	2	1	4	4	2	4	4	3	3	1	1
Furfural	4	4	1	4	4	1	2	2	4	1	1	-
Gasoline	4	4	1	4	4	2	4	4	2	3	1	1
Glucose	1	1	1	1	1	1	1	1	1	1	1	1
Glycerine	1	1	1	1	1	1	1	1	1	1	1	1
Hydraulic Oil	4	2	2	3	4	2	4	4	4	3	1	1
Hydrochloric Acid	3	3	4	3	2	1	1	1	4	3	1	2
Kerosene	4	4	2	4	4	3	4	4	4	3	1	2
Lacquers	4	4	4	4	4	4	4	4	4	4	4	1
Lard	4	2	2	3	4	3	4	4	2	1	1	1
Limestone	1	1	1	1	1	1	2	1	1	1	1	1
Linseed Oil	4	2	1	3	4	2	2	2	4	2	1	1
Lubricating Oil	4	1	1	3	4	2	4	4	3	3	1	2

Chemical	PVC		Rubber						Other			
	Std.	Oil Res-istant	Nitrile	SBR	Natural	Neoprene	Butyl	EPDM	Urethane	Silicone	Teflon	Hytrel
Magnesium Chloride	1	1	1	1	1	1	1	1	1	1	1	2
Magnesium Hydroxide	1	1	2	2	2	1	1	1	1	1	1	2
Magnesium Sulfate	1	1	1	1	2	1	1	1	1	1	1	2
Methyl Alcohol	3	3	1	3	1	1	1	1	4	2	1	1
Methyl Ethyl Ketone	4	4	4	4	4	4	1	1	4	3	1	1
Mineral Oil	3	1	1	3	4	2	3	4	1	3	1	1
Mineral Spirits	4	4	3	4	4	2	4	4	4	3	1	1
Molasses	1	1	1	1	1	1	1	1	1	1	1	1
Naptha	4	4	3	4	4	4	4	4	4	3	1	1
Nitric Acid	3	3	4	4	4	4	3	2	4	3	1	3
Oil Sands	4	1	1	3	4	2	4	4	1	3	1	1
Oil Shale	4	1	1	3	4	2	4	4	1	2	1	1
Ozone	3	3	4	4	4	2	2	1	1	2	1	-
Paraffin	2	1	1	2	4	2	2	2	3	1	1	1
Peanut Oil	4	2	2	3	4	2	3	3	2	2	1	1
Petroleum Oils	4	2	1	4	4	2	3	4	3	2	1	1
Phosphate Ore	2	2	1	1	1	1	1	1	1	1	1	1
Phosphoric Acid	1	1	2	3	3	2	2	1	3	3	1	1
Pine Oil	3	1	1	3	4	4	4	4	2	2	1	2
Potassium Chloride	1	1	1	1	1	1	1	1	1	1	1	2
Potassium Hydroxide	1	1	2	2	2	1	1	1	2	2	1	1

Chemical	PVC		Rubber						Other			
	Std.	Oil Res-istant	Nitrile	SBR	Natural	Neoprene	Butyl	EPDM	Urethane	Silicone	Teflon	Hytrel
Potassium Nitrate	1	1	1	1	1	1	1	1	1	1	1	1
Potassium Sulfate	1	1	1	1	2	1	1	1	1	1	1	1
Silicone Oil	2	1	1	2	3	1	1	2	1	1	1	1
Soda Ash	1	1	1	1	1	1	1	1	1	1	1	1
Sodium Bicarbonate	1	1	1	1	1	1	1	2	1	1	1	1
Sodium Bisulfate	1	1	1	2	2	1	1	1	1	1	1	1
Sodium Chloride	1	1	1	1	1	1	1	1	1	1	1	1
Sodium Hydroxide	1	1	2	1	1	1	1	1	2	3	1	1
Sodium Hypochlorite	3	3	3	3	3	2	2	2	3	3	1	1
Sodium Nitrate	1	1	2	2	2	1	1	1	1	1	1	1
Sodium Peroxide	1	1	2	2	2	1	1	1	1	1	1	1
Sodium Phosphates	1	1	1	1	1	1	1	1	1	1	1	1
Sodium Silicate	1	1	1	1	1	1	1	1	1	1	1	1
Sodium Sulfate	1	1	1	3	2	1	1	2	1	1	1	1
Sodium Sulfide	1	1	4	3	3	2	2	2	1	1	1	1
Soybean Oil	3	2	1	3	4	2	1	2	2	2	1	1
Sugar Beets	1	1	1	1	1	1	1	1	1	1	1	1
Sugar Cane	1	1	1	1	1	1	1	1	1	1	1	1
Sulfur	1	1	4	4	4	1	1	1	1	1	1	1
Sulfuric Acid	2	2	4	3	3	1	2	2	3	3	1	1

Chemical	PVC		Rubber						Other			
	Std.	Oil Res-istant	Nitrile	SBR	Natural	Neoprene	Butyl	EPDM	Urethane	Silicone	Teflon	Hytrel
Tar (Bituminous)	3	1	1	3	4	2	4	4	1	1	1	1
Tartaric Acid	1	1	1	2	2	2	2	2	1	1	1	2
Tetrachloro-ethylene	4	4	4	4	4	4	4	4	4	4	4	4
Toluene	4	3	3	4	4	4	4	4	4	4	1	2
Trichloroethylene	4	4	4	4	4	4	4	4	4	4	4	4
Trichloroethane	4	4	4	4	4	4	4	4	4	4	1	4
Turpentine	4	3	1	3	4	4	4	4	4	3	1	4
Ultra-Violet	1	1	3	3	2	1	1	2	2	1	1	2
Urea	1	1	1	1	1	1	1	1	1	1	1	1
Urine	1	1	2	2	2	2	2	2	2	1	1	2
Vegetable Oils	4	2	1	3	4	2	3	3	2	2	1	1
Vinegar	1	1	2	2	2	1	1	1	1	2	1	1
Water	1	1	1	1	1	1	1	1	1	1	1	1
Wood Oils	3	1	1	2	4	2	4	4	1	1	1	1
Xylene	4	4	4	4	4	4	4	4	4	4	1	2
Zinc Chloride	1	1	1	1	1	1	1	1	1	1	1	1
Zinc Sulfate	1	1	1	1	2	1	1	1	1	1	1	1

Note: The above chemical resistance chart does not refer to chemical blends or combination of chemical exposures. Chemical exposure is at room temperature.

g. PERSONAL AND FOOD HYGIENE

You are working with food which is usually for human consumption. Therefore it is essential that you maintain the highest standards of hygiene within the process area. Adherence to GMP (Good Manufacturing Practices) is necessary with any operation where food items are being produced.

You should have received training in personal and food hygiene from your employer. If you have not received this training, DO NOT use the equipment or enter the process area. Arrange training with your supervisor or training manager. Working in the process area without adequate understanding of hygiene can lead to contamination of food.

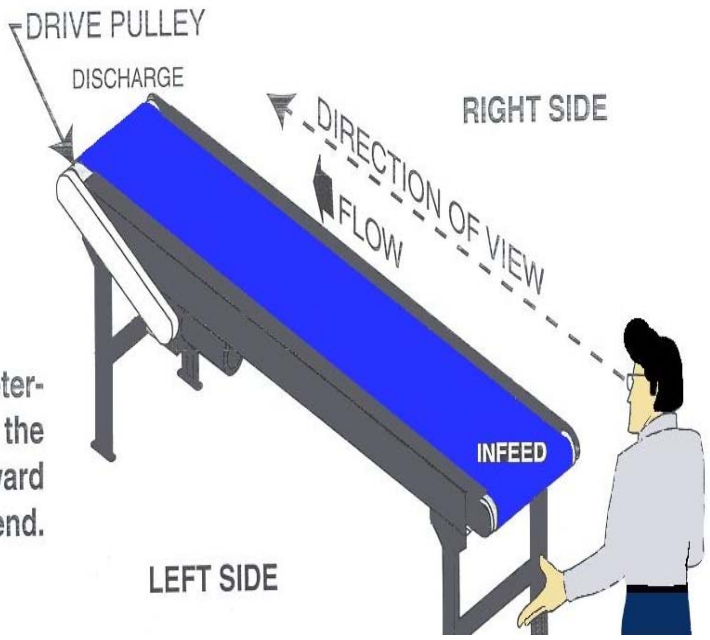
Below is a list of basic hygiene rules. This list is not a substitute for proper training by the user and is issued here for guidance only.

- Wash your hands thoroughly before entering the process area.
- Wear all provided protective clothing recommended by your employer such as hair-net, beard-net, and coveralls.
- If suffering from an illness or infection, obtain a doctor's approval before coming to work.
- Avoid touching your nose, ears and mouth when you are in the process area.
- Remove your watch and any loose jewelry before entering the process area.
- Leave all medicines, pills and tablets which you need during the day in the First Aid station (securely locked away if necessary).
- Don't carry small loose items in your shirt/blouse pockets.
- Never take food or drinks into the process area.
- Keep all tools in a box or bag.

h. HOW TO DETERMINE THE LEFT OR RIGHT SIDE OF A CONVEYOR

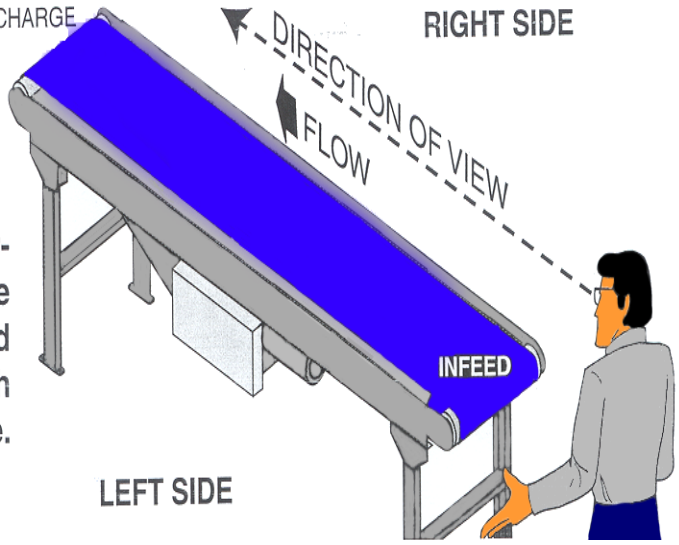
Models with an END DRIVE

Right or left side is determined by standing at the infeed end looking toward the discharge end.



Models with a CENTER DRIVE

Right or left side is determined by standing at the end of the conveyor and looking toward drive with reducer on left side.



i. LUBRICATION TABLE

		S = Standard K = At Choice A = Alternative
Ball bearings in SEW motor	Aralub HL3 BP Energrease LS3 Mobilux Grease #3 Shell Alvania Grease #3 Tribol 3030	K K K S A
Ball bearings in SEW motor (brake side)	Kluber Unisilon TK44N3 Mobil Grease 28 Wacker Silicon 511	K K K
Ball bearings in demag motor		
Bearing blocks (open)	Shell Alvania Grease #3 Tribol 3030	K A
Bearings (open)	Shell Alvania Grease #3 Tribol 3030	K A
Bearing with eccentric lock collar	Shell Alvania Grease #3 Tribol 3030	K A
Bearing blocks and bearings (fan)	Shell Alvania Grease #3 Tribol 3030	K A
Linear ball bearing	Shell Alvania EP Grease R3 Tribol 3030	S A
Threaded rod		
Reduction gearing	Aralub FDPOO Avia Gear Grease BP Energrease LS2 BP Energrease RBB2 Esso Andok B Esso Beacon 2 Esso Fibrax EP370 Fuchs Renosod FGB Kluber Natosbin B1600EP Mobil Mobilplex 44 Moblux Grease #2 Optimol Longtime PDOO Shell Alavania Grease #2 Shell Grease FP4 Shell Gear Grease H Tribol 3030 Texaco Glissando GF1464 Tunap Tungrease OMC2-OO	K K K K K K K K K K K K K K S A K K
Toothed rack (if protected)	Molub Alloy - 00 Shell Gear Grease H Tribol 3030	A K A
Turning point (steel on steel)	Shell Unedo Grease Tribol 3030	K A
Ball bearing ring	Shell Alvania Grease #3 Tribol 3030	K A
Plain bearing bronze (not self lube)	Shell Unedo Grease Tribol 3030	K A

		S = Standard K = At Choice A = Alternative
WAN-3 gearbox (servo vacuum valve greased for life)		
Demag gearbox filled with grease	Aralub FDPOO BP Energrease HTEPOO Esso Fibrax EP370 Molub Alloy-00 Shell Gear Grease H	K K K A K
Demag worm gearbox filled with grease	Aralub FDPOO BP Energrease HTEPOO Esso Fibrax EP370 Molub Alloy-00 Shell Gear Grease H	K K K A K
SITI gearbox for depanner height adjustment (automatic)	Shell Tivelta Compound A	S
SEW shaft mounted (helical bevel gearbox toothed wheel in half-bath, planetary gearbox)	Shell Omala 150 BP Energol GRX 150 Esso Spartan EP 150 Tribol 1100-150	S A A A
SEW work gearbox*	Shell Omala C460 Tribol 1100-460	S A
Demag helical gearbox	Shell Omala 220 Esso Spartan EP 220 BP Energol GR.XP 220 Aral Degol BG 220 Tribol 1100-220	K K K K A
Axis planetroll filled with grease	Santotrac 50 Tribol 1100 ISO 68 Variotrac 68	S A A
All conveyors and automatic lubrication of Capproof and Capmatic roller chain which contacts the product	Cheveron FM 460 X Quinplex White Gear #4090	S A
Driving chain for all conveyors and machines	Molub Alloy 10-46	S
Lifting roller chain	Bel-Ray No-Tox 2500	S
Captrack roller chain Capway belt	Bel-Ray No-Tox 2500 (proofers) Bel-Ray No-Tox 550 or 65 (freezers) Chevron IM460X	S S S
NOTE: NEVER USE TWO TYPES OF GREASE TOGETHER! NEVER MIX SYNTHETIC OIL WITH MINERAL OIL!		

* The difference of mineral oil versus synthetic oil shows the motor efficiency is 82% for the SEW box motor when the gearbox had mineral oil in it and 85% when the gearbox had synthetic oil in it. According to the gear manufacturers, the oil sump temperature can be as high as 200°F and be considered a normal operating temperature. Another "rule of thumb" according to the engineer is an ambient temperature plus 100°F. This would explain the "warm gearbox syndrome" when the units are operating in the plants.

j. MAINTENANCE INFORMATION

(See manufacturer's specific recommendations in the Component Literature folder or on their Web site)

Maintenance Activities

The equipment should never be operated without the safety systems. However on rare occasions and for specific tasks, it may be necessary to operate the equipment with some guards or safety devices removed. For example, a maintenance person repairing a machine may have to have the power turned "ON" to operate the machine with the guard removed in order to determine whether or not the repairs are successful.

These situations are potentially very dangerous and great care must be taken to execute this work in a safe manner.

When servicing or maintaining equipment it is strongly recommended that personnel never work alone. A "safety buddy" should always be standing by in case there is an accident.

Before performing any maintenance tasks, be familiar with and fully understand your company's Lockout/Tagout procedures.

Read the safety instructions before any maintenance is performed to this equipment.

Only authorized, competent, trained personnel can perform maintenance to this equipment.

When working on the equipment, the work switch must be set to the "OFF" ("O") position and locked in place with a padlock.

Use safe working practices at all times. Examples of safe working practices would be:

- **Using suitable protective equipment, such as:**
  - **Hardhats**
  - **Safety glasses**
  - **Ear protection**
  - **Gloves**
  - **Overalls**
  - **Dust masks**
  - **Fume and dust extraction**

Mechanical

This equipment is equipped with moving mechanical components. **Be familiar with all associated risks related to mechanical components.**

Never mix different types of lubricants.
Never mix synthetic oil with mineral oil.

When lubricating metal chains the oil must reach the pivot-points (between pin and bush).

Maximum chain-wear (elongation percentage):

3% for sprocket wheels with 15 to 32 teeth
2% for sprocket wheels with 33 to 80 teeth
3% for sprocket wheels with more than 81 teeth

Interval	Component (if applicable)	What to do…	What to check…
A	Conveyor belt		• Correct path in the guidance • Tension: tighten or loosen if necessary
A	Guards		• In place and secure
B	Bearings	Lubricate*	• Wear • Free spinning • Excessive noise: squeaking, grinding, etc.
C	Conveyor belt		• Check for excessive wear
C	Wearstrips		• Excessive wear
C	Machine		• Alignment adjustment
C	Drive and roller chains	Lubricate	• Excessive wear • Damaged links • Proper alignment • Tension
C	Chain sprocket	Lubricate	• Excessive wear • Missing teeth
D	Frame		• Loose or missing hardware
D	Motor gearbox	Add/remove oil	• Oil level • Excessive noise: squeaking, grinding, etc. • Excessive heat
D	Threaded rods	Lubricate	• Check for stiffness
D	Nibbling belt and carriage		• Check traveling position • Check for damage
F	Drive chain		• Disassemble; clean with dry cleaning naphtha (lighter fluid); put in lukewarm oil and let drip
G	Motor gearbox	Change oil	• Drain oil • Rinse gearbox and fill with fresh oil • Check brake function, if applicable

* Under normal operating conditions bearings are lubricated for life, however, regular lubrication prolongs their life span. The bearing manufacturer recommends using no more than 3 grams when re-greasing bearings. Over greasing can lead to overheating and/or unsealing the bearing seals.

Electrical

This equipment may be equipped with electrical-powered components such as switches, solenoids, motors, photo-eyes, etc. **Be familiar with all associated risks related to electricity and electrical equipment.**

Tasks concerning electricity the main power switch must be set to the "OFF" ("O") position and locked in place with a padlock.

Interval	Component (if applicable)	What to do…	What to check…
B	Photo-eyes and reflectors		• Proper alignment with clear field of view • Function (voltage LED should be on, detection LED should come on if an object passes in front)
B	Wiring		• Pinched or severed wires • Cuts in insulation • Hanging wires, secure if necessary
B	Junction boxes		• Fixed in place, secure if necessary • Securely closed • Wires clamped leading into box
B	Solenoids and switches		• Proper function • Fixed in place, tighten if necessary • Wires securely connected
C	Motors		• Excessive noise: squeaking, grinding, etc.

Pneumatic

This equipment may be equipped with additional air-powered components such as lifting mechanisms, lift gate, clamps, etc. **Be familiar with all associated risks related to this type of equipment.**

Interval	Component (if applicable)	What to do…	What to check…
A	Air piping and tubes		• Leaks in tubing • Leaks at connections • Tightness of connections
B	Pressure regulator		• Pressure must be ± 6 bar • Remove dirt, oil, and water from bowl
B	Cylinders		• Proper function • Air leaks around seals and fittings

Capway Systems recommends regular inspection of the equipment by our expert personnel. This can be arranged by contacting our service department at 717-843-0003.

Preventive Maintenance

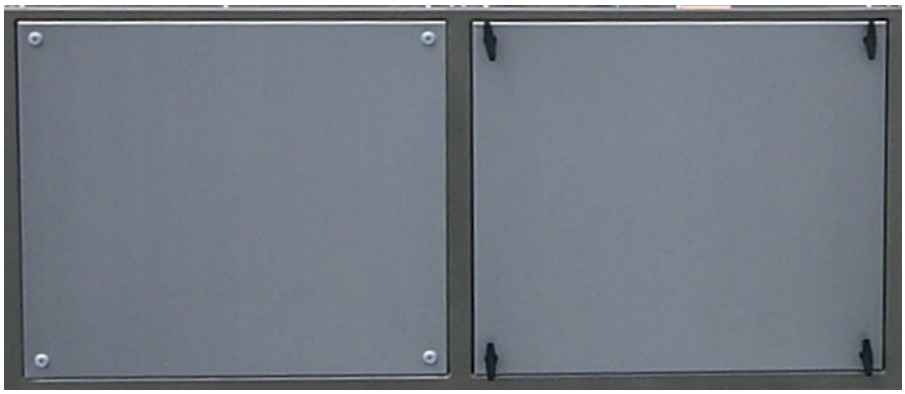
To maintain the well functioning and efficient capabilities of this equipment it is necessary that routine preventive maintenance be performed. The machine must be checked, tested, and maintained on a regular basis. If these checks are not performed, equipment failure may occur leading to prolonged production downtime. If possible these actions should be completed outside of production hours.

Interval	Frequency	
A	Daily	8-10 hrs
B	Weekly	50-70 hrs
C	Monthly	200 hrs
D	Quarterly	500 hrs
E	6 Months	1000 hrs
F	Yearly	2000 hrs
G	2 Years	4000 hrs

The maintenance interval table above is given as a general guideline and should be referenced when performing preventive maintenance activities. However, due to varying run hours and other environmental issues we suggest that you supplement the maintenance schedule advised here with your own experience in practice.

Enclosure Access Panels

The enclosure access panels are opened by means of an Allen wrench (left panel) or by turning hand latches (right panel). (See fig. below)



Maintenance of Intralox Belt

General Sprocket Guidelines

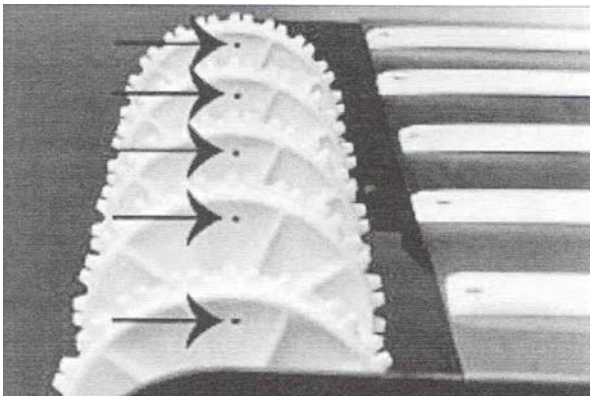
Metal and plastic sprockets should NOT be combined on the same shaft as the teeth will not line up properly.

Two sprockets are required on each drive shaft and on each tail shaft. The sprockets must be positioned with a minimum of 0.125” clearance between sprockets and knuckle on one side of the drive shaft and 0.250” on the other side with the opposite situation occurring at the tail end. This applies to both straight running and constant radius turn installations.

Aligning Intralox Sprockets

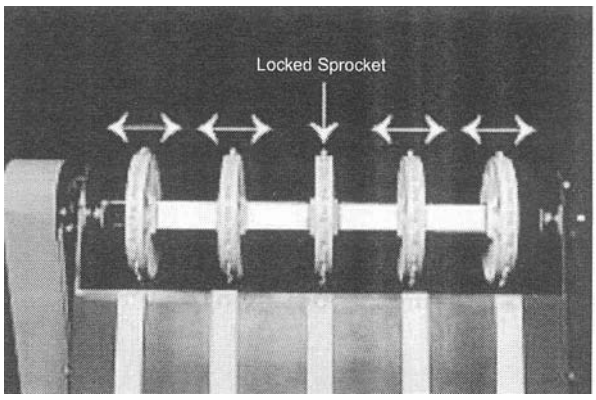
Sprockets must be installed on the shafts so that the teeth are properly aligned. On sprockets having square bores and a number of teeth evenly divisible by four, the teeth will be aligned properly no matter how the sprockets are placed on the square shaft (i.e., 16 ÷ 4 = 4).

However, when the number of teeth on a sprocket cannot be evenly divided by four, special care must be taken to insure all sprockets are “timed” alike. In this case, there is a pilot hole manufactured in each sprocket. When the sprockets are installed all of these holes must be placed on the same side of the shaft. (See illustration below)



Intralox Sprocket Positions on the Shaft

Intralox recommends that only one sprocket be “locked” on each of the drive and idle shafts. These sprockets, normally in or close to the center, provide positive lateral tracking and keep the belt running properly between the side frames. (See illustration below)



The locked sprocket on the drive shaft must be in the same lateral position as the locked sprocket on the idle shaft. All other sprockets must be laterally free on the shaft to follow the thermal elongation/contraction of the belt. Where there are only two sprockets per shaft, lock the sprockets on the drive journal side.

Preventive Maintenance

The Intralox belt needs the following preventive maintenance items checked to ensure long life of the belt.

- Measure the pitch of the belt every three months to check its remaining useful life.
- Check for cracked modules.
- Check sprocket teeth for wear due to bread crumbs.
- Check wearstrips (especially in radiuses) for wear from friction. Intralox belts are designed so that the wearstrips wear down before the belt, but once the plastic belt makes contact with the steel conveyor, the belt will be damaged.

Intralox Belt Recycling

The Intralox belting is made of 100% recyclable materials. When it is time to change your belting, please recycle by contacting Maine Plastics, Inc. (www.maineplastics.com, Brennan Giersch at bgiersch@maineplastics.com or call 800-338-7728) for your recycling options. (Belting with hazardous residue will not be accepted.)

Maintenance of "Fabric" Belt

Belt Tension

The belt, over time, may begin to stretch slightly which may cause the belt to slip on the pulley. If this occurs the tension on the belt will need to be adjusted.

DO NOT apply excessive tension when tightening the belt. Too much tension can lead to premature belt wear and bearing failure which could cause the drive and tail shaft to break and ultimately lead to extensive periods of production down-time and costly repairs.

Proper tension on the belt is critical not only to the belt life but also the bearings, bushings, or shafts. When adjusting or setting the belt tension, enough pressure should be applied to make the belt taut with just enough tension to allow the belt to move without slipping.

To correctly tension the belt, follow the procedures and refer to Figure 1 below.

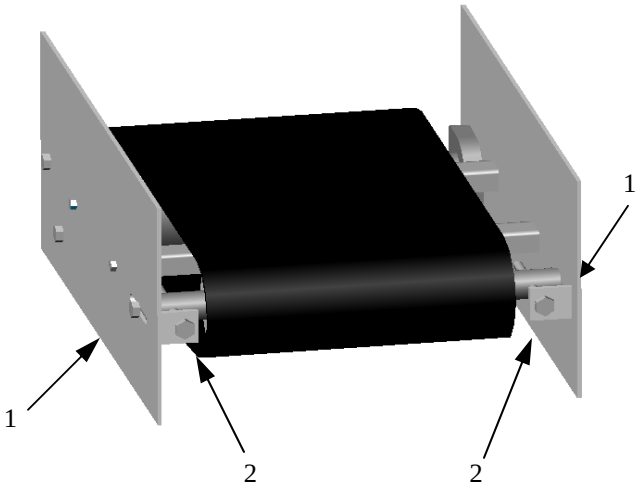
1. Loosen the bolts for the tail shaft on both sides (end take-up only). (Item 1)

2. Turn both of the adjustment bolts in the appropriate direction. (Item 2)
   a. Clockwise to add tension
   b. Counterclockwise to release tension

   To ensure that the belt will align properly, be sure to turn each bolt the same amount. If the belt is not tracking straight (walking to one side), slight adjustments can be made to align the belt by turning one bolt more than the other. (Does not apply to "V" type belts.)

3. After the correct amount of tension has been applied and the belt is tracking straight, the tail shaft bolts (end take-up only) can be tightened to "lock" the shaft in place. (Item 1)

End take-up



"S" take-up

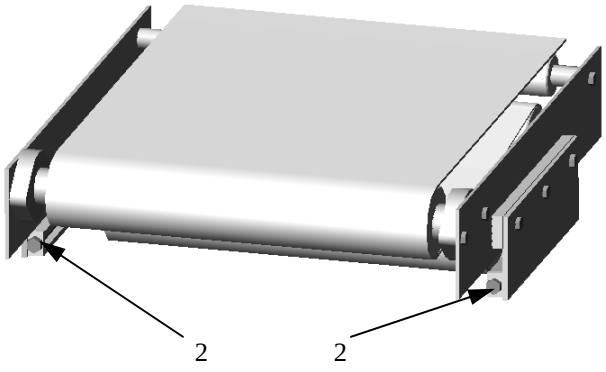


Figure 1

Maintenance of Capway Belt

Belt Elongation

In bends only the outside chain is tensioned resulting in unequal wear of the belt. (This does not apply if bends turn in opposite directions.)

The lifetime of the belt can be extended by turning the belts regularly so that the outside bend becomes the inside bend. The belt must be turned around as soon as the outside chain has become 2 mm longer measured over 15 links. (See Figure 1 below)

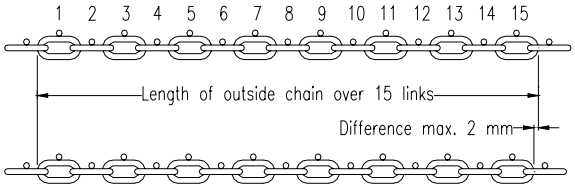


Figure 1

The Capway belt can no longer be turned around if the outside chain has become more than 2 mm longer.

Although the belt may stretch over time, the tension should be constant because it is controlled by springs. Therefore no manual tension adjustments should be required. The springs, however, should be checked periodically to ensure that they are taut but not tight.

Bent Bars

If by any accident a bar gets bent, remove the piece as soon as possible: there is a great risk of the belt not staying within the guide strips and excessive wear will be unavoidable.

The best way of detecting bent bars is to look over a long straight section. (See Figure 2 below)

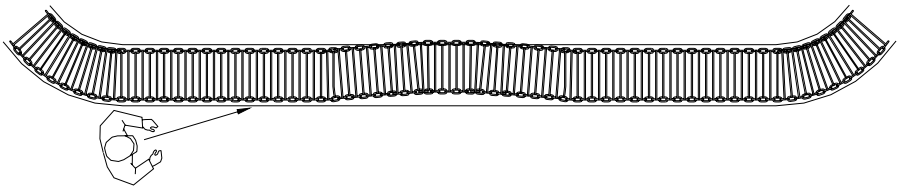


Figure 2

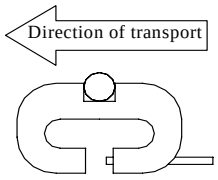
To remove a damaged bar or to change the length of the belt, the bar must be removed by cutting. This can be done with Capway's specially adapted tool (P/N: OO6-5950-3356) shown below.

Belt Repair

Remove as many bread/pans as possible from the system. Repairs can be done to the belt without emptying the entire system.

Replace the damaged belt with a new section of belt (maximum 2 meters in length) and replace the remaining damaged belt with a used section from another conveyor. It is better to separate old and new pieces: the belt breakage safety will function better.

DO NOT re-use damaged bars, they should be repaired or destroyed.



Only use original connecting links.
Press in the lock pin with the specially adapted tool (P/N: OO3-MAST-TOOL) shown below.
Locking pin **MUST** be in the correct direction!

Fitting of Joining Links for Capway Conveyor Belt

To join a Capway conveyor belt there are special joining links. (Pic. 1)

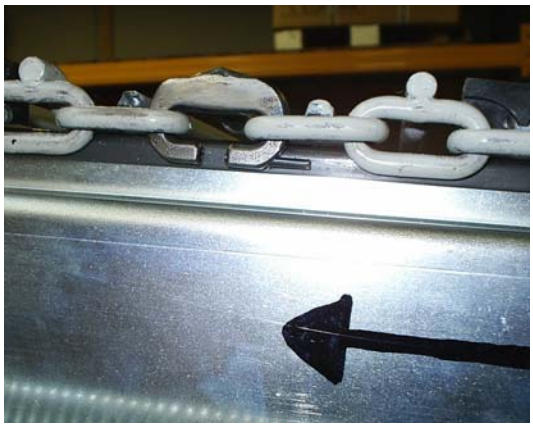
To make sure that the links don't jump loose during production, they need to be closed by a steel pin.

To fit this pin Capway offers a special pair of pliers. (Pic. 2)

When fitting a link it is important to fit the pin, looking in the running direction of the conveyor, from the back side of the link. (Pics. 3 & 4)

Pic. 1

Pic. 2



Pic. 3

Pic. 4

Troubleshooting Chain Faults

Problem	Cause	Solution
Excessive noise	• Faulty alignment of the sprocket wheels. • Insufficient lubrication. • Worn or incorrectly fitted bearings. • Too much play in the return part. • Worn chain and/or sprocket wheels. • The chain is hitting an obstacle. • Chain hinge points stuck. • Heavy and pulsating loading. • Chain pitch is too large (chain worn).	• Re-align sprocket wheels. • Lubricate. • Replace bearings. • Replace worn part. • Replace chain and/or sprocket wheels. • Remove obstacle. • Lubricate hinge points. • Load evenly. • Replace chain.
Chain transmission becomes hot	• Lubrication method chosen is not suitable for the speed developed. • Insufficient lubricant applied and/or present. • Chain keeps hitting an obstacle. • Chain pitch is too large (chain worn).	• Use correct lubricant. • Lubricate. • Remove obstacle. • Replace chain.
Chain climbs and/or jumps over the teeth of the sprocket wheel	• Worn chain and/or sprocket wheels. • Too much play in the return part. • Angle of contact with the sprocket wheel is too small. • Build up of dirt in the hollows between the teeth of the sprocket wheel.	• Replace chain and/or sprocket wheels. • Replace worn part. • Increase angle of contact. • Clean sprocket wheel.
Chain “angles” or “slaps”	• Worn chain and/or sprocket wheels. • Too much play in the return part. • Heavy and pulsating loading. • One or more chain hinge points stuck.	• Replace chain and/or sprocket wheels. • Replace worn part. • Load evenly. • Lubricate hinge point.
Pin breakage	• Usually occurs if the loading is far above the nominal loading of the chain.	• Reduce nominal loading.
Side plate breakage	• Result of continuous shock loading. • Pulsating loading can also lead to side plate breakage.	• Reduce shock loading. • Load evenly.
Breakage in bushings or rollers	• Torn rollers occur when the chain is overloaded at high speeds and the roller smashes into the tooth of a sprocket wheel. • Torn or open rollers can occur by extreme overloading at low speeds. • Incorrect shapes of the teeth, incorrect alignment, too much play in the chain causing damage to the surface of the roller.	• Reduce nominal loading. • Reduce nominal loading. • Replace sprocket wheel/chain.
Side plates of the inside link are worn out	• By faulty alignment. • Chain hits an obstacle.	• Re-align. • Remove obstacle.

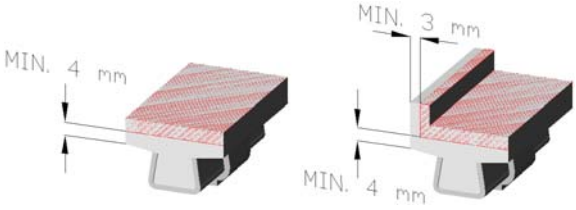
Troubleshooting Thermal Protection System Faults

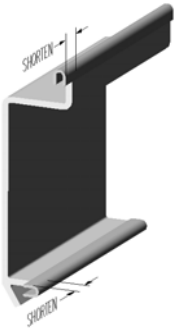
Effect	Cause	Solution
The movement of the motor is blocked	An obstacle is preventing the motor from turning or part of the motor is defective/loose and blocks the motor.	Remove obstacle or repair defective part.
One of the three phases has become disconnected	One of the phases has become disconnected from the clamp strip (usually by the motor).	Connect the phase to the clamp strip. Explanation: • The motor, however, continues to demand power in order to move. Result: more current required.
Nominal current setting is not correct	The setting is not correct.	The thermal protection can be set. (Ask advice from Capway Systems.)

Wearstrips

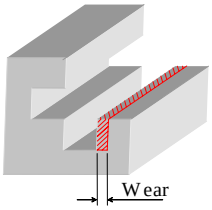
Under normal operation the wearstrips for plastic belts do not typically wear rapidly. However, if there is noticeable wear, the problem may be caused by other contributing factors such as improper belt path. If the wear is excessive, the wearstrips will need to be changed to prevent damage to the belt and other conveyor components. See illustrations below for determination of excessive wear. The wearstrips for the chain conveyors are an ultra-high molecular weight material and/or nylon depending on the application. These materials do not require any special lubrication.

Capway wearstrips utilize a specialized crimping process to lock the UHMW guide rail profile shape permanently in place to create a solid guide rail that eliminates the potential for hidden contamination. The UHMW profile shape and 304 stainless steel sheave are married solidly together so that liquids or material fines cannot penetrate beyond the guide rail mating surfaces. These guide rails meet the requirements set forth by the FDA for food contact applications, USDA standards for handling meat and poultry and 3-A sanitary standards for contact surfaces of dairy equipment.

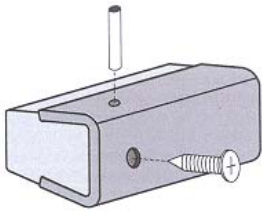




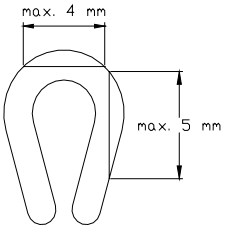
The plastic profiles will lengthen due to the belt friction.
Shorten the guide to ± 10 mm before the end of the steel profile.



Guides in the outside of bends wear faster than others.
Check regularly and replace if wear exceeds 2 mm.



When the guide rail is used as a wearstrip, the UHMW insert should be fastened to the metal sheath at the leading end of the rail. Using a sheet metal screw through the back of the sheath or a heavy wire pin from the side should be adequate. This will prevent the insert from sliding within the sheath in the event the chain accidentally catches on a leading edge. This also allows for the thermal expansion and contraction of the UHMW insert.



Replace these guides when wear has flattened out 4 mm of material on top and 5 mm on the side.

Intralox Belting

The Intralox belt is a modular plastic conveyor belt that is used to convey pans or product. For the cleaning procedure for the Intralox belt, see “Cleaning Procedure for the Modular Plastic Conveyor Belt” in the Intralox conveyor section of this manual. It is made of 100% recyclable materials, please recycle at the end of its useful life. When it is time to change your belting, please recycle it by contacting Maine Plastics, Inc. (www.maineplastics.com, Brennan Giersch at bgiersch@maineplastics.com or call 800-338-7728) for your recycling options. (Belting with hazardous residue will not be accepted.)

Rough Top Belting

The rough top belting provides enough friction to convey product or pans up an incline and is available with two different types of belt depending on the application. A rough top belt which is primarily used to carry pans or boards is available in black. A rough top belt which is used to carry product is available in white.

Cleatrac Belting

The Cleatrac belt is a steel mesh belt which needs to be kept clear of any debris to realize a long life. It needs to be cleaned regularly of hard deposits by raising the temperature of the band to about 800°F-900°F [400°C-480°C] to carbonize any debris. Soft accumulations can be removed by steam cleaning with an industrial cleaning agent. After cleaning, the band must be oiled with a light coating of food grade oil to prevent rusting. General inspection should include: no product debris, equal tension across full width, equal sag on both sides (no greater than 1/32 inch [1 mm]), no broken welds, no curl along belt edges, no broken wires, out of crimp, discolored and evenly distributed load and tension/tracking.

Capgrid Belting

The Capgrid belt is manufactured from non-corrosive spring steel (stainless steel optional) with a wire diameter of 5 mm. The Capgrid belt is built of two hardened and calibrated linked chains between which steel bars are welded. The Capgrid belt is finished with a coating. Plastic rollers (optional) can be attached to the belting to provide a pan friendly conveying surface. The belt is ideal for curves that require a tight-turning radius. The straight and curved belts are also available with an optional “U” bar welded to the wire to help minimize the space between the wires.

Gravity Rollers

The gravity rollers are used to convey pans down an incline by means of gravity. The rollers are maintenance free and require only cleaning for proper operation.

k. MAINTENANCE TABLES

Maintenance Table List

Maintenance Table – Depanner

	Maintenance Point	Lubrication & Cleaning Agent	Remarks
A	**Every 8 working hours or daily**		
A1	Depanner	With damp cloth. **DO NOT** spray with water or steam!	Clean depanner outside.
A2	Conveyor		Remove product contamination.
A3	Filter element and filter box	Clean as required	Remove excess contaminations. Close the hatch properly. (**NOTE:** Never open the hatch when the fan is running.)
A4	Cyclone unit	Clean and empty barrel	Confirm all valves/cover locks are operating properly.
B	**Every 50 working hours or weekly**		
B1	Drive chain(s)		Remove product contamination with brush.
B2	Proximity and photo electric switches	Clean with dry cloth	Check function.
B3	Check filter box door gasket	Clean or replace as required	Confirm door is closed properly.
C	**Every 200 working hours or monthly**		
C1	Vacuum cups	Warm water with soft cleaning agent	Clean and check for damage and cracks. Replace damaged cups.
C2	Vacuum belt	Warm water with soft cleaning agent	Remove stuck on remains of oil or emulsion.
C3	Conveyor chain(s)	Oil lightly after cleaning	Clean and check for wear.
C4	Drive chain(s)	Type of oil (See Table)	Check for wear.
C5	Linear ball bearings	Type of oil (See Table)	Clean and check for wear.
D	**Every 500 working hours or quarterly**		
D1	Vacuum fan wheel	Clean blades with dry cleaning naphtha (lighter fluid).	**DO NOT** spray with water! (It gives poor results and can affect the balance of the fan.)
D2	Fan V-belt		Check tension.
D3	Geared motor(s)		Check oil level. Clean cooling vanes.
D4	Bearings drive shaft of fan	Grease with Kluber Staurgas NBU 81 P (10 gr) or equivalent	Check bearings (400 hours, based on 6000 rpm and low contamination; 250 hours if moderate to high contamination).

	Maintenance Point	Lubrication & Cleaning Agent	Remarks
E	**Every 1000 working hours or every 6 months**		
E1	Drive and slave wheels		Check.
E2	Threaded rods	Type of oil (See Table)	Check for stiffness.
E3	Flange bearings and bearing blocks	Lubricated for life	Check if eccentric collar is correctly positioned. Re-tension if necessary. Clean and check for damage. Replace if required.
E4	Geared motor(s)	Type of oil (See Table)	Drain oil. Flush casing and refill with fresh oil. Service only after the first 1000 hours. Check brake functions.
F	**Every 2000 working hours or yearly**		
F1	Driving chain(s)	Type of oil (See Table)	Disassemble; clean with dry cleaning naphtha (lighter fluid); put in lukewarm oil and let drip.
F2	Electrical enclosure cooling fan		Replace with new.
F3	PLC battery		Replace with new.
F4	Installation		Electrical and mechanical inspection.
G	**Every 4000 working hours or every 2 years**		
G1	Geared motor(s)	Type of oil (See Table)	Drain oil. Flush casing and refill with fresh oil.
G2	Motor bearings	Type of grease (See Table)	Check, clean and grease.
G3	Installation		General inspection.

NOTE: NEVER USE TWO TYPES OF GREASE TOGETHER!
NEVER MIX SYNTHETIC OIL WITH MINERAL OIL!
CHECK LUBRICATION TABLE FOR RECOMMENDED LUBRICATION MATERIAL!

Maintenance Table – Filter and Filter Box




Daily (maximum 40 working hours) remove the hatch of the air case and clean the filter bag.

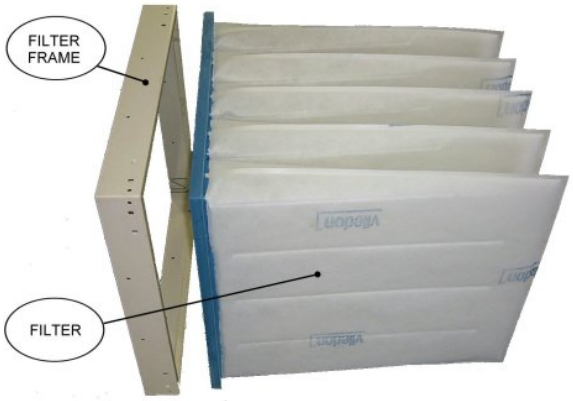
Open the hatch of the vacuum chamber and clean the inner compartment.

NOTE: By cleaning or exchanging the filter, care should be taken that the filter bags are set in the right position.

FILTER BAG

Slide filter in from this side.

Whenever the filter box door is removed, the door gasket should be cleaned and checked for softness.



Maintenance Table – Pneumatics

	Maintenance Point	Lubrication & Cleaning Agent	Remarks
A	**Every 8 working hours or daily**		
A1	Air hoses/tubing		Check for tightness.
B	**Every 40 working hours or weekly**		
B1	Service unit		Fill with new oil.
B2	Compressed air connection and pressure		Check pressure (±6 bars).
C	**Every 200 working hours or monthly**		
C1	Air filter		Clean.
C2	Cylinder(s)		Clean.
C3	Valves		Clean and check.
D	**Every 500 working hours or quarterly**		
D1	Service unit		Empty filter and clean pressure regulator.
D2	Air connections and pneumatic couplings		Check.

I. COMPONENT LITERATURE WEB SITES

Aaxeon Technologies – www.aaxeon.com
ABB – www.abb.us
Acme Electric Corporation – www.acmepowerdist.com
Aget Manufacturing – www.agetmfg.com
Allen-Bradley (Rockwell Automation) – www.ab.com
Allied Electronics – www.alliedelec.com
Altech – www.altechcorp.com
AMF – www.amfbakery.com
Ammeraal – www.ammeraal.com
Anderson – www.andersonfittings.com
APW – www.apw.com
Ashworth – www.ashworth.com
Autogard – www.autogardcorp.com
Baldor – www.baldor.com
Balluff – www.balluff.com
Banner Engineering – www.bannerengineering.com
BDI – www.bdi-usa.com
Beka – www.beka.nl
Belden – www.belden.com
Belimo – www.belimo.com
Bimba – www.bimba.com
Boston Gear – www.bostongear.com
Bulgin – www.bulgin.co.uk/usa
Busch – www.buschpumps.com
Bussmann – www.bussmann.com
Cables To Go - www.cablestogo.com
Cambridge Inc. – www.cambridge-inc.com
Candy Controls – www.candycontrols.com
Capway Systems Inc. (USA) – www.capwayusa.com
Celesco – www.celesco.com
Control Techniques – www.controltechniques.com
Condair – www.axair.ch
Crydom – www.crydom.com
Danfoss – www.danfoss.com
Dart Controls – www.dartcontrols.com
Daybrite – www.daybrite.com
Duff-Norton – www.duffnorton.com
EIC Solutions – www.eicsolutionsinc.com
ETI Systems – www.etisystems.com
Euchner – www.euchner-usa.com
Faultless – www.faultlesscaster.com
Federal Signal Corporation – www.federalsignal-indust.com
Ferraz – www.ferrazshawmut.com
Festo – www.festo-usa.com
Fincor – www.fincor.net
Flex-Cable – www.flexcable.com
Gamlet Inc. – www.gamlet.com
Gardan – www.gardanmfg.com
Grace Engineered Products – www.grace-eng.com
Gudel – www.gudel.com
Hoffman – www.hoffmanonline.com
Honeywell – www.honeywell.com
Hubbell – www.hubbell.com

Hytrol – www.hytrol.com
IDEC – www.idec.com
IFM Efector/ IFM Electronics – www.ifm-electronic.com or www.ifmefector.com
Igus – www.igus.com
INA – www.ina.com
Intralox – www.intralox.com
I.T.E. – www.ite.com.sg
Jet Air Technologies, LLC – www.jetairtech.com
Johnson Controls – www.jci.com
Joyce Dayton – www.joycejacks.com
K&M (Moeller) – www.klocknermoeller.com or www.moellerusa.com
KEBCO – www.kebco.com
LAAP – http://lappusa.lappgroup.com
Lenze – www.lenze.com or www.lenze-actech.com
Lincoln Lube – www.lincolnindustrial.com
Lincoln Motors – www.lincolnmotors.com
Lithonia Lighting – www.lithonia.com
Lovejoy – www.lovejoy-inc.com
Lumsden Corp – www.lumsdencorp.com
Lutze – www.lutze.com
Lynn Electronics Corp. – www.lynnelec.com
Maine Plastics, Inc. – www.maineplastics.com (Intralox belt recycling)
Marshalltown – www.mmcontrol.com
Maryland Wire Belt – www.marylandwirebelts.com
McLean – www.mcleancoolingtech.com
McMaster-Carr – www.mcmaster.com
Meltric Corp. – www.meltric.com
Mennekes – www.mennekes.com
Merlin Gerin (US) – www.us.merlingerin.com
Mitsubishi Electric Automation – www.meau.com
Moeller – www.moellerusa.net
MURR – www.murrelektronik.com
N-Tron – www.n-tron.com
Ned Air – www.ned-air.nl
Nexen – www.nexengroup.com
Norgren – www.norgren.com
Numatics – www.numatics.com
Olflex – www.olflex.com
Omega – www.omega.com
Omron – www.omron.com
Penn Wire Products Corp. – www.pennwire.com
Pepperl+Fuchs – www.am.pepperl-fuchs.com
Pfannenberg – www.pfannenbergusa.com or www.filterfan.com
Pfening – www.pfening.com
Phoenix Contact – www.interface.phoenixcontact.com
Pick Heaters – www.pickheaters.com
PILZ – www.pilzusa.com
Pinnacle Systems – www.pinnaclesystems.com
Portec – www.portec.com
Proportion-Air - www.proportionair.com
PULS – www.puls-power.com
Red Lion – www.redlion-controls.com
Rexroth – www.rexrothmecman.com
Rittal – www.rittal-corp.com
Rohaco – www.rohaco.nl
Rose & Bopla – www.rose-bopla.com

Rotor Motors – www.rotor.nl
Scales Industrial Technologies, Inc. – www.scalesair.com
Schmersal – www.schmersalusa.com
Schneider Electric (Merlin Gerin) – www.schneider-electric.us
Scientific Technologies Inc. – www.sti.com
SEW – www.seweurodrive.com
Shatter Shield – www.shatrshield.com
SICK – www.sick.com
Siemens – www.sea.siemens.com
SignalGuys – www.signalguys.com
SMC Corp. – www.smcusa.com
Sola – www.sola-hevi-duty.com
Solus – www.solusii.com
Southco – www.southco.com
Southeast Cooler – www.secooler.com
Square D – www.squared.com
Square D (US) – www.us.squared.com
SSAC – www.ssac.com
Stewart Systems Inc. – www.stewart-systems.com
Stober Drives Inc. – www.stober.com
SYMMCO – www.symmco.com
TB Woods – www.tbwoods.com
TE (Telemecanique US) – www.us.telemecanique.com
Thomas & Betts (T&B) – www.tnb.com
Tsubaki – www.tsubaki-emerson.co.jp
TURCK Inc. – www.turck-usa.com
Vaisala – www.vaisala.com
Valu-Guide – www.valu-guide.com
Valvcon – www.valvcon.com
Van der Graaf – www.vandergraaf.com
WAM – www.wamgroup.com
Weidmuller – www.weidmuller.com
Winco – www.jwwinco.com

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OPERATIONS MANUAL

a. INSTALLATION

	GENERAL	Examine the machine for damage. Any damage must be reported to us immediately. See that no fasteners are missing or have loosened while in transit. Open the small vent holes in the oil filler cap of the gearmotor, and check the oil level of the gearboxes. This must be at the correct level. If it is not, add oil according to the instructions given by the manufacturer.
	SET-UP	Place the machine in its permanent position. The machine must stand level. Make sure that the machine fits properly at the infeed and discharge end(s). The whole assembly must be performed by the supplier's experienced installation personnel. After assembly, all functions must be carefully checked and adjusted.
	CONNECTION	The customer must arrange beforehand: • The connection of electrical service to the main electrical panel. • The provision of the necessary compressed air service.
GROUNDING MUST BE DONE AS REQUIRED BY LOCAL CODES!		

b. PREPARATION FOR START-UP

	PREPARATION FOR START-UP	Before putting the machine into production, the following points must be carefully checked: • Check that all fasteners are properly tightened. • Check all equipment. • Check drives and wheels. • Check the position and functions of the proximity switches, limit switches and photo-eyes. • Check oil levels of drive motors and top them off if required. • Check the tension and position of the driving chains. • Check the air pressure lines for leakage. • Air pressure set @ 80 psi.
	ELECTRICAL	The electrical installation must be put into service by a qualified electrician. • Check the grounding and correct functioning of the electrical installation. • Check the main supply, correct voltages, cutouts and safety switches. • Check the operations, jam and signal voltages. • Check the tightness of screws in the panel and tighten them further if necessary. • Check that motor protectors and thermal relays values are correct. • Check the rotational direction of the motors. If necessary, reverse two-phase connections. • Check all functions according to the circuit diagram.
THE CIRCUIT DIAGRAMS ARE SITUATED IN THE CONTROL BOX.		

c. COMMISSIONING

- Turn main disconnect switch on.
- Reset alarm.
- Check the adjustments.
- Switch on the start button.
- Set speed.
- Open or close the vacuum valve sufficiently to ensure that the product is sucked out of the pans, but without damaging the crust.
- When work is finished, switch off the machine.

d. GENERAL MAINTENANCE

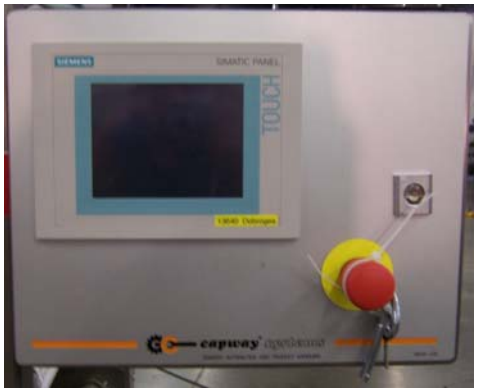
(See manufacturer's specific recommendations in the Component Literature folder or on their Web site)

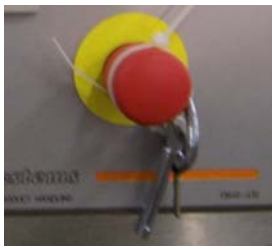
	GENERAL MAINTENANCE	The maintenance program is designed to restrict failures to a minimum, ensuring a long life and good functioning of your machine. We suggest that you supplement the maintenance schedule advised here with your own experience in practice. As with all moving parts, they must be periodically checked for wear and adjustment. Careful adherence to the maintenance schedules will greatly enhance the productivity of your installation. Use only those lubricants recommended by the manufacturer (or others clearly equal to them). The following maintenance and lubrication schedule is given as a general guide based on an eight-hour working day for the installation. Many of the maintenance points can be inspected visually and adjustments made without the need for disassembly.
	GENERAL ELECTRICAL MAINTENANCE	1. Electrical Enclosures • Check the door seals. • Check the connections. • Remove dirt with a vacuum cleaner. • Check the pilot lights. • Check for loose fuses. • Check all connections in the control box every year. 2. Wiring • Check wiring. • Check the cable functions to the switch box and the components of the machine. 3. Proximity Switches/Photo-Eyes/Limit Switches • Check function. • Check mounting. • Remove dirt.

	MAINTENANCE SCHEDULE	Maintenance Interval = 8 hours working time per day		
		Working Time (Hours)		
		A.	8-10	Daily
		B.	50-70	Weekly
		C.	200	Monthly
		D.	500	Quarterly
		E.	1000	Every 6 Months
		F.	2000	Yearly
		G.	4000	Every 2 Years

Panel View Box Access (Optional)

Access to the panel view box is by means of the supplied key. (See fig. below)





e. TROUBLESHOOTING

Problem	Cause	Remedy
Damage to bread crust	Vacuum pressure probably too high	Close vacuum valve a little
	The vacuum chamber is too low	The cups must not be compressed more than 15 mm (9/16")
Bread sticks to form	Ventilator does not work	Check the thermal magnetic motor safety device
	Air passage through vacuum cups is blocked	Clean
	Damage to connecting hose (from ventilator to vacuum chamber)	Replace hose
	Baking forms/pansets not greased or incorrectly greased	Check greasing machine
	Insufficient vacuum power	Open vacuum valve a little more
	Bread crust loose so only flakes are sucked up	After baking the flakes must be firmly attached to the crust
Vacuum cups are split or burned	Distance between vacuum chamber and baking form/panset is too small	Set vacuum chamber higher
Loss of vacuum pressure	Filter clogged	Clean or replace
	Dirty ventilator	Clean
	Leaking air hose	Replace
Loaf or roll slips back on discharge conveyor	Wear of discharge belts	Replace
	Discharge conveyor belt slanting too much	Adjust
The depanner stops without obvious reason	Broken chain	Repair
	Motor failure	Check the thermal magnetic motor

f. METHOD OF OPERATION FOR 2010 DEPANNER

Screen Navigation

1. There are three levels of access in this system. The basic access level has access to any screen that does not have the lock  symbol next to it.
2. The next level has the user name “Operator” and has access to every screen except the “Maint Setup” screen.
3. The last level has the user name “Capway” and has full access to all functions.

Button Symbols

1.  This symbol is used on “Start” buttons to start either the conveyors or the vacuum blower.
2.  This symbol is used on “Stop” buttons to stop either the conveyors or the vacuum blower.
3.  This symbol is used on the “Reset” button to reset a fault after it has been corrected.
4.  This symbol is used on the “Silence” button to silence the alarm buzzer during an active alarm condition.
5.  This symbol is used on the “Alarm History” button to view previous alarms.
6.  This symbol is used on the “Login” button to unlock higher access level screens.
7.  This symbol is used on a locked access level screen button.
8.  This symbol is used on the button that navigates to the “Main” screen.
9.  This symbol is used on the “Diagnostics” button to navigate to the screen to troubleshoot all sensors on the machine.
10.  This symbol is used on any screen button that does not require higher access level rights.
11.  This symbol is used on the button to open the damper valve (increase vacuum).
12.  This symbol is used on the button to close the damper valve (decrease vacuum).
13.  This symbol is used on an “Enter” button.
14.  This symbol is used on a “Raise” (scroll up) button.
15.  This symbol is used on a “Lower” (scroll down) button.

Misc. Information

1. On the main screen pressing the “Capway” banner will open an information screen with contact data and a running time hour meter.
2. If you press the “Diagnostics” button a screen will open that has all the sensors and their locations. They light up green when the sensor is blocked and red when they are clear. Also, the chamber lift sensors are always blocked until it reaches the end of its travel.
3. There is also a button on the main screen called “Enable Clean Screen”. This will take you to a blank screen with a countdown telling you the time remaining to clean the touch screen without affecting the machine.

Changing Recipes (Only on Auto Depanners)

1. From the main screen use the up and down scroll buttons to navigate to the recipe desired and press the “Enter” button to select it.
2. After selecting a new recipe the accept button will appear. If the selection is correct press the accept button and the machine will start the changeover.
3. The machine will home all of the axis’s first and then move the axis’s to the preset positions for that recipe.
4. During the changeover procedures no manual control of the machine is possible. As soon as the changeover is complete, manual control is restored and fine tuning of each axis and speed is possible.
5. If positions have been changed during this fine tuning and it is desired that they be made permanent, then it is required that someone with a proper access, login and go to the “Settings” screen to save the recipe.
6. This procedure will also be used to setup a new recipe. (See the “Recipe Creation and Renaming” section of this document.)

Preventive Maintenance System

1. This machine contains a PM tracking system that operates as follows.
2. When one of the scheduled PM(s) comes due, a banner will pop up on the main screen and will contain the PM schedule due and the amount of time overdue it is.
3. This banner will remain until the PM(s) have been completed and logged.
4. To find out what tasks are required, login to gain access and navigate to the “PM Log” screen. **DO NOT** press the “Log Completed PM” button at this time.
5. Next find the PM schedule button that describes the PM that is due.
6. All the information that is required to complete the PM will be found on this page (or pages) depending on the PM due.
7. After completing all PM tasks, return to the “PM Log” screen and press the “Log Completed PM” button and fill in the name of the individual that completed the PM and then press “Enter”.
8. This will add the completed PM to the displayed list and remove the banner on the main screen.
9. The log holds 200 entries and will start over at the beginning erasing the oldest entry and replacing it with a new one.
10. Individual PM schedules can be disabled if desired. Navigate to the “Maint Setup” screen and use the schedule buttons to enable or disable schedules as required. Disabled schedules will not appear when their schedule is due.

Recipe Creation and Renaming (Only on Auto Depanners)

To create a new recipe you have two options.

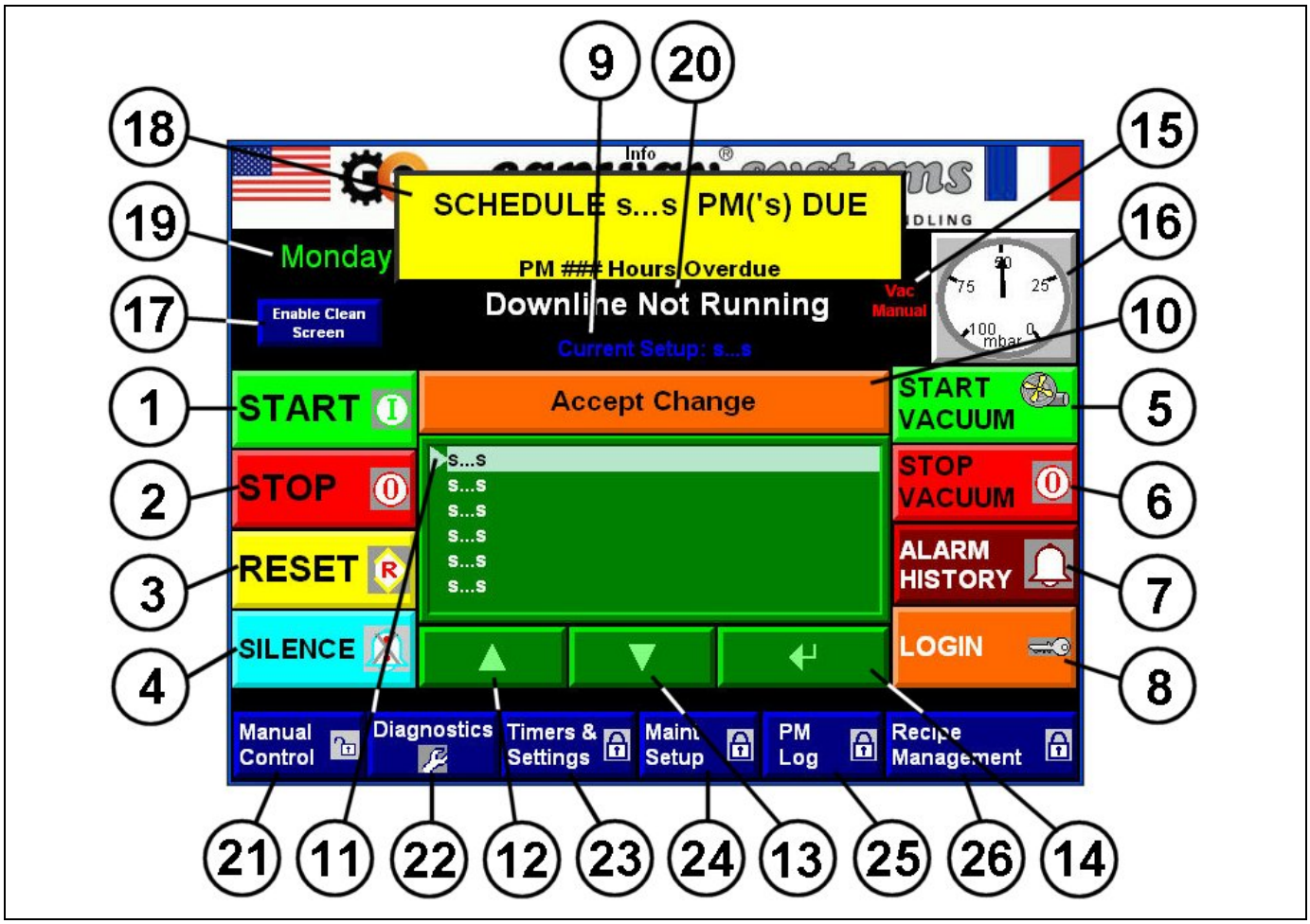
First Option

1. First, login and navigate to the "Recipe Management" screen.
2. Caution should be used in this screen, be sure you have made the proper selections before pressing "Copy" since you could copy the recipe into an existing recipe (and lose the one you copied into it).
3. If you wish to start with a recipe that already exists, first select the recipe on the **LEFT** (source) panel that you want to copy and press "Enter". (Make sure you press "Enter" on each panel after making your selection.)
4. Next select the first blank recipe position in the **RIGHT** (destination) panel and press "Enter".
5. Now press "Copy" and everything in the source recipe is now in the destination recipe.
6. Last step is to name the new recipe. Be sure the new recipe is still highlighted in the **RIGHT** (destination) panel and press the "Change Recipe Name Use Destination Selector" button. Then type in a name for your new recipe and press "Enter".

Second Option

1. If you wish to start from scratch, first login and navigate to the "Recipe Management" screen.
2. In the **RIGHT** (destination) panel select the first blank recipe position and press "Enter".
3. Press the "Change Recipe Name Use Destination Selector" button. Type in a name for your new recipe and press "Enter".
4. Navigate to the main screen, select and accept the new recipe.
5. Next navigate to the "Manual" screen and use the manual controls to setup the axis as desired.
6. After setting the positions is complete, login and navigate to the "Settings" screen and set the timers as needed. **DO NOT** change the ratio values unless absolutely necessary.
7. Last, press the "Save" button.
8. For best results, fine tune all settings during a production run and save the final results.
9. Always be sure you are on the correct recipe before making changes.

g. DEPANNER PANEL VIEW SCREENS

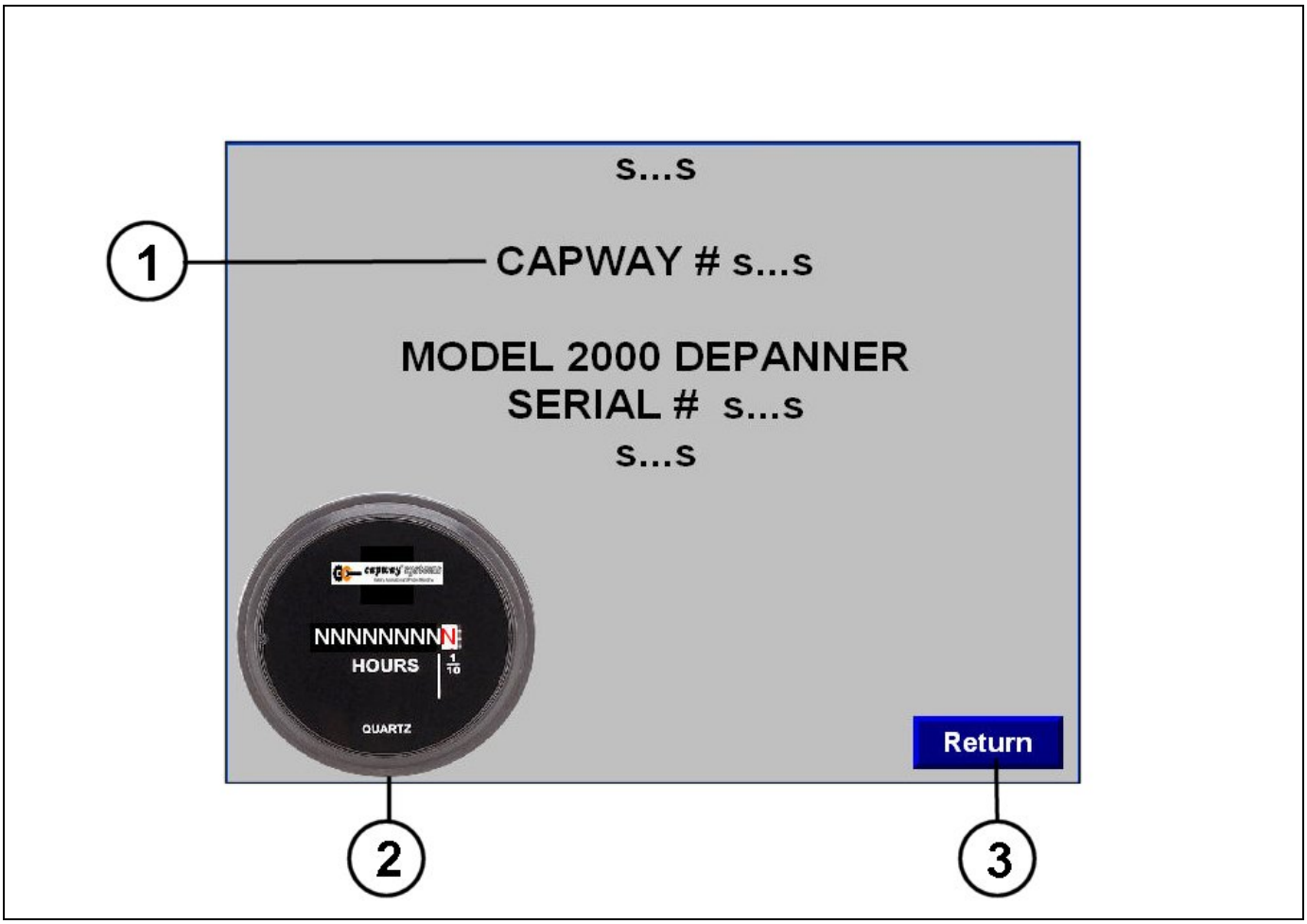


MAIN SCREEN

ITEM #	DESCRIPTION
1	Start depanner.
2	Stop depanner.
3	Reset the system.
4	Silence the alarm horn.
5	Start vacuum blower motor.
6	Stop vacuum blower motor.
7	Goes to alarm history screen.
8	Login.
9	Displays current recipe running.
10	Accepts new selected recipe to run.
11	Arrow pointer (selects recipe arrow is pointing to when hitting enter).
12	Scroll up. (Arrow pointer only).
13	Scroll down. (Arrow pointer only).
14	Enter. (Selects recipe the arrow is pointing to.)
15	Indicates if vacuum system is in auto or manual mode.
16	Displays current vacuum (mbar).

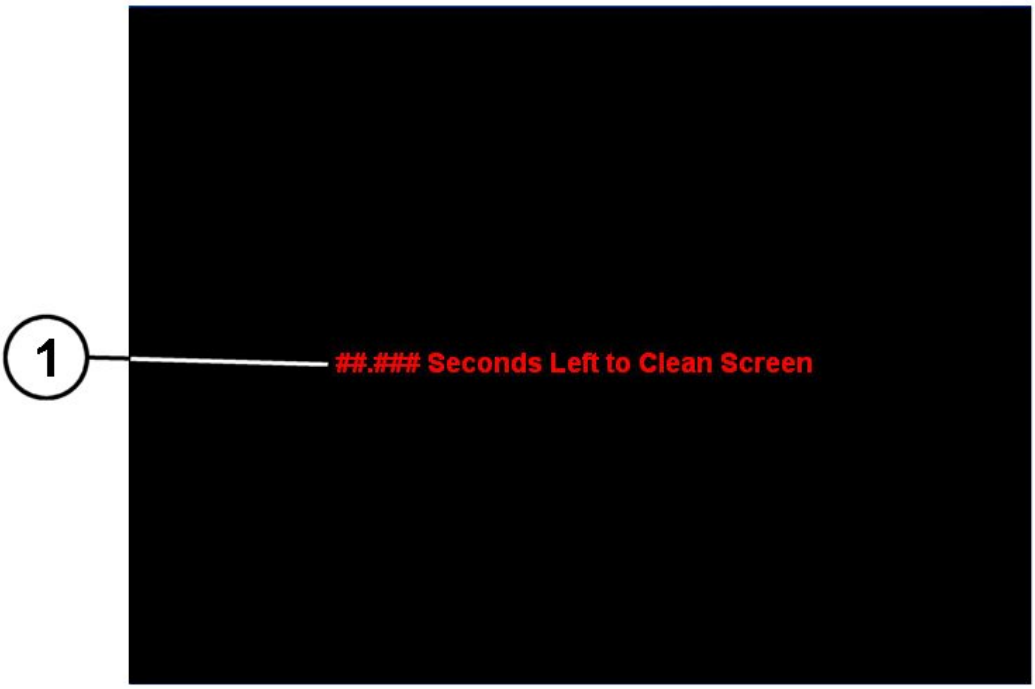
17	Push to go to the screen cleaning mode (blank screen).
18	Displays PM schedules due and PM time overdue (hours).
19	Display current date and time.
20	Displays if downline not running.
21	Goes to manual control screen.
22	Goes to diagnostics screen.
23	Goes to timers & settings screen.
24	Goes to maintenance setup screen.
25	Goes to PM log screen.
26	Goes to recipe management screen.

The depanner is factory shipped with a user name of “capway” and a password of “0003” for accessing the hidden screens.



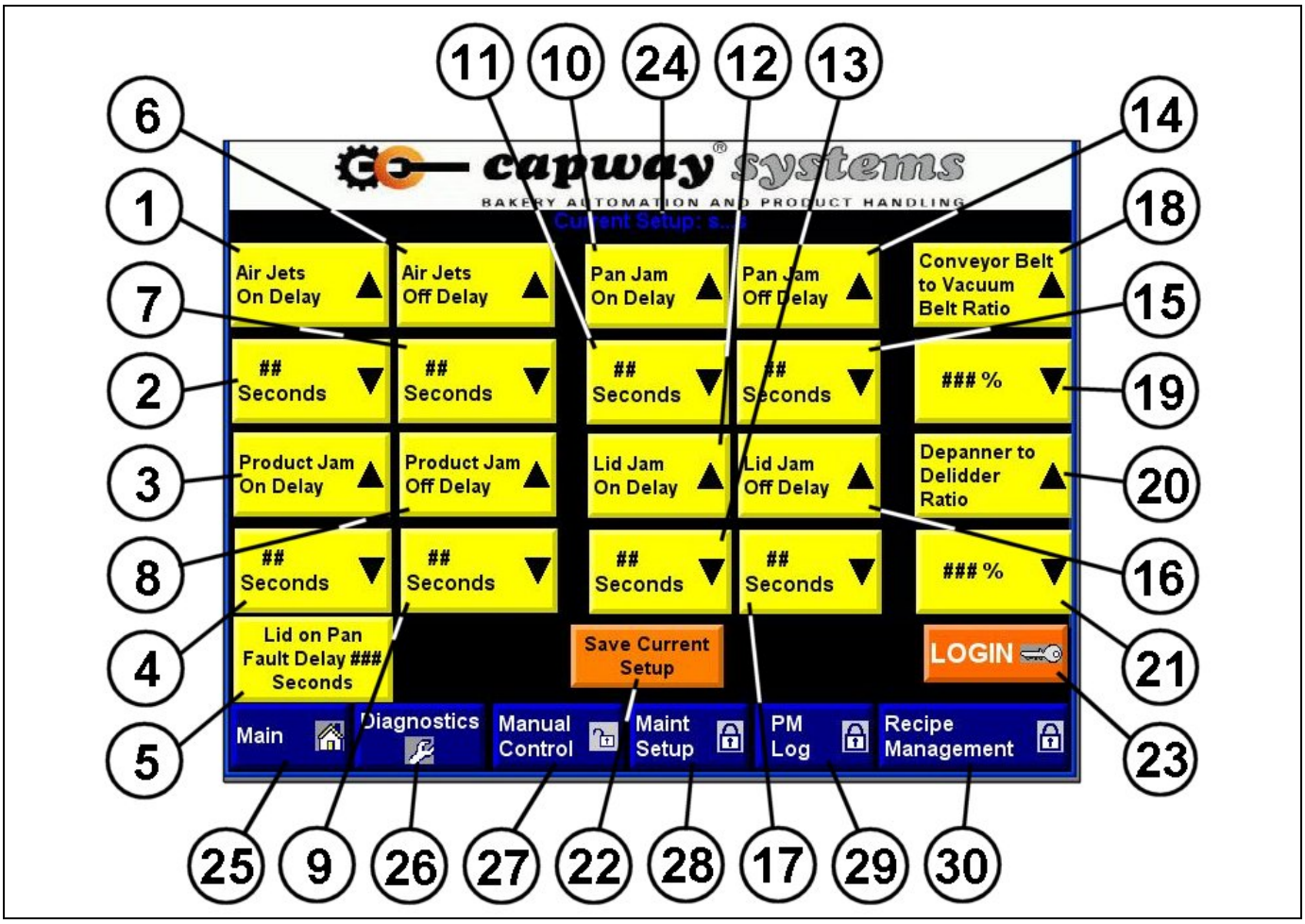
INFORMATION SCREEN

ITEM #	DESCRIPTION
1	Information display.
2	Displays run hours (hours).
3	Goes to main screen.



CLEAN SCREEN

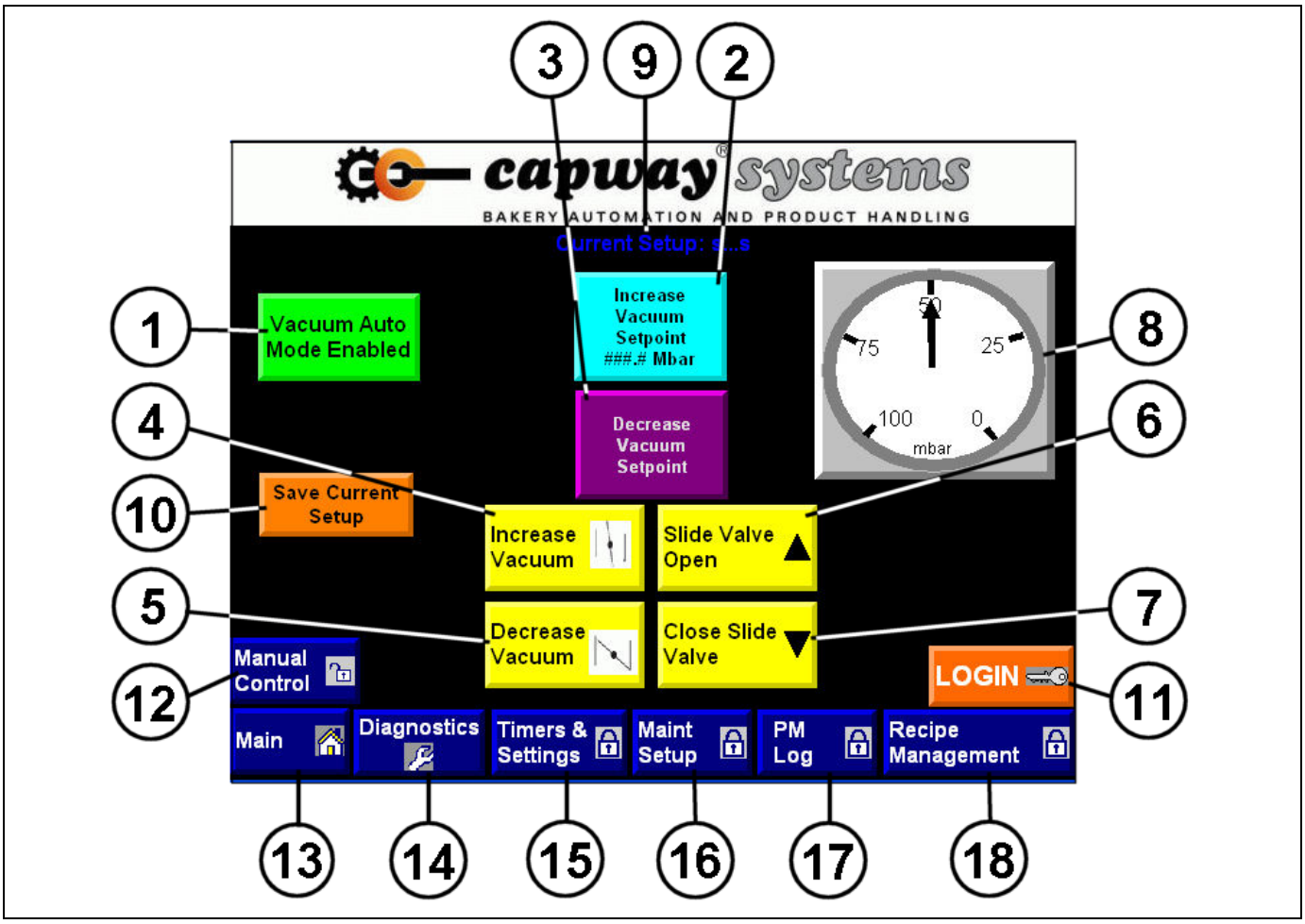
ITEM #	DESCRIPTION
1	Displays time remaining in screen cleaning mode (seconds).



TIMERS & SETTINGS SCREEN

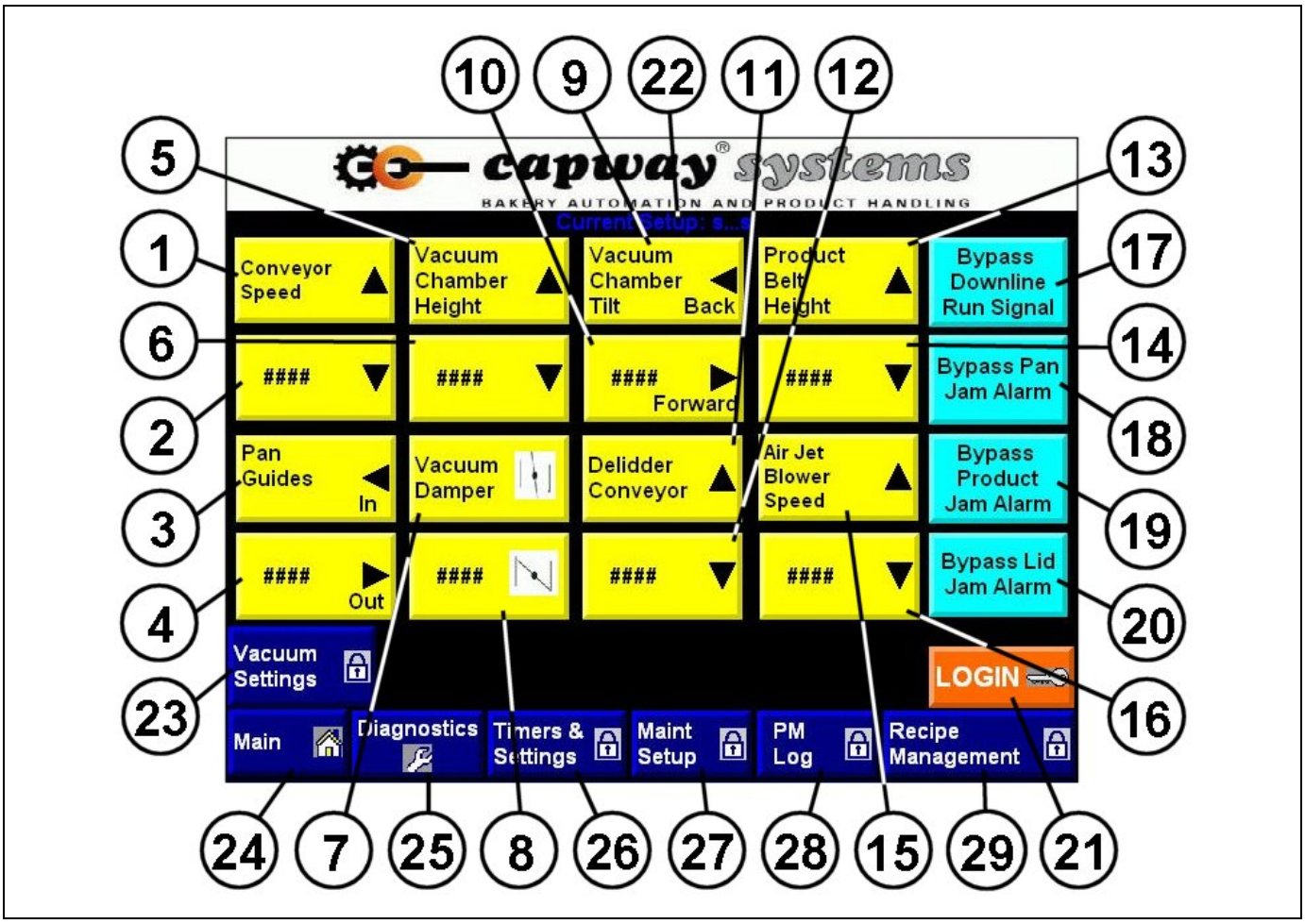
ITEM #	DESCRIPTION
1	Increases air jets on delay time (seconds).
2	Decreases air jets on delay time (seconds).
3	Increases product jam on delay time (seconds).
4	Decreases product jam on delay time (seconds).
5	Lid on pan fault delay (seconds).
6	Increases air jets off delay time (seconds).
7	Decreases air jets off delay time (seconds).
8	Increases product jam off delay time (seconds).
9	Decreases product jam off delay time (seconds).
10	Increases pan jam on delay time (seconds).
11	Decreases pan jam on delay time (seconds).
12	Increases lid jam on delay time (seconds).
13	Decreases lid jam on delay time (seconds).
14	Increases pan jam off delay time (seconds).
15	Decreases pan jam off delay time (seconds).
16	Increases lid jam off delay time (seconds).
17	Decreases lid jam off delay time (seconds).
18	Increases conveyor belt to vacuum belt ratio (%).
19	Decreases conveyor belt to vacuum belt ratio (%).

20	Increases depanner to delidder belt ratio (%).
21	Decreases depanner to delidder belt ratio (%).
22	Saves current setup.
23	Login.
24	Displays current recipe running.
25	Goes to main screen.
26	Goes to diagnostics screen.
27	Goes to manual control screen.
28	Goes to maintenance setup screen.
29	Goes to PM log screen.
30	Goes to recipe management screen.



VACUUM SETTINGS SCREEN
(Screen only available with auto vacuum option)

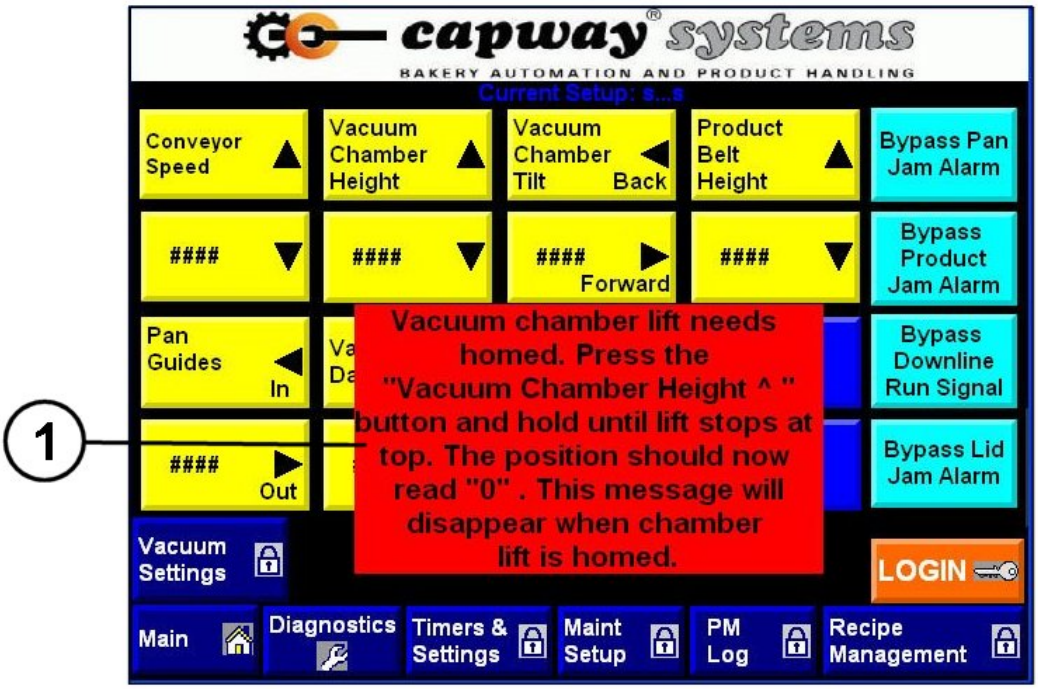
ITEM #	DESCRIPTION
1	Switches between vacuum auto and manual mode.
2	Increases vacuum setpoint in auto mode (mbar).
3	Decreases vacuum setpoint in auto mode (mbar).
4	Manual open vacuum damper in manual mode (increases vacuum).
5	Manual close vacuum damper in manual mode (decreases vacuum).
6	Manual open slide valve in manual mode.
7	Manual close slide valve in manual mode.
8	Displays current vacuum (mbar).
9	Displays current recipe running.
10	Saves current setup.
11	Login.
12	Goes to manual control screen.
13	Goes to main screen.
14	Goes to diagnostics screen.
15	Goes to timers & settings screen.
16	Goes to maintenance setup screen.
17	Goes to PM log screen.
18	Goes to recipe management screen.



MANUAL CONTROL SCREEN

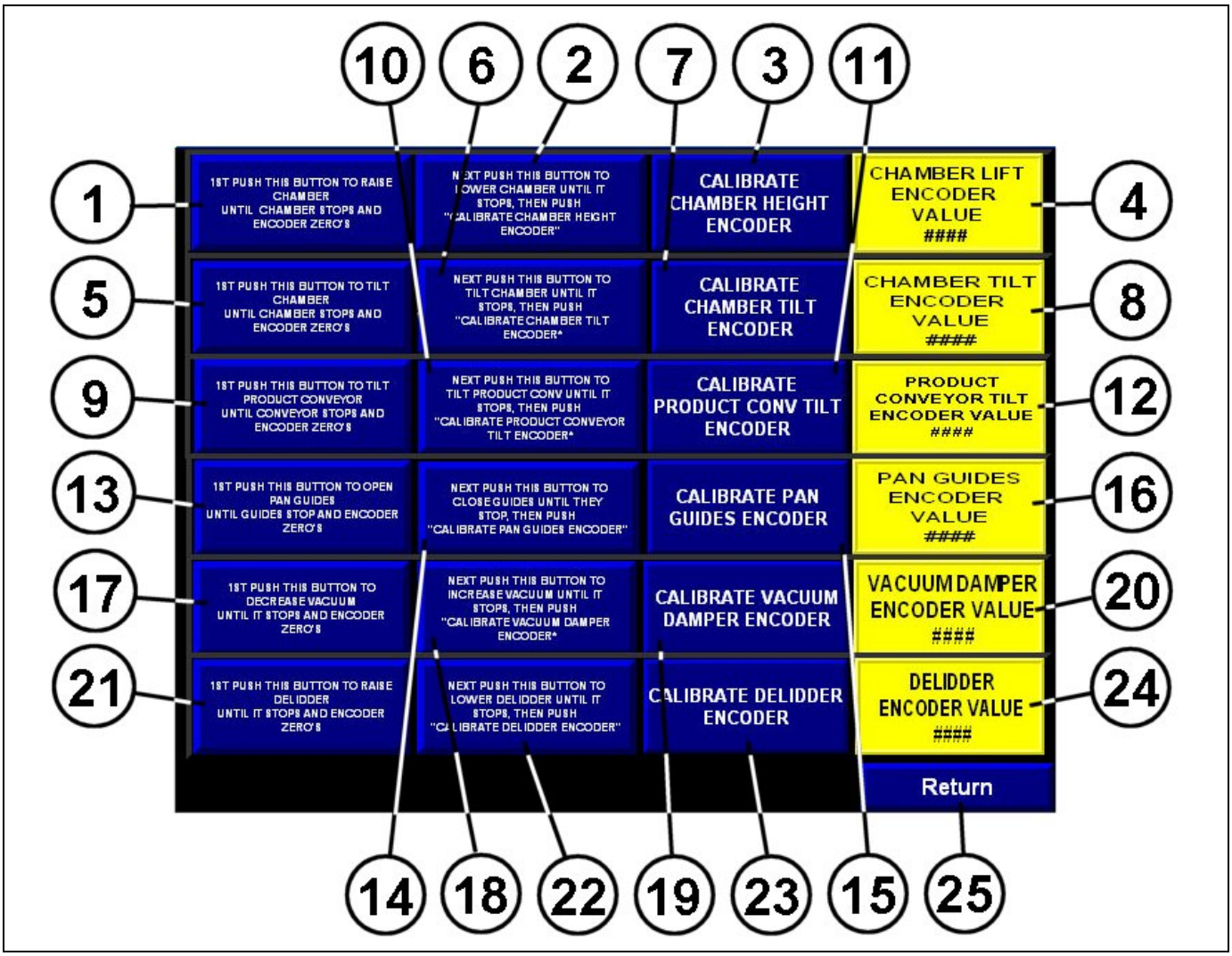
ITEM #	DESCRIPTION
1	Increases conveyor speed.
2	Decreases conveyor speed.
3	Moves pan guides in.
4	Moves pan guides out.
5	Raises vacuum chamber height.
6	Lowers vacuum chamber height.
7	Opens vacuum damper (increases vacuum). (Only if not equipped with auto vacuum option.)
8	Closes vacuum damper (decreases vacuum). (Only if not equipped with auto vacuum option.)
9	Tilts vacuum chamber back.
10	Tilts vacuum chamber forward.
11	Raises delidder conveyor (when so equipped).
12	Lowers delidder conveyor (when so equipped).
13	Increases product belt height.
14	Decreases product belt height.
15	Increases air jet blower speed.
16	Decreases air jet blower speed.
17	Enables bypass of downline run signal.
18	Enables bypass of pan jam alarm.
19	Enables bypass of product jam alarm.

20	Enables bypass of lid jam alarm (when so equipped).
21	Login.
22	Displays current recipe running.
23	Goes to vacuum settings screen. (Only available with auto vacuum option.)
24	Goes to main screen.
25	Goes to diagnostics screen.
26	Goes to timers & settings screen.
27	Goes to maintenance setup screen.
28	Goes to PM log screen.
29	Goes to recipe management screen.



MANUAL CONTROL 2 SCREEN

ITEM #	DESCRIPTION
1	Displays when vacuum chamber lift needs homed. (A power off condition will require this.)



AXIS CALIBRATION SCREEN

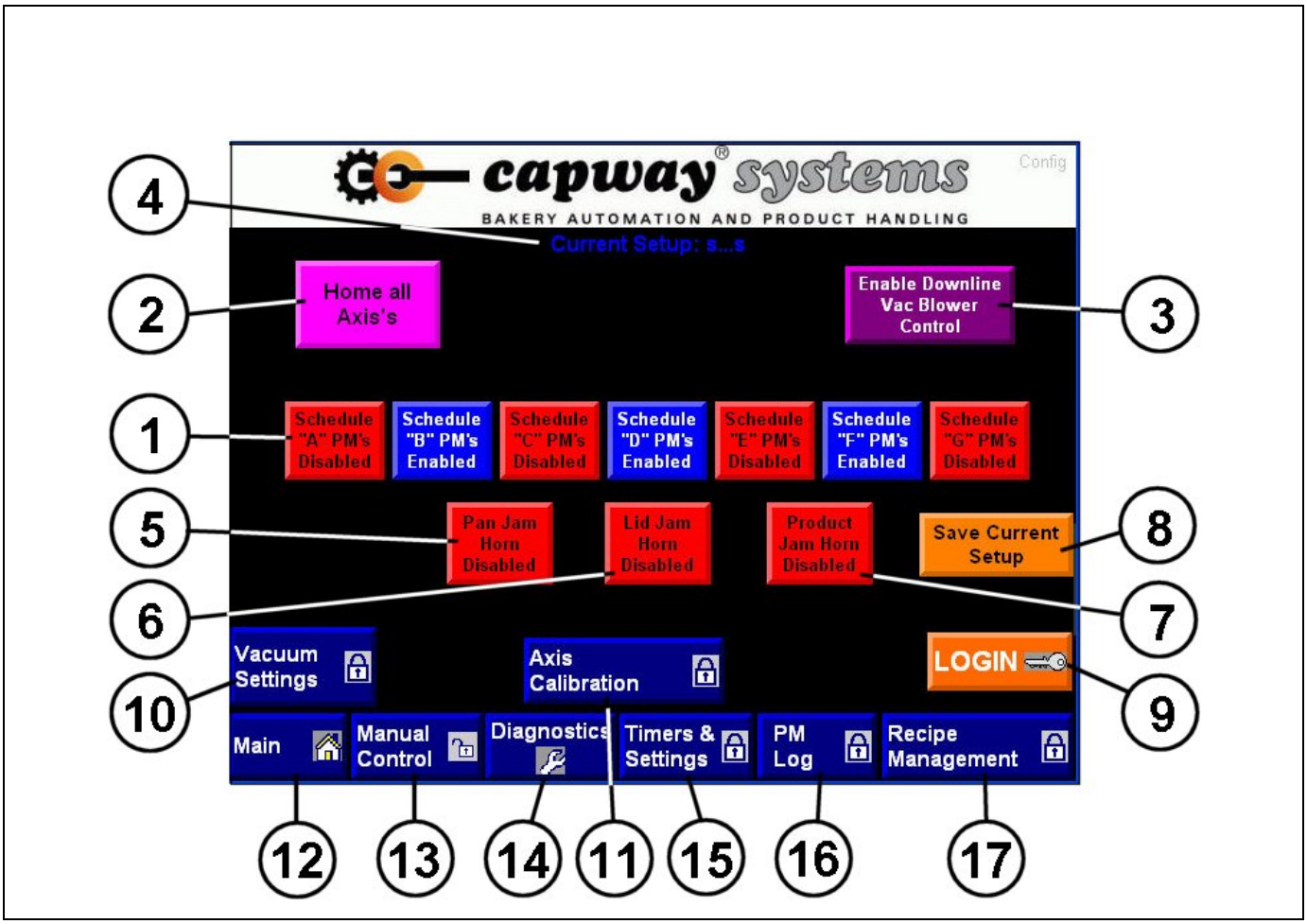
ITEM #	DESCRIPTION
1	Raises chamber lift until it stops and zeros encoder.
2	Lowers chamber lift until it stops.
3	Calibrates chamber lift height encoder.
4	Displays chamber lift height encoder value.
5	Tilts chamber forward until it stops and zeros encoder.
6	Tilts chamber backward until it stops.
7	Calibrates chamber tilt encoder.
8	Displays chamber tilt encoder value.
9	Raises product conveyor until it stops and zeros encoder.
10	Lowers product conveyor until it stops.
11	Calibrates product conveyor tilt encoder.
12	Displays product conveyor tilt encoder value.
13	Opens pan guides until they stop and zeros encoder.
14	Closes pan guides until they stop.
15	Calibrates pan guides encoder.
16	Displays pan guides encoder value.

17	Decreases vacuum until it stops and zeros encoder.
18	Increases vacuum until it stops.
19	Calibrates vacuum damper encoder.
20	Displays vacuum damper encoder value.
21	Raises delidder until it stops and zeros encoder (when so equipped).
22	Lowers delidder until it stops (when so equipped).
23	Calibrates delidder encoder (when so equipped).
24	Displays delidder encoder value (when so equipped).
25	Goes to main screen.

DIAGNOSTICS SCREEN

ITEM #	DESCRIPTION
1	Diagnostics for air jet sensors.
2	Diagnostics for vacuum chamber lift sensors.
3	Diagnostics for product conveyor and vacuum head tilt sensors.
4	Diagnostics for delidder lift sensors (when so equipped).
5	Diagnostics for pan guide sensors.
6	Diagnostics for vacuum damper sensors.
7	Indicates current off/on state of displayed item.
8	Goes to main screen.

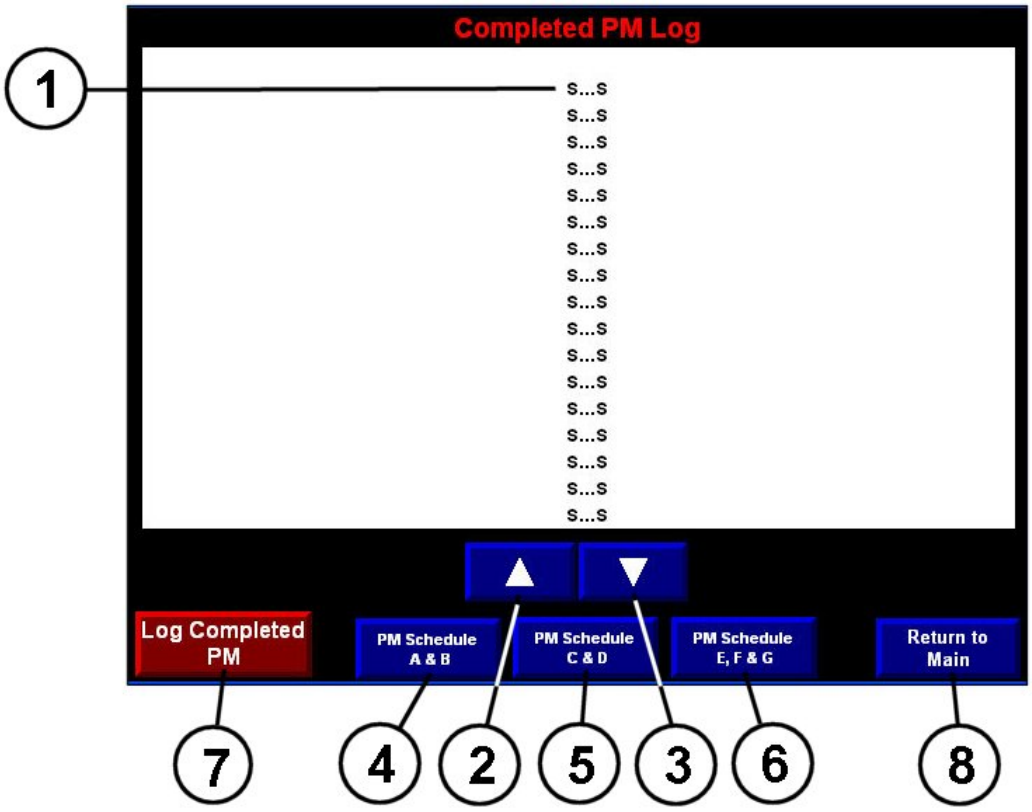
The calibration settings are factory shipped with a user name of “maint” and a password of “0004” for accessing the hidden screens (when applicable).



MAINTENANCE SETUP SCREEN

ITEM #	DESCRIPTION
1	Enables or disables PM schedules.
2	Homes all axis.
3	Enables downline control of vacuum blower.
4	Displays current recipe running.
5	Disables pan jam horn.
6	Disables lid jam horn.
7	Disables product jam horn.
8	Saves current setup.
9	Login.
10	Goes to vacuum settings screen. (Only available with auto vacuum option.)
11	Goes to axis calibration screen.
12	Goes to main screen.
13	Goes to manual control screen.
14	Goes to diagnostics screen.
15	Goes to timers & settings screen.
16	Goes to PM log screen.
17	Goes to recipe management screen.

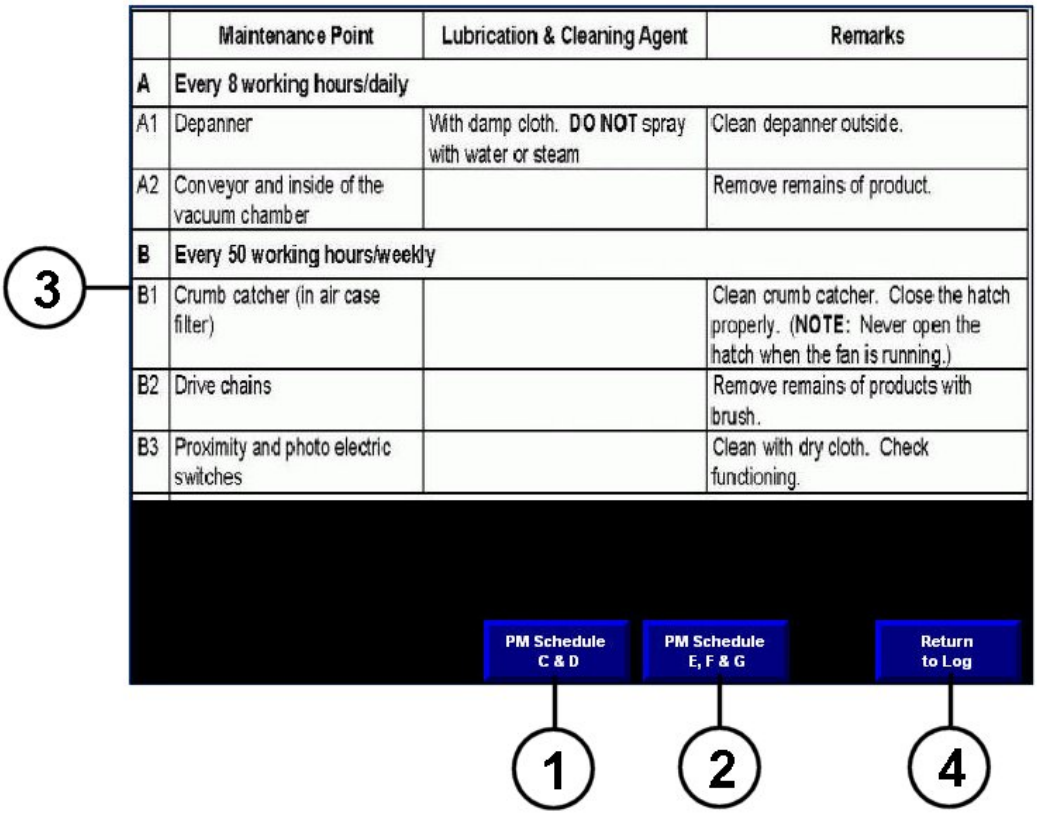
The calibration settings are factory shipped with a user name of “maint” and a password of “0004” for accessing the hidden screens (when applicable).



PM LOG SCREEN

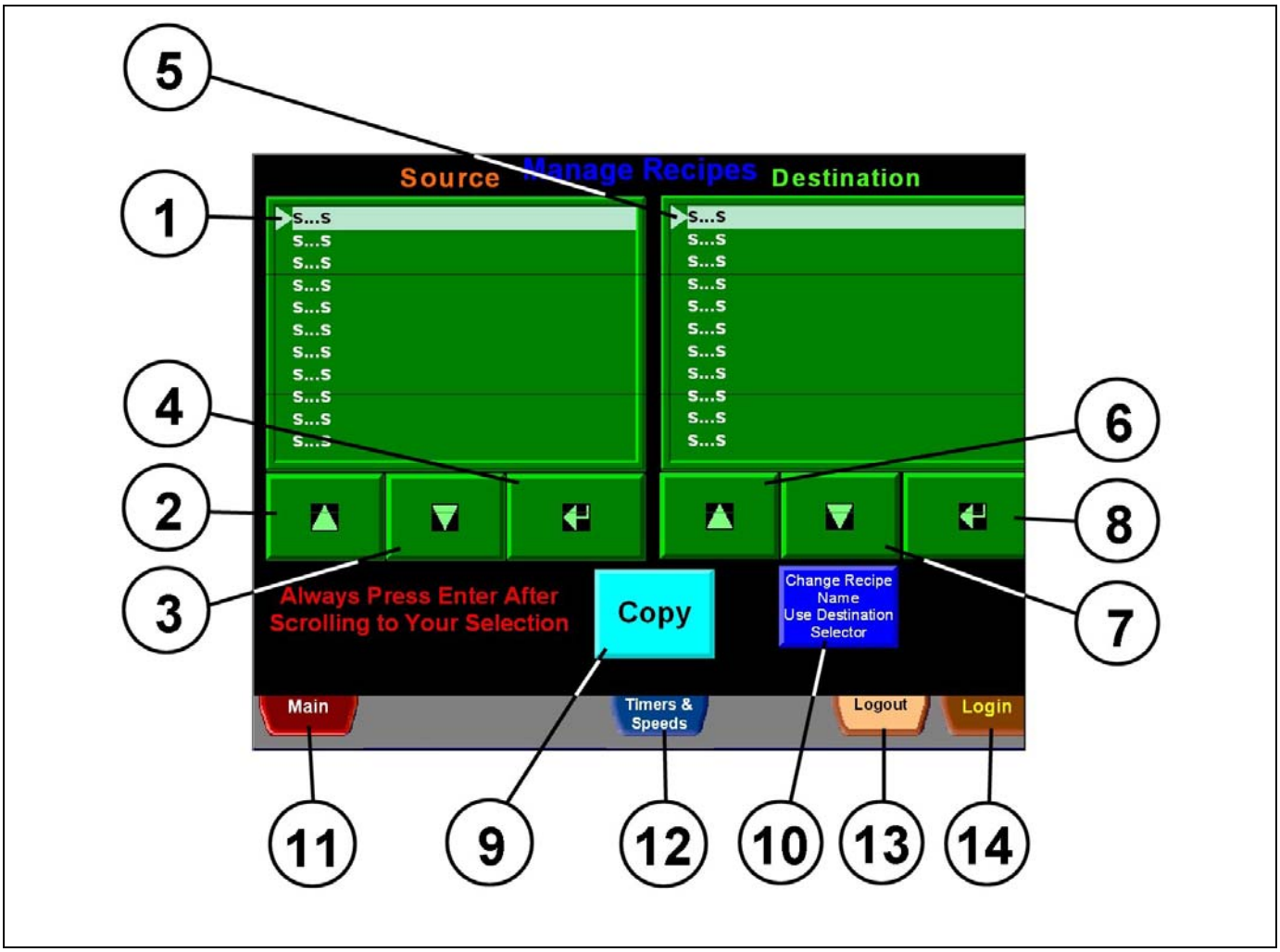
ITEM #	DESCRIPTION
1	Displays completed PM log.
2	Scroll up.
3	Scroll down.
4	Goes to PM A & B schedule description screen.
5	Goes to PM C & D schedule description screen.
6	Goes to PM E, F & G schedule description screen.
7	Logs completed PM.
8	Goes to main screen.

The calibration settings are factory shipped with a user name of “maint” and a password of “0004” for accessing the hidden screens (when applicable).



SAMPLE PM SCHEDULE SCREEN

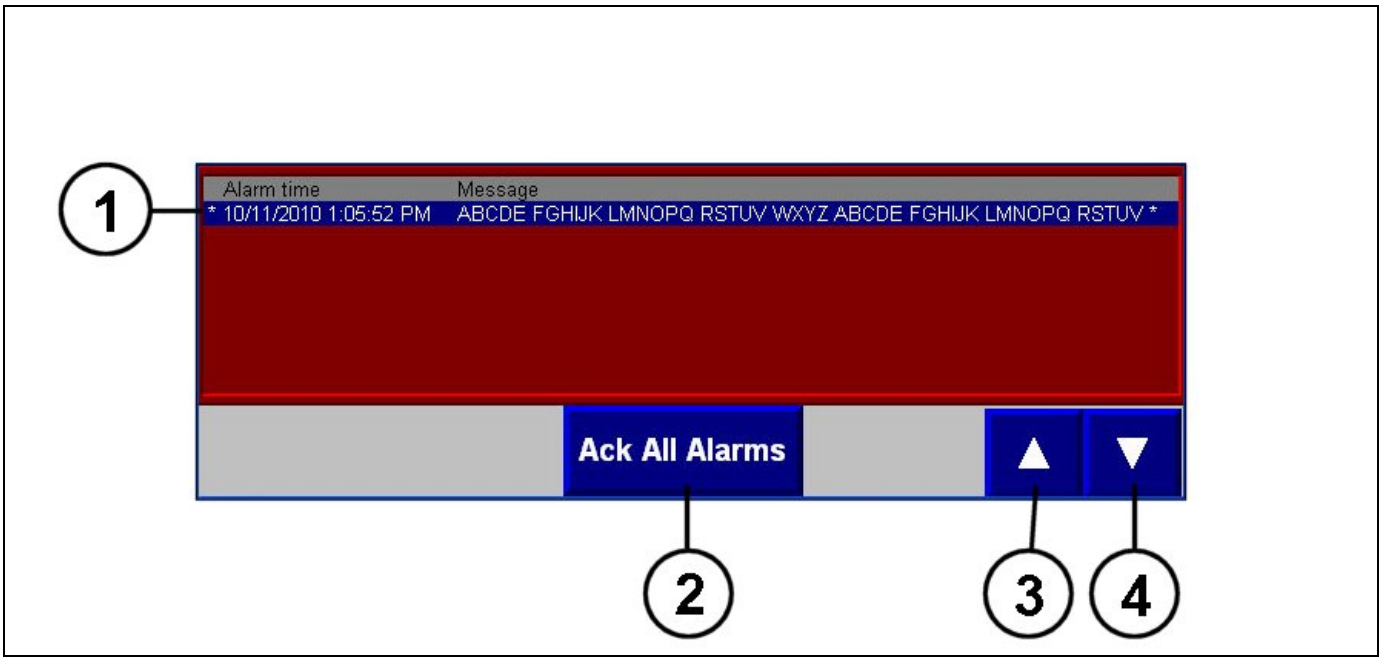
ITEM #	DESCRIPTION
1	Goes to PM C & D schedule screen.
2	Goes to PM E, F & G schedule screen.
3	Shows tasks for PM schedule that is due.
4	Goes to PM log screen.



RECIPE MANAGEMENT SCREEN

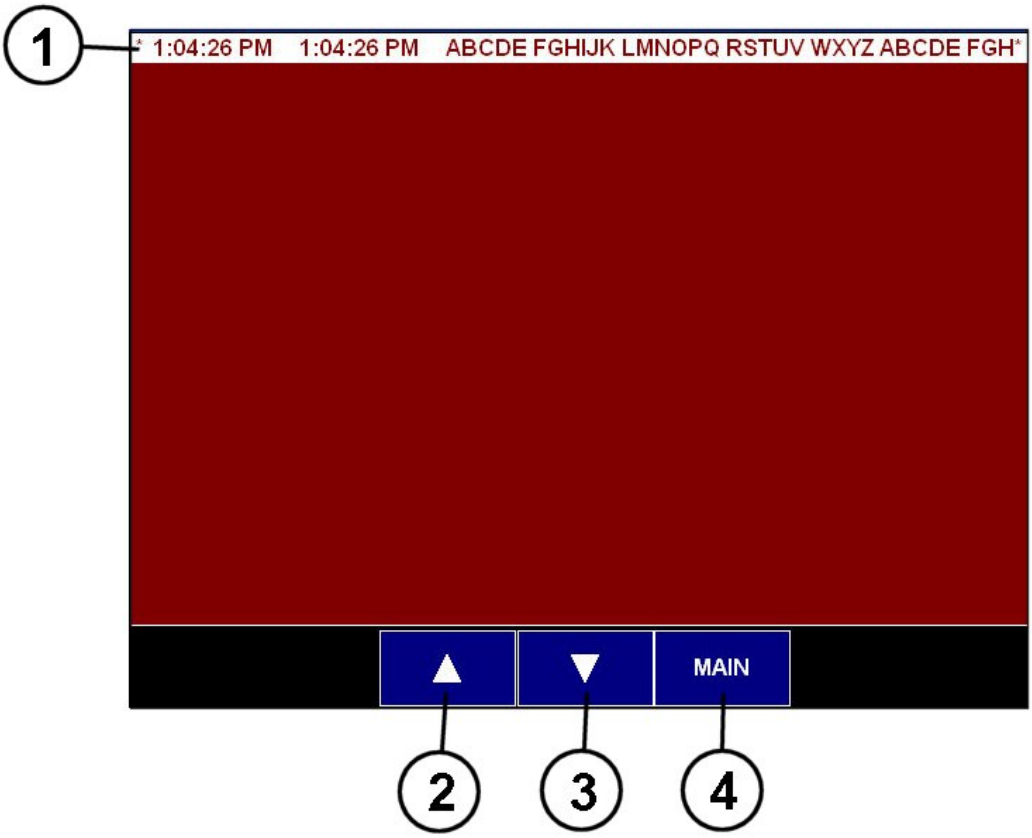
ITEM #	DESCRIPTION
1	Arrow pointer. (Selects recipe arrow is pointing to when hitting enter.)
2	Scroll up. (Arrow pointer only.)
3	Scroll down. (Arrow pointer only.)
4	Enter. (Selects recipe the arrow is pointing to.)
5	Displays destination current recipe. (Selects recipe the arrow is pointing to.)
6	Scroll up. (Arrow pointer only.)
7	Scroll down (Arrow pointer only.)
8	Enter. (Selects recipe the arrow is pointing to.)
9	Copy selected source selected recipe to destination selected recipe.
10	Change destination recipe name. (First select recipe to act upon.)
11	Goes to main screen.

To access this screen a user login is required.



ALARM SCREEN

ITEM #	DESCRIPTION
1	Displays unacknowledged alarm time and message for current alarms.
2	Acknowledges all unacknowledged alarms and closes pop-up window.
3	Scroll up.
4	Scroll down.



ALARM HISTORY SCREEN

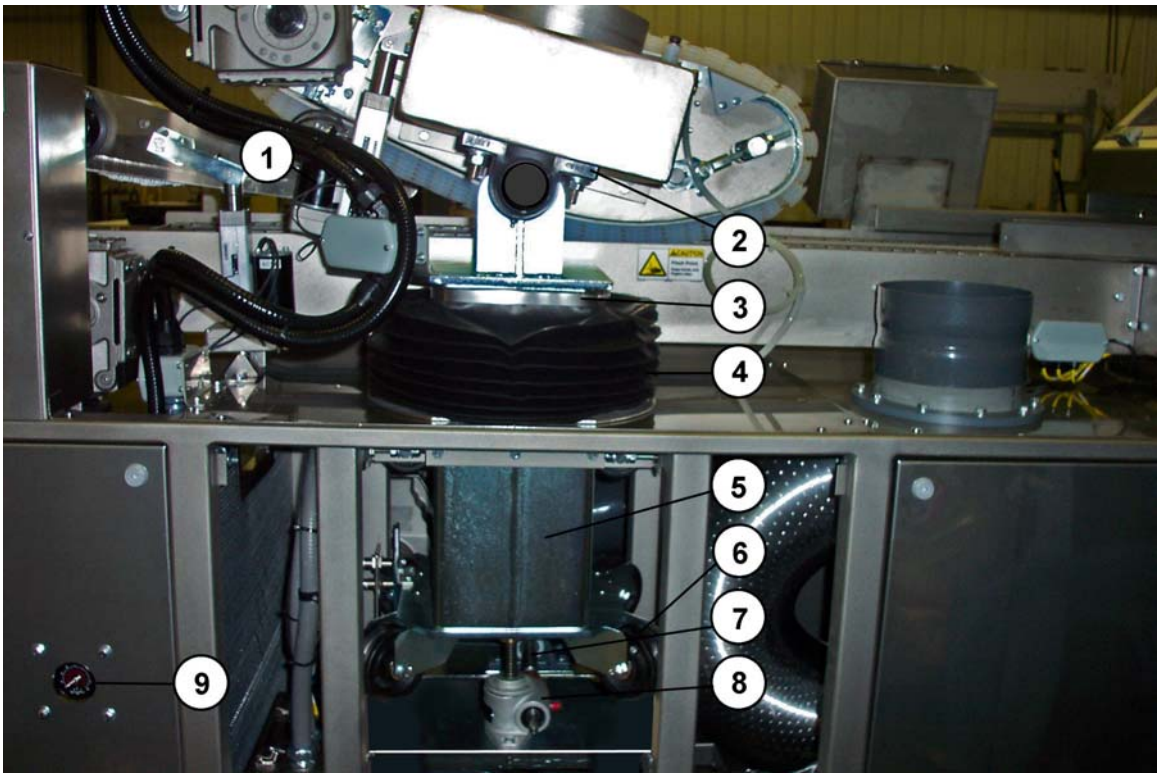
ITEM #	DESCRIPTION
1	Displays alarm time and message history.
2	Scroll up.
3	Scroll down.
4	Goes to main screen.

PARTS MANUAL

PARTS ORDER	
“DEPANNER” CAD-1-42-C	
ORDERING PARTS	We would like to help you by supplying parts quickly. We have therefore drawn up the following part identification drawings.
EXAMPLE FOR ORDERING PARTS	
THE FOLLOWING DETAILS ARE NECESSARY WHEN ORDERING PARTS.	
	ORDER#: E3281-401
	INSTALLATION:
	DESCRIPTION:
	DRAWING OR PART #:
	POS #:
	QUANTITY:
	CURRENT DATA:

LIFT AND TILT ASSEMBLY

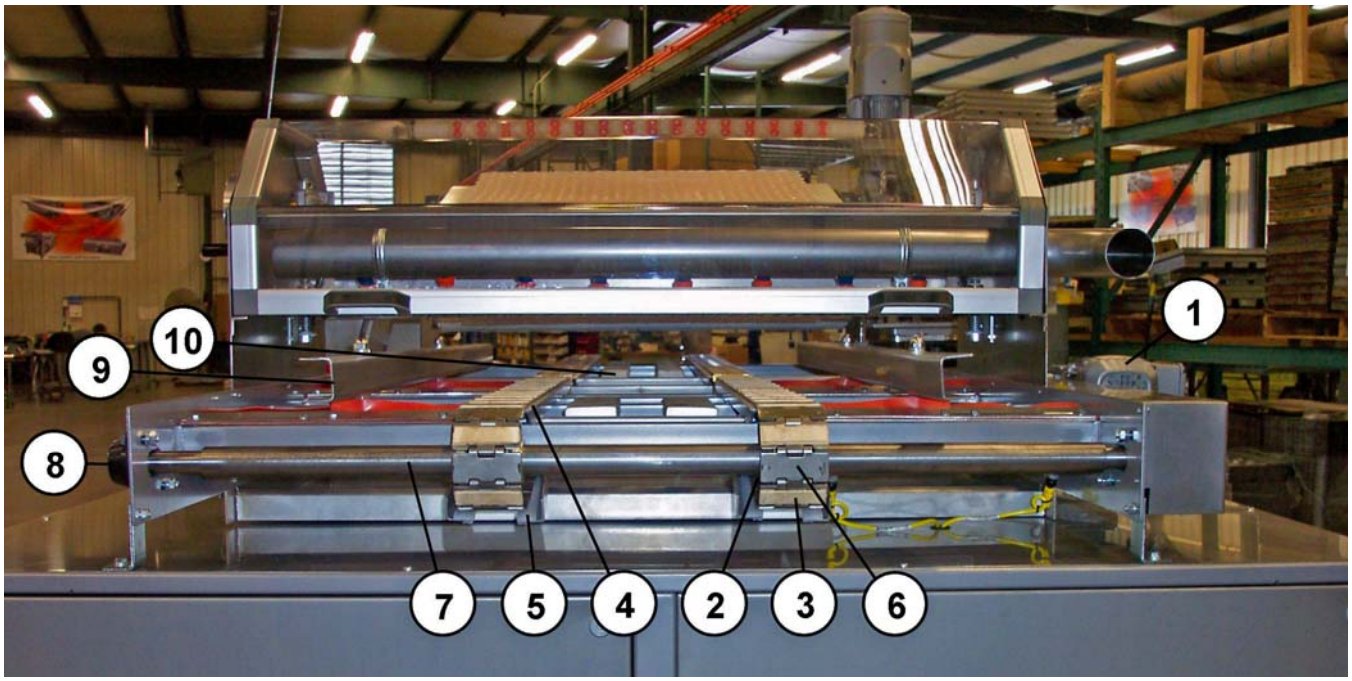
(DRAWING NUMBER D-400-2528-LHC)



POS	DESCRIPTION	PART/DRAWING NUMBER
1	ACTUATOR	OOD-ELEC-ACTR
2	PILLOW BLOCK BEARING	OO1-P030-PBPL 30 B.
3	HOSE CLAMP	OOD-5000-0004
4	BELLOWS BOOT	OOD-5000-0003
5	LIFT POST AUTO W/O HOLE	C-400-2401-1
6	V-GROOVE WHEEL	OOD-5000-0001
7	EXTENSION SHAFT	A-400-2407
8	ACME JACK SCREW	ODC-WJ51-ACME
9	FILTER REGULATOR W/GAGE	NA
	GEARMOTOR (NOT SHOWN)	SEE MOTOR SHEET

ROLL CONVEYOR

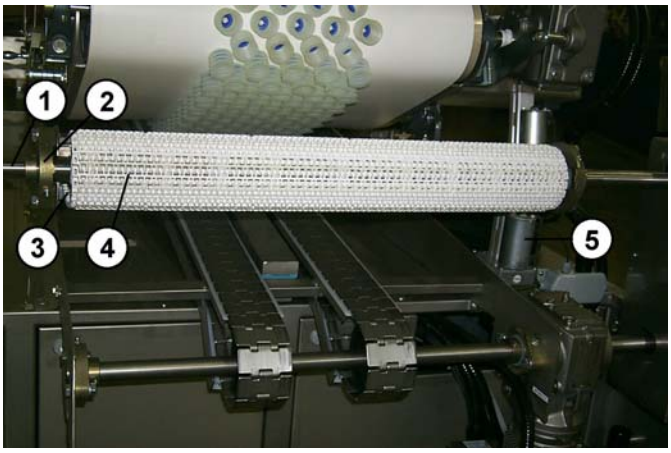
(DRAWING NUMBER D-400-4249-42)



POS	DESCRIPTION	PART/DRAWING NUMBER
1	MOTOR	SEE MOTOR SHEET
2	DRIVE/IDLER SPROCKET	OOT-0449-0193 19T, #815, 40 B.
3	TABLETOP CHAIN W/VUL. TOP	OOT-0SSE-0815
4	TOP WEARSTRIP	OOT-4320-0011
5	BOTTOM WEARSTRIP	OOT-4320-0010
6	TABLETOP CHAIN	OTC-1815-0325
7	DRIVE SHAFT MODEL 2000	C-400-3200-42
8	FLANGE BEARING	OO1-P030-2FPL 30 B.
9	AUTO GUIDE ASSEMBLY	D-400-2626-42
10	MAGNETS	OOD-2331-0000 (31.5”), OOA-1502-0275 (275)

PRODUCT DISCHARGE CONVEYOR

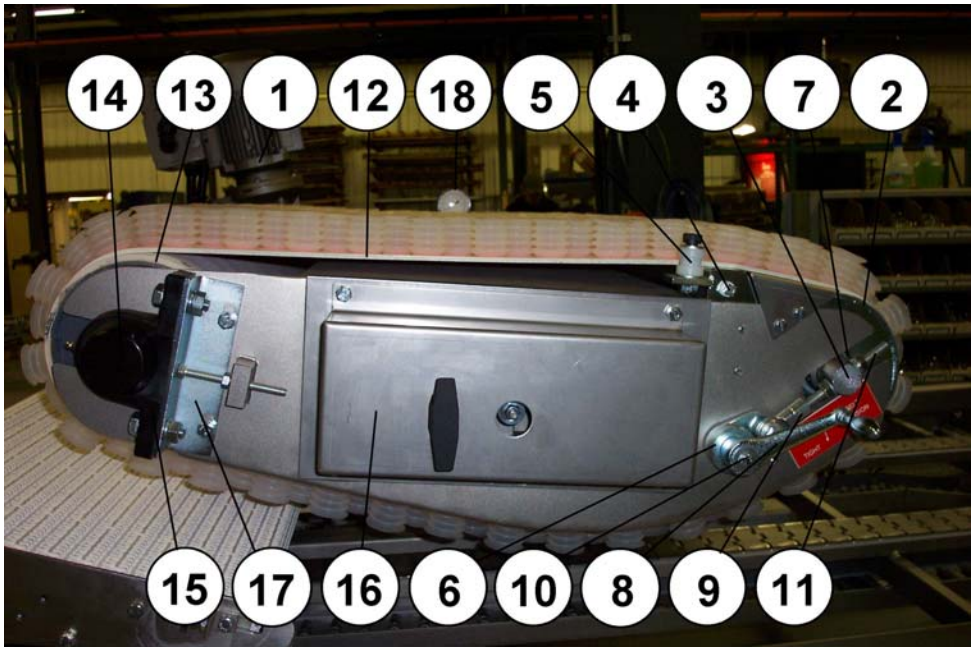
(DRAWING NUMBER C-400-2517-42)



POS	DESCRIPTION	PART/DRAWING NUMBER
1	DRIVE SHAFT	C-400-3190-42
2	FLANGE BEARING	40 B.
3	INTRALOX SPROCKET	INT-INLX-15SB 20T, 1.5” SQ. BORE 1100
4	INTRALOX FLUSH GRID FRICTION TOP	48” WIDE, SERIES 1100
5	ACTUATOR	ODC-ELEC-ACTR
6	PIVOT ARM	A-400-2415
7	IDLER ROLLER	OOD-4002-7591
8	TAKE-UP ANGLE	A-400-2421-2
9	NOSE BAR	A-400-2501-42
	DRIVE SPROCKET (NOT SHOWN)	SEE MOTOR SHEET

VACUUM CHAMBER ASSEMBLY

(DRAWING NUMBER D-400-2548-42)



POS	DESCRIPTION	PART/DRAWING NUMBER
1	MOTOR	SEE MOTOR SHEET
2	TAIL PULLEY	B-400-2540-42
3	TAIL SHAFT	A-400-0453-42
4	BELT IDLER W/O CUP CLEANER	B-400-0234-42
5	GUIDE ROLLER	OOD-4502-0000
6	FLANGE BUSHING	OO1-SF32-4012 1” B.
7	RADIAL BEARING	OO1-0012-0000 30 B.
8	CRANK HANDLE	O28-1000-0006
9	PIVOT ARM	OOD-4000-4551
10	PIVOT SHAFT	B-400-0456-42
11	ADJUSTABLE SCREW	OOD-4000-4571
12	VACUUM BELTS	A-400-1090, A-400-1298
13	VACUUM CHAMBER DRIVE PULLEY	B-400-2530-42
14	DRIVE SHAFT KA37	B-400-2432-42
15	PILLOW BLOCK BEARING	OO1-P030-PBPL 30 B.
16	PRESSURE RELIEF VALVE	OOD-4000-8210
17	DRIVE PULLEY ADJUSTMENT BRACKET	OOD-4000-2409
18	2 1/2” DIA VACUUM GAUGE	OOD-3508-0000
	AIR CONTROL	NA

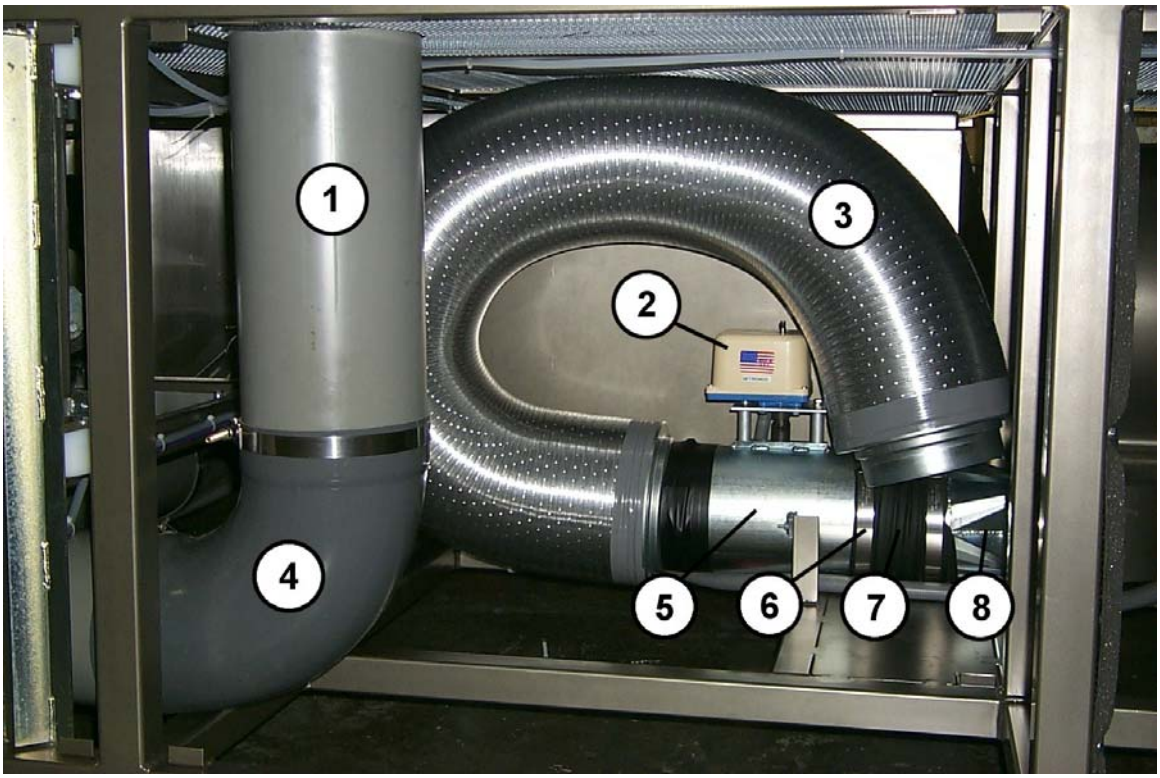
PRESSURE RELIEF VALVE

(DRAWING NUMBER B-400-0821)

POS	DESCRIPTION	PART/DRAWING NUMBER
	PRESSURE RELIEF VALVE	OOD-4000-8210
1	SELF-ADHESIVE GASKET	OO9-1000-1262
2	SPRING	OOD-4000-0012
3	PAWL LATCH	O27-1000-0008

VACUUM DUCTS

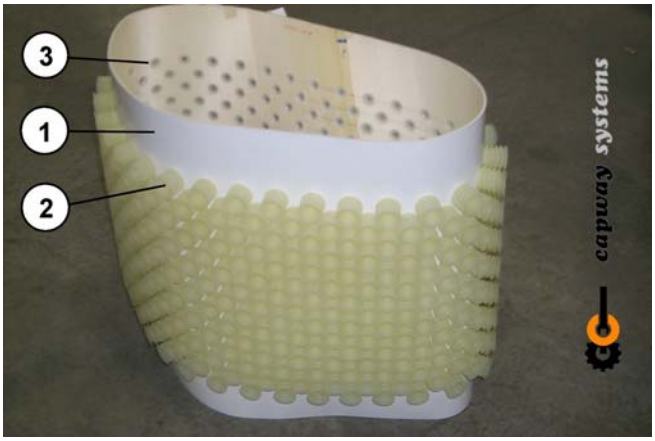
(DRAWING NUMBER D-400-0936)



POS	DESCRIPTION	PART/DRAWING NUMBER
1	STRAIGHT PIPE, PVC 200 mm	OOD-4359-0200
2	ELECTRIC ACTUATOR	ODC-ELEC-ACTR
3	AIR DUCT (SILVER)	OOD-3814-0000
4	90° ELBOW, PVC 200 mm	OOD-3821-0000
5	VACUUM DAMPER VALVE ASSEMBLY	OOD-4000-2446
6	HOSE CLAMP	ODC-5000-C511
7	FLEXHAUST HOSE (BLACK)	ODC-FLEX-0008
8	TRANSITION	OOD-3815-0000

VACUUM BELTS, CUPS & RETAINERS

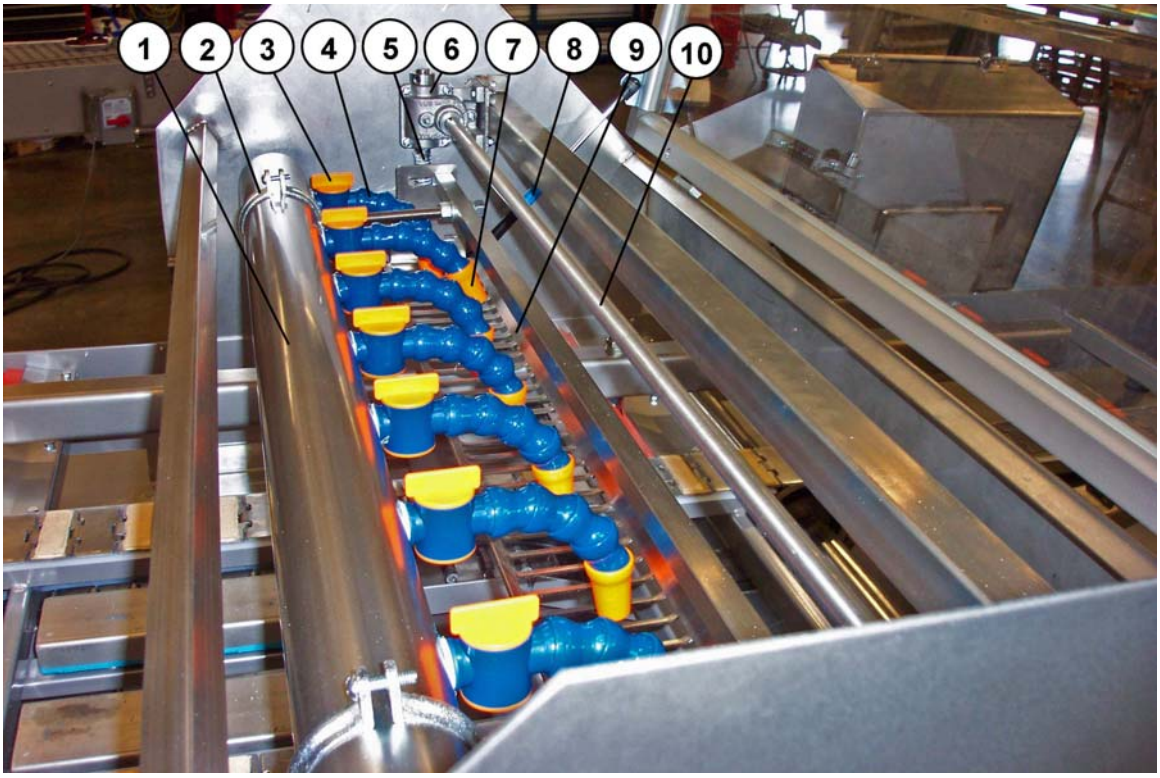
(DRAWING NUMBERS A-400-1090, A-400-1298)



POS	DESCRIPTION	PART/DRAWING NUMBER
	A-400-1090	
1	VACUUM BELT	#3M1604 1110W x 1860L 961 HOLES
2	VACUUM CUP	ODC-3514-PBMD 40 MM DIA. SOFT METAL DETECTABLE
3	RETAINER	ODC-3513-1005 3/8" SQ. BORE METAL DETECTABLE
	A-400-1298	
1	VACUUM BELT	#3M1604 1110W x 1860L 465 HOLES
2	VACUUM CUP	ODC-3514-PBMD 40 MM DIA. SOFT METAL DETECTABLE
3	RETAINER	ODC-3513-1005 3/8" SQ. BORE METAL DETECTABLE

SEED CONTAINMENT UNIT w/AIR JETS

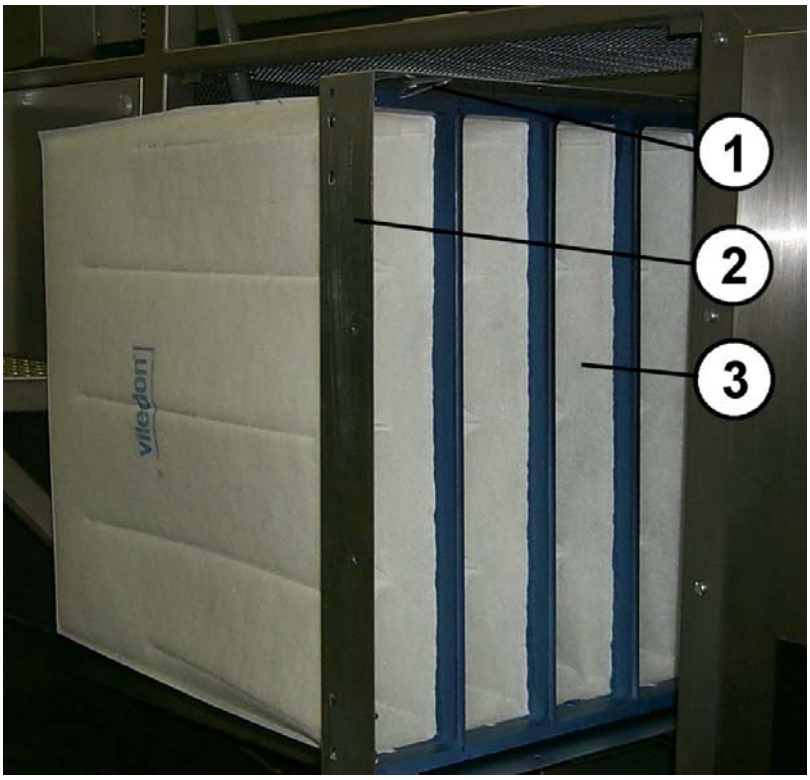
(DRAWING NUMBER D-400-4268-42)



POS	DESCRIPTION	PART/DRAWING NUMBER
1	AIR NOZZLE TUBE WELDMENT	B-400-4297L-42
2	2 PIECE TUBE CLAMP W/HANGER	#5661K14 McMASTER-CARR
3	VALVE	3/4” MALE NPT #69556 LOC-LINE
4	HOSE SEGMENT	3/4” LOC-LINE
5	ADJUSTING ROD	A-400-2376
6	FLOAT-A-SHAFT MOUNT	B-400-4237-42
7	NOZZLE	3/4” ROUND LOC-LINE
8	GAS SPRINGS	ODC-FTGS-1220
9	HOLD DOWN GRILL	B-400-2997-42
10	HANDWHEEL SHAFT	B-400-2375-42
	REDUCING DISCHARGE FITTING (NOT SHOWN)	4” X 3”
	FOOD GRADE DISCHARGE HOSE (CLEAR) (NOT SHOWN)	3” X 6” LG FLX-THANE LD
	CENTRIFUGAL BLOWER (NOT SHOWN)	MODEL JET-1 5 HP, 460 V – 3 PH – 60 HZ JETAIR TECH., LLC

FILTER ASSEMBLY

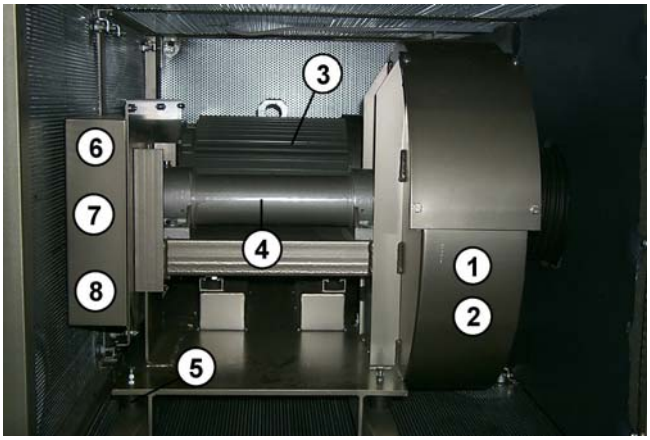
(DRAWING NUMBER D-400-0936)

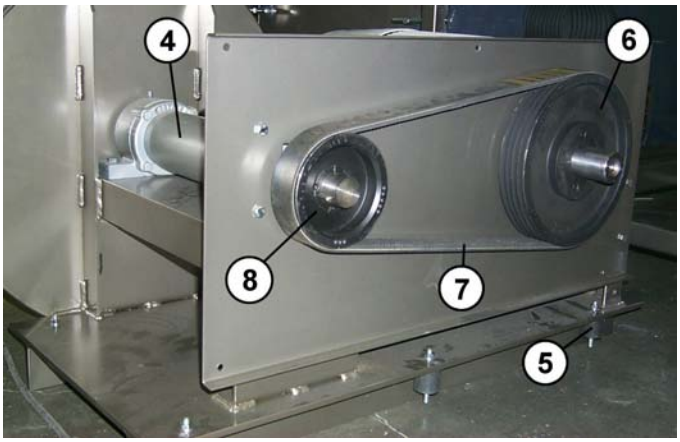


POS	DESCRIPTION	PART/DRAWING NUMBER
1	FILTER CLIP	OOD-3811-0001
2	FILTER FRAME	OOD-3812-0000
3	FILTER	OOD-3811-0000

BLOWER ASSEMBLY

(DRAWING NUMBER D-400-2050-3)





POS	DESCRIPTION	PART/DRAWING NUMBER
1	BLOWER WELDMENT	OOD-4000-000L
2	FAN WHEEL (INSIDE GUARD)	OOD-4000-0001
3	MOTOR	25 HP, 284TS, 480 V – 3 PH – 60 HZ LINCOLN
4	BLOWER SHAFT ASSEMBLY #BLV40	OOD-4000-BLV4
5	VIBRATION DAMPER	OOD-4000-0005
6	TAPERLOCK SHEAVE MOTOR (INSIDE GUARD)	OOD-0003-V690
7	TORQUE TEAM V-BELT (INSIDE GUARD)	ODC-VBLT-0560
8	TAPERLOCK SHEAVE BLOWER (INSIDE GUARD)	OOD-0003-V450

CYCLONE SEPARATOR

(DRAWING NUMBER C-400-0567-1)

POS	DESCRIPTION	PART/DRAWING NUMBER
1	DUSTKOP CYCLONE ONLY ASSEMBLY (BEHIND PANELS)	ODC-DEPA-CYCL #203S-D1-SP
2	55 GALLON DRUM	#4115T13 McMASTER CARR
3	BARREL LID RING	B-400-2079